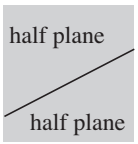
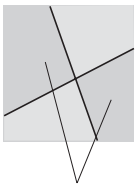
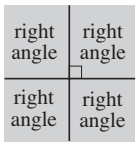
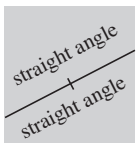
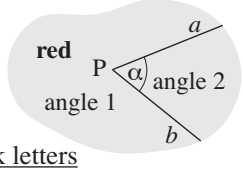
Bk5

R: Compass directions
C: Angles. Comparison (right angles, straight angles)
E: Clockwise and anti-clockwise turns

Lesson Plan 65

Activity		*Notes*
1	**Angles 1** Ps each have 3 sheets of paper on desks. T has large sheet for demonstration. a) Imagine that your sheet of paper is an endless plane (flat shape) and extends to <u>infinity</u> in all directions. (Revise what infinity means if necessary.) Fold it into two parts like this. (T demonstrates an unequal fold.) Then unfold it. How many parts of the plane are there? (2) What do we call these parts? (<u>half planes</u>) What do they have in common? (They share the points on the fold line.) b) Now take another sheet and fold it twice like this. (T demonstrates 2 unequal folds.) Now unfold it. What can you tell me about the plane now? (divided into 4 parts; <u>opposite</u> parts equal or <u>congruent</u> [not on limit of the sheet, but on imagined endless plane]; <u>adjacent</u> parts share points on fold lines) We call each part of the plane an <u>angle</u> and we can say that the <u>opposite angles</u> are equal. There are 2 pairs of opposite angles. c) Take the 3rd sheet and fold it twice so that the opposite edges meet exactly like this.(T demonstrates) Then unfold it. What can you tell me about the plane? (Divided into 4 congruent (equal) parts, so forms 4 equal angles. What can you tell me about the angles? (They have square corners, so they are <u>right angles.</u>) T asks Ps to hold up the first sheets that Ps folded. [in a)] We call these two half planes angles too. If we mark a point on the fold line and think of the fold line as being 2 rays which start at the point and extend endlessly in opposite directions, what kind of angle do you think that they form? (<u>straight angle</u>) (T tells its name if Ps cannot guess it.) A straight angle forms a straight line. *5 min*	Whole class activity T demonstrates and explains the new concepts, involving Ps as much as possible. e.g.   opposite <u>angles</u>   Praising
2	***Book 5, page 65*** Q.1 Read: *Imagine that this shape continues in any direction wthout ending, so it represents a plane.* *The rays a and b are drawn from the same starting point, P. We call the two parts of the plane angles. We call the measure of them an angle too.* *Mark in red the angle which is greater than the other.* Allow half a minute for Ps to decide and colour, then review with whole class. **A**, come and show us which angle you think is greater. Who agrees? etc. (In case of disagreement, or as a check, T has enlarged copy of shape, cuts out the 2 angles and lays one on top of the other) If we want to talk about this angle (T points to smaller angle), we can say that it has vertex P and its sides are the rays *a* and *b*. But so has the other angle, so we mark the angle we want by drawing an arc like this. T draws on BB and Ps copy in *Pbs*. We label the angle with a letter and somtimes use small Greek letters like these. T says each letter and writes it on BB. Ps repeat it in unison and write it in *Ex. Bks*. Ps choose a letter to label the angle. Who has seen any of them before? Where? *10 min*	Individual work, monitored Drawn on BB or use enlarged copy master or OHP Agreement, confirmation by comparison, correction, praising Whole class explanation of how to mark and lablel angles BB:  <u>Greek letters</u> α (alpha), β (beta), γ (gamma), δ (delta), ε (epsilon), ϕ (phi) etc.

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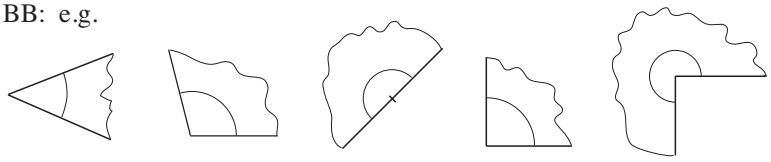
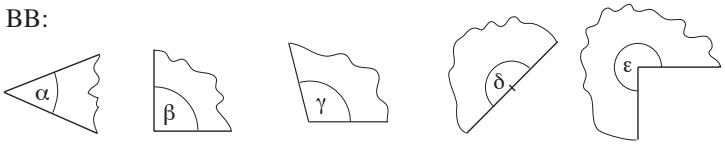
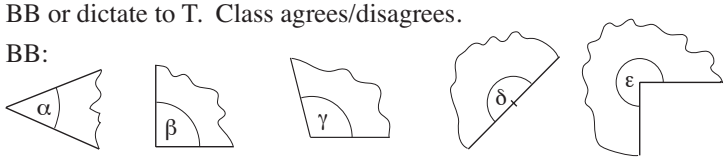
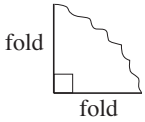
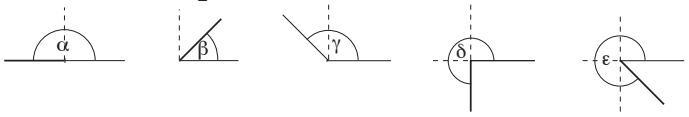
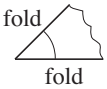
Lesson Plan 65

Activity		*Notes*
3	**Angles 2** T sticks different sizes of cut-out angles on BB. (Use different colours.) BB: e.g. 	Whole class activity (Or use copy master, enlarged, cut out and stuck on BB)
	a) Let's put them in increasing order of size. Ps come to BB to rearrange the angles by eye. Class agrees/disagrees. If disagreement, Ps lay one on top of the other to cofirm. Let's label them with Greek letters. T labels the angles with Ps help. BB: 	At a good pace Agreement, checking, praising T points to an angle and Ps say the name of the Greek letter.
	b) T (Ps) folds a sheet of paper once, then again with the folded edges meeting exactly. What kind of angle have we made? (right angle) Let's compare the angles on the BB with a right angle. Ps come to BB to say what they think by eye first, then to confirm with their right angle template. Who can write it mathematically? Ps come to BB or dictate to T. Class agrees/disagrees. BB:  α < 1 r.a. β = 1 r.a. 1 r.a. < γ < 2 r.a. δ = 2 r.a. ε = 3 r.a.	Ps make own right angle templates too using one of the sheets in *Activity 1*.  T suggests using 'r.a.' for 'right angle' to save time. Agreement, checking, praising
	15 min	
4	***Book 5, page 65*** Q.2 Read: *Draw these angles. (r.a. means 'right angle')* Ps use a ruler and their right angle template to measure the angles and compasses to mark them with arcs. Ask Ps to label them too. Set a time limit. (Do not insist on exact measurements yet.) Review at BB with whole class. Ps come to BB or T could have solution already prepared and Ps compare their own angles against it. Mistakes discussed and corrected. *Solution:* α = 2 r. a. $\beta = \frac{1}{2}$ r. a. γ = 1.5 r. a. δ = 3 r. a. ε = 3.5 r. a. 	Individual work, monitored, helped, corrected Drawn on BB or use enlarged copy master or OHP Discussion, agreement, checking, self-correction, praising (The right angle template can be folded in half to measure half a right angle.) $\frac{1}{2}$ r. a. 
	20 min	

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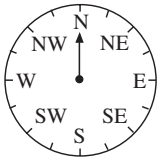
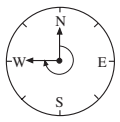
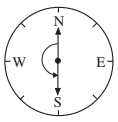
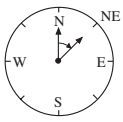
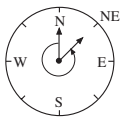
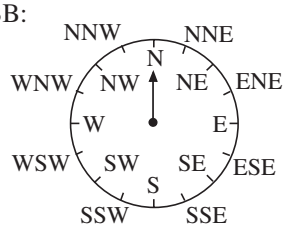
Activity		*Notes*
5	**Compass directions** T has a large compass to show to class. Who knows what this is? (compass) What is it used for? (Showing directions). Let's see if you can remember the compass directions. T draws/sticks a large circle on BB and Ps point come to BB to point to a compass point, say its name and label it (N, NE, E, SE, S, SW, W, NW) Class agrees/disagrees. Let's make sure sure that you know them! Who can use the compass to show in which direction North is? How did you do it? P explains, with T's help, about the magnetic needle always pointing towards North, whichever direction you are facing. (T could stick a large 'N' on correct part of classroom wall to help less able Ps.) Everyone stand up and face North! T covers up the compass digram on the BB and gives instructions on how Ps should <u>rotate</u> (turn). • From North, turn to face East (South, West, North-East, etc.) . . . now! • From North, turn by half a right angle to the left. Where are you facing? (NW) etc. • From North, turn by 1 right angle clockwise. Where are you facing? (East), etc. (Revise clockwise and anti-clockwise rotations if Ps have forgotten what they mean.) *24 min*	Whole class activity Drawn on BB or use enlarged copy master or OHP BB:  Ps come to front of class to point the compass in different directions to confirm it. In unison In good humour, at speed. Ps can give instructions too. Feedback for T
6	***Book 5, page 65*** Q.3 Read: *Start at the compass direction North and draw the rotations asked for.* Ps use their rulers to draw the lines. Ask Ps to label any compass direction not already given in diagrams. Set a time limit. Review at BB with whole class. Ps come to BB to draw the rotations. Class agrees/disagrees. Mistakes discussed and corrected. Who can describe a <u>different</u> turn that starts at North but ends up in the same direction? [e.g. a) 1 right angle anti-clockwise] *Solution:* a)  3 right angles clockwise b)  2 right angles anti-clockwise c)  half a right angle clockwise d)  3 and a half right angles anti-clockwise	Individual work, monitored, helped Drawn on BB or use enlarged copy master or OHP Discussion, reasoning, agreement, self-correction, praising Extra praising
Extension	Everyone stand up! From North, turn by 1 and a quarter right angles clockwise. In which direction are you facing? (ESE) Where would it be on the compass diagram? Deal with NNE, ENE, SSE, SSW, etc. in the same way. Ps could draw compass diagram and direction in *Ex. Bks*. *30 min*	BB: 

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Activity		*Notes*
7	**Rotations on a clock** T has large real or model clock and Ps have own models too. a) i) T sets the large clock and Ps say the time it shows in different ways. (e.g. 14:15, 2.15 pm, a quarter past 2, etc.) Ps can set some times too. ii) Set your clock to 6:25 (a quarter to 10, 5 past 3, 20:40, 8.40 pm, 8.40 am, etc.) Ps show their clocks on command. Ps can say some times too. b) Let's look just at the minute hand. Through how many right angles does it turn if it moves: from 12 to 4 ($1\frac{1}{3}$ r.a.); from 2 to 8 (2 r.a.) [= 1 straight angle]; etc. Who can describe the rotation in minutes? (e.g. 12 to 4: the hand moves 20 minutes clockwise) *35 min*	Whole class activity Quick revision of how to tell the time on a clock. Agreement, praising In unison Agreement, praising Feedback for T Ps could write the number of right angles on slates and show in unison on command. In good humour! Feedback for T
8 **Extension**	***Book 5, page 65*** Q.4 Read: *Write down the angle formed by the arms of the clock in right angles.* Use r.a. for 'right angles' to save time. Set a time limit. Review at BB with whole class. Ps could show on slates or scrap paper on command, or Ps come to BB or dictate to T. Class agrees/disagrees. If disagreement, check with right angle template. Mistakes discussed and corrected. How many right angles are needed to complete the whole rotation? Ps write it as an addition on BB. (see opposite) *Solution:* a) 3 r.a. b) $\frac{2}{3}$ r.a. c) $2\frac{1}{3}$ r.a. d) $3\frac{2}{3}$ r.a. Express each rotation in straight angles (i.e. 2 right angles) a) $1\frac{1}{2}$ s.a. b) $\frac{1}{3}$ s.a. c) $1\frac{1}{6}$ s.a d) $1\frac{5}{6}$ s.a. *40 min*	Individual work, monitored, helped Drawn on BB or use enlarged copy master or OHP Discussion, agreement, self-correction, praising Elicit that there are 4 right angles in a whole rotation. BB: a) $3 + 1 = 4$ (r.a.) b) $\frac{2}{3} + (3 + \frac{1}{3}) = 4$ (r.a.). etc. Extra praise if Ps realise that the number of straight angles is half the number of right angles.
9	***Book 5, page 65*** Q.5 Read: *In your exercise book, draw a quadrilateral (if it is possible) which has:* *a) only one right angle* *b) two adjacent right angles and two angles which are not right angles* *c) exactly 3 right angles* *d) 4 right angles.* Deal with one part at a time or set a time limit. Ps come to BB to draw their shapes and describe them. Who agrees? Who drew another shape? etc. Mistakes corrected. *45 min*	Individual work, monitored, helped Discussion, agreement, self-correction, praising *Solution:* e.g. a) b) (trapeziums) c) Impossible d) or (rectangles)

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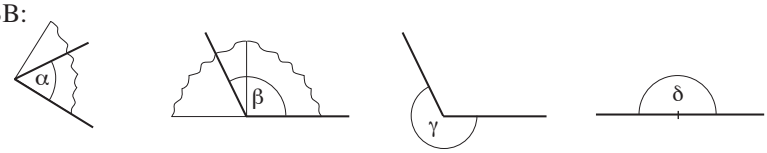
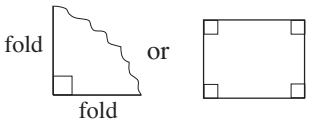
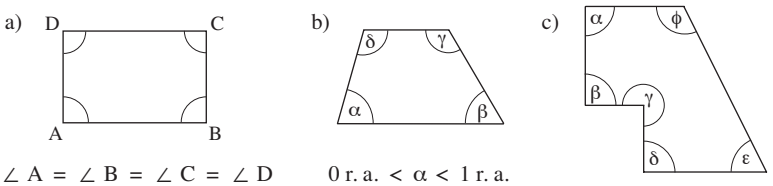
R: Calculation
C: Measurement of angles in degrees with a protractor
E: Drawing angles with a protractor

Lesson Plan 66

Activity		*Notes*
1	**Measuring angles with right angles** Let's compare these angles with a right angle. Ps come to BB to lay a right angle template (or the corner of a rectangle or square) over the angle (with T's help) and say and write an equation or inequality. Class points out errors. T reminds Ps how the Greek letters are pronounced. BB:  $0 < \alpha < 1$ r. a. $\quad 1$ r. a. $< \beta < 2$ r. a. $\quad 2$ r. a. $< \gamma < 3$ r. a. $\quad \delta = 2$ r. a. *5 min*	Whole class activity Drawn on BB or SB or OHT Measuring tools:  Agreement, praising Feedback for T
2	**Measuring angles in polygons** Let's compare the angles in these polygons with a right angle. Ps come to BB to measure the angles as in *Activity 1*. T helps them to write an equation or inequality (or class dictates what P should write). BB:  $\angle A = \angle B = \angle C = \angle D = 1$ r. a. [$\angle A$ means the marked angle with vertex A] 0 r. a. $< \alpha < 1$ r. a. 0 r. a. $< \beta < 1$ r. a. 1 r. a. $< \gamma < 2$ r. a. 1 r. a. $< \delta < 2$ r. a. $\alpha = \beta = \delta = 1$ r. a. $\gamma = 3$ r. a. 0 r. a. $< \varepsilon < 1$ r. a. 1 r. a. $< \phi < 2$ r. a. Do you think that this is a good way to measure angles? (It's a very rough measure.) How could we improve it? (e.g. Use half, quarter, third, etc. of a right angle as the unit of measure) *10 min*	Whole class activity Drawn on BB or use enlarged copy master or OHP Ps use right angle template or square corner. Agreement, praising T could have names of Greek letters written on BB: α: alpha $\quad \beta$: beta γ: gamma $\quad \delta$: delta ε: epsilom $\quad \phi$: phi Discussion, agreement Extra praise if Ps suggest smaller fractions of a r.a.
3	**Measuring angles in degrees** When we measure something, we are comparing it with a certain unit of measure. We can choose any unit ourselves, like the length of our handspan to measure length or, as we have suggested, half a right angle to measure angles. But there are set <u>standard units</u> of measure. Why are they important? (e.g. Anybody can use them and be certain of getting exactly the same measurement as somebody else.) Who can tell me some standard units of measure? (e.g. length: km, m, cm, mm; mass: tonne, kg, g; capacity: litre, cl, ml; time: day, hour, minute, second; money: £, p) The standard unit for measuring angles is <u>1 degree</u>. It is written like this. (BB) It is a different from the degree Celsius that we use to measure temperature, although it uses the same symbol. This degree is $\frac{1}{180}$ of a straight angle, so there are <u>180 degrees</u> in a straight angle. We write it like this. (BB) How many degrees do you think are in a right angle? (90 degrees) What part of a right angle is 1 degree? $\left(\frac{1}{90}\right)$ We write it like this. (BB)	Whole class activity *Ps have protractors on desks and T has lage model for demonstration.* Discussion on units of measure and standard units. Involve several Ps. Agreement, praising BB: <u>1 degree</u> = 1° $1° = \frac{1}{180}$ of a straight angle 1 <u>straight</u> angle = 180° 1 <u>right</u> angle = 90° $1° = \frac{1}{90}$ of a right angle

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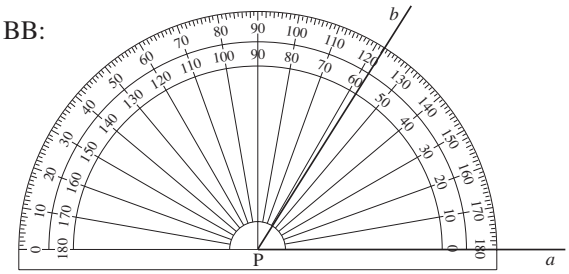
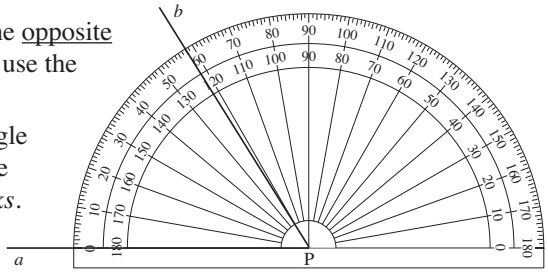
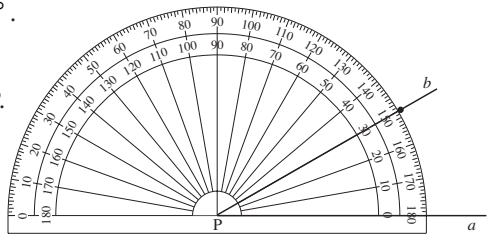
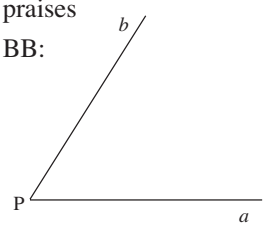
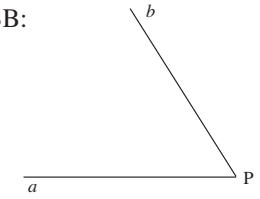
Activity		*Notes*
3	(Continued) This is the tool we use to measure angles. Who knows what it is called? (protractor) T tells it if Ps do not know. What do you notice about it? (e.g. semi-circle; there are two scales from $0°$ to $180°$, one starting on the left and one on the right.; there is a horizontal line at $0°$ to $180°$ which shows a straight angle; there is a vertical line at $90°$ to show a right angle; there are slanting lines like the rays of the sum at every 10 degrees.) Let's draw an angle and measure it with the protractor. Let's draw an angle which has its vertex at point P and has sides *a* and *b*. T works on BB and Ps copy what T does in *Ex. Bks*. Ps angles can be different fron T's. This is the cente point of the protractor (i.e. the centre of the circle it is made from). T points and Ps find it on own protractors. Lay it on top of your angle so that its centre point is on P and the horizontal line showing zero on the scale fits along side *a* exactly. We read the angle from the scale on side *b*. BB: If side *b* is not long enough, extend it beyond the protractor.  This angle is about (e.g. $58°$). What does your angle measure? Ask several Ps for their measurements. If the angle faced the opposite direction we would use the opposite scale. T draws another angle on BB and Ps do the same in their *Ex. Bks*. T goes through the same steps again and asks for Ps' measurements.  If time, T could draw other angles on BB, some facing left and some right. Ps come to BB to measure them, explaining what they are doing. If we want to draw an angle of a certain size, this is how we do it. Let's draw an angle of $30°$. Mark a point P. Draw a ray *a* from point P. Lay the protractor with its centre on P and its zero line along ray *a*.  Find $30°$ on the correct scale and mark it with a dot. Remove the protractor and use your ruler to draw a ray from point P through the dot. Mark the angle with an arc and label it α. What can we write about it mathematically? ($\alpha = 30°$, or $\alpha \approx 30°$, as we might not have lined up the protractor exactly.)	BB: protractor Use enlarged copy master to explain if no large protractor is available. T prompts if necessary. Praise all contributions. T monitors, helps, corrects, praises BB:  Individual drawing and measuring but class kept together on each step. T quickly checks Ps angles. Praising, encouragement only Praising, encouragement only BB:  T demonstrates on BB and Ps follow each step in *Ex. Bks*. Praising, encouragement only T helps and corrects. T demonstrates and Ps follow the steps in *Ex. Bks*. **N.B.** T should amend instructions to suit the type of protractor used by Ps. T (and Ps) draw other angles. (e.g. $45°$, $60°$, $90°$, $135°$) Agree that the protractor can be used to measure or draw any angle from $0°$ to $180°$.

20 min

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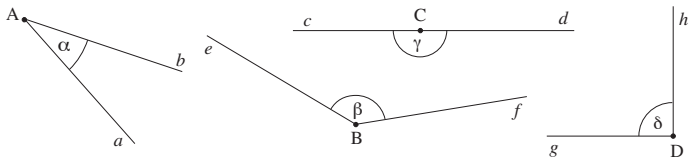
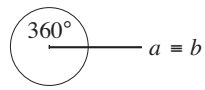
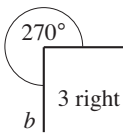
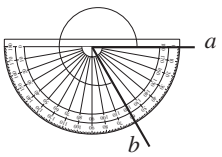
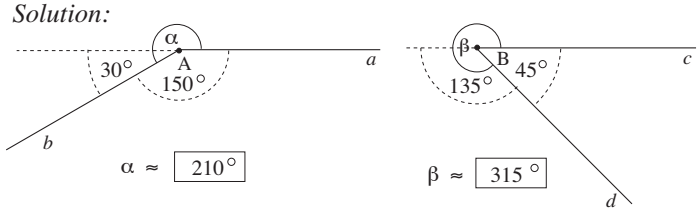
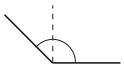
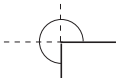
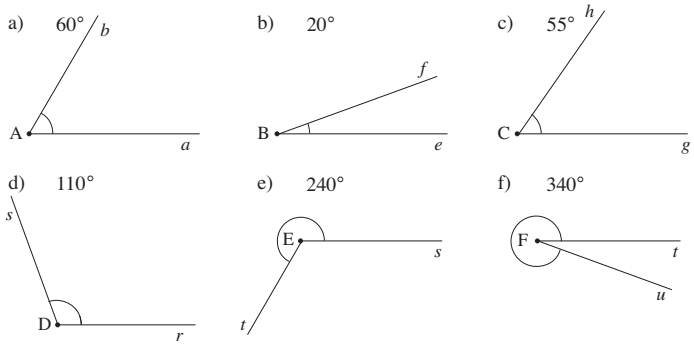
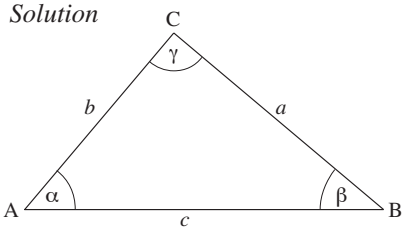
Lesson Plan 66

Activity		*Notes*
4	***Book 5, page 66*** Q.1 Read: *Measure these angles using a protractor and write their sizes in the boxes.* Set at time limit. T watches closely what every P is doing and helps and corrects them when necessary. (If most of the class are struggling, deal with one angle at a time and demonstrate again on the BB how to use the protractor.) Review with whole class. Ps come to BB or dictate their angles. Class agrees/disagrees. Mistakes corrected. Elicit the names of the angles too. (acute angle: less than $90°$, right angle: $90°$, obtuse angle: more than $90°$ but less than $180°$, straight angle: $180°$) *Solution:*  $\alpha \approx$ 30° acute angle; $\beta \approx$ 140° obtuse angle; $\gamma =$ 180° straight angle; $\delta =$ 90° right angle Is it possible to have angles that are more than $180°$? (Yes) Elicit/tell that a whole angle (or a whole turn) is $360°$. T draws some angles greater than $180°$ on BB. How can we measure them? Ps suggest their ideas. Agree that the protractor can be used upside down, as shown, and the angle can be calculated either by adding to $180°$ or subtracting from $360°$ (a whole angle). BB: e.g.  whole angle (4 right angles)  3 right angles or $360° - 90° = \underline{270°}$ reflex angle reflex angle  $360° - 60° = \underline{300°}$ or $180° + 120° = \underline{300°}$	Individual work, monitored closely, helped, corrected Drawn on BB or use enlarged copy master or OHP Discussion, agreement, self-correction, praising Feedback for T Accept slight variations but Ps who were wildly inaccurate should measure the angle again with another P's help. Whole class discussion Extra praise for good ideas T gives hints if necessary. T explains that: ≡ means 'identical to' '$a \equiv b$' means 'a is identical to b' T tells class that an angle greater than a straight angle but less than a whole angle is called a reflex angle.
	26 min	
5	***Book 5, page 66*** Q.2 Read: *Measure these angles with a protractor and write their sizes in the boxes.* What is special about these angles? (Both are reflex angles.) Set a time limit. Ps use the method they like best. Review with whole class. Ps come to BB to explain what they did. Who agrees? Who did it another way? etc. Mistakes corrected. *Solution:*  $\alpha \approx$ 210°; $\beta \approx$ 315°	Individual work, monitored closely, helped, corrected Drawn on BB or use enlarged copy master or OHP Discussion, reasoning, agreement, self-correction, praising BB: $\alpha \approx 180° + 30° = 210°$, or $\alpha \approx 360° - 150° = 210°$ $\beta \approx 180° + 135° = 315°$, or $\beta \approx 360° - 45° = 315°$
	30 min	

Bk5

Lesson Plan 66

Activity		*Notes*
6	**Angles practice** What is the size in degrees of each of these angles? Ps come to BB to calculate if necessary and explain reasoning. Then they choose another P to draw a rough sketch of the angle on the BB. Class points out errors. BB: e.g. a) 1 right angle = $90°$  b) 2 right angles = $180°$ (straight angle) c) $1\frac{1}{2}$ right angles = $90° + 45° = 135°$  d) $\frac{1}{4}$ right angle = $90° \div 4 = 22.5°$  $4\overline{)90.0}$ (22.5; 12) e) $\frac{1}{3}$ right angle = $90° \div 3 = 30°$  f) $\frac{2}{3}$ right angle = $30° \times 2 = 60°$  g) $1\frac{2}{3}$ right angles = $90° + 60° = 150°$  h) 3 right angles = $90° \times 3 = 270°$  *35 min*	Whole class activity Written on BB or SB or OHT At a good pace (For some questions, Ps could show answer on slates or scrap paper in unison on command.) Reasoning, agreement, praising T might also ask: How many right angles is an angle measuring: i) $45°$ $\left(\frac{1}{2}\text{ a right angle}\right)$ j) $225°$ $(= 180° + 45°$ $= 2\text{ r. a.} + \frac{1}{2}\text{ r. a.} = 2\frac{1}{2}\text{ r. a.})$ etc. Feedback for T
7	***Book 5, page 66*** Q.3 Read: *Use a ruler and a protractor to draw the given angles*. T (P) demonstrates first angle on BB if some Ps are still unsure about how to use a protractor. Set a time limit. Review with whole class. Ps compare their angles with correct ones. Accept slight variations, but Ps with wildly incorrect angles should drawn them again (with the help of more able Ps.) *Solution:*  *40 min*	Individual work, monitored closely, helped, corrected Drawn on BB or use enlarged copy master or OHP Ps finished early could each draw an angle on BB with BB protractor (or T has solution already prepared and uncovers each angle as it is dealt with). Ps come to BB to explain the construction if problems. Reasoning, agreement, self-correction, praising for any angle drawn correctly Extra praise for more than 4 angles drawn correctly! Feedback for T

Bk5		*Lesson Plan 66*
Activity		***Notes***
8	***Book 5, page 66*** Q.4 Read: *Measure the angles of the triangle and add them up*. Set a time limit for measuring. T helps Ps to place their protractors correctly and to read from the scale. Review with whole class. **A**, what did you measure for angle α? Who agrees? Who had a different measurement? etc. Let's check it. Repeat for each angle in turn. When sizes of angles are agreed, class adds them up together and Ps write the total in box in *Pbs*. *Solution*  $\alpha \approx \boxed{50°}$ $\beta \approx \boxed{40°}$ $\gamma \approx \boxed{90°}$ (right angle) $\alpha + \beta + \gamma = \boxed{180°}$ (straight angle) *45 min*	Individual work in measuring, then whole class addition Drawn on BB or use enlarged copy master or OHP Discussion, agreement, praiisng Accept ± 1 or 2 degrees, but Ps who were very inaccurate should measure the angles again. Extra praise to Ps who measured accurately without help from T.

Bk5

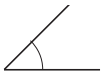
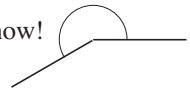
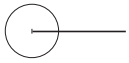
R: Calculation

C: Measuring and drawing angles with a protractor

E: 1° = 60' = 3600 '' *(1 degree = 60 minutes = 3600 seconds)*

Lesson Plan 67

Activity		*Notes*
1	**Making angles** Lay your straws so that one is exactly on top of the other. Open them so that they make the angle that I describe and show me your angle when I say. Ps indicate with finger of other hand the angle they mean. a) Make an angle smaller than a right angle. Show me . . . now! b) Make an angle greater than a right angle but smaller than a straight angle Show me . . . now! c) Make an angle which is equal to 2 right angles. Show me . . . now! d) Make an angle which is equal to 3 right angles. Show me . . . now! e) Make an angle which is equal to 4 right angles. Show me . . . now! f) Make an angle greater than 2 right angles but smaller than 4 right angles Show me . . . now! *5 min*	Whole class activity *Ps each have 2 straws fastened together at one end with a paper clip (or knotted thread or wool) on desks.* Angles shown in unison. T quickly checks each P, correcting where necessary. Praising, encouragement only After each angle has been shown and corrected, Ps say what they know about it. a) <u>acute</u> angle (< 90°) b) <u>obtuse</u> angle (90° < obtuse < 180°) c) <u>straight</u> angle (= 180°) d) <u>reflex</u> angle (180° < reflex < 360°) e) <u>whole</u> angle (= 360°)
2	**Types of angles** Let's summarise what we have learned. T describes the type of angle, draws an example on BB and writes an equation or inequality about its size (with Ps dictating). Ps write the name of the angle and its measure in *Ex. Bks.* and draw their own example (freehand sketch). a) T: If the two sides of the angle <u>coincide</u> (i.e. $a \equiv b$), the smaller angle is called a <u>zero angle</u>. b) T: If an angle is greater than a zero angle but less than a right angle, we call it an <u>acute</u> angle. c) T: If the two sides of an angle are perpendicular, it is a <u>right</u> angle d) T: If an angle is greater than 1 right angle but less than 2 right angles, we call it an <u>obtuse</u> angle. e) T: If an angle is twice a right angle, it is called a <u>straight</u> angle. [A straight angle is also known as pi (π).] f) T: If an angle is more than 2 right angles but less than 4 right angles, we call it a <u>reflex</u> angle. g) T: If an angle is 4 times a right angle, we call it a <u>whole</u> angle. (It is a complete circle or rotation) *12 min*	Whole class activity, but individual writing and drawing At a good pace BB: a) P, a, b <u>zero</u> angle = 0° b) e.g P, a, b 0° < <u>acute</u> angle < 90° c) P, a, b <u>right</u> angle = 90° d) e.g. P, a, b 90° < <u>obtuse</u> angle < 180° e) b, P, a, π <u>straight</u> angle = 180° f) e.g. P, a, b 180° < <u>reflex</u> angle < 360° g) P, a, b <u>whole</u> angle = 360°

Bk5		*Lesson Plan 67*
Activity		***Notes***
3	**Estimating angles** a) T says the size of an angle, Ps estimate what it looks like with their two straws and hold up their angles on command, indicating the angle they mean. T has exact angle prepared and does quick check of all Ps. Ps who are very inaccurate correct their angles to match T's angle. Meanwhile Ps say what they know about the angle. i) Show me an angle which is $90°$ . . . now! (right angle)  ii) Show me an angle which is about $45°$ . . . now! (half a right angle, acute angle)  iii) Show me an angle which is about $120°$ . . . now! (obtuse angle)  iv) Show me an angle which is about $150°$ . . . now! (obtuse angle)  v) Show me an angle which is $180°$ . . . now! (2 right angles, straight angle, π)  vi Show me an angle which is about $210°$ . . . now! (reflex angle)  vii) Show me an angle which is $360°$ . . . now! (whole angle, complete rotation)  viii) Show me an angle which is $0°$ . . . now! (zero angle, i.e. no angle) b) T shows some angles and Ps say what size they think they are. T writes esimates on BB, then a P measures the angle with a protractor and class applauds the P whose estimate was closest. *18 min*	Whole class activity T has angles already prepared. Ps show angles in unison. In good humour! At a fast pace Quick checking and correcting where necessary Praising, encouragement only Ingenuity required here! In good humour! Extra praise for Ps who estimate exactly! Ps can show some angles too.

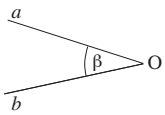
Bk5

Lesson Plan 67

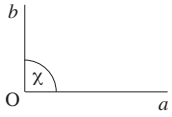
Activity		*Notes*
4	***Book 5, page 67*** Q.1 Read: *Write the name of the type of angle in the box, then measure the angle.* Set a time limit. Ps use protractors to measure the angles accurately, extending the sides if necessary with T's guidance. Review at BB with whole class. Ps come to BB or dictate to T. Class agrees/disagrees. Mistakes discussed and corrected. If disagreement, Ps measure angles again on BB or OHP. *Solution:*	Individual work, monitored helped Drawn on BB or use enlarged copy master or OHP Discussion, agreement, self-correction, praising (If T does not have a BB protractor, use protractor copy master enlarged onto an OHT) T helps Ps to pronounce the Greek letters. Feedback for T
	25 min	
5	**Angle units less than 1 degree** Some people need units smaller than 1 degree as they need to use very accurate angles. What kind of people do you think they could be? (e.g. astronauts, geologists, cartographers, sailors, soldiers, etc) So we sometimes <u>calculate</u> with <u>angle-minutes</u> and <u>angle-seconds</u>, although we cannot measure them with our protractors. There are 60 angle-minutes in 1 degree, and 60 angle-seconds in 1 angle-minute (just as when dealing with time). Let's write it all down in a mathematical way. T writes on BB and Ps copy in *Ex. Bks*. Ps dictate what T should write and T shows the notation used for minutes and seconds (also used in time).	Whole class activity T gives hints if necessary. T writes unkown occupations on BB and explains what they do. T explains and Ps listen. BB: $1^\circ = 60'$ $1' = 60''$ $1^\circ = 60'' \times 60 = 3600''$
	28 min	

a) 

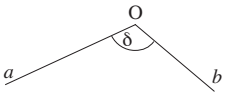
zero angle α = 0° (alpha)

b) 

acute angle β = 30° (beta)

c) 

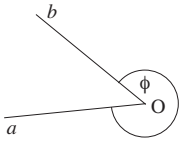
right angle χ = 90° (chi)

d) 

obtuse angle δ = 115° (delta)

e) 

straight angle ε = 180° (epsilon)

f) 

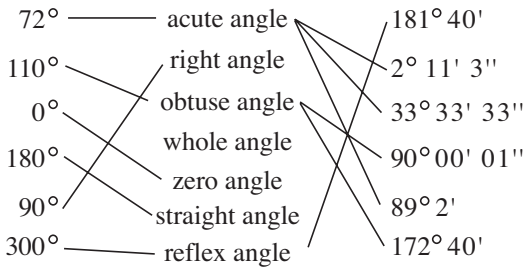
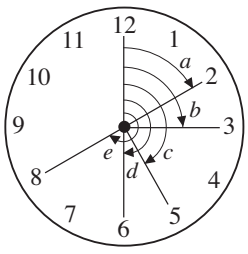
reflex angle ϕ = 315° (phi)

g) 

whole angle γ = 360° (gamma)

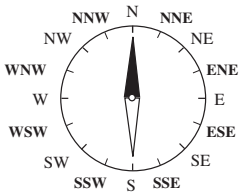
Bk5

Lesson Plan 67

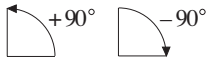
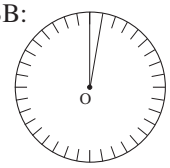
Activity		*Notes*
6	**Equal values** Let's join the angles to the correct types. Ps come to BB to draw joining lines, explaining reasoning. Class agrees/disagrees. T asks Ps to demonstrate or draw the angles (approximately). BB:  *32 min*	Whole class activity Written on BB or use enlarged copy master or OHP At a good pace Reasoning, agreement, praising Which type of angle is not joined up? (whole angle) Who can write an angle for it? (360°) Feedback for T
7	**Angles on a clock** What can the time be when the minute hand points to a whole number on the clock face and the angle between the minute hand and the hour hand is: a) 30°  or  1 o'clock 11 o'clock b) 45°  or  4:30 7:30 c) 60°  or  2:00 10:00 d) 90°  or  3:00 9:00 e) 135°  or  1:30 10:30 f) 180°  6:00 *36 min*	Whole class activity (or paired trial first if Ps wish) Use a real or model clock. (For paired trial, ideally Ps should have model clocks with hands that move in synchrony.) Ps suggest times, then T confirms on the clock. Praise approximate solutions but slowly make Ps understand that only accurate solutions are possible (as the hour hand moves along with the minute hand).
8	***Book 5, page 87*** Q.2 Read: *Measure or calculate the angles marked on the clock.* T explains that each curved arrow shows how far the minute hand on the clock has moved from 12. Set a time limit. Review with whole class. Ps come to BB to show the relevant turn on the diagram and fill in the angle in degrees. Class agrees/disagrees. Mistakes discussed and corrected. T asks less able Ps to say the type of angle and more able Ps to say what fraction of a right angle or straight angle it is. *Solution:* $\angle a =$ 60° $\angle b =$ 90° $\angle c =$ 150° $\angle d =$ 180° $\angle e =$ 240°  *40 min*	Individual work, monitored, (helped) Drawn on BB or use enlarged copy master or OHP Discussion, reasoning, agreement, self-correction, praising e.g. *a*: acute angle, $\frac{2}{3}$ of a r. a. *b*: right angle, $\frac{1}{2}$ of a s. a. *c*: obtuse angle, $\frac{5}{6}$ of a s. a. etc.

Bk5

Lesson Plan 67

Activity		*Notes*
9	***Book 5, page 67*** Q.3 Read: *Measure or calculate the angles between the given compass directions.* Do part a) with whole class first, showing the two methods. First a P measures with a protractor, with T's help if necessary. Then elicit that: a whole turn is $360°$; the whole turn has been divided into 16 equal parts so each 'tick' shows 1 sixteenth of a whole turn. BB: N and NE: $\frac{2}{16}$ of $360° = \frac{1}{8}$ of $360° = 360° \div 8 = \underline{45°}$ (= half a right angle) Let's see how many you can do in 2 minutes! Use whichever method you like. Review at BB with whole class. Ps come to BB or dictate to T. Class agrees/disagrees. Ask Ps who did it by calculation to explain their reasoning. Who did the same? Who did it another way? etc. Mistakes discussed and corrected *Solution:*  a) N and NE 45° (315°) b) N and E 90° (270°) c) N and SE 135° (225°) d) N and SW 225° (135°) e) NE and SE 90° (270°) f) E and NW 225° (135°) g) W and SSW 67.5° (292.5°) h) E and NNE 67.5° (292.5°)	Individual work, monitored, helped Drawn on BB or use enlarged copy master or OHP Differentiation by time limit Discussion, reasoning, agreement, self-correction, praising BB: e.g. b) $\frac{4}{16}$ of $360° = \frac{1}{4}$ of $360°$ $= 360° \div 4 = 90°$ (= 1 right angle) or $2 \times 45° = 90°$, etc. Parts g) and f) could be done with the whole class if no P has attempted them. First elicit the names of the unlabelled compass points (NNE, ENE, ESE, etc.) as shown in diagram. *Calculation*: e.g. g) W and SSW: $\frac{3}{16}$ of $360°$ $= \frac{3}{4}$ of $90° = 90° \div 4 \times 3$ $= 22.5° \times 3 = \underline{67.5°}$
Extension	Elicit the sizes of the angles when measured in an anti-clockwise direction. (Angles from anti-clockwise turns are given in brackets).	

45 min

Bk5	R: Calculation. Angles **C: Compass directions** *E: Problems*	*Lesson Plan* *68*
Activity		***Notes***
1	**Direction** Everyone stand up and face me. Imagine you are soldiers on the parade ground and follow my instructions. Left . . . turn! Who can describe the turn you have made in degrees? (+ 90° anti-clockwise, or – 90° clockwise) Right . . . turn! Who can describe this turn in degrees? (–90° anti-clockwise, or + 90° clockwise) Everyone . . . about turn! (Some Ps might turn to the left and some to the right – chaos!) Discuss the need for soldiers all to turn in the same direction when following orders, so they learn always to turn to the left for the command, 'About turn!' Let's try it again! We do the same in mathematics. A positive turn is always to the left, i.e. anti-clockwise, and a negative turn is always to the right (clockwise). *5 min*	Whole class activity Ps turn in unison Discussion, agreement In good humour! (Most Ps might agree that it is easier to turn to the left.) BB: 
2	**Making angles** Ps have 2 straws on desks (joined at one end with a paper clip or piece of thread) and T has larger model for demonstration. a) Study the diagram. What can you tell me about it? (Circle, centre O, circumference divided into 36 equal parts, so each part is $\frac{1}{36}$ of the circle.) How many degrees is a turn from one 'tick' to the next? Who can write an operation about it? BB: $360° \div 36 = \underline{10°}$ Let's use 10° as the unit of measure. b) Set your 2 straws so that the angle between them is: 20° (2 units), 40° (4 units), 50° (5 units), etc.  T quickly checks each P, correcting where necessary. c) Lay your straws on your desks horizontally so that they lie one on top of the other. T describes turns and Ps turn the top straw to show them. e.g. + 60°, – 40°, +80°, –180°, 120° anti-clockwise, etc. T quickly checks every P. How many units is the turn? (6 units, 4 units, etc.) d) Into how many equal parts should we divide the circumference of the circle to show every 5° turn? Who can write an operation about it? BB: $360° \div 5° = \underline{72}$ (times) How could we do it easily? (Draw an extra 'tick' half-way between each pair of ticks already there.) *10 min*	Whole class activity Circle drawn on BB or use enlarged copy master or OHP, with straws joined at centre O so that they can be rotated. BB:  1 unit: 10° If possible, Ps have copy of circle on desks too to help gauge the angles, otherwise Ps estimate them. Individual manipulation of straws but class kept together. T (P) demonstrates on diagam if problems. Discussion, reasoning, agreement, praising
3	**Compass directions** Let's see if you can remember the compass directions. Everyone stand up and face North. **A,** which direction do you think is North? Who agrees? Who thinks it is somewhere else? How can we check it? (with a compass) If possible, all Ps have simple compasses on desks, otherwise T has a compass and a P comes to front of class to determine where North is. T (or P) explains that the red part of the magnetic needle always points towards North, in whatever direction the compass is held. Ps face the true North, then follow T's (or Ps') instructions. From N, turn to face E (S, NW, SE, W, SSW, etc.) *15 min*	Whole class activity Agreement, checking, praising [N.B. The optimal situation would be for the T and Ps to go into the playground for this activity and the next one.] In good humour! Praising, encouragement only

Bk5

Lesson Plan 68

Activity

4

Using a compass

If possible, each P (or pair of Ps) should have a compass and a rough 'map' of their own classroom (or playground or local park, etc.)

T instructs Ps on how to use a compass, keeping the class together on each step the first time through, then helping Ps to practise using the compass in pairs. e.g.

a) *We are standing at A and want to go to B on the map. In which direction should we walk?*

i) Place the compass on the map so that the centre of the compass is on point A and the direction arrow is pointing towards B.

ii) Turn the rotating dial so that the grid lines on the compass are parallel to the vertical (North) grid lines on the map.

iii) Remove the compass from the map, hold it directly in front of you and turn yourself and the compass until the North pointer points towards North on the compass dial.

iv) The direction arrow on the compass now shows the direction in which to walk.

b) *We are standing at A and can see B. Where is B on the map?*

i) Stand facing B and hold the compass directly in front of you so that the direction arrow is pointing towards B.

ii) Turn the rotating dial so that the North pointer points to North on the dial.

iii) Place the compass on the map so that its centre is on A and its grid lines are parallel to the vertical grid lines on the map.

iv) The direction arrow on the compass now shows the direction of B on the map.

Note that:

- b) is just a) in reverse.
- If Ps do not have individual compasses, Ps practise in pairs in front of class Class chooses the points A and B and helps and corrects Ps at front. Ensure that all Ps have at least one turn.
- If using the sample map on copy master (as opposite), Ps can choose where they are sitting and decide what the various shapes are (e.g. plant, cupboard, display table, overhead projector, whiteboard, etc.) or can add other items if they wish.
- If all Ps have compasses and local maps, allow them to continue practising outside for the rest of the lesson.

(The exercises in *Pbs* could be done for homework.)

25 min

Notes

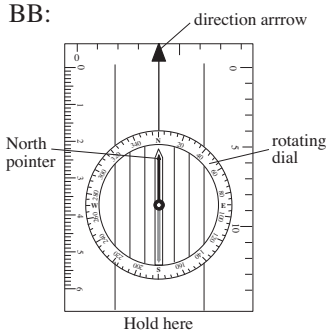
Whole class activity to start

T has map already prepared and Ps have a copy each.

Ideally, T should use a map of own class or playground, etc. otherwise use copy master as an example.

Use a real compass (and also diagram on copy master if it is suitable).

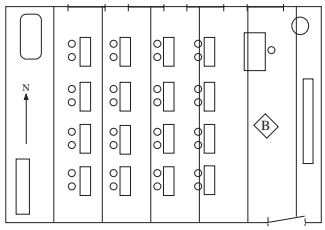
BB:



T instructs and Ps follow.

This will probably be rather difficult for many Ps, so have no expectations! Some Ps might understand quickly and be able to help others, while others might find it easier to understand in later years.

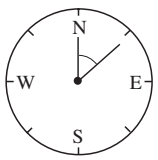
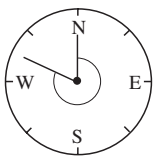
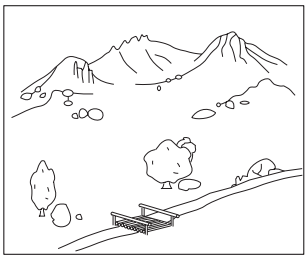
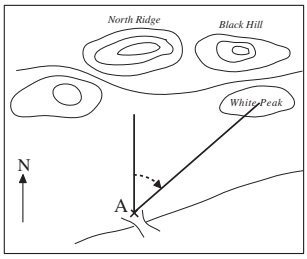
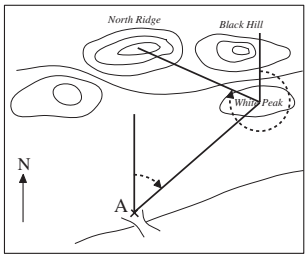
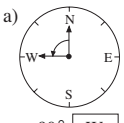
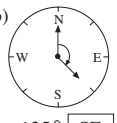
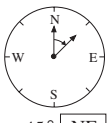
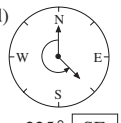
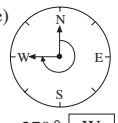
Copy Master



(Vertical grid lines on map are parallel to the North arrow.)

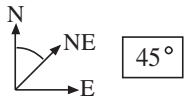
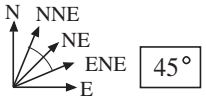
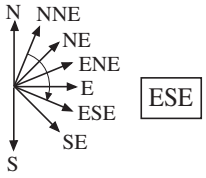
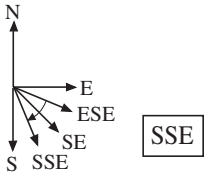
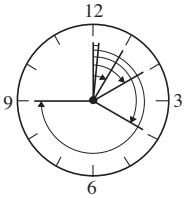
Bk5

Lesson Plan 68

Activity		*Notes*
5	***Book 5, page 68*** Q.1 Read: *Here is the sketch of some mountain peaks and the corresponding map.* T points to a place on the sketch and Ps show it on map. T points to a place on the map and Ps show it on the sketch. a) Read: *You are at the bridge (A) and want to walk to White Peak.* *On the map, draw and measure the angle at point A between North and your planned direction of travel.* *Write the angle and draw it on the compass diagram.* Ps use rulers to draw a vertical line (parallel to the arrow showing N) from A and a line from A to the centre of *White Peak*, marking the angle between them with an arc. Then they use a ptrotractor to measure the angle. (Or Ps can use a compass if they have one and are able to use it.) Set a time limit, then reveiw with whole class before Ps do part b). If Ps are struggling, continue as a whole class activity, with T working on BB and Ps in *Pbs,* but class kept together at each step. b) Read: *You have reached the top of White Peak and want to continue to North Ridge.* *Measure the angle, in a **clockwise** direction, between North and your next planned direction of travel.* *Write the angle and draw it on the compass diagram.* Set a time limit for individual work, (or continue as a whole class activity as in part a)). Review with the whole class. Ps come to BB, explaining reasoning. Class agrees/disagrees. Mistakes discussed and corrected Praise and encourage throughout! *Solution:* a) ≈ 48°  b) ≈ 295° 	Individual work, monitored, helped Drawn on BB or use enlarged copy master or OHP BB: *Sketch*  a) *Map*  b) *Map*  Accept slight variations in measurements. (Also accept measurement of the smaller angle in b), then subtraction from 360° .)
	30 min	
6	***Book 5, page 68*** Q.2 Read: *Draw the turns from North by the given angles. Write the new compass directions below* Set a time limit. Ps use ruler and protractor (or a compass). Review at BB with whole class. Ps come to BB to draw the turns and write the compass directions, explaining reasoning. Class agrees/disagrees. Mistakes discussed and corrected. *Solution:* a)  + 90° W b)  − 135° SE c)  − 45° NE d)  + 225° SE e)  − 270° W	Individual work, monitored, (helped) Drawn on BB or use enarged copy master or OHP Elicit/remind Ps that: • a positive angle means a turn anti-clockwise ; • a negative angle means a turn clockwise. Differentiation by time limit Reasoning, agreement, self-correction, praising Feedback for T
	35 min	

Bk5

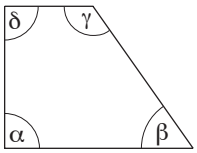
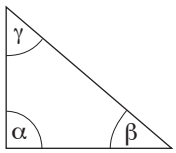
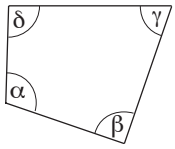
Lesson Plan 68

Activity		*Notes*
7	***Book 5, page 68*** Q.3 Ps read problems themselves. They can use the compass diagrams in Q.2 to help them, or draw own diagrams in *Ex. Bks*, or use a real compass. Set a time limit. Review at BB with whole class Ps could show answers on scrap paper or slates on command. Ps responding correctly explain at BB to those who did not. Class agrees/disagrees. Mistakes discussed and corrected. *Solution:* a) *How many degrees is the angle between:* *i) N and NE*  *ii) NNE and ENE?*  b) *If a ship sails NNE and then turns to the right by 90°, in which compass direction is the ship travelling now?*  c) *If we are facing ESE and turn to the right by 45°, in which direction are we facing now?* 	Individual work, monitored, helped (or whole class activity if time is short) Deal with one at a time if Ps are unsure. Demonstrate the turns on a large model compass or draw diagrams on BB. Discussion, reasoning, agreement, self-correction, praising Note that in a), only the size of the angle is required, not the direction of the turn, so a positive angle is correct. Elicit that $90°$ to the right (i.e. clockwise) can also be written as a turn of $-90°$. Elicit that $45°$ to the right (i.e. clockwise) can also be written as as a turn of $-45°$.
	40 min	
8	***Book 5, page 68*** Q.4 Read: *In your exercise book, write the angle made by the minute hand of a clock as it moves:* *a) 5 minutes b) 10 minutes c) 20 minutes* *d) 45 minutes e) 1 minute.* Deal with one at a time. Ps calculate in *Ex. Bks.* and show results on scrap paper or slates on command. Ps answering correctly explain at BB to those who were wrong. Who did the same? Who did it another way? etc. Deal with all methods. Ps demonstrate the turns on a model clock, or on diagrams already drawn by T on BB or OHT. (Or use the copy master) Mistakes discussed and corrected. *Solution:* e.g. a) 5 minutes: $360° \div 12 = 30°$ (as 12 numbers on clock) b) 10 minutes: $360° \div 6 = 60°$, or $2 \times 30° = 60°$ c) 20 minutes: $360° \div 3 = 120°$, or $2 \times 60° = 120°$ d) 45 minutes: $360° \div 4 \times 3 = 90° \times 3 = 270°$ (as 45 minutes is 3 quarters of an hour) e) 1 minute: $360° \div 60 = 36° \div 6 = 6°$ (as there are 60 minutes in an hour)	Individual work, monitored, helped (or set a time limit for all the questions, then review) In unison Discussion, reasoning, agreement, self-correction, praising Extra praise for clever calculations BB: 1 whole turn: 12 numbers 60 minutes $360°$  Elicit that: 1 min. $= \frac{1}{60}$ of an hour. 5 min $= \frac{1}{12}$ of an hour, etc.
	45 min	

Bk5

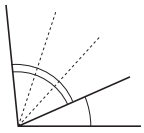
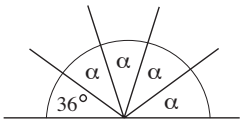
R: Calculation. Angles
C: Reflection: line symmetry
E: Coordinate system

Lesson Plan *69*

Activity		*Notes*
1	**Measuring angles** Ps have 3 shapes on desks and T has larger versions stuck (drawn) on BB. For each shape, measure its angles with a protractor, note them in your *Ex. Bks*, then add them up. Set a time limit. Review with whole class. Ps come to BB or dictate to T. Class agrees/ disagrees. When dealing with each shape, elicit its name and the type of angles it has. Mistakes in additions corrected. BB: e.g. a)  $\alpha + \beta + \gamma + \delta$ $\approx 90° + 55° + 125° + 90°$ $\approx \underline{360°}$ (right-angled trapezium) b)  $\alpha + \beta + \gamma$ $\approx 90° + 41° + 49°$ $\approx \underline{180°}$ (right-angled triangle) c)  $\alpha + \beta + \gamma + \delta$ $\approx 110° + 91° + 68° + 92°$ $\approx \underline{361°}$ (quadrilateral) *8 min*	Individual or paired work, monitored, helped Use own polygons or enlarged copy master. Discussion, agreement, self-correction, praising Accept slight variations in angles as long as they have been added correctly. Ps with wildly inaccurate measurements should measure again with the help of more able Ps. Do not state the sum of the angles in a quadrilateral or a triangle just yet.
2	**Angles** I will ask you a question about angles. Write *Yes* on one side of your slate and *No* on the reverse. Show me what you think when I say. Ps answering correctly come to BB to explain and draw a diagram. a) Can the sum of two acute angles be: i) an acute angle Show me . . . now! (Yes) ii) a right angle " (Yes) iii) an obtuse angle " (Yes) iv) a straight angle? " (No) b) Can the sum of two obtuse angles be: i) an obtuse angle Show me . . . now! (No) ii) a straight angle " (No) iii) a reflex angle? " (Yes) Elicit that: • an acute angle is less than $90°$; • a right angle is equal to $90°$; • an obtuse angle is more than $90°$ but less than $180°$; • a straight angle is equal to $180°$; • a reflex angle is more than $180°$ but less than $360°$. *15 min*	Whole class activity Responses shown in unison. In good humour! Reasoning, agreement, praising BB: e.g. a) i)  ii)  iii)  b) iii)  T shows notation for indicating different angles in the same diagram: (single arc for 1st angle, double arc for 2nd angle, etc.) Agreement, praising

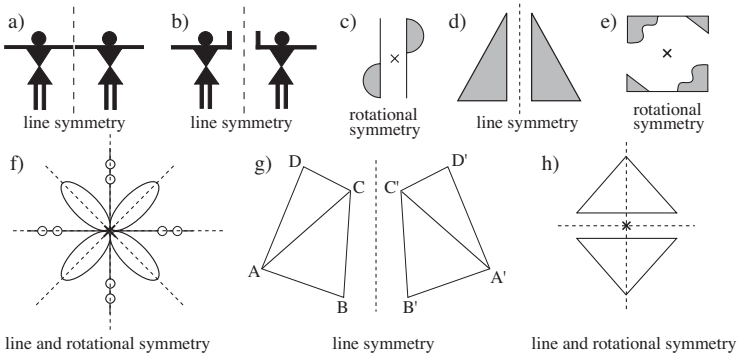
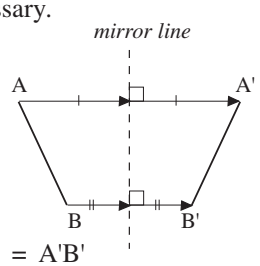
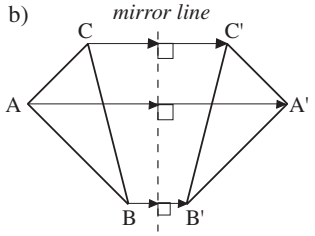
Bk5

Lesson Plan 69

Activity		*Notes*
3	**Problems** T reads problem and Ps note the relevant data and calculate in *Ex. Bks*. Ps show result on slates or scrap paper on command. Ps anwering correctly explain reasoning at BB. Who agrees? Who did it a different way? etc. Mistakes discussed and corrected. T draws a diagram to show solution. a) *The sum of two angles is* $96°$. *One of the angles is 3 times the other angle. What size are the two angles?* BB: e.g. $\alpha = 3 \times \beta$ and $\alpha + \beta = 96°$ $\alpha + \beta = 3 \times \beta + \beta + = 4 \times \beta = 96°$ $\beta = 96° \div 4 = \underline{24°}$ $\alpha = 3 \times 24° = \underline{72°}$ *Answer:* One angle is $24°$ and the other is $72°$. b) *If we add* $36°$ *to 4 times an angle, we get a straight angle. What size is the angle?* BB: e.g. $4 \times \alpha + 36° = 180°$ $4 \times \alpha = 180° - 36° = 144°$ $\alpha = 144° \div 4 = \underline{36°}$ *Answer:* The angle is $36°$.	Individual trial first, then whole class review (or whole class activity, with Ps coming to BB or dictating what T should write) Discussion, reasoning, agreement, self-correction, praising BB:  *Check*: $72 + 24 = 96$ ✓ BB:  *Check:* $36 \times 4 + 36$ $= 36 \times 5 = 180$ ✓
	20 min	
4	**Symmetry 1** a) T has different pairs of congruent shapes cut from paper and stuck on BB in various positions, some in line symmetry, some in rotational symmetry and some in asymmetrical positions. Which pairs of shapes are in symmetrical positions? What kind of symmetry do they have? Ps come to BB to draw mirror lines or centres of rotation or to explain the translation. Class agrees/disagrees. Elicit that if they have line symmetry, one shape is the image of the other, i.e. a <u>reflection</u> in the mirror line. b) T has various shapes stuck randomly on BB. What can you tell me about any of the shapes? (names, number of sides, type of angles, convex or concave, etc.) Which shapes are symmetrical? What kind of symmetry do they have? Ps come to BB to draw mirror lines or centres of rotation. Class agrees/disagrees. T helps where necessary.	Whole class activity T has shapes already prepared. Discussion, reasoning, agreement, praising Accept all positive contributions but help Ps with wording and vocabulary and repeat vague explanations more clearly where necessary. Praising, encouragement only
	25 min	
5	***Book 5, page 69*** Q.1 Read: *If the diagram has line symmetry, draw the lines of symmetry in red.* *If the diagram has rotational symmetry, mark the centre of rotation in green.* Set a time limit. Ps use rulers to help them measure and draw. Review with whole class. Ps come to BB to say what type of symmetry each diagram has and to draw the mirror lines and centres of rotation. Class agrees/disagrees. Elicit that matching points on a shape and on its image are the same <u>perpendicular</u> distance from the mirror line.	Individual trial first, monitored, helped Drawn on BB or use enlarged copy master or OHP Discussion, reasoning, agreement, self-correction, praising Ps label some vertices with A, A', etc. (as in g)

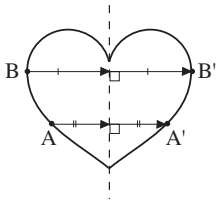
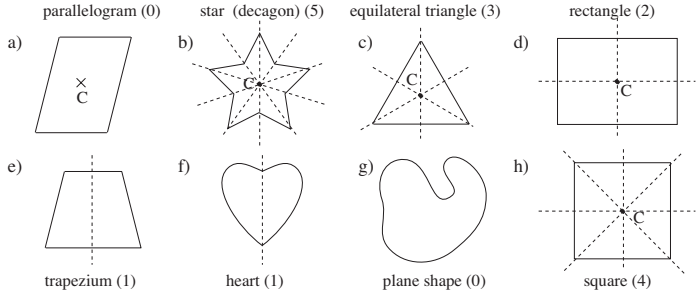
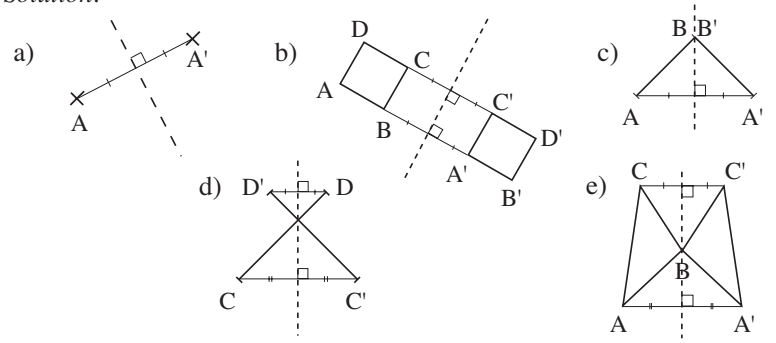
Bk5

Lesson Plan 69

Activity		*Notes*
5	(Continued) *Solution:*  	T points out that: f) has 4 lines of symmetry (mirror lines) and the point where they meet is also the centre of rotation. h) the 2 triangles are in symmetrical positions (2 lines of symmetry and the point where they meet is the centre of rotation) but if we label the vertices or sides, the vertical line of symmetry and the rotational symmetry will be lost.
	30 min	
6	**Symmetry 2** Imagine that I am a line of symmetry (mirror). T calls out pairs of Ps to stand in symmetrical positions on either side of the 'mirror line' and T (Ps) gives instructions to one P, which the other P must mirror. e.g. Raise your right (left) hand. Touch your left (right) ear. Bend your left (right) knee. Take one step away from (towards) the mirror line. Put the hand furthest away on the nearest hip, etc. Ps could show rotational symmetry too, with the T as the centre of rotation. (Ask for positive and negative turns.)	Whole class activity In good humour! Class agrees/disagrees. Ps can be the line of symmetry instead of T. Extra praise for clever instructions Praising, encouragement only
	34 min	
7	***Book 5, page 69, Q.2*** Read: *Reflect the shape in the mirror line. Label the corresponding points A', B', etc.* Deal with one at a time. Ps first describe the image to be drawn [e.g. in a), it is the line segment A'B'], then they say how they would draw it accurately. Who agrees? Who can think of a another way to do it? T prompts and helps or makes suggestions if necessary and ask Ps what they think about it. After agreement, T works on BB, Ps in *Pbs*. a) To reflect line segment AB in the mirror line, we first reflect the 2 end points, A and B. To reflect point A, draw a horizontal line from A perpendicular to the mirror line, then measure its distance. Extend the line on the other side of the mirror line for the same distance and mark and label point A'. Repeat for point B', then join up A' and B' with a straight line. What can we write about the two line segments? (BB) b) To reflect triangle ABC in the mirror line, we only need to reflect the 3 vertex points A, B and C [as in a)], then join up adjacent points to form the triangle A'B'C'. In what other way could we get from triangle ABC to triangle A'B'C'? (Rotate out of the plane by 180° around the mirror line.) T demonstrates with cut-out triangle and a straw as the mirror line. What can we write about the 2 triangles? Ps dictate to T. (BB) Elicit equal sides, angles and congruent triangles.	Whole class activity Drawn on BB or use enlarged copy master or OHP Discussion, agreement, praising all positive contributions T helps, corrects and repeats Ps' suggestions more clearly if necessary. BB: a)  AB = A'B' b)  AB = A'B', BC = B'C', etc. ∠A = ∠A', etc. Δ ABC ≅ Δ A'B'C'

Bk5

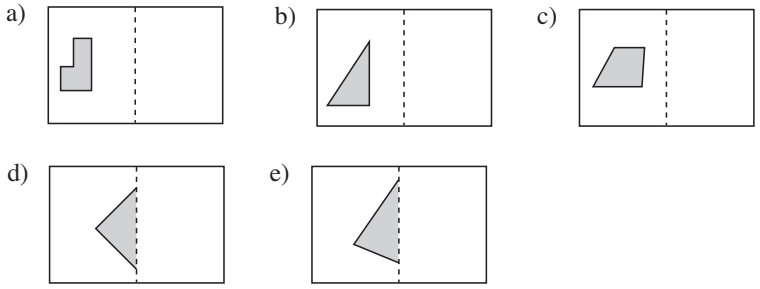
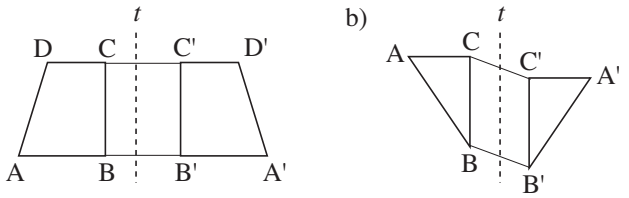
Lesson Plan 69

Activity		*Notes*
7	(Continued) c) To reflect the curve in the mirror line, is it enough to reflect the points A and B? (No, many other points must be marked and reflected too.) Ps come to BB to try it. Agree that the more points marked, the more accurate is the image. T shows an accurate reflection already prepared. We can say that the curve is reflected in the mirror line to form a whole heart. If the whole heart was reflected in the mirror line, what would its image be? (Itself but the points A and B would be on the RHS.)	Discussion, demonstration, agreement, praising Ps try it in *Pbs* too. BB: c) *mirror line* 
	39 min	
8	***Book 5, page 69*** Q.3 Read: *If the shape has line symmetry, draw the lines of symmetry. If the shape has rotational symmetry, mark the centre of rotation and label it C.* Set a time limit. Ps use rulers to measure and draw. Review with whole class. Ps come to BB to name the shape, say whether it has line and/or rotational symmetry and draw the lines of symmetry or centre of rotation. Class agrees/disagrees. Mistakes discussed and corrected. (T could have large cut-out shapes for Ps to fold in case of disagreement.). Elicit that a shape has line symmetry if it can be folded along <u>at least one</u> line so that one half of the shape covers the other half exactly. Ps come to BB to indicate matching pairs of points (i.e. a point and its image) when reflected in certain mirror lines. *Solution*: 	Individual work, monitored, helped, corrected Drawn on BB or use enlarged copy master or OHP Differentiation by time limit Discussion, reasoning, confirmation by folding, agreement, self-correction, praising T chooses the point and the line of symmetry. Agreement, praising Elicit that only shape g) does not have line symmetry.
	45 min	
Homework	***Book 5, page 69, Q.4*** *Solution:* 	Optional Review interactively with whole class before start of *Lesson 87*. In c) and e), B ≡ B' (B is <u>equivalent to</u> B')

Bk5

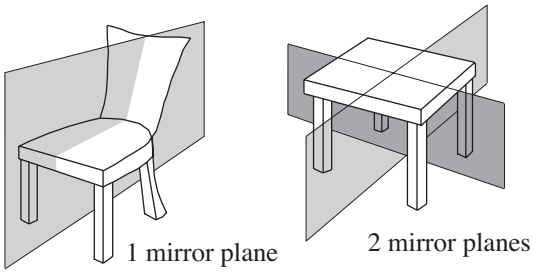
R: Shapes
C: Reflection. Line symmetry
E: Recognising and drawing reflections

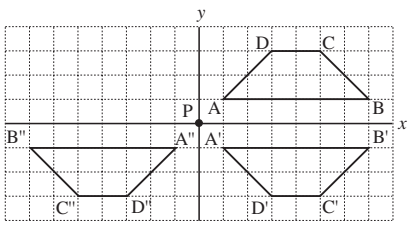
Lesson Plan
70

Activity		*Notes*
1	**Find the rule** Study the table and think what the rule could be. Ask several Ps what they think. After agreement, Ps come to BB to choose a column and draw the missing item. Class agrees disagrees. BB: **etc.**  *Rule*: The bottom row is a mirror image of the top row, reflected in the horizontal line. *4 min*	Whole class activity Drawn on BB or use enlarged copy master or OHP Discussion, agreement, praising At a good pace Ps think of own shapes to draw in empty columns and choose a P to draw its image. Feedback for T
2	**Reflection** Ps have 5 sheets of paper on desks, already prepared by T. e.g.  T holds up one of them. What is this shape called? (e.g. hexagon) Think of the vertical line as the *mirror line*. Imagine where the image of the hexagon would be. How could we draw the image of the shape without having to measure all the points? If no P can think of it, T instructs Ps and demonstrates on a large model. 1. Fold your sheet of paper along the mirror line, so that the shape is on the outside. 2. Pierce the vertices (with sharp pencil or pointed end of protractor). 3. Open out the sheet of paper. 4. Draw the image by joining up the holes with straight lines. Show me your drawing . . . now! T quickly checks each Ps' work. Ps with wildly inaccurate images should try again. Repeat for other sheets, either one at a time if several Ps had difficulty or set a time limit. Ps say what they know or notice about the shapes and point out and label matching vertices. (A and A', B and B', etc.) *10 min*	Whole class activity Use own shapes or enlarged copy master or OHP T has larger versions for demonstration. Extra praise if Ps thinks of this strategy by themselves T demonstrates and Ps copy. T monitors, helps, corrects In unison e.g. the original shape and its image form in: d) a square e) a deltoid
3	**Find the mistake** Look carefully at these diagrams. What is wrong with the reflections? BB: a) b)  P come to BB to explain diagrams and point out mistakes. Class agrees/ disagrees. Stress the 2 conditions for line symmetry, as opposite. *15 min*	Whole class activity Drawn on BB or use enlarged copy master or OHP Reasoning, agreement, praising a) The image should be the same distance from *t* as the original. b) A line drawn between a point on the original and its matching image point should be perpendicular to the mirror line.

Bk5

Lesson Plan 70

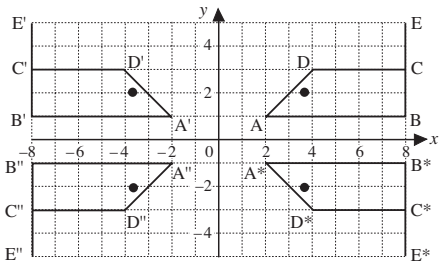
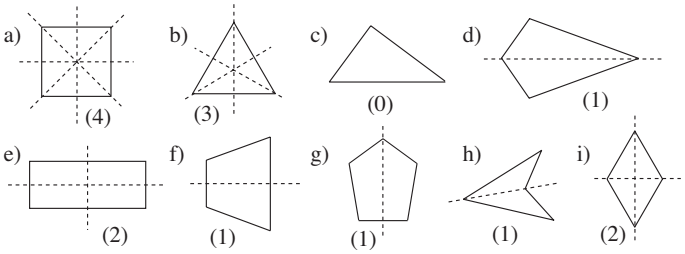
Activity		*Notes*
4	**Plane symmetry** What is a plane? (A flat surface stretching endlessly in all directions) For 2-dimensional shapes which are symmetrical we can draw, or imagine, lines of symmetry which divide them in half. Can a 3-dimensional shape be symmetrical? T asks several Ps what they think. T points to objects in the classroom, (e.g. a table, a chair) and Ps say whether they are symmetrical or not. If so, Ps decide how the object could be divided in half. Elicit/tell that 3-D objects can be cut in half by an imaginary mirror or plane of symmetry. (BB) e.g.  1 mirror plane 2 mirror planes T (Ps) point to other objects in the classroom and Ps say whether they are symmetrical and if so, show where the mirror planes or planes of symmetry are. Class agrees/disagrees or points out any missed.	Wholc class activity BB: Symmetry in 2-D shapes: shown by mirror line or line of symmetry Debate, reasoning, agreement BB: Symmetry in 3-D shapes: shown by mirror plane or plane of symmetry Draw diagrams on BB or use enlarged copy master or OHP if Ps have difficulty with visualisation. Agreement, praising Feedback for T
	20 min	

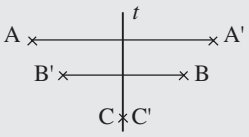
5	***Book 5, page 70***
	Q.1 Read *Reflect quadrilateral ABCD in the x-axis, then reflect its image in the y-axis. Fill in the missing signs.*
	What can you tell me about ABCD? (trapezium, AD = BC, AB || CD) Revise the notation for labelling images. (A, A', A", etc.) Set a time limit for drawing and labelling the 2 images.
	Review with whole class. Ps come to BB or T has images already prepared. Mistakes discussed and corrected.
	Let's fill in the missing signs. Ps come to BB to point to relevant line segments and write possible signs, explaining reasoning. Who agrees? Is there another sign we could write?
	Solution:
	 
	
	AB =, // A'B' =, // A"B"
	CD =, // C'D' =, // C"D"
	BC = B'C' = B"C"
	DA = D'A' = D"A"
		Individual work in drawing images, monitored, helped
		Drawn on BB or use enlarged copy master or OHP
		Agreement, self-correction, praising
		Whole class activity
		Reasoning, agreement, praising
		Ps write signs in *Pbs* too.
		Elicit other statements which could be written about the diagram. e.g.
		$\angle A = \angle A' = \angle A''$, etc.
		$AA' \perp x$, $A'A'' \perp y$, etc.

Extensions	• We have reflected ABCD twice to get to A"B"C"D". In what other way could we have done it? (Rotate ABCD by 180° around the the point where x and y meet, e.g. label it P.) • How can we get from A"B"C"D" back to ABCD? (Reflection in x, then reflection of image in y, or rotation by 180° around P)	Whole class activity Ps come to BB to explain and demonstrate with a cut-out trapezium. Praising, encouragement only
	25 min	

Bk5

Lesson Plan 70

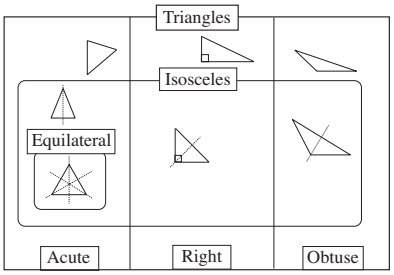
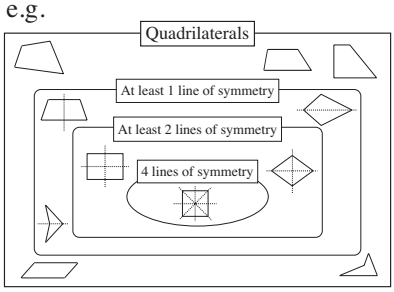
Activity		*Notes*
6	***Book 5, page 70*** Q.2 Read: *a) Reflect the mouse in the y-axis. Label the image of point A with A', etc.* *b) Reflect the original mouse in the x-axis. Label the image of A with A*, etc.* *c) Reflect the image in a) in the x-axis. Label the image of A' with A'', etc.* Deal with one part at a time or set a time limit. Ps draw each image, label it and write the missing coordinates. Review with whole class. Ps come to BB to draw images and write coordinates, indicating relevant points on diagram. Class agrees/disagrees. Mistakes discussed and corrected. *Solution:*  A (2,1) B (8,1) C (8,3) D (4,3) E (8,5) A' (−2,1) B' (−8,1) C' (−8,3) D' (−4,3) E' (−8,5) A* (2,−1) B* (8,−1) C* (8,−3) D* (4,−3) E* (8,−5) A'' (−2,−1) B'' (−8,−1) C'' (−8,−3) D'' (−4,−3) E'' (−8,−5) *35 min*	Individual work, monitored, helped Drawn on BB or use enlarged copy master or OHP (or Ps finished early draw images on diagram on BB or OHT, or T has solution already prepared) Discussion, reasoning, agreement, self-correction, praising Is the mouse symmetrical? (No) What about its <u>positions</u>? (line symmetry in *x* and *y* and rotational symmetry for ABCDE to A"B"C"D"E" and A*B*C*D*E* to A'B'C'D'E')
7	***Book 5, page 70*** Q.3 Read: *Draw lines of symmetry on the polygons.* Set a time limit. Ps use rulers to measure and draw. Review with whole class. Ps come to BB to draw lines of symmetry and say what they know about the shape. Class agrees/disagrees. Mistakes corrected. *Solution:*  a) square, b) equilateral triangle, c) right-angled triangle, d) deltoid (convex), e) rectangle, f) trapezium, g) pentagon, h) deltoid (concave), i) rhombus *40 min*	Individual work, monitored, (helped) Drawn on BB or use enlarged copy master or OHP (and/or shapes cut from enlarged copy master and stuck to BB, so that lines of symmetry can be confirmed by folding) Differentiation by time limit. Reasoning, agreement, self-correction, praising

Bk5		*Lesson Plan 70*
Activity		***Notes***
8	***Book 5, page 70, Q.4*** Read: *Imagine that the whole plane is reflected in mirror line t.* *Are these statements true or false? Write T or F.* T (or P) reads each statement, then Ps show responses on slates or scrap paper in unison on command. Ps with opposing views come to BB to explain their reasoning on diagram, or to draw examples or counter examples. Class decides who is correct. Agreed response written in *Pbs*. *Solution:* a) Each half plane determined by *t* is a reflection of the other. (T) b) Every point in the plane has just 1 image point. (T) c) The image of any line is also a line. (T) d) The image of a point on the *mirror line* is the point itself. (T) e) The image of a line perpendicular to the *mirror line* is the line itself. (T) f) The length of a line segment is greater than the length of its image. (F) (The end points of a line segment are the same distance from *t* as the endpoints of its image, so the length of a line segment is equal to the length of its image.) g) The size of any angle is equal to the size of its image. (T) h) The midpoint between any point A and its image A' lies on the *mirror line*. (T) *45 min*	Whole class activity Drawn on BB or use enlarged copy master or OHP BB:  Have no expectations! (If all Ps give the same response, still ask 1 or 2 Ps to explain their reasoning, as it will consolidate their understanding and give them practice in using appropriate vocabulary) T helps with wording where necessary. Reasoning, agreement, praising, encouragement only

Bk5

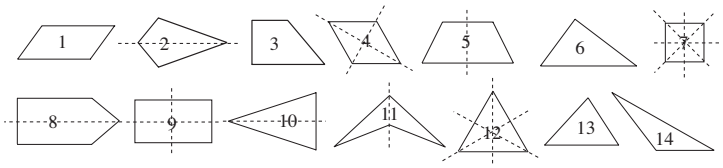
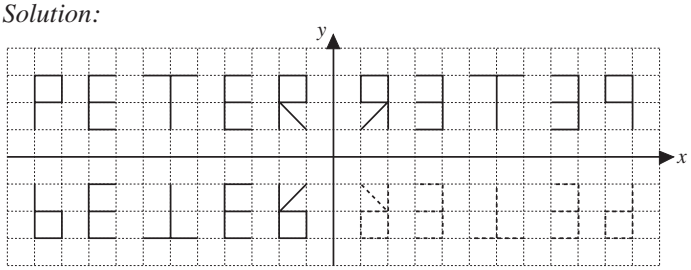
R: Simple constructions
C: Reflection. Line symmetry. Translation
E: Sets

Lesson Plan *71*

Activity		*Notes*
1	**Triangles** If we wanted to sort triangles, how could we do it? Ps suggest different ways, with prompting from T where necessary. e.g. By angles: • acute-angled triangles (each of its 3 angles is less than $90°$) • right-angled triangles (one angle is $90°$, the other two are acute) • obtuse-angled triangles (one angle is more than $90°$, the other two are acute) By sides: • irregular triangles (all 3 sides are different lengths) • isosceles triangles (at least 2 sides are equal in length) • equilateral triangles (all 3 sides are equal lengths, and all angles are equal; equilateral triangles are also isosceles triangles)	Whole class activity Involve as many Ps as possible. BB: acute-angled right-angled obtuse-angled isosceles equilateral
	Let's draw a Venn diagram which shows all these types of triangles. Which set should we draw first? (set for all triangles) T continues the drawing, allowing Ps to suggest the sets and labels if they can. BB: e.g.  (without triangles to start with – see below)	Diagram built up gradually, or use enlarged copy master or OHT with labels covered up and Ps suggest what they should be. Ps could draw Venn diagram in *Ex. Bks* too (or have copies of copy master and draw their own example in each set.)
	T has examples of the 6 types of triangle listed above stuck to side of BB. Ps come to BB to choose one and stick it in appropriate set (or T points to each set in turn and Ps come to BB to draw a suitable triangle). Elicit which triangles have line symmetry.	At a good pace Reasoning, agreement, praising
	6 min	
2	**Quadrilaterals** Let's draw a Venn diagram for quadrilaterals but this time we will sort them according to how many lines of symmetry they have. Again T builds up diagram, helped by Ps (or uses prepared diagram and Ps suggests labels for the sets). BB: e.g.  Agree that **no** quadrilateral has exactly 3 lines of symmetry. T has models of different types of quadrilaterals already prepared and Ps come to BB to choose one and stick in appropriate set, confirming by folding or drawing the lines of symmetry. Ps also say its name and the properties that they know. Who can think of true statements to say bout the Venn diagram? (e.g. 'If a deltoid has only one line of symmetry then it is not a rhombus.' 'Every rectangle is a trapezium.' 'A rectangle which has 4 lines of symmetry is a square.' etc.)	Whole class activity (Or use enlarged copy master or OHP, with labels covered up) Ps could draw Venn diagram in *Ex. Bks*. too (or Ps come to BB to draw quadrilaterals) (including types of angles) T gives examples if Ps cannot think of any. Praising, encouragement only
	10 min	

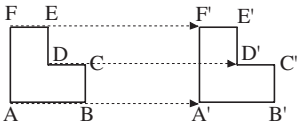
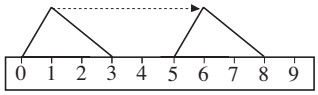
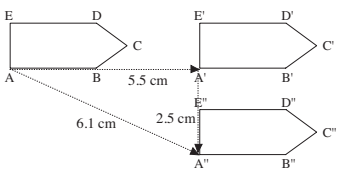
Bk5

Lesson Plan 71

Activity		*Notes*
3	***Book 5, page 71*** Q.1 Read: *Which of these shapes is symmetrical? Draw the lines of symmetry.* Set a time limit. Ps use rulers to measure and draw. Review with whole class. Which shapes have no (1, 2, 3, 4, 5) lines of symmetry? Ps dictate to T who lists them on BB. Class agrees/disagrees. Mistakes discussed and corrected. (T could have enlarged versions cut out for confirmation by folding in case there is disagreement.) *Solution:*  Who can think of questions to ask about the shapes? (e.g. Which shapes are rectangles, have right angles, have a pair of parallel (equal) sides? What is the name of shape11? etc.) *20 min*	Individual work, monitored, helped Drawn (stuck) on BB or use enlarged copy master or OHP Differentiation by time limit T chooses appropriate number of Ps to draw the lines of symmetry on relevant shapes. At a good pace BB: <u>Lines of symmetry</u> 0: 1, 3, 6, 13, 14 1: 2, 5, 8, 10, 11 2: 4, 9, 3: 12 4: 7 5: none Extra praise for creativity!
4	***Book 5, page 71*** Q.2 Read: *Reflect the word PETER:* *a) in the x-axis b) in the y-axis.* Set a time limit. Ps finished early come to BB to draw reflections (or T has solution already prepared). Review with whole class. Ps compare their reflections with those on BB and correct mistakes. *Solution:*  What do you notice about the images? (Neither image is the correct way of writing PETER.) What would we have to do to make them correct? Ps come to BB to show and explain. (If each image is reflected once more, it forms the word PETER correctly but upside down (shown by dotted image in solution); or rotate each image out of the plane by 180° around the *y*-axis). What else do you notice about the <u>positions</u> of the two images? (They have rotational symmetry about the origin.) *25 min*	Individual work, monitored, helped Drawn on BB or use enlarged copy master or OHP Agreement, sef-correction, praising Whole class discussion Involve several Ps. Agreement, praising T prompts or demonstrates if Ps cannot think of anything.

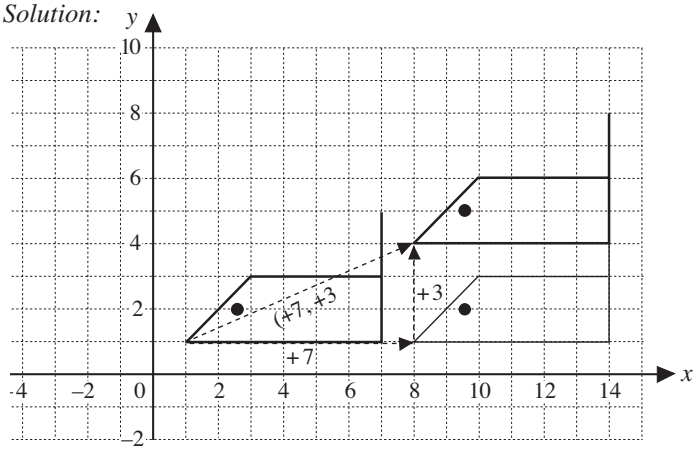
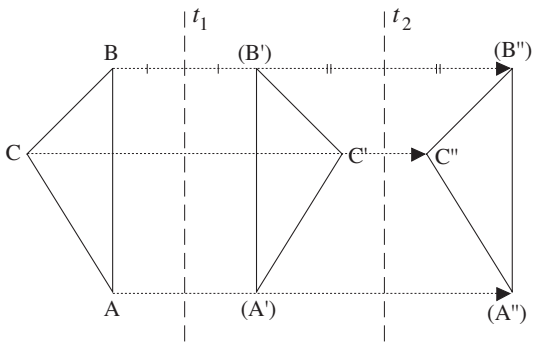
Bk5

Lesson Plan 71

Activity		*Notes*
5	**Translations** Ps have rulers and triangles cut from card on desks. T has larger version and BB ruler for demonstration. a) Hold your ruler horizontally on your desk and lay the triangle against it so that the LH vertex is at zero. Note where the other two vertices are on the ruler. i) Push the triangle 5 cm to the right and note where the other 2 vertices are. ii) Now push the triangle 3 cm to the left and again note the positions of the other 2 vertices. What did you notice? (All the vertices moved by the same distance each time.) T: We call such a movement a <u>translation</u>. (BB) b) Here is a drawing of another translation. What can we tell from it? Ps come to BB to say what they can and T helps where necessary. BB:  e.g. The hexagon ABCDEF has been moved horizontally along the plane to position A'B'C'D'E'F'. Every point on the original hexagon has moved the same distance in the same direction. The two hexagons are <u>congruent</u>. (ABCDEF ≅ A'B'C'D'E'F') The corresponding sides are equal and parallel (AB = A'B' and AB || A'B', etc.) The corresponding angles are equal. (e.g. ∠ A = ∠ A', etc.) T: We say that the movement of ABCDEF to A'B'C'D'E'F' is a <u>translation</u>, or that ABCDEF has been <u>translated</u> to A'B'C'D'E'F'.	Whole class activity Triangles already prepared by T a) Individual manipulation T demonstrates on BB too.  (Ps can try out other movements too.) Agrement, praising BB: <u>translation</u> Drawn on BB or use enlarged copy master or OHP (for demonstration only) Involve several Ps. Where appropriate, T asks Ps to write their contributions in a mathematical way on BB . T prompts if Ps miss important points. Praising, encouragement only
	30 min	
6	***Book 5, page 71*** Q.3 Read: *Two translations were done one after the other. Replace them with just one translation. Draw arrows between the corresponding points on the diagram.* Who can describe the two translations? (Pentagon ABCDE has been translated horizontally to the right, then vertically down.) If we moved from ABCDE to A"B"C"D"E" in one translation, how could we do it? P comes to BB to show it. Who agrees? Who would do it a different way? (diagonally) Read: *Measure the distance of each translation and write it below the arrow. How much shorter is your translation than the sum of the two given?* Elicit that only one pair of corresponding points is needed to measure each translation, as all points move the same distance. Set a time limit. Review with whole class. Ps come to BB to explain solution. Class agrees/disagrees. Mistakes discussed and corrected. Elicit true statements about the shapes. T: The arrow showing a translation is called a <u>vector</u>. (BB)	Individual work, monitored, helped (or whole class activity) Drawn on BB or use enlarged copy master or OHP Discussion, reasoning, agreement, praising *Solution:* e.g.  5.5 cm + 2.5 cm = 8 cm 8 cm – 6.1 cm = <u>1.9 cm</u> (Accept slight variations.)
	35 min	

Bk5

Lesson Plan 71

Activity		*Notes*
7	***Book 5, page 71*** Q.4 Read: *Translate the mouse by adding 7 to the first coordinate and 3 to the second coordinate of each vertex.* Elicit that the first coordinate is the x coordinate and the 2nd is the y-coordinate. Set a time limit. Review with whole class. Ps come to BB to show and explain how they did the translation. Who did the same? Who did it a different way? etc. Mistakes discussed and corrected. If all Ps did the translation in one step, T shows how it could be done in 2 steps. (Increasing the x-corrdinate first to move horizontally to the right, then increasing the y-coordinate to move vertically up.) *Solution:*  *40 min*	Individual work, monitored, helped (or whole class activity if Ps are still unsure) Drawn on BB or use enlarged copy master or OHP Discussion, reasoning, agreement, self-correction, praising T could have a cut-out mouse to demonstrate the translations. (Or Ps might suggest labelling the vertices A, B, C, D and E, listing the original coordinates in *Ex. Bks*, increasing them by the required amounts to give new coordinates for A', B', C', D' and E', then drawing the mouse in the new position.)
8	**Reflections and translations** Look carefully at the diagram. Who can explain it? (Two reflections of the triangle ABC have been done one after the other, first in mirror line t_1, then in mirror line t_2.) Let's write the labels missing from the vertices. Ps come to BB, explaining reasoning. Class agrees/disagrees. BB:  How could we get from triangle ABD to triangle A"B"C" in one step? (By a translation horizontally to the right) Who can say true statements about the diagram? (e.g. equal sides, equal angles, parallel and perpendicular lines, congruent triangles, etc.) Is this statement true or false? 'The distance of the translation is twice the distance between the two mirror lines.' (T) Why? Ps explain at BB. *45 min*	Whole class activity Drawn (stuck) on BB or use enlarged copy master or OHP At a good pace Agreement, praising (Missing labels are in brackets.) (Arrows added to diagram to show translation) (Equality marks added to show that B to B" is twice the distance of t_1 to t_2.) Discussion, demonstration, agreement, praising At speed, involving several Ps. Class points out errors. Ps show on slates or by actions. Reasoning, agrement, praising

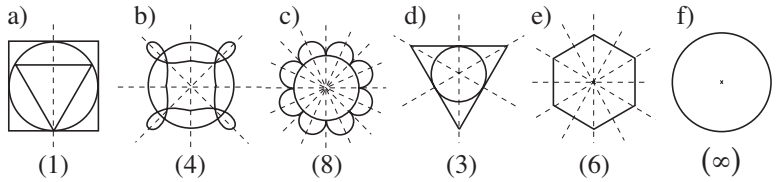
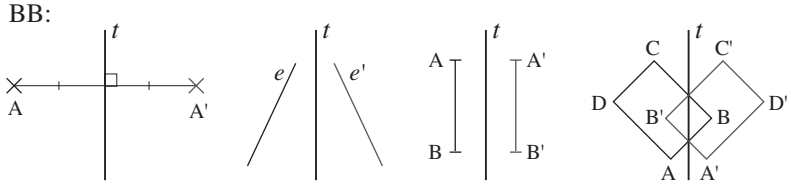
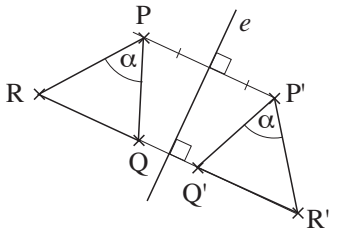
Bk5

R: Freehand drawing and using ruler and compasses

C: Reflection. Line symmetry. Translation. Congruence. Similarity

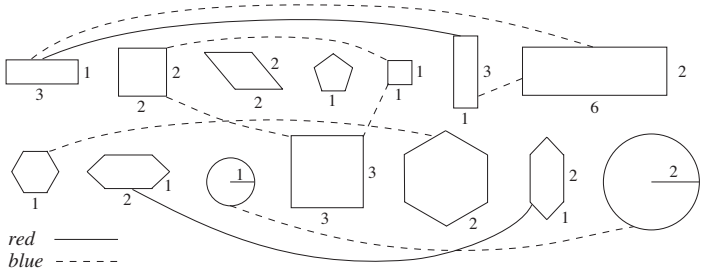
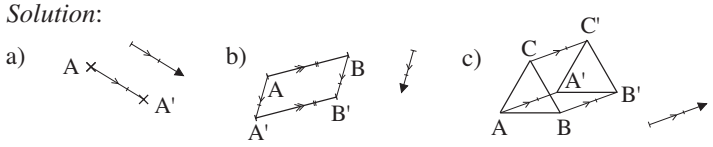
E: Areas of similar shapes

Lesson Plan 72

Activity		*Notes*
1	**Line symmetry** How many lines of symmetry does each shape have? T asks several Ps what they think, then Ps come to BB to draw them. Class agrees/disagrees.  *5 min*	Whole class activity Drawn on BB or use enlarged copy master or OHP At a good pace Agreement, praising Extra praise if Ps realise that it is not possitble to draw <u>all</u> the lines of symmetry in a circle as there is an <u>infinite</u> number.
2	**Reflection** Ps come to BB to try to sketch the reflections of the shapes and label them. T helps if necessary. Class agrees/disgrees. BB:  *10 min*	Whole class activity Drawn on BB or sue enlarged copy master or OHP Have no expectations. Allow freehand sketch as long as Ps indicate equal, parallel and perpendicular lines. (Less able Ps might be given a sheet to fold and pierce.)
3	***Book 5, page 72*** Q.1 Read: *a) Reflect the points P, Q and R in line e.* *b) Draw the triangles PQR and P'Q'R'* *c) Measure the angles in each triangle and add them up.* Allow freehand sketch as long as important criteria are marked, or Ps use rulers and set squares it they have them to measure and draw accurately. Set a time limit. Review with whole class. Ps come to BB to show solution, explaining (with T's help) the steps in reflecting a point. [Draw perpendicular line from the point to the line of symmetry, measure the distance, then extend the line by the <u>same</u> distance on the other side of the line of symmetry and mark the image point. Label it with the same letter and a dash (')] Class agrees/disagrees. Mistakes discussed and corrected. Elicit that R, Q, Q' an R' are on the same straight line. *Solution:*  PQR ≅ P'Q'R' *15 min*	Individual work, monitored, helped, corrected Drawn on BB or use enlarged copy master or OHP Discussion, reasoning, agreement, self-correction, praising T repeats the steps more clearly if necessary. What can you say about triangles PQR and P'Q'R'? (They are congruent.) How could we prove it? (Cut out the triangles and place one on top of the other. One should cover the other exactly.) T demonstrates that PQR and P'Q'R' are the same size and shape, i.e. they are <u>congruent</u>.

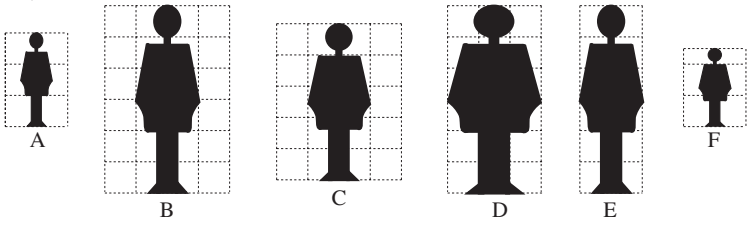
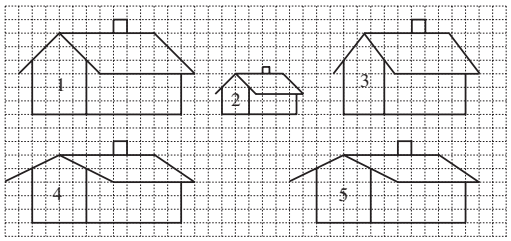
Bk5

Lesson Plan 72

Activity		*Notes*
4	***Book 5, page 72*** Q.2 Read: *Join up **congruent** shapes in red and **similar** but not congruent shapes in blue.* When are shapes similar? (When they are the same shape but not necessarily the same size.) Elicit that all congruent shapes are also similar, but not all similar shapes are congruent. Set a time limit. (Quicker Ps could mark right angles and parallel sides on the shapes.) Review with whole class. Ps come to BB to draw joining lines, explaining reasoning. Class agrees/disagrees. Mistakes discussed and corrected. Agree that any 2 squares are similar and any 2 circles are similar. *Solution:*  *20 min*	Individual work, monitored helped Drawn (stuck) on BB or use enlarged copy master or OHP Agreement, praising Discussion, reasoning, agreement, self-correction, praising What is common to <u>all</u> the shapes? (They are all <u>symmetrical</u>.) T points to each shape in turn and chooses Ps to name it and say how many lines of symmetry it has. Class agrees/disagrees. Ps come to BB to draw them if there is disagreement Feedback for T
5	***Book 5, page 72*** Q.3 Read: *Translate the shape according to the given **vector** (arrow).* What does each vector tell us? (the direction and the distance that we have to move each point) How could we do it? Allow Ps to explain if they can. Demonstrate a) on BB if Ps are unsure. (Use 2 rulers, or ruler and set square, to draw a line from A parallel to the vector. Measure the vector with a ruler or pair of compasses and measure the same distance on the parallel line. Mark and label the point A'.) T might also allow freehand sketches as long as all the important criteria are marked. Set a time limit. Review with whole class. Ps come to BB to show solutions, explaining reasoning. Class agrees/disagrees. Mistakes discussed and corrected. *Solution*:  *25 min*	Individual trial, monitored, helped, corrected Drawn on BB or use enlarged copy master or OHP (for demonstration only) Discussion, reasoning, demonstration if necessary, agreement, praising Or continue as whole class activity if Ps are still unsure, with P working at BB and rest of Ps in *Pbs*. Discussion, agreement, self-correction, praising Elicit that: Δ ABC $\cong$ Δ A'B'C'

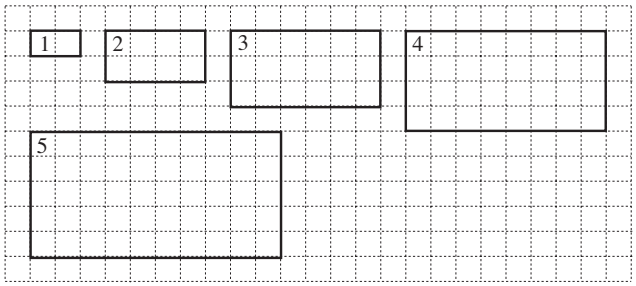
Bk5

Lesson Plan 72

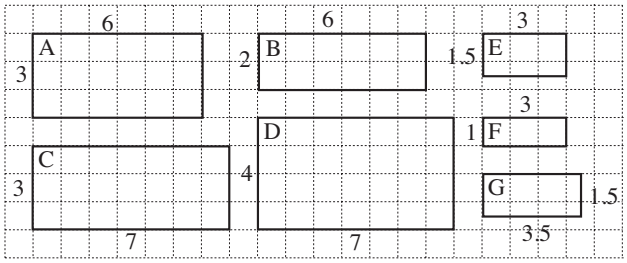
Activity		*Notes*
6	**Similarity and congruence** These are the negatives of some photos. Which do you think are of the same person? BB:  Ps come to BB to point them out and give a reason for their choice (e.g. by counting the unit squares; if congruent the height and width are exactly the same, if similar the height and width are in proportion to one another, i.e. are in the same ratio, but the angles are the same.) Class agrees/disagrees. Let's write it mathematically. Ps come to BB or dictate to T. Class agrees/disagrees.	Whole class activity Drawn (stuck) on BB or use enlarged copy master or OHP Discussion, reasoning, agreement, praising Elicit that the photos are of 3 different people. 1st person: A, B and E (but A is a smaller photo) 2nd person: C and F (but F is a smaller photo. 3rd person: D *Ratio* BB: A ~ B, A ~ E (1 : 2) B ≅ E (1 : 1) C ~ F (2 : 1)
	30 min	
7	***Book 5, page 72*** Q.4 Read: *List the houses which are* ***similar*** *to one another.* Set a time limit. Ps write statements in space in *Pbs* or in *Ex. Bks*. Review with whole class. Ps come to BB to point out similar houses, explain reasoning by giving the ratio of the segments, and to write a statement. Who agrees? Who thinks something else? etc. Mistakes discussed and corrected. *Solution*:  ① ~ ② ~ ⑥ ④ ~ ⑤ ④ ≅ ⑤	Individual work, monitored, (helped) Drawn on BB or use enlarged copy master or OHP At a good pace Reasoning, agreement, self-correction, praising Agree that for similarity, <u>all</u> dimensions should be in the same proportion. (Of course, each house is also similar and congruent to itself!) Feedback for T
	35 min	

Bk5

Lesson Plan 72

Activity		*Notes*
8	**Ratio of enlargement** BB:  	Individual work, monitored, helped Drawn on BB or use enlarged copy master or OHP
	What can you tell me about these rectangles? (Height is increasing by 1 unit and width is increasing by 2 units, or width is twice the height.) Continue enlarging the rectangles in your *Ex. Bks.* and draw and complete this table. Set a time limit. Review with whole class. Ps come to chooses a column and complete it, explaining reasoning. Class agrees/disagrees. Mistakes discussed and corrected. BB:	Agreement, praising Table drawn on BB or use enlarged copy master or OHP (Slower Ps could have copies of table on desks.) Differentiation by time limit Reasoning, agreement, self-correction, praising **Bold** numbers already given.

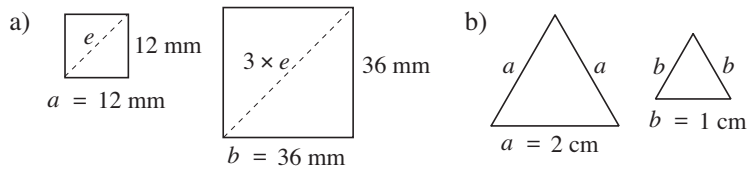
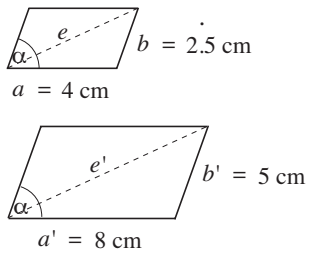
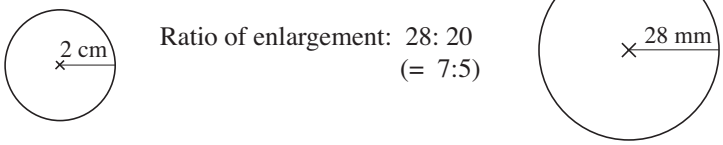
Shorter side	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Longer side	**2**	**4**	**6**	**8**	**10**	12	14	16	18	20
Perimeter (units)	6	12	18	24	30	36	42	48	54	60
Area (unit squares)	2	8	18	32	50	72	98	128	162	100

	What do you notice about the perimeter? (It is in direct proportion to *S* or *L*, e.g. if *S* or *L* increases by 3 times, *P* also increases by 3 times.) What do you notice about the area? (If *S* or *L* increases by 2 times, *A* increases by 2 × 2 times; if *S* or *L* increases by 6 times, *A* increases by 6 × 6 times, etc. (Extra praise if Ps notice this without hint from T) T: We say that the area is in square proportion to *S* or *L*.
	41 min
9	***Book 5, page 72, Q.5*** Read: *In your exercise book, list similar pairs of shapes.* *Write the ratio of enlargement or reduction beside each pair.* T points to each rectangle in turn and Ps dictate similar rectangles, giving the ratio of enlargement or reduction too. Class checks that they are correct. *Solution:*  A ~ E (2 : 1) B ~ F (2 : 1) C ~ G (2 : 1) or E ~ A (1 : 2) or F ~ B (1 : 2) or G ~ C (1 : 2)	Whole class activity (or individual trial first if there is time) Drawn on BB or use enlarged copy master or OHP At a good pace Reasoning, agreement, praising Ps count the units high and wide to work out the ratios. BB: Ratio of areas $A_A = 18$, $A_E = 4\frac{1}{2}$ (4 : 1) $A_B = 12$, $A_F = 3$ (4 : 1) $A_C = 21$, $A_G = 5\frac{1}{4}$ (4 : 1)
Extension	T points to each rectangle and Ps dictate its area. T writes it on BB. What do you notice? Area of enlargement is in square proportion to length of side. Ratio of sides: 2 : 1; ratio of area: (2 × 2): 1	
	45 min	

Bk5

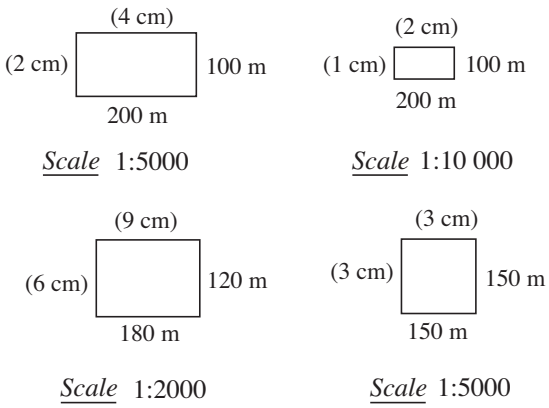
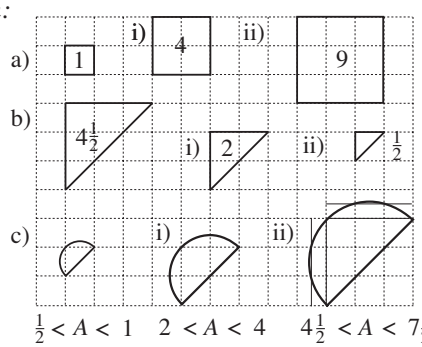
R: Calculation
C: Similarity. Enlargement and reduction on grids
E: Ratios of corresponding sides, perimeters and areas

Lesson Plan *73*

Activity		*Notes*
1	**Similarity** Who thinks that these two shapes are similar? Why? BB:  Ps come to BB to explain their reasoning. Who agrees? Who thinks something else? a) Elicit that the ratio between any pair of corresponding line segments is 1:3. i.e. Every side of the smaller square has been enlarged by 3 times to make the larger square. Agree that <u>any</u> two squares are similar. b) Elicit that $a = 2 \times b$ so the ratio between any pair of corresponding line segments is 1:2. i.e. the larger triangle square has been reduced by a half to make the smaller triangle. Agree that <u>any</u> two equilateral triangles are similar. *5 min*	Whole class activity Drawn on BB or SB or OHT Discussion, reasoning, agreement, praising [a) or larger square has been reduced by 1 third of its size to make the smaller square if it was drawn first] [b) or smaller triangle has been enlarged by 2 times to make the larger triangle] Point out that when writing a ratio, the enlargement or reduction is written first.
2	**Enlargement and reduction 1** T has a parallelogram drawn on BB. How can we draw a shape which is similar to this parallelogram? Ps suggest ideas and T helps them by drawing a sketch on BB. BB: a)  e.g. We could make each side <u>twice</u> as long. $a' = 8$ cm, $b' = 5$ cm The angle, α, would be the same, as would the 3 other angles. The ratio of enlargement is 2:1. Is the ratio of the two diagonals also 2:1? (Yes) b) How can we draw a shape which is similar to this circle? Elicit that <u>any</u> circle is similar to any other circle. e.g. BB:  *10 min*	Whole class activity Drawn on BB or SB or OHT Involve several Ps. Discussion, agreement, praising T repeats explanations more clearly where necessary. Stress and show with cut-out shapes (or shapes copied on OHTs) that lengthening the sides by the same amount of times does not change the angle of their rotation; i.e. in enlargement and reduction, angles <u>do not change</u>.

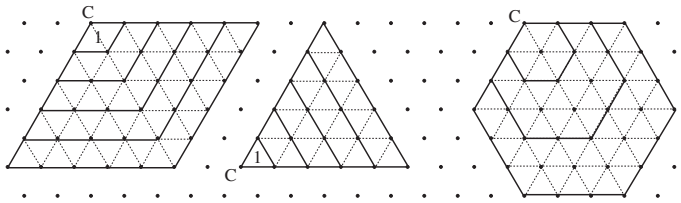
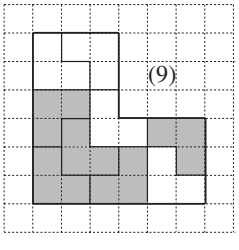
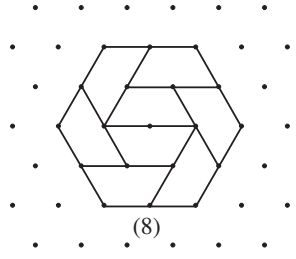
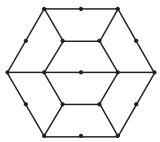
Bk5

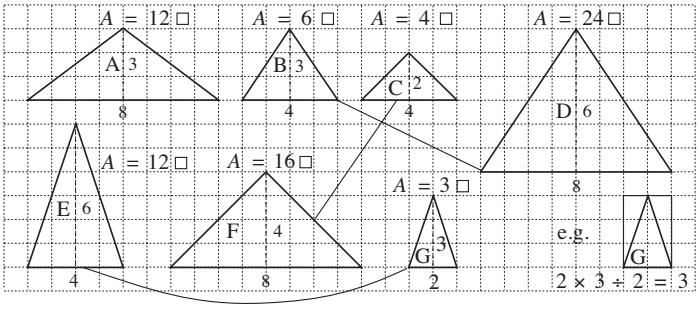
Lesson Plan 73

Activity		*Notes*
3	**Enlargement and reduction 2** If we know that a rectangular garden has a perimeter of 600 m, what length could its sides be? Ps suggest measurements and explain how they got them. Who agrees? Who can think of other measurements? How could we make a scale drawing of the garden? (e.g. Let every 1 cm on the drawing represent 50 m (= 5000 cm) in real life, or every 1 cm on the drawing represent 100 m (= 10 000 cm) in real life, etc.) T chooses one of the rectangles listed on BB and decides which scale to use. After agreement on length of each side, T draws diagram on BB while Ps draw it in *Ex. Bks*. What is the ratio of each side of our diagram to the corresponding side in the garden? Ask several Ps what they think and why. Let's write the ratio below our diagram. How shoudl we do it? We say that this is the scale of our diagram. Repeat for some of the other dimensions suggested. BB: e.g.  *Scale* 1:5000 *Scale* 1:10 000 *Scale* 1:2000 *Scale* 1:5000 *20 min*	Whole class activity Discussion, reasoning, agreement, praising BB: $2 \times (a + b) = 600$ m $a + b = \frac{300 \text{ m}}{}$ $\frac{300 \text{ m}}{} = 200 \text{ m} + 100 \text{ m}$ $= 120 \text{ m} + 180 \text{ m}$ $= 150 \text{ m} + 150 \text{ m}$ etc. T could draw a rough sketch on BB first so that Ps can discuss what length to draw the sides (shown in brackets on diagrams opposite) Ps use rulers and compasses or set squares to measure and draw accurately.. T monitors, helps, corrects. Discussion, agreement on how to write the ratio or scale. Praising, encouragement only
4 **Extension**	***Book 5, page 73*** Q.1 Read: *a)* ***Enlarge*** *the square in the ratio of: i) 2:1 ii) 3:1. Write the area inside eqch square.* *b)* ***Reduce*** *the triangle in the ratio of: i) 2:3 ii) 1:3.* *c)* ***Enlarge*** *the semicircle in the ratio of: i) 2:1 ii) 3:1.* Deal with one part at a time. Set a time limit. Review with whole class. Ps come to BB to draw shapes and explain reasoning. Class agrees/disagrees. Mistakes discussed and corrected. Also elicit the perimeters in a). What do you notice about the areas and perimeters in a)? (Areas are the square numbers, perimeters are increasing by 4. Elicit the areas for b) and for c), the latter as inequalities. *Solution:*  *25 min*	Individual work, monitored, helped Drawn on BB or use enlarged copy master or OHT Encourage Ps to use compasses to draw arcs in c). Reasoning, agreement, self-correction, praising Whole class activity, or extra work for quicker Ps BB: a) $P = 4$ units i) $P = 8$ units ii) $P = 12$ units Area of semicircles estimated by counting squares and half squares, e.g. as shown by thin solid lines on diagram in iii).

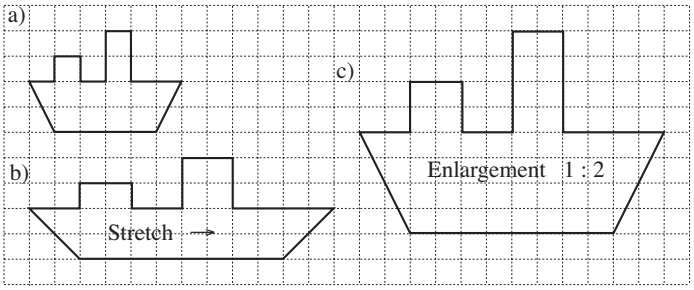
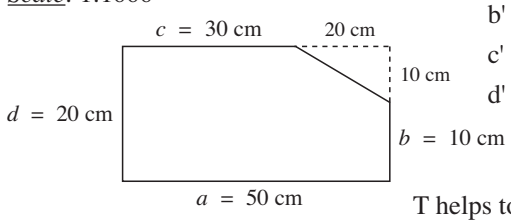
Bk5

Lesson Plan 73

Activity		*Notes*
5	***Book 5, page 73*** Q.2 Read: *Continue enlarging the rhombus, the triangle and the regular hexagon.* *Write their areas as sequences in your exercise book.* T explains/elicits that C in each diagram is the centre of enlargement, i.e. the starting point for the enlargement, and the smallest shape (1) in each diagram is the shape being enlarged. T advises Ps to join up the grid dots lightly in pencil to help them count the areas. Elicit that the unit of measure for the areas is a grid triangle. (△) Deal with one part at a time. Set a time limit. Review with whole class. Ps come to BB to draw the shapes and write the areas, stating the name of the shapes involved. Class agrees/disagrees. Elicit the rule for the sequence, then ask Ps to dictate further terms (using a calculator if necessary). Deal with the perimeters too if there is time. *Solution:*  Areas of parallelograms: 2, 8, 18, 32, 50, (72, 98, 128, . . .) △s *Rule*: 2 times the square numbers [or $2 \times n \times n$, $n = 1, 2, 3, \ldots$] Areas of triangles: 1, 4, 9, 16, 25, [36, 49, 64, . . .] △s *Rule*: the square numbers [or $n \times n$, $n = 1, 2, 3, \ldots$] Areas of hexagons: 6, 24, 54, (96, 150, 216, 294, 384, . . .) △s *Rule*: 6 times the square numbers [or $6 \times n \times n$, $n = 1, 2, 3, \ldots$]	Individual work, monitored, helped (or whole class activity if time is short) Drawn on BB or use enlarged copy master or OHP Initial discussion about enlargement Extra praise if Ps might notice that in each enlargement the sides are increasing by 1 unit. Discussion, reasoning, agreement, self-correction, praising Perimeters (in grid units: ⋯) parallelograms: 4, 8, 12, 16, 20, . . . [+ 4] ⋯ [or $n \times 4$, $n = 1, 2, 3, \ldots$] triangles: 3, 6, 9, 12, 15, . . . [+ 3] ⋯ [or $n \times 3$, $n = 1, 2, 3, \ldots$] hexagons: 6, 12, 18, . . . [+6] ⋯ [or $n \times 6$, $n = 1, 2, 3, \ldots$] [Note to Ts: n is the ordinal value in the sequence, e.g. 1st term, $n = 1$, 2nd term, $n = 2$, etc.]
	33 min	
6	***Book 5, page 73*** Q.3 Read: *Continue dividing the large shape into congruent parts.* What is common to both shapes? (They are hexagons.) What is different about the shapes? (one is irregular and concave, the other is regular and convex) Set a time limit. Review with whole class. **A**, how many congruent shapes did you draw in a)? Who agrees? Who drew a different number? Come and show us. etc. *Solution:* a)  b)  	Individual work, monitored, helped Drawn on BB or use enlarged copy master or OHP Agreement, self-correction, praising (or T has solutions already prepared as confirmation) **Extensions** In a), colour a pair of similar but not congruent hexagons. In b), find another way to divide the hexagon into 8 congruent trapeziums. 
	39 min	

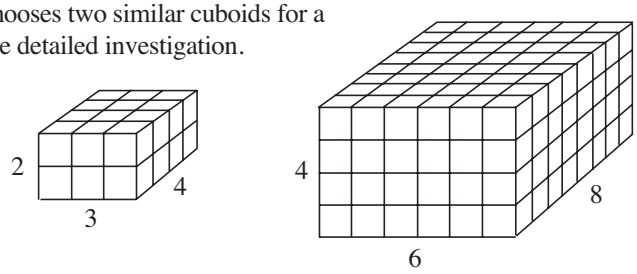
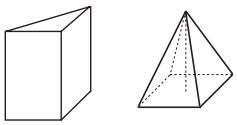
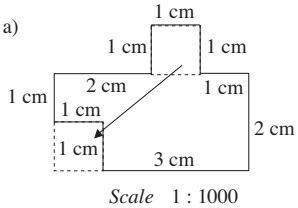
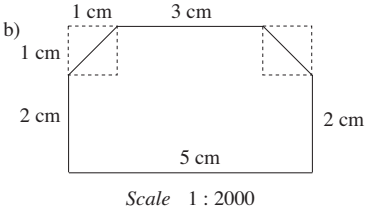
Bk5		*Lesson Plan 73*
Activity		***Notes***
7	***Book 5, page 73*** Q.4 Read: *Colour similar triangles in the same colour.* *Calculate their areas in your exercise book.* Elicit that shapes are similar if the lengths of their corresponding sides are in the same ratio or in direct proportion to one another. Set a time limit. Review with whole class. Ps come to BB or dictate to T, explaining reasoning. Class agrees/disagrees. Mistakes discussed and corrected. *Solution:* (similar triangles joined up)  *45 min*	Individual trial first, monitored, helped (or individual colouring then whole class discussion of how to calculate the areas) Differentiation by time limit Discussion, reasoning, agreement, self-correction, praising T shows how the areas of the triangles can be found by visualising or drawing the appropriate rectangle, counting or calculating its area, then halving it.

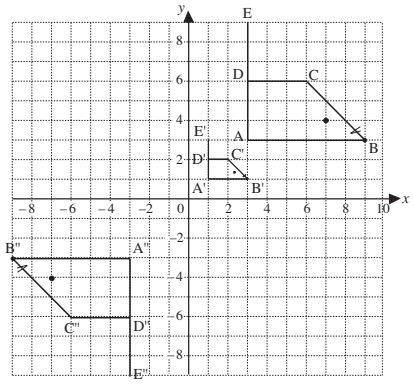
Bk5	R: Calculations **C: Similarity. Enlargement and reduction. Coordinate system** *E: Congruence as a special case of similarity (1:1). 3–D questions*	*Lesson Plan* *74*

Activity		***Notes***
1	**Maps** *Ps all have the same map(s) on desks.* Let's measure the distance from A to B. (Class agrees on distance.) How could we calculate the real distance? Ps explain, with T's help if necessary, or T leads Ps through solution, involving them where possible. e.g. 'The scale on the map is 1 : 500 000 which means that every 1 mm on the map represents 500 000 mm in real life. We measured the distance from A to B as 38 mm. BB: 38 mm × 500 000 = 38 m × 500 = 19 000 m = <u>19 km</u> The real distance is 19 km.' Repeat with other distances on the same map (or use another map with a different scale). *6 min*	Whole class activity Any map (local or national) will do. T also has it on OHT for demonstration only. Ps could choose the two places. Ps come to BB or dictate what T should write. Rest of class copies calculation in *Ex. Bks.* Reasoning, agreement, praising Feedback for T
2	**Stretching and enlargement** T gives one instruction at a time. a) Copy this shape in your *Ex. Bk.* What does it look like? (a boat) b) <u>Stretch</u> it horizontally to the right so that it is twice as long but still the same height. c) <u>Enlarge</u> the first boat in the ratio 2:1. BB:  *14 min*	Individual work, monitored, helped, corrected Drwn on BB or use enlarged copy master or OHP Ps use squared *Ex. Bks.* or sheets of squared paper. Discuss which boats are similar and why (why not). BB: a) ~ c) Elicit that <u>stretching</u> is enlarging in only 1 direction.
3	**Reduction** This is the plan of a field. How can we calculate the area of the real field? Ps come to BB to explain the scale and work out the corresponding lengths of the field, or Ps dictate what T should write, explaining reasoning. Class agrees/disagrees. e.g. BB: <u>*Scale*</u>: 1:1000  In real field: a' = 50 000 cm = 500 m b' = 10 000 cm = 100 m c' = 30 000 cm = 300 m d' = 20 000 cm = 200 m T helps to calculate the area. e.g. A = 500 m × 200 m − 200 m × 100 m ÷ 2 = 100 000 m^2 − 10 000 m^2 = <u>90 000 m^2</u> T explains that: BB: 1 <u>hectare</u> = 100 × 100 m^2 = 10 000 m^2 so the area of the real field is <u>9 hectares</u>. (9 ha) *19 min*	Whole class activity Drawn on BB or SB or OHT Discuss meaning of scale (e.g. 12 cm on diagram represents 1000 m in real life) and method of solution. Involve several Ps. T gives hints or prompts if Ps are having difficulty. Reasoning, agreement, praising Ps could copy steps of solution and the information about hectares in *Ex. Bks* as they are dealt with on BB.

Bk5

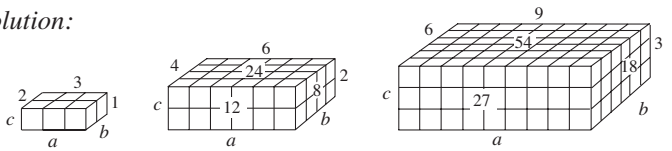
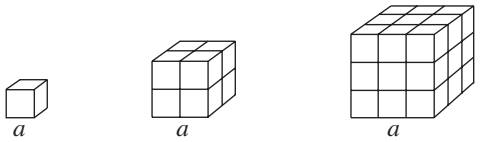
Lesson Plan 74

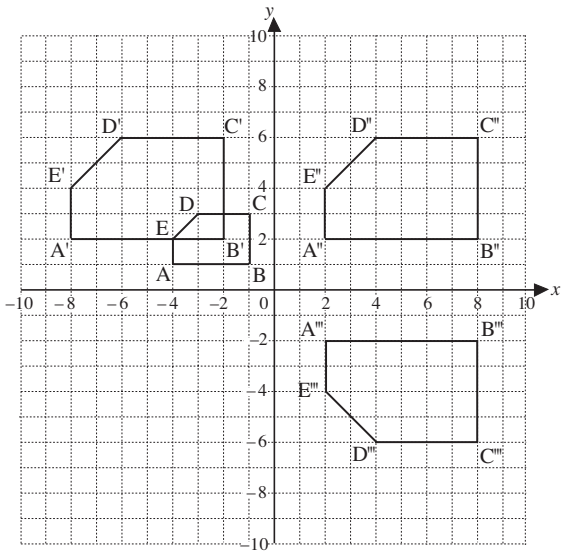
Activity		*Notes*
4	**Similarity in 3–D shapes** T has various cuboids on desk, some similar and some not. a) Which of these cuboids are similar? Ps come to BB to choose them and explain reasoning. Class agrees/disagrees. b) T chooses two similar cuboids for a more detailed investigation. e.g.  Let's compare these 2 cuboids. Ps come to front of class to count the length of the edges, calculate the surface area and volume and say what their ratios are. e.g. • Ratio of lengths of edges: 1 : 2 • $A_1 = 2 \times (2 \times 3 + 2 \times 4 + 3 \times 4)$ $= 2 \times (6 + 8 + 12) = 2 \times 26 = \underline{52}$ (unit squares) $A_2 = 2 \times (4 \times 6 + 4 \times 8 + 6 \times 8)$ $= 2 \times (24 + 32 + 48) = 2 \times 104 = \underline{208}$ (unit squares) $A_1 : A_2 = 52:208 = 1 : 4$ • $V_1 = 2 \times 3 \times 4 = \underline{24}$ (unit cubes) $V_2 = 4 \times 6 \times 8 = \underline{192}$ (unit cubes) $V_1 : V_2 = 24 : 192 = 1 : 8$ c) T has other types of solids to show to class Which of these solids do you think are similar? Ps come to front of class to choose them and say why they think they are similar (if possible by eye) before confirming by measuring. *25 min*	Whole class activity Cuboids already prepared by T (multilink cubes, cartons, boxes, Cuisennaire rods, etc.) Use models made from multilink cubes for demonstration so that Ps can count the edges easily. Discussion, reasoning, agreement, praising Ps dictate what T should write. T helps, corrects where necessary Ps could write calculations in *Ex. Bks.* too. e.g. prisms, pyramids,  cylinders, spheres, etc. and/or some real objects.
5	***Book 5, page 74*** Q.1 Read: *In your exercise book, calculate the real area of the gardens shown in these plans.* Suggest that the scales be in cm, e.g.. in a), every 1 cm on the diagram represents 1000 cm (= 10 m) in real life. Set a time limit. Ps first measure the diagrams in *Pbs* and write lengths beside relevant sides, then calculate areas in *Ex.Bks*. Review with whole class. Ps come to BB to write and explain their calculations. Class agrees/disagrees. Mistakes discussed and corrected. *Solution:* a)  *Scale* 1 : 1000 b)  *Scale* 1 : 2000	Individual work, monitored, helped Drawn on BB or use enlarged copy master or OHP for demonstration only Differentiation by time limit: a) expected from all Ps, b) expected only from more able Ps. Discussion, reasoning, agreement, self-correction, praising Extra praise if Ps notice that in a) if the top square is moved to the bottom LH corner, a 2 cm × 4 cm rectangle is formed.

Bk5		*Lesson Plan 74*
Activity		***Notes***
5	(Continued) Areas a) Area of diagram: 4 cm × 2 cm = 8 cm² Area of garden: 40 m × 20 m = 800 m² b) Area of diagram: (3 × 5) cm² – (1 × 1) cm² = 15 cm² – 1 cm² = 14 cm² Area of garden: (60 × 100) m² – (20 × 20) m² = 6000 m² – 400 m² = 5600 m²	In b), the shape can be thought of as a 5 cm × 4 cm rectangle with half a cm square cut from each top corner.
Extension	What is the ratio of the area of the diagram to the area of the real garden? Elicit that: 1 m² = 100 cm × 100 cm = 10 000 cm² So a) 800 m² = 800 × 10 000 cm² = 8 000 000 cm² b) 5600 m² = 5600 × 10 000 cm² = 56 000 000 cm² a) Ratio of diagram to garden: 8 : 8 000 000 = 1 : 1 000 000 (1 : 1 million) b) Ratio of diagram to garden: 14 : 56 000 000 = 1 : 4 000 000 (1 : 4 million)	Whole class activity Ps to suggest what to do and how to calculat, with hints or prompts from T where necessary Extra praise if Ps remember that 1000 thousands is 1 million. (6 zeros)
	32 min	
6	***Book 5, page 74*** Q.2 Read: *a) Fill in the coordinates of the points.* *b) Divide the coordinates of each point by 3. Draw the new shape.* *c) Change each of the original coordinates to its* ***opposite*** *number. Draw the new shape.* Deal with one part at a time under a time limit and review before continuing with next part. Ps come to BB to draw shapes and write coordinates (or dictate to T). Class agrees/disagrees. Mistakes discussed and corrected *Solution:* 	Individual work, monitored, helped (or whole class activity) Drawn on BB or use enlarged cop;y master or OHP Reasoning, agreement, self-correction, praising Coordinates a) A (3, 3), B (9, 3), C (6, 6), D (3, 6), E (3, 9) b) A' (1, 1), B' (3, 1), C' (2, 2), D' (1, 2), E' (1, 3) c) A" (– 3, – 3), B" (– 9, – 3), C" (– 6, – 6), D" (– 3, – 6), E" (– 3, – 9)
Extension	• What is the ratio of the sides of the original mouse to the corresponding sides of each of its two images? ABCDE : A'B'C'D'E' = 3 : 1 (or 1 : 1 third) ABCDE : A"B"C"D"E" = 1 : 1 (They are congruent.) • Who could describe another way to get from ABCDE to A"B"C"D"E'? (Rotation by 180° around the origin, or reflection in the origin.)	Whole class activity Ps dictate what T should write. [i.e. a reduction by 1 third] [To reflect shape in origin, draw a line from each vertex to the origin and extend the line for the same distance.]
	39 min	

Bk5

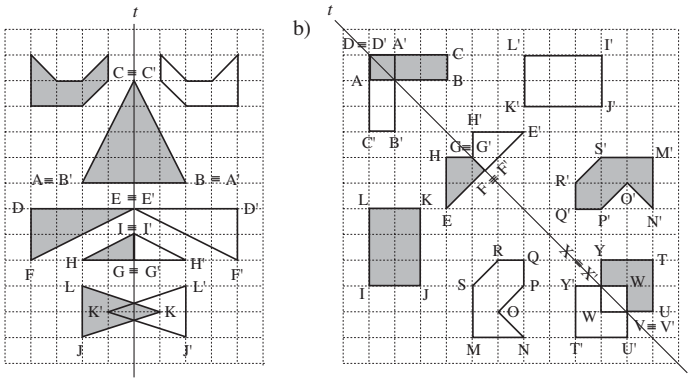
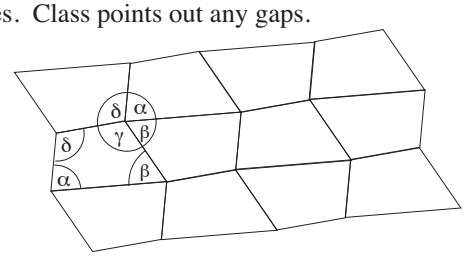
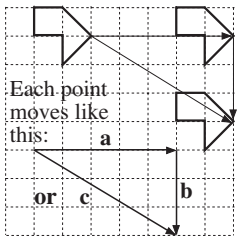
Lesson Plan 74

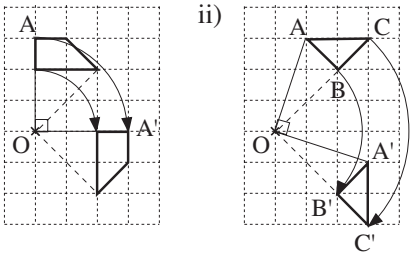
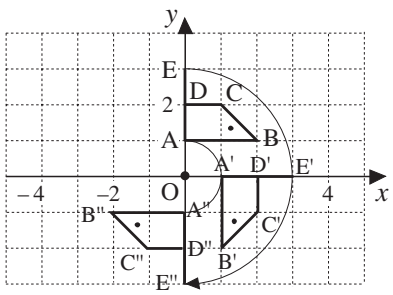
Activity		*Notes*
7	***Book 5, page 74***	
	Q.3 Read: *a) Complete the drawing of the third cuboid.*	Individual work, monitored, helped
	Continue the sequences for sides a, b and c and for area (A) and volume (V) in your exercise book.	(or whole class activity if time is short)
	b) Continue the sequences for a, A and V in your exercise book.	Drawn on BB or use enlarged copy master or OHP
	Deal with one part at a time or set a time limit. Ps calculate surface areas in *Ex. Bks*.	
	Review with whole class. T has cuboids already made from large unit cubes for demonstration. Ps dictate the sequences, with T's help for area and volume if necessary. Mistakes discussed and corrected.	Reasoning, agreement, self-correction, praising
	Solution:	
	a) 	
	a: 3, 6, 9, 12, 15, 18, . . . (+ 3) [3 × *n*, *n* = 1, 2, 3, . . .]	Rules in square brackets are shown for Ts and are not expected from Ps.
	b: 2, 4, 6, 8, 10, 12, . . . (+ 2) [2 × *n*, *n* = 1, 2, 3, . . .]	
	c: 1, 2, 3, 4, 5, . . . (+ 1) [*n*, *n* = 1, 2, 3, . . .]	
	A: 22, 88, 198, 352, . . . [22 × *n* × *n*, *n* = 1, 2, 3, . . .]	Ps say what they notice about corresponding edges, areas and volume. e.g.
	V: 6, 48, 162, 384, . . . [6 × *n* × *n* × *n*, *n* = 1, 2, 3, . . .]	if *a* increases by 2 times:
	b) 	• *b* and *c* also increase by 2 times (direct proportion)
	a: 1, 2, 3, 4, 5, . . . [*n*, *n* = 1, 2, 3, . . .]	• area increases by 2 × 2 times (square proportion)
	A: 6, 24, 54, 96, 150, . . . [6 × *n* × *n*, *n* = 1, 2, 3, . . .]	• volume increases by 2 × 2 × 2 times (cube proportion)
	V: 1, 8, 27, 64, 125, . . . [*n* × *n* × *n*, *n* = 1, 2, 3, . . .]	
	45 min	

Bk5	R: Simple consruction **C: Axial reflection and symmetry. Translation. Rotation** *E: Reflection. Symmetry. Coordinate system*	*Lesson Plan* *75*
Activity		***Notes***
1	**Coordinate system** Ps have coordinate grids (copy master) on desks or able Ps could draw *x* and *y* axes in *Ex. Bks* and mark +10 to − 10 on both.	Individual drawing, one step at a time, monitored, helped, corrected
	a) Draw a pentagon which has these coordinates. BB: A (– 4, 1), B (– 1, 1), C (– 1, 3), D (– 3, 3), E (– 4, 2)	Grid drawn on BB or use enlarged copy master or OHP T dictates starting coordinates and writes them on BB too
	 e.g	T gives instructions. Ps draw and label new image, then dictate its coordinates to T who writes then on BB. Ps correct any mistakes before T gives the next instruction.
	b) Multiply each of the coordinates by 2 and draw the new shape in *red*. Ps dictate new coordinates to T who writes on BB. BB: A' (– 8, 2), B' (– 2, 2), C' (– 2, 6), D' (– 6, 6), E' (– 8, 4) Elicit that this is an enlargement in the ratio of 2:1.	Agreement, self-correction, praising
	c) Add 10 to each *x*-coordinate of the shape in b) and draw the new shape in *blue*. Ps dictate new coordinates to T. BB: A" (2, 2), B" (8, 2), C" (8, 6), D" (4, 6), E" (2, 4) Elicit that this is a translation horizontally to the right by 10 units.	
	d) Reflect the shape in c) in the *x*-xis. Ps dictate new coordinates to T. BB: A (2, – 2), B" (8, – 2), C" (8, – 6), D" (4, – 6), E" (2, – 4) Elicit that the *y* coordinates are the opposite value of those in c).	
	What can you tell me about the shapes? (e.g. ABCDE ~ A'B'C'D'E', A'B'C'D'E' ≅ A"B"C"D"E" , etc. Area of ABCDE = $5\frac{1}{2}$ unit squ. and area of A'B'C'D'E' = 22 unit squ., etc.) **(= 4 × $5\frac{1}{2}$ unit squ.)**	T gives hints if necessary. Praising, encouragement only
Extension	Ps give instructions for drawing a shape in the 3rd quadrant.	(Reflection, rotation, or stating change in coordinates)
	10 min	

Bk5

Lesson Plan 75

Activity		*Notes*
2	***Book 5, page 75*** Q.1 Read: *Reflect the shapes in axis t.* Elicit the 2 conditions for reflection. (Corresponding points should be an <u>equal</u> and <u>perpendicular</u> distance from the axis or *mirror line*.) Deal with one shape at a time or set a time limit. Review with whole class. Ps come to BB to name the shape and draw its reflection. If problems, Ps label the corresponding points on the original and the image. Class points out errors. Mistakes discussed and corrected. *Solution:* (showing corresponding points) a) b)  	Individual work, monitored, helped, corrected Drawn on BB or use enlarged copy master or OHP (Differentiation by time limit) Discussion, reasoning, agreement, self-correction, praising Ps check by counting the number of grid units down and across (or diagonally). There is no need to label <u>all</u> points if Ps have had no difficulties but do elicit <u>equivalent</u> points,
	18 min	
3	**Tessellation** T has 12 congruent quadrilaterals on desk. Who can come and tile (tessellate) the BB with them? Ps come to BB one after the other to stick on one of the shapes. Class points out any gaps. BB: e.g.  Which quadraliterals are translations (reflections, rotations)? Ps come to BB to point them out, showing corresponding points, angles or sides. Class agrees/disagrees. If we label the angles in the quadrilateral α, β, γ and δ, what do you notice? ($\alpha + \beta + \gamma + \delta = 360°$) T points it out if no P sees it. T : <u>All</u> quadrilaterals have this property of tessellation, so the sum of their angles is always $360°$.	Whole class activity [If possible, Ps tessellate on desks too. Ps could have 12 layers of scrap paper, (or 3 A4 sheets folded in four) on desks and cut out <u>any</u> quadrilateral so that they have 12 congruent shapes, or Ps cut out shapes from reduced copy master] T could use copy master, enlarged and cut out. Discussion, agreement, praising Extra praise if a P notices this. If Ps made their own shapes, ask them to confirm that this is true for all their shapes too.
	23 min	
4	**Translation and rotation** a) Copy this shape in your *Ex. Bks*. BB: i) Translate it horizontally to the right by 5 units. ii) Translate it vertically down by 3 units. iii) How can we replace a) and b) with one translation? Ps draw arrows on BB. T explains that arrows showing direction and distance are called <u>vectors</u>. Vectors are usually labelled with **bold** letters.  	Individual work for i) and ii) Whole class discussion for iii) Drawn on BB or SB or OHT (or use cut-out shapes on a grid to show movements) P shows each step on BB. Discussion, agreement, self-correction, praising (or underlined when written)

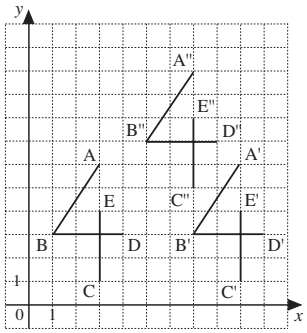
Bk5		*Lesson Plan 75*
Activity		***Notes***
4	(Continued) b) Let's rotate this shape by $-90°$ around the point O. Elicit or remind Ps that turning through a negative angle means turning clockwise. P comes to BB to show rotation. Class agrees/disagrees. T draws a curved arrow to show how the shape has moved. We can check that every vertex has moved by $-90°$ if we draw lines from the corresponding points to meet at O. The angle the lines form should be $90°$. Ps choose a vertex and check with T's help. Repeat the process with another shape. BB: e.g. i) ii)  Note that: OA = OA' OB = OB' etc.	Whole class activity Drawn (stuck) on BB (or shapes copied onto 2 OHTs and held one exactly on top of the other by a pin or the point of a pair of compasses, so that the top OHT can be rotated) Ideally, Ps have OHTs or shapes on desks too. T demonstrates on BB or OHP. (Ps could copy diagram in *Ex. Bks*.) Check right angles with square corner template or protractor. Discussion, agreement, praising
	30 min	
5	***Book 5, page 75*** Q.2 Read: *a) Write the coordinates of the shape.* *b) Rotate the shape by $-90°$ around point O. Write the new coordinates.* *c) Repeat the rotation with the image. Write the new coordinates.* Deal with one part at a time if Ps are still unsure, or set a time limit. Review at BB with the whole class. Ps come to BB to draw images and write coordinates. Class agrees/disagrees. Mistakes discussed and corrected. *Solution:*  What do you notice about the coordinates? (e.g. in shapes in a) and c), x and y coordinates are opposite values.) If we rotated shape c) for two more rotations by $-90°$ around point O, where would it get to? (back to the original position)	Individual work, monitored, helped, corrected Drawn on BB or use enlarged copy master or OHP Discussion, reasoning, agreement, self-correcting, praising or coordinates in a) and b) have exchanged values and the y coordinate has the opposite sign. e.g. $(2, 1) \rightarrow (1, -2)$
	36 min	

Bk5

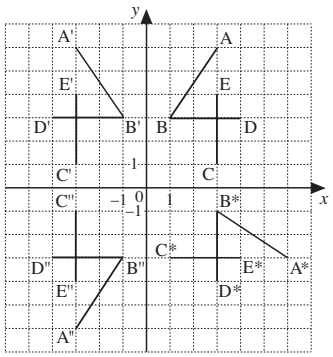
Lesson Plan 75

Activity		*Notes*
6	***Book 5, page 75*** Q.3 Read: *Write the coordinates of the points in the original diagram and in its images in your exercise book.* *What kind of transformations have been done?* T explains/elicits that a transformation in mathematics is a change from one position to another. Set a time limit for a) and review before dealing with part b). Ps dictate coordinates to T, who writes them on BB. Class agrees/disagrees. Mistakes discussed and corrected. Ps describe each transformation. Class agrees/disagrees or describes a different one which has the same effect. *Solution*:	Individual work in writing the coordinates, whole class discussion on the kind of transformations (or all done as whole class activity if time is short) Drawn on BB or use enlarged copy master or OHP Discussion, reasoning, agreement, self-correction, praising T repeats Ps descriptions more clearly and concisely if necessary.

a)



b)



a) A (3, 6), A' (9, 6), A'' (7, 10)
B (1, 3), B' (7, 3), B'' (5, 7)
C (3, 1), C' (9, 1), C'' (7, 5)
D (4, 3), D' (10, 3), D'' (8, 7)
E (3, 4), E' (9, 4), E'' (7, 8)

All movements are <u>translations</u>.

A to A': 6 units horizontally to the right

A' to A'': 4 units vertically up and 2 units horizontally to the left

b) A (3, 6), A' (– 3, 6), A'' (– 3, – 6), A* (6, – 3)
B (1, 3), B' (– 1, 3), B'' (– 1, – 3) B* (3, – 1)
C (3, 1), C' (– 3, 1), C'' (– 3, – 1) C* (1, – 3)
D (4, 3), D' (– 4, 3), D'' (– 4, – 3) D* (3, – 4)
E (3, 4), E' (– 3, 4), E'' (– 3, – 4) E* (4, – 3)

A to A': Reflection in the y-axis

A' to A'': Reflection in the x-axis

A'' to A*: Rotation by – 90° around point O

How could we get from this shape to this shape? (T points them out.)

Ps describe transformation in own words.

e.g. A to A' (Reflection in O or rotation by 180° around O)

etc.

45 min

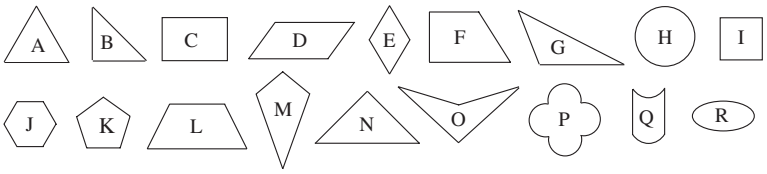
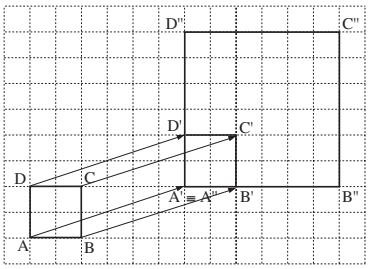
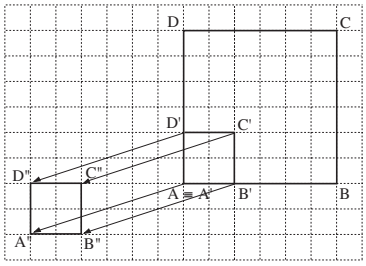
Bk5

R: Coordinate system. Symmetry

C: Geometric transformations: rotation, translation, reflection

E: Rotational symmetry. Problems with 3-D shapes

Lesson Plan 76

Activity		*Notes*
1	**Line symmetry** Let's group these shapes by how many lines of symmetry they have. Ps come to BB to name each shape, draw its lines of symmetry and write its letter in the correct set. Class agrees/disagrees. BB: e.g.  <u>No. of lines of symmetry</u> 0: D, F, G (parallelogram, trapezium, triangle) 1: B, L, M, N, O, Q (isosceles triangle, trapezium with 1 pair of opposite sides equal, deltoid, plane shape) 2: C, E, R (rectangle, rhombus, ellipse) 3: A (equilateral triangle) 4: I, P (square, plane shape) 5: K (regular pentagon) 6: J (regular hexagon) ∞: H (circle) *6 min*	Whole class activity Drawn or stuck on BB or use enlarged copy master or OHP At a good pace Reasoning agreement, praising Which shapes are: • triangles (A, B, G, N) • trapeziums (C, D, E, F, I, L) • deltoids (E. I, M, O) • parallelograms (C, D, E, I) • rectangles (C, I) • rhombi? (E, I) Review the properties of each type of shape. (parallel/perpendicular/equal sides, number of sides; equal angles, types of angles; convex/concave; etc.)
2	**Transformations** a) What can you tell from this diagram? Ps come to BB to explain. Who agrees? Who thinks something else? etc. BB:  (The square ABCD was translated to A'B'C'D'. Then A'B'C'D' was enlarged by 3 times, or in the ratio 3:1, starting from point A', to A"B"C"D" .) Who can tell us true statements about the diagram? [Elicit parallel and equal lines (including the vectors AA', BB', etc.), perpendicular lines and equal angles.] b) If we had drawn the largest square first, who can explain the transformation in reverse? Ps come to BB to draw new diagram, or amend original diagram, explaining their reasoning. BB:  (The square ABCD was reduced by 1 third, or in the ratio 1:3, from A to A'B'C'D'. Then A'B'C'D' was translated to A"B"C"D" .) *12 min*	Whole class activity Drawn on BB or use enlarged copy master or OHP Involve several Ps. Discussion, reasoning, agreement, praising T repeats explanation more clearly if necessary. e.g. $AB = A'B' = \frac{1}{3}$ of A"B" AA' || BB' || CC' || DD' $D\hat{A}B = D'\hat{A}'B' = D"\hat{A}"B"$ etc. Draw grid on BB or use enlarged copy master or OHP Reasoning, agreement, praising

Bk5

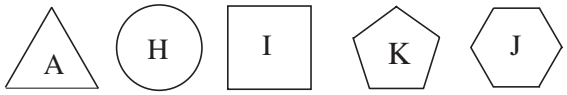
Lesson Plan 76

Activity

3

Preparation for rotational symmetry

Ps have these thick card shapes and sheets of <u>plain</u> paper on desks.
T has larger versions for demonstration.



a) Take shape A. Lay it on a sheet of paper, draw around it and label the vertices. Now follow my instructions.

i) How many lines of symmetry does it have? (3) How could we draw them? Elicit that each line passes through the vertex and cuts the opposite side in half. Ps use a ruler to measure the mid-points of each side and join it to the vertex opposite.

Where is the centre of the triangle? (where the lines of symmetry meet) Let's label it O.

ii) What does each of its angles measure? ($60°$) Ps use protractors.

Now measure this angle. (T points to an angle at the centre.) We call it angle COB and write it like this. (BB: $\angle$ COB or $C\hat{O}B$) The <u>middle</u> letter shows where the vertex is.

Let's measure all the centre angles. Ps dictate their sizes in degrees and T writes on BB. (All 3 centre angles measure $120°$.)

iii) Let's rotate the triangle around O and see if there are any postions where the image lines up exactly with the original triangle. Agree that there are 3 such positions: after rotating the triangle through angles of $120°$, $240°$ and $360°$)

Deal with the other shapes in a similar way.

b) Let's look at shape I. Does it have a centre? (Yes) Ps come to BB to show it and label it O (the point where the 2 diagonals meet).

Let's rotate the square around O and see if its image lines up exactly with the original square. Agree that there are 4 such positions: after turns of $90°$, $180°$, $270°$ and $360°$)

c) What about the pentagon? How many times in a complete turn will the image line up exactly with the original shape? Ask several Ps what they think. Let's check it.

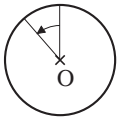
How can we find the centre point? (Draw lines of symmetry from each vertex. The point where they meet is the centre.) Agree that there are 5 such positions in a complete turn.

How could we work out the angles of the turns without having to measure them? Ps dictate what T should write. (BB)

Agree that the 5 positions are after turns of $72°$, $144°$, $216°$, $288°$ and $360°$.

d) What about the hexagon? (6 positions: $60°$, $120°$, $180°$, $240°$, $300°$, $360°$)

e) What about the circle? (infinite number of positions, as it lines up when rotated through <u>any</u> angle)



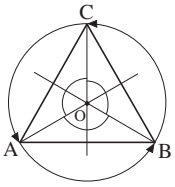
25 min

Notes

Whole class activity with individual drawing on plain sheets of paper (or in plain *Ex. Bks*.)

T demonstrates on BB and Ps work on desks.

BB:



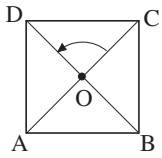
$C\hat{O}B = 120°$

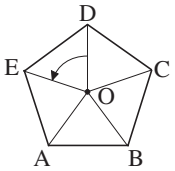
$C\hat{O}A = 120°$

$A\hat{O}B = 120°$

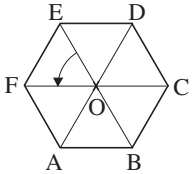
T demonstrates turns on BB (if possible with an OHT on top of the original).
Ps rotate own shapes on desks.
Agreement, praising

BB:





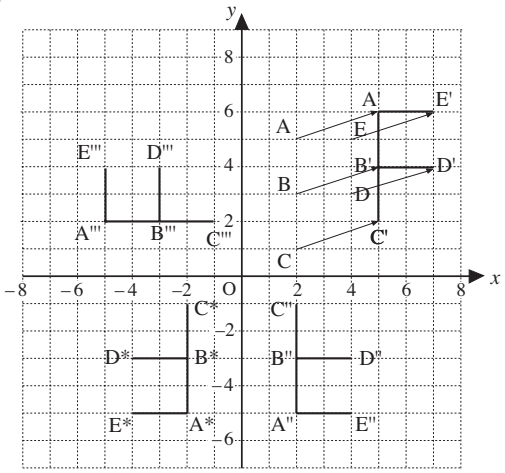
$360° \div 5 = 72°$



$360° \div 6 = 60°$

Bk5

Lesson Plan 76

Activity		*Notes*
4	***Book 5, page 76*** Q.1 Read: *a)* ***Translate*** *shape* F *so that the coordinates of point* C' *are (5, 2).* *b)* ***Reflect*** *the original shape* F *in the x-axis.* *c)* ***Rotate*** *the original shape* F *by* $90°$ *around point O.* *c)* ***Rotate*** *the original shape* F *by* $180°$ *around point O.*	Individual work, monitored, helped (or whole class activity if time is short) Drawn on BB or use enlarged copy master or OHP
	Deal with one part at a time or set a time limit. Ps label the images appropriately and write coordinates in *Ex. Bks*.	e.g. A, A', A", A''', A*
	Review with whole class. Ps come to BB to draw image and explain the transformation, pointing out the changes in the coordinates and drawing vectors where relevant. Class agrees/ disagrees. Mistakes discussed and corrected.	(Ps finished early could draw solution, or T could have solution already prepared) Discussion, reasoning, agreement, self-correction, praising
	Solution:  	Elicit that in: b) *x* coordinates are the same but *y* coordinates change to opposite value; c) numerical values are exchanged and *x*-coordinate has the opposite sign. d) in both coordinates, numerical values are the same but the signs change to the opposite value.
	What do you notice about the shapes? e.g. • All 5 shapes are congruent. • F" is not a proper letter F. • F* is the mirror image of shape F" reflected in the *y* axis. • F''' is F* rotated by $-90°$ around O. • F* is F reflected in the origin. etc.	T gives hints if Ps cannot think of anything Extra praise for unexpected notices. Feedback for T
	32 min	

Bk5

Lesson Plan 76

Activity

5

Book 5, page 76

Q.2 Read: *a) Reflect shape ABCDE in line e.*

b) Reflect its image in line f.

c) Translate the image 4 units to the right.

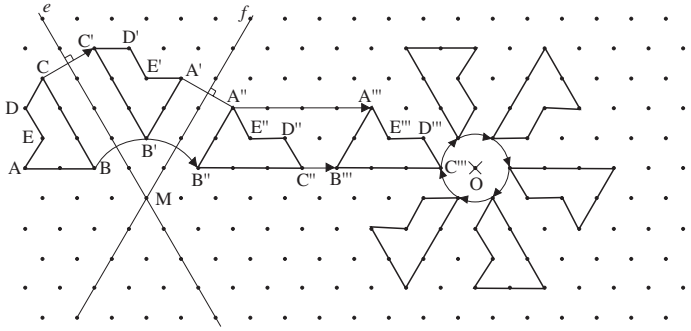
d) Rotate the last shape by $60°$ *around point O. Repeat the rotation several times.*

What is the shape? (pentagon, irregular, concave)

Deal with one part at a time or set a time limit.

Review with whole class. Ps come to BB to draw, label and explain transformations. Class agrees/disagrees. Mistakes discussed and corrected.

Solution:



Elicit that the 2 reflections in a) and b) could be replaced by a rotation of $-120°$ around point M.

40 min

6

Book 5, page 76, Q.3

a) Read: *Write beside each solid how many planes of symmetry it has.*

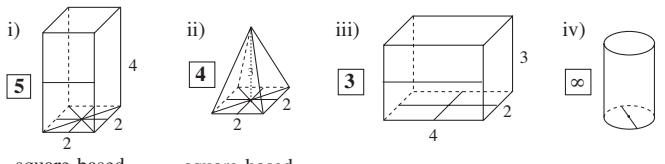
T has models for demonstration, as well as diagrams on BB.

T holds up each solid in turn. Ps name the solid and say what they know about it. Elicit that a plane of symmetry divides the solid into two equal parts.

Ps come to show the planes of symmetry on the model and to write how many there are on the diagram on BB. Class agrees/disagrees.

(If Ps are struggling, ask them to think how many lines of symmetry the base has first, then to think how many more are in the extra dimension, the height.) Ps write agreed number in *Pbs* too.

Solution: (Planes represented by lines in diagrams.)



b) Read: *Which type of solid is formed by rotating each of the shaded shapes around the given axis? Write the names in your exercise book.*

Ask Ps to visualise the rotations in their heads. Ps write names on slates or scrap paper and show on command. After confirmation with models, elicit how many planes of symmetry they have. (∞)

45 min

Notes

Individual work, monitored, helped, corrected

(or whole class activity if Ps are still unsure)

Drawn on BB or use enlarged copy master or OHP

Ps do not need to label all the images in d).

(or Ps finished early draw solution on BB or T has solution already prepared)

Discussion, reasoning, agreement, self-correction, praising

d) Agree that after the 6th rotation, we get back to the image we started with.

the 6 rotations clockwise are:

$60°$, $120°$, $180°$, $240°$, $300°$, $360°$

Whole class activity

Diagrams drawn on BB or use enlarged copy master or OHP

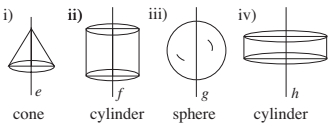
(Models could be made from modelling clay or plasticine, so that perspex sheets can be pushed through them)

Or Ps could show number of planes of symmetry on scrap paper or slates in unison on command, then a P answering correctly explains on model and diagram.

Note that:

- all square-based solids have at least 4 planes of symmetry;
- all circular-based solids have an infinite number of planes of symmetry (as in b).

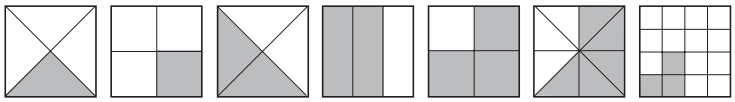
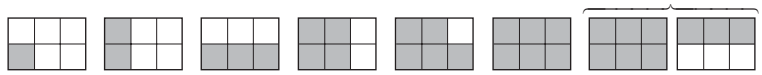
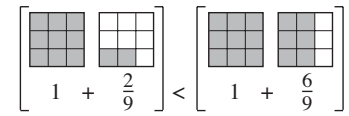
Solution:



Bk5

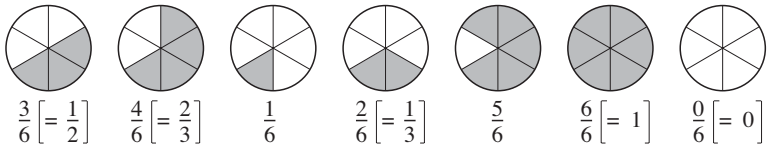
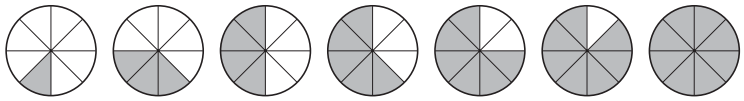
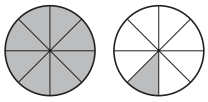
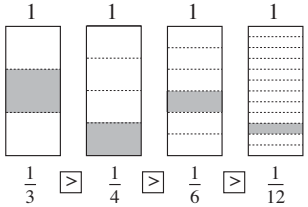
R: Mental calculation
C: Fractions with equal denominators. Adding/subtracting from 1
E: Fractions greater than 2. Negative fractions. Comparison

Lesson Plan 77

Activity		*Notes*
1	**Fractions of a square** Each of these squares is 1 unit. **A**, come and shade part of a square and see whether the class knows what fraction you have shaded. Rest of class shouts out the fraction (or shows on scrap paper or slates). T asks **A** to explain his/her fraction. (e.g. 'I divided the square into 4 equal parts and shaded 1 of them, so the shaded part is 1 quarter.') Who can show the same fraction shaded in a different way? Who can show a different fraction? T might also specify certain fractions. BB: e.g.  $\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{2}=\frac{2}{4}$ $\frac{2}{3}$ $\frac{3}{4}$ $\frac{5}{8}$ $\frac{3}{16}$ What part of each square is <u>not</u> shaded? Who can write an addition or an inequality about each square? Ps come to BB or dictate to T. Class agrees/disagrees.	Whole class activity Drawn on BB or SB or OHT At a good pace In unison Reasoning, agreement, praising e.g. sixths, ninths, 5 quarters, etc. Elicit the names of top (<u>numerator</u>) and bottom (<u>denominator</u>) numbers in a fraction and what they mean. BB: e.g. $\frac{1}{4}+\boxed{\frac{3}{4}}=1,\quad \frac{1}{4}<\underset{\frac{3}{4}}{1}$
	5 min	
2	**Fractions of a rectangle** Each rectangle is 1 unit. Let's shade the given fractions and compare them by filling in the missing signs. Ps come to BB to shade rectangles and write missing signs, explaining reasoning. Class agrees/disagrees or points out equivalent fractions. BB:  $\frac{1}{6}$ $\boxed{<}$ $\frac{2}{6}$ $\boxed{<}$ $\frac{3}{6}$ $\boxed{<}$ $\frac{4}{6}$ $\boxed{<}$ $\frac{5}{6}$ $\boxed{<}$ $\frac{6}{6}$ $\boxed{<}$ $\frac{9}{6}$ $\frac{1}{3}$ $\frac{1}{2}$ $\frac{2}{3}$ 1 $1+\frac{3}{6}=1\frac{1}{2}$	Whole class activity Drawn on BB or use enlarged copy master or OHP At a good pace Reasoning, agreement, praising T prompts if Ps do not notice equivalent fractions. Feedback for T
	10 min	
3	***Book 5, page 77*** Q.1 a) Read: *If this square is 1 unit, what part of the unit is each grid square?* Show me . . . now! ($\frac{1}{9}$) P answering correctly explains to Ps who were wrong. (The unit has been divided into 9 <u>equal</u> parts, so each part is 1 ninth of the unit) b) Read: *Compare the fractions. Fill in the missing signs.* Set a time limit. Ps can draw diagrams in *Ex. Bks.* to help them. Review with whole class. Ps dictate the whole inequality or equation. Class agrees/disagrees. Mistakes discussed and corrected. Ps draw diagrams on BB if problems or disagreement. *Solution:* i) $\frac{1}{9}<\frac{2}{9}$ ii) $\frac{3}{9}<\frac{5}{9}$ iii) $\frac{6}{9}>\frac{3}{9}$ iv) $\frac{4}{9}>\frac{2}{9}$ v) $\frac{9}{9}>\frac{7}{9}$ vi) $\frac{4}{9}<\frac{7}{9}$ vii) $\frac{8}{9}<\frac{9}{9}$ viii) $\frac{11}{9}<\frac{15}{9}$	Whole class activity to start BB:  **1 unit** Responses shown on scrap paper or slates in unison. Agreement, praising Individual work, monitored, helped Agreement, self-correction, praising e.g viii) $\frac{11}{9}\ \boxed{<}\ \frac{15}{9}$  $\left[1+\frac{2}{9}\right]<\left[1+\frac{6}{9}\right]$ Elicit equivalent fractions and differences.
	18 min	

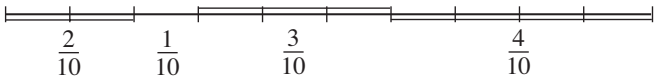
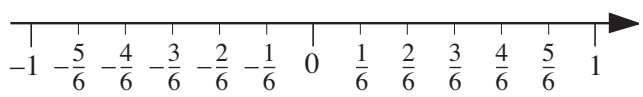
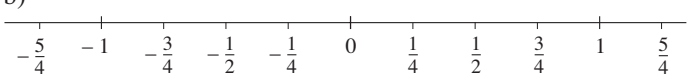
Bk5

Lesson Plan 77

Activity		*Notes*
4	**Fractions of a circle 1** T has circles drawn (stuck) on BB. Each circle is 1 unit. What do you notice about it? (The circle has been divided in to 6 equal parts, so each part is 1 sixth of the circle.) Ps come to BB to shade in part of the circle and class shouts out which fraction is shaded. P at BB writes the agreed fraction beneath his/her drawing. Ps point out any equivalent fractions. e.g. BB:  $\frac{3}{6}\left[=\frac{1}{2}\right]$ $\frac{4}{6}\left[=\frac{2}{3}\right]$ $\frac{1}{6}$ $\frac{2}{6}\left[=\frac{1}{3}\right]$ $\frac{5}{6}$ $\frac{6}{6}\left[=1\right]$ $\frac{0}{6}\left[=0\right]$ Let's put the fractions in increasing order. Ps dictate what T should write. e.g. Using fractions above: $0 < \frac{1}{6} < \frac{1}{3} < \frac{1}{2} < \frac{2}{3} < \frac{5}{6} < 1$ *23 min*	Whole class activity Drawn (stuck) on BB or use enlarged copy master or OHP At a good pace Agreement, praising T could ask for other fractions too. e.g. $\frac{9}{6}$, $\frac{7}{3}$, etc. Feedback for T
5	**Fractions of a circle 2** Each circle is 1 unit. Let's shade the given fractions and compare them by filling in the missing signs. Ps come to BB to shade different parts of the circle and write missing signs, explaining reasoning. Class agrees/disagrees. Elicit equivalent fractions where relevant. BB:  $\frac{1}{8}$ < $\frac{3}{8}$ < $\frac{4}{8}$ < $\frac{5}{8}$ < $\frac{6}{8}$ < $\frac{7}{8}$ < $\frac{8}{8}$ $\frac{1}{2}$ $\frac{3}{4}$ 1 What is the difference between each pair? What do you notice when comparing fractions? (e.g. If two fractions have equal denominators, the greater fraction has the greater numerator.) *28 min*	Whole class activity Drawn (stuck) on BB or use enlarged copy master or OHP At a good pace Agreement, praising T asks Ps to show other fractions too, e.g. How can we show $\frac{9}{8}$?  $\frac{9}{8} = 1 + \frac{1}{8} = 1\frac{1}{8}$
6	***Book 5, page*** 77 Q.2 Read: *Each rectangle is 1 unit.* *a) Colour red one part of each of the rectangles. Write below it what fraction the red part is of the whole unit.* *b) List the fractions in decreasing order.* Set a time limit. Review with whole class. Ps come to BB or dictate to T, explaining reaoning. Class agrees/disagrees. Mistakes discussed and corrected. If we coloured 2 (3) parts of each rectangle, what part of the unit rectangle would we have coloured? Ps dictate to T. (BB) What do you notice about the fractions? (e.g. If two fractions have equal numerators, the fraction with the greater denominator is the smaller fraction.) *33 min*	Whole class activity Drawn on BB or use enlarged copy master or OHP Reasoning, agreement, praising *Solution:*  1 1 1 1 $\frac{1}{3}$ > $\frac{1}{4}$ > $\frac{1}{6}$ > $\frac{1}{12}$ BB: $\frac{2}{3} > \frac{2}{4} > \frac{2}{6} > \frac{2}{12}$

Bk5

Lesson Plan 77

Activity		*Notes*
7	**Fractions of a line segment** Draw a line segment 10 cm long in your *Ex. Bk* and make a mark at every 1 cm. If we think of the whole line segment as 1 unit, what fractions can you see on it? (tenths) Let's list all the possible tenths in increasing order. Ps dicate to T, pointing out equivalent fractions where relevant. BB: $\frac{1}{10} < \frac{2}{10} < \frac{3}{10} < \frac{4}{10} < \frac{5}{10} < \frac{6}{10} < \frac{7}{10} < \frac{8}{10} < \frac{9}{10} < \frac{10}{10}$ $\frac{1}{5}$ $\frac{2}{5}$ $\frac{1}{2}$ $\frac{3}{5}$ $\frac{4}{5}$ 1 T covers over different parts of the line segment and Ps come to BB to write the fractions, explaining reasoning. Class agrees/disagrees. BB: e.g.  	Whole class activity, with individual drawing Ps explain that the line segment has been divided into 10 equal parts, so each part is 1 tenth. Extra praise for equivalent fractions At a good pace Ue different colours for different fractions. Agreement, praising
	36 min	
8	***Book 5, page 77*** Study this number line. What can you tell me about it? (e.g. ranges from – 1 to 1, with a tick at each sixth; positive fractions are to the right and negative fractions to the left of zero; every positive fraction has an opposite negative fraction an equal distance from zero.) Ps come to BB to point out pairs of opposite fractions. BB:  Q.3 Read: *a) Write beside each fraction its opposite value.* *b) Use your ruler to measure and draw appropriate ticks on the number line, then mark on it and label all the eight fractions.* *c) List the fractions in increasing order.* Set a time limit or deal with one part at a time. Review with whole class. Ps come to BB or dictate to T, explaining reasoning. Class agrees/disagrees. Mistakes discussed and corrected. *Solution:* **a)** $\frac{3}{4}, \boxed{-\frac{3}{4}}$; $-\frac{1}{2}, \boxed{\frac{1}{2}}$; $\frac{4}{4}, \boxed{-\frac{4}{4}}$; $-\frac{5}{4}\ \boxed{\frac{5}{4}}$ b)  c) $-\frac{5}{4} < -\frac{4}{4} < -\frac{3}{4} < -\frac{1}{2} < \frac{1}{2} < \frac{3}{4} < \frac{4}{4} < \frac{5}{4}$	Whole class activity to start Drawn on BB or use enlarged copy master or OHP T gives hints if necessary. Agreement, praising Individual work, monitored, helped (or continue as whole class activity if Ps are unsure, with Ps working at BB with T's help and rest of class in *Pbs*.) Reasoning, agreement, self-correction, praising
	41 min	
Extension	Elicit other forms of the fractions and how much more should be added to, or subtracted from, each fraction to make 1.	e.g. $-\frac{5}{4} = -1\frac{1}{4}$, $\frac{5}{4} = 1\frac{1}{4}$ $\frac{3}{4} + \boxed{\frac{1}{4}} = 1$, $\frac{5}{4} - \boxed{\frac{1}{4}} = 1$

Bk5		*Lesson Plan 77*
Activity		***Notes***
9	***Book 5, page 77*** Q.4 Read: *Write these fractions in increasing order.* a) Set a time limit. Review with whole class. Ps come to BB or dictate to T, explaining reaoning. Class agrees/disagrees. Mistakes discussed and corrected. *Solution*: $-\frac{18}{12} < -\frac{13}{12} < -\frac{12}{12} < -\frac{1}{12} < \frac{5}{12} < \frac{8}{12} < \frac{14}{12}$ **A**, come and underline the positive fractions. How can we tell which is greater? (Elicit that among positive fractions with equal denominators, the greatest fraction has the greatest numerator, i.e. is furthest from 0 on the number line) **B**, come and underline the negative fractions. How can we tell which is greater? (Elicit that among negative fractions with equal denominators, the greater fraction has the smallest numerator, i.e. is closest to zero on the number line) b) What do you notice about these fractions? (Equal numerators but different denominators) Which fraction should we write first? **X**, what do you think? Who agrees? Who thinks another fraction? Why? Ps show approximate positions on class number line if disagreement. Class decides on correct order. Ps write agreed order in *Pbs*. *Solution*: $-\frac{3}{2} < -\frac{3}{4} < -\frac{3}{6} < -\frac{3}{12} < \frac{3}{8} < \frac{3}{7} < \frac{3}{5} < \frac{3}{2}$ Elicit that: • among positive fractions with equal numerators, the greatest fraction has the smallest denominator, i.e. it is furthest from zero); • among negative fractions with equal numerators, the greatest fraction has the greatest denominator, i.e. it is the closest to zero. *45 min*	Individual trial, monitored, helped Fractions written on BB or SB or OHT Discussion, reasoning, agreement, self-correcting, praising T repeats Ps' explanations more clearly if necessary. Praising only Whole class activity (or individual trial first if Ps wish) Discussion, reasoning, checking on number line, agreement, praising Extra praise if Ps reason by converting to equal denominators but do not insist on this yet. Feedback for T

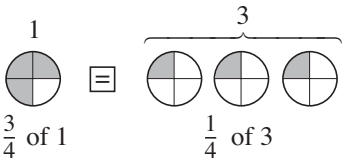
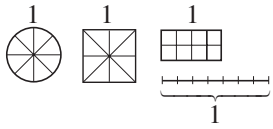
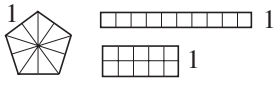
Bk5

R: Number line. The concept of a fraction

C: Comparison of fractions. Equal denominators

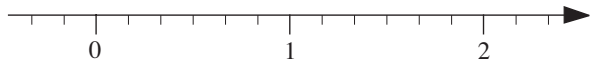
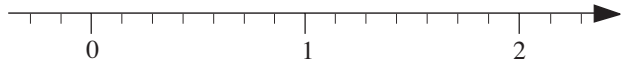
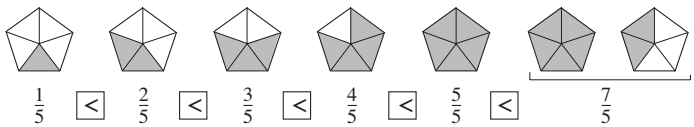
E: Equal numerators

Lesson Plan 78

Activity		*Notes*
1	**Fractions of 1 unit and more than 1 unit** This circle is 1 unit. Who can shade 3 quarters of it? P comes to BB to shade and explain reasoning. Class agrees/disagrees. How many units are here? (3 units) Who can shade 1 quarter of 3 units? P comes to BB to shade and explain reasoning. Class agrees/disagrees. What sign could we write between them? (=) BB:  Agree that $\frac{3}{4}$ means '3 quarters of 1 unit' or '1 quarter of 3 units'. Who can write an addition and subtraction about the digrams? (BB) Repeat for other fractions (e.g. $\frac{1}{2}$, $\frac{3}{5}$, $\frac{7}{10}$, etc.) on different models. *6 min*	Whole class activity Drawn on BB or SB or OHT (Make sure that the circles are equal sizes!) Reasoning, agreement, praising BB: e.g. $\frac{3}{4} = \frac{1}{4} + \frac{1}{4} + \frac{1}{4}$ $\frac{3}{4} = 1 - \frac{1}{4}$ or $\frac{3}{4} = 3 - (\frac{3}{4} + \frac{3}{4} + \frac{3}{4})$ [or $\frac{3}{4} = 3 - (2 + \frac{1}{4})$]
2	**Sequences** T says the first 3 terms of a sequence. Ps say the following terms. Class points out errors. What is the rule? Who agrees? etc. a) $\frac{1}{8}, \frac{2}{8}, \frac{3}{8}, (\frac{4}{8}, \frac{5}{8}, \frac{6}{8}, \frac{7}{8}, \frac{8}{8}, \frac{9}{8}, \frac{10}{8}, \frac{11}{8}, \ldots)$ *Rule:* Increasing by 1 eighth $(+\frac{1}{8})$ How could we show eighths on a diagram? Ps come to BB. Which eighths can you write in other forms? Come and show them on a diagram. (e.g. $\frac{2}{8} = \frac{1}{4}$  ; $\frac{4}{8} = \frac{1}{2}$  ; $\frac{8}{8} = 1$  ; or b) $\frac{15}{10}, \frac{13}{10}, \frac{11}{10}, (\frac{9}{10}, \frac{7}{10}, \frac{5}{10}, \frac{3}{10}, \frac{1}{10}, -\frac{1}{10}, -\frac{3}{10}, -\frac{5}{10}, \ldots)$ *Rule:* Decreasing by 2 tenths $(-\frac{2}{10})$ How could we show tenths on a diagram? Ps come to BB. Agree that only positive tenths can be shown in a pentagon, rectangle, etc. but positive and negative tenths can be shown on a number line. Which tenths can be written in other forms? (e.g. $\frac{5}{10} = \frac{1}{2}$, or Find pairs which make 1 unit. (e.g. $\frac{9}{10} + \frac{1}{10} = \frac{7}{10} + \frac{3}{10} = 1$) *14 min*	Whole class activity At speed, in order round class T decides when to stop. Praising, encouragement only BB: e.g  $\frac{10}{8} = 1 + \frac{2}{8} = 1 + \frac{1}{4} = 1\frac{1}{4}$ etc. BB: e.g.  $\frac{13}{10} = 1 + \frac{3}{10} = 1\frac{3}{10}$, etc.) At speed. T chooses Ps at random. Class agrees/disagrees.

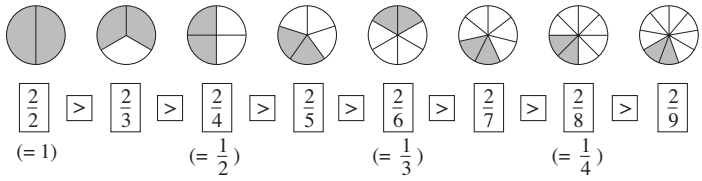
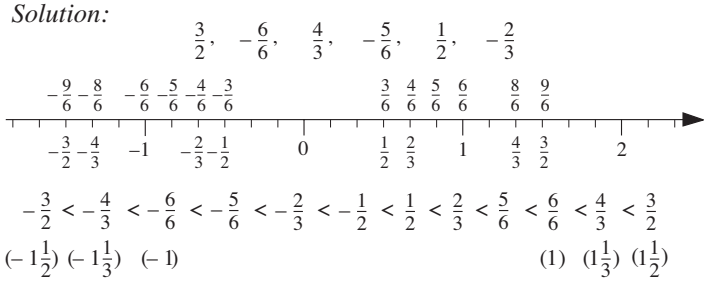
Bk5

Lesson Plan 78

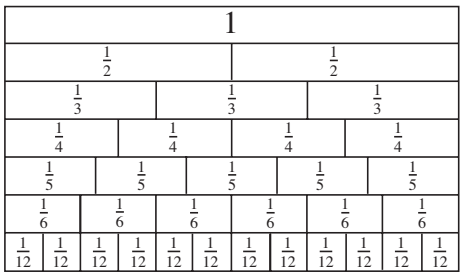
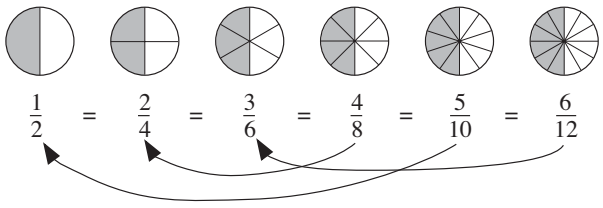
Activity		*Notes*
3	**Number line** a) BB:  What can you tell me about this number line? (There is a tick at every sixth.) Where are these fractions on the number line? T says a fraction and chooses a P to come to BB to label appropriate point. Class agrees/disagrees. Elicit equivalent fractions where relevant. e.g. $\frac{1}{6}$, $\frac{3}{6}$ ($\frac{1}{2}$), $\frac{10}{6}$ ($1\frac{2}{3}$), $\frac{0}{6}$ (0), $\frac{5}{6}$, $-\frac{1}{6}$, $\frac{4}{6}$ ($\frac{2}{3}$), $\frac{7}{6}$, $\frac{13}{6}$ ($2\frac{1}{6}$) How long is the line segment for 1 sixth? (1 sixth of a unit) T says and/or points to 2 fractions on the number line and Ps say the distance between them. b) Deal with sevenths in a similar way. BB:  e.g. $\frac{2}{7}$, $\frac{0}{7}$ (0), $\frac{14}{7}$ (2), $-\frac{2}{7}$, $\frac{10}{7}$ ($1\frac{3}{7}$), $\frac{1}{7}$, $\frac{16}{7}$ ($2\frac{2}{7}$), $\frac{5}{7}$, etc. How long is the line segment from 0 to 5 ninths? (5 ninths of a unit) Ps come to BB to point to 2 fractions and say the distance between them. Class points out errors.	Whole class activity Number lines drawn on BB or use enlarged copy master or OHP At a good pace Agreement, praising At speed. Praising, encouragement only At speed. In good humour Praising, encouragement only
	22 min	
4	**Equivalent fractions** Tell me or show me different ways of describing $\frac{5}{11}$. Ps say additions, subtractions, etc. or come to BB to write them or draw diagrams. e.g. $\frac{5}{11} = \frac{1}{11} + \frac{1}{11} + \frac{1}{11} + \frac{1}{11} + \frac{1}{11} = 5 \times \frac{1}{11} = 1 - \frac{6}{11}$, etc. Repeat for, e.g. $\frac{3}{2}$, $\frac{4}{5}$, $\frac{6}{12}$, etc.	Whole class activity Encourage creativity Agreement, praising Ps might draw number line segment, or divide circle into elevenths and shade 5, or write 'five elevenths', etc. Extra praise for unexpected forms!
	25 min	
5	***Book 5, page 78*** Q.1 Read: *Each pentagon is 1 unit. Colour the given fractions and compare them.* Set a time limit of 1 minute. Review at BB with whole class. Ps come to BB to colour fractions and write missing signs. Class agrees/disagrees. Mistakes discussed and corrected. *Solution:*  (Equal denominators, so greater fraction has greater numerator) Find two fractions which add up to $\frac{4}{5}$ (or to 1, or to $\frac{7}{5}$, etc.).	Individual work, monitored Drawn on BB or use enlarged copy master or OHP Discussion, reasoning, agreement, self-correction, praising Orally at speed. Praising
	28 min	

Bk5

Lesson Plan 78

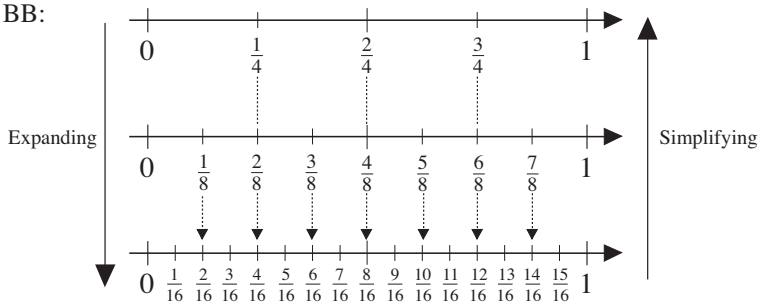
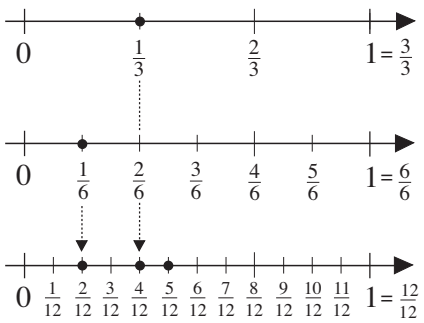
Activity		*Notes*
6	***Book 5, page 78*** Q.2 Read: *Each circle is 1 unit. Colour two parts in each circle.* *Write the fractions coloured below the circles and compare them.* Set a time limit of 2 minutes. Review at BB with whole class. Ps come to BB to colour fractions and write fractions and missing signs, explaining reasoning. Class agrees/disagrees. Mistakes discussed and corrected. Elicit equivalent fractions. What do you notice? (numerators equal, so greater fraction has the smaller denominator) *Solution:*  $\frac{2}{2} > \frac{2}{3} > \frac{2}{4} > \frac{2}{5} > \frac{2}{6} > \frac{2}{7} > \frac{2}{8} > \frac{2}{9}$ $(=1)$ $(=\frac{1}{2})$ $(=\frac{1}{3})$ $(=\frac{1}{4})$ *33 min*	Individual work, monitored, (helped) Drawn on BB or use enlarged copy master or OHP Reasoning, agreement, self-correction, praising Feedback for T
7	***Book 5, page 78*** Q.3 Read: *a) Mark these fractions and their opposite values on the number line.* *b) List all the marked fractions in increasing order.* What can you tell me about the number line? (There is a tick at every sixth of a unit.) How many fractions will you mark altogether? (12) Tell me what they are. (Ps recite in unison.) Set a time limit. Ps mark with dots and label (small writing!). Review with whole class. Ps come to BB to mark and label number line, explaining reasoning and pointing out equivalent fractions. Class agrees/disagrees. Mistakes discussed and corrected. Elicit/remind Ps that numbers made up of a whole number and a fraction are called <u>mixed numbers</u>. *Solution:*  $\frac{3}{2}, -\frac{6}{6}, \frac{4}{3}, -\frac{5}{6}, \frac{1}{2}, -\frac{2}{3}$ $-\frac{3}{2} < -\frac{4}{3} < -\frac{6}{6} < -\frac{5}{6} < -\frac{2}{3} < -\frac{1}{2} < \frac{1}{2} < \frac{2}{3} < \frac{5}{6} < \frac{6}{6} < \frac{4}{3} < \frac{3}{2}$ $(-1\frac{1}{2})$ $(-1\frac{1}{3})$ (-1) (1) $(1\frac{1}{3})$ $(1\frac{1}{2})$ *38 min*	Individual work, monitored, helped (or whole class activity if time is short) Drawn on BB or use enlarged copy master or OHP Less able Ps could use enlarged copy master. Reasoning, agreement. self-correction, praising Ps explain how they decided which fraction was bigger. (Convert to sixths first.) BB: <u>mixed number</u> e.g. $1\frac{1}{3} = 1 + \frac{1}{3}$

Bk5		*Lesson Plan 78*
Activity		***Notes***
8	***Book 5, page 78*** Q.4 Read: *Fill in the missing numbers*. Set a time limit. Review with whole class. Ps come to BB or dictate to T, saying the whole addition or subtraction. Class agrees/disagrees. Mistakes discussed and corrected. If problems or disagreement, show on class number line or draw diagrams on BB or demonstrate with a model. *Solution:* a) $\frac{1}{2}+\boxed{\frac{1}{2}}=1$ $\quad \frac{1}{3}+\boxed{\frac{2}{3}}=1$ $\quad \frac{2}{3}+\boxed{\frac{1}{3}}=1$ $\quad \frac{3}{3}+\boxed{0}=1$ $\frac{3}{7}+\boxed{\frac{4}{7}}=1$ $\quad \boxed{\frac{7}{9}}+\frac{2}{9}=1$ $\quad \frac{4}{5}+\boxed{\frac{1}{5}}=1$ $\quad \frac{4}{5}+\boxed{1\frac{1}{5}}=2$ b) $1-\frac{2}{2}=\boxed{0}$ $\quad 1-\frac{1}{2}=\boxed{\frac{1}{2}}$ $\quad 1-\frac{0}{2}=\boxed{1}$ $\quad 1-\frac{3}{4}=\boxed{\frac{1}{4}}$ $2-\frac{4}{5}=\boxed{1\frac{1}{5}}$ $\quad 1-\frac{3}{7}=\boxed{\frac{4}{7}}$ $\quad 2-\frac{6}{6}=\boxed{1}$ $\quad 3-\frac{2}{5}=\boxed{2\frac{3}{5}}$	Individual work, monitored, helped (or whole class activity if time is short) Written on BB or use enlarged copy master or OHP Differentiation by time limit Reasoning, agreement, self-correction, praising Feedback for T
	45 min	
Homework	***Book 5, page 78, Q.5*** *Solution:* a) $\frac{2}{15}<\frac{7}{15}$ $\quad$ b) $\frac{6}{7}>\frac{1}{7}$ $\quad (1\frac{1}{7})$ $\quad$ c) $-\frac{2}{8}>-\frac{3}{8}$ $\quad (-\frac{1}{4})$ d) $\frac{51}{10}<\frac{52}{10}$ $\quad (5\frac{1}{10})$ $\quad (5\frac{2}{10}=5\frac{1}{5})$ $\quad$ e) $\frac{4}{8}>\frac{4}{10}$ $\quad (\frac{1}{2})$ $\quad (\frac{2}{5})$ $\quad$ f) $\frac{3}{2}>\frac{3}{4}$ $\quad (1\frac{1}{2})$ g) $-\frac{1}{3}>-\frac{1}{2}$ $\quad$ h) $\frac{40}{50}=\frac{80}{100}>\frac{40}{100}$ $\quad (\frac{4}{5})$ $\quad (\frac{2}{5})$	Optional Review interactively with whole class before start of *Lesson 79*. (or set as extra work for quicker Ps within the lesson)

Bk5	R: Models and the concept of a fraction **C: Compariing and simplifying fractions (different denominators)** *E: Expanding fractions*	*Lesson Plan* *79*
Activity		***Notes***
1	**Number strips** T has strips of cloured paper stuck to BB, or use large Cuisennaire rods, or diagram drawn on BB or OHT. We have divided the unit strip into equal parts. Let's write the fraction in (below if using rods) each part. Ps come to BB or dictate to T, explaining reasoning. (e.g. 'The unit is divided into 2 equal parts, so each part is 1 half.') BB:  Let's find different forms of the same quantities. T starts and Ps continue (coming to BB or dictating to T). e.g. BB: $1 = \frac{2}{2} = \frac{3}{3} = \frac{4}{4} = \frac{5}{5} = \frac{6}{6} = \frac{12}{12}$ $\frac{1}{2} = \frac{2}{4} = \frac{3}{6} = \frac{6}{12}$; $\frac{1}{3} = \frac{2}{6} = \frac{4}{12}$; $\frac{2}{3} = \frac{4}{6} = \frac{8}{12}$; $\frac{1}{4} = \frac{3}{12}$; $\frac{3}{4} = \frac{9}{12}$; $\frac{1}{6} = \frac{2}{12}$; $\frac{5}{6} = \frac{10}{12}$ *10 min*	Whole class activity Drawn (stuck) on BB or use enlarged copy master or OHP (Ps might have copy on desks too and fill in fractions on diagram.) Reasoning, agreement, praising At a good pace Ps could write in *Ex. Bks.* too What do you notice about the numerators and denominator? (Increased by same no. of times) What do you notice about the fifths? (No equivalent fraction less than 1, as none of the other denominators is a multiple of 5.)
2	**Equivalent fractions 1** Let's write different forms of the same number. Ps come to BB to write fractions, explaining reasoning. Class agrees/disagrees. What sign can we write betwee each fraction? (=) BB:  What do you notice about the fractions? (If numerator and denominator of a fraction are multiplied or divided by the same number, the value of the fraction does not change.) Ps come to BB to point out specific examples. T reviews: T: If we <u>divide</u> the numerator and denominator of a fraction by the same number (<u>not</u> 0) the value of the fraction does not change. We say that we are <u>simplifying</u> the fraction. If we <u>multiply</u> the numerator and denominator of a fraction by the same number (<u>not</u> 0) the value of the fraction does not change. We say that we are <u>expanding</u> the fraction. *15 min*	Whole class activity Drawn on BB or use enlarged copy master or OHP At a good pace Reasoning, agreement, praising e.g. 'The circle has been divided into 8 equal parts, so each part is 1 eighth. 4 of the parts are shaded, so the fraction shaded is 4 eighths.' Ps explain in own words, with T's help BB: <u>Simplifying</u> $\frac{6}{12} = \frac{3}{6} = \frac{1}{2}$ <u>Expanding</u> $\frac{1}{2} = \frac{3}{6} = \frac{6}{12} = \ldots$

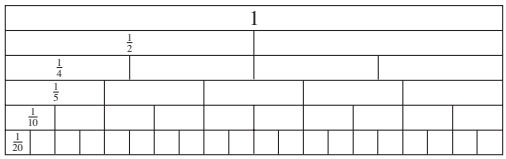
Bk5

Lesson Plan 79

Activity		*Notes*
3	**Equivalent fractions 2** Let's find all the different forms of the same number shown in this diagram. Ps come to BB to point them out and write and say an equation about them. Class agrees/disagrees. BB:  e.g. $\frac{1}{4} = \frac{2}{8} = \frac{4}{16}$; $\frac{3}{8} = \frac{6}{16}$; $\frac{3}{4} = \frac{6}{8} = \frac{12}{16}$; $\frac{5}{8} = \frac{10}{16}$; etc. Fractions which have equal value are called <u>equivalent</u> fractions. Elicit that: • fractions highlighted in the bottom number line are <u>simplified</u> to make the forms highlighted in the middle and top number lines. • fractions in the top number line are <u>expanded</u> to make the forms highlighted in the middle and bottom number lines. *20 min*	Whole class activity (or Ps could write equations in *Ex. Bks* first) Drawn on BB or use enlarged copy master or OHP At a good pace Reasoning, agreement, praising BB: <u>Equivalent fractions</u> (equal fractions) Extra praise if Ps remember the names and explain them without help from T. T writes arrows and names on diagram.
4	**Comparing fractions** Let's compare these 3 fractions. BB: $\frac{1}{3}$ $\frac{5}{12}$ $\frac{1}{6}$ Which do you think is smallest (greatest)? T asks several Ps what they think and why. How could we check to make sure? Ps suggest ways. (e.g. number lines, or using diagram from *Activity 1*) e.g. BB: $\frac{1}{3}$ $\frac{5}{12}$ $\frac{1}{6}$ $\downarrow$ $\downarrow$ $\downarrow$ $\frac{4}{12}$ $\frac{5}{12}$ $\frac{2}{12}$ As $\frac{2}{12} < \frac{4}{12} < \frac{5}{12}$ then $\frac{1}{6} < \frac{1}{3} < \frac{5}{12}$  *25 min*	Whole class activity Drawn on BB or use enlarged copy master or OHP Discussion, reasoning, agreement, self-correction, praising Agree that when comparing fractions with different numerators and denominators, it is easier to change them all to equivalent fractions which have the same denominator, i.e. they have a <u>common denominator</u>.

Bk5

Lesson Plan 79

Activity		*Notes*
5	***Book 5, page 79*** Q.1 Read: *Write different forms of the same quantities from the diagram.* Do we need to write a fraction in every part of a strip? (No, as all parts in each strip are the same as the fraction given at the beginning.) Set a time limit. Review with whole class. Ps come to BB or dictate to T, explaining reasoning. Class agrees/disagrees or points out fractions missed. Mistakes discussed and corrected. *Solution*:  $1 = \frac{2}{2} = \frac{4}{4} = \frac{5}{5} = \frac{10}{10} = \frac{20}{20}$ $\quad \frac{1}{2} = \frac{2}{4} = \frac{5}{10} = \frac{10}{20}$ $\quad \frac{1}{4} = \frac{5}{20}$ $\frac{3}{4} = \frac{15}{20}$ $\quad \frac{1}{5} = \frac{2}{10} = \frac{4}{20}$ $\quad \frac{2}{5} = \frac{4}{10} = \frac{8}{20}$ $\quad \frac{3}{5} = \frac{6}{10} = \frac{12}{20}$ $\frac{4}{5} = \frac{8}{10} = \frac{16}{20}$ $\quad \frac{1}{10} = \frac{2}{20}$ $\quad \frac{3}{10} = \frac{6}{20}$ $\quad \frac{7}{10} = \frac{14}{20}$ $\quad \frac{9}{10} = \frac{18}{20}$ *31 min*	Individual work, monitored, helped Drawn on BB or use enlarged copy master or OHP Differentiation by time limit Reasoning, agreement, self-correction, praising Why do you think that $\frac{2}{4}, \frac{2}{10}, \frac{4}{10}$, etc are not asked for? (Because they are dealt with in other equations.)
6	***Book 5, page 79*** Q.2 Read: *Each hexgon is 1 unit.* *Which form of the fraction shaded do they each show?* Set a time limit. Ask Ps to write the fraction and also to compare them by writing appropriate sign between them. Review with the whole class. Ps come to BB or dictate to T, explaining reasoning. Mistakes discussed and corrected. Agree that an 'equals' sign can be written between each pair. *Solution:*  $\boxed{\frac{1}{2}} = \boxed{\frac{2}{4}} = \boxed{\frac{3}{6}} = \boxed{\frac{4}{8}} = \boxed{\frac{6}{12}}$ *35 min*	Individual work, monitored, (helped) Drawn on BB or use enlarged copy master or OHP Reasoning, agreement, self-correction, praising **Extension** What other fractions are equal to 1 half? (Whole class activity or extra work for quicker Ps.)

Bk5

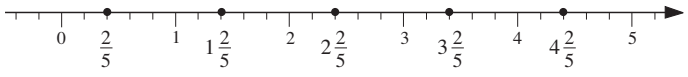
Lesson Plan 79

Activity		*Notes*
7	***Book 5, page 79*** Q.3 Read: *Write each of these fractions in at least 5 different forms.* Set a time limit. (Ps could draw light horizontal lines with pencil and ruler to separate the parts of the question.) Review with whole class. Ps come to BB or dictate to T, explaining what they have done to change the fraction. Class agrees/disagrees. Deal with all cases written by Ps. *Solution:* e.g. a) $\frac{2}{3} = \frac{4}{6} = \frac{6}{9} = \frac{8}{12} = \frac{10}{15} = \frac{12}{18}$ $(= \frac{20}{30} = \frac{44}{66}$, etc.) b) $\frac{4}{7} = \frac{8}{14} = \frac{12}{21} = \frac{16}{28} = \frac{20}{35} = \frac{24}{42}$ $(= \frac{36}{63} = \frac{400}{700}$, etc.) c) $\frac{0}{6} = \frac{0}{12} = \frac{0}{18} = \frac{0}{24} = \frac{0}{30} = \frac{0}{36}$ $(= \frac{0}{2} = \frac{0}{1} = 0$, etc.) d) $\frac{11}{11} = \frac{22}{22} = \frac{33}{33} = \frac{44}{44} = \frac{55}{55} = \frac{66}{66}$ $(= \frac{2}{2} = \frac{1}{1} = 1$, etc.) Let's compare the fractions. How can we do it? Ps come to BB or dictate to T. T directs Ps' thinking if necessary. BB: e.g. $\frac{2}{3} \overset{\times 7}{=} \frac{14}{21} > \frac{4}{7} \overset{\times 3}{=} \frac{12}{21}$ $\quad \frac{0}{6} = 0 \quad \frac{11}{11} = 1$ $0 < \frac{4}{7} < \frac{2}{3} < 1$ *40 min*	Individual work, monitored, helped Reasoning, agreement, self-correction, praising Accept any valid form and give extra praise for unexpected forms. Whole class activity Involve several Ps. Discussion, reasoning, agreement, praising Ps write details in *Ex. Bks.* T: We say that we have <u>expanded</u> 2 thirds and 4 sevenths to a <u>common denominator</u>.
8	***Book 5, page 79*** Q.4 Read: *a) Simplify these fractions.* *b) Compare the fractions and write them in increasing order.* What does simplify mean? (Reduce numerator and denominator of a fraction by dividing by the same number.) Set a time limit. Review with whole class. Ps come to BB or dictate to T, explaining reasoning. Class agrees/disagrees. Deal with all cases. Mistakes discussed and corrected. *Solution:* e.g. a) i) $\frac{6}{10} = \frac{3}{5}$ ii) $\frac{24}{72} = \frac{12}{36} = \frac{6}{18} = \frac{3}{9} = \frac{1}{3}$ iii) $\frac{4}{8} = \frac{2}{4} = \frac{1}{2}$ iv) $\frac{15}{45} = \frac{3}{9} = \frac{1}{3}$ v) $\frac{8}{5}$ (cannot be simplified further, but $= 1\frac{3}{5}$) vi) $\frac{8}{4} = \frac{4}{2} = \frac{2}{1} = 2$ b) $\frac{1}{3} < \frac{1}{2} < \frac{3}{5} < 1\frac{3}{5} < 2$ (e.g. $\frac{1}{3} = \frac{2}{6} < \frac{1}{2} = \frac{3}{6}$) *45 min*	Individual work, monitored, helped Discussion, reasoning, agreement, self-correction, praising Accept any simplification but extra praise to Ps who simplified the fraction in more direct ways, e.g. ii) $\frac{24}{72} = \frac{2}{6} = \frac{1}{3}$, or $\frac{15}{45} = \frac{1}{3}$ $(\div 15)$ By finding on a number line, or by changing to common denominators.

Bk5

R: Calculations
C: Comparison of fractions. Different denominators
E: Negative fractions. Fractions of quantities

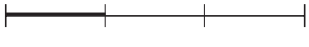
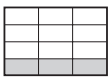
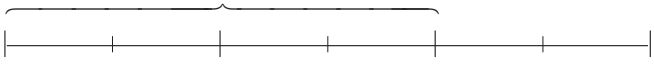
Lesson Plan 80

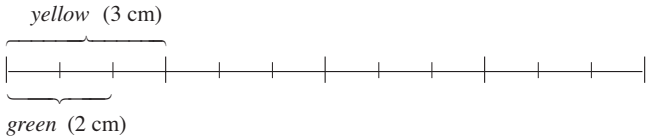
Activity		*Notes*
1	**Sequences** T writes first 3 terms of a sequence on BB. Ps continue the sequence and give the rule. Class agrees/disagrees. What do you notice? (All the sequences are the same numbers written in different forms.) a) $\frac{2}{3}, \frac{5}{3}, \frac{8}{3}, (\frac{11}{3}, \frac{14}{3}, \frac{17}{3}, \frac{20}{3}, \ldots)$ *Rule*: Increasing by $\frac{3}{3}$ (+ 1) b) $\frac{2}{3}, 1+\frac{2}{3}, 2+\frac{2}{3}, (3+\frac{2}{3}, 4+\frac{2}{3}, 5+\frac{2}{3}, 6+\frac{2}{3}, \ldots)$ (+ 1) c) $\frac{2}{3}, 1\frac{2}{3}, 2\frac{2}{3}, (3\frac{2}{3}, 4\frac{2}{3}, 5\frac{2}{3}, 6\frac{2}{3}, \ldots)$ (+ 1) Who remembers what we call a number which consists of a whole number and a fraction? (mixed number) Let's try to understand what a mixed number really means. BB: $5\frac{2}{3} = 5+\frac{2}{3} = \frac{5}{1}+\frac{2}{3} = \frac{15}{3}+\frac{2}{3} = \frac{15+2}{3} = \frac{17}{3}$ Shorter calculation: $5\frac{2}{3} = \frac{5\times 3+2}{3} = \frac{17}{3}$ Is this correct? Why? If we started with $\frac{17}{3}$ and wanted to change it to a mixed number, how could we do it? Ps suggest ways. T confirms the reverse calculation: BB: $\frac{17}{3} = \frac{15}{3}+\frac{2}{3} = 5+\frac{2}{3} = 5\frac{2}{3}$, or $\frac{17}{3} = 17 \div 3 = 5+(2 \div 3)$ *6 min*	Whole class activity (or Ps write terms for a) in *Ex. Bks* first) Reasoning, agreement, praising Extra praise if Ps notice they are the same without prompting from T. BB: mixed number e.g. $5\frac{2}{3}$ T starts and allows Ps to dictate what to write next if they can. T shows short calculation. Ps decide whether it is correct. Discussion, agreement, praising $= 5+\frac{2}{3} = 5\frac{2}{3}$
2	***Book 5, page 80*** Q.1 Read: *List the numbers marked on the number line in increasing order and continue the sequence.* Set a time limit. Review with whole class. Ps come to BB to write their sequence, explaining the rule. Who agrees? Who wrote it a different way? T starts the other form if all Ps wrote mixed numbers and asks Ps to continue it. *Solution:*  $\frac{2}{5}, 1\frac{2}{5}, 2\frac{2}{5}, 3\frac{2}{5}, 4\frac{2}{5}, 5\frac{2}{5}, 6\frac{2}{5}, 7\frac{2}{5}, \ldots$ (+ 1) or $\frac{2}{5}, \frac{7}{5}, \frac{12}{5}, \frac{17}{5}, \frac{22}{5}, \frac{27}{5}, \frac{32}{5}, \frac{37}{5}, \ldots$ $(+\frac{5}{5} = 1)$ Ps show some calculations from mixed numbers to fractions and from fractions to mixed numbers on BB, with T's help. Rest of Ps write them in *Ex. Bks*. e.g. BB: $7\frac{2}{5} = \frac{7\times 5+2}{5} = \frac{37}{5}$; $\frac{32}{5} = 32 \div 5 = 6+(2 \div 5)$ $= 6+\frac{2}{5} = 6\frac{2}{5}$ *12 min*	Whole class activity. Drawn on BB or use enlarged copy master or OHP Discussion, reasoning, agreement, self-correction, praising Ps give details of reasoning. Class points out errors. Encourage Ps to study the number and to practise doing the calculations mentally. Praising, encouragement only

Bk5		*Lesson Plan 80*
Activity		***Notes***
3	**Comparing fractions** Let's compare these fractions. Ps come to BB to write the missing signs, explaining reasoning in detail and writing conversions on BB where necessary. Class agrees/disagrees. Confirm on number line (especially for negative fractions) or use a diagram or model if there are problems. BB: a) $\frac{2}{3} \boxed{<} \frac{5}{6}$ as $\frac{4}{6} < \frac{5}{6}$ b) $\frac{3}{5} \boxed{>} \frac{11}{20}$ as $\frac{12}{20} > \frac{11}{20}$ c) $\frac{6}{10} \boxed{>} \frac{2}{5}$ as $\frac{6}{10} > \frac{4}{10}$ d) $\frac{3}{8} \boxed{>} \frac{1}{3}$ as $\frac{9}{24} > \frac{8}{24}$ e) $\frac{5}{8} \boxed{<} \frac{5}{6}$ as $\frac{15}{24} < \frac{20}{24}$ f) $-\frac{7}{10} \boxed{<} \frac{3}{10}$ g) $-\frac{7}{10} \boxed{<} -\frac{3}{10}$ h) $-\frac{3}{4} \boxed{<} -\frac{1}{2}$ as $-\frac{3}{4} < -\frac{2}{4}$ What do you notice? Elicit or point out that: • among <u>positive</u> fractions with equal denominators, the greater fraction has the greater numerator; • among <u>negative</u> fractions with equal denominators, the greater fraction has the smaller numerator. [a] among <u>positive</u> fractions with equal numerators, the greater fraction has the smaller denominator. • any positive fraction is greater than any negative fraction. *18 min*	Whole class activity Written on BB or use enlarged copy master or OHP At a good pace Ps suggest the methods (and models) to use. Reasoning, agreement, praising only Accept <u>any</u> common multiple but point out that the lowest possible is simplest. Praise all positive contributions. T repeats what Ps' have noticed more clearly and concisely if necessary. Ps point out, or think of new examples of, each type.
4	***Book 5, page 80*** Q.2 Read: *Fill in the missing numerators and denominators. Write other forms of the numbers.* Set a time limit. Review with whole class. Ps come to BB or dictate to T, explaining reasoning. Class agrees/disagrees. Mistakes discussed and corrected. *Solution:* a) $\frac{3}{4} = \frac{6}{8} = \frac{\boxed{9}}{12} = \frac{\boxed{12}}{16} = \frac{15}{\boxed{20}} = \overbrace{\frac{\boxed{18}}{\boxed{24}}}^{\text{e.g.}} = \frac{30}{40} = \frac{36}{48}$ etc. b) $\frac{6}{5} = \frac{12}{\boxed{10}} = \frac{\boxed{24}}{20} = \frac{18}{\boxed{15}} = 1 + \frac{\boxed{1}}{5} = 1\frac{\boxed{1}}{5}$ c) $\frac{12}{3} = \frac{24}{\boxed{6}} = \frac{\boxed{36}}{9} = \frac{\boxed{4}}{1} = \frac{4}{\boxed{1}} = \frac{\boxed{48}}{12} = \overbrace{\frac{40}{10} = \frac{8}{2}}^{\text{e.g.}}$ etc. *24 min*	Individual work, monitored, helped Written on BB or use enlarged copy master or OHP Reasoning, agreement, self-correcting, praising Show on number line or draw diagram or use model if needed. Extra praise for unexpected equivalent fractions

Bk5

Lesson Plan 80

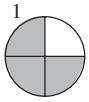
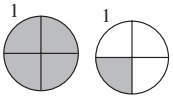
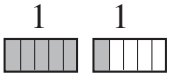
Activity		*Notes*
5	***Book 5, page 80*** Q.3 Read: *Compare the fractions in each pair. Fill in the missing signs.* Set a time limit. Ps can write details in *Ex. Bks* (or calculate mentally and write equivalent fraction beside that given in *Pbs*). Review with whole class. Ps come to BB to BB or dictate to T, explaining reasoning. Class agrees/disagrees. Mistakes discussed and corrected. *Solution:* a) $\frac{3}{4} \boxed{>} \frac{5}{8}$ as $\frac{6}{8} > \frac{5}{8}$ b) $\frac{4}{5} \boxed{=} \frac{8}{10}$ as $\frac{8}{10} = \frac{8}{10}$ c) $\frac{7}{9} \boxed{>} \frac{2}{3}$ as $\frac{7}{9} > \frac{6}{9}$ d) $\frac{23}{50} \boxed{>} \frac{4}{10}$ as $\frac{23}{50} > \frac{20}{50}$ e) $\frac{2}{3} \boxed{>} \frac{5}{8}$ as $\frac{16}{24} > \frac{15}{24}$ f) $\frac{1}{4} \boxed{>} \frac{1}{5}$ as $\frac{5}{20} > \frac{4}{20}$ g) $\frac{5}{6} \boxed{>} \frac{7}{9}$ as $\frac{15}{18} > \frac{14}{18}$ h) $\frac{40}{30} \boxed{>} \frac{25}{20}$ as $\frac{80}{60} > \frac{75}{60}$ *30 min*	Individual work, monitored helped (or 2nd row done with whole class if class is not very able or Ps are still unsure) Written on BB or use enlarged copy master or OHP Discussion, reasoning, agreement, self-correction, praising Extra praise if Ps notice that in: f) equal numerators, so greater fraction has smaller denominator h) fractions can be simplified: $\frac{4}{3} = 1\frac{1}{3} > \frac{5}{4} = 1\frac{1}{4}$
6	**Equal fractions** Which do you think is more? Ps show on scrap paper or slates on command. P answering correctly explains at BB to Ps who were wrong. BB: a) i) $\frac{1}{3}$ of this line segment:  or ii) $\frac{2}{3}$ of this line segment?  (They are equal.) b) $\frac{1}{3}$ or $\frac{2}{3}$? $(\frac{1}{3} < \frac{2}{3})$ c) i) $\frac{1}{4}$ of this rectangle or ii) $\frac{3}{4}$ of this rectangle?  (They are equal.)  *35 min*	Whole class activity Drawn on BB or SB or OHT (Thirds in a) and quarters in c) not marked at first, but lengths should be appropriate multiples of 3 or 4.) Responses shown in unison. T helps P at BB to divide the line segments and rectangles into equal parts. Discussion, reasoning, agreement, praising Agree that fractions of quantities are not the same as fractions as numbers on the number line!
7	***Book 5, page 80*** Q.4 a) Read: *Draw a line segment 12 cm long in your exercise book.* *i) Colour 2 thirds of it in red. How long is the red part?* *ii) Colour 1 quarter of 2 thirds of the line segment in blue. How long is the blue part?* Ps draw, measure (or calculate) and colour under a time limit. Review with whole class. Ps could show results on scrap paper or slates on command. P answering correctly explains at BB to those who were wrong. Mistakes discussed and corrected. *Solution:* *red* (8 cm)  *blue* (2 cm) Agree that 2 cm = $\frac{1}{6}$ of 12 cm	Individual work, monitored, helped, corrected Deal with one part at a time. Discussion, reasoning, agreement, self-correction, praisng Or T has line segment already prepared on BB or OHT and Ps amend it as they explain how they worked out their answers.

Bk5		*Lesson Plan 80*
Activity		***Notes***
7	(Continued) b) Read: *Draw another line segment 12 cm long in your exercise book.* *i) Colour 1 quarter of it in yellow. How long is the yellow part?* *ii) Colour 2 thirds of 1 quarter of the line segment in green. How long is the green part?* As with a). *Solution:*  What do you notice about the results of a) and b)? Elicit that: $(\frac{1}{4}$ of $\frac{2}{3})$ of 12 cm $=$ $(\frac{2}{3}$ of $\frac{1}{4})$ of 12 cm $=$ 2 cm	T helps with dividing the line segment into twelfths. Agree that : $2 \text{ cm} = \frac{2}{12} = \frac{1}{6}$ of 12 cm So $\frac{1}{4}$ of $\frac{2}{3} = \frac{2}{3}$ of $\frac{1}{4}$
	41 min	
8	***Book 5, page 80*** Q.5 Read: *How many cm are in:* *i) 2 fifths of 10 metres* *ii) 2 fifths of 1 metre?* Deal with one part at a time. Set a time limit of 1 minute. Calculations can be done in *Ex. Bks* if necessary but encourage Ps to do it mentally if they can. Review with whole class. Ps could show answers on scrap paper or slates on command. Ps answering correctly explain to those who were wrong. Mistakes discussed and corrected. *Solution:* a) 2 fifths of 10 m $=$ 10 m $\div$ 5 $\times$ 2 $=$ 4 m $=$ <u>400 cm</u> b) 2 fifths of 1 m $=$ 100 cm $\div$ 5 $\times$ 2 $=$ <u>40 cm</u> or using ratio: a) $\frac{5}{5} \rightarrow$ 10 m $\frac{1}{5} \rightarrow$ 10 m $\div$ 5 $=$ 2 m $\frac{2}{5} \rightarrow$ 2 m $\times$ 2 $=$ 4 m $=$ <u>400 cm</u>	Individual work, monitored, (or whole class activity if time is short) Responses shown in unison. Reasoning, agreement, self-correction, praising b) $\frac{5}{5} \rightarrow$ 1 m $=$ 100 cm $\frac{1}{5} \rightarrow$ 100 cm $\div$ 5 $=$ 20 cm $\frac{2}{5} \rightarrow$ 20 cm $\times$ 2 $=$ <u>40 cm</u>
	45 min	

Bk5

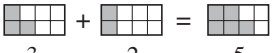
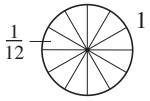
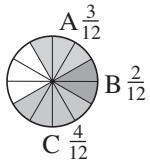
R: Calculations with integers
C: Addition and subtraction of positive fractions with equal denominators
E: Problems

Lesson Plan *81*

Activity		*Notes*
1	**Grouping fractions** What is common to all these fractions? (All are positive fractions.) BB: $\frac{2}{4}, \frac{9}{6}, \frac{4}{8}, \frac{6}{4}, \frac{4}{6}, \frac{3}{2}, \frac{5}{10}, \frac{7}{3}, \frac{12}{8}, \frac{8}{12}, \frac{4}{5}, \frac{15}{10}$ How could we group them? Ps suggest different ways. e.g. P_1: Equal to 1 half: $\frac{2}{4}, \frac{4}{8}, \frac{5}{10}$; and not equal to 1 half (the rest) P_2: Equal to 2 thirds: $\frac{4}{6}, \frac{8}{12}$; and not equal to 2 thirds (the rest) P_3: Equal to $\frac{3}{2}$: $\frac{9}{6}, \frac{6}{4}, \frac{3}{2}, \frac{12}{8}, \frac{15}{10}$; and not equal to $\frac{3}{2}$ (the rest) P_4: Less than 1: $\frac{2}{4}, \frac{4}{8}, \frac{4}{6}, \frac{5}{10}, \frac{8}{12}, \frac{4}{5}$; and more than 1 (the rest) *6 min*	Whole class activity Written on BB or SB or OHT (or written on cards stuck to BB for easy manipulation) Revise meaning of numerator and denominator. Ps come to BB to rewrite (rearrange) the fractions, explaining reasoning. Agreement, praising T points to some fractions and asks Ps to reduce (expand) them or convert to a mixed number, e.g BB: $\frac{9}{6} = 1 + \frac{3}{6} = 1\frac{3}{6} = 1\frac{1}{2}$
2	**Fractions as additions** a) T draws a circle on BB and asks a P to divide it into 4 equal parts. If the circle is 1 unit, what is each part? (1 quarter) If I colour 1 part (2 parts, 3 parts, 4 parts, etc.) , how much is coloured? Ps dictate fractions or come to BB to write and colour. T asks Ps to say each fraction as an addition, simplifying where possible. Class agrees/disagrees. BB: $\frac{1}{4}$  $\frac{1}{4} + \frac{1}{4} = \frac{2}{4}$ $(= \frac{1}{2})$  $\frac{1}{4} + \frac{1}{4} + \frac{1}{4} = \frac{3}{4}$  $\frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} = \frac{4}{4}$ $(= 1)$  $\frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} = \frac{5}{4}$ $(= 1 + \frac{1}{4} = 1\frac{1}{4})$  b) Repeat with a rectangle divided into 5 equal parts. e.g. BB: $\frac{1}{5}$  $\frac{1}{5} + \frac{1}{5} = \frac{2}{5}$  . . . $\frac{1}{5} + \frac{1}{5} + \frac{1}{5} + \frac{1}{5} + \frac{1}{5} = \frac{6}{5}$ $(= 1 + \frac{1}{5} = 1\frac{1}{5})$  *12 min*	Whole class activity Reasoning, agreement, praising At a good pace Ps could write some additions in *Ex*. *Bks*. too. Ps show each fraction on a diagram on BB. Ps come to BB to divide up the rectangle and colour 1 fifth. Ps show each fraction on diagram on BB.
Extension	In what other way could we write the additions? (as multiplications) T points to each in turn and Ps dictate the matching multiplication.	e.g. BB: $\frac{1}{5} + \frac{1}{5} + \frac{1}{5} = \frac{1}{5} \times 3 = \frac{3}{5}$

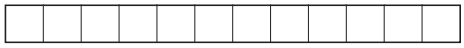
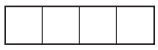
Bk5

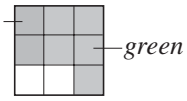
Lesson Plan 81

Activity		*Notes*
3	**Adding fractions** Let's add $\frac{3}{8}$ and $\frac{2}{8}$. How could we show it ? Ps suggest ways. e.g. BB: P_1:  $\frac{3}{8} + \frac{2}{8} = \frac{5}{8}$ P_2:  $\frac{3}{8} + \frac{2}{8} = \frac{5}{8}$ P_3: $\frac{3}{8} + \frac{2}{8} = (\frac{1}{8} + \frac{1}{8} + \frac{1}{8}) + (\frac{1}{8} + \frac{1}{8}) = \frac{5}{8}$  Do you think it is correct to write the addition this way? T shows it. BB: $\frac{3}{8} + \frac{2}{8} = \frac{3+2}{8} = \frac{5}{8}$ Ask one or two Ps what they think and why. Agree that it is correct.	Whole class activity At a good pace Reasoning, agreement, praising Ps draw a diagram and write the calkculation that they like best in *Ex. Bks*. (When adding fractions which have equa denominators, only the numerators need be dealt with.)
	17 min	
4	**Problem 1** A *birthday cake was cut into 12 equal pieces*. Let's draw it. P comes to BB to draw it, with T 's helps if necessary. What part of the cake is each piece? $\left(\frac{1}{12}\right)$ a) *Ann ate 3 pieces, Ben ate 2 pieces and Charlie ate 4 pieces. What part of the cake was eaten?* Ps come to BB to colour diagram and write a plan. Who agrees? Who would write it another way? etc. e.g. P_1: $3 + 2 + 4 = \underline{9}$ (pieces), P_2: $\frac{3}{12} + \frac{2}{12} + \frac{4}{12} = \frac{9}{12}$ P_3: $\frac{1}{12} \times 3 + \frac{1}{12} \times 2 + \frac{1}{12} \times 4 = \frac{1}{12} \times 9 = \frac{9}{12}$ T shows this way if no P has done so and asks whether it is correct. BB: $\frac{3}{12} + \frac{2}{12} + \frac{4}{12} = \frac{3+2+4}{12} = \frac{9}{12}$ $(= \frac{3}{4})$ Which plan do you like best? Why? Write it in your *Ex. Bks*. T chooses a P to say the answer in a sentence. *Answer:* 9 twelfths (or 3 quarters) of the cake was eaten. b) *What part of the cake was left?* Ps shout out in unison. $\left(\frac{3}{12}\right)$ Who can write a subtraction about it? BB: $1 - \frac{9}{12} = \frac{12}{12} - \frac{9}{12} = \frac{3}{12}$ $(= \frac{1}{4})$ [or $1 - \frac{3}{4} = \frac{4}{4} - \frac{3}{4} = \frac{1}{4}$] After agreement, P gives the answer in a sentence. *Answer:* 3 twelfths (or 1 quarter) of the cake was left.	Whole class activity BB:  Ps shout out in unison. BB:  Reasoning, agreement, praising Extra praise if Ps point out simplification. Extra praise for Ps who shout '1 quarter' or who write it as: $1 - \frac{9}{12} = \frac{12-9}{12} = \frac{3}{12} = \frac{1}{4}$ T shows it if no P has done so.
	22 min	

Bk5

Lesson Plan 81

Activity		*Notes*
5	**Problem 2** a) If this rectangle is 1 unit, BB:  1 how many units is this rectangle? BB:  Ps come to BB to explain. Who agrees? Who can explain another way? etc. e.g. 1 unit $= \frac{9}{9}$, so the longer rectangle is $\frac{12}{9} = 1 + \frac{3}{9} = 1\frac{3}{9}$ (units). or if we divide the unit into 3 equal parts (3 grid squares in each part): 1 unit $= \frac{3}{3}$, so the longer rectangle is $\frac{4}{3} = 1 + \frac{1}{3} = 1\frac{1}{3}$ (units). b) If this rectangle is 1 unit, BB:  1 how many units is this rectangle? BB:  Ps come to BB to explain. Who agrees? etc. e.g. 1 unit $= \frac{4}{4}$, so the longer rectangle is $\frac{10}{4} = 2 + \frac{2}{4} = 2\frac{2}{4}$ (units) or if we divide the unit into 2 equal parts (2 grid squares in each part): 1 unit $= \frac{2}{2}$, so the longer rectangle is $\frac{5}{2} = 2 + \frac{1}{2} = 2\frac{1}{2}$ (units).	Whole class activity Drawn (stuck) on BB or drawn on SB or OHT (or use Cuisennaire rods if T and Ps have them, or use a cuboid made from mulilink cubes) Reasoning, agreement, praising T gives hint about equivalent fractions if necessary. BB: $\frac{12}{9} \overset{\div 3}{=} \frac{4}{3}$ (÷3 above, ÷3 below) Agree that the value of the fraction has not changed. If Ps have understood part a), allow individual trial first, with responses shown on scrap paper or slates on command; otherwise continue as a whole class activity. Reasoning, agreement, praising
	26 min	
6	***Book 5, page 81*** Q.1 Read: *Put these numbers into three groups:* *less than 1, equal to 1 and greater than 1.* Set a time limit. Review with whole class. Ps come to BB or dictate to T. Class agrees/disagrees. Mistakes discussed and corrected. T asks extra questions about each group. *Solution*: Less than 1: $\frac{1}{8}, \frac{2}{4} (= \frac{1}{2}), \frac{5}{8}, \frac{1}{2}, \frac{3}{8}, \frac{7}{9}$ How much more do we need to add to each fraction to make 1? Equal to 1: $\frac{4}{4}, \frac{6}{6}, \frac{8}{8}$ Tell me other forms of 1. Greater than 1: $\frac{3}{2} (= 1\frac{1}{2}), \frac{7}{2} (= 3\frac{1}{2}), \frac{7}{6} (= 1\frac{1}{6})$ Elicit each fraction as a mixed number.	Individual work, monitored, helped Written on BB or SB or OHT Reasoning, agreement, self-correction, praising e.g. $\frac{7}{9} + \boxed{\frac{2}{9}} = 1$ e.g. $\frac{10}{10}, \frac{100}{100}, \frac{11}{11}$, etc.
Extension	Which of all the numbers could we add together easily? Ps come to BB to write additions or dictate to T, explaining reasoning. e.g. BB: $\frac{1}{8} + \frac{5}{8} + \frac{3}{8} + \frac{8}{8} = \frac{1+5+3+8}{8} = \frac{17}{8} = 2\frac{1}{8}$	Whole class activity Agreement, praising or $\frac{6}{6} + \frac{7}{6} = \frac{13}{6} = 2\frac{1}{6}$, etc.
	30 min	

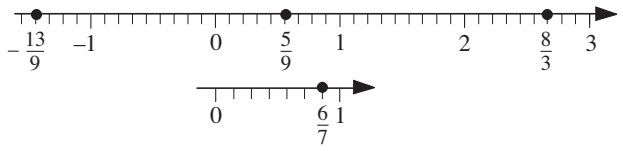
Bk5		*Lesson Plan 81*
Activity		***Notes***
7	***Book 5, page 81*** Q.2 Read: *What part of each diagram is shaded? Write the fraction and show it as an addition.* Set a time limit. Review with whole class. Ps could show the fractions on slates or scrap paper on command. Ps answering correctly come to BB to write addition and explain reasoning. Class agrees/disagrees. Mistakes discussed and corrected. *Solution:* e.g. a) 1  $\frac{3}{8} = \frac{1}{8} + \frac{1}{8} + \frac{1}{8}$ b) 1  $\frac{5}{12} = \frac{3}{12} + \frac{1}{12} + \frac{1}{12}$ c) 1  $\frac{3}{7} = \frac{2}{7} + \frac{1}{7}$ d) 1  $\frac{7}{10} = \frac{5}{10} + \frac{2}{10}$	Individual work, monitored, helped Drawn on BB or use enlarged copy master or OHP Reasoning, agreement, self-correction, praising Feedback for T
	34 min	
8	***Book 5, page 81*** Q.3 Read: *Andrew planted 2 ninths of his garden with strawberries and 5 ninths of his garden with gooseberries.* *a) Shade the part used for strawberries in red and the part used for gooseberries in green.* *b) What part of his garden did Andrew use to plant the fruit?* *c) What part of his garden did he <u>not</u> use to plant some fruit?* Set a time limit of 1 minute. Review quickly with whole class. Ps come to BB to explain reasoning on diagram on BB. Class agrees/ disagrees. Mistakes discussed and corrected. *Solution:* e.g. a) *red* *green*  b) Part used to plant fruit: $\frac{2}{9} + \frac{5}{9} = \frac{7}{9}$ c) Part <u>not</u> used: $1 - \frac{7}{9} = \frac{2}{9}$ (or $\frac{9}{9} - \frac{7}{9} = \frac{2}{9}$)	Individual work, monitored, (helped) Drawn on BB or SB or OHT (or Ps could show answers to b) and c) in unison) Reasoning, agreement, self-correction, praising
	37 min	

Bk5		*Lesson Plan 81*
Activity		***Notes***
9	***Book 5, page 81*** Q.4 Read: *a) In your exercise book, write each fraction as an addition so that one of the terms is a whole number and the other is a fraction.* *b) Write each sum as a single fraction.* Deal with one part at a time. P explains the example given. If the majority of Ps understand what to do, set a time limit . (Otherwise continue as a whole class activity, with Ps working on BB and rest of Ps in *Ex. Bks*.) Review with whole class. Ps dicate additions or come to BB. Class agrees/disagrees. Mistakes discussed and corrected. *Solution:* a) i) $\frac{9}{7} = 1+\frac{2}{7}$ ii) $\frac{16}{5} = 1+\frac{11}{5} = 2+\frac{6}{5} = 3+\frac{1}{5}$ iii) $\frac{49}{22} = 1+\frac{27}{22} = 2+\frac{5}{22}$ iv) $\frac{13}{4} = 1+\frac{9}{4} = 2+\frac{5}{4} = 3+\frac{1}{4}$ b) i) $1+\frac{1}{2} = \frac{2}{2}+\frac{1}{2} = \frac{3}{2}$ ii) $1+\frac{2}{3} = \frac{3}{3}+\frac{2}{3} = \frac{5}{3}$ iii) $3+\frac{1}{5} = \frac{15}{5}+\frac{1}{5} = \frac{16}{5}$ iv) $5+\frac{2}{7} = \frac{35}{7}+\frac{2}{7} = \frac{37}{7}$ v) $3+\frac{7}{4} = \frac{12}{4}+\frac{7}{4} = \frac{19}{4}$ vi) $6+\frac{2}{9} = \frac{54}{9}+\frac{2}{9} = \frac{56}{9}$ *42 min*	Individual work, monitored after initial discussion (or whole class activity) Discussion, reasoning, agreement, self-correction, praising Show on model or diagram if problems or disagreement. (Quicker Ps could practise writing own fractions and additions.)
10	***Book 5, page 81, Q.5*** T chooses P to read out the addition. Ps write result on slates or scrap paper and show on command. T chooses Ps with different forms of correct answer and asks them to explain at BB to Ps who were wrong. Show on model or diagram if necessary. *Solution:* a) $\frac{1}{4}+\frac{3}{4}+\frac{7}{4}+\frac{2}{4} = \frac{13}{4}\ (=3\frac{1}{4})$ b) $\frac{7}{3}-\frac{2}{3} = \frac{5}{3}\ (=1\frac{2}{3})$ c) $\frac{9}{11}+\frac{3}{11}-\frac{1}{11}-\frac{5}{11} = \frac{12}{11}-\frac{6}{11} = \frac{6}{11}$ d) $\frac{110}{50}-\frac{41}{50}+\frac{12}{50} = \frac{69}{50}+\frac{12}{50} = \frac{81}{50}\ (=1\frac{31}{50})$ *45 min*	Whole class activity (or individual work under a time limit, or set as homework if time has run out) Ps can write details in *Pbs*. but encourage mental calculation where possible. Responses shown in unison. Reasoning, agreement, (self-correction), praising In good humour! Feedback for T

Bk5

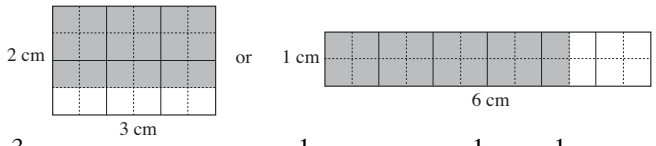
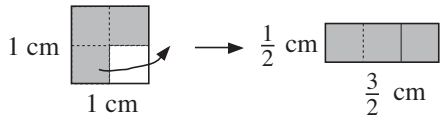
R: Concept of a fraction
C: Addition and subtraction of fractions with equal denominators
E: Negative fractions

Lesson Plan 82

Activity		*Notes*
1	**Fractions** T has fractions written as words on BB. a) Write these fractions as numbers in your *Ex. Bks*. Review quickly. Ps come to BB to write them. BB: eight thirds five ninths minus thirteen ninths six sevenths Ps: $\frac{8}{3}$ $\frac{5}{9}$ $-\frac{13}{9}$ $\frac{6}{7}$ b) T points to each fraction in turn and asks Ps to say true statements about them. Class decides whether they are correct. e.g. $\frac{8}{3} > 1,\ \frac{8}{3} > 2,\ \frac{8}{3} < 3,\ \frac{8}{3} = 2+\frac{2}{3} = 2\frac{2}{3},\ \frac{8}{3} = 3-\frac{1}{3}$, etc. $\frac{5}{9} > 0,\ \frac{5}{9} < 1,\ \frac{5}{9}+\frac{4}{9} = 1$, etc.; $-\frac{13}{9} < 0,\ -\frac{13}{9} < -1, -\frac{13}{9} = -(1+\frac{4}{9}) = -1\frac{4}{9}$, etc. $\frac{6}{7} > 0,\ \frac{6}{7} < 1,\ \frac{6}{7} = \frac{4}{7}+\frac{2}{7},\ \frac{6}{7} = 1-\frac{1}{7},\ \frac{6}{7} = \frac{12}{14}$, etc. c) Let's draw a number line and mark the positions of these fractions. What range should it be? Into how many equal parts should we divide each unit? (Agree that thirds and ninths can be on the same diagram but sevenths will need its own diagram, as the smallest common multiple of 7 and 9 is 63 – too many ticks to draw!) T draws number line according to what Ps dictate, then Ps come to mark the fractions. Class agrees/disagrees. BB:  d) Let's write the fractions in increasing order. Ps dictate to T. BB: $-\frac{13}{9} < \frac{5}{9} < \frac{6}{7} < \frac{8}{3}$	Whole class activity (but individual writing of fractions) At a good pace Ps explain meaning of each fraction. e.g. 8 thirds: 'Each unit has been divided into 3 equal parts, so each part is 1 third, and we have taken 8 of them.' Orally, at speed round class. T writes important ones on BB. T gives hints if Ps cannot think of anything else. Extra praise for creativity! Agreement, praising only Discussion involving several Ps. T directs Ps' thinking if necessary. Agreement, praising (or T has number line already prepared, or use enlarged copy master or OHP, but show only when Ps have agreed on what is needed) Agreement, praising
	6 min	
2	**True or false?** I will say a statement. If you think it is true, put up your hand. If you think it is false, hold your ears. T says statement and repeats it slowly to give Ps time to think. Ps show responses on command. Ps with different responses explain their choice, giving examples or counter examples. Class decides who is correct. e.g. a) *A positive fraction is less than 1 if its numerator is less than its denominator.* [T] b) *There is a negative fraction which is greater than 1 tenth.* [F] (Any negative number is less than any positive number.) c) *Two fractions can be equal only if their numerators and denominators are equal.* [F] d) *If two positive fractions have equal denominators, the greater fraction has the greater numerator.* [T]	Whole class activity (or any pre-agreed actions, or T and F written on slates) In unison Reasoning, agreement, praising e.g. a) $\frac{5}{8} < 1$ and $5 < 8$ c) $\frac{2}{3} = \frac{6}{9}$ d) $\frac{4}{5} < \frac{7}{5}$
	10 min	

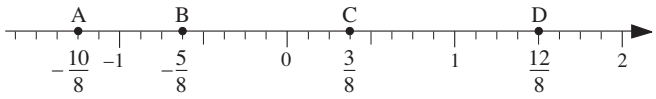
Bk5

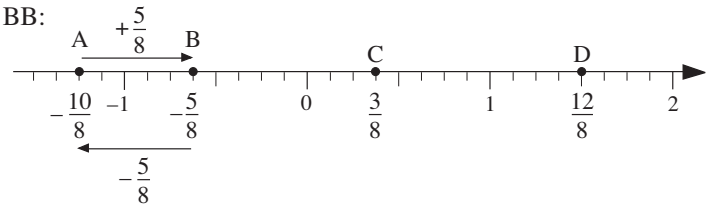
Lesson Plan 82

Activity		*Notes*
3	***Book 5, page 82*** Q.1 Read: *a) Draw a rectangle which has an area of 6 cm². Colour 3 quarters of its area.* *b) Draw a rectangle which has an area of 3 quarters of a cm².* Set a time limit. Ps draw rectangles accurately in *Ex. Bks* (or on sheets of 5 mm squared paper) then colour appropriate areas. Review with whole class. Ps come to BB or dictate lengths of sides of rectangle. Who agrees? Who drew a different rectangle? Class checks area of the rectangles by counting or by calculation and agrees on the part shaded. In b),T chooses Ps who drew rectangle correctly to explain their ideas and reasoning to class. If no P was correct, T leads Ps through the solution, involving Ps where possible. *Solution*: e.g. a) $A = 6$ cm²  $\frac{3}{4}$ of $6 = 6 \div 4 \times 3 = 1\frac{1}{2} \times 3 = 3 + 1\frac{1}{2} = 4\frac{1}{2}$ (cm²) or 6 = 24 quarters, $\frac{3}{4}$ of $24 = 24 \div 4 \times 3 =$ <u>18</u> ($\frac{1}{4}$ cm²) b) $= 4\frac{1}{2}$ (cm²)  Shaded area is $\frac{3}{4}$ cm² but is not a rectangle, so move bottom quarter to top row to form a rectangle $\frac{1}{2}$ cm by $1\frac{1}{2}$ cm. *15 min*	Individual trial first, monitored, <u>helped</u> (or a) as individual work and b) done with whole class.) Differentiation by time limit If Ps are struggling with b), stop individual work and continue as a whole class activity, with T directing Ps' thinking. Discussion, reasoning, checking, agreement, self-correction, praising As $6 = 2 \times 3 = 6 \times 1$ T could write on BB: $A = \frac{3}{4}$ cm² $= \frac{1}{2} \times \frac{3}{2}$ (cm²) Extra praise for Ps who thought of doing this without help from T.
4	**Integers** What can you tell me about integers? (whole numbers; can be positive or negative or 0; integers without signs are always positive) T dictates operations. Ps write them in *Ex. Bks* and calculate the results. (Ps can use a number line or draw cash and debt symbols to help them). Review with whole class. Ps explain reasoning in context or on number line, or show with the car model. Mistakes discussed and corrected. a) $3 + (-5) = [-2]$ e.g. (I have £3 in cash but am £5 in debt.) b) $(-2) + (-17) = [-19]$ (I had debts of £2 and £17.) c) $(+8) - (+3) = [+5]$ (I had £8 then spent £3.) d) $(-7) - (-4) = [-3]$ (I owed £7 then a £4 debt was cancelled.) e) $+5 - (+1) = [-6]$ or (+ 5 is 6 <u>less</u> than + 11) f) $-2 - (-10) = [8]$ (– 2 is 8 <u>more</u> than – 10) g) $40 - (-5) = [45]$ (40 is 45 <u>more</u> than – 5) h) $-6 - (+15) = [-21]$ (– 6 is 21 <u>less</u> than 15) *23 min*	Individual work, monitored, helped T also has operations written on BB or SB or OHT. Discussion, reasoning, agreement, self-correction, praising Class checks with <u>reverse</u> operations. *Checks:* e.g. a) $-2 - (-5) = +3$ d) $-3 + (-4) = -7$ g) $45 + (-5) = 40$ Revise the 'rules' for adding and subtracting negative integers.

Bk5

Lesson Plan 82

Activity		*Notes*
5	**Negative fractions** What do you notice about the fractions in each calculation? (equal denominators) Let's calculate the operations together. Ps come to BB or dictate what T should write, explaining reasoning. Who agrees? Who thinks something else? Why? Agree that as the denominators are the same, we need deal only with the numerators. BB: a) $\frac{2}{5} + \left(-\frac{3}{5}\right) = \left[-\frac{1}{5}\right]$ as $2 + (-3) = -1$ b) $\frac{4}{7} - \frac{6}{7} = \left[-\frac{2}{7}\right]$ as $4 - 6 = -2$ c) $\frac{5}{11} + \left(-\frac{2}{11}\right) = \left[\frac{3}{11}\right]$ as $5 + (-2) = 3$ d) $\frac{3}{4} - \left(-\frac{1}{4}\right) = \left[\frac{4}{4} = 1\right]$ as $3 - (-1) = 4$ e) $-\frac{2}{10} - \left(+\frac{3}{10}\right) = \left[-\frac{5}{10} = -\frac{1}{2}\right]$ as $-2 - (+3) = -5$ f) $-\frac{1}{4} - \left(-\frac{3}{4}\right) = \left[\frac{2}{4} = \frac{1}{2}\right]$ as $-1 - (-3) = 2$	Whole class activity Written on BB or SB or OHT Allow Ps to explain in own words first, then T explains more clearly if necessary. Reasoning, agreement, praising, encouragement only Elicit equivalent fractions where relevant. Show on number line or with diagrams on BB, or with models, if problems or disagreement.
	27 min	
6	***Book 5, page 82*** Q.2 a) Read: *Write the numbers below the dots marked on the number line.* First elicit that there is a tick at every eighth. Set a time limit. Review with whole class. Ps come to BB or dictate to T, explaining reasoning. Class agrees/disagrees. Mistakes corrected. *Solution:*  b) and c) Ps write details in *Ex. Bks* and write only result in *Pbs*, under a time limit , using the number line to help them. Review with whole class. Ps come to BB or dictate to T, explaining reasoning using only the numerators, or referring to number line. [Number line needs to be extended to the left for b) i)] Class agrees/disagrees. Mistakes discussed and corrected. *Solution:* b) i) A + B: $-\frac{10}{8} + \left(-\frac{5}{8}\right) = -\frac{15}{8}\ (= -1\frac{7}{8})$ ii) B + C: $-\frac{5}{8} + \frac{3}{8} = -\frac{2}{8}\ (= -\frac{1}{4})$ iii) A + C: $-\frac{10}{8} + \frac{3}{8} = -\frac{7}{8}$ iv) B + D: $-\frac{5}{8} + \frac{12}{8} = \frac{7}{8}$ v) A + D: $-\frac{10}{8} + \frac{12}{8} = \frac{2}{8}\ (= \frac{1}{4})$ vi) C + D: $\frac{3}{8} + \frac{12}{8} = \frac{15}{8}\ (= 1\frac{7}{8})$	Individual work, monitored, helped Drawn on BB or use enlarged copy master or OHP Part a) reviewed and corrected before Ps attempt b) and c). Differentiation by time limit Discussion, reasoning: e.g. $-10 + (-5) = -15$, etc. agreement, self-correction, praising Extra praise if Ps notice equivalent fractions and mixed numbers Point out the commutative property of addition, e.g. as B + D = D + B, then $-\frac{5}{8} + \frac{12}{8} = \frac{12}{8} + (-\frac{5}{8}) = \frac{7}{8}$

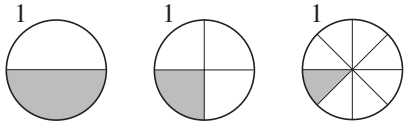
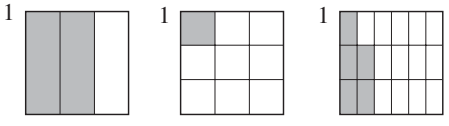
Bk5		*Lesson Plan 82*
Activity		***Notes***
6	(Continued) c) Expect answers obtained by counting the eighths between the 2 points. Distance of: i) A from B: $\frac{5}{8}$ ii) B from C: $\frac{8}{8}$ (= 1) iii) A from C: $\frac{13}{8}$ (= $1\frac{5}{8}$) iv) B from D: $\frac{17}{8}$ (= $2\frac{1}{8}$) v) A from D: $\frac{22}{8}$ (= $2\frac{6}{8}$ = $2\frac{3}{4}$) vi) C from D: $\frac{9}{8}$ (= $1\frac{1}{8}$)	Extra praise for equivalent fractions and mixed numbers **Extension** (for less able Ps) How far is A (B, etc.) from 0 (1, 2, etc.)?
Extension	More able Ps could be asked to write a subtraction (with T's help). Show it by drawing an arrow from subtrahend to reductant on the number line. Show both directions. e.g. BB:  B – A: $-\frac{5}{8}-\left(-\frac{10}{8}\right)=+\frac{5}{8}$; A – B: $-\frac{10}{8}-\left(-\frac{5}{8}\right)=-\frac{5}{8}$, etc.	Whole class activity Discussion, demonstration, agreement, praising Elicit that if the arrow from subtrahend to reductant points to the right, the difference is positive; if it points to the left, the difference is negative (Ps could write agreed subtractions in *Ex. Bks*.)
	34 min	
7	***Book 5, page 82*** Q.3 Read: *Answer each question by writing an operation*. Deal with one part at a time. Ps read question themselves and write operation. Ps could show result on scrap paper or slates on command. P answering correctly comes to BB to write operation, explaining reasoning. Who agrees? Who wrote a different one? etc. Mistakes discussed and corrected. *Solution:* a) *How much should we add to 3 tenths to get 8 tenths?* $\frac{3}{10}+\boxed{\frac{5}{10}}=\frac{8}{10}$, or $\frac{8}{10}-\frac{3}{10}=\boxed{\frac{5}{10}}$ b) *How much more is 4 elevenths than one eleventh*? $\frac{1}{11}+\boxed{\frac{3}{11}}=\frac{4}{11}$, or $\frac{4}{11}-\frac{1}{11}=\boxed{\frac{3}{11}}$ c) *How much should be added to 1 to get 7 fifths?* $1+\boxed{\frac{2}{5}}=\frac{7}{5}$, or $\frac{7}{5}-1=\frac{7}{5}-\frac{5}{5}=\boxed{\frac{2}{5}}$ d) *How much more is 8 fifths than 1*? $1+\boxed{\frac{3}{5}}=\frac{8}{5}$, or $\frac{8}{5}-1=\frac{8}{5}-\frac{5}{5}=\boxed{\frac{3}{5}}$ e) *How much should be added to 6 ninths to get 11 ninths?* $\frac{6}{9}+\boxed{\frac{5}{9}}=\frac{11}{9}$, or $\frac{11}{9}-\frac{6}{9}=\boxed{\frac{5}{9}}$	Individual work, monitored, (helped) At a good pace Reasoning, agreement, self-correction, praising Show on number line or diagram or model if problems or disagreement. Feedback for T
	40 min	

Bk5		*Lesson Plan 82*
Activity		***Notes***
8	***Book 5, page 82*** Q.4 Let's see how many of these you can do in 3 minutes! Start . . . now! . . . Stop! Review with whole class. Ps show results on scrap paper or slates on command. P answering correctly explains to Ps who were wrong. Mistakes discussed and corrected. Stand up if you had all 10 correct! Let's give them 3 cheers! Who had all the questions they had time to do correct? Let's give them a clap! *Solution:* a) $\frac{3}{6}+\frac{1}{6}+\frac{5}{6}+\frac{2}{6}=\frac{11}{6}\ (=1\frac{5}{6})$ b) $1+\frac{3}{8}=1\frac{3}{8}$ c) $6+\frac{5}{9}=6\frac{5}{9}$ d) $\frac{4}{7}-\frac{3}{7}=\frac{1}{7}$ e) $1-\frac{3}{8}=\frac{8}{8}-\frac{3}{8}=\frac{5}{8}$ f) $6-\frac{5}{9}=5\frac{4}{9}$ g) $\frac{13}{9}-1=\frac{13}{9}-\frac{9}{9}=\frac{4}{9}$ h) $\frac{3}{8}-1=\frac{3}{8}-\frac{8}{8}=-\frac{5}{8}$ i) $\frac{3}{10}+\frac{4}{10}-\frac{7}{10}-\frac{2}{10}=\frac{7}{10}-\frac{7}{10}-\frac{2}{10}=-\frac{2}{10}$ j) $\frac{2}{3}-\left(-\frac{2}{3}\right)=\frac{4}{3}$ *45 min*	Individual work, monitored (or whole clas activity if time is short) Differentiation by time limit Encourage mental calculation where possible. Reasoning, agreement, self-correction, praising Show on number line or on a diagram if problems. Feedback for T

Bk5	R: Expanding and simplifying fractions **C: Addition and subtraction of positive fractions with different denominators** *E: Problems*	*Lesson Plan* *83*
Activity		***Notes***
1	**Adding and subtracting fractions 1** Let's do these operations. Ps come to BB to say operations and write the results. Class agrees/disagrees. BB: a) $\frac{1}{5}+\frac{1}{5}+\frac{1}{5}+\frac{1}{5} = (\frac{4}{5})$ $(= \frac{1}{5}\times 4)$ b) $\frac{2}{7}+\frac{3}{7} = (\frac{5}{7})$ c) $3+\frac{4}{9} = (3\frac{4}{9})$ $(= \frac{31}{9})$ d) $\frac{12}{30}-\frac{5}{30} = (\frac{7}{30})$ e) $1\frac{3}{4}-\frac{3}{4} = (1)$ f) $2\frac{11}{20}-2 = (\frac{11}{20})$ g) $13\frac{2}{7}-1 = (2\frac{2}{7})$ $(= \frac{16}{7})$ h) $1-\frac{3}{10} = (\frac{7}{10})$ i) $5-\frac{3}{4} = (4\frac{1}{4})$ j) $6\frac{11}{12}-1\frac{10}{12} = (5\frac{1}{12})$ k) $\frac{3}{8}-\frac{5}{8} = (-\frac{2}{8} = -\frac{1}{4})$, etc. *8 min*	Whole class activity (or individual work in *Ex. Bks*, reviewed with whole class) Written on BB or SB or OHT At a fast pace Reasoning, agreement, praising Show on number line or on diagram on BB if problems or disagreement. T asks Ps to give some mixed numbers as a single fraction, and to simplify where possible. (If time, Ps think of extra operations for class to do). Feedback for T
2	**Adding and subtracting fractions 2** T writes an addition and a subtraction on BB. Let's work out the results in different ways. Ps make suggestions and T writes them on BB. T shows some methods too and asks Ps whether they are correct. e.g. a) $14\frac{1}{3}+134\frac{1}{3} = 148+\frac{1}{3}+\frac{1}{3} = 148+\frac{2}{3} = 148\frac{2}{3}$ (1) or $14 = \frac{42}{3}$ and $134 = \frac{402}{3}$, so $\frac{42}{3}+\frac{1}{3}+\frac{402}{3}+\frac{1}{3} = \frac{43}{3}+\frac{403}{3} = \frac{446}{3} = 148\frac{2}{3}$ (2) or $14\frac{1}{3}+134\frac{1}{3} = \frac{14\times 3+1}{3}+\frac{134\times 3+1}{3} = \frac{43}{3}+\frac{403}{3}$ $= \frac{446}{3} = 148\frac{2}{3}$ (3) Which method do you like best? (Ps will probably choose (1) as it is simpler and easier.) T also agrees that it is best. T highlights it and Ps write it in their *Ex. Bks*. b) $4\frac{2}{5}-2\frac{4}{5} = \frac{20+2}{5}-\frac{10+4}{5} = \frac{22}{5}-\frac{14}{5} = \frac{8}{5} = 1\frac{3}{5}$ (1) or $4\frac{2}{5}-2\frac{4}{5} = (4-2)+(\frac{2}{5}-\frac{4}{5}) = 2-\frac{2}{5} = 1\frac{3}{5}$ (2) or $4\frac{2}{5}-2\frac{4}{5} = 2+\frac{2-4}{5} = 2-\frac{2}{5} = 1\frac{3}{5}$ (3) or $4\frac{2}{5}-2\frac{4}{5} = 3\frac{7}{5}-2\frac{4}{5} = 1\frac{3}{5}$ [1 in reductant changed to $\frac{5}{5}$] (4) Which method do you prefer? (Ps might choose (1) or (3); T chooses (3) and (4). T highlights them and Ps write them in *Ex. Bks*. *16 min*	Whole class activity BB: a) $14\frac{1}{3}+134\frac{1}{3} =$ b) $4\frac{2}{5}-2\frac{4}{5} =$ Involve several Ps. Discussion, reasoning, agreement, praising T shows any of the methods not suggested by Ps. Agree that it is easier to add or subtract the whole numbers first, then to add or subtract the fractions. T writes any of the methods shown which are not suggested by Ps. Ps can also write the method <u>they</u> prefer if different from T's choice.

Bk5

Lesson Plan 83

Activity		*Notes*
3	***Book 5, page 83*** Q.1 Read: *Do the calculations*. Let's see how many of these you can do in 3 minutes! Start . . . now! . . . Stop! Review with whole class. Ps come to BB or dictate results to T, explaining reasoning. Who agrees? Who did it another way? etc. Mistakes discussed and corrected. Who had a) to e) correct? Well done! Who had all 9 correct? Who made 1 mistake? Give them a pat on the back! *Solution:* a) $\frac{1}{6}+\frac{1}{6}+\frac{1}{6}=\frac{3}{6}\ (=\frac{1}{2})$ b) $\frac{2}{5}+\frac{1}{5}=\frac{3}{5}$ c) $\frac{5}{8}-\frac{2}{8}=\frac{3}{8}$ d) $\frac{3}{7}+\frac{1}{7}+\frac{2}{7}=\frac{6}{7}$ e) $\frac{8}{10}+\frac{3}{10}-\frac{5}{10}+\frac{2}{10}=\frac{13}{10}-\frac{5}{10}=\frac{8}{10}\ (=\frac{4}{5})$ f) $\frac{3}{9}-\frac{7}{9}=-\frac{4}{9}$ g) $1\frac{2}{3}+\frac{1}{3}=2$ h) $2\frac{8}{9}-\frac{5}{9}=2\frac{3}{9}$ i) $4\frac{2}{3}-3\frac{1}{3}=1\frac{1}{3}$ *21 min*	Individual work, monitored (helped) Written on BB or SB or OHT Differentiation by time limit Discussion, reasoning (using number line or model if needed), self-correction, ealuation, praising Feedback for T
4	**Addition and subtraction of fractions 3** Let's write additions and subtractions about these diagrams. What could we do first to make the calculations easier? (Change the fractions to the same denominator.) Ps come to BB or dictate to T, explaining reasoning. Class agrees/disagrees. e.g. BB: a)  $\frac{1}{2}=\frac{2}{4}=\frac{4}{8}$ $\frac{1}{4}=\frac{2}{8}$ $\frac{1}{8}$ Agree that 8 is the smallest possible positive whole number which is divisible by 2, 4 and 8. Ps dictate different additions and subtractions, changing the fractions to a common denominator where necessary. Class points out errors. e.g. $\frac{1}{2}+\frac{1}{4}=\frac{2}{4}+\frac{1}{4}=\frac{3}{4}$, $\frac{1}{2}+\frac{1}{8}=\frac{4}{8}+\frac{1}{8}=\frac{5}{8}$, etc. $\frac{1}{2}-\frac{1}{4}=\frac{2}{4}-\frac{1}{4}=\frac{1}{4}$, $\frac{1}{2}-\frac{1}{8}=\frac{4}{8}-\frac{1}{8}=\frac{3}{8}$, etc. b)  $\frac{2}{3}=\frac{6}{9}=\frac{12}{18}$ $\frac{1}{9}=\frac{2}{18}$ $\frac{5}{18}$ Agree that 18 is the smallest possible positive whole number which is divisible by 3, 9 and 18. e.g. $\frac{2}{3}+\frac{1}{9}=\frac{6}{9}+\frac{1}{9}=\frac{7}{9}$, $\frac{1}{9}+\frac{5}{18}=\frac{2+5}{18}=\frac{7}{18}$, etc. *26 min*	Whole class activity Drawn on BB or SB or OHT Discussion, reasoning, agreement, praising Or Ps could be allowed 1 min. for each part to write additions/subtractions in *Ex Bks*. before dictating to T or coming to BB. If problems or disagreement, Ps amend diagrams on BB or draw new ones. Extra praise for unexpected calculations, e.g. $\frac{1}{4}-\frac{1}{2}=\frac{1-2}{4}=-\frac{1}{4}$, etc. $\frac{2}{3}+\frac{1}{9}+\frac{5}{18}=\frac{12+2+5}{18}=\frac{19}{18}=1\frac{1}{18}$ $\frac{1}{9}-\frac{2}{3}=\frac{1-6}{9}=-\frac{5}{9}$, etc.

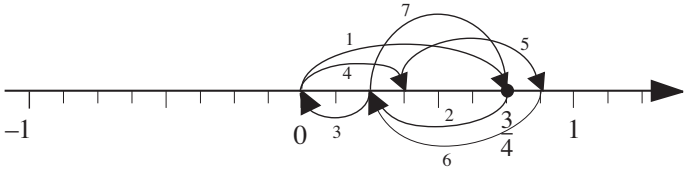
Bk5

Lesson Plan 83

Activity		*Notes*
5	***Book 5, page 83*** Q.2 Read: *Calculate the sums and differences. Use the diagrams to help you.* Set a time limit, or deal with one row at a time if Ps are unsure. Details can be written in *Ex. Bks.* if necessary. Review with whole class. Ps could show results on scrap paper or slates on command. Ps responding correctly explain at BB to those who were wrong. Who did the same? Who did it a different way? etc. Mistakes discussed and corrected. *Solution*: a) 1  i) $\frac{3}{5}+\frac{2}{10}=\frac{6+2}{10}=\frac{8}{10}\left(=\frac{4}{5}\right)$ ii) $\frac{3}{5}-\frac{2}{10}=\frac{6-2}{10}=\frac{4}{10}\left(=\frac{2}{5}\right)$ iii) $\frac{1}{2}+\frac{4}{10}-\frac{3}{5}=\frac{5+4-6}{10}=\frac{3}{10}$ b) 1  i) $\frac{3}{8}+\frac{1}{4}=\frac{3}{8}+\frac{2}{8}=\frac{5}{8}$ ii) $\frac{5}{8}-\frac{1}{2}=\frac{5}{8}-\frac{4}{8}=\frac{1}{8}$ iii) $\frac{3}{8}+\frac{1}{2}-\frac{1}{4}=\frac{3+4-2}{8}=\frac{5}{8}$ c) 1  i) $\frac{2}{9}+\frac{2}{3}=\frac{2+6}{9}=\frac{8}{9}$ ii) $\frac{8}{9}-\frac{2}{3}=\frac{8-6}{9}=\frac{2}{9}$ iii) $\frac{1}{9}+\frac{2}{3}-\frac{4}{9}=\frac{1+6-4}{9}=\frac{3}{9}\left(=\frac{1}{3}\right)$	Individual work, monitored, helped Drawn on BB or use enlarged copy master or OHP Discussion, reasoning, agreement, self-correcting, praising Accept and praise single fractions or all numerators over a common denominator or $\frac{3}{5}+\frac{2}{10}=\frac{3}{5}+\frac{1}{5}=\frac{4}{5}$ or $\frac{3}{5}-\frac{2}{10}=\frac{3}{5}-\frac{1}{5}=\frac{2}{5}$ Agree that writing all numerators over one common denominator is quicker. Feedback for T
	31 min	
6	***Book 5, page 83*** Q.3 Read: *Calculate the sums and differences. Write details in your exercise book if necessary.* Set a time limit or deal with one row at a time. Review with whole class. Ps could show results on scrap paper or slates on command. Ps responding correctly explain at BB to those who were wrong. Who did the same? Who did it a different way? etc. Mistakes discussed and corrected. *Solution*: a) $\frac{2}{5}+\frac{3}{10}=\frac{4+3}{10}=\frac{7}{10}$ b) $\frac{5}{12}+\frac{3}{4}=\frac{5+9}{12}=\frac{14}{12}\left(=1\frac{2}{12}=1\frac{1}{6}\right)$ c) $\frac{1}{3}+\frac{2}{9}-\frac{3}{18}=\frac{6+4-3}{18}=\frac{7}{18}$	Individual work, monitored, helped Written on BB or SB or OHT Reasoning, agreement, self-correcting, praising Show on number line or draw diagrams on BB if problems or disagreement. Feedback for T

Bk5

Lesson Plan 83

Activity		***Notes***
6	(Continued) d) $\frac{6}{2}+\frac{4}{10}+\frac{3}{5}=\frac{30+4+6}{10}=\frac{40}{10}\left(=4\right)$ or $\frac{6}{2}+\frac{4}{10}+\frac{3}{5}=3+\frac{2}{5}+\frac{3}{5}=3+\frac{5}{5}=4$ e) $\frac{3}{5}-\frac{4}{10}=\frac{6-4}{10}=\frac{2}{10}\left(=\frac{1}{5}\right)$ or $\frac{3}{5}-\frac{2}{5}=\frac{1}{5}$ f) $\frac{11}{12}-\frac{3}{4}=\frac{11-9}{12}=\frac{2}{12}\left(=\frac{1}{6}\right)$ g) $\frac{3}{7}-\frac{2}{21}=\frac{9-2}{21}=\frac{7}{21}\left(=\frac{1}{3}\right)$ h) $\frac{21}{12}-\frac{4}{3}=\frac{21-16}{12}=\frac{5}{12}$ i) $1\frac{2}{3}-\frac{7}{6}=\frac{5}{3}-\frac{7}{6}=\frac{10-7}{6}=\frac{3}{6}=\frac{1}{2}$ or $1\frac{2}{3}-\frac{7}{6}=1\frac{2}{3}-1\frac{1}{6}=\frac{2}{3}-\frac{1}{6}=\frac{4-1}{6}=\frac{3}{6}=\frac{1}{2}$	
	37 min	
7	***Book 5, page 83*** Q.4 Read: *Start from 0 and draw these steps along the number line one after the other. Convert the fractions first. Where do you end up? Mark it and label it.* What do you notice about the number line? (There is a tick at every eighth.) So which common denominator should you use? (eighths) Ps convert the fractions orally round class and Ps write in *Pbs*. If the fraction is positive (negative), in which direction will you move along the number line? [to the right (left)] Ps put fingers on zero and a P reads out each step. Ps follow the steps on number line in *Pbs*. Show me where you have ended up . . . now! $\left(\frac{6}{8}\text{ or }\frac{3}{4}\right)$ How could we write it as a calculation? Ps come to BB or dictate to T. Accept an operation for each step, or one long calculation. Ps write long calculation in *Ex. Bks*. *Solution:* Step 1 $\frac{3}{4}\ \boxed{\frac{6}{8}}$, Step 2 $-\frac{1}{2}\ \boxed{-\frac{4}{8}}$, Step 3 $-\frac{1}{4}\ \boxed{-\frac{2}{8}}$, Step 4 $\frac{3}{8}$, Step 5 $\frac{2}{4}\ \boxed{\frac{4}{8}}$, Step 6 $-\frac{5}{8}$, Step 7 $\frac{1}{2}\ \boxed{\frac{4}{8}}$  $0+\frac{6}{8}-\frac{4}{8}-\frac{2}{8}+\frac{3}{8}+\frac{4}{8}-\frac{5}{8}+\frac{4}{8}=\frac{17}{8}-\frac{11}{8}=\frac{6}{8}=\frac{3}{4}$	Individual work but Ps kept together on the steps. Drawn on BB or use enlarged copy master or OHP Agreement, praising At a good pace T monitors, helps, corrects In unison, on slates or scrap paper Ps answering incorrectly help T to write calculation. Agree that in a long calculation it is easier to add all the positive fractions, then all the negative fractions and then subtract the negative result from the positive result. Extra praise if Ps notice that the first 3 operations result in 0.
	42 min	

Bk5		*Lesson Plan 83*
Activity		***Notes***
8	***Book 5, page 83***	Individual work, monitored, helped
	Q.5 Read: *Solve the equations. Draw suitable number lines in your exercise book if necessary*	(or whole class activity if time is short, with Ps at BB explaining reasoning)
	Set a time limit. Details can be written in *Ex. Bks* if necessary.	Written on BB or SB or OHT
	Review with whole class. Ps come to BB to explain reasoning. Class checks answer by inserting value for the letter in each equation. Mistakes discussed and corrected.	Reasoning, checking, agreement, praising
	Show on appropriate segment of the number line drawn on BB.	Feedback for T
	Solution:	
	a) $\frac{1}{3} + a = \frac{3}{3}$ $\quad a = \frac{3}{3} - \frac{1}{3} = \frac{2}{3}$	b) $\frac{3}{8} - b = \frac{1}{8}$ $\quad b = \frac{3}{8} - \frac{1}{8} = \frac{2}{8} = \frac{1}{4}$
	c) $\frac{7}{4} + c = \frac{11}{4}$ $\quad c = \frac{11}{4} - \frac{7}{4} = \frac{4}{4} = 1$	d) $d - \frac{3}{7} = \frac{2}{7}$ $\quad d = \frac{2}{7} + \frac{3}{7} = \frac{5}{7}$
	e) $e + \frac{7}{9} = 1$ $\quad e = 1 - \frac{7}{9} = \frac{2}{9}$	f) $1 + f = \frac{6}{5}$ $\quad f = \frac{6}{5} - 1 = \frac{6}{5} - \frac{5}{5} = \frac{1}{5}$
	45 min	

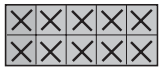
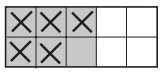
Bk5

R: Expanding and reducing fractions

C: Addition and subtraction of positive fractions (different denominators)

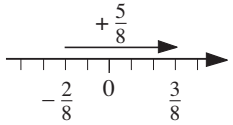
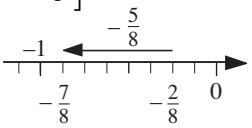
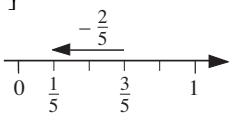
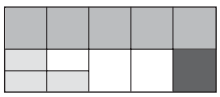
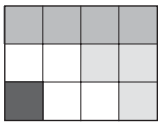
E: Negative fractions

Lesson Plan *84*

Activity		*Notes*
1	**Sequences** T writes first 3 terms of a sequence on BB. Ps continue it in relay round class, with T writing what Ps dictate on BB. T decides when to stop and asks final P to give the rule. Let's simplify the fractions and change to a mixed number where possible. Ps come to BB or dictate to T, explaining reasoning. Class agrees/disagrees. BB: e.g. a) $\frac{1}{8}, \frac{4}{8}, \frac{7}{8}, (\frac{10}{8}, \frac{13}{8}, \frac{16}{8}, \frac{19}{8}, \frac{22}{8}, \frac{25}{8}, \frac{28}{8}, \ldots)$ $\left[+\frac{3}{8}\right]$ $\frac{1}{2}$ $1\frac{1}{4}$, $1\frac{5}{8}$, 2, $2\frac{3}{8}$, $2\frac{3}{4}$, $3\frac{1}{8}$, $3\frac{1}{2}$ b) $\frac{11}{3}, \frac{8}{3}, \frac{5}{3}, (\frac{2}{3}, -\frac{1}{3}, -\frac{4}{3}, -\frac{7}{3}, -\frac{10}{3}, -\frac{13}{3}, \ldots)$ [– 1] $3\frac{2}{3}$, $2\frac{2}{3}$, $1\frac{2}{3}$, $-1\frac{1}{3}$, $-2\frac{1}{3}$, $-3\frac{1}{3}$, $-4\frac{1}{3}$	Whole class activity Orally at speed round class In good humour! If a P makes a mistake the next P corrects it. Elicit that: • to simplify a fraction is to reduce the numerator and denominator by the same number of times; (the value of the fraction does not change) • a mixed number is a whole number + a fraction
	6 min	
2	**Adding and subtracting fractions 1** Let's calculate these sums. First let's simplify fractions where possible to make the calculation easier. Ps come to BB or dictate to T, explaining reasoning. Class points out errors. If problems, show on a number line or draw a diagram or use a model. BB: a) $\frac{5}{25} + \frac{7}{5} - \frac{21}{14} = \left[\frac{1}{5} + \frac{7}{5} - \frac{3}{2} = \frac{2 + 14 - 15}{10} = \frac{1}{10}\right]$ b) $\frac{7}{7} - \frac{5}{5} + \frac{11}{11} = [1 - 1 + 1 = 1]$ c) $\frac{7}{14} + \frac{42}{21} - \frac{0}{11} = \left[\frac{1}{2} + 2 - 0 = 2\frac{1}{2}\right]$ d) $\frac{12}{18} + \frac{24}{36} - \frac{1}{3} = \left[\frac{2}{3} + \frac{2}{3} - \frac{1}{3} = \frac{3}{3} = 1\right]$	Whole class activity Written on BB or SB or OHT At a good pace Reasoning, agreement, praising, encouragement only (Ps could write calculations in *Ex. Bks.* too.) BB: e.g. a) 1  1 
	12 min	
3	**Adding and subtracting fractions 2** T gives some mental addition and subtraction of integers. e.g. $3 + 4 = \underline{7}$, $3 + (-4) = \underline{-1}$, $3 - (-4) = \underline{7}$, $3 - (+4) = \underline{-1}$, etc. Agree that : • adding a negative number has the same effect as subtracting the opposite positive number; • subtracting a negative number has the same effect as adding the opposite positive number. Let's do these additions and subtractions. Think of them as steps along the number line. Ps come to BB or dictate to T, explaining reasoning. Class agrees/disagrees. T helps with drawing relevant segment of number line if problems or disagreement.	Whole class activity Quick revision of the rules for adding and subtracting integers Agreement, praising Written on BB or SB or OHT Reasoning, agreement, praising

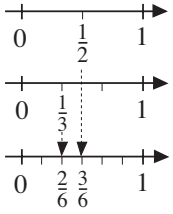
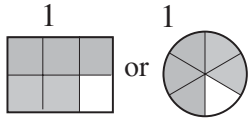
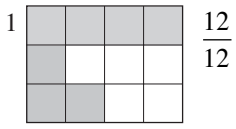
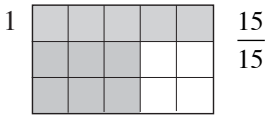
Bk5

Lesson Plan 84

Activity		*Notes*
3	(Continued) BB: a) i) $\frac{3}{8} + \left(-\frac{1}{4}\right) = \left[\frac{3}{8} - \frac{2}{8} = \frac{1}{8}\right]$ ii) ii) $\frac{3}{8} - \left(-\frac{1}{4}\right) = \left[\frac{3}{8} + \frac{2}{8} = \frac{5}{8}\right]$ BB:  b) i) $-\frac{7}{8} + \left(-\frac{1}{4}\right) = \left[-\frac{7}{8} + \left(-\frac{2}{8}\right) = -\frac{9}{8} = -1\frac{1}{8}\right]$ ii) $-\frac{7}{8} - \left(-\frac{1}{4}\right) = \left[-\frac{7}{8} + \frac{2}{8} = -\frac{5}{8}\right]$ BB:  c) i) $\frac{2}{10} + \left(-\frac{3}{5}\right) = \left[\frac{2}{10} - \frac{6}{10} = -\frac{4}{10} = -\frac{2}{5}\right]$ or $\frac{2}{10} + \left(-\frac{3}{5}\right) = \left[\frac{1}{5} - \frac{3}{5} = -\frac{2}{5}\right]$ ii) $\frac{2}{10} - \left(+\frac{3}{5}\right) = \left[\frac{2}{10} - \frac{6}{10} = -\frac{4}{10} = -\frac{2}{5}\right]$ or $\frac{2}{10} - \left(+\frac{3}{5}\right) = \left[\frac{1}{5} - \frac{3}{5} = -\frac{2}{5}\right]$ BB: 	[Part of calculation to be written by Ps is shown in square brackets.] In the subtractions, Ps draw an arrow from the subtrahend to the reductant on relevant segment of number line (previously drawn on BB or SB ro OHT by T) (If arrow points to the right, the difference is positive; if arrow points to the left, the difference is negative.)
	18 min	
4	**Addition of fractions 1** If each rectangle is 1 unit, what part of it has been coloured? Ps say what fraction has been shaded in each colour, then come to BB to write an addition and do the calculation, explaining reasoning, with help of T and rest of class where necessary. BB: a) 1  $\frac{10}{10} = \frac{20}{20}$ Part coloured: $\frac{1}{2} + \frac{1}{10} + \frac{3}{20}$ $= \frac{10}{20} + \frac{2}{20} + \frac{3}{20}$ $= \frac{15}{20} = \frac{3}{4}$ b) 1  $\frac{12}{12}$ $\frac{1}{3} + \frac{1}{4} + \frac{1}{12}$ $= \frac{4}{12} + \frac{3}{12} + \frac{1}{12}$ $= \frac{8}{12} = \frac{2}{3}$	Whole class activity Rectangles drawn on BB or SB or OHT and shaded in different colours. Accept any form of the fractions for the addition but ask Ps to simplify the result as far as possible. Discussion, reasoning, agreement, praising Ps could write the additions in *Ex. Bks*.
Extension	Who can think of a problem in context about each rectangle? (e.g. squares of a bar of chocolate eaten by differentt people or by 1 person at diffent times; garden planted with different flowers, etc.)	Praising only Extra praise for unexpected contexts
	22 min	

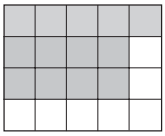
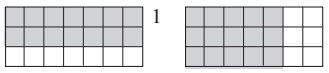
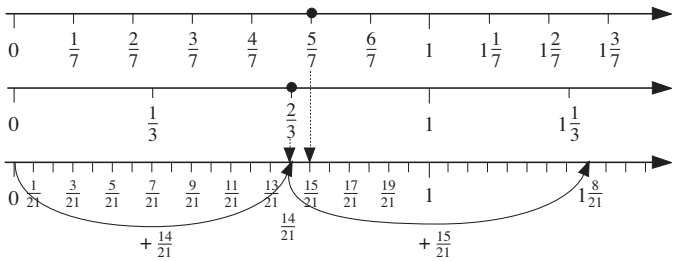
Bk5

Lesson Plan 84

Activity		*Notes*
5	**Addition of fractions** Think of different ways to show how to add 1 half and 1 third. Ps make suggestions and come to BB to show and explain on BB. Who agrees? Who can think of another way? etc. e.g. By calculation: First convert to a common denominator: BB: $\frac{1}{2} = \frac{2}{4} = \boxed{\frac{3}{6}} = \frac{4}{8} = \frac{5}{10} = \ldots$ or $\frac{1}{3} = \boxed{\frac{2}{6}} = \frac{3}{9} = \frac{4}{12} = \ldots$ So $\frac{1}{2} + \frac{1}{3} = \frac{3}{6} + \frac{2}{6} = \frac{5}{6}$  T: As 2 and 3 are prime numbers, their lowest common multiple is $2 \times 3 = 6$, so 6 is the lowest common denominator of 1 half and 1 third. *26 min*	Whole class activity Involve several Ps. T gives hints if Ps cannot think of anything. By drawing a diagram:  or show as steps along a number line Discussion, reasoning, agreement, praising BB: prime number divisible only by itself and 1
6	***Book 5, page 84*** Q.1 Read: *Use the diagram to help you do the calculations*. How can the diagram help you? (It is a 3 by 4 rectangle so both thirds and quarters can be shown on it easily.) Set a time limit. Ps colour the relevant parts of the rectangles and complete the additions. Review with whole class. Ps come to BB to show solutions, explaining reasoning. Class agrees/disagrees. Mistakesdiscussed and corrected. *Solution:*  a) $\frac{1}{3} + \frac{1}{4} = \frac{4}{12} + \frac{3}{12} = \frac{7}{12}$ b) $\frac{2}{3} + \frac{1}{12} - \frac{1}{4} = \frac{8 + 1 - 3}{12} = \frac{6}{12} = \frac{1}{2}$ *30 min*	Individual work, monitored helped Diagram drawn on BB or SB or OHT Ps can draw a diagram for part b) in space in *Pbs* or in *Ex. Bks* if needed. Reasoning, agreement, self-correction, praising Elicit that 3 and 4 are prime numbers, so their lowest common multiple is: $3 \times 4 = \underline{12}$
7	***Book 5, page 84*** Q.2 Read: *Use the diagram to help you do the calculations*. How can the diagram help you? (It is a 5 by 3 rectangle so both thirds and fifths can be shown on it easily.) Continue as in *Activity 6*. *Solution:*  a) $\frac{1}{3} + \frac{2}{5} = \frac{5}{15} + \frac{6}{15} = \frac{11}{15}$ b) $\frac{2}{3} - \frac{2}{5} = \frac{10}{15} - \frac{6}{15} = \frac{4}{15}$ c) $\frac{1}{5} + \frac{2}{3} - \frac{3}{5} = \frac{3 + 10 - 9}{15} = \frac{4}{15}$ or $\frac{1}{5} + \frac{2}{3} - \frac{3}{5} = \frac{2}{3} - \frac{2}{5} = \frac{4}{15}$ *34 min*	Individual work, monitored helped Diagram drawn on BB or SB or OHT Ps can draw a diagram for part b) and part c) n space in *Pbs* or in *Ex. Bks* if needed. Reasoning, agreement, self-correction, praising Elicit that 3 and 5 are prime numbers, so their lowest common multiple is: $3 \times 5 = \underline{15}$

Bk5

Lesson Plan 84

Activity		*Notes*
8	***Book 5, page 84*** Q.3 Read: *Use the diagram to help you do the calculations.* How can the diagram help you? (It is a 4 by 5 rectangle so both quarters and fifths can be shown on it easily.) Set a time limit. Ps colour the relevant parts of the rectangles and complete the additions. Review with whole class. Ps come to BB to show solutions, explaining reasoning. Class agrees/disagrees. Mistakes discussed and corrected. Who could write a subtraction about it? *Solution:* a) $\frac{1}{4}+\frac{2}{5}=\frac{5}{20}+\frac{8}{20}=\frac{13}{20}$ b) $\frac{4}{5}-\frac{1}{4}=\frac{16}{20}-\frac{5}{20}=\frac{11}{20}$ c) $\frac{1}{2}+\frac{3}{5}-\frac{3}{10}-\frac{3}{20}=\frac{10+12-6-3}{20}=\frac{13}{20}$ 1  $\frac{20}{20}$ Elicit that 4 and 5 are prime numbers, so their lowest common multiple is $4\times5=20$, and 20 is the lowest common denominator for 1 quarter and 1 fifth.	Individual work, monitored, helped Diagram drawn on BB or SB or OHT Ps draw extra diagrams for b) and c) in *Ex. Bks.* if needed. Reasoning, agreement, self-correction, praising Subtractions: a) $1-\frac{13}{20}=\frac{7}{20}$ b) $1-\frac{11}{20}=\frac{9}{20}$ c) $1-\frac{13}{20}=\frac{7}{20}$
	38 min	
9	***Book 5, page 84, Q.4*** Read: *Add 2 thirds and 5 sevenths in different ways.* *Complete the diagrams and equations.* Deal with one part at a time. Ps come to BB to say what they can about the diagram (or number line or equation) and to complete it, explaining reasoning and with T's help or prompting where necessary. Class agrees/disagrees. Rest of class complete the diagram or equation in *Pbs* too. S*olution:* a)  $\frac{2}{3}+\frac{5}{7}=\frac{14}{21}+\frac{15}{21}=\frac{29}{21}=1\frac{8}{21}$ b)  c) $\frac{2}{3}=\frac{4}{6}=\frac{6}{9}=\frac{8}{12}=\frac{10}{15}=\frac{12}{18}=\boxed{\frac{14}{21}}=\frac{16}{24}$ $\frac{5}{7}=\frac{10}{14}=\boxed{\frac{15}{21}}=\frac{20}{28}=\frac{25}{35}$ $\frac{2}{3}+\frac{5}{7}=\frac{14+15}{21}=\frac{29}{21}=1\frac{8}{21}$	Whole class activity Drawn on BB or use enlarged copy master or OHP Discussion, reasoning, agreement, praising Agree that each method shows how to convert the fractions to a common denominator first, then how to work out the result. Elicit that as 3 and 7 are prime numbers, their lowest common multiple is $3\times7=\underline{21}$ T asks a few Ps which of the 3 methods they like best and why.
	42 min	
10	**Mental practice** T says a simple addition or subtraction (using fractions with equal or different denominators). Where relevant, Ps say the fractions with a common denominator, then say the result. Ps may write fractions in *Ex. Bks* or on slates first if necessary. Class points out errors.	Whole class activity At a fast pace In good humour. Praising, encouragement only
	45 min	

Bk5

R: Mental calculations. Minutes and hours

C: Practice in addition and subtraction of integers and fractions

E: Problems. Fractions as coordinates in coordinate system

Lesson Plan 85

Activity		*Notes*
1	**Converting minutes to hours** T has large real or model clock and/or diagram drawn on BB. How long does it take for the minute hand to move right round the clock? T demonstrates on model. (1 hour) How many minutes are in 1 hour? (60 minutes) So what part of 1 hour is each minute? (1 sixtieth) (BB) Let's write these times as fractions of an hour. T says a time in minutes and Ps come to front of class to show on clock then to write as a fraction of an hour on BB ((first as sixtieths, then simplified). e.g. a) 30 min $= \frac{30}{60}$ h $= \frac{1}{2}$ h  b) 5 min $= \frac{5}{60}$ h $= \frac{1}{12}$ h c) 10 min $= \frac{10}{60}$ h $= \frac{1}{6}$ h d) 15 min $= \frac{15}{60}$ h $= \frac{1}{4}$ h e) 20 min $= \frac{20}{60}$ h $= \frac{1}{3}$ h f) 25 min $= \frac{25}{60}$ h $= \frac{5}{12}$ h g) 35 min $= \frac{35}{60}$ h $= \frac{7}{12}$ h h) 40 min $= \frac{40}{60}$ h $= \frac{2}{3}$ h i) 45 min $= \frac{45}{60}$ h $= \frac{3}{4}$ h j) 50 min $= \frac{50}{60}$ h $= \frac{5}{6}$ h k) 55 min $= \frac{55}{60}$ h $= \frac{11}{12}$ h l) 60 min $= \frac{60}{60}$ h $= 1$ h m) 65 min $= \frac{65}{60}$ h $= \frac{13}{12}$ h $= 1\frac{1}{12}$ h n) 23 min $= \frac{23}{60}$ h o) 70 min $= \frac{70}{60}$ h $= \frac{7}{6}$ h $= 1\frac{1}{6}$ h *8 min*	Whole class activity (If possible, Ps have model clocks on desks too.) BB: 1 hour = 60 minutes 1 minute $= \frac{1}{60}$ hour If necessary, T shows a) as an example for Ps to follow. At a good pace Reasoning, agreement praising (Ps could also be asked to give the times as twelfths, as there are 12 numbers on the clock.) **Extension** If time, T could ask Ps to write other examples of their own in *Ex. Bks.* then tell them to the class.
2	**Converting hours to minutes** This time, let's change parts of an hour to minutes. Lets try some easy ones mentally first. Ps dictate what T should write. BB: e.g. $\frac{1}{60}$ h $=$ <u>1 min</u>; $\frac{1}{2}$ h $=$ <u>30 min</u>; $\frac{2}{2}$ h $= 1$ h $=$ <u>60 min;</u> Let's see if you can do more difficult examples! T says a fraction of an hour and Ps come to BB or dictate to T, then show it on the clock, model or diagram. Class agrees/disagrees. e.g. a) i) $\frac{1}{3}$ h $= \frac{60}{3}$ min $=$ <u>20 min</u>  ii) $\frac{2}{3}$ h $= \frac{120}{3}$ min $= 40$ min; iii) $\frac{5}{3}$ h $= \frac{300}{3}$ min $=$ <u>100 min</u> b) i) $\frac{1}{4}$ h $= \frac{60}{4}$ min $=$ <u>15 min</u>  ii) $\frac{3}{4}$ h $= 15$ min $\times 3 = 45$ min; iii) $1\frac{1}{4}$ h $= 60 + 15 =$ <u>75 (min)</u>	Whole class activity Accept any valid calculation. $1\frac{1}{2}$ h $= 60 + 30 =$ <u>90 (min)</u> At a good pace Reasoning, agreement, praising T can show different ways to calculate if Ps do not suggest them. (e.g. 2 thirds of 1 hour equals 1 third of 2 hours) or $\frac{5}{3}$ h $= 1\frac{2}{3}$ h $= 60 + 40$ $=$ <u>100 (min)</u> or $= \frac{5}{4}$ h $= \frac{300}{4} =$ <u>75 (min)</u>

Bk5

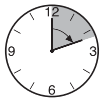
Lesson Plan 85

Activity | **Notes**

2

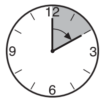
(Continued)

c) i) $\frac{1}{5}$ h = $\frac{60}{5}$ min = <u>12 min</u>



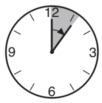
ii) $\frac{2}{5}$ h = 12 × 2 = <u>24 (min)</u> iii) $\frac{3}{5}$ h = 12 × 3 = <u>36 (min)</u>

d) i) $\frac{1}{6}$ h = $\frac{60}{6}$ min = <u>10 min</u>



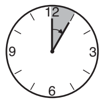
ii) $\frac{5}{6}$ h = 10 min × 5 = <u>50 min</u> iii) $\frac{6}{6}$ h = 1 h = <u>60 min</u>

e) i) $\frac{1}{10}$ h = $\frac{60}{10}$ min = <u>6 min</u>



ii) $\frac{3}{10}$ h = 6 min × 3 = <u>18 min</u> iii) $\frac{7}{10}$ h = 6 × 7 = <u>42 (min)</u>

f) i) $\frac{1}{12}$ h = $\frac{60}{12}$ min = <u>5 min</u>



ii) $\frac{5}{12}$ h = 5 min × 5 = <u>25 min</u> iii) $\frac{7}{12}$ h = 5 × 7 = <u>35 (min)</u>

17 min

Notes:

Ps write some of the examples in *Ex. Bks*.

iv) $\frac{4}{5}$ h = 12 × 4 = <u>48 (min)</u>

iv) $\frac{8}{6}$ h = $1\frac{2}{6}$ h = 60 + 20 = <u>80 (min)</u>

iv) $\frac{9}{10}$ h = 6 × 9 = <u>54 (min)</u>

[g) $\frac{1}{7}$ h = $\frac{60}{7}$ = $8\frac{4}{7}$ (min)]

3

Coordinate system

What can you tell me about the diagram. (4 <u>quadrants</u> are shown; each unit on the *x* and *y* axes has been divided into 8 equal parts, so there is a tick at every eighth)

a) Mark these points on the grid. T dictates the coordinates and writes them on BB. Elicit that the 1st value is the *x*-coordinate and the 2nd value is the *y* coordinate.

Ps come to BB to mark the points, explaining reasoning. Class agrees/disagrees. (Rest of Ps mark the points on own grids.)

b) Join up the points in alphabetical order and join H to A. P works at BB and rest of class on sheets on desks.

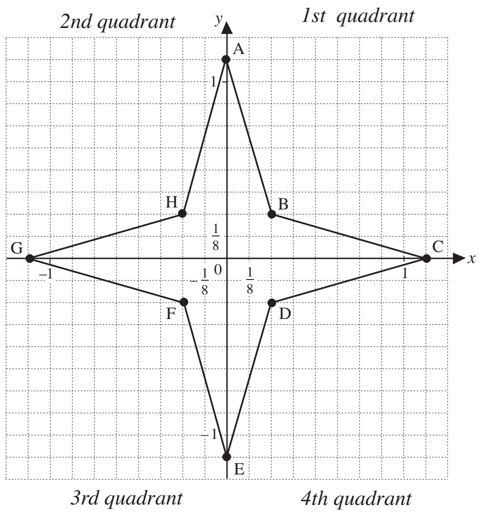
BB:

A $(0, 1\frac{1}{8})$ B $(\frac{1}{4}, \frac{1}{4})$

C $(1\frac{1}{8}, 0)$ D $(\frac{1}{4}, -\frac{1}{4})$

E $(0, -1\frac{1}{8})$ F $(-\frac{1}{4}, -\frac{1}{4})$

G $(-1\frac{1}{8}, 0)$ H $(-\frac{1}{4}, \frac{1}{4})$



c) What can you tell me about the shape? (e.g. polygon, octagon, concave, equal sides, acute and reflex angles, 4 lines of symmetry, rotational symmetry about the point O, etc.)

d) Tell me the coordinates of another point inside (outside) the shape.

Extension [What are the coordinates of its image if it is reflected in the *x* (*y*) axis?]

24 min

Notes:

Whole class activity

Drawn on BB or use enlarged copy master or OHP

(If possible, also individual work on smaller versions of copy master on desks, monitored, helped.)

Remind Ps about quadrants if necessary and how they are numbered (from top right, anticlockwise).

BB: <u>quadrant</u>

(1 quarter of a turn)

1st quadrant: *x* is +, *y* is +

2nd quadrant: *x* is –, *y* is +

3rd quadrant: *x* is –, *y* is –

4th quadrant: *x* is +, *y* is –

At a good pace

Encourage Ps to use rulers to draw the lines. P at BB should use a BB ruler.

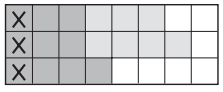
Agreement, praising

Extra praise for unexpected properties

Orally round class. If problems, Ps mark points on diagram.

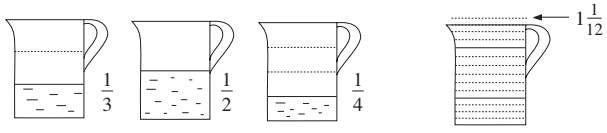
Bk5

Lesson Plan 85

Activity		*Notes*
4	***Book 5, page 85*** Q.1 Read: *Calculate the sums and differences. Write details in your exercise book.* Set a time limit. Review with whole class. Ps come to BB or dictate to T, explaining reasoning. Class agrees/disagrees. Mistakes discussed and corrected. *Solution:* a) i) $\frac{3}{7}+\frac{2}{7}=\frac{5}{7}$ ii) $\frac{13}{20}-\frac{6}{20}=\frac{7}{20}$ iii) $1-\frac{5}{9}=\frac{4}{9}$ iv) $1+\frac{3}{8}=1\frac{3}{8}$ $(=\frac{8+3}{8}=\frac{11}{8})$ b) i) $\frac{4}{10}+\frac{2}{5}=\frac{4+4}{10}=\frac{8}{10}=\frac{4}{5}$ ii) $\frac{3}{4}-\frac{5}{8}=\frac{6-5}{8}=\frac{1}{8}$ iii) $\frac{5}{6}+\frac{1}{3}-\frac{1}{2}=\frac{5+2-3}{6}=\frac{4}{6}=\frac{2}{3}$	Individual work, monitored, (helped) Written on BB or SB or OHT Differentiation by time limit Reasoning, agreement, self-correction, praising Show on number line or model or diagram if problems or disagreement. Feedback for T
	28 min	
5	***Book 5, page 85*** Q.2 Read: *This 3 by 8 rectangle is 1 unit. Use it to help you do the additions and subtractions.* What part of the rectangle is each small square? (1 twenty-fourth) Deal with one row at a time time limit. Ps can draw extra rectangles in *Ex. Bks* if necessary. Review at BB with whole class. Ps come to BB or dictate to T, explaining reasoning. Class agrees/disagrees. Mistakes discussed and corrected. Ps colour rectangles on BB if problems. *Solution*: a) i) $\frac{3}{8}+\frac{4}{8}=\frac{7}{8}$ ii) $\frac{1}{2}+\frac{1}{4}+\frac{1}{8}=\frac{4+2+1}{8}=\frac{7}{8}$ iii) $\frac{7}{8}-\frac{3}{4}=\frac{7-6}{8}=\frac{1}{8}$ b) i) $\frac{2}{3}+\frac{1}{8}=\frac{16+3}{24}=\frac{19}{24}$ ii) $\frac{1}{3}+\frac{3}{8}=\frac{8+9}{24}=\frac{17}{24}$ iii) $\frac{7}{8}-\frac{2}{3}=\frac{21-16}{24}=\frac{5}{24}$ c) i) $\frac{1}{6}+\frac{5}{24}=\frac{4+5}{24}=\frac{9}{24}$ $(=\frac{3}{8})$ ii) $\frac{5}{8}-\frac{1}{6}=\frac{15-4}{24}=\frac{11}{24}$ iii) $\frac{5}{12}+\frac{7}{24}-\frac{1}{8}=\frac{10+7-3}{24}=\frac{14}{24}=\frac{7}{12}$	Individual work, monitored, helped Written on BB or SB or OHT (with several blank rectangles prepared too for Ps to colour if problems or disagreement) If Ps are not confident, do part c) with whole class. Discussion, reasoning, agreement, self-correction, praising Agree that the lowest common multiple of 3 and 8 is 24. (List multiples of greater number, then underline the 1st common multiple) 8, 16, <u>24</u>, . . . Agree that 24 is also the lowest common multiple of 8 and 6. BB: e.g. c) iii)  1
	33 min	

Bk5

Lesson Plan 85

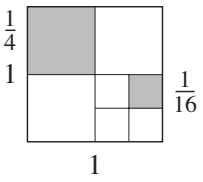
Activity		*Notes*
6	***Book 5, page 85*** Q.3 Read: *People in Britain need to heat their houses for 7 months of the year.* Quick discussion first on how houses are heated (central heating – radiators, gas, electric, open fires – coal, wood, etc.) and in which 7 months of the year heating is usually needed. Set a time limit or deal with one part at a time. Ps read problems themselves, write a plan, do the calculation and write the answer in a sentence. (Ps can work in *Ex.Bks* if they need more room.) Review with whole class. Ps come to BB to show solution, explaining reasoning. Who agrees? Who did it another way? etc. Mistakes discussed and corrected. Refer to calendar if necessary. *Solution:* a) *For what part of the year do British people **not** need to heat their houses?* *Plan:* $\frac{12}{12} - \frac{7}{12} = \frac{5}{12}$ (yr) *Answer*: British people do no need to heat their houses for 5 twelfths of the year. b) *For how many months will British people heat their houses over the next 5 years?* *Plan:* Each year $\rightarrow$ 7 months 5 years $\rightarrow$ 7 months $\times$ 5 = <u>35 months</u> or $\frac{7}{12} \times 5 = \frac{35}{12}$ (yr) = <u>35 months</u> *Answer*: British people will heat their houses for 35 months over the next 5 years. *37 min*	Individual work, monitored, helped Involve several Ps. Ps tell what happens in own homes. Elicit that: BB: 1 year = 12 months Reasoning, agreement, self-correction, praising or 12 months – 7 months = 5 months = $\frac{5}{12}$ year
7	***Book 5, page 85*** Q.4 Read: *The 3 jugs each have a capacity of 5 litres.* *The first jug is a third full, the second jug is half full and the third jug is a quarter full of water.* *If all the water is poured into one of the jugs, what part of the jug will be filled?* What is capacity? (How much liquid a container can hold.) Set a time limit. Review with whole class. Ps could show result on scrap paper or slates on command. Ps answering correctly explain at BB to those who were wrong. Who agrees? Who did it another way? etc. Mistakes discussed and corrected. *Solution:* BB:  *Plan:* $\frac{1}{3} + \frac{1}{2} + \frac{1}{4} = \frac{4+6+3}{12} = \frac{13}{12} = 1\frac{1}{12}$ (jugs) *Answer:* The whole jug will be filled and 1 twelfth of 5 litres of water will overflow. *41 min*	Individual or paired work, monitored, helped (or whole class activity) Jugs drawn on BB or use enlarged copy master or OHP (or have real 5 litre jugs filled with appropriate amounts of water) Discussion, reasoning, agreement, (demonstration if possible), self-correction, praising Show that the lowest common multiple of 3, 2 and 4 is 12: 4, 8, <u>12</u>, . . ., as 12 is also exactly divisible by 2 and 3. Extra praise for Ps who thought of this themselves!

Bk5		*Lesson Plan 85*
Activity		***Notes***
8	***Book 5, page 85, Q.5*** a) Read: *What part of each square is shaded?* Ps come to BB to say how many equal parts each square has been divided into, what each part is called and how many are shaded, writing the fraction shaded below each square. Class agrees or disagrees. Rest of Ps write fractions below squares in *Pbs*. BB: i)  ii)  iii)  (Count half rectangles.) Shaded: $\frac{2}{4} = \frac{1}{2}$ $\frac{5}{9}$ $\frac{10}{16} = \frac{5}{8}$ What fraction of each square is <u>not</u> shaded? ($\frac{1}{2}$, $\frac{4}{9}$, $\frac{3}{8}$)	Whole class activity (or individual trial first if Ps wish) Drawn on BB or use enlarged copy master or OHP At a good pace Discussion, reasoning, agreement, (self-correction), praising T points to one square at a time and Ps shout out the fractions in unison.
	b) Read: *Subtract the smallest from the greatest fraction*. Which fraction is smallest (greatest)? How can we compare them? • Show on number line, or • use reasoning: e.g. $\frac{1}{2} = \frac{4}{8} < \frac{5}{8}$, and $\frac{5}{8} > \frac{5}{9}$, as in two fractions with equal numerators, the greater fraction has the smaller denominator; or • expand the 3 fractions to a common denominator: How can we find the lowest common multiple of 2, 8 and 9? Agree that as any multiple of 8 is also divisible by 2, we need consider only 8 and 9. BB: 9, 18, 27, 36, 45, 54, 63, <u>72</u>, . . . (72 is a multiple of 8) so $\frac{1}{2} = \frac{36}{72}$, $\frac{5}{9} = \frac{40}{72}$, $\frac{5}{8} = \frac{45}{72}$ Agree that: BB: $\frac{1}{2} < \frac{5}{9} < \frac{5}{8}$ So difference between smallest and greatest is: BB: $\frac{5}{8} - \frac{1}{2} = \frac{5-4}{8} = \frac{1}{8}$	Whole class activity Extra praise for good ideas. T directs Ps thinking if necessary. and $\frac{1}{2} = \frac{9}{18} < \frac{5}{9} = \frac{10}{18}$ Ps suggest what to do and come to BB or dictate what T should write. Discussion, reasoning, agreement, praising Ps write inequality and subtraction in *Pbs*.
	45 min	

Bk5	R: Calculations **C: Practice in addition and subtraction** *E: Word problems. Equations*	*Lesson Plan* *86*
Activity		***Notes***
1	**Mental practice** a) How many cm are in: half of 1 m (50 cm); 2 halves of 1 m (100 cm); 3 halves of 1 m (150 cm)? etc. b) How many metres are in: 1 fifth of 1 km (200 m); 2 fifths of 1 km (400 m); 3 fifths of 1 km (600 m)? etc. c) How many cl are in: 1 hundredth of 1 litre (1 cl); 5 hundredths of 1 litre (5 cl); 20 hundredths of 1 litre (20 cl)? etc. Use other units of measure too (time, money, mass) if there is time. *6 min*	Whole class activity T chooses Ps at random. At a good pace Agreement, praising T asks some Ps how they worked out the answer, or Ps write calculations on BB if problems. e.g. $\frac{3}{2}$ of 1 m = 100 cm ÷ 2 × 3 (or = 100 cm + 50 cm) = <u>150 cm</u>
2	**Equations** Let's solve these equations (i.e. calculate which numbers the letters represent). Ps come to BB to explain solution. Class checks mentally by inserting value for letter in equation. BB: $\frac{1}{3}+a=1$ $1-b=\frac{5}{9}$ $\frac{4}{3}+c=2$ $a=1-\frac{1}{3}=\frac{2}{3}$ $b=1-\frac{5}{9}=\frac{4}{9}$ $c=2-1\frac{1}{3}=\frac{2}{3}$ $\frac{2}{5}+d=1$ $2-e=\frac{7}{5}$ $\frac{1}{6}+f=\frac{5}{6}$ $d=1-\frac{2}{5}=\frac{3}{5}$ $e=2-1\frac{2}{5}=\frac{3}{5}$ $f=\frac{5}{6}-\frac{1}{6}=\frac{4}{6}=\frac{2}{3}$ $\frac{3}{4}-g=\frac{1}{2}$ $h-\frac{3}{10}=\frac{2}{5}$ $i+\frac{4}{7}=\frac{3}{7}$ $g=\frac{3}{4}-\frac{2}{4}=\frac{1}{4}$ $h=\frac{4}{10}+\frac{3}{10}=\frac{7}{10}$ $i=\frac{3}{7}-\frac{4}{7}=-\frac{1}{7}$ *12 min*	Whole class activity (or individual work in *Ex. Bks.* first, then whole class review) Written on BB or use enlarged copy master or OHP At a good pace Reasoning, checking, agreement, praising Do not expect Ps working individually to write all these details. Feedback for T
3	**Addition and subtraction** Let's calculate the sums and differences Ps come to BB to write the answers, or dictate to T, explaining reasoning. Class agrees/disagrees. BB: a) i) $-5+(+2)=[-3]$ b) i) $7+(-2)=[5]$ ii) $-\frac{5}{8}+\left(+\frac{2}{8}\right)=\left[-\frac{3}{8}\right]$ ii) $\frac{7}{6}+-\left(\frac{1}{3}\right)=\left[\frac{7}{6}+\left(-\frac{2}{6}\right)=\frac{5}{6}\right]$ c) i) $3-(+9)=[-6]$ d) i) $-4-(+1)=[-5]$ ii) $\frac{3}{10}-\left(+\frac{9}{10}\right)=\left[-\frac{6}{10}\right]$ ii) $-\frac{2}{5}-\left(+\frac{1}{10}\right)=$ e) i) $3-(-2)=[5]$ ii) $\frac{1}{3}-\left(-\frac{2}{9}\right)=\left[\frac{3}{9}-\left(-\frac{2}{9}\right)=\frac{5}{9}\right]$ $\left[-\frac{4}{10}-\left(+\frac{1}{10}\right)=-\frac{5}{10}\right]$ *18 min*	Whole class activity Written on BB or SB or OHT Reasoning, agreement, praising Ask Ps to explain the integer calculations with cash and debt, and to show fraction calculations on the number line, or subtractions by comparison, e.g. c) ii) $\frac{3}{10}$ is <u>less</u> than $\frac{9}{10}$ by $\frac{6}{10}$

Bk5

Lesson Plan 86

Activity		*Notes*
4	***Book 5, page 86*** Q.1 Read: *Solve the equations*. Set a time limit or deal with one row at a time. Encourage Ps to check their solutions by mentally substituting values for the letters in the equations. Review at BB with whole class. Ps come to BB or dictate to T, explaining reasoning. Class agrees/disagrees. Mistakes discussed and corrected. *Solution:* a) $\frac{1}{2} + a = \frac{3}{2}$ $\quad a = \frac{3}{2} - \frac{1}{2} = \frac{2}{2} = 1$ b) $\frac{3}{4} - b = \frac{1}{4}$ $\quad b = \frac{3}{4} - \frac{1}{4} = \frac{2}{4} = \frac{1}{2}$ c) $\frac{7}{8} + c = \frac{11}{8}$ $\quad c = \frac{11}{8} - \frac{7}{8} = \frac{4}{8} = \frac{1}{2}$ d) $d - \frac{3}{7} = \frac{2}{7}$ $\quad d = \frac{2}{7} + \frac{3}{7} = \frac{5}{7}$ e) $e + \frac{7}{9} = 1$ $\quad e = 1 - \frac{7}{9} = \frac{2}{9}$ f) $1 + f = \frac{6}{5}$ $\quad f = \frac{6}{5} - 1 = \frac{1}{5}$ g) $2 - g = \frac{7}{5}$ $\quad g = 2 - \frac{7}{5} = \frac{10-7}{5} = \frac{3}{5}$ h) $h - \frac{5}{6} = 1$ $\quad h = 1 + \frac{5}{6} = 1\frac{5}{6}$ *24 min*	Individual work, monitored, helped Written on BB or use enlarged copy master or OHP Reasoning, checking, agreement, self-correction, praising Do not expect Ps to write these details in *Pbs*. Encourage mental calculation by more able Ps and use of a number line by less able Ps. Show details only if problems or disagreement in review. Feedback for T
5	***Book 5, page 86*** Q.2 Read: *a) What part of the unit square is shaded?* *b) What part is not shaded?* *c) What area is shaded if the area of the unit square is 64 m² ?* Set a time limit, or deal with one part at a time. Ps write operations in *Pbs*, then show result on scrap paper or slates on command. Ps answering correctly explain at BB to Ps who were wrong. Mistakes discussed and corrected. *Solution:* a) Part shaded: $\frac{1}{4} + \frac{1}{16} = \frac{4+1}{16} = \frac{5}{16}$ b) Part <u>not</u> shaded: $1 - \frac{5}{16} = \frac{11}{16}$ (or $\frac{1}{4} + \frac{1}{4} + \frac{3}{16} = \frac{11}{16}$) c) <u>Area</u> shaded: $\frac{5}{16}$ of 64 m² $= 64 \div 16 \times 5 = 4 \times 5 = 20$ <u>(m²)</u> *29 min*	Individual work, monitored, helped Drawn on BB or use enlarged copy master or OHP In unison Reasoning, agreement, self-correction, praising BB:  or $\frac{1}{4}$ of 64 + $\frac{1}{16}$ of 64 = 16 + 4 = <u>20 (m²)</u>

Bk5		*Lesson Plan 86*
Activity		***Notes***
6	***Book 5, page 86*** Q.3 Read: *The first number in a sequence is 2 thirds. We know that each of the other terms is 1 half more than the previous term. Write the first five terms and add them up.* Set a time limit. Ps can do necessary calculations in *Ex Bks*. Review with whole class. Ps come to BB or dictate to T, explaining reasoning. Who agrees? Who did it another way? etc. Mistakes discussed and corrected. *Solution:* e.g. $\frac{2}{3} + \frac{1}{2} = \frac{4+3}{6} = \frac{7}{6}$, then add $\frac{3}{6}$ each time, so first 5 terms are: $\frac{2}{3}, \frac{7}{6}, \frac{10}{6}, \frac{13}{6}, \frac{16}{6}$ (or $\frac{2}{3}, 1\frac{1}{6}, 1\frac{2}{3}, 2\frac{1}{6}, 2\frac{2}{3}$) Sum: $\frac{4}{6} + \frac{7}{6} + \frac{10}{6} + \frac{13}{6} + \frac{16}{6} = \frac{50}{6} = \frac{25}{3} = 8\frac{1}{3}$ *34 min*	Individual work, monitored, helped (or whole class activity) Discussion, reasoning, agreement, self-correction, praising Extra praise if Ps realise that it is easier not to simplify the fractions in this case!
7	***Book 5, page 86, Q.4*** T (or P) reads each question. Ps calculate mentally where possible and show answers on scrap paper or slates on command. Ps responding correctly explain at BB to Ps who were wrong. Mistakes discussed and corrected. Ps write agreed operations in *Pbs*. *Solution:* *Mum made 18 butterfly cakes for Saturday tea.* *a) If Andrew ate 1 third of them, how many cakes did he eat?* (6) BB: $\frac{1}{3}$ of 18 = 18 ÷ 3 = 6 (cakes) *b) If Bella ate 2 ninths of them, how many cakes did she eat?* (4) BB: $\frac{2}{9}$ of 18 = 18 ÷ 9 × 2 = 2 × 2 = 4 (cakes) *c) If Christine ate 2 sixths of them, how many cakes did she eat?* (6) BB: $\frac{2}{6}$ of 18 = 18 ÷ 6 × 2 = 3 × 2 = 6 (cakes) *d) If Mum ate what was left, how many cakes did she eat?* (2) BB: 18 – (6 + 4 + 6) = 18 – 16 = 2 (cakes) *40 min*	Whole class activity At a fast pace and in good humour! T could have 'cakes' drawn (stuck) on BB (or real cakes to give to Ps at end of lesson for working so hard) Responses shown in unison. Reasoning, agreement, self-correction, praising or $\frac{2}{6} = \frac{1}{3}$, so 6 cakes [as a)] What part of the 18 cakes did Mum eat? (2 eighteenths, or 1 ninth)
8	***Book 5, page 86*** Q.5 Read: *Three eighths of a 4 m 24 cm long pipe was cut off.* *a) What part of the pipe was left?* *b) How many cm were cut off?* Set a time limit. Review with whole class. Ps could show answers on slates or scrap paper on command. Ps responding correctly explain at BB to Ps who were wrong. Who agrees? Who did it a different way? etc. Mistakes discussed and corrected. *45 min*	Individual work, monitored, helped Reasoning, agreement, self-correction, praising *Solution:* a) $1 - \frac{3}{8} = \frac{5}{8}$ b) 424 cm ÷ 8 × 3 = 53 cm × 3 = 159 cm

Bk5

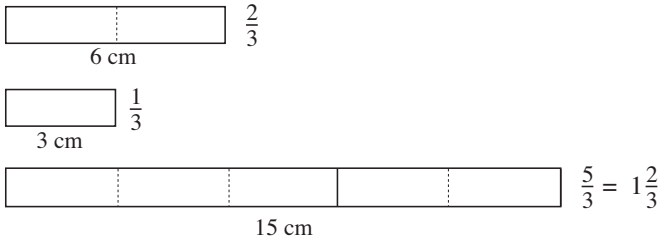
R: Calculations with integers
C: Practice: addition and subtraction of fractions
E: Word problems. Equations

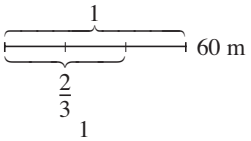
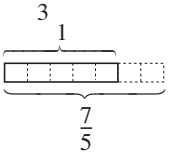
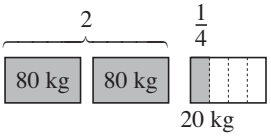
Lesson Plan 87

Activity		*Notes*
1	**Find the mistakes!** Joe did not concentrate enough on his homework and has made some mistakes. Let's find his mistakes and correct them. Ps come to BB to say whether the calculation is correct or not and if incorrect to point out the mistake and write calculation again correctly, explaining what Joe did wrong. Class agrees/disagrees. BB: a) $\frac{3}{4}+\frac{3}{7}=\frac{3}{11}$ × $\frac{3}{4}+\frac{3}{7}=\frac{21+12}{28}=\frac{33}{28}=1\frac{5}{28}$ b) $\frac{1}{2}+\frac{1}{4}=\frac{3}{4}$ ✓ as $\frac{1}{2}+\frac{1}{4}=\frac{2+1}{4}=\frac{3}{4}$ c) $\frac{8}{16}-\frac{1}{2}=0$ ✓ as $\frac{8}{16}-\frac{1}{2}=\frac{1}{2}-\frac{1}{2}=0$ d) $\frac{7}{8}-\frac{2}{5}=\frac{5}{3}$ × $\frac{7}{8}-\frac{2}{5}=\frac{35-16}{40}=\frac{19}{40}$ *5 min*	Whole class activity Written on BB or SB or OHT Reasoning, agreement, praising (He has mixed up numerators and denominators.) Ps could write correct calculations in *Ex Bks*. (He subtracted the numerators and the denominators.)
2	**Fractions 1** What part of each rectangle is shaded? Ps could show fractions on scrap paper or slates on command. Ps answering incorrectly come to BB to try again with the help of another P. BB: a) $\frac{11}{15}$ b) $\frac{12}{15}=\frac{4}{5}$ c) $\frac{10}{15}=\frac{2}{3}$ d) $\frac{7}{15}$ e) $\frac{7}{15}$ Let's write the fractions in decreasing order. Ps dictate what T should write. Which two of these fractions have a difference of 1 third? *10 min*	Whole class activity Drawn on BB or use enlarged copy master or OHP At a good pace Reasoning, agreement, praising BB: $\frac{12}{15}>\frac{11}{15}>\frac{10}{15}<\frac{7}{15}$ BB: $\frac{12}{15}-\frac{7}{15}=\frac{5}{15}=\frac{1}{3}$
3	**Fractions 2** Draw 1 unit if: BB: a) ▭ is $\frac{1}{2}$ e.g. P: ▭ 1 b) ▭ is $\frac{1}{3}$ P: e.g. ▭ 1 c) ◺ is $\frac{2}{3}$ e.g. P: ◺ 1 or ▭ 1 d) ▭ is 2 P: ▭ 1 e) ▭ is 3 e.g. P: ▭ 1 f) ◺ is $\frac{3}{2}$ e.g. P: ▭ 1 *15 min*	Whole class activity Drawn on BB or SB or OHT Show one at a time. Ps come to BB to draw new shapes, explaining reasoning. Who agrees? Who could draw 1 unit another way? Accept and praise any shape which has the correct number of grid squares. Feedback for T

Bk5

Lesson Plan 87

Activity		*Notes*
4	**Fractions 3** This card strip (or Cuisennaire rod or multilink cubes or diagram drawn on BB) is 6 cm long. a) If 6 cm is 1 unit, how long is: $\frac{1}{2}$(3 cm); $\frac{2}{3}$ (4 cm); $\frac{4}{6}$ (4 cm); $\frac{3}{2}$ (9 cm); $\frac{5}{3}$ (10 cm)? b) If 6 cm is half a unit, how long is: 1 unit (12 cm); 2 units (24 cm); $\frac{1}{4}$ of a unit (3 cm); $\frac{2}{3}$ of a unit (8 cm); $\frac{5}{6}$ of a unit (10 cm)? c) If 6 cm is 2 thirds of a unit, how long is: 1 unit (9 cm); 2 units (18 cm); 3 units (27 cm); $\frac{4}{3}$ of a unit (12 cm); $\frac{5}{3}$ of a unit (15 cm)*? BB:  *21 min*	Whole class activity Done orally in relay round class, or Ps write answers in *Ex. Bks* first, then review, or Ps show results on scrap paper or slates in unison on command. Reasoning, agreement, praising If problems or disagreement, Ps write details and draw diagrams on BB or demonstrate with models (card strips, rods, multilink cubes). Details, e.g. BB: ['starred' question in c)] 6 cm ÷ 2 × 5 = 15 cm, or $\frac{2}{3}$ → 6 cm $\frac{1}{3}$ → 6 cm ÷ 2 = 3 cm $\frac{5}{3}$ → 3 cm × 5 = 15 cm
5	***Book 5, page 87*** Q.1 Read: *Do the calculations. Write details in your exercise book where needed.* Set a time limit. Encourage mental calculation and simplification of results where possible. Review with whole class. Ps dictate to T or come to BB, explaining reasoning. Who agrees? Who did it another way? Demonstrate with diagrams or models or on number line if problems. Mistakes discussed and corrected. *Solution:* a) i) $\frac{4}{15}+\frac{9}{15}=\frac{13}{15}$ ii) $\frac{14}{20}-\frac{9}{20}=\frac{5}{20}=\frac{1}{4}$ iii) $\frac{1}{2}+\frac{5}{3}+\frac{1}{3}-1=\frac{1}{2}+2-1=1\frac{1}{2}$ (as $\frac{5}{3}+\frac{1}{3}=2$) b) i) $\frac{3}{2}+\frac{3}{10}=\frac{15+3}{10}=\frac{18}{10}=\frac{9}{5}=1\frac{4}{5}$ ii) $\frac{17}{18}-\frac{2}{3}=\frac{17-12}{18}=\frac{5}{18}$ iii) $\frac{5}{15}+\frac{1}{5}-\frac{1}{3}=\frac{1}{3}+\frac{1}{5}-\frac{1}{3}=\frac{1}{5}$ c) i) $\frac{4}{7}+\frac{1}{6}=\frac{24+7}{42}=\frac{31}{42}$ ii) $\frac{4}{5}-\frac{3}{11}=\frac{44-15}{55}=\frac{29}{55}$ iii) $\frac{1}{2}+\frac{1}{3}-\frac{2}{5}=\frac{15+10-12}{30}=\frac{13}{30}$	Individual work, monitored, helped with c) and d) Written on BB or SB or OHT Differentiation by time limit Ps list multiples in *Ex Bks* to find the kowest common denominator. Reasoning, agreement, self-correcting, praising Extra praise if Ps notice easier methods (T points them out if no P suggests them.) Feedback for T **Extension** Ps choose an equation and think of a word problem about it.

Bk5		*Lesson Plan 87*
Activity		***Notes***
5	(Continued) d) i) $\frac{3}{10} + \frac{6}{15} = \frac{3}{10} + \frac{2}{5} = \frac{3+4}{10} = \frac{7}{10}$ ii) $\frac{7}{9} - \frac{1}{6} = \frac{14-3}{18} = \frac{11}{18}$ iii) $\frac{7}{12} + \frac{3}{4} - \frac{9}{20} = \frac{35+45-27}{60} = \frac{53}{60}$ *28 min*	iii) BB: 20, 40, <u>60</u>, . . . (as 60 is also a multiple of 12, and any multiple of 12 is also a multiple of 4)
6	***Book 5, page 87*** Q.2 Let's see if you can do these in 3 minutes! Start . . . now! . . . Stop! Review with whole class. Ps could show results on scrap paper or slates on command. Ps responding correctly explain at BB to Ps who were wrong and draw diagrams (with T's help if needed). Mistakes discussed and corrected *Solution:* a) $\frac{2}{3}$ of 60 m = 60 m ÷ 3 × 2 = 20 m × 2 = <u>40 m</u> b) $\frac{1}{4}$ of 3 hours = $\frac{3}{4}$ of 1 hour = <u>45 min</u>  c) $\frac{7}{5}$ of 40 litres = 40 ÷ 5 × 7 = 8 × 7 = <u>56 (litres)</u> d) $2\frac{1}{4}$ times 80 kg = 2 × 80 kg + 80 kg ÷ 4 = 160 kg + 20 kg = <u>180 kg</u> or = $\frac{9}{4}$ of 80 kg = 80 ÷ 4 × 9 = 20 × 9 = <u>180 kg</u> *33 min*	Individual work monitored, helped Written on BB or SB or OHT Differentiation by time limit Discussion, reasoning, agreement, self-correction, praising Diagrams, e.g. a)  c)  d) 
7	***Book 5, page 87*** Q.3 What do you notice about this question? (Very similar to Q.2, as fractions and two quantities are the same.) What is different? (Given quantities are the fractions, not the whole unit.) Set a time limit. Ps write operations in *Pbs* or work in *Ex Bks*. Review with whole class. Ps could show results on scrap paper or slates on command. Ps responding correctly explain at BB to Ps who were wrong. Who did the same? Who did it a different away? etc. Mistakes discussed and corrected *Solution:* a) $\frac{2}{3}$ is 60 m, so 1 unit = 60 m ÷ 2 × 3 = 30 m × 3 = <u>90 m</u> b) $\frac{1}{4}$ is 3 hours, so 1 unit = 3 hours × 4 = <u>12 hours</u> c) $\frac{7}{5}$ is 35 litres, so 1 unit = 35 ÷ 7 × 5 = 5 × 5 = <u>25 (litres)</u> d) $2\frac{1}{4}$ is 90 kg, so 1 unit = 90 kg ÷ 9 × 4 = 10 kg × 4 = <u>40 kg</u> *38 min*	Individual work monitored, helped Written on BB or SB or OHT Differentiation by time limit Discussion, reasoning, agreement, self-correction, praising Demonstrate with digrams or models if problems. or Ps might use direct proportion, e.g. a) $\frac{2}{3} \rightarrow$ 60 m $\frac{1}{3} \rightarrow$ 60 m ÷ 2 = 30 m $\frac{3}{3} \rightarrow$ 30 m × 3 = <u>90 m</u>

Bk5		*Lesson Plan 87*
Activity		***Notes***
8	***Book 5, page 87*** Q.4 Read: *Jim was putting up a 120 m fence around his garden. On the first day he put up 3 fifths of the fence. How many metres of fence did he still have to put up?* Set a time limit of 2 minutes. Ps work in *Pbs* or use *Ex. Bks* if they need more room and write only the result in box in *Pbs*. Review with whole class. Show me your answer . . . now! (48 m) **A**, come and explain how you worked it out. Who did the same? Who did it a different way? etc. Mistakes discussed and corrected. T chooses a P to say the answer in a sentence. *Solution:* e.g. Part put up: $\frac{3}{5}$; Part still to put up: $1 - \frac{3}{5} = \frac{2}{5}$ $\frac{2}{5}$ of 120 m = 120 m ÷ 5 × 2 = 24 m × 2 = <u>48 m</u> or Put up: $\frac{3}{5}$ of 120 m = 120 m ÷ 5 × 3 = 24 m × 3 = 72 m Length still to be put up: 120 m – 72 m = <u>48 m</u> *Answer*: Jim still had 48 m of fence to put up. *42 min*	Individual work, monitored, (helped) Results written on scrap paper or slates in unison. Reasoning, agreement, self-correction, praising Feedback for T
9	***Book 5, page 87*** Q.5 Read: *I had 24 marbles. I lost 1 third of them, then I lost another 12 marbles.* Try to work out the solution quickly in your head, then stand up as soon as you know it. a) *How many marbles did I have left?* **B**, tell us how you worked it out so quickly. e.g. $\frac{1}{3}$ of 24 = 8; 8 + 12 = 20; 24 – 20 = <u>4</u> Who did the same? Who did it a different way? etc. e.g. $24 - 12 - \frac{1}{3}$ of 24 = 12 – 8 = <u>4</u> *Answer:* I had 4 marbles left. b) *What part of the 24 marbles did I have left?* **C**, tell us how you worked it out. 4 marbles left out of 24, so part left is $\frac{4}{24} = \frac{1}{6}$. *Answer*: I had 1 sixth of the 24 marbles left. *45 min*	Whole class activity At a good pace In good humour! As first 4 or 5 P stands up, T goes to them and Ps whisper answer in T's ear. T praises correct answers but asks P who are incorrect to sit down and think again. or T chooses 2 Ps with different answers to explain their reasoning to class and class decides who is correct. T chooses a P to say each answer in a sentence.

Bk5	R: Calculations with integers **C: Practice: addition and subtraction with fractions** *E: Problems. Equations*	*Lesson Plan* *88*
Activity		***Notes***
1	**Find the mistakes!** Joe still cannot concentrate enough on his homework and has made some more mistakes. Let's find them and correct them. Ps come to BB to say whether the calculation is correct or not and if incorrect to point out the mistake and write calculation again correctly, explaining what Joe did wrong. Class agrees/disagrees. BB: a) $5 + (-2) = 7$ × *Correction:* $5 + (-2) = \underline{3}$ b) $\frac{2}{3} + \frac{1}{4} = \frac{3}{7}$ × *Correction:* $\frac{2}{3} + \frac{1}{4} = \frac{8+3}{12} = \frac{11}{12}$ c) $\frac{2}{5} + \frac{3}{5} = \frac{5}{5}$ ✓ But can be simplified: $\frac{5}{5} = 1$ d) $\frac{1}{4} + \frac{1}{8} = \frac{3}{8}$ ✓ as $\frac{1}{4} + \frac{1}{8} = \frac{2+1}{8} = \frac{3}{8}$ e) $2 + \frac{1}{2} = \frac{3}{2}$ × *Correction:* $2 + \frac{1}{2} = 2\frac{1}{2} = \frac{5}{2}$ f) $\frac{9}{8} - 1 = \frac{8}{8}$ × *Correction:* $\frac{9}{8} - 1 = \frac{9}{8} - \frac{8}{8} = \frac{1}{8}$ *5 min*	Whole class activity Written on BB or SB or OHT Reasoning, agreement, praising (He has added 5 + 2, instead of 5 + (– 2).) (He has added the numerators and the denominators.) (He has added the whole number to the numerator.) (He has subtracted the whole number from the numerator.)
2	**Sequences** T says and writes on BB the first 3 terms of a sequence. Ps continue the sequence until T decides to stop. Final P gives the rule. BB: a) 5200, 4900, 4600, (4300, 4000, 3700, 3400, 3300, . . .) *Rule*: Decreasing by 300 (– 300) b) 1024, 512, 256, (128, 64, 32, 16, 8, 4, 2, 1, $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, . . .) *Rule*: Each following term is half the previous term. (÷ 2) c) 11, 22, 33, (44, 55, 66, 77, 88, 99, 110, 121, 132, . . .) *Rule*: Increasing by 11 (+ 11) d) $44\frac{3}{4}$, $40\frac{2}{4}$, $36\frac{1}{4}$, (32, $27\frac{3}{4}$, $23\frac{2}{4}$, $19\frac{1}{4}$, 15, $10\frac{3}{4}$, $6\frac{2}{4}$, . . .) *Rule*: Decreasing by $4\frac{1}{4}$ ($-4\frac{1}{4}$) *10 min*	Whole class activity Orally at speed round class In good humour! If a P makes a mistake the next P must correct it. Agreement on the rule Praising, encouragement only [or $n \times 11$, where n is the ordinal value of each term] Continue into negative numbers.
3	**Exchanging units of measure 1** T asks questions and Ps write answers on slates and show on command. How many: a) i) minutes is 1 hour (60 min.) ii) hours is 1 minute ($\frac{1}{60}$ h) b) i) hours is 1 day (24 h) ii) days is 1 hour ($\frac{1}{24}$ day) c) i) months is 1 year (12 months) ii) years is 1 month ($\approx \frac{1}{12}$ year)	Whole class activity At a good pace Responses shown in unison. Ps responding correctly explain to Ps who were wrong. Agreement, praising only T writes equation on BB, e.g. b) ii) 1 hour = $\frac{1}{24}$ of a day

Bk5		*Lesson Plan 88*
Activity		***Notes***
3	(Continued) d) weeks are Tuesday, Wednesday and Thursday altogether ($\frac{3}{7}$ week) e) days are 5 hours? ($\frac{5}{24}$ day) *16 min*	Feedback for T
4	**Exchanging units of measure 2** T asks questions and Ps come to BB or dictate what T should write, explaining reasoning. Class checks calculations in *Ex. Bks* or on slates, then agrees/disagrees. e.g. a) *How many weeks are 5 hours?* BB: 1 week = 7 days = (7 × 24) hours = <u>168 hours</u> 5 hours = $\frac{5}{168}$ of a week b) *How many years are 5 hours?* BB: 1 year = 365 days = (365 × 24) hours = <u>8760 hours</u> 5 hours = $\frac{5}{8760}$ year = $\frac{1}{1752}$ year (8760 has units digit 0, so we know it is divisible by 5) c) *How many years are 10 hours?* BB: 1 year = 8760 hours 10 hours = $\frac{10}{8760}$ year = $\frac{1}{876}$ year *21 min*	Whole class activity Reasoning, agreement, praising T helps where necessary. BB: $\begin{array}{r} 24 \\ \times\ 7 \\ \hline 168 \\ \hline 2 \end{array}$ $\begin{array}{r} 365 \\ \times\ 24 \\ \hline 1460 \\ +7300 \\ \hline 8760 \end{array}$ $5\overline{)8760}$ (1752, 32 1) or 10 hours = $\frac{2}{1752}$ year = $\frac{1}{876}$ year
5	***Book 5, page 88*** Q.1 Read: *Exchange the quantities*. Revise quickly the relevant units of measure. (BB) Set a time limit. Ps can do necessary calculations in *Ex.Bks* or on scrap paper but encourage metnal calculation where possible. Review with whole class. Ps come to BB or dictate to T, explaining reasoning. Class agrees/disagrees or points out further simplifications. Mistakes discussed and corrected. *Solution:* a) 1 week = 7 days, 1 day = $\frac{1}{7}$ week, 4 days = $\frac{4}{7}$ week b) 4 m = 400 cm, 1 cm = $\frac{1}{100}$ m, 27 cm = $\frac{27}{100}$ m c) 2 h = 120 min, 1 min = $\frac{1}{60}$hour, 40 min = $\frac{40}{60} = \frac{2}{3}$ (h) d) 17 litres = 1700 cl, 17 cl = $\frac{17}{100}$ litre, 320 ml = $\frac{320}{1000}$ litre = $\frac{32}{100}$ litre = $\frac{8}{25}$ litre *26 min*	Individual work, monitored, helped Written on BB or use enlarged copy master or OHP BB: 1 m = 100 cm = 1000 mm 1 litre = 100 cl = 1000 ml Reasoning, agreement, self-correction, praising Feedback for T

Bk5

Lesson Plan 88

Activity		*Notes*
6	***Book 5, page 88***	Individual work. monitored, helped
	Q.2 Read: *Exchange the quantities. Do the calculations in your exercise book.*	(or e) and f) done with whole class)
	Set a time limit or deal with one row at a time.	Written on BB or use enlarged copy master or OHP
	Review with whole class. Ps come to BB or dictate to T, saying the whole equation and explaining reasoning. Who agrees? Who did it another way? etc. Deal with all methods. Mistakes discussed and corrected. Ps who did not have time to complete all the rows fill in the boxes as the questions are dealt with.	Reasoning, agreement, self-correction, praising
	Stand up if you had them all correct! Let's give them 3 cheers!	
	Solution: e.g.	Accept any valid method.
		T could ask Ps which method they prefer and why.
		(T could show other methods if Ps do not suggest them and ask Ps if they are correct.)
	a) 20 min $= \frac{20}{60} = \boxed{\frac{1}{3}}$(hour), 45 min $= \frac{45}{60} = \boxed{\frac{3}{4}}$(hour),	
	90 min $= (60 + 30)$ min $= 1$ hour $+ \frac{1}{2}$ hour $= \boxed{1\frac{1}{2}}$ hours	
	b) $\frac{1}{2}$ hour $= \underline{30}$ min, $\frac{2}{5}$ hour $= 60 \div 5 \times 2 = \underline{24}$ min,	
	$\frac{61}{60}$ hour $= \underline{61}$ min	
	c) 70 cm $= \frac{70}{100} = \boxed{\frac{7}{10}}$(m),	or
	110 cm $= 100$ cm $+ 10$ cm $= 1$ m $+ \frac{10}{100}$ m $= \boxed{1\frac{1}{10}}$m,	110 cm $= \frac{110}{100}$ m $= \frac{11}{10}$ m $= \boxed{1\frac{1}{10}}$ m
	3 cm $= \boxed{\frac{3}{100}}$m	
	d) $\frac{1}{5}$ m $= 100$ cm $\div 5 = \underline{20}$ cm,	or $\frac{9}{4}$ m $= \frac{9 \times 25}{100}$ m $= 9 \times 25$ cm $= \underline{225}$ cm
	$\frac{9}{4}$ m $= 2$ m $+ \frac{1}{4}$ m $= 200$ cm $+ 25$ cm $= \underline{225}$ cm	
	$\frac{3}{50}$ m $= \frac{6}{100}$ m $= \underline{6}$ cm	or $\frac{9}{4}$ m $= \frac{900}{4}$ cm $= \underline{225}$ cm
	e) 43 cl $= \boxed{\frac{43}{100}}$litre, 350 g $= \frac{350}{1000} = \frac{35}{100} = \boxed{\frac{7}{20}}$(kg),	
	11 m $= \boxed{\frac{11}{1000}}$km	
	f) $\frac{5}{4}$ litre $= 1$ litre $+ \frac{1}{4}$ litre $= 100$ cl $+ 25$ cl $= \underline{125}$ cl	or $\frac{5}{4}$ litre $= \frac{125}{100}$ litre $= \underline{125}$ cl
	$\frac{42}{1000}$ kg $= \underline{42}$ g, $\frac{32}{1000}$ km $= \underline{32}$ m	
	33 min	

Bk5

Lesson Plan 88

Activity		*Notes*
7	***Book 5, page 88*** Q.3 Read: *Calculate the sums and differences.* What do you notice about each of the calculations in a) to d)? (Denominators are the same, so only the numerators need to be dealt with.) Set a time limit. Review with whole class. Ps come to BB or dictate to T, explaining reasoning. Class agrees/disagrees. Mistakes discussed and corrected. In the subtractions, also ask Ps to check differences by comparison on the number line. *Solution:* a) $\frac{3}{50}+\frac{41}{50}-\frac{10}{50}=\frac{44-10}{50}=\frac{34}{50}=\frac{17}{25}$ b) $\frac{6}{14}+\left(-\frac{9}{14}\right)=\frac{6-9}{14}=-\frac{3}{14}$ c) $\frac{5}{21}-\left(-\frac{2}{21}\right)=\frac{5+2}{21}=\frac{7}{21}=\frac{1}{3}$ d) $-\frac{8}{15}+\left(-\frac{4}{15}\right)=-\frac{8}{15}-\frac{4}{15}=-\frac{12}{15}=-\frac{4}{5}$ e) $-\frac{7}{10}-\left(-\frac{2}{5}\right)=\frac{-7+4}{10}=-\frac{3}{10}$ f) $-\frac{7}{10}-\left(+\frac{2}{5}\right)=\frac{-7-4}{10}=-\frac{11}{10}=-1\frac{1}{10}$ *38 min*	Individual work, monitored, helped (or e) and f) done with whole class) Written on BB or SB or OHT Discussion, reasoning, agreement, self-correction, praising Reasoning by comparison on number line: e.g. e) $-\frac{7}{10}$ is $\frac{3}{10}$ less than $-\frac{4}{10}$, or using only numerators: – 7 is 3 less than – 4. f) $-\frac{7}{10}$ is $\frac{11}{10}$ less than $\frac{4}{10}$ or usng only numerators: – 7 is 1 less than 4
8	***Book 5, page 88*** Q.4 Read: *Fill in the missing numbers. Do the calculations in your exercise book* Let's see how many of these you can do in 3 minutes! Start . . . now! . . . Stop! Review at BB with whole class. Ps come to BB or dictate to T, explaining reasoning. Class agrees/disagrees. Mistakes discussed and corrected. *Solution:* a) $\frac{4}{5}+\left[\frac{3}{5}\right]=\frac{7}{5}$ b) $\frac{11}{8}-\left[\frac{5}{8}\right]=\frac{3}{4}$ (as $\frac{3}{4}=\frac{6}{8}$) c) $\left[-\frac{1}{9}\right]+\frac{4}{9}=\frac{3}{9}$ d) $\left[\frac{5}{6}\right]-\frac{2}{3}=\frac{1}{6}$ (as $\frac{2}{3}=\frac{4}{6}$) e) $\frac{8}{7}-\left[\frac{1}{7}\right]+2=3$ f) $\frac{5}{6}-\left[\frac{1}{12}\right]=\frac{3}{4}$ (as $\frac{5}{6}=\frac{10}{12}$, and $\frac{3}{4}=\frac{9}{12}$) *42 min*	Individual work, monitored, helped Written on BB or SB or OHT Reasoning, agreement, self-correction, praising Show on number line if problems or disagreement. Calculations, e.g. a) $\frac{7}{5}-\frac{4}{5}=\left[\frac{3}{5}\right]$ b) $\frac{11}{8}-\frac{3}{4}=\frac{11-6}{8}=\left[\frac{5}{8}\right]$ d) $\frac{5}{6}-\frac{3}{4}=\frac{10-9}{12}=\frac{1}{12}$ [Missing numbers are in straight brackets]

Bk5		*Lesson Plan 88*
Activity		***Notes***
9	***Book 5, page 88, Q.5*** Read: *Charlie spends a quarter of every week-day in school and 1 third of the day sleeping. How many hours does he have left for doing other things?* Ps suggest what to do first and how to continue, coming to the BB or dictating what T should write. Who agrees? Who would do it another way? etc. T chooses a P to say the answer in a sentence. *Solution:* e.g. 1 day = 24 hours In school: $\frac{1}{4}$ of 24 hours = 6 hours Sleeping: $\frac{1}{3}$ of 24 hours = 8 hours Time left: $24 - (6 + 8) = 24 - 14 = \underline{10}$ (hours) or Time left: $1 - \frac{1}{4} - \frac{1}{3} = \frac{12 - 3 - 4}{12} = \frac{5}{12}$ (day) $\frac{5}{12}$ of 24 hours $= 24 \div 12 \times 5 = 2 \times 5 = \underline{10}$ (hours) *Answer:* Charlie has 10 hours left for doing other things. What other things might Charlie be doing? *45 min*	Whole class activity Discussion, reasoning, agreement, praising T helps only if necessary. Involve several Ps.
Homework	Ps write down how many hours they spent last Sunday (or yesterday) doing certain things and what part of the day each activity took up.	*Optional* Review at the start of next lesson.