Bk4	R: Calculations **C: Revision and practice: Geometry** *E: Geometric games. Problems*	*Lesson Plan 113*

Activity		***Notes***

1

Factorisation

a) Let's factorise 140 and 141. Ps come to BB or dictate to T, drawing factor tree if needed and checking possible prime divisors.

BB: 140 = 2 × 2 × 5 × 7; 141 = 3 × 47

b) Who can tell me <u>all</u> the factors of 140 and 141? Ps dictate to T, using the prime factors to help them. Class agrees/disagrees.

BB: 140: 1, 2, 4, 5, 7, 10, 14, 20, 28, 35, 70, 140;

141: 1, 3, 47, 141

5 min

Notes: Whole class activity

Reasoning, agreement, praising

At a good pace

Ps may use a calculator.

Ps could join up the factor pairs.

2

Calculation relay

T says a multiplication or division. Ps say result (in steps if necessary). Start with practice in multiplication and division facts, e.g. 6 × 9, 49 ÷ 7, then gradually move on to more difficult operations. e.g.

14 × 13 (= 140 + 30 + 12 = 170 + 12 = <u>182</u>),

28 × 7 (= 140 + 56 = <u>196</u>), 350 × 11 (= 3300 + 550 = 3850),

$\frac{1}{5} \times 5$, 2.7 × 10, 3400 ÷ 5 (= 600 + 80 = 680), $\frac{100}{10} \div 10$,

$257 \div 4$ (= $50 + 10 + 4 + \frac{1}{4} = 64\frac{1}{4}$, or 64, r 1), etc.

Ps can think of multiplications and divisions too.

12 min

Notes: Whole class activity

T chooses Ps at random.

Allow Ps to write interim steps on scrap paper or slates or, in difficult cases, to write the whole calculation.

Emphasis should be on quick calculation, done mentally if possible.

At a good pace

Class points out errors.

Praising, encouragement only

3

Written exercises

T dictates the operations and Ps write them down vertically in *Ex. Bks*.

a) 13 0870 – 1308 b) 428.3 – 60.2 c) 4752 × 4

d) 444 × 21 e) 651.28 + 207.43 + 1040.05 + 99.99

f) 17 253 ÷ 8 g) 19 605 ÷ 17

Let's see how many you can do in 5 minutes! You can use any method you wish. Remember to check your results. Start . . . now! . . . Stop!

Review at BB with whole class. Ps come to BB or dictate results to T, explaining reasoning loudly and with place values. Class points out errors. Mistakes discussed and corrected.

BB: a)

			^{10}		^{10}
	1	3	0	8	7
–		1_1	3	0_1	8
	1	**1**	**7**	**7**	**9**

b)

		^{10}			
	4	2	8	.	3
–	$_1$	6	0	.	2
	3	**6**	**8**	**.**	**1**

c)

	4	7	5	2
			×	4
1	**9**	**0**	**0**	**8**
	3	2		

d)

	4	4	4
	×	2	1
	4	4	4
8	8	8	0
9	**3**	**2**	**4**
1	1		

e)

		6	5	1 .	2	8
		2	0	7 .	4	3
	1	0	4	0 .	0	5
+			9	9 .	9	9
	1	**9**	**9**	**8 .**	**7**	**5**
		1	1	1	2	

f)

		2	**1**	**5**	**6**	**r 5**
8	1	7	2	5	3	
		1	4	5	5	

g)

			1	**1**	**5**	**3**	**r 4**
1	7	1	9	6	0	5	
	–	1	7				
			2	6			
		–	1	7			
				9	0		
			–	8	5		
					5	5	
				–	5	1	
						4	

15 min

Notes: Individual work, monitored, d) to g) helped

(Write vertically on BB or use enlarged copy master for review and for less able Ps.)

Differentiation by time limit

(Or deal with one at a time if class is not very able.)

Reasoning, agreement, self-correcting, praising

Check with reverse operations (or with a calculator).

Feedback for T

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Bk4

Lesson Plan 113

Activity | **Notes**

4

Book 4, page 113

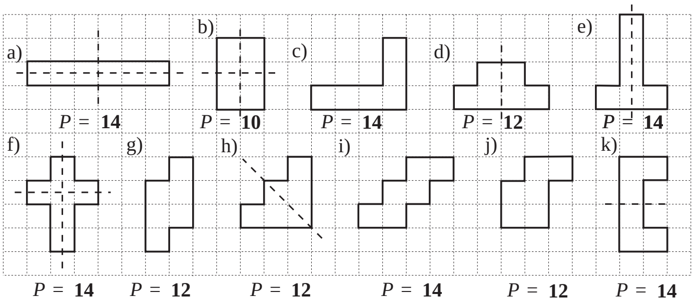
Q.1 Read: *i) Colour the shapes which are symmetrical and draw the lines of symmetry.*

ii) Write the perimeter length (in grid units) below each shape.

Elicit what 'symmetrical' and 'line of symmetry' mean.
(If you folded the shape in half, one half would cover the other exactly. The line of symmetry is the fold line or is some times called the mirror line, as one half of the shape is a mirror image of the other half.)

Set a time limit. Review at BB with whole class. Ps come to point to each shape in turn, say whether it is symmetrical, draw the lines of symmetry where appropriate and write its perimeter length. Class agrees/disagrees. Mistakes discussed and corrected.

Solution:



Notes:
Individual work, monitored, helped

Drawn on BB or use enlarged copy master or OHP

Revision of symmetry.
Allow Ps to explain if they can.
Ps might point out symmetrical shapes in the classroom.

Elicit that the unit of measure for the perimeters is the side of a grid square.

Differentiation by time limit.

Reasoning, agreement, self-correction, praising

Feedback for T

Extension

What do you notice about all the shapes? (They all have an area of 6 grid squares.)

What is the name of each shape?

a), b): rectangles

c): hexagon (plane shape with 6 straight sides)

d), e), g), h), j) , k): octagons (plane shape with 8 straight sides)

f) and i) dodecagon (plane shape with 12 straight sides)

Notes:
Whole class activity

Agreement, praising

Extra praise if Ps remember the name dodecagon.

26 min

5

Book 4, page 113

Q.2 Read: *These shapes are congruent. What has been done to Shape 1 to make Shape 2, Shape 2 to make Shape 3, and so on? Write it in your exercise book.*

Elicit what 'congruent' means. (exactly the same shape and size)

Revise the vocabulary for transforming shapes first. T manipulates a cardboard shape on BB and elicits the name for the movement. rotation: turning around a central point, reflection: forming a mirror image, i.e. flipping the shape over,

Discuss the form of what Ps should write in *Ex. Bks.*

Ps should draw the mirror line in *Pbs* if it is a reflection.

Review at BB with whole class. Elicit by how much the shape has been turned if it is a rotation. T should have cut-out shapes to demonstrate on BB. Mistakes discussed and corrected.

Notes:
Individual trial first, monitored, after introductory whole class discussion (or continue as a whole class activity)

Drawn on BB or use enlarged copy master or OHP

Discussion and demonstration

BB: reflection rotation

e.g. S1 $\rightarrow$ S2: reflection

Encourage Ps to use a ruler.

Discussion, reasoning, agreement, self-correction, praising

Feedback for T

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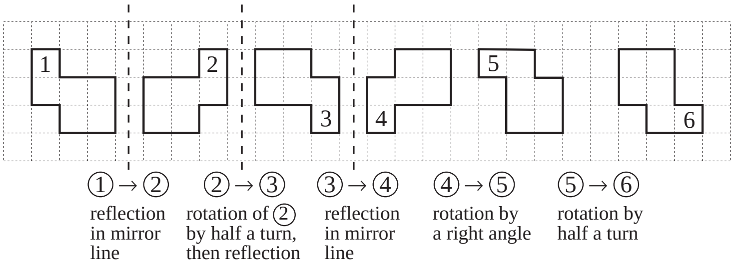
Bk4

Lesson Plan 113

Activity		*Notes*

5 (Continued)

Solution:



Extension What can you tell me about the shape?
(e.g. octagon, P = 12 units, A = 6 square units)

Notes:
Feedback for T

Elicit that
- half a turn = 2 right angles
- quarter of a turn = 1 right angle

31 min

6 ***Book 4, page 113***

Q.3 Read: *What has been done to Shape A to make Shape B, Shape B to make Shape C, and so on? Write it in your exercise book.*

First discuss the form of what Ps should write in *Ex. Bks.*

e.g. A $\rightarrow$ B: rotation

Set a time limit. Review at BB with whole class. Ps dictate findings . T helps with vocabulary. Elicit that to make bigger in all directions is to enlarge (and to make smaller is to reduce); to make bigger in only one direction is to stretch. Class agrees/ disagrees with solutions. Mistakes discussed and corrected.

Solution:

A $\rightarrow$ B: rotation (by quarter of a turn, or a right angle, or $90°$)

B $\rightarrow$ C: stretch horizontally (to twice its length)

C $\rightarrow$ D: rotation (by a right angle or quarter of a turn, or $90°$)

D $\rightarrow$ E: stretch horizontally (to twice its length)

Which shapes are congruent? Which shapes are similar?

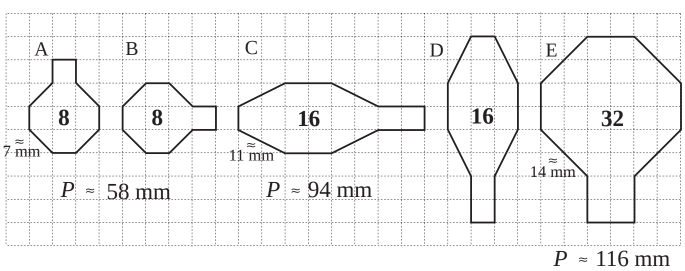
Extension Read: *Write the area inside each shape and the perimeter below.*

Ps count the grid squares and parts of grid squares for the area. (This is not too difficult, as Ps can find parts which combine to make a complete square, but accept approximations.)

It is difficult to find the perimeter in grid units, so Ps should measure a slanting side with rulers (to the nearest mm) and as the side of each grid square is 5 mm, the total perimeter can be calculated. e.g.

A: $P \approx 6 \times 5$ mm + 4×7 mm = 30 mm + 28 mm = 58 mm
= 5.8 cm

Solution:



Notes:
Individual work, monitored, helped

Drawn on BB or use enlarged copy master or OHP

Discussion, reasoning, agreement, self-correcting, praising

Extra praise if Ps remember the vocabulary.

Whole class activity

BB: A $\cong$ B, C $\cong$ D
A ~ B ~ E; C ~ D

Whole class activity
(or individual work if Ps wish, after initial discussion on units of measure)

Discussion, reasoning, agreement, (self-correction), praising

Area given in grid squares.

Perimeter given in mm, but Ps could then convert to cm

36 min

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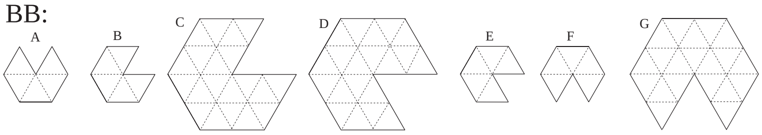
Bk4

Lesson Plan 113

Activity		*Notes*
7	**Shapes** T has shapes drawn (or stuck) on BB. What has been done to the previous shape to make the next one? BB:  Ps come to BB or dictate to T. Class agrees/disagrees. T should have cut-out versions of the small and large shape so that Ps can demonstrate rotation or measure and compare the length of the sides. *Solution:* A $\rightarrow$ B: rotation (by 1 sixth of a turn) B $\rightarrow$ C: enlargement (to twice its size) C $\rightarrow$ D: rotation (by 1 sixth of a turn) D $\rightarrow$ E: reduction (to half its size) E $\rightarrow$ F: rotation (by 1 sixth of a turn) F $\rightarrow$ G: enlargement (to twice its size)	Whole class activity Use copy master or OHP, shapes enlarged and cut out (or draw on triangular grid) Ps could have copy of copy master on desks too. Discussion, reasoning, agreement, praising Elicit that the shape is a hexagon with one of the 6 segments cut out, so rotating it by one segment will be 1 sixth of a turn. BB: A $\cong$ B $\cong$ E $\cong$ F; C $\cong$ D $\cong$ G e.g. A ~ C, etc.
Extension	Which shapes are congruent (similar)? What is their area (perimeter)? *41 min*	
8	***Book 4, page 113, Q.4*** Read: *Barry Bear is planning his route to visit Piggy, then Rabbit, then Goat. He draws the possible paths he could take.* Who can explain the diagram? (The letters stand for each of the animals and the dots are their houses The lines are the possible paths.) a) Read: *How many routes are possible?* T asks several Ps what they think and why (or Ps could write number on scrap paper or slates and show on command.) Agree that for each of the 4 different paths from B to P, there are 5 different paths from P to R and for each of these, there are 3 different paths from R to G, i.e. there are: BB: $4 \times 5 \times 3 = 20 \times 3 = \underline{60}$ possible routes. b) Read: *What chance has Goat of guessing Barry's route?* T asks several Ps what they think and why (or Ps could show on scrap paper or slates on command). BB: 1 out of 60 or $\frac{1}{60}$ (Unless *Barry Bear* had a favourite route and *Goat* knew it.) *45 min*	Whole class activity but individual calculating Diagram drawn on BB or use enlarged copy master or OHP BB:  Discussion, reasoning, agreement, praising Reasoning, agreement, praising Extra praise if a P points this out without hint from T.

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Bk4

R: Calculations

C: Revision and practice: Geometry

E: Geometric game. Problems

Lesson Plan 114

Activity | ***Notes***

1

Factorisation

a) Let's factorise 142. Ps come to BB or dictate to T, drawing factor tree if needed and checking possible prime divisors.

BB: $142 = 2 \times 71$;

b) Who can tell me <u>all</u> the factors of 142? Ps dictate to T, using the prime factors to help them. Class agrees/disagrees.

BB: 142: 1, 2, 71, 142

Notes: Whole class activity. Reasoning, agreement, praising. At a good pace. Ps may use a calculator to check the divisors.

4 min

2

Numbers

a) Let's call a natural number a <u>perfect number</u> if it equals the sum of all its natural factors except for itself.

Who can tell me a perfect number? Who agrees? Let's check it.

Who can think of another perfect number? Class checks it.

To Ts only:

Perfect numbers are rare and only 39 such numbers are known but we do not know if there are others. The first 3 perfect numbers: 6, 28 and 496 were known to the ancient mathematicians since the time of Pythagoras (C 500 BC)

All <u>even</u> perfect numbers are of the form $2^n \times (2^{n+1} - 1)$:

$\underline{6} = 2^1 \times (2^2 - 1)$; $\underline{28} = 2^2 \times (2^3 - 1)$; $\underline{496} = 2^4 \times (2^5 - 1)$;
$\underline{8128} = 2^6 \times (2^7 - 1)$, then $2^{10} \times (2^{11} - 1)$, $2^{12} \times (2^{13} - 1)$, . . .

but note that the formula works only if 2^{n+1} is a prime number.

We do not know if odd perfect numbers exist, as none have been found yet. (See *http:home1.pacific.net.sg/~novelway/MEW2/*)

Notes: Whole class activity. Agreement, checking, praising

BB: <u>Perfect numbers</u>

e.g. $\underline{6} = 1 + 2 + 3$
$\underline{28} = 1 + 2 + 4 + 7 + 14$

T could have more ready in case Ps wish to know them.

b) Let's call a natural number a <u>nice number</u> if it equals the product of all its factors except for 1 and itself.

Who can tell me a nice number? Who agrees? Let's check it.

Who can think of another nice number? Ps try out other numbers and tell class when they have found one. Class checks it.

Notes: BB: <u>Nice numbers</u>

e.g. $\underline{6} = 2 \times 3$
$\underline{10} = 2 \times 5$, $\underline{15} = 3 \times 5$
$\underline{14} = 2 \times 7$, $\underline{22} = 2 \times 11$
$\underline{33} = 3 \times 11$, $\underline{35} = 5 \times 7$

142 is also a nice number..

Have no expectations!

10 min

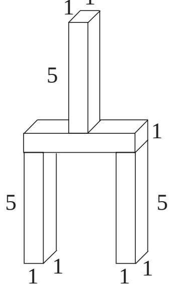
3

Problem 1

I made this solid from four 5-unit long rods, 1 unit wide and 1 unit thick. (Or T could have model constructed from strips of 5 multi-link cubes.)

Here is a diagram of it on the BB. I will ask you questions about it and you must show me the answer when I say.

BB:



Ps answering correctly explain reasoning to class.

a) How many unit cubes did I use to make it?
($4 \times 5 = \underline{20}$ unit cubes)

b) How many unit squares cover its surface?
(82) By counting, or by calculation:

$4 \times (4 \times 5 + 2 \times 1) - 3 \times 2 = 4 \times 2 - 6$
$= 88 - 6$
$= \underline{82}$ (unit squares)

(6 squares cover each other, so cannot be seen)

Notes: Whole class activity. Drawn on BB or use enlarged copy master or OHP. T has large model (and if possible Ps make own model using *yellow* (5 cm long) Cuisennaire rods or strips of multi-link 1 cm cubes). Ps show answers on scrap paper or slates in unison. Reasoning, agreement, praising

16 min

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Bk4

Lesson Plan 114

Activity		*Notes*

4

Book 4, page 114

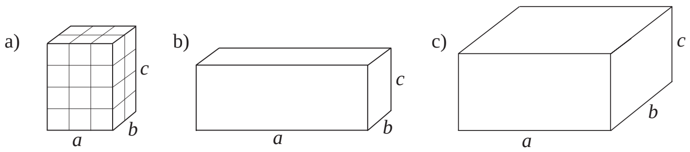
Q.1 Read: *How many unit cubes are needed to build each cuboid? Colour the cubes which are similar.*

Elicit that the number of unit cubes is the volume of the cuboid and that it is calculated by: length × width × height.

Ps can do calculations in *Ex. Bks*. or on slates if they need to but encourage mental calculation if possible. Set a time limit.

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) a = 3 units, b = 2 units, c = 4 units

b) a = 8 units, b = 2 units, c = 8 units

c) a = 6 units, b = 4 units, c = 8 units

Notes: Individual work, monitored, helped

Drawn on BB or use enlarged copy master or OHP

(or T has large models already made up)

Reasoning, agreement, self-correction, praising

BB:

a) $V = 3 \times 2 \times 4 = \underline{24}$

b) $V = 8 \times 2 \times 8 = \underline{128}$

c) $V = 6 \times 4 \times 8 = \underline{192}$

(unit cubes)

a) ~ c) (same shape but twice the size)

i.e. each edge of a) has been enlarged by 2 times to make c).

Note that the lengths are twice as long but the volume is 8 times more: $192 = 8 \times 24$

Extension

What is the surface area of the cuboids? Ps come to BB or dictate to T. Class points out errors.

a) $A = 2 \times (3 \times 2 + 3 \times 4 + 2 \times 4)$

$= 2 \times (6 + 12 + 8) = 2 \times 26 = \underline{52}$ (unit squares)

b) $A = 2 \times (8 \times 2 + 8 \times 8 + 2 \times 8)$

$= 2 \times (16 + 96 + 16) = 2 \times 128 = \underline{256}$ (unit squares)

a) $A = 2 \times (6 \times 4 + 6 \times 8 + 4 \times 8)$

$= 2 \times (24 + 48 + 32) = 2 \times 104 = \underline{208}$ (unit squares)

Notes: Reasoning, agreement, praising

Extra praise if Ps notice that the diagrams hve not been drawn to scale!

26 min

5

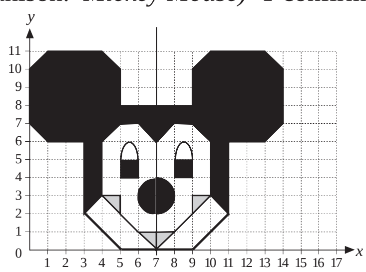
Book 4, page 114

Q.2 Read: *Find the points and join them up. Colour the shapes you make.*

Who can explain to us what the numbers in the brackets mean? Ps come to BB to point and explain (The first number is the x coordinate and refers to the horizontal numbers on the x-axis in the diagram. The 2nd number is the y coordinate and refers to the vertical numbers on the y-axis.) If Ps are still unsure, T (or P) P could demonstrate how to find the first point by moving two fingers along the grid lines until they meet and drawing a dot.

Set a time limit. Review with whole class. T has solution already prepared but keeps covered until Ps have said what they have drawn. (Ps in unison: *Mickey Mouse)* T confirms it.

Solution:



T gives coordinates for a point on LHS (e.g. 3, 6) and Ps say the coordinates of the corresponding point on the RHS (e.g. 11, 6).

Notes: Individual work, monitored, helped

Drawn on BB or use enlarged copy master or OHP

Initial discussion on meaning of coordinates.

Involve several Ps.

Differentiation by time limit.

(Ps can finish it at home if they wish.)

T has solution already prepared from enlarged copy master or on an OHT

Agreement, praising

Ps can choose the coordinates too. In good humour!

36 min

Bk4

Lesson Plan 114

Activity		Notes

Activity 6

Book 4, page 114

Q.3 Read: *A group of children are standing in a circle to play a game. Each child has been given a number in order round the circle.*

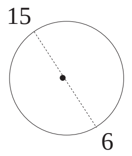
If the child numbered 6 stands opposite the child numbered 15, how many children are playing the game?

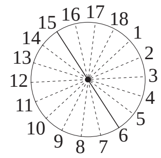
Ps to try to solve it using their own methods. Set a time limit.

Review with whole class. Ps who have found a solution could show on scrap paper or slates in unison on command. Ps responding correctly explain at BB to rest of class. Who did the same? Who did it a different way? etc. Deal with all methods.

Possible methods of solution:

1) Draw a diagram:





or 2)

$6 \rightarrow 15$
$5 \rightarrow 14$
$4 \rightarrow 13$
$3 \rightarrow 12$
$2 \rightarrow 11$
$1 \rightarrow 10$

$7 \rightarrow 16$
$8 \rightarrow 17$
$9 \rightarrow$ **18**

or

3) From 6 to 1 we could move 5 steps back.

5 steps back from 15 is 10, so the number opposite 1 is 10.

Therefore the greatest number must be opposite 9.

As the difference between opposite numbers is 9, $(15 - 6 = 9)$ the greatest number must be $9 + 9 = \underline{18}$

or

4) $15 - 6 = 9$ is half of the children, so there are $2 \times 9 = \underline{18}$ children altogether.

Notes: Individual (or paired) work, monitored, helped

(Or whole class activity if time is short)

Ps can discuss strategies with their neighbours.

Discussion, reasoning, agreement, self-correcting, praising

Accept any valid method which is reasoned correctly

(including real-life demonstration with Ps a front of class holding number cards)

41 min

Activity 7

Book 4, page 114

Q.4 *Read: The Rabbit family grow their yearly supply of carrots in a rectangular garden. Its area is 180 m².*
How long is the garden if it is 15 m wide?

Ps solve the problem in *Ex. Bks* under a time limit.

Review with whole class. Ps could show result on scrap paper or slates on command. Ps answering correctly come to BB to explain their reasoning. Mistakes discussed and corrected.

Solution:

$A = a \times b = 180 \text{ m}^2$, $b = 15$ m

So $a = 180 \div b = 180 \div 15$

$= 60 \div 5 = \underline{12}$ (m)

or

			1	2
1	5	1	8	0
			3	

Answer: The garden is 12 m long.

Notes: Individual work, monitored, (helped)

Discussion, reasoning, agreement, self-correction, praising

BB: $b = 15$ m, $A = 180 \text{ m}^2$, a

Extension

- What is the perimeter of the garden?

  Ps come to BB or dictate to T. Class agrees/disagrees.

  BB: $P = 2 \times (15 + 12) = 30 + 24 = \underline{54}$ (m)

- What is wrong with the question? (15 m > 12 m, so 15 m should be the length and 12 m should be the width.)

Notes: Whole class activity

Reasoning, agreement, praising

Agree that usually the longer side of a rectangle is its length and the shorter side is its width.

45 min

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Bk4

R: Calculations
C: Revision and practice: Geometry
E: Problems

Lesson Plan *115*

Activity		*Notes*
1	**Factorisation** a) Let's factorise 143. Ps come to BB or dictate to T, checking possible prime divisors. (1, 2, 3, 5, 7, 9, 11) BB: 143 = 11 × 13; b) Ps dictate all its factors and T writes on BB. 143: 1, 11, 13, 143 What is special about this number? (It is a <u>nice</u> number, i.e. it is equal to the the product of all its factors, apart from 1 and itself.)	Whole class activity Reasoning, agreement, praising Ps may use a calculator to check the divisors. Extra praise if Ps remember.
	4 min	

2	**Problem 1**
	Listen carefully and think how you would solve the problem.
	Donald Duck says:
	'If the sum of the digits of a natural number is divisible by 3, then that number is also divisible by 3.'
	Is he right or wrong?
	Allow Ps to think about it and discuss with their neighbours for a couple of minutes. Who thinks that *Donald Duck* is right? T asks several Ps why they think so. Ps who think the statement is wrong try to give counter examples.
	Reasoning, e.g.
	P_1: The multiples of 3 are: 0, 3, 6, 9,12, 15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48, 51, 54, 57, 60, . . . and we could not find one which shows that the statement is wrong.
	P_2: I chose numbers out of my head, e.g. 6318.
	6318 → 6 + 3 + 1 + 8 = 18, and 18 is a multiple of 3
	So I divided 6318 by 3 and found that it was also a multiple of 3.
	All the numbers I tried matched up with what *Donald Duck* said.
	P_3: I chose a number, e.g. 7153
	7153 → 7 + 1 + 5 + 3 = 16, and 16 ÷ 3 = 5, <u>r 1</u>
	So I divided 7153 by 3 and found that it also has a remainder of 1.
	Then I tried 7154.
	7154 → 7 + 1 + 5 + 4 = 17, and 17 ÷ 3 = 5, <u>r 2</u>
	So I divided 7154 by 3 and found that it also has a remainder of 2.
	Then I tried 7155. 7155 → 7 + 1 + 5 + 5 = 18, and 18 <u>is</u> a multiple of 3.
	So I divided 7155 by 3 and found that it is a multiple of 3 too.
	No other remainders are possible, so what *Donald Duck* said seems to be true.
	T tells class that the statement <u>is</u> true but you will learn how to prove it another year. It is an easy method of telling if a number is a multiple of 3.
		Whole class activity but individual (paired) trial first
		T repeats slowly and Ps repeat in own words.
		Discussion, reasoning, agreement, praising
		Accept and praise any positive conjecture and do not finish the discussion too early.
		
		   2 1 0 6
		3 | 6 3 1 8
		       1
		
		   2 3 8 4 r 1
		3 | 7 1 5 3
		   1 2 1 1
		
		   2 3 8 4 r 2
		3 | 7 1 5 4
		   1 2 1 2
		
		   2 3 8 5
		3 | 7 1 5 5
		   1 2 1

	12 min	

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Bk4

Lesson Plan 115

Activity | ***Notes***

3

Problem 2

Listen carefully and think how you would solve the problem.

Whole class activity

a) *Mickey Mouse says:*

'If the last two digits of a natural number show a 2-digit number which is divisible by 4, then whole number is also divisible by 4.'

Is he right or wrong?

T repeats slowly to give Ps time to think.

Who thinks that he is right? Why? Ps might suggest using some of the strategies used in the previous question. T helps with wording of reasoning. Class agrees/disagrees.

Discussion reasoning, agreement, praising

Reasoning, e.g.

P_1: The multiples of 4 are: 0, 4, 8, 12,16, 20, 24, 28, 32, . . . and the statement is true for all these.

P_2: I chose numbers out of my head, e.g. 3728

37<u>28</u> $\rightarrow$ 28, and 28 is a multiple of 4.

So I divided 3728 by 4 and found that it was a multiple of 4.

Then I tried 7328 and got the same result, so the thousands and hundreds digits do not seem to matter.

		9	3	2
4	3	7	2	8
		1		

	1	8	3	2
4	7	3	2	8
	3	1		

P_3: Any whole hundred and any whole thousand is a multiple of 4, which is why we can decide from the tens and units digits only.

This shows that what *Mickey Mouse* said is true.

Extra praise if P suggests this clever reasoning. (T gives it if no P does.)

Extension

b) *Barry Bear says:*

'If the sum of the digits of a natural number is divisible by 6, then that number is also divisible by 6'

Is he right or wrong?

T repeats slowly to give Ps time to think.

Who thinks he is right? Why? Why not? Ps explain their reasoning or give counter examples. Class agrees/disagrees.

Discussion reasoning, agreement, praising

Reasoning, e.g.

P_1: The multiples of 6 are: 0, 6, 12, 18, 24, 30, . . .

12 $\rightarrow$ 3, which is <u>not</u> a multiple of 6, so the statement is wrong.

Accept and praise P_1's reasoning for the moment unless a P disagrees with it. (See P_3 below)

P_2: I chose a number whose digits add up to a multiple of 6, e.g.

2523 $\rightarrow$ 2 + 5 + 2 + 3 = <u>12</u>, which is a multiple of 6.

So I divided 2523 by 6 and found that it had a remainder of 3.

So 2523 is <u>not</u> a multiple of 6 and the statement is wrong.

		4	2	0	r 3
6	2	5	2	3	
		1		3	

P_3: I chose a number whose digits do <u>not</u> add up to a multiple of 6. e.g. 96 $\rightarrow$ 9 + 6 = <u>15</u>, which is not a multiple of 6.

So I divided 96 by 6 and found that it <u>is</u> a multiple of 6.

So I think that *Barry Bear* is wrong.

If Ps do not suggest this or P_1, T might give it to make Ps think about what is a counter example and what is not.

Does this really show that *Barry Bear* is wrong? (It is not a counter-example because the reasoning is the wrong way round. He did not say that <u>all</u> numbers divisible by 6 have the sum of their digits as a multiple of 6.)

The same goes for P_1 above.

Agree that only <u>one</u> counter example, e.g. 2523 above, is needed to prove that *Barry Bear* is wrong.

Praise all Ps who contributed to the discussion

20 min

Bk4

Lesson Plan 115

Activity		Notes

4

Book 4, page 115

Q.1 Read: *Snow White is painting a picture of the seven dwarfs. The area of the rectangular canvas is 4500 cm². How long is the canvas if its width is 500 mm?*

What should you do first? (Change the width to cm.)

Set a time limit. Ps write a plan, do the calculation and write the answer as a sentence in *Pbs*.

Review with whole class. Ps could show result on scrap paper or slates on command. Ps who answered correctly explain at BB. Class agrees/disagrees. Mistakes discussed and corrected.

Solution: e.g.

BB: $A = 4500\text{ cm}^2$ $\quad W = 500\text{ mm} = 50\text{ cm}$

Plan: $L = A \div W = 4500 \div 50 = 450 \div 5 = \underline{90}$ (cm)

Answer: The canvas is 90 cm long.

25 min

Notes:

Individual work, monitored, helped

T could show a real canvas.

BB:

$\boxed{A = 4500\text{ cm}^2}$ $\quad W = 500$ mm

$L = ?$

Reasoning, agreement, self-correction, praising

Extension (for quick Ps)

What is the perimeter of the canvas?

$P = 2 \times (50 + 90) = \underline{280}$ (cm)

5

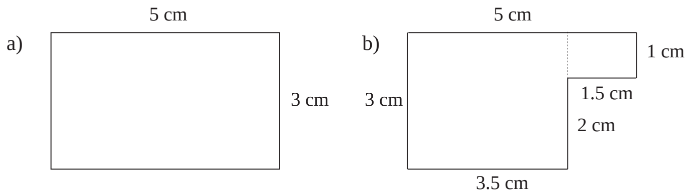
Book 4, page 115

Q.2 Read: *Measure the sides of each polygon. Calculate the perimeter and the area.*

Deal with the measurements first to ensure that Ps have the correct values before they do the calculations. Calculations can be done in *Ex. Bks* and only the results writen in *Pbs*.

Review with whole class. Ps come to BB or dictate to T, explaining reasoning. Class agrees/disagrees. Mistakes dicussed and corrected.

Solution:



a) $P = 2 \times (5 + 3) = 2 \times 8 = \underline{16}$ (cm)

$A = (5 \times 3)\text{ cm}^2 = \underline{15\text{ cm}^2}$

b) $P = (3.5 + 2 + 1.5 + 1 + 5 + 3)$ cm $= \underline{16\text{ cm}}$

$A = 3.5 \times 3 + 1.5 \times 1 = 10.5 + 1.5 = \underline{12}$ (cm²)

Why are the perimeters equal? Ps come to BB to explain.

30 min

Notes:

Individual work, monitored, helped

Drawn on BB or use enlarged copy master or OHP for demonstration only.

Discussion on how to find the area of b).

Reasoning agreement, self-correction, praising

or

$A = 5 \times 3 - 1.5 \times 2 = 15 - 3 = \underline{12}$ (cm²)

Reasoning, agreement

6

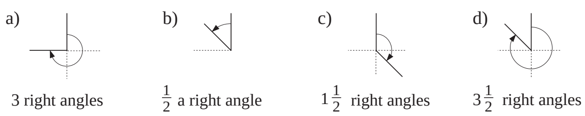
Book 4, page 115

Q.3 Read: *How many right angles are the angles shown by the arrows?*

What is a right angle? (1 quarter of a turn or 90°)

Set a time limit. Review at BB with whole class. Ps come to BB or dictate to T. Class agrees/disagrees. Mistakes corrected.

Solution:



34 min

Notes:

Individual work, monitored (helped)

Drawn on BB or use enlarged copy master or OHP

Ps could stand up and turn by a right angle to the left.

Reasoning, agreement, self-correction, praising

Elcit that:

1 turn = 4 right angles = 360°

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Bk4

Lesson Plan 115

Activity		Notes

7

Book 4, page 115

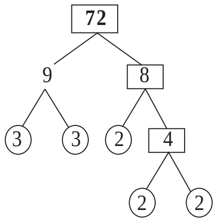
Q.4 Read: *A cuboid is built from 72 unit cubes. How many units long can the edges be? First factorise 72, then show the possibiities in the table.*

What do the circles and rectangles mean in the diagram? (The rectangles are factors which are not prime numbers and the circles are prime factors.)

What do the letters in the table represent? (the length, width and height of the cuboid) Set a time limit.

Review at BB with whole class. Ps come to BB or dictate to T. Class agrees/disagrees. Mistakes discussed and corrected.

Solution:



a	**1**	**1**	**1**	1	1	1	2	2	2	2	3	3
b	**1**	**2**	**3**	4	6	8	2	3	4	6	3	4
c	**72**	36	24	18	12	9	18	12	9	6	8	6

Agree that there are 12 different combinations.

Notes: Individual work, monitored, helped

(or whole class activity if time is short)

Drawn on BB or use enlarged copy master or OHP

Initial discussion on meaning of diagram and table.

Differentiation by time limit

Reasoning, agreement, self-correction, praising

At a good pace

Extension

If you think of the values of *a*, *b* and *c* as being interchangeable how many possibilities will there be then?

BB: $3 + 6 + 6 + 6 + 6 + 6 + 3 + 6 + 3 + 3 + 6 = 4 \times 3 + 8 \times 6$
$= 12 + 48$
$= \underline{60}$ cases

40 min

Notes: Whole class discussion, reasoning, agreement

Extra praise if a P points this out without help from T.

40 min

8

Book 4, page 115

Q.5 Read: *Try to divide a square into 6 smaller squares.*

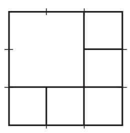
Ps measure the given square and use their rulers to draw smaller squares. T might give a hint before Ps start, or if Ps are having difficulties, e.g.

Into how many <u>congruent</u> squares could we divide the square? (4, 9 16, etc., i.e. square numbers)

But 6 is not a square number, so what can you say about the 6 squares? (They are not all an equal size.)

If Ps finds a solution, they come to BB to show it. If not, T shows it. Or T could leave the question open and Ps try to solve it at home or in *Lesson 145*.

Solution:



5 1 cm squares
1 2 cm square

Notes: Individual trial first, monitored, helped

Drawn on BB or SB or OHT

Reasoning, agreement

Discussion. Ps show their findings.

Elicit that the length of each side is 3 cm.

Agreement, (self-correction), praising

45 min

Bk4

R: Calculations
C: Geometric games, puzzles
E: Problems

Lesson Plan
116

Activity		*Notes*

1

Factorising

a) Find the prime factors of 144 in your *Ex. Bks.* and write it as the product of its prime factors.

b) List all its factors using the prime factors to help you.

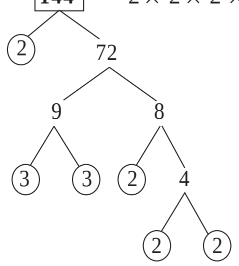
Set a time limit. Ps come to BB or dictate to T. Class agrees/disagrees. Mistakes discussed and corrected.

Notes: Individual work in *Ex. Bks.* monitored, helped

Reasoning, agreement, self-correction, praising

BB:

a) $\boxed{144} = 2 \times 2 \times 2 \times 2 \times 3 \times 3$



or

144	2
72	2
36	2
18	2
9	3
3	3
1	

T could show this quick way too.

Ps may use a calculator to work out all the factors.

Ps might use it in future if they like it.

b) 1, 2, 3, 4, 6, 8, 9, 12, 16, 18, 24, 36, 48, 72, 144 (15 factors)

What kind of number is 144? (It is a <u>square number</u> as $144 = 12 \times 12$
$= 12^2$)

Extra praise for Ps who remember the name.

BB: 12 by 12 square with $\boxed{144}$

5 min

2

Missing numbers

Study these equations. Which numbers are missing?

When you come to the BB, first say the equation as a word problem, then explain how you will solve it. Then do the calculation at the side of the BB, explaining your reasoning.

BB:

a) $645 + \boxed{8357} = 9002$

e.g. How much is added to 654 to get 9002?

We get the unknown term of a sum if we take away the known term from the sum.

C: $\begin{array}{r} 9002 \\ -\ 645 \\ \hline 8357 \end{array}$

b) $7318 - \boxed{4772} = 2546$

e.g. How much is subtracted from 7318 to get 2546?

We get the unknown subtrahend if we subtract the difference from the reductant.

C: $\begin{array}{r} 7318 \\ -\ 2546 \\ \hline 4772 \end{array}$

c) $\boxed{11\,879} - 7608 = 4271$

e.g. How much is 7608 taken away from to get 4271?

We get the reductant of a subtraction if we add the subtrahend and the difference.

C: $\begin{array}{r} 7608 \\ +\ 4271 \\ \hline 11879 \end{array}$

d) $4 \times \boxed{3827} = 15\,308$

e.g. What is multiplied by 4 to get 15 308?

We get the unknown factor of a product if we divide the product by the known factor.

C: $\begin{array}{r} 3827 \\ 4 \overline{)\ 15308} \end{array}$
3 1 2

Notes:

Whole class activity

Written on BB or SB or OHT

At a good pace

T helps with wording if necessary.

Revise the mathematical terms if required.

At a good pace

Reasoning, agreement, agreement, praising

Rest of class could check with a reverse operation or with a calculator.

Feedback for T

Bk4

Lesson Plan 116

Activity | ***Notes***

2

(Continued)

e) $630 \div \boxed{7} = 90$

C: $630 \div 90 = 63 \div 9 = \underline{7}$

e.g. What do we divide 630 by to get 90?

We get the unknown divisor if we divide the dividend by the quotient.

f) $\boxed{19\,287} \div 9 = 2143$

C:
$$\begin{array}{r} 2143 \\ \times 9 \\ \hline \underline{19287} \end{array}$$

e.g. What is divided by 9 to get 2143?

We get the unknown dividend if we multiply the quotient by the divisor.

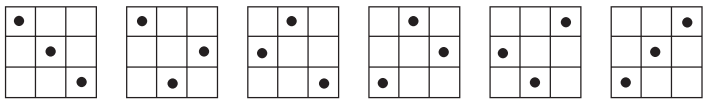
15 min

3

Problem

In how many different ways can you draw 3 dots on this 3×3 grid so that there is only 1 dot in each row, column and diagonal?

Ps come to BB to draw dots in different configurations. Agree that there are 6 possible ways. Who can explain why there are 6 ways?

BB: 

e.g. The first row can have a dot in any of 3 squares.

For each of the cases in the 1st row, the 2nd row can have a dot in either of 2 squares.

For each of the cases in the 2nd row, there is only one possible place for the dot in the 3rd row.

ie. there are $3 \times 2 \times 1 = \underline{6}$ possible ways**.**

Notes:

Whole class activity

Drawn on BB or use enlarged copy master or OHP

Or Ps have copies on desks or draw the grid in *Ex. Bks* for individual trials first

Reasoning, agreement, praising

T repeats reasoning in a clearer way if necessary.

20 min

4

Book 4, page 116

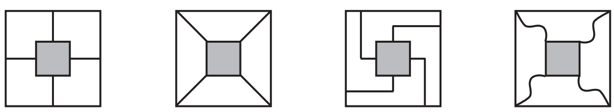
Q.1 Read: *The diagram shows the plan of a house in the middle of its garden.*

Divide up the garden into 4 congruent parts in different ways.

What does congruent mean? (the same size and shape)

Set a time limit. T chooses Ps come to BB to show their patterns (or T has some already prepared) Class checks that the parts are congruent. If disagreement, Ps could trace their patterns, cut out the parts and lay one on top of the other. If congruent, they should cover each other exactly.

e.g.

 etc.

Elicit that each part is 1 quarter of the garden (but <u>not</u> 1 quarter of the diagram).

Notes:

Individual work, monitored, helped

Drawn on BB or use enlarged copy master or OHP

Agreement, checking, praising

Deal with all cases.

Extra praise for creativity!

Agree that many ways are possible.

25 min

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Bk4

Lesson Plan 116

Activity		*Notes*

5

Book 4, page 116

Q.2 Read: *The perimeter of a triangle is 10 units. It has two equal sides. The length of each side is whole units. What is the length of each side?*

Ps can draw triangles and try out different lengths in *Ex. Bks*, then write the answer in *Pbs*. Set a time limit.

Review with whole class. **X**, what lengths did you answer? Who agrees? Who got a different answer? etc. Ps come to BB to explain their reasoning. Class agrees/disagrees.

Solution: e.g.

List 2 numbers the same + another number to make 10:

BB: ~~1, 1, 8~~, ~~2, 2, 6~~, 3, 3, 4 4, 4, 2, ~~5, 5, 0~~

then cross out those which cannot make a triangle, i.e. the sum of the two smallest sides must be more than the 3rd side.

Answer: The lengths of the sides can be 3 units, 3 units and 4 units; or 2 units, 4 units and 4 units.

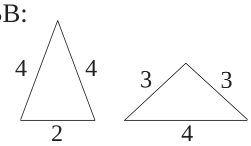
Notes:

Individual work, monitored, helped

Discussion, reasoning, agreement, praising

T could check lengths by drawing on BB with BB compasses and ruler.

BB:



30 min

6

Book 4, page 116

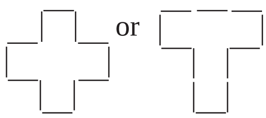
Q.3 Read: *The diagram shows a 5-unit shape made from 12 equal sticks. Make another shape from 12 equal sticks which has an area of 5 units.*

Ps have sticks or straws on desks to manipulate. They first make the shape in *Pbs* and agree that it has an area of 5 squares.

Now make another shape which uses all the sticks and also has an area of 5 squares. When you have found it, draw it in your *Pbs*.

Review at BB with whole class. P comes to BB to draw his/her shape and point to the 5 units. Class agrees/disagrees.

Solution:



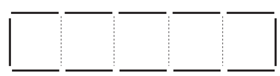
What can you say about the shapes? e.g. for LHS shape:

- It is symmetrical. Ps come to BB to draw lines of symmetry.
- It is a dodecagon (12-sided polygon, if corners are joined up)

Notes:

Individual work, monitored

Original diagram drawn on BB (or straws or sticks stuck on BB):



If no P has found it after a set time, T gives hints or shows it on BB. Ps make it on desks with sticks.

Discussion, demonstration, agreement, praising

and for RHS: e.g.

1 line of symmetry

octagon (8-sided polygon)

35 min

7

Book 4, page 116

Q.4 Read: *Draw 12 dots on a 6 by 6 grid so that there are exactly 2 dots in each row, column and diagonal.*

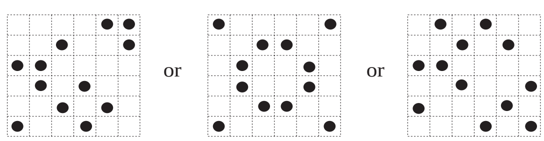
Less able Ps could have enlarged grids and counters on desks.

Set a time limit. As soon as a P finds a configuration he or she comes to BB to show it. Class checks that it meets the conditions.

Deal with all cases. Agree that many arrangements are possible.

Solution:

e.g.



etc.

Notes:

Individual work, monitored, (helped)

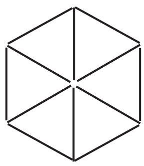
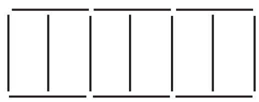
(Or whole class activity if time is short)

Grids drawn on BB or use enlarged copy master or OHP

Reasoning, agreement, (self-correction), praising

Which of the patterns are symmetrical?

40 min

Bk4		*Lesson Plan 116*
Activity		***Notes***
8	***Book 4, page 116*** Q.5 Read: *Six goblins live in 6 rooms, one goblin in each room. Make another plan of six congruent rooms but using 1 less stick.* Ps have sticks or straws on desks to manipulate. They first make the shape in *Pbs* and agree that the rooms are 6 congruent rectangles and are made with 13 sticks. Now make another plan which uses 12 sticks. Make sure that your rooms are congruent! When you have found it, draw it in your *Pbs*. (Ps use rulers.) Review with whole class. If a P has found a plan, he or she shows it on BB. Class check that there are 6 congruent rooms. If nobody has solved it, T gives a hint (e.g. think of triangles). *Solution:* 	Individual work, monitored Original diagram drawn on BB (or straws or sticks stuck on BB):  Discussion, demonstration, agreement, praising Or T could leave question open for Ps to try at home or in *Lesson 145*.
Extension	What can you say about the shape? e.g. • It is symmetrical. (It has line and rotational symmetry.) • It is a regular <u>hexagon</u>. • It contains 6 <u>equilateral</u> (equal-sided) triangles.	Whole class activity Agreement, praising

45 min

Bk4

R: Calculations

C: Collecting data. Tally charts and grouping

E: Different ways to display data

Lesson Plan 117

Activity		*Notes*

1

Factorisation

Let's factorise 145 and 146 and then list all their factors.

Ps come to BB or dictate to T, trying the prime numbers in turn as divisors. Class agrees/disagrees.

BB: $145 = 5 \times 29$; Factors: 1, 5, 29, 45

$146 = 2 \times 73$; Factors: 1, 2, 73, 146

What kind of numbers are they? (Both are nice numbers.)

Notes: Whole class activity

Reasoning, agreement, praising

Ps may use a calculator to check the divisors.

Feedback for T

5 min

2

Missing numbers

Let's fill in the missing numbers.

Ps come to the BB to say the equation as a word problem and explain how they will solve it. Then they do the calculation at the side of the BB, explaining reasoning in detail. Class points out errors.

BB:

a) $7.32 + \boxed{2.96} = 10.28$

C: $\begin{array}{r} 10.28 \\ -\ 7.32 \\ \hline 2.96 \\ \hline \end{array}$

e.g. How much is added to 7.32 to get 10.28?

We get the unknown term of a sum if we take away the known term from the sum.

b) $54.63 - \boxed{45.26} = 9.37$

C: $\begin{array}{r} 54.63 \\ -\ 9.37 \\ \hline 45.26 \\ \hline \end{array}$

e.g. How much is subtracted from 54.63 to get 9.37?

We get the unknown subtrahend if we subtract the difference from the reductant.

c) $\boxed{1266.3} - 452.6 = 813.7$

C: $\begin{array}{r} 813.7 \\ +\ 452.6 \\ \hline 1266.3 \\ \hline {\scriptstyle 1}\ \ \end{array}$

e.g. How much is 452.6 taken away from to get 813.7?

We get the reductant of a subtraction if we add the subtrahend and the difference.

d) $5 \times \boxed{£25.74} = £128.70$

C: $\begin{array}{r|l} & 25.74 \\ \hline 5 & 128.70 \\ & {\scriptstyle 2\ 3\ \ 2} \end{array}$

e.g. What amount is multiplied by 5 to get £128.70?

We get the unknown factor of a product if we divide the product by the known factor.

e) $£17.60 \div \boxed{2} = £8.80$

(Ps might notice that £8.80 is half of £17.60)

e.g. What do we divide £17.60 by to get £8.80?

We get the unknown divisor if we divide the dividend by the quotient.

f) $\boxed{£123.20} \div 8 = £15.40$

C: $\begin{array}{r} 15.40 \\ \times 8 \\ \hline 123.20 \\ \hline {\scriptstyle 4\ 3}\ \ \ \ \ \ \end{array}$

e.g. What amount is divided by 8 to get £15.40?

We get the unknown dividend if we multiply the quotient by the divisor.

Notes: Whole class activity

Written on BB or SB or OHT

At a good pace

T helps with wording if necessary.

Revise the mathematical terms if required.

At a good pace

Reasoning, agreement, checkingt, praising

Rest of class could check with a reverse operation or with a calculator.

Feedback for T

Or, e.g.

$17.60 \div 8.80 = 1760 \div 880$

$= 176 \div 88 = 16 \div 8 = \underline{2}$

f) Details of reasoning: e.g.

8 times 0 hundredths = $\underline{0}$h

8 times 4 tenths = 32t = 3U + $\underline{2}$t

8 times 5U = 40U ,

40U + 3U = 43U = 4T + $\underline{3}$U

8 times 1T = 8T,

8T + 4T = 12T = $\underline{1}$H + $\underline{2}$T

15 min

Bk4		*Lesson Plan 117*

Activity		***Notes***

3

Problem 1

Listen carefully and think about how you would solve this problem.

We have several coins.
When we arrange them in rows of 2, 3 or 4, 1 coin is always left over.
How many coins could we have?

Allow Ps a minute to think and discuss with neighbours if they wish.

Ps explain their ideas and findings to class. Who agrees? Who thinks something else? etc.

Elicit that the number of coins must be 1 more than a multiple of 2, 3 and 4 (or multiples of 12, as 12 is the first multiple of 2, 3, and 4).

BB:

Multiples of 2, 3 and 4: 12, 24, 36, 48, 60, 72, 84, 96, 108, . . .

Possible number of coins: 13, 25, 37, 49, 61, 73, 85, 97, 109, . . .

Notes:
Whole class activity

T repeats slowly to give Ps time to think and discuss.

Less able Ps could have counters on desks.

Discussion, reasoning, agreement, praising

Ps check the numbers by saying how many rows of 2, 3 and 4 coins there would be for each quantity of coins.

20 min

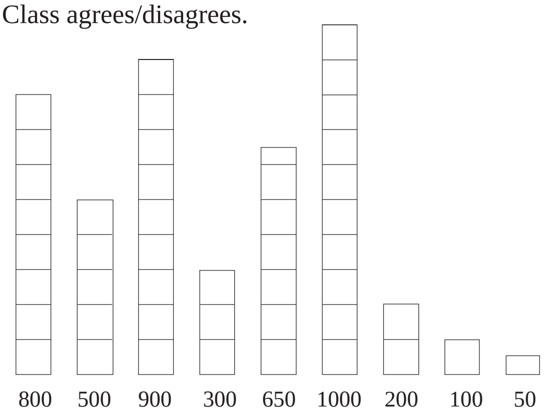
4

Problem 2

If a square means 100 units, what is the area of each of these rectangles?

Ps come to BB to count the squares and write the area below each column. Class agrees/disagrees.

BB:



Let's list the numbers in increasing order. Ps dictate to T.

BB: 50, 100, 200, 300, <u>500</u>, 650, 800, 900, 1000

Which is the middle number? P comes to BB to underline it.

Who remembers the name for the middle number in a set of data? (<u>median</u>) T tells it and writes on BB if nobody remembers.

Notes:
Whole class activity

Drawn on BB or use enlarged copy master or OHP

At a good pace

Agreement, praising

T chooses Ps at random or class shouts out in unison.

Agreement, praising

BB: <u>median</u>
middle value in a set of data

25 min

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Bk4

Lesson Plan 117

Activity | **Notes**

5

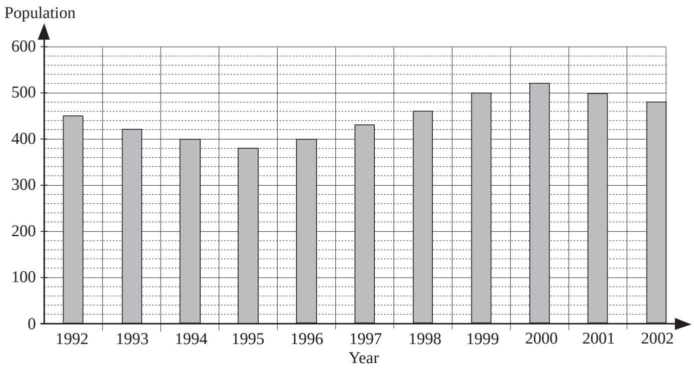
Book 4, page 117

Q.1 Read: *This graph shows how many people lived in Bananaville on the 1st of January in the years given.*

Individual work, monitored, helped

Drawn on BB or use enlarged copy master or OHP

BB:



Who can explain the graph? (the horizontal axis shows the years; the vertical axis shows the number of people and there is a grid line at every 20 people; the height of each shaded rectangle above a year shows how many people lived in *Bananaville* on the 1st of January that year.)

Initial discussion to clarify meaning of diagram.

a) Read: *Collect the data from the graph and write it in this table.*

Set a time limit. Review at BB with whole class. Ps come to BB to show the relevant rectangle in the graph and fill in the table. Class agrees/disagrees. Mistakes discussed/corrected.

Reasoning agreement, self-correction, praising

Makes sure that Ps have correct data in the table before they attempt the questions.

Solution:

Year	**1992**	**1993**	1994	1995	1996	1997	1998	1999	2000	2001	2002
Population	450	420	400	380	400	425	460	500	520	500	480

b) Ps read questions themselves and answer them in *Pbs.*

Review with whole class. Ps dictate results or show on scrap paper or slates on command. Ps answering correctly explain at BB to those who were wrong. Mistakes discussed/corrected.

Individual work, monitored, (helped)

Demonstration, agreement, self-correcting, praising

Solution:

i) *When was the population highest?* (2000)

ii) *When was the population 500?* (1999 and 2001)

iii) *When was the population increasing?* (1995 to 2000)

c) i) Read: *Write the population numbers in increasing order.*

Ps dictate to T who writes on BB. Ps also write in *Pbs*.

BB: 380, 400, 400, 420, 425, <u>450</u>, 460, 480, 500, 500, 520

Whole class activity

Agreement, praising

ii) Read: *Which number is the median (in the middle)?*

Ps shout out in unison. (450)

BB: <u>median</u>
the middle data

Which number is the most frequent? Elicit that 400 and 500 both occur twice. Who remembers what the most frequent value ina a set of data is called? (<u>mode</u>) T tells it if Ps have forgotten.

BB: <u>mode</u>
the most frequent data

32 min

Bk4		*Lesson Plan 117*

Activity		Notes

6

Book 4, page 117

Q.2 Read: *The table shows the number of pupils in the different years in a school.*

a) Show the data in the graph.

b) Write the pupil numbers in increasing order.

c) What is the median?

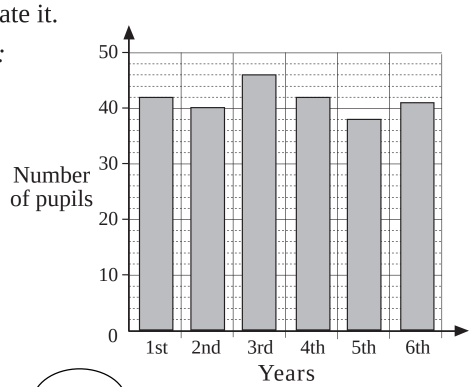
First make sure that Ps understand the table and graph. Set a time limit. Deal with one step at a time if necessary.

Review at BB with whole class. Ps come to BB to draw rectangles (bars) on the graph, then to write the data in order and underline the median. Class points out errors. Mistakes discussed and corrected.

Ps might have a problem with the median and point out that there is no single middle number. What should we do? (The median is half-way between the two numbers.) Ps suggest how to calculate it.

Solution:

a)



b) 38, 40, 41, 42, 42, 46

c) Median: (41 + 42) ÷ 2 = 83 ÷ 2 = <u>41.5</u>

Which number is the <u>mode</u>? (42)

Individual work, monitored, helped

Drawn on BB or use enlarged copy master or OHP

BB:

Year	1st	2nd	3rd	4th	5th	6th
No. of pupils	42	40	46	42	38	41

Discussion, reasoning, agreement, self-correction, praising

Extra praise if Ps remembered what to do without help.

(Rectangles can be wider and touch each other.)

Or $42 - 41 = 1$, $1 \div 2 = \frac{1}{2}$

Median: $41 + \frac{1}{2}$, or $42 - \frac{1}{2}$

Ps shout out in unison.

38 min

7

Cash and debt

T calls 5 Ps to front of class and gives them cards showing cash and debt. Each P in turn writes an operation on the BB to show their balance, explaining reasoning loudly and showing on class number line.

Lets' show the balances in a table. Each of the 5 Ps complete their column. Class agrees/disagrees.

BB: e.g.

Children	A	B	C	D	E
Balance (£)	+ 3	– 3	0	+ 4	– 2

Let's show it as a bar graph. T has axes already prepared and Ps come to BB or OHP to draw and colour the bars. Class agrees/disagrees.

Let's put the balances in increasing order. Ps come to BB or dictate to T.

BB: – 3, – 2, <u>0</u>, + 3, + 4

What is the <u>median</u>? (0) What is the <u>mode</u>? (There isn't one.)

What is the difference between the smallest and greatest balances? (£7) This is called the <u>range</u> of the data. Show it on the graph.

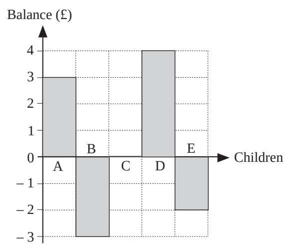
Whole class activity

Drawn on BB or use enlarged copy master or OHP

e.g. A: £5 + – £2 = £3
B: – £5 + £2 = – £3
C: £3 + – £3 = £0
D: £10 + – £6 = £4
E: – £7 + £5 = – £2

Reasoning, agreement, praising

BB:



45 min

Bk4	R: Calculations **C: Collecting and displaying data** *E: Different graphs. Problems*	*Lesson Plan 118*

Activity		***Notes***
1	**Factorising** Factorise 147 in your *Ex. Bk*s and then list all its factors. Review with whole class. Ps come to BB or dictate to T, explaining reasoning (e.g. 3 is a factor of 147 because 1 + 4 + 7 = 12, which is a mulitple of 3). Class agrees/disagrees. Mistakes corrected. BB: $147 = 3 \times 7 \times 7$ 147 → 3, 49; 49 → 7, 7 Factors: 1, 3, 7, 21, 49, 147 *4 min*	Individual work, monitored Discussion, reasoning, agreement, self-correction, praising (Ps may use a calculator.) Feedback for T
2	**Problem** Listen carefully and think about how you would solve this problem. *We have between 100 and 200 marbles.* *When we arrange them in rows of 2, 3, 4 or 5, one marble is always left over. How many marbles could we have?* Allow Ps a minute to think and discuss with neighbours if they wish. Ps explain their ideas and findings to the class. Who agrees? Who thinks something else? etc. Elicit that the number of marbles must be 1 more than a multiple of 2, 3, 4 and 5 (or a multiple of 60, as 60 is the first multiple of 2, 3, 4 and 5). BB: Multiples of 2, 3, 4 and 5: 60, 120, 180, 240, 300, . . . So possible numbers of marbles are: 61, 121, 181, 241, 301, . . . but the only numbers between 100 and 200 are 121 and 181. *Answer*: We could have 121 or 181 marbles *10 min*	Whole class activity T repeats slowly to give Ps time to note down the data. Discussion, reasoning, agreement, praising Ps check the two numbers by saying how many rows of 2, 3, 4, 5 marbles there would be.
3	**Missing numbers** Let's complete the operations. Ps come to BB to say the operation in words, explain what they have to do to solve it and then do the calculation. Class checks mentally that they are correct. BB: a) $\frac{2}{5} + \boxed{\frac{4}{5}} = \frac{6}{5}$ $\left(\frac{6}{5} - \frac{2}{5} = \frac{4}{5}\right)$ b) $3\frac{1}{4} - \boxed{\frac{3}{4}} = 2\frac{1}{2}$ $\left(3\frac{1}{4} - 2\frac{1}{2} = 1\frac{1}{4} - \frac{1}{2} = \frac{3}{4}\right)$ c) $\boxed{4} - 1\frac{1}{6} = 2\frac{5}{6}$ $\left(2\frac{5}{6} + 1\frac{1}{6} = 3 + \frac{6}{6} = 4\right)$ d) $\frac{3}{8} \times \boxed{3} = 1\frac{1}{8}$ $\left(\frac{9}{8} \div \frac{3}{8} = 3\right)$ How many 3 eighths are in 9 eighths? e) $\frac{5}{7} \div \boxed{5} = \frac{1}{7}$ (How many $\frac{1}{7}$ are in $\frac{5}{7}$?) f) $\boxed{2\frac{2}{3}} \div 4 = \frac{2}{3}$ $\left(\frac{2}{3} \times 4 = \frac{2}{3} + \frac{2}{3} + \frac{2}{3} + \frac{2}{3} = \frac{8}{3} = 2\frac{2}{3}\right)$ *18 min*	Whole class activity Written on BB or SB or OHT e.g. Ps: a) 'What must be added to 2 fifths to get 6 fifths?' 'To find the missing term in an addition, subtract the known term from the sum.' T helps with wording when necessary. At a good pace Reasoning, agreement, praising

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Bk4

Lesson Plan 118

Activity		*Notes*
4	**Displaying data.** T has various graphs copied from books, magazines or newspapers and enlarged (e.g. pie charts, tally charts, histograms, bar charts, pictograms, line graphs, etc.). Ps come to BB to explain the meaning of each graph and to ask and answer questions about the data shown. Class agrees/disagrees. T could have some questions already prepared, in case Ps cannot think of any. *24 min*	Whole class activity Stuck (or drawn) on BB (Or Ps could have been asked to collect them.) Discussion led by T. Involve as many Ps as possible.
5	**Median** T has sets of numbers written on BB or SB or OHT. Which number is in the middle of the set? What is it called? (the <u>median</u>) Ps come to BB circle the median, explaining reasoning. Class agrees/ disagrees. T helps in sets with even numbers if necessary. What do you notice about any of the sets? e.g. BB a) 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 (increasing by 1) b) 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24 (positive even nos.) ↓ 13 [(12 + 14) ÷ 2 = 26 ÷ 2 = <u>13</u>] c) 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37 (prime numbers) d) 1, 4, 9, 16, 25, 36, 49, 64, 81, 100 (square numbers) ↓ 30.5 [(25 + 36) ÷ 2 = 61 ÷ 2 = <u>30.5</u>] e) – 11, – 9, – 7, – 5, – 3, – 1, 1, 3, 5, 7, 9 (increasing by 2) *30 min*	Whole class activity BB: <u>median</u> middle data At a good pace Reasoning, agreement, praising Extra praise if Ps remember what to do with an even number of data without T's help or 36 – 25 = 11, 11 ÷ 2 = 5.5 Median: 25 + 5.5 = 30.5, or 36 – 5.5 = 30.5 Feedback for T
6	***Book 4, page 118*** Q.1 Read *This graph shows the highest point of some mountain ranges and the deepest point of some seas.* T has a large map of the world beside the BB. Which of the mountains or seas have you heard of? Where is it on this map? Which country is it in (near)? Who has been there? etc. Ps tell of those they know and show them on the map. T points out any that Ps have not heard of. Read: *Read the graph and fill in the approximate missing values.* Who can explain what the graph means? (The horizontal axis shows the mountains or seas, represented by triangles; the vertical axis shows the height in metres, with a grid line at every 1000 m) Ps come to BB to read the data from the graph and fill in the missing numbers. T helps with closer approximation if Ps' reading is too rough. Ps fill in agreed heights in *Pbs* too. Ps read questions themselves and answer in *Pbs*. Set a time limit. Review with whole class. Ps dictate answers to T and confirm on the graph. Mistakes discussed and corrected.	Whole class discussion to start If possible, Ps have copies of world map on desks too. T has brief information prepared for the mountains and seas in case Ps know nothing about them. Whole class activity Graph drawn on BB or use enlarged copy master or OHP Discussion, reasoning, agreement, praising Individual work, monitored, helped Reasoning, agreement, self-correcting, praising

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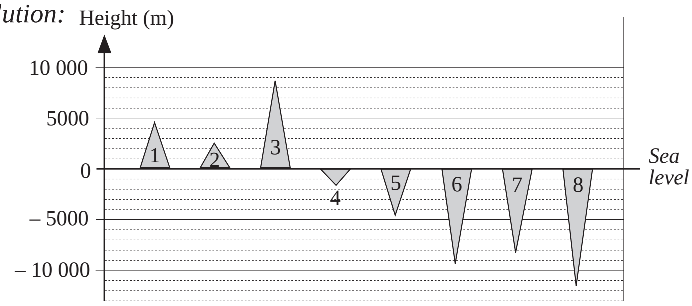
Bk4

Lesson Plan 118

Activity		*Notes*

6 (Continued)

Solution:



1. Alps	≈	4800	m		5. Mediterrean Sea	≈	– 4600	m
2. Carpathians	≈	2600	m		6. Atlantic Ocean	≈	– 9300	m
3. Himalayas	≈	8900	m		7. Indian Ocean	≈	– 8100	m
4. Adriatic Sea	≈	– 1600	m		8. Pacific Ocean	≈	– 11 600	m

(Or accept approximations to the nearest 500 or 1000)

a) *Which is higher, the Alps or the Carpathian Mountains?* (Alps)

How much higher? BB: $\underbrace{4800 \text{ m} > 2600 \text{ m}}_{2200 \text{ m}}$

(Or Ps could show results on scrap paper or slates in unison on command.)

b) *Which sea is deeper, the Mediterranean or the Adriatic?* (Med.)

How much deeper? BB: $\underbrace{-4600 \text{ m} < -1600}_{3000 \text{ m}}$

c) *What is the difference between the highest mountain and the deepest sea?*

BB: 8900 m – (– 11 600 m) = 8900 m + 11 600 m = <u>20 500 m</u>

Elicit that this is the <u>range</u> of the data. Show on the vertical axis.

BB:
$$\begin{array}{rl} 11600 & (-11600 \text{ to } 0) \\ +\ 8900 & (0 \text{ to } 8900) \\ \hline 20500 & \end{array}$$

38 min

7 ***Book 4, page 118***

Q.2 Read: *How many acorns did the Squirrel family collect each day? Complete the diagram.*

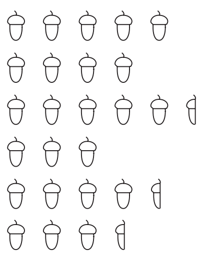
Tell (elicit) that data shown in the form of pictures is called a <u>pictogram</u>. What does half an acorn represent? (75 acorns)

Set a time limit. Ps write operations horizontally in *Pbs.*

Review at BB with whole class. Ps come to write on BB or dictate to T, explaining reasoning. Mistakes discussed/corrected.

Solution:

(acorn) = 150 acorns



Day	Calculation	Total
Monday:	5 × 150 = 500 + 250 =	750
Tuesday:	4 × 150 = 400 + 200 =	600
Wednesday:	5 × 150 + 75 = 750 + 75 =	825
Thursday:	3 × 150 = 300 + 150 =	450
Friday:	4 × 150 + 75 = 600 + 75 =	675
Saturday:	3 × 150 + 75 = 450 + 75 =	525
Sunday:		0

Read: *How many acorns did they collect altogether?*

Ps add up the columns and show result on command. (3825)

Individual work, monitored, helped

Drawn on BB or use enlarged copy master or OHP

BB: <u>Pictogram</u>
data as pictures

(Or Ps do can necessary calculations in *Ex. Bks.)*

Reasoning, agreement, self-correction, praising

BB:
$$\begin{array}{r} 750 \\ 600 \\ 825 \\ 450 \\ 675 \\ +\ 525 \\ \hline 3825 \\ {\scriptstyle 2\ 1} \end{array}$$

Extension

What is the mode? (none)

What is the median? (600)

What is the range? (825)

45 min

Bk4

R: Calculations

C: Collecting and displaying data

E: Problems. Grouping by 2, 3, 4, 5 and 10

Lesson Plan 119

Activity		***Notes***

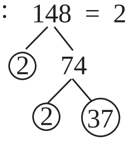
1

Factorising

Factorise 148 in your *Ex. Bk*s and then list <u>all</u> its factors.

Review with whole class. Ps come to BB to draw a factor tree and explain their reasoning. Class agrees/disagrees. Mistakes corrected.

BB: $148 = 2\times 2\times 37$



Factors: 1, 2, 4, 37, 74, 148

4 min

Notes: Individual work, monitored

Discussion, reasoning, agreement, self-correction, praising

(Ps may use a calculator.)

Feedback for T

2

Counting in different bases

Ps have 17 counters (or coins or cubes, etc.) on desks and T has 17 circles stuck on BB at random.

a) Let's put the counters in groups of 2.
Elicit that there are 8 groups of 2, and 1 single unit left over.

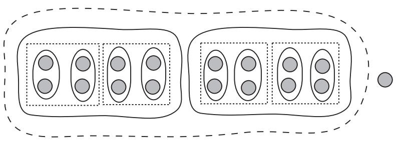
Now let's put the groups of 2 in twos. (i.e. $2 \times 2 = \underline{4}$ per group)
Elicit that there are 4 groups of 4, no groups of 2, and 1 left over.

Now let's put the groups of 4 in twos. (i.e. $2 \times 2 \times 2 = \underline{8}$ per group)
Elicit that there are now 2 groups of 8, no groups of 4, no groups of 2, and 1 left over.

If we continue in this way, what will the next grouping be?
(Put the 8-element groups in twos.) i.e. $2 \times 2 \times 2 \times 2 = \underline{16}$ per group) Elicit that there is now 1 group of 16, no groups of 8, no groups of 4, no groups of 2, and 1 left over.

Let's show in a table how we can make 17 using 2 as a base for counting. T draws table and Ps dictate the headings and place-values.

BB:



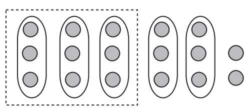
Base 2

32	16	8	4	2	1
–	1	0	0	0	1

$17 = 1\times 16 + 1\times 1$

b) Let's group the 17 counters using 3 as the base. Ps manipulate counters on desks then dictate to T or come to BB.

BB:



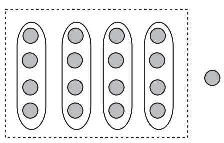
Base 3

27	9	3	1
–	1	2	2

$17 = 1\times 9 + 2\times 3 + 2\times 1$

c) Let's group them using 4 as the base.

BB:

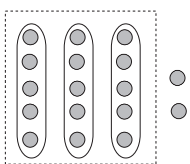


Base 4

16	4	1
1	0	1

$17 = 1\times 16 + 1\times 1$

d) Let's group them using 5 as the base.



Base 5

25	5	1
–	3	2

$17 = 3\times 5 + 2\times 1$

Notes: Whole class activity but individual (or paired) manipulation of groups

Ps manipulate counters on desks and surround the groups with different coloured string or wool (or arrange counters on sheets of paper and draw around the groups)

T groups (or draws) counters on BB, using coloured lines to show the different groupings.

Discussion, agreement, praising

Ps draw tables in *Ex. Bks* too.

Ask Ps to explain the headings for each table. e.g.

<u>Base 3</u>

$3 \times \underline{1} = \underline{3}$, $3 \times 3 = \underline{9}$,
$3 \times 9 = \underline{27}$, . . .

<u>Base 4</u>

$4 \times \underline{1} = \underline{4}$, $4 \times 4 = \underline{16}$,
$4 \times 16 = \underline{64}$, . . .

<u>Base 5</u>

$5 \times \underline{1} = \underline{5}$, $5 \times 5 = \underline{25}$,
$5 \times 25 = \underline{125}$, . . .

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Bk4

Lesson Plan 119

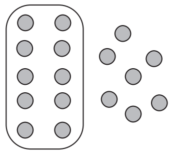
Activity		*Notes*

2

(Continued)

e) Let's group them using 10 as the base.

BB:



Base 10

100	10	1
–	1	7

$17 = 1\times 10 + 7\times 1$

Of course, this is the base that we usually use in counting!

Notes:

Base 5

$10 \times \underline{1} = \underline{10}$,

$10 \times 10 = \underline{100}$,

$10 \times 100 = \underline{1000}$,

. . .

[Preparation for studying the number system]

15 min

3

Missing numbers

Let's complete the operations. Ps come to BB to explain the operation in words and fill in the missing number either by counting on the class number line or by calculation. Class agrees/disagrees.

BB:

a) $5 + \boxed{-9} = -4$

(by counting 9 to the left from 5)

b) $4 - \boxed{7} = -3$

(by counting 7 to the left from 4)

c) $\boxed{2} - (-3) = 5$

$[5 + (-3) = 5 - 3 = \underline{2}]$

d) $-5 \times \boxed{4} = -20$

$[(-5) + (-5) + (-5) + (-5) = -20]$

e) $-14 \div \boxed{7} = -2$

[by guessing, or $(-2) + (-2) + (-2) + (-2) + (-2) + (-2) + (-2) = -14$]

f) $\boxed{-12} \div 3 = -4$

[by guessing, or $(-4) \times 3 = (-4) + (-4) + (-4) = -12$]

Notes:

Whole class activity

Written on BB or SB or OHT

T helps where necessary but give Ps time to reason in their own way, with help of class, if they can.

Demonstrate each operation on the class number line.

Elicit that:

- adding a '+' number or subtracting a ' –' number means moving to the <u>right;</u>
- subtracting a '+' number or adding a '–' number means moving to the <u>left.</u>

Agreement, praising

20 min

4

Problem

Listen carefully and think about how you would solve this problem.

We have several coins.

When we arrange them in rows of 2, 1 coin is left over.
When we arrange them in rows of 3, 2 coins are left over.
When we arrange them in rows of 4, 3 coins are left over.

How many coins could we have?

Allow Ps a minute to think and discuss with neighbours if they wish.

Ps explain their ideas and findings to the class. Who agrees? Who thinks something else? etc.

Elicit that the number must be odd (1 more than a mulitple of 2), 2 more than an odd multiple of 3, and 3 more than a multiple of 4.

BB: e.g.

Possible multiples of 3:	3, 9, 15, 21, 27, 33, 39, 45, 51, . . .
Add on 2 more:	5, 11, 17, 23, 29, 35, 41, 47, 53, . . .
	↑ ↑ ↑ ↑
Subtract 3 and underline the multiples of 4:	2, <u>8</u>, 14, <u>20</u>, 26, <u>32</u>, 38, <u>44</u>, 50, . . .

What do you notice? (The possible numbers form a sequence, starting at 11 and increasing by 12.)

Answer: We could have 11, 23, 35, 47, 59, . . . coins.

Notes:

Whole class activity

Ps note data in *Ex. Bks.*

Ps could have counters on desks to help them.

Discussion, reasoning, agreement, checking

Praise all positive contributions.

If Ps have no good ideas, T gives hints and leads Ps through the solution shown opposite.

25 min

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Bk4

Lesson Plan 119

Activity		Notes

5

Book 4, page 119

Q.1 a) Read: *Group the elements by 3. Make groups of 3 by circling in red.*

Then circle every 3 red groups in green.
Then circle every 3 green groups in blue.

Write the number of different groups and the remainder in the table.

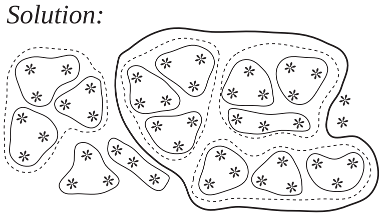
Liken the task to the earlier class activity about counting in different bases. Make sure that Ps realise that it is the final grouping which should be described in the table.

Set a time limit. Ps finished first come to BB to draw the groups (or T has solution already prepared).

Review with whole class. Ps come to BB or dictate to T, explaining reasoning. Class agrees/disagrees. Mistakes discussed and corrected.

How many stars are there altogether? (44)

Solution:



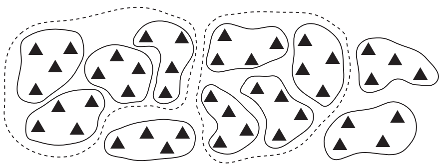
Number in each group	27	9	3	1
Number of groups	1	1	2	2

b) Read: *Group the elements by 4 in a similar way.*
Fill in the table.

As in a). If class is very able, review a) and b) together.

How many triangles are there? (44)

Solution:



Number in each group	16	4	1
Number of groups	2	3	0

Notes:

Individual work, monitored, helped

Drawn (stuck) on BB or use enlarged copy master or OHP

Allow Ps to explain tas k if possible.

Reasoning, agreement, self-correction, praising

BB:
$1 \times 27 + 1 \times 9 + 2 \times 3 + 2 \times 1$
$= 27 + 9 + 6 + 2 = \underline{44}$

Reasoning, agreement, self-correction, praising

BB:
$2 \times 16 + 3 \times 4 = 32 + 12 = \underline{44}$

[Preparation for studying the number system]

31 min

6

Book 4, page 119

Q.2 Read: *The tally chart shows the months in which 37 pupils in a class were born.*

Let's see if you can do questions a) to d) on your own.
Set a time limit. (Or deal with one part at a time if class is unsure and review before next step.)

Review at BB with whole class. Ps come to BB or dictate to T (or T could have the graph already prepared). Class agrees/ disagrees. Mistakes discussed and corrected.

Solution:

a) *Write the number of pupils in the bottom row of the table.*

Number born in each month

<table>
<tr><td>Jan</td><td>Feb</td><td>Mar</td><td>Apr</td><td>May</td><td>Jun</td><td>Jul</td><td>Aug</td><td>Sep</td><td>Oct</td><td>Nov</td><td>Dec</td></tr>
<tr><td>||</td><td>|||</td><td>|||</td><td></td><td>||||</td><td>|</td><td>𝍸 |</td><td>|||</td><td>𝍸</td><td>|||</td><td>||||</td><td>|||</td></tr>
<tr><td>2</td><td>3</td><td>3</td><td>0</td><td>4</td><td>1</td><td>6</td><td>3</td><td>5</td><td>3</td><td>4</td><td>3</td></tr>
</table>

Notes:

Individual work, monitored, helped for parts a) to d)

Table drawn on BB or use enlarged copy master or OHP

Discussion, reasoning, agreement, self-correction, praising

(or activity done with real data collected from Ps in class and Ps' form own class tally chart and graph)

Bk4

Lesson Plan 119

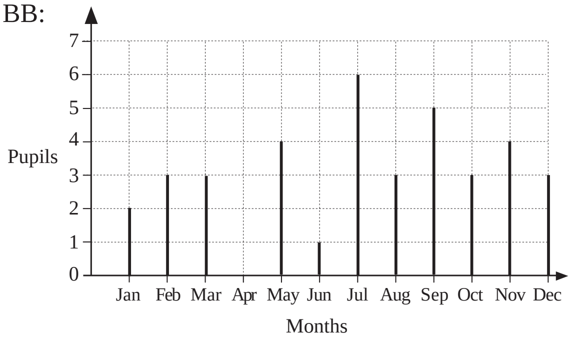
Activity | ***Notes***

6

(Continued)

b) Draw a graph about the table.

BB:



Accept thick lines as here or shaded columns centred on the ticks for each month.

c) Put the data in order.

BB: 0, 1, 2, 3, 3, 3, 3, 3, 4, 4, 5, 6

d) Which are the middle data? (3 and 3)

What is the <u>median</u>? (3 + 3) ÷ 2 = <u>3</u>

e) Read: T*hink of another 37 people, Would this statement about them be certain, possible or impossible?*

At least 4 people were born in the same month.

T asks several Ps what they think and why. Class decides on correct answer. [Certain]

Reasoning: e.g.

Among 36 people, at least 3 must be born in the same month, as there are only 12 different months. So the 37th person must make 4 people born in one of the months.

Whole class activity

(Or Ps could show their responses on scrap paper or slates on command and T chooses Ps for each response to explain their reasoning.)

Discussion, reasoning, agreement, praising

37 min

7

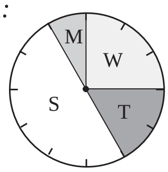
Book 4, page 119

Q.3 Read: *60 pupils were given a choice of 4 activities. How many pupils chose each one and what fraction of them chose it? Use the pie chart to complete the table.*

How many equal parts has the pie chart been divided into? (12) Work out the fraction first, then calculate the number of Ps for each activity. Set a time limit.

Review with whole class. Ps come to BB to complete table, explaining their reasoning by referring to the pie chart. Class agrees/disagrees. Mistakes discussed and corrected.

Solution:



	M	S	T	W
No. of pupils	5	30	10	15
Fraction	$\frac{1}{12}$	$\frac{1}{2}$	$\frac{1}{6}$	$\frac{1}{4}$

Individual work, monitored, helped

Drawn on BB or use enlarged copy master or OHP

Discussion reasoning, agreement, self-correction, praising

How can we check our data?

(The numbers should add up to 60 and the fractions should add up to 1.)

BB: 5 + 30 + 20 + 15 = 60 ✔

$$\frac{1}{12} + \frac{6}{12} + \frac{2}{12} + \frac{3}{12} = \frac{12}{12}$$ ✔

41 min

8

Real data

T chooses 12 (or 18) Ps to say, e.g. which fruit they prefer (or Ps could choose the subject). Ps come to BB to make a tally above each column in the table, fill in the numbers and fractions and complete the pie chart.

Class (T) helps and corrects when necessary.

Whole class activity

Drawn on BB or use enlarged copy master or OHP

Reasoning, agreement, praising In good humour!

45 min

Bk4

R: Calculations

C: Collecting and displaying data

E: Problems

Lesson Plan 120

Activity | *Notes*

1

Factorising

Let's factorise 149 and list all its factors.

Ps try out the prime numbers 2, 3, 5, 7, 11 as divisors and dictate their findings. e.g.

- 2 is not a factor because 149 is odd;
- 3 is not a factor because 1 + 4 + 9 = 14, which is not a factor of 3;
- 5 is not a factor because the units digit is not 0 or 5;
- 7 is not a factor because 149 ÷ 7 = 21, r 2
- 11 is not a factor because 149 ÷ 11 = 13, r 6

What is the next prime number? (13) Should we try 13? (No, as 13 × 13 = 169, which is more than 149.)

So 149 is a prime number and has factors 1 and 149,

4 min

Notes:

Whole class activity

At a good pace

Reasoning, agreement, checking, praising

Ps do not really need a calculator but allow them to use one if they wish.

2

Numberlands

Alfie, Jack, Cindy and Sammy live in different numberlands and count using different base numbers. Alfie lives in *Tenland* and counts in groups of 10, Jacky lives in *Twoland* and counts in groups of 2. Cindy lives in *Threeland* and counts in groups of 3. Sammy lives in *Sevenland* and counts in groups of 7.

How would they each count 149 marbles? Let's help them complete their tables. Ps come to BB to choose a base number, work out the table headings and divide up 149 into the appropriate groups. Class agrees/ disagrees. T directs Ps in using a systematic method.

BB: e.g. Starting at LH side of table:

Base 10

Alfie

100	10	1
1	4	9

149 ÷ 100 = $\boxed{1}$ r 49

49 ÷ 10 = $\boxed{4}$ r 9

9 ÷ 1 = $\boxed{9}$

Check: 1 × 100 + 4 × 10 + 9 × 1 = 149 ✔

Base 2

Jacky

128	64	32	16	8	4	2	1
1	0	0	1	0	1	0	1

149 ÷ 128 = $\boxed{1}$ r 21

21 ÷ 64 = $\boxed{0}$ r 21

21 ÷ 32 = $\boxed{0}$ r 21

21 ÷ 16 = $\boxed{1}$ r 5

5 ÷ 8 = $\boxed{0}$ r 5

5 ÷ 4 = $\boxed{1}$ r 1

1 ÷ 2 = $\boxed{0}$ r 1

1 ÷ 1 = $\boxed{1}$

Check: 1 × 128 + 1 × 16 + 1 × 4 + 1 × 1 = 149 ✔

Base 3

Cindy

81	27	9	3	1
1	2	1	1	2

149 ÷ 81 = $\boxed{1}$ r 68

68 ÷ 27 = $\boxed{2}$ r 14

14 ÷ 9 = $\boxed{1}$ r 5

5 ÷ 3 = $\boxed{1}$ r 2

2 ÷ 1 = $\boxed{2}$

Check: 1 × 81 + 2 × 27 + 1 × 9 + 1 × 3 + 2 × 1 = 149 ✔

Base 7

Sammy

49	7	1
3	0	2

149 ÷ 49 = $\boxed{3}$ r 2

2 ÷ 7 = $\boxed{0}$ r 2

2 ÷ 1 = $\boxed{2}$

Check: 3 × 49 + 0 × 7 + 2 × 1 = 149 ✔

18 min

Notes:

Whole class activity

Deal with one at a time and gradually build up the tables and the divisions.

T suggests the method if Ps do not think of it.

At a good pace

Reasoning, agreement, correcting, praising

Or starting at RHS of table:

A: 149 ÷ 10 = 14, r 9
14 ÷ 10 = 1, r 4
1 ÷ 10 = 0, r 1

J: 149 ÷ 2 = 74, r 1
74 ÷ 2 = 37, r 0
37 ÷ 2 = 18, r 1
18 ÷ 2 = 9, r 0
9 ÷ 2 = 4, r 1
4 ÷ 2 = 2, r 0
2 ÷ 2 = 1, r 0
1 ÷ 2 = 0, r 1

etc.

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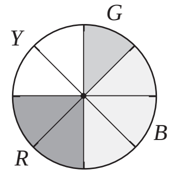
Bk4		*Lesson Plan 120*
Activity		***Notes***
3	**Inequalities** What whole numbers could the rectangles represent in these inequalities? Ps come to BB to fill in the possible numbers, explaining reasoning. Calculations can be done at side of BB. Class agrees/disagrees and checks that the numbers make the inequalities true. BB: a) $687 + \square < 1425$ $\square < 1425 - 687$ $\square < 738$ $\square$: 737, 736, 735, . . . b) $7200 - \square \geq 1500$ $\square \leq 7200 - 1500$ $\square \leq 5700$ $\square$: 5700, 5699, 5698, . . . c) $\square - 400 > 630$ $\square > 400 + 630$ $\square > 1030$ $\square$: 1031, 1032, . . . d) $7 \times \square < 3500$ $\square < 3500 \div 7$ $\square < 500$ $\square$: 499, 498, 497, . . . e) $250 \div \square \geq 25$ $\square \leq 250 \div 25$ $\square \leq 10$ $\square$: 10, 9, 8, . . . f) $\square \div 3 > 22$ $\square > 22 \times 3$ $\square > 66$ $\square$: 67, 68, 69, . . . *24 min*	Whole class activity Written on BB or SB or OHT At a good pace In difficult inequalities, advise Ps to think of the inequality sign as an '='sign, do the appropriate calculation and then decide from the result which way the inequality sign should be pointing. Reasoning agreement, checking, praising Feedback for T
4	***Book 4, page 120*** Q.1 Read: *Four children, 1 eighth of the class, have a green school bag and 3 eighths of the class have a blue bag. Eight children have a red bag and the rest have yellow bags.* *Colour the pie chart to show the data. Complete the table.* Set a time limit. Review with whole class. Ps come to BB to colour pie chart and fill in numbers and fractions, explaining reasoning. Class agrees/disagrees. Mistakes discussed and corrected. *Solution:*  Extra praise for Ps who notice that $\frac{2}{8} = \frac{1}{4}$ *30 min*	Individual work, monitored, helped Drawn on BB or use enlarged copy master or OHP Reasoning, agreement, self-correction, praising BB: $\frac{1}{8} \rightarrow 4$ $\frac{3}{8} \rightarrow 4 \times 3 = 12$, etc. Totals: $\frac{8}{8} \rightarrow 4 \times 8 = \underline{32}$ or $4 + 12 + 8 + 8 = \underline{32}$ $\frac{1}{8} + \frac{3}{8} + \frac{2}{8} + \frac{2}{8} = \frac{8}{8} = 1$

Colour of bag	*Green*	*Blue*	*Red*	*Yellow*	**Total**
No. of pupils	4	12	8	8	32
Fraction	$\frac{1}{8}$	$\frac{3}{8}$	$\frac{2}{8}$	$\frac{2}{8}$	$\frac{8}{8}$

Bk4

Lesson Plan 120

Activity | **Notes**

5

Book 4, page 120

Q.2 Read: *A chain of supermarkets made a pictogram of how many pies they had sold in a year.*

Each pie on the diagram means 1000 real pies.

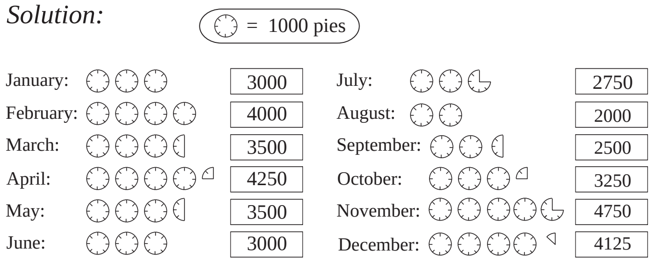
Who can explain the pictogram? (The number of whole pies tells you how many thousands of real pies that they sold; the pies are divided into 8 equal segments, so each part means 1 eighth of 1000; half a pie means 500 real pies, 1 quarter of a pie means 250 real pies and 3 quarters of a pie means 750 real pies.)

Notes: Whole class discussion to start. Drawn (stuck) on BB or use enlarged copy master or OHP. Clarification of meaning of pictogram to start. Involve several Ps. Agreement, praising

a) Read: *Fill in the missing numbers and draw pies to show the numbers given.*

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 before doing other questions.

Solution:



Notes: Individual work, monitored, helped. Drawings need only be rough. Necessary calculations can be done on scrap paper or slates or in *Ex. Bks.*

BB: e.g.

$1000 \div 8 = 800 \div 8 + 160 \div 8 + 40 \div 8 = 100 + 20 + 5 = \underline{125}$

or $250 \div 2 = \underline{125}$

Ps read questions b) to d) themselves and write answers in *Pbs*.

Review with whole class. Ps come to BB or dictate to T, explaining reasoning, or Ps could show results on scrap paper or slates for c) and d). Mistakes discussed and corrected.

Notes: Individual wok, monitored, d) helped. Reasoning, agreement, self-correction, praising

Solution:

b) *Write the data in increasing order.*

BB: 2000, 2500, 2750, 3000, 3000, <u>3250</u>, <u>3500</u>, 3500, 4000, 4125, 4250, 4750

c) *What is the difference between the first and last numbers?*

BB: $4750 - 2000 = \underline{2750}$

Elicit that this is called the <u>range</u> of the data.

d) *Underline the two middle numbers. Which number is half-way between them? This is the <u>median</u>.*

BB: Median: $(3250 + 3500) \div 2 = 6750 \div 2 = \underline{3375}$

or $(3500 - 3250) \div 2 = 250 \div 2 = 125$,

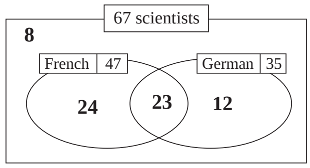
$3250 + 125 = \underline{3375}$ or $3500 - 125 = \underline{3375}$

Notes: (If no Ps used the 2nd method, T could show it and explain by drawing on BB the relevant segment of the number line.) Which way do you think is easiest? Why?

36 min

Bk4

Lesson Plan 120

Activity		*Notes*
6	***Book 4, page 120, Q.3*** Read: *67 scientists are at a conference.* *47 speak French, 35 speak German and 23 speak both languages.* *How many of them speak neither French nor German?* *Complete the Venn diagram.* Who has an idea of what we should do? Who agrees? Who thinks something else? etc. Ps come to BB to explain their reasoning and write calculations. T gives hints only if Ps are stuck. *Solution:* French: 47; German: 35; French + German: <u>23</u> so number speaking: French but not German: 47 – 23 = <u>24</u> German but not French: 35 – 23 = <u>12</u> Number speaking German <u>or</u> French: 23 + 24 + 12 = 59, so number <u>not</u> speaking German or French: 67 – 59 = <u>8</u>	Whole class activity (or individual or paired trial first if Ps wish) Drawn on BB or use enlarged copy master or OHP. Discussion, reasoning, agreement, praising BB: 
	41 min	
7	***Book 4, page 120*** Q.4 Read: *How many dictionaries would be needed to translate among these languages: English, German, French, Spanish?* Allow Ps to try it in *Ex. Bks*. for a couple of minutes. If Ps are struggling, T could give a hint about drawing tree diagrams. If you found an answer, show me . . .now! (12) P answering correctly explains reasoning. Some Ps might answer 6, forgetting that, e.g. E $\rightarrow$ G is not the same as G $\rightarrow$ E *Solution:* $E \begin{cases} F \\ G \\ S \end{cases} \quad F \begin{cases} E \\ G \\ S \end{cases} \quad G \begin{cases} E \\ F \\ S \end{cases} \quad S \begin{cases} E \\ F \\ G \end{cases} \qquad 4 \times 3 = \underline{12}$ *Answer:* 12 dictionaries would be needed.	Individual work, monitored, helped (T could have some such dictionaries to show to class.) In unison on scrap paper or slates Discussion, reasoning, agreement, self-correction, praising Or by reasoning: Each of the 4 languages would need a dictionary for each of the other 3 languages.
	45 min	

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Bk4	R: Calculations **C: Data and graphs** *E: Problems*	*Lesson Plan 121*

Activity | *Notes*

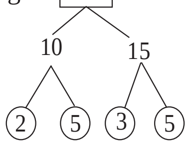
1

Factorising

In your *Ex. Bks*, factorise 150 and 151 and then list all their factors.

Review at BB with whole class. Ps come to BB to draw tree diagram, show the numbers as the product of their prime factors, and list all their factors. Class agrees/disagrees. Mistakes discussed and corrected.

BB: e.g. $\boxed{150} = 2 \times 3 \times 5 \times 5$



151 is a prime number (not divisible by 2, 3, 5, 7 or 11, and $13 \times 13 = 169 > 151$)

Factors: 150: 1, 2, 3, 5, 6, 10, 15, 25, 30, 50, 75, 150

151: 1, 151

Notes: Individual work, monitored, helped

Discussion, reasoning, agreement, self-correction, praising

Ps may use a calculator.

Ps could join up the factor pairs for 150.

5 min

2

Different bases

Imagine that we have 151 counters. Let's group them using different numbers as the base.

Ps first dictate headings for the place value table for each base number. Then Ps show the groupings in two ways: starting from the LHS and then the RHS of the table. Ps come to BB or dictate operations to T, with T's help if necessary. Class points out errors.

BB: e.g.

a) Grouping by 3

Starting at LHS of table:

$151 \div 81 = \boxed{1}$ r 70
$70 \div 27 = \boxed{2}$ r 16
$16 \div 9 = \boxed{1}$ r 7
$7 \div 3 = \boxed{2}$ r 1
$1 \div 1 = \boxed{1}$

Base 3

81	27	9	3	1
1	2	1	2	1

Or starting at RHS of table:

$151 \div 3 = 50$, r $\boxed{1}$
$50 \div 3 = 16$, r $\boxed{2}$
$16 \div 3 = 5$, r $\boxed{1}$
$5 \div 3 = 1$, r $\boxed{2}$
$1 \div 3 = 0$, r $\boxed{1}$

Check: $1 \times 81 + \underbrace{2 \times 27}_{54} + 1 \times 9 + 2 \times 3 + 1 \times 1 = \underline{151}$ ✔

b) Grouping by 4

Starting at LHS of table:

$151 \div 64 = \boxed{2}$ r 23
$23 \div 16 = \boxed{1}$ r 7
$7 \div 4 = \boxed{1}$ r 3
$3 \div 1 = \boxed{3}$

Base 4

64	16	4	1
2	1	1	3

Or starting at RHS of table:

$151 \div 4 = 37$, r $\boxed{3}$
$37 \div 4 = 9$, r $\boxed{1}$
$9 \div 4 = 2$, r $\boxed{1}$
$2 \div 4 = 0$, r $\boxed{2}$

Check: $\underbrace{2 \times 64}_{128} + 1 \times 16 + 1 \times 4 + 3 \times 1 = \underline{151}$ ✔

c) Grouping by 5

Starting at LHS of table:

$151 \div 125 = \boxed{1}$ r 26
$26 \div 25 = \boxed{1}$ r 1
$1 \div 5 = \boxed{0}$ r 1
$1 \div 1 = \boxed{1}$

Base 5

125	25	5	1
1	1	0	1

Or starting at RHS of table:

$151 \div 5 = 30$, r $\boxed{1}$
$30 \div 5 = 6$, r $\boxed{0}$
$6 \div 5 = 1$, r $\boxed{1}$
$1 \div 5 = 0$, r $\boxed{1}$

Check: $1 \times 125 + 1 \times 25 + 0 \times 5 + 1 \times 1 = \underline{151}$ ✔

Notes: Whole class activity

Deal with one at a time and gradually build up the tables and the two methods of divisions.

At a good pace

Reasoning, agreement, praising

(Ps may use a calculator.)

Feedback for T

15 min

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Bk4		*Lesson Plan 121*
Activity		***Notes***
3	**Problem** Listen carefully and think about how you would solve this problem. *We have between 200 and 250 coins.* *When we arrange them in rows of 2, 1 coin is left over.* *When we arrange them in rows of 3, 2 coins are left over.* *When we arrange them in rows of 4, 3 coins are left over.* *When we arrange them in rows of 5, 4 coins are left over.* *How many coins could we have?* Allow Ps a minute to think and discuss with neighbours if they wish. Ps explain their ideas and findings to the class. Who agrees? Who thinks something else? etc. Elicit that the number of coins must be odd (1 more than a multiple of 2), so the only multiples of 5 possible have units digit 5 (as 0 + 4 = 4 which is even). BB: e.g. Possible multiples of 5: 205, 215, 225, 235, 245 Add on 4: 209, 219, 229, 239, 249 ↑ Subtract 2 and underline the multiples of 3: <u>207</u>, 217, 227, <u>237</u>, 247 ↑ Subtract 1 more and underline the multiples of 4: 206, <u>236</u> (as 2 has already been subtracted) *Answer:* We have 239 coins. *20 min*	Whole class activity T repeats slowly to allow Ps time to note the data. Discussion, reasoning, checking, praising Praise all positive contributions. T gives hints if necessary. (as the sum of all the digits is a multiple of 3) (as 36 is divisible by 4)
4	***Book 4, page 121*** Q.1 Read: *a) Continue the list of 3-digit natural numbers with decreasing digits (to 500).* *b) Calculate the difference between the smallest and the greatest.* *c) Which are the two middle numbers?* Makes sure that Ps understand the condition for chooosing the numbers. Set a time limit. Ps can list the numbers in *Ex. Bks*. if they need more space. Review with whole class. Ps dictate numbers or come to BB. Class agrees/disagrees. Mistakes discussed and corrected. *Solution:* a) **210; 310, 320, 321; 410**, 420, 421, 430, 431, 432; b) 432 – 210 = <u>222</u> (Elicit that this is the <u>range</u> of the sample of 10 numbers.) c) Two middle numbers: <u>410</u> and <u>420</u> *26 min*	Individual work, monitored, helped Discussion, reasoning, agreement, self-correction, praising **Bold** numbers are given.

Bk4		*Lesson Plan 121*

Activity		***Notes***

5 ***Book 4, page 121***

Q.2 Read: *Jack is in training for a marathon. These were the distances he ran every day last week.*

What do you notice about the distances? What should you do first? (Change all the distances to metres to match the unit of measure on the graph.)

BB: 2.9 km = 2900 m, 10 km = 10 000 m

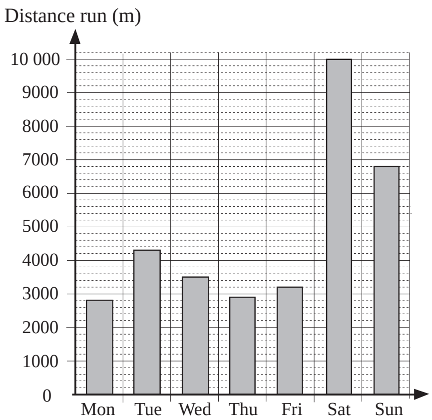
a) Read: *Show the data in a graph.*

Elicit that the distances are shown on the vertical axis, with a grid line at every 200 m, and the days are on the horizontal axis. Set a time limit. Ps can draw the rectangle for each day of the week in a different colour.

Review at BB with whole class. Ps come to BB or T has solution already prepared. Mistakes corrected.

Solution:

Mon: 2800 m
Tue: 4300 m
Wed: 3500 m
Thu: 2.9 km
Fri: 3200 m
Sat: 10 km
Sun: 6800 m



Ps read questions b) to d) themselves and answer them in *Pbs*.

Review at BB with whole class. Ps come to BB or dictate to T, explaining reasoning. Class agrees/disagrees. Mistakes discussed and corrected.

Solutions:

b) *List the distances in increasing order.*

BB: 2800 m, 2900 m, 3200 m, 3500 m, 4300 m, 6800 m, 10 000

c) *What is the difference between the smallest and greatest distance?*

BB: 10 000 m – 2800 m = <u>7200 m</u>

Elicit that this is the <u>range</u> of the data.

d) Read: *What is the median (the middle number)?*

Median: <u>3500 m</u>

32 min

Notes:

Individual work, monitored, helped

Drawn on BB or use enlarged copy master or OHP

Initial discussion to clarify the meaning of the graph.

Discussion, reasoning, agreement, self-correction, praising

(or bars can be the width of the column and touch either)

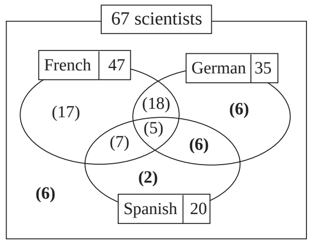
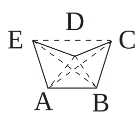
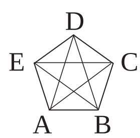
Individual work, monitored under a time limit

Reasoning, aagreement, self-correction, praising

(Or Ps could show responses for c) and d) on scrap paper or slates in unison on command.)

Bk4

Lesson Plan 121

Activity		*Notes*
6	***Book 4, page 121*** Read: *Among 67 scientists at a conference:* *47 speak French, 35 speak German, 20 speak Spanish,* *12 speak French and Spanish, 11 speak German and Spanish,* *5 speak all three languages.* Who can show us where each piece of information is in the diagram? Ps come to BB to say the information and to point to the matching area. Class agrees/disagrees. a) Read: *Complete the Venn diagram.* Who knows how to work out one of the missing numbers? Ps come to BB to fill in a number and explain their reasoning. Class agrees/ disagrees. T gives hints only if Ps are stuck. Ps fill in diagram in *Pbs* too. *Solution:* e.g. German + Spanish: 11, but 5 of the 11 also speak French, so: • number speaking only Spanish and German: 11 – 5 = <u>6</u> • number speaking only Spanish: 20 – (7 + 5 + 6) = 20 – 18 = <u>2</u> • number speaking only German: 35 – (18 + 5 + 6) = 35 – 29 = <u>6</u> • number <u>not</u> speaking a language: 67 – (17 + 18 + 7 + 5 + 6 + 2 + 6) = 67 – 61 = <u>6</u> T reads one question at a time and Ps could show results on scrap paper or slates on command. Ps responding correctly explain at BB to those who were wrong. b) *How many scientists speak: i) only French* (17) *ii) only German* (6) *iii) only Spanish?* (2) c) *How many scientists speak Spanish and German but not French?* (6) d) *How many scientists speak neither Spanish, nor German, nor French?* (6)	Whole class activity Diagram drawn on BB or use enlarged copy master or OHP At a good pace Agreement, praising Discussion, reasoning, agreement, praising BB:  (Or individual work if Ps wish, monitored, helped and reviewed with whole class) Responses shown in unison. Ps point to appropriate area on diagram on BB. Agreement, (self-correcting), praising
Extension	Who can think of another question to ask about the Venn diagram? *40 min*	P who asks the question chooses another P to answer it
7	**Diagonals** What is a pentagon? (plane shape with 5 straight sides) Draw a pentagon in your *Ex. Bks* and lable the vertices A, B, C, D and E. It does not need to be a <u>regular</u> hexagon (i.e. its sides need not be equal). What is a diagonal? (It is a straight line which joins up one vertex in a polygon to another vertex which is not adjacent to it.) Ps draw them in *Ex. Bks*. How many diagonals does a pentagon have? (5) Ps name them. (e.g. AC, AD, BD, BE, CE) and T draws them on diagram on BB. What if I draw the pentagon like this? BB:  Does it still have 5 diagonals? (Yes) *45 min*	Whole class activity T draws regular pentagon on BB or SB or OHT:  Ps shout out in unison. Agreement, praising Ps dictate names to T or come to BB. Class agrees/disagrees.

Bk4

R: Calculations

C: Data, diagrams, tables, functions (single line graphs)

E: Problems

Lesson Plan **122**

Activity		*Notes*

1

Factorising

In your *Ex. Bk*, factorise 152 and then list all its factors.

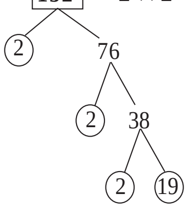
Individual work, monitored, helped

Review at BB with whole class. Ps come to BB to draw tree diagram, show the numbers as the product of their prime factors, and list all their factors. Class agrees/disagrees. Mistakes discussed and corrected.

Discussion, reasoning, agreement, self-correction, praising

Ps may use a calculator.

BB: e.g. $\boxed{152} = 2 \times 2 \times 2 \times 19$



Factors: 152: 1, 2, 4, 8, 19, 38, 76, 152

Ps could join up the factor pairs.

4 min

2

Different bases

Whole class activity

Imagine that we have 152 coins. How can we group them using different numbers as the base number?

Ps first dictate headings for the place value table for each base number. Then Ps show the groupings in two ways: starting from the LHS and then the RHS of the table. Ps come to BB or dictate operations to T, with T's help if necessary. Class points out errors.

Deal with one at a time and gradually build up the tables and the two methods of division.

At a good pace

Reasoning, agreement, praising

Ps may use a calculator or do the calculations in Ex. Bks or at side of BB.

BB: e.g.

a) Grouping by 6

Starting at LHS of table:

$152 \div 36 = \boxed{4}$ r 8

$8 \div 6 = \boxed{1}$ r 2

$2 \div 1 = \boxed{2}$

Base 6

36	6	1
4	1	2

Or starting at RHS of table:

$152 \div 6 = 25$, r $\boxed{2}$

$25 \div 6 = 4$, r $\boxed{1}$

$4 \div 6 = 0$, r $\boxed{4}$

Check: $\underbrace{4 \times 36}_{144} + 1 \times 6 + 2 \times 1 = \underline{152}$ ✔

Feedback for T

b) Grouping by 7

Starting at LHS of table:

$152 \div 49 = \boxed{3}$ r 5

$5 \div 7 = \boxed{0}$ r 5

$5 \div 1 = \boxed{5}$

Base 7

49	7	1
3	0	5

Or starting at RHS of table:

$152 \div 7 = 21$, r $\boxed{5}$

$21 \div 7 = 3$, r $\boxed{0}$

$3 \div 7 = 0$, r $\boxed{3}$

Check: $\underbrace{3 \times 49}_{147} + 0 \times 7 + 5 \times 1 = \underline{152}$ ✔

c) Grouping by 8

Starting at LHS of table:

$152 \div 64 = \boxed{2}$ r 24

$24 \div 8 = \boxed{3}$ r 0

$0 \div 1 = \boxed{0}$

Base 8

64	8	1
2	3	0

Or starting at RHS of table:

$152 \div 8 = 19$, r $\boxed{0}$

$19 \div 8 = 2$, r $\boxed{3}$

$2 \div 8 = 0$, r $\boxed{2}$

Check: $\underbrace{2 \times 64}_{128} + 3 \times 8 + 0 \times 1 = \underline{152}$ ✔

d) Grouping by 9

Starting at LHS of table:

$152 \div 81 = \boxed{1}$ r 71

$71 \div 9 = \boxed{7}$ r 8

$8 \div 1 = \boxed{8}$

Base 9

81	9	1
1	7	8

Or starting at RHS of table:

$152 \div 9 = 16$, r $\boxed{8}$

$16 \div 9 = 1$, r $\boxed{7}$

$1 \div 9 = 0$, r $\boxed{1}$

Check: $1 \times 81 + 7 \times 9 + 8 \times 1 = \underline{152}$ ✔

16 min

Bk4

Lesson Plan 122

Activity

Notes

3

Solving inequalities

Which numbers could the circles represent in these inequalities?

Ps come to BB or dictate each line of the solution to T, explaining reasoning. Calculations can be done at side of BB. Class agrees or disagrees and checks that the solution makes the inequality true.

BB:

a) $3 \times (120 + \bigcirc) < 450$

$120 + \bigcirc < 450 \div 3 = 150$

$\bigcirc < 150 - 120$

$\bigcirc < 30$

or $\bigcirc$: $\underline{29,\ 28,\ 27}$, . . .

b) $(\bigcirc - 48) \div 7 \leq 83$

$\bigcirc - 48 \leq 83 \times 7 = 581$

$\bigcirc \leq 581 + 48$

$\bigcirc \leq 629$

or $\bigcirc$: $\underline{629,\ 628,\ 627}$, . . .

c) $(27 + 36) \times 4 < \bigcirc - 105 < (1100 - 335) \div 3$

$63 \times 4 < \bigcirc - 105 < 765 \div 3$

$252 < \bigcirc - 105 < 255$

$357 < \bigcirc < 360$

or $\bigcirc$: $\underline{358}$ or $\underline{359}$ (if only whole numbers)

Notes:

Whole class activity

Written on BB or SB or OHT

At a good pace

Reasoning agreement, checking, praising

Discuss and agree that if solution is restricted to whole numbers, the numbers can be listed (using ellipses to save time and space).

If the solution can be <u>any</u> number, i.e. whole numbers, fractions or decimals, then the solution should be left as a simple inequality,

e.g. $\underline{\bigcirc < 30}$

Feedback for T

22 min

4

Book 4, page 122

Q.1 Read: *The graph shows how many people saw a certain play in each month over a year. The numbers have been rounded to the nearest 100.*

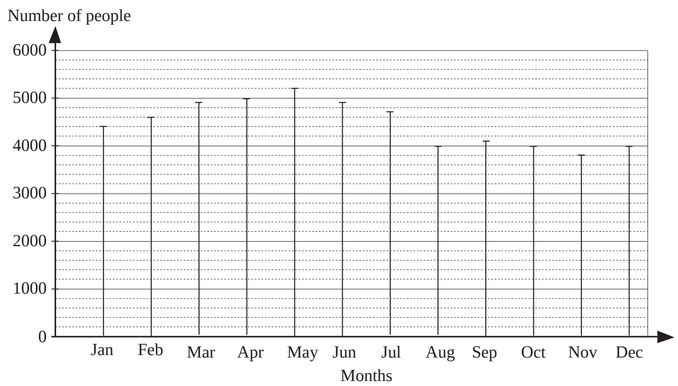
Read the data from the graph and fill in the table.

Ps come to BB to explain what the graph means. Elicit that the vertical (y) axis has grid lines at every 200 people.

Do the first two months with the whole class first if Ps are unsure, otherwise set a time limit for individual work.

Review at BB with whole class. Ps come to BB to fill in the data, explaining reasoning and referring to relevant graph line. Class agrees/disagrees. Mistakes discussed and corrected.

Solution:



Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
No. of people	4400	4600	4900	5000	5200	4900	4700	4000	4100	4000	3800	4000

Notes:

Whole class introduction

Who has been to a theatre? Who has seen a play? When did you go? What was the play? Did you enjoy it? etc. Ps tell of own experiences (or T tells if no P has seen a play).

Drawn on BB or use enlarged copy master or OHP

Discussion reasoning, agreement, self-correction, praising

(Ps might notice that each 1000 on y-axis measures 1 cm, so every mm means 100 people.)

Extension

Who can think of questions to ask about the data? e.g.

What is the mode? (4000)
What is the median? (4500)
What is the range? (1400)

But also, e.g.

In which month was the play most (least) popular?

Why do you think more (fewer) people attended in these months? etc.

27 min

Bk4		*Lesson Plan 122*

Activity		***Notes***

5

Book 4, page 122

Q.2 Read: *We heated a pan of water and noted its temperature every minute.*

The temperature of the water rose steadily to 100 °C but did not go above it.

Individual worked, monitored, helped

Drawn on BB or use enlarged copy master or OHP

Who has seen a pan of water heat up? What happens to it? Why do you think that the temperature never rises above 100 °C?

(Because the water boils at 100 °C and turns into steam.)

Whole class discussion to clarify the context.

T explains if Ps do not know.

Deal with one question at a time if class is not very able, otherwise set a time limit. Ps read questions themselves and write solutions in *Pbs*.

(Or do a), then b) with whole class, then c) to e) as individual work)

Review with whole class. Ps come to BB or dictate to T. Mistakes discussed and corrected.

Discussion, reasoning, agreement, self-correction, praising

Solution:

a) *Complete the table*

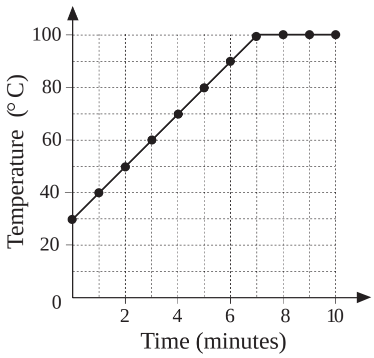
BB:

Time (minutes)	0	1	2	3	4	5	6	7	8	9	10
Temperature (°C)	**30**	40	**50**	60	**70**	80	90	100	100	100	100

Bold numbers are given.

b) *Continue drawing dots in the graph to show the data.*

BB:



Ps finished early could come to BB to draw the dots, or T has solution already prepared.

c) *By how many °C does the temperature rise each minute before it reaches 100 °C?* (<u>10</u> °C)

Ps could show answers on scrap paper or slates in unison on command.

d) *When does the temperature reach 100 °C?* (after 7 minutes)

e) *Is it correct to join up the dots?*

(Yes, because the temperature is increasing at the same rate, so the values could also include any fraction of a minute or any fraction of 10 °C.) T join up dots on BB and Ps in *Pbs*.

What does the slanting part of the graph line show? (temperature and time are increasing)

What does the horizontal part of the graph line show? (temperature staying at 100 °C, and time increasing)

T points to relevant sections of graph line.

T repeats Ps' responses more clearly if necessary.

35 min

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Bk4		*Lesson Plan 122*

Activity | *Notes*

6

What is the rule?

Study these tables and think about what the rule could be. Which of the equations belongs to which table?

Ps come to BB to choose a table and colour its number and the letters of the matching equations in the same colour (or list them on BB), explaining reasoning. Class checks that they are correct.

BB:

1

x	12	4	3
y	4	12	13

2

x	12	4	3
y	4	12	16

3

x	12	4	16
y	16	8	20

a $x + y = 16$ d $y = x + 4$ g $y = 16 - x$

b $x \times y = 48$ e $x + 2 = y - 2$ h $y - 4 = x$

c $y = x - 8$ f $y + 8 = x$ i $48 \div x = y$

Notes: Whole class activity

Written on BB or use enlarged copy master or OHP

At a good pace

Reasoning, agreement, praising

Extension

Ps draw a table with appropriate values to match the equations c) and f)

41 min

7

Book 4, page 122

Q.3 Read: *There are 5 people at a party. Each person clinks glasses with each of the others.*

How many clinking of glasses will there be?
Work it out in your exercise book and write the answer.

I will give you 2 minutes to work out the answer!

Show me your answer . . now! (10)

A, explain your reasoning to us. Who thought the same? Who worked it out in a different way? etc.

Solution:

Each of the 5 people will clink glasses with each of the other 4 people, i.e. $5 \times 4 = 20$, but each clinking of glasses involves 2 people, so there will actually be $20 \div 2 = \underline{10}$ different clinkings.

Or 1st person links with 4 other people,
2nd person clinks with 3 other people
3rd person clinks with 2 other people
4th person clinks with 5th person

$\Bigg\}\ 4 + 3 + 2 + 1 = \underline{10}$

Answer: There will be 10 clinking of glasses.

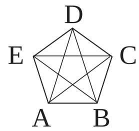
Notes: Individual work, monitored

Answers written on slates or scrap paper and shown in unison.

Reasoning, agreement, praising

Demonstrate if necessary, or show in a diagram:

BB:



Each line is a 'clinking'.

45 min

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Bk4

R: Calculations

C: Functions, tables, graphs

E: Problems. Numbers up to 100 000 (or above)

Lesson Plan 123

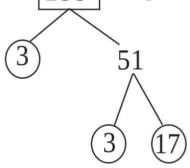
Activity | *Notes*

1 Factorising

In your *Ex. Bk*, factorise 153 and then list all its factors.

Review at BB with whole class. Ps come to BB to draw tree diagram, show the number as the product of its prime factors and list all its factors. Class agrees/disagrees. Mistakes discussed and corrected.

BB: $\boxed{\mathbf{153}} = 3 \times 3 \times 17$



Factors: 1, 3, 9, 17, 51, 153

Notes: Individual work, monitored, helped

Discussion, reasoning, agreement, self-correction, praising

Ps may use a calculator.

Feednback for T

4 min

2 Different bases

Imagine that we have 153 shells. Let's group them using 2 and then 9 as the base number.

Ps first dictate the headings for each place value table. Then Ps show the groupings in two ways: starting from the LHS and then the RHS of the table. Ps come to BB or dictate operations to T, with T's help if necessary. Class points out errors.

BB: e.g.

a) Grouping by 2

Starting at LHS of table:

$153 \div 128 = \boxed{1}$ r 25
$25 \div 64 = \boxed{0}$ r 25
$25 \div 32 = \boxed{0}$ r 25
$25 \div 16 = \boxed{1}$ r 9
$9 \div 8 = \boxed{1}$ r 1
$1 \div 4 = \boxed{0}$ r 1
$1 \div 2 = \boxed{0}$ r 1
$1 \div 1 = \boxed{1}$ r 0

Base 2

128	64	32	16	8	4	2	1
1	0	0	1	1	0	0	1

Check: 128 + 16 + 8 + 1 = 153 ✔

Or starting at RHS of table:

$153 \div 2 = 76$, r $\boxed{1}$
$76 \div 2 = 38$, r $\boxed{0}$
$38 \div 2 = 19$, r $\boxed{0}$
$19 \div 2 = 9$, r $\boxed{1}$
$9 \div 2 = 4$, r $\boxed{1}$
$4 \div 2 = 2$, r $\boxed{0}$
$2 \div 2 = 1$, r $\boxed{0}$
$1 \div 2 = 0$, r $\boxed{1}$

b) Grouping by 9

Starting at LHS of table:

$153 \div 81 = \boxed{1}$ r 72
$72 \div 9 = \boxed{8}$ r 0
$0 \div 1 = \boxed{0}$

Base 9

81	9	1
1	8	0

Or starting at RHS of table:

$153 \div 9 = 17$, r $\boxed{0}$
$17 \div 9 = 1$, r $\boxed{8}$
$1 \div 9 = 0$, r $\boxed{1}$

Check: $1 \times 81 + 8 \times 9 + 0 \times 1 = 153$ ✔

Notes: Whole class activity

Deal with one at a time and gradually build up the tables and the two methods of division.

At a good pace

Reasoning, agreement, praising

Ps may use a calculator, or do the calculations in *Ex. Bks* or at side of BB.

Feedback for T

11 min

3 Place values

T has BB already prepared. First elicit what the headings in the table mean and their relationship to one another. (Group ing by 10, i.e. base 10)

Ps come to BB to read the number and write it as digits in the table, explaining place-value detail. Class points out errors.

BB:

a) 54 thousand 3 hundred and 21
b) thirty thousand, six hundred and eleven
c) 99 thousand, 7 hundred and 48
d) forty-two thousand, nine hundred and eight
e) twenty-six thousand and seventy three

TTh	Th	H	T	U
5	4	3	2	1
3	0	6	1	1
9	9	7	4	8
4	2	9	0	8
2	6	0	7	3

Notes: Whole class activity

Written on BB or use enlarged copy master or OHP

At a good pace

Reasoning, agreement, praising

T covers up the words, points to a digit in the table and chooses Ps to say its real value.

Which is the smallest (greatest) number?

(26 073, 99 748)

16 min

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Bk4		*Lesson Plan 123*

Activity | ***Notes***

4

Sequences

T says the first 3 terms of a sequence and Ps note them in *Ex. Bks.*

I will give you 1 minute to work out the rule and continue the sequence for as many terms as you can. Start . . . now! . . . Stop!

Review at BB with whole class. Eveyone stand up! T chooses a P to give a term in order round class. Ps sit down if they made a mistake or have reached their last term. Last P(s) standing gives the rule and if correct receives a round of applause for writing the most terms.

e.g.

a) 7843, 17 843, 27 843, (37 843, 47 843, 57 843, 67 843, . . .)

Rule: The terms are increasing by 10 000. [+ 10 000]

b) 9000, 18 000, 27 000, (36 000, 45 000, 54 000, 63 000, . . .)

Rule: The terms are increasing by 9000. [+ 9000]

c) 100, 300, 900, (2700, 8100, 24 300, 72 900, 218 700, . . .)

Rule: The terms are increasing by 3 times. [× 3]

Notes:

Individual work, monitored

Deal with one sequence at a time.

If a P says an initial unexpected term, ask them to say what rule they are using.

T could write terms on BB as Ps dictate them.

Agreement, self-correction, praising

(T might allow Ps to use a calculator for c) .)

21 min

5

Calculation practice

T has additions and subtractions written on BB. Ps copy them in *Ex. Bks*. and do the calculations under a time limit. Remember to check your work!

Review at BB with wholeclass. Ps come to BB to do the calculations, explaining reasoning with place-value detail. Class agrees/disagrees. Mistakes discussed and corrected.

BB:

a)
$$\begin{array}{r} 12806 \\ 19510 \\ 16044 \\ +\ 17362 \\ \hline 65722 \\ \hline {}_{2\,1\,1\,1\ } \end{array}$$

b)
$$\begin{array}{r} 38019 \\ 17650 \\ 9407 \\ +\ 22222 \\ \hline 87298 \\ \hline {}_{2\,1\ \ \ 1\ } \end{array}$$

c)
$$\begin{array}{r} 647{}^{10}1{}^{10}5 \\ -\ 243{}_{1}8{}_{1}9 \\ \hline 40326 \\ \hline \end{array}$$

Ps check a) and b) by adding in opposite direction, c) by addition.

Notes:

Individual work, monitored, helped

Or T reads the numbers aloud and Ps write in column form in *Ex. Bks.*)

Written on BB or SB or OHT

Reasoning, agreement, self-correction, praising

Extension

- What is the difference between the greatest and smallest answer? (46 972)
- What is the total of the three answers? (193 346)

25 min

6

Book 4, page 123

Q.1 Read: *Sammy Snail climbed up the wall at a steady speed. You can read from the table where he got to after the first 4 minutes.*

At the end of the 5th minute, Sammy Snail turned and went back down the wall, again at a steady speed. This time you can read from the graph where he got to in the last 5 minutes.

Who can explain the graph? What is the relationship between the table and the graph? Ps come to BB to demonstrate.

Elicit that the missing values in the table can be found from the dots on the graph and the missing dots on the graph relate to the given values in the table.

a) Read: *Complete the table and the graph.*

Set a time limit. Review with whole class. Ps come to BB to complete table and graph, explaining reasoning. Class points out errors. Mistakes discussed and corrected.

Notes:

Individual work, monitored, helped

Drawn on BB or use enlarged copy master or OHP

Whole class discussion to start, with T's where necessary

Differentiation by time limit

Reasoning, agreement, self-corrction, praising

Bk4		*Lesson Plan 123*

Activity		*Notes*

6

(Continued)

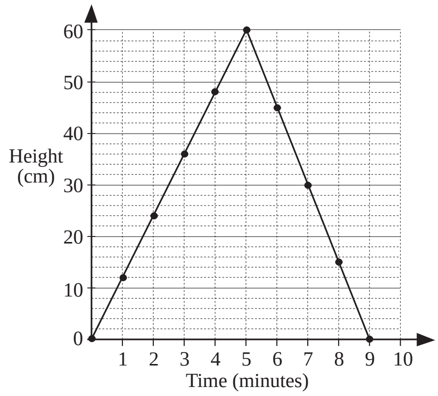
b) Read: *Is it correct to join up the dots?*

T asks several Ps what they think and why. (Yes, because *Sammy Snail* moved at a steady speed without a break and any time on his journey could be shown on the graph.)

Let's join up the dots. T draws lines on BB and Ps in *Pbs*.

Solution:

Time (minutes)	0	1	2	3	4	5	6	7	8	9
Height (cm)	0	12	24	36	48	**60**	**45**	**30**	**15**	**0**



Notes:

Discussion, agreement, praising

T helps with wording of reasoning.

Where would *Sammy Snail* be after, e.g.

- 2 and a half minutes
- 6 and a half minutes? etc.

Ps come to BB to point and give approximate height.

Extension

Did *Sammy Snail* go up the wall and down the wall at the same speed? (No)

Up: 12 cm every minute

Down: 15 cm every minute

So *Sammy Snail* came down the wall faster than he went up! (Why?)

34 min

7

Book 4, page 123, Q.2

Read: *We ran water from a tap into a jug shaped like a cylinder and noted the water level at certain times.*

We found that the relationship betweeen the time and the water level is $w = 2 \times t$ *(where w is the water level in cm and t is the time in seconds).*

If possible, T has a cylindrical jug or container to show to class. Stress that it is the same width through all its length, so will fill at a steady rate. What would happen if the container was narrower (wider) at the bottom? (The water level would increase more quickly (slowly) at first and then more slowly (quickly) later on, so we could not make a rule from the data.)

Demonstrate the experiment if there is a tap in the classroom, otherwise ask Ps to imagine it. Elicit that the water flowing from the tap must be a steady trickle or there would not be time to mark the water levels!

a) Read: *Fill in the table using this rule.*

Ps come to BB to complete the table, explaining reasoning. Class agrees/disagrees. Ps fill in table in *Pbs* too.

Solution:

t	0	1	2	3	4	5	6	7	8	9	10
w	0	2	4	6	8	10	12	14	16	18	20

b) Read: *Draw a graph by drawing dots on this grid and then joining them up.*

Ps come to BB to choose a column, point to the values for *r* and *w* on the axes, move fingers along the grid lines until they join up, then draw (stick on) a dot. Ps draw dots in *Pbs* too.

Notes:

Whole class activity

Drawn on BB or use enlarged copy master or OHP

Intitial discussion (and demonstration if possible) to clarify the context and the concept of a constant rate of flow and filling.

BB: *Rule:* $w = 2 \times t$

At a good pace

Reasoning, agreement, praising

Make sure that Ps understand what the graph means.

Elicit that there is a vertical grid line at every second, but a horizontal grid line at every 2 cm.

Bk4

Lesson Plan 123

Activity		***Notes***

7

(Continued)

Is it correct to join up the dots? (Yes, because the water is flowing continuously without a break, so there are values between the dots which are not shown in the table.) T joins up dots on BB and Ps do the same in *Pbs*. (See final diagram)

Discussion, agreement, praising

(with rulers)

c) Read: *We did the same experiment another day but this time the jug already had 5 cm of water in it when we started.*

Draw a table in your exercise books to show the new set of data. Write the rule.

T draws/shows table on BB and Ps copy it in *Ex. Bks*. Why is there a 5 for the first value of the bottom row? (Because there is 5 cm of water in the jug before the start of the experiment.)

Drawn on BB or use enlarged copy master or OHP

Ps complete the table in *Ex. Bks*, then dictate results to T, who writes in table on BB. Mistakes corrected. What is the rule? (BB)

Individual work, monitored, helped

BB: *Rule:* $w = 2 \times t + 5$

Reasoning, agreement, self-correction, praising

Solution:

t (sec)	0	1	2	3	4	5	6	7	8	9	10
w (cm)	5	7	9	11	13	15	17	19	21	23	25

Read: *Draw its graph line on this grid in red.*

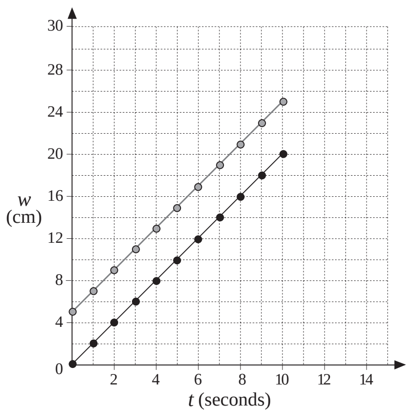
Ps come to BB as before to find the values and draw (stick on) red dots. Agree that the odd numbers are half-way between the horizontal grid lines. Should we join up the dots? (Yes, for same reason as before.) Ps draw dots and joining line in *red* in *Pbs* too.

Whole class activity

At a good pace

Agreement, praising

Solution:



What do you notice about the two graph lines? (They are <u>parallel</u> and the *red* line is 5 cm higher up on the vertical axis.)

Extra praise if Ps notice this without hints from T.

42 min

8

Problem

Listen carefully, solve the problem in your *Ex. Bks* and show me the answer when I say. Discuss it with your neighbour if you wish.

How many dictionaries would be needed to translate among these languages: English, French, German, Spanish and Italian?

If you found an answer, show me . . . now! (20)

P answering correctly explains reasoning. Who agrees? Who did it another way? etc. (T helps Ps to solve it if no P answered correctly.)

e.g.. Each of the 5 languages would need 4 different dictionaries:

(e.g. E $\rightarrow$ F, E $\rightarrow$ G, E $\rightarrow$ S, E $\rightarrow$ I), i.e. $5 \times 4 = \underline{20}$

or $2 \times (4 + 3 + 2 + 1) = 2 \times 10 = \underline{20}$, or draw tree diagrams (*LP 149*).

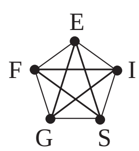
Individual work, monitored

(or whole class activity if time is short)

Discussion, reasoning, agreement, self-correction, praising

Or draw connections among 5 dots:

i.e. a <u>pentagon</u>



45 min

Bk4

R: Calculations

C: Functions, tables, graphs

E: Problems. Numbers up to 100 000 (or above)

Lesson Plan *124*

Activity		*Notes*

1 **Factorising**

In your *Ex. Bk*, factorise 154 and then list all its factors.

Review at BB with whole class. Ps come to BB to draw tree diagram, show the number as the product of its prime factors and list all its factors. Class agrees/disagrees. Mistakes discussed and corrected.

BB: $\boxed{154} = 2 \times 7 \times 11$

154 → 2, 77; 77 → 7, 11

Factors: 1, 2, 7, 11, 14, 22, 77, 154

Notes: Individual work, monitored, helped

Discussion, reasoning, agreement, self-correction, praising

Ps may use a calculator.

Feedback for T

4 min

2 **Problem**

Listen carefully and think about how you would solve this problem.

Dizzy Domble has just come back from a visit to Threeland where they count in base 3. He bought a box of biscuits while he was there and on the lid it stated that there were 12201 biscuits.

He wants to send the box of biscuits to a friend who lives in Sevenland where they count in base 7 but thinks that he had better cross out the 12201 and write the number of biscuits in base 7, otherwise his friend will expect there to be more biscuits in the box than there really are.

What should he change it to?

Notes: Whole class activity

T repeats slowly to give Ps time time to think and discuss.

T reads '12201' as 'one, two, two, zero, one' and writes on BB:
12201 (base 3)

Ps suggest what to do first and how to continue. T gives hints if Ps are stuck or leads Ps through the solution if they have no ideas.

Notes: Discussion, reasoning, agreement, praising

1. Change the number in base 3 to base 10

   T draws the table on BB and Ps decide on the place-value headings and digits.

   BB: *Base 3*

81	27	9	3	1
1	2	2	0	1

Notes: Ps come to BB or dictate to T. Class agrees/disagrees.

   So the number of biscuits in base 10 is:

   BB: $1 \times 81 + 2 \times 27 + 2 \times 9 + 0 \times 3 + 1 \times 1$
   $= 81 + 54 + 18 + 1 = 135 + 19 = \underline{154}$

2. Change the number in base 10 to base 7

   T draws the table on BB and Ps dictate the place value headings.

   Then Ps use one of the methods of division to determine the groupings. e.g.

   BB:

Starting at LHS of table:

$154 \div 49 = \boxed{3}$ r 7

$7 \div 7 = \boxed{1}$ r 0

$0 \div 1 = \boxed{0}$

→ *Base 7* ←

49	7	1
3	1	0

Or starting at RHS of table:

$154 \div 7 = 22$, r $\boxed{0}$

$22 \div 7 = 3$, r $\boxed{1}$

$3 \div 7 = 0$, r $\boxed{3}$

Check: $3 \times 49 + 1 \times 7 + 0 \times 1 = \underline{154}$ ✔

Notes: Ps decide on which division method to use.

Ps come to BB to do the calculations, explaining reasoning, and fill in the table.

Class points out errors.

(Ps may use a claculator.)

Answer: He should change the 12201 in base 3 to 310 in base 7.

Notes: Agreement, praising

10 min

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Bk4		*Lesson Plan 124*
Activity		***Notes***
3	**Calculation practice** T has operations already written on BB. Ps copy into *Ex. Bks.* and do the calculations. Set a time limit. Review at BB with whole class. Ps come to BB to explain their reasoning with place-value detail. Class agrees/disagrees. Mistakes discussed and corrected. BB: a) $47506 + 21835 = 69341$ b) $47506 - 21835 = 25671$ c) $8516 \times 6 = 51096$ d) $27210 \times 3 = 81630$ e) $39184 \div 5 = 7836$, r 4 f) $99999 \div 6 = 16666$, r 3 *18 min*	Individual work, monitored, helped (or whole class activity if class is not very able) Written on BB or SB or OHT Reasoning, agreement, checking, self-correction, praising Class checks with reverse operations (or with a calculator). (Show as long division if Ps have difficulties.) Feedback for T
4	**Rounding** Let's round these numbers to the nearest 10, 100, 1000 and 10 000. Ps come to BB to fill in the table, explaining reasoning. Class agrees/disagrees. If disagreement, draw relevant segment of the number line on the BB. BB: (table below) *23 min*	Whole class activity Involve several Ps. Drawn on BB or use enlarged copy master or OHP At a good pace Reasoning, agreement, praising Review the rules of rounding. Feedback for T

Rounded to nearest:

Number	10	100	1000	10 000
21 875	21 880	21 900	22 000	20 000
85 000	85 000	85 000	85 000	90 000
36 243	36 240	36 200	36 000	40 000
54 999	55 000	55 000	55 000	50 000

5	**Problem** How much is 3 quarters of £68 252? Who can write a plan for the solution? Ps come to BB or dictate to T. Class agrees/disagrees. Now let's do the calculations. Ps come to BB to write the calculations in column form at side of BB, explaining reasoning in detail. Class points out errors. *Solution:* *Plan*: $\frac{3}{4}$ of £68 252 = £68 252 ÷ 4 × 3 = £17 063 × 3 = <u>£51 189</u> *Answer*: Three quarters of £68 252 is £51 189. *26 min*	Whole class activity Reasoning, agreement, checking, praising BB: *C:* $68252 \div 4 = 17063$; $17063 \times 3 = 51189$ Ps may check with a calculator.

Bk4

Lesson Plan 124

Activity		Notes

6

Book 4, page 124

Q.1 Read: *Find different rules to complete the table.*
Write each rule in different ways.

What do you notice about the tables? (The numbers are the same but the letters are different.)

Set a time limit. Ps can do necessary calculations on scrap paper or slates or in *Ex. Bks*.

Review with whole class. One P at a time comes to BB to complete a table and chooses another P to give the rule that they used. Class checks it with values from the table.

Who found a different rule? Come and show us. Deal with all cases.

Solution: e.g.

a)

a	20	200	2000	1260	1400	**70**	**2470**	**8970**
b	50	**230**	**2030**	**1290**	**1430**	100	2500	9000

Rule: $b = a + 30$, $a = b - 30$, $b - a = 30$

b)

x	20	200	2000	1260	1400	**40**	**1000**	**3600**
y	50	**500**	**5000**	**3150**	**3500**	100	2500	9000

Rule: $y = x \div 2 \times 5$, $x = y \div 5 \times 2$, or $x = \frac{2}{5}$ of y

c)

u	20	200	2000	1260	1400	**120**	**4920**	**17920**
v	50	**140**	**1040**	**670**	**740**	100	2500	9000

Rule: $v = u \div 2 + 40$, $u = (v - 40) \times 2$

32 min

Notes:

Individual trial first, monitored, helped

Tables drawn on BB or use enlarged copy master or OHP

Discussion, reasoning, agreement, checking, self-correction, praising

Extra praise for clever or unexpected but valid rules

If problems, Ps write and say calculations with place-value detail at side of BB. e.g.

b) $630 \times 5 = 3150$ (carry 1); $9000 \div 5 = 1800$ (remainder 4)

c) $2460 \times 2 = 4920$ (carry 1); $8960 \times 2 = 17920$ (carry 1 1)

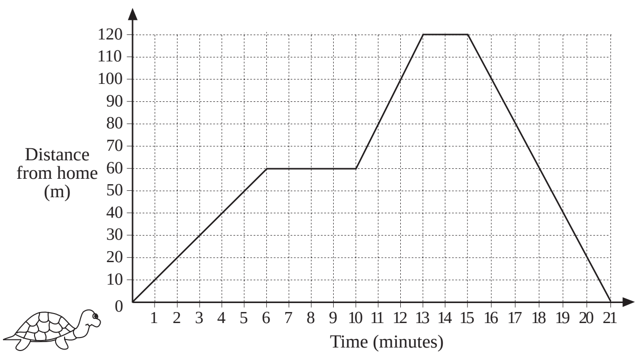
Other rules are possible.

7

Book 4, page 124, Q.2

Read: *Tammy Tortoise went for a walk from her house to the field and back again. The graph shows how far she was from home during that time.*

BB:



Talk about the meaning of the graph first. Who can explain the graph? Where is the x-axis? What does it show? (the time *Tammy* spent walking, with a grid line at every minute) Where is the y-axis? What does it show? (How far *Tammy* was from home, with a grid line at every 10 m) Where does *Tammy* start (finish) her walk? What part of the graph shows where she was walking away from home (coming back home, stopping for a rest)? etc.

Notes:

Whole class activity

Drawn on BB or use enlarged copy master or OHP

Initial discussion to clarify the graph and what kind of motion the graph line shows.

Allow Ps to explain first without prompting if they can.

Involve several Ps.

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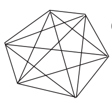
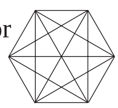
Bk4

Lesson Plan 124

Activity		***Notes***
7	(Continued) Now let's see if you are clever enough to answer the questions! T (P) reads each question aloud and Ps show answers on scrap paper or slates on command. Ps answering correctly come to BB to explain to those who were wrong. Class agrees/disagrees. *Solution:* a) *How far away from home did Tammy go?* (120 m) b) *For how long was she away from home?* (21 minutes) c) *When did she start her return journey?* (after 15 minutes) d) *How many times did Tammy stop to rest?* (twice)	Whole class activity (or individual work if Ps wish, monitored, helped and reviewed with whole class) Responses given in unison. Agreement, (self-correcting), praising Ps show relevant parts of the graph.
Extension	Who can think of other questions to ask about the graph? e.g. • For how long did she rest? • How far away from home was she after 2 min (10 min, etc.)? • How far had she walked before her first rest? • When did *Tamm*y walk more slowly? etc. *38 min*	Extra praise for clever questions Ps who asked the question choose a P to answer it.
8	**Problem 2** Listen carefully, note the data and try to solve the problem in your *Ex. Bks*. Show me the answer when I say. *There are 200 litres of water in my bath. When I take out the plug, the water gurgles down the plughole at a rate of 25 litres every minute. After how many minutes will my bath be empty?* Set a time limit. Ps can discuss with their neighbours if they wish. If you found an answer, show me . . . now! (8 minutes) P who answered correctly explains at BB. Who did the same? Who did it a different way? etc. If no P found the answer, T gives hints and class solves it together. *Solution:* e.g. 200 – 25 – 25 – 25 – 25 – 25 – 25 – 25 – 25 = 0 (litres) $\rightarrow$ $\underline{8}$ min. or 200 litres ÷ 25 litres = 40 litres ÷ 5 litres = $\underline{8}$ (times) *Answer:* My bath will be empty after 8 minutes. *42 min*	Individual work, monitored T repeats slowly to give Ps time to think and calculate. In unison Discussion, agreement, self-correction, praising Or Ps might draw a table to show the different amounts left after each minute. Ps say answer in unison.
9	***Book 4, page 124*** Read: *How many diagonals does a hexagon have?* *Show it by drawing a hexagon and its diagonals.* How many sides does a hexagon have? (6) I will give you 2 minutes to find the answer! You do not need to draw a regular hexagon. Start . . now! . . . Stop! Show me the answer . . now! (9) P answering correctly shows solution on BB. Class agrees/disagrees. *Solution:* <u>irregular</u>  or <u>regular</u>  9 diagonals or by calculation: 6 × 3 ÷ 2 = $\underline{9}$ *45 min*	Individual work, monitored Elicit that a diagonal joins up vertices which are <u>not</u> adjacent, so a side is not a diagonal. Agreement, self-correcting, praising (as each of the 6 vertices is joined to 3 other vertices which are not adjacent, but there are 2 vertices on each diagonal)

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Bk4

R: Calculations

C: Probability games. Fair and unfair games

E: Problems

Lesson Plan
125

Activity		*Notes*

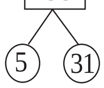
1

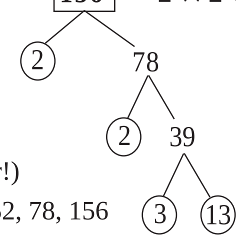
Factorising

In your *Ex. Bk*, factorise 155 and 156 and then list all their factors.

Review at BB with whole class. Ps come to BB to draw tree diagrams, show the numbers as the product of their prime factors and list <u>all</u> their factors. Class agrees/disagrees. Mistakes discussed and corrected.

BB: $\boxed{155} = 5 \times 31$ $\qquad$ $\boxed{156} = 2 \times 2 \times 3 \times 13$





Factors:

155: 1, 5, 31, 155 (a <u>nice</u> number!)

156: 1, 2, 3, 4, 6, 12, 13, 26, 39, 52, 78, 156

Notes: Individual work, monitored, helped

Discussion, reasoning, agreement, self-correction, praising

Ps may use a calculator.

Ps may join up the factor pairs for 156.

Feedback for T

6 min

2

Calculation practice

Ps come to BB to do the calculations, explaining reasoning in detail. Class checks mentally and points out errors.

BB:

a) $\begin{array}{r} 27364 \\ +\ 72635 \\ \hline 99999 \end{array}$ $\qquad$ b) $\begin{array}{r} 43518 \\ 12476 \\ +\ 44006 \\ \hline 100000 \\ {\scriptstyle 1\ 1\ 1\ 2\ } \end{array}$ $\qquad$ c) $\begin{array}{r} 73419 \\ -\ 63420 \\ \hline 9999 \end{array}$

d) $\begin{array}{r} 8347 \\ \times\ 6 \\ \hline 50082 \\ {\scriptstyle 2\ 2\ 4\ } \end{array}$ $\qquad$ e) $\begin{array}{r} 8347 \\ \times\ 12 \\ \hline 16694 \\ 83470 \\ \hline 100164 \\ {\scriptstyle 1\ 1\ 1\ } \end{array}$ $\qquad$ f) $\begin{array}{r} 9999 \text{ r } 7 \\ 8 \overline{)79999} \\ {\scriptstyle 7\ 7\ 7\ 7} \end{array}$

Who notices quicker ways of calculating c), e) and f)?

c) 73 419 – 63 419 = 10 000, 10 000 – 1 = <u>9999</u>

e) 8347 × 12 = 8347 × 6 × 2 = 50082 × 2 = <u>100 164</u> (using d)

f) 80 000 ÷ 8 = 10 000, so 79 999 ÷ 8 = <u>9999, remainder 7</u>

Notes: Whole class activity

Written on BB or use enlarged copy master or OHP

At a good pace

Reasoning, checking, agreement, praising

(If disagreement, check with a calculator.)

Extra praise if Ps notice without help from T.

12 min

3

Rounding

Who can explain to us what these statements really mean?

a) *64000 is the value of a number which has been rounded to the nearest thousand.*

P: e.g. The number is at least 63 500 and it is less than 64 500.

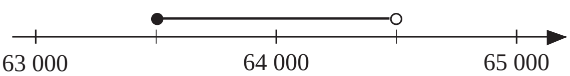
Who can write it as an inequality? BB: $63\,500 \le n < 64\,500$

If the number is a <u>natural</u> number, what could the number be?

(n: 63 500, 63 501, . . ., 64 499)

If the number can be a whole number or a fraction or a decimal, who can show us the possible values on this number line? T draws on BB and Ps come to BB to draw circles and join them up, explaining reasoning. Class agrees/disagrees. Revise the notation if necessary.

BB:



Notes: Whole class activity

BB: 64 000 (to nearest 1000)

Agreement, praising

Elicit that a <u>natural number</u> is a positive whole number.

Ps dictate possible numbers.

Extra praise if Ps remember without help from T how to show the complete solution.

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Bk4		*Lesson Plan 125*

Activity		*Notes*

3

(Continued)

b) *64000 is the value of a number which has been rounded to the nearest hundred.*

P: e.g. The number is at least 63 950 and it is less than 64 050.

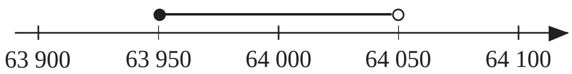
Who can write it as an inequality? BB: 63 950 $\leq$ n $<$ 64 050

If the number is a natural number, what could the number be?

(n: 63 950, 63 951, . . ., 64 049)

If the number can be a whole number or a fraction or a decimal, who can show us the possible values on this number line? T draws on BB and Ps come to BB to draw circles and join them up, explaining reasoning. Class agrees/disagrees.

BB:



17 min

Notes:

BB: 64 000 (to nearest 100)

Agreement, praising

Ps dictate possible numbers.

Reasoning, agreement, praising

4

Perimeter

This is an equilateral triangle. What does equilateral mean? (Its sides are equal in length.)

The two smaller triangles are also equilateral, and their perimeters are 15 units and 24 units long.

What is the perimeter of the largest triangle?

Ps suggest what to do first and how to continue. T gives hints only if necessary.

e.g. Each side of the smallest triangle is: 15 units ÷ 3 = 5 units

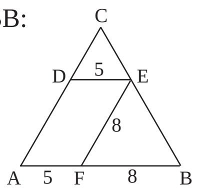
Each side of the middle-sized triangle is: 24 units ÷ 3 = 8 units

So each side of the large triangle is: 5 units + 8 units = 13 units

and its perimeter is: 3 × 13 units = 39 units.

Or: The perimeter of the largest triangle is equal to the sum of the perimeters of the two smaller triangles.

BB:



(as DE is equal to AF and FE is equal to AD)

Perimeter = (CD + CE + AF) + (FB + BE + AD

= 15 units + 24 units = 39 units.

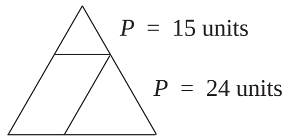
22 min

Notes:

Whole class activity

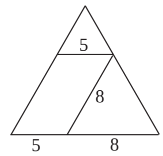
Drawn on BB or use enlarged copy master or OHP

BB:



T gradually adds lengths to diagram as each value is worked out.

BB:



Reasoning,agreement, praising

If no P suggests the 2nd method, T shows it.

5

Book 4, page 125

Q.1 Read: *If we put a 3-volume encyclopedia back on the shelf without looking at the volume numbers, in what order might they end up? Show all the possiblities.*

Set a time limt. Review with whole class. Ps come to BB or dictate to T. Mistakes corrected and omissions added.

Agree that there are only 6 different possible arrangements.

BB:

1	2	3

1	3	2

2	1	3

2	3	1

3	1	2

3	2	1

Notes:

Individual work, monitored, helped

Drawn on BB or use enlarged copy master or OHP

Agreement, self-correcting, praising

Or by calculation:

3 × 2 × 1 = 6

Bk4		*Lesson Plan 125*
Activity		***Notes***
5	(Continued) a) Read: *What chance is there of them being in the order 2 3 1?* (1 out of 6, or 1 sixth, as each of the 6 possibilities has an <u>equal</u> chance of occurring.) $\left[\frac{1}{6}\right]$ b) Read: *What chance is there of these events happening?* *i) the book on the left-hand side is Volume 1* $\left[\frac{2}{6}=\frac{1}{3}\right]$ (2 out of 6, or 2 sixths, or 1 third) *ii) the volume numbers are decreasing from the left.* $\left[\frac{1}{6}\right]$ (1 out of 6, or 1 sixth) If necessary T revises the vocabulary of probability: • the chance (probability) of something (an event) happening (occurring) is usually given as a fraction between 0 and 1. • the less chance there is of an event occurring, the nearer the fraction is to 0. • the greater the chance, the nearer the fraction is to 1. *27 min*	Individual work, monitored, helped, then reviewed with whole class, or whole class activity, with Ps showing answers on scrap paper or slates in unison on command. Reasoning, agreement, praising Whole class discussion Ps think of other events too! e.g. What is the probability of volume 2 being in the middle? $\left[\frac{1}{3}\right]$
6	***Book 4, page 125, Q.2*** Read: *Four children are playing a game with these cards.* T has a large set stuck to BB for demonstration. Let's play the game! T calls 4 Ps to front of class to be A, B C and D. T or P reads out one rule at a time and the group carries it out. Repeat until all 4 Ps in the group have drawn a 2-digit number and written it on the BB. Repeat if some Ps still do not understand the game. a) Read: *List in your exercise book all the 2-digit numbers that could be chosen.* Set a time limit. Review with whole class. Ps dictate the numbers and T writes on BB in a logical order. Class points out any missed. BB: (01, 02, 03, 04, 05), 10, 12, 13, 14, 15; 20, 21, 23, 24, 25; 30, 31, 32, 34, 35; 40, 41, 42, 43, 45; 50, 51, 52, 53, 54 Agree that there are <u>30</u> possible combinations. Are they all 2-digit numbers? (No, 01, 02, 03, 04 and 05 are 1-digit numbers, so the extra rules do not apply to them, only to the 25 2-digit numbers.) b) Read: *Who might complain because the extra rules are unfair?* Let's work out the probability of each person missing a turn. T reads out the extra rules one at a time and Ps count how many of of that type of number there are (not counting the 1-digit numbers), then give the probability. Class agrees/disagrees. *Alan misses a turn if the 2-digit number is even.* $\left(\frac{13}{25}\right)$ *Becky misses a turn if the 2-digit number is odd.* $\left(\frac{12}{25}\right)$ *Callum misses a turn if the 2-digit number is a whole 10.* $\left(\frac{5}{25}\right)$ *Diana misses a turn if the 2-digit number is divisible by 5.* $\left(\frac{9}{25}\right)$ All but Callum might complain as he has least chance of missing a turn. *34 min*	Whole class activity BB: $\boxed{0}\ \boxed{1}\ \boxed{2}\ \boxed{3}\ \boxed{4}\ \boxed{5}$ Demonstration of card game Individual work, monitored, helped Agreement, self-correction, praising Extra praise if Ps reason without prompting that 01, 02, etc. contain only units, so are not 2-digit numbers. Whole class activity Or Ps could show results on scrap paper or slates in unison on command. Reasoning, agreement, praising T asks several Ps what they think and why.

Bk4

Lesson Plan 125

Activity | ***Notes***

7

Book 4, page 125

Q.3 Read: *A marble is dropped into this maze and has an equal chance of falling to the left or to the right.*

a) In how many ways can the marble come out at A, B, C, D or E?

Set a time limit. Review at BB with whole class. Ps come to BB or dictate to T. Class agrees/disagrees. If disagreement, Ps come to BB to show the different routes. Mistakes corrected.

How many different routes are there altogether? (16)

BB: A: 1, B: 4, C: 6, D: 4, E: 1

Total routes: 1 + 4 + 6 + 4 + 1 = <u>16</u>

b) Read: *Where is the marble most likely to come out?*

Show me . . . now! (C) (as it has most possible routes)

c) Read: *Write the ratio of the chance of where it comes out.*

What kind of number should we write in the boxes? (fraction)

What will the denominator be? (16) What will the numerator be? (the number of possible routes leading to that letter).

Ps write fractions in *Pbs*, then come to BB or dictate to T, explaining reasoning. Class agrees/disagrees. Mistakes discussed and corrected.

BB: A B C D E

$$\boxed{\frac{1}{16}} : \boxed{\frac{4}{16}} : \boxed{\frac{6}{16}} : \boxed{\frac{4}{16}} : \boxed{\frac{1}{16}}$$

[**Note**: For ratio, it is also acceptable to use 1 : 4 : 6 : 4 : 1 as the denominator is the same for each fraction.]

Notes:

Individual trial first, monitored, helped

(or whole class activity)

Drawn on BB or use enlarged copy master or OHP

Agreement, self-correction, praising

Ps shout out in unison.

Ps could show on scrap paper or slates in unison.

Initial discussion to clarify the meaning of the question.

Individual work, monitored

Agreement, self-correction, praising

40 min

8

Problem

Listen carefully and think about how to solve this problem

There are 5 locked doors and 5 keys but the keys are not marked.

What is the <u>most</u> number of tries that have to be made to be <u>certain</u> of finding the correct key for each door?

Set a time limit. and allow Ps to discuss with neighbours if they wish.

If you have an answer, show me . . now! (14)

Ps who responded correctly explain their reasoning. Who agrees? Who did it a different way? etc. If no P found the solution, class solves it with hints from T. (Praise Ps who answer with 15, but see below.)

Solution: e.g.

Doors:	A	B	C	D	E
No of keys that must be tried:	5	4	3	2	0

The worst possible case is that always the last key tried fits the lock, and after D there is only one key left for E, so there is no need to try it.

So the most number of tries to be <u>certain</u> is: 5 + 4 + 3 + 2 + 0 = <u>14</u>

(Or the 1st key can be tried in 5 doors, the 2nd key in 4 doors, etc.)

Answer: The most number of tries that have to be made is 14.

Notes:

Individual (paired) trial first, monitored

T repeats slowly and P repeats in own words.

In unison

Discussion, reasoning, agreement, praising

Involve several Ps.

Class applauds Ps who solved it without help.

(Of course, it is <u>possible</u> that the 1st key tried fits A, the 2nd key tried fits B, etc. so it could be done in 4 tries – but that is very unlikely and not at all certain!)

45 min

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Bk4	R: Calculations **C: Probability games** *E: Problems*	*Lesson Plan 126*

Activity		***Notes***
1	**Factorising** Let's factorise 157 and then list all its factors. Ps dictate or come to BB to try each of the prime numbers, 2, 3, 5, 7 and 11 as divisors, using 'quick' methods where possible. Should we try dividing by 13? (No, as $13 \times 13 = 169 > 157$) Elicit that 157 is a <u>prime number</u>, and its factors are 1 and 157. *4 min*	Whole class activity At a good pace Ps explain reasoning or do divisions at side of BB. Class agrees/disagrees Praising, encouragement only
2	**Problem** Listen carefully, picture the story in your head and think about how you would work out the answer. *A knight fell in love with a young princess and promised her that every Sunday he would bring her as many roses as it is the day of the month.* *What is the most number of roses that he might take to the princess in a month?* **A**, tell us what you would do. Who agrees? Who would do it another way? etc. T gives hints if nobody is on the right track. *Solution:* The most number of days in a month is 31. In a 31-day month, the most roses that the knight could take to the princess woud be if the 31st was a Sunday. So the roses he took to the princess during that month would be: BB: $31 + 24 + 17 + 10 + 3 = \underline{85}$ *Answer:* The most roses that the knight might take to the princess in a month is 85. *9 min*	Whole class activity T repeats slowly to give Ps time to think and discuss. Discussion, reasoning, agreement, praising T helps with wording of reasoning. Ps do addition on slates or scrap paper or in *Ex. Bks* and dictate result to T. T chooses a P to say the answer in a sentence.
3	**Calculation practice** Listen carefully, write down the numbers and do the calculation in your *Ex. Bks*. Show me the result when I say. Deal with one question at a time. Ps responding correctly explain at BB to those who were wrong. Class agrees/disagrees. Mistakes discussed and corrected. a) *Which number is 4 times as much as 9350?* (37 400) BB: $9350 \times 4 = \underline{37\,400}$ b) *Five times a number is 43810. What is the number? (8762)* BB: $43\,810 \div 5 = \underline{8762}$ c) *Which number is 2 fifths of 45 600?* ($45\,600 \div 5 \times 2 = 9120 \times 2 = \underline{18\,240}$) d) *Three quarters of a number is 45 600. What is the number?* ($45\,600 \div 3 \times 4 = 15\,200 \times 4 = \underline{60\,800}$) *15 min*	Individual calculation, then whole class review (Or whole class activity, with Ps coming to BB to write the operations and do the calculations, explaining reasoning. Class points out errors.) BB: e.g. a) $\begin{array}{r} 9350 \\ \times 4 \\ \hline 37400 \\ {\scriptstyle 1\,2} \end{array}$ b) $\begin{array}{r} 8762 \\ 5\,\overline{)\,43810} \\ {\scriptstyle 3\,3\,1} \end{array}$ c) $\begin{array}{r} 9120 \\ 5\,\overline{)\,45600} \\ {\scriptstyle 1} \end{array}$ $\begin{array}{r} 9120 \\ \times 2 \\ \hline 18240 \end{array}$ d) $\begin{array}{r} 15200 \\ 3\,\overline{)\,45600} \\ {\scriptstyle 1} \end{array}$ $\begin{array}{r} 15200 \\ \times 4 \\ \hline 60800 \\ {\scriptstyle 2} \end{array}$

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Bk4		*Lesson Plan 126*
Activity		***Notes***
4	**Converting units of measure** Let's convert these quantities. Revise units of measure first if necessary. Ps come to BB or dictate what T should write. Class agrees/disagrees. BB: a) 32 m 35 cm = (3235 cm = 32350 mm) b) 15 684 mm = (1568 cm 4 mm = 15 m 68 cm 4 mm) c) 57 litres 24 cl = (5724 cl = 57 240 ml) d) 28 315 ml = (2831 cl 5 ml = 28 litres 31 cl 5 ml) e) 46 kg 380 g = (46 380 g) f) 65 904 g = (65 kg 904 g) g) 98 km 540 m = (98 540 m) h) 21 480 m = (21 km 480 m) *21 min*	Whole class activity Written on BB or SB or OHT At a good pace Reasoning, agreement, praising Feedback for T
5	***Book 4, page 126, Q.1*** Read: *Three boys, A, B and C, decided to have a race. We know that there was a tie but not for which place.* What possibilities could there be? (there is a winner and 2 boys tie for 2nd place, 2 boys tie for 1st place and there is a 3rd place, 3 boys tie for 1st place) a) Read: *What could the finishing order be? Show all the possibilities.* Ps come to BB or dictate to T. Class agrees/disagrees. Ps complete the tables in *Pbs* too. BB: 1st | 2nd/3rd: A | B, C; B | A, C; C | A, B 1st/2nd | 3rd: A, B | C; A, C | B; B, C | A 1st/2nd/3rd: A, B, C b) Read: *If each possible result has an equal chance of happening, what is the chance that there was a tie for 1st place?* How many different possibilities are there? (7) How many of them have ties for 1st place? (4) What is the probability of a 1st place tie? Show me . . now! ($\frac{4}{7}$) *26 min*	Whole class activity (or individual work if Ps wish) Discussion, agreement If Ps do not sggest the last possibility, T asks them to keep thinking! Drawn on BB or SB or OHT At a good pace Agreement, praising (on slates in unison) Agreement, praising
6	***Book 4, page 126*** Q.2 Read: *Predict the results for each outcome first, then do the experiment.* T puts 2 *red*, 2 *white* and 2 *green* counters in a bag and chooses **A** to take out 2 counters with his/her eyes shut. Before he/she does so, T asks Ps to predict the outcome. Will they both be the same (s) or different (d); will there be 1 *red* + 1 *white* (R + W) or 2 *green*? (2G) Ps write their prediction on slates and show in unison on command. **A** takes out the counters. Ps who predicted correctly stand up and class gives them a round of applause! This is only one outcome from one experiment! If we do the experiment 15 times, how many times do you think the different outcomes will occur? Write your prediction in this column in the table. (T points on BB.) Now let's do the experiment properly!	Whole class introduction Table drawn on BB or use enlarged copy master or OHP Ps work in pairs and each pair has appropriately coloured counters and bag on desks. Demonstration of experiment to show Ps what to do. Ps write predictions in table in *Pbs* and T could write on table on BB.

Bk4		*Lesson Plan 126*

Activity		*Notes*

6

(Continued)

Keep class together on each experiment. Ps work in pairs, taking turns to shake the bag and take out the counters but both Ps record result in table in *Pbs* with a tally mark. Make sure that Ps realise that they must mark either of the top two rows each time, and also one of the bottom two rows where appropriate.

After 15th experiement, Ps add up the totals in each row of their table.

Write a tick beside your prediction if it is equal to the result of your experiment.

e.g.

Outcome	Prediction	Experiment 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Totals
Both the same	7		|		|				|				|				4
Both different	8	|		|		|	|	|		|	|	|		|	|	|	11
1 red + 1 white	2														|		1
2 green	1 ✔								|								1

Who has 4 ticks (3 ticks)? Let's give them a clap!

Do not worry if you have no ticks – it is very difficult to make predictions!

Ps read the questions themselves and use their own data to estimate the chances. T chooses one or two Ps to show their data and explain their answers to class.

e.g. *Solution* using the data in the table above:

What chance is there of you taking out of the bag:

a) *2 counters of the same colour* $\left(\frac{4}{15}\right)$

b) *2 counters of different colours* $\left(\frac{11}{15}\right)$

c) *a red and a white counter* $\left(\frac{1}{15}\right)$

d) *2 green counters?* $\left(\frac{1}{15}\right)$

Extension

Elicit that Ps have different results because the experiment has not been done enough times. How could we get a better estimate? (Collect the data for the class.)

T adds another column to table above, or uses a class table. Ps dictate their results to T or come to BB to fill in a column in class table. Ps keep running totals or T uses a calculator.

BB: e.g.

Outcome	Pair data P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	Class Totals
Both the same																	
Both different																	
1 red + 1 white																	
2 green																	

The chances for a), b), c) and d) are estimated using class totals divided by the total number of trials (e.g. $15 \times 16 = 240$ if there are 16 pairs of Ps). Ps use calculators to work out the chances.

If possible, use a computer program to generate more data, then the closer the probabilities will get to the theoretical results.

Notes:

Paired work, monitored

If class has an odd number of Ps, T could work with a P.

In any case, T has table drawn on BB, or uses enlarged copy master or OHP for reference.

Ps should check that their totals in the top 2 rows of the table add up to 15.

P working with T could fill in table on BB.

Individual work, monitored, helped

Reasoning, agreement, (self-correcting), praising

Whole class activity

Class table drawn on BB or use copy master or OHP

[**Note to Ts**

Theoretically, there are 30 possible outcomes using R_1, R_2, for the 2 *r*ed, etc. and all are equally likely:

	R_1	R_2	W_1	W_2	G_1	G_2
R_1		✔	✔	✔	✔	✔
R_2	✔		✔	✔	✔	✔
W_1	✔	✔		✔	✔	✔
W_2	✔	✔	✔		✔	✔
G_1	✔	✔	✔	✔		✔
G_2	✔	✔	✔	✔	✔	

So the probabilities are:

a) $\frac{6}{30} = \frac{1}{5}$ b) $\frac{24}{30} = \frac{4}{5}$

c) $\frac{8}{30} = \frac{4}{15}$ d) $\frac{2}{30} = \frac{1}{15}$]

34 min

Bk4

Lesson Plan 126

Activity		*Notes*

7

Book 4, page 126

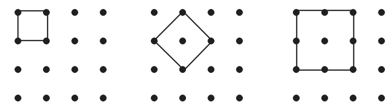
Q.3 Read: *How many squares which have vertices on the grid dots can you draw on this diagram?*

T could draw a square on grid on BB if Ps do not understand what they have to do. Set a time limit. Ps draw copies of the grid in *Ex. Bks* for their trials.

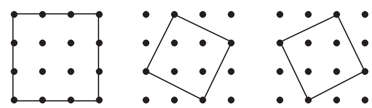
Review at BB with whole class. **A**, how many squares did you find? Come and show them to us. Who agrees? Who found more? etc. (T could have solution already prepared on 6 grids as below and uncover those that Ps did not find.)

Agree that it is possible to draw <u>20</u> squares on the grid.

Solution:



(9 of this) (4 of this) (4 of this)



(1 of this) (1 of this) (1 of this)

Notes:

Individual work, monitored, helped

Grids drawn on BB or use enlarged copy master or OHT

(or Ps have copies of copy master on desks)

Discussion, demonstration, agreement, self-correction, praising

Extra praise for Ps who found all 20 squares without help

39 min

8

Book 4, page 126

Q.4 Read: *Which digits can be the last digits of the square numbers? Continue the list in your exercise book.*

Let's see how many more you can find in 2 minutes!

Review at BB with whole class. Ps dictate the list to the T who writes on BB. Continue the list as far as any P has reached.

BB: $1 \times 1 \rightarrow \underline{1}$, $2 \times 2 \rightarrow \underline{4}$, $3 \times 3 \rightarrow \underline{9}$, $4 \times 4 \rightarrow \underline{6}$

$5 \times 5 \rightarrow \underline{5}$, $6 \times 6 \rightarrow \underline{6}$, $7 \times 7 \rightarrow \underline{9}$, $8 \times 8 \rightarrow \underline{4}$

$9 \times 9 \rightarrow \underline{1}$, $10 \times 10 \rightarrow \underline{0}$, $11 \times 11 \rightarrow \underline{1}$, $12 \times 12 \rightarrow \underline{4}$, etc.

Agree that the last digit can be 0, 1, 4, 5, 6 or 9.

T reads the statements and Ps write T or F in *Pbs*, then show their answer (on scrap paper or slates or by pre-agreed actions) in unison on command.

a) Is it true or false that in 7 different square numbers there are at least 2 in which the units digits are the same? (T)

X, why do you think so? (The first 6 numbers could all have different units digits, but the 7th number <u>must</u> have a units digit the same as one of the previous 6 numbers.)

b) *Is it true or false that in 7 different square numbers there are at least 2 in which their difference is divisible by 10?* (T)

Y, why do you think so? (The first 6 numbers could all have different units digits, but the 7th number <u>must</u> have a units digit the same as one of the previous 6 numbers, so their difference must have 0 as the units digit and is therefore divisible by 10.)

Notes:

Individual work, monitored

Differentiation by time limit

Agreement, self-correcting, praising

i.e. <u>6</u> possible units digits

In good humour!

(Ps decide on the actions if used.)

Discussion, reasoning, agreement, self-correction, praising

T helps with wording of explanations if necessary.

45 min

Bk4

R: Calculations
C: Probability games and experiments
E: Problems

Lesson Plan
127

Activity		*Notes*

1

Factorising

In your *Ex. Bk*, factorise 158 and list all its factors.

Review at BB with whole class. Ps come to BB to draw tree diagram, show the number as the product of its prime factors and list all its factors. Class agrees/disagrees. Mistakes discussed and corrected.

BB: $\boxed{\mathbf{158}} = 2 \times 79$

2 79

Factors: 1, 2, 79, 158 (It is a nice number.)

Notes: Individual work, monitored, helped

Discussion, reasoning, agreement, self-correction, praising

Ps may use a calculator.

4 min

2

Problem 1

Draw a 4 by 4 grid in your *Ex. Bk*. like this.

a) *In how many ways can you place 4 dots on the grid so that there is 1 dot in each row and column?*

Set a time limitt of 3 minutes. Review at BB with the whole class. **A**, how many ways have you find? How did you work it out? Who found more than **A**? Who worked it out without needing to draw the grids? If nobody did, allow Ps the chance to explain if they can, otherwise T gives hints

For each of the 4 possible rows in the first column, there are 3 possible rows in the 2nd column, and for each of these there are 2 possible rows in the 3rd column, and for each of these there is only 1 possible row left in the 4th column.

i.e. there are $4 \times 3 \times 2 \times 1 = \underline{24}$ possible ways.

If we wanted to show all the different patterns, we could do it without needing to draw 24 grids!

Let's label the rows 1 to 4 and the columns A to D and show one pattern of the dots.

The first dot is in column A, row 1, so we can call it A1. What will the 2nd dot be? (B2) etc. We can write each pattern in brackets:

BB: (A1, B2, C3, D4)

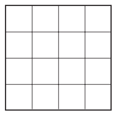
To list all the possibilities, we could write:

(A1, B2, C3, D4), (A1, B2, C4, D3), (A1, B3, C2, D4),
(A1, B3, C4, D2), (A1, B4, C2, D3), (A1, B4, C3, D2), . . .

Or, keeping the same order: A, B, C, D, we could leave out the letters and just write:

(1234), (1243), (1324), (1342), (1423), (1432), . . . When Ps understand the pattern, allow them to dictate all 24 cases.

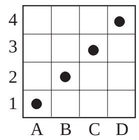
Notes: Individual work to start, monitored

BB:  (Draw, or use enlarged copy master)

Accept and praise any number found, but also elicit/tell the method of calculation opposite, explaining by referring to the diagram.

Whole class discussion.

T starts the strategy but involve Ps once they understand.

BB: 

(1234), (1243), (1324),
(1342), (1423), (1432),

(2134), (2143), (2314),
(2341), (2413), (2431),

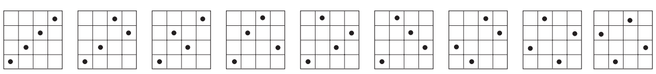
(3124), (3142), (3214),
(3241), (3412), (3421),

(4123), (4132), (4213),
(4231), (4312), (4321)

Extension

b) If we did not label the rows or columns and could rotate the grid like this (T demonstrates), would there be more or less different patterns? (Less, as e.g.1234 would be the same as 4321 and 1243 would be the same as 3421. etc.)

T sticks the different grids one at a time on BB and Ps dictate the patterns that they show. T helps by rotating the grids where necessary. Ps underline or tick each pattern as it is dealt with.

BB: 

1234 4321	1243 2134 3421 4312	1324 4231	1342 3124 3241 4132	1423 2314 2431 4213	1432 2341 3214 4123	2143 3412	2413	3142

Notes: Whole class activity

Grids drawn on card, cut out and stuck to BB (or use enlarged copy master with dots drawn/stuck on)

Agreement, praising

Elicit that there are only 9 different ways if the grid can be rotated.

13 min

Bk4

Lesson Plan 127

Activity		***Notes***

3

Book 4, page 127

Q.1 Read: *Predict the results for each outcome first, then do the experiment.*

Toss 2 coins one after the other 20 times and note how they land in this table.

Whole class introduction to clarify the task

Table drawn on BB or use enlarged copy master or OHP for reference

Demonstrate the experiment first. Ps decide which outcome they think will happen and write on scrap paper or slates. T chooses a P to come to front to toss two coins one after the other and T writes the result on BB.

In good humour!

Show me what you predicted . . . now! If you guessed correctly, give yourself a pat on the head.

In unison

Now predict how many times out of 20 you would get the outcomes in the table. Ps fill in 2nd column in table.

Paired work, monitored, helped

Ps work in pairs, taking turns to toss the coins, but both write the result in table in *Pbs*. After the 20th toss, Ps count their totals in each row.

Keep class together on the tosses if Ps are not very able.

Write a tick beside your prediction if it is equal to your real data.

Ps say whether they guessed or reasoned their predictions.

e.g.

Outcome	Prediction	Tosses 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Totals
2 Heads	6				|						|		|			|			|			5
1 Head + 1 Tail	3		|			|			|					|				|				5
1 Tail + 1 Head	4 ✔			|			|					|					|					4
2 Tails	7	|						|		|					|					|	|	6

In unison

Who has 4 (3) ticks? Let's give them a clap!

Now answer the questions using your own data. Set a time limit.

Individual work, monitored, helped

T chooses one or two Ps to give their outcome totals and their fractions. Class points out errors.

Solution e.g. using the data in the table above:

What fraction of the tosses resulted in:

a) 2 heads   *b) 2 tails*   *c) a head and a tail*   *d) at least 1 head?*

$\left(\frac{5}{20}\right)$ $\left(\frac{6}{20}\right)$ $\left(\frac{9}{20}\right)$ $\left(\frac{14}{20}\right)$

(It might be a surprise to some Ps that the outcome 1H + 1T occurred more frequently than HH or TT.)

How many different outcomes are there? (4) HH, HT, TH, TT

Whole class discussion about expected outcomes.

If the coins were evenly balanced so that one side had an equal chance of landing heads up as tails up, what fractions would you expect to get?

(4 possible outcomes with an equal chance of happening, so each outcome would have a probablity of 1 quarter.)

i.e. 5 times out of 20

But you have to be careful which coins you use, as some coins are biased. Who knows what that means? (They are not made evenly and one side tends to land face up more often than the other side.)

BB: biased

Elicit that it unfair to those who do not know!

T might tell class:

Have you heard about an experiment done by some Polish mathematicians? They found that Euro coins are biased, because when they are tossed, they land tails up more often than heads up!

In good humour!

Extension

T could collect class data and/or do the experiment using a computer program to show that the more times the experiment is done, the closer the results get to the expected values.

(Could be done in *Lesson 160*)

25 min

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Bk4

Lesson Plan 127

Activity		Notes

4

Book 4, page 127

Q.2 Read: *At the entrance to a wood there are 5 paths leading to the first clearing. From the first clearing there are 6 paths leading to the 2nd clearing. From the 2nd clearing there are 3 paths leading to the 3rd clearing.*

a) Draw a diagram to show it in your exercise book.

b) How many routes could you take from the 1st clearing to the 3rd clearing?

c) What chance would you have of guessing correctly a person's route from the entrance of the wood to the 3rd clearing?

Notes: Individual work monitored (but diagram helped or done with whole class first)

Deal with part a) first. Ps come to BB to draw the diagram (with T's help) and rest of Ps draw it in *Ex. Bks*.

Notes: Agreement, praising

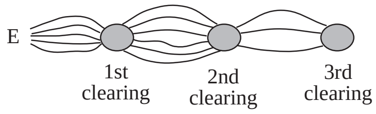
Ps read questions b) and c) themselves and write the answers.

Review with whole class . Ps could show responses on scrap paper or slates on command. Ps answering correctly explain at BB to those who were wrong. Class agrees/disagrees. Mistakes discussed and corrected.

Notes: Reasoning, agreement, self-correction, praising

Solution:

a) BB:
e.g.



b) For each of the 6 paths to the 2nd clearing, there are 3 paths to the 3rd clearing, so there are: $6 \times 3 = \underline{18}$ routes.

c) Altogether, there are $5 \times 6 \times 3 = \underline{90}$ possible routes from the entrance to the 3rd clearing, so the chance of guessing correctly is:

$$1 \text{ out of } 90, \quad \text{or} \quad \underline{\frac{1}{90}}.$$

Notes: (Unless you know that the person has a usual or favourite route.)

30 min

5

Book 4, page 127

Q.3 Read: *Predict the results for each outcome first, then do the experiment.*

Throw a dice 20 times and keep a tally of how it lands in this table.

Notes: Individual (or paired) work, monitored

T or P demonstrates experiment first if necessary. Set a time limit. Ps have dice on desks and work in pairs (or individually if they prefer).

Notes: Table drawn on BB or use enlarged copy master or OHP for reference

Notes: Remind Ps that their final totals should add up to 20.

Review table totals and compare with predictions.

e.g.

	Prediction	Tally of 20 throws	Totals
⚀	3	||||	4
⚁	4	|||	3
⚂	3	|||	3
⚃	4	|||	3
⚄	3	~~||||~~	5
⚅	3	||	2

Notes: Class applauds Ps who made accurate predictions by reasoning rather than by guessing.

Ps read questions themselves and write answers in *Pbs* using their own data.

Notes: Individual work, monitored, helped

Bk4		*Lesson Plan 127*
Activity		***Notes***
5	(Continued) T chooses one or two Ps to give their totals and answers and class checks whether they are correct. *Solutions:* e.g. using data from table above *How many times did you get:* *a)* *a 2 or a 3* (6) *b)* *less than 5* (13) *c)* *not less than 5* (7) *d)* *not more than 6* (20) *e)* *more than 6?* (0) What fraction of the 20 throws were these numbers? a) $\frac{6}{20} = \frac{3}{10}$ b) $\frac{13}{20}$ c) $\frac{7}{20}$ d) $\frac{20}{20} = 1$ e) $\frac{0}{20} = 0$ If you throw a dice once, how many possible outcomes are there? (6) If each number has an <u>equal</u> chance of being thrown, what is the probability of you throwing a 6? (1 out of 6 times, or $\frac{1}{6}$)	Reasoning, agreement, self-correcting, praising T elicits/points out that if an outcome is: • <u>certain</u> of happening, as d), its probability is 1; • impossible, as e), its probability is 0.
Extension	T could collect class data or use a computer program to show that the more times a dice is thrown, the closer the real data gets to what is expected. *40 min*	
6	**Problem 2** Listen carefully and tell me whether you think that the statement is true or false. (Ps show T or F on slates or use pre-agreed actions.) *There are 2 red, 2 white and 2 green counters in a bag. I take out two counters with my eyes shut. Are these statements true or false?* a) It is <u>possible</u> that both counters are *green.* (T) b) It is <u>certain</u> that both counters are *green.* (F) c) It is <u>impossible</u> that both counters are *green*. (F) d) It is <u>certain</u> that one of the 2 counters is *green*. (F) e) It is <u>possible</u> that one of the 2 counters is *green*. (T) *45 min*	Whole class activity Ps can choose the actions. Responses shown in unison on command. Ps responding correctly explain to those who were wrong In good humour! Praising, encouragement only

Bk4	R: Calculations C: **Probability games and experiments** E: *Problems*	*Lesson Plan* *128*

Activity		***Notes***
1	**Factorising** In your *Ex. Bk*, factorise 159 and list all its factors. Review at BB with whole class. Ps come to BB to draw tree diagram, show the number as the product of its prime factors and list <u>all</u> its factors. Class agrees/disagrees. Mistakes discussed and corrected. BB: $\boxed{\mathbf{159}} = 3 \times 53$ 3 53 Factors: 1, 3, 53, 159 (It is a <u>nice</u> number.) *4 min*	Individual work, monitored, helped Discussion, reasoning, agreement, self-correction, praising Ps may use a calculator.
2	**Problem 1** Listen carefully and think about how you would solve this problem. *The sum of 5 adjacent natural numbers is 5 times 25. What are the numbers?* Allow Ps 2 or 3 minutes to think about it and try to work it out. Ps may discuss with their neighbours if they wish. Who thinks that they know what to do. Come and explain it to us. Who agrees? Who would do it another way? etc. e.g. $5 \times 25 = 25 + 25 + 25 + 25 + 25 = 125$ so the 5 adjacent numbers must each be close to 25: $23 + 24 + 25 + 26 + 27 = \underline{125}$ ✔ *Answer:* The 5 adjacent numbers are 23, 24, 25, 26 and 27. *8 min*	Individual trial first, then whole class solution Ps tell their ideas and findings to class. Reasoning, checking, agreement, praising Elicit that: $24 + 26 = 23 + 27 = 50$ T chooses a P to answer in a sentence.
3	**Problem 2** If we throw a *red* and a *white* dice at the same time, what are the possible outcomes? Let's write the *red* number first, then the *white* number. Ps dictate what T should write on BB. BB: (1, 1) (1, 2) (1, 3) (1, 4) (1, 5) (1, 6); (2, 1) (2, 2) (2, 3) (2, 4) (2, 5) (2, 6); (3, 1) (3, 2) (3, 3) (3, 4) (3, 5) (3, 6); (4, 1) (4, 2) (4, 3) (4, 4) (4, 5) (4, 6); (5, 1) (5, 2) (5, 3) (5, 4) (5, 5) (5, 6); (6, 1) (6, 2) (6, 3) (6, 4) (6, 5) (6, 6) Agree that there ate 36 possible outcomes. Could we have worked it out without writing them all down? (Yes –for each of the 6 possible outcomes on the *red* dice, there are 6 possible outcomes on the *white* dice, i.e. $6 \times 6 = 36$)	Whole class activity Ps dictate in order round class. Class points out errors. Agreement, praising Discussion, agreeement, praising
Extension	If the dice are not biased, what is the probability of you throwing 2 sixes? ($\frac{1}{36}$, as each of the 36 outcomes has an <u>equal</u> chance of happening) *14 min*	Ps could show fraction on scrap paper or slates in unison on command.

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Bk4

Lesson Plan 128

Activity		*Notes*

4

Problem 3

Listen carefully and think about how you would solve this problem.

In how many ways could you draw 5 dots on this 5 × 5 grid so that there is 1 dot in each row and column?

X, what do you thank that we should do? Who agrees? Who thinks something else? etc. Ps tell class their ideas.

Reasoning: e.g.

The rows and columns are labelled, so we cannot turn the grid.

For each of the possible 5 rows in column A, there are 4 possible rows in column B, 3 possible rows in column C, 2 possible rows in column D and only 1 possible row in column D, so there are

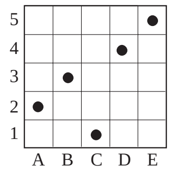
BB: $5 \times 4 \times 3 \times 2 \times 1 = \underline{120}$ ways

20 min

Whole class activity

Drawn on BB or use enlarged copy master or OHP

BB: e.g.



Discussion, reasoning, agreement, praising

T helps with wording if necessary.

5

Book 4, page 128

Q.1 Read: *Throw 2 dice at the same time 36 times. Keep a tally of the outcomes here.*

If possible, Ps should have 2 different coloured dice each, but otherwise Ps work in pairs with one dice each.

Set a time limit or keep class together on the throws.

e.g.

<table>
<tr><td>1 and 1</td><td>|</td></tr>
<tr><td>1 and 2</td><td>||</td></tr>
<tr><td>1 and 3</td><td>|</td></tr>
<tr><td>1 and 4</td><td>||</td></tr>
<tr><td>1 and 5</td><td>|||</td></tr>
<tr><td>1 and 6</td><td>||</td></tr>
</table>

<table>
<tr><td>2 and 2</td><td>||</td></tr>
<tr><td>2 and 3</td><td>||</td></tr>
<tr><td>2 and 4</td><td>||</td></tr>
<tr><td>2 and 5</td><td>||</td></tr>
<tr><td>2 and 6</td><td>||</td></tr>
</table>

<table>
<tr><td>3 and 3</td><td>|</td></tr>
<tr><td>3 and 4</td><td>|||</td></tr>
<tr><td>3 and 5</td><td>||</td></tr>
<tr><td>3 and 6</td><td>|</td></tr>
</table>

<table>
<tr><td>6 and 6</td><td>|</td></tr>
</table>

<table>
<tr><td>4 and 4</td><td></td></tr>
<tr><td>4 and 5</td><td>|||</td></tr>
<tr><td>4 and 6</td><td>|</td></tr>
</table>

<table>
<tr><td>5 and 5</td><td>||</td></tr>
<tr><td>5 and 6</td><td>|</td></tr>
</table>

[T could collect the class data if there is time.]

After the 36 throws, Ps read the questions themselves and answer the using their own data (or if class is not very able, deal with one question at a time). T monitors thoroughly, correcting mistakes.

Choose some Ps to show and explain their results to class. Class agrees/disagrees with their reasoning and answers.

Solution: (e.g. using the data in the tables above)

a) *How many times were these numbers the **product** of the two numbers?*

1	2	3	4	5	6	8	9	10	12	15	16	18	20	24	25	30	36
1	2	1	4	3	4	2	1	2	5	2	0	1	3	1	2	1	1

b) *How many times was the product of the two numbers even?* (26)

What fraction is it of the 36 throws? $\left(\frac{26}{36} = \frac{13}{18}\right)$

c) *How many times were these numbers the **sum** of the two numbers thrown?*

$\cancel{1}$	2	3	4	5	6	7	8	9	10	11	12	$\cancel{13}$
$\cancel{0}$	1	2	3	4	6	7	4	4	3	1	1	$\cancel{0}$

Elicit that 0 and 13 are impossible!

Individual (or paired) work, monitored, helped

Tables drawn on BB or use enlarged copy master or OHP for reference

(or for collecting class data)

Individual work, monitored closely, praising

Reasoning, checking, agreement, praising

Bk4

Lesson Plan 128

Activity | **Notes**

5

(Continued)

d) *How many times was the sum of the two numbers even?* (18)

What fraction is it of the 36 throws? ($\frac{18}{36} = \frac{1}{2}$)

Extension

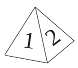
Ps could think of questions to ask about the class data if collected.

30 min

6

Book 4, page 128

Q.2 Read: *Leslie threw a pyramid-shaped dice 100 times. It has 5 written on its square base and 1, 2, 3 and 4 written on its triangular sides.*



T has a large model to show to class. Ps could demonstrate the experiment a few times so that T can explain the table. Elicit that there are 5 possible <u>outcomes</u>: landing on 1, 2, 3, 4 or 5.

Read: *Leslie made this table to show how many times* (T points to <u>frequency</u> in table) *the dice landed on each number* (T points to <u>outcome</u> in the table). *We say that it shows the **frequency** of each **outcome**.* (i.e. how many times it landed on each number)

a) Read: *Write in the bottom row of the table what fraction of the 100 times each number was landed on.*

*This is called the **probability** of an outcome happening.*

Ps complete table. Review at BB with whole class.
What would the fractions be as decimals? Ps dictate to T.

b) Read: *How many times did Leslie throw:*

i) *at most a 3* (15 + 18 + 19 = <u>52</u>)

ii) *at least a 3?* (19 + 16 + 32 = <u>67</u>)

Individual work but class kept together on each question

(or whole class activity)

Large dice already prepared beforehand, table drawn on BB or use enlarged copy master or OHP

Initial discussion to ensure that Ps understand the task and vocabulary

BB:

Outcome	1	2	3	4	5
Frequency	15	18	19	16	32
Probability	$\frac{15}{100}$	$\frac{18}{100}$	$\frac{19}{100}$	$\frac{16}{100}$	$\frac{32}{100}$
	0.15	0.18	0.19	0.16	0.32

Reasoning, agreement, self-correction, praising

Ps think of other questions to ask about the data.

35 min

7

Problem 3

Listen carefully, picture the problem in your head and think about how you would solve it. Discuss it with your neighbour if you wish.

In a game, they chose only players whose birthdays are on the 13th of any month

*How many players could they have chosen if it is **certain** that among them were 3 players who were born in the same month?*

Who thinks that they know what to do? Who agrees? Who would do it another way? etc. Ps tell their ideas to class. If no P is on the right track, T gives hints and class solve it together.

Solution: e.g.

If the first 12 players all have birthdays on the 13th day of different months, and so do the next 12 players, the 25th player <u>must</u> have a birthday in the same month as two other players.

(However, it is possible, but not certain, that the first 3 players chosen could all have the same birthday!)

Answer: The least number of players chosen to be certain of there being 3 players who were born in the same month is 25.

Whole class activity

T repeats slowly to give Ps time to think and discuss.

In unison

Discussion, reasoning, agreement, praising

T helps with wording of explanation if necessary if Ps have the right idea.

Who could write it mathematically?

BB: $n \geq 25$

40 min

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Bk4		*Lesson Plan 128*
Activity		***Notes***
8	***Book 4, page128***	
	Q.3 Read: *If we toss a 10 p, a 20 p and a 50 p coin at the same time just once, which sides could face up?*	Individual work, monitored, helped
	Write T or H in the table.	Drawn on BB or use enlarged copy master or OHP
	Less able Ps could have model coins on desks to help them.	
	Set a time limit. Reiew with whole class. Ps come to BB or dictate to T. Class agrees/disagrees. Mistakes discussed and corrected.	Agreement, self-correction, praising
	Solution:	

Possible outcomes

10 p coin	T	T	T	H	T	H	H	H		
20 p coin	T	T	H	T	H	T	H	H		
50 p coin	T	H	T	T	H	H	T	H		

	Who could have worked out the answer without a table?	With T's help with wording if P has the right idea
	(For each of the two possible sides of the 50 p coin, there are two possible sides of the 20 p coin, and for each of these there are 2 possible sides of the 10 p coin, i.e. there are: $2 \times 2 \times 2 = \underline{8}$ possible outcomes so the last 2 columns in the table are not needed.)	Extra praising
Extension	Ps think of probability questions to ask about the data.	Whole class activity
	(e.g. What is the chance of the 3 coins landing Heads up?) $\left(\frac{1}{8}\right)$	In good humour!

45 min

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Bk4

R: Mental calculation
C: Revision and practice
E: Problems

Lesson Plan 129

Activity		*Notes*

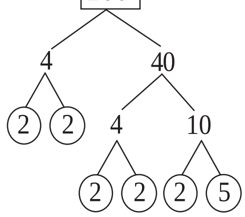
1

Factorising

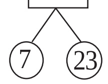
In your *Ex. Bk,* factorise 160 and 161 and then list all their factors.

Review at BB with whole class. Ps come to BB to draw tree diagrams, show the numbers as the product of their prime factors and list <u>all</u> their factors. Class agrees/disagrees. Mistakes discussed and corrected.

BB: $\boxed{\mathbf{160}} = 2 \times 2 \times 2 \times 2 \times 2 \times 5$



$\boxed{\mathbf{161}} = 7 \times 23$



Factors:

160: 1, 2, 4, 5, 8, 10, 16, 20, 32, 40, 80, 160

161: 1, 7, 23, 161 (It is a <u>nice</u> number!)

Notes: Individual work, monitored, helped

Discussion, reasoning, agreement, self-correction, praising

Ps may use a calculator.

Ps join up the factor pairs for 160.

Feedback for T

6 min

2

Problem 1

Listen carefully and think about how you would solve this problem.

In how many ways could you draw 6 dots on this 6 × 6 grid so that there is 1 dot in each row and column?

X, what do you thank that we should do? Who agrees? Who thinks something else? etc. Ps tell class their ideas.

Reasoning: e.g.

The rows and columns are labelled, so we cannot turn the grid.

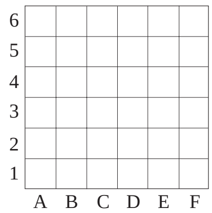
For each of the possible <u>6</u> rows in column A, there are <u>5</u> possible rows in column B, for each of these there are <u>4</u> possible rows in column C, for each of these there are <u>3</u> possible rows in column D, for each of these there are <u>2</u> possible rows in column E and for each of these there is only <u>1</u> possible row in column F, so there are

BB: $6 \times 5 \times 4 \times 3 \times 2 \times 1 = \underline{720}$ ways

Notes: Whole class activity

Drawn on BB or use enlarged copy master or OHP

BB:



Discussion, reasoning, agreement, praising

T helps with wording if necessary.

11 min

3

Problem 2

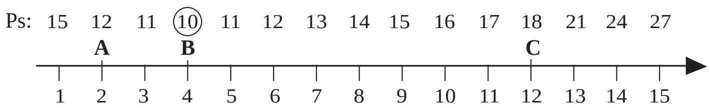
Three friends, Alan, Ben and Charlie, live in the same street. Alan lives at no. 2, Ben lives at no. 4 and Charlie lives at no. 12. The houses in their street are the same distance apart.

Here is a diagram of their street showing the house numbers. They want to meet at a house on the street where the total distance they have to walk is as short as possible. Let's work out where they should meet.

What should we do first? (Write the number of houses they have to pass in total above each house, then see which is the smallest.)

Ps come to BB or dictate to T, explaining reasoning. Class checks that they are correct.

BB:



Agree that the meeting point should be at <u>no. 4</u> (Ben's house).

Notes: Whole class activity

Drawn on BB or use enlarged copy master or OHP

Discussion on strategy for solution.

Accept and praise any positive contribution. If no P thinks of the idea opposite, T gives hints or suggests it.

At a good pace

Ps can work out the totals in *Ex. Bks* first before coming to BB.

Reasoning, agreement, praising

16 min

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Bk4

Lesson Plan 129

Activity		*Notes*

4

Book 4, page 129

Q.1 Read: *Calculate the product of the 7 smallest*

a) postive, even whole numbers

b) 1-digit numbers.

Ps write plans in *Pbs*, do calculations in *Ex. Bks*, then write answers in *Pbs*. Set a time limit.

Review with whole class. Ps could show results on scrap paper or slates on command. Ps answering correctly explain reasoning at BB. Who did the same? Who did it another way? etc. Mistakes discussed and corrected.

Solution: e.g.

a) $2 \times 4 \times 6 \times 8 \times 10 \times 12 \times 14$

$= 8 \times 6 \times 8 \times 10 \times 168 = 8 \times 6 \times 8 \times 1680$

$= 8 \times 6 \times 13440 = 8 \times 80\,640 = \underline{645\,120}$

b) $0 \times 1 \times 2 \times 3 \times 4 \times 5 \times 6 = \underline{0}$

What is another name for positive, even whole numbers? (<u>natural</u> numbers)

What is another name for a whole number? (<u>integer</u>)

Remind Ps that an integer can be positive or negative or zero.

Elicit that zero is neither positive nor negative.

Notes:

Individual work, monitored (less able helped)

Ps can use any combination of multiplications.

In unison

Reasoning, agreement, self-correction, praising

C: e.g.

$$\begin{array}{r} 1680 \\ \times 8 \\ \hline 13440 \\ {\scriptstyle 5\,6} \end{array} \qquad \begin{array}{r} 13440 \\ \times 6 \\ \hline 80640 \\ {\scriptstyle 2\,2\,2} \end{array} \qquad \begin{array}{r} 80640 \\ \times 8 \\ \hline 645120 \\ {\scriptstyle 5\,3} \end{array}$$

Revision of types of numbers.

Agreement, praising

21 min

5

Book 4, page 129

Q.2 Read: *Circle the natural numbers up to 100 which have only two factors. (e.g. the only factors of 7 are 7 and 1)*

We call these numbers <u>prime numbers</u>.

List them in increasing order.

Ps try out divisors 2, 3, 5, 7 and 9 in *Pbs* if necessary, although Ps might use other strategies (e.g. after circling 2, we know that any other even number is <u>not</u> a prime number, so can be crossed out; after circling 3, we know that any other multiple of 3 is <u>not</u> a prime number, so can be crossed out, etc.)

Review with whole class. Ps come to BB or dictate to T. Class agrees/disagrees. Mistakes discussed and corrected.

Elicit that 1 is <u>not</u> a prime number as it has only 1 factor – itself!

Solution:

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89, 97

Notes:

Individual work, monitored, helped

Written on BB or use enlarged copy master or OHP

Discussion, agreement, self-correction, praising

Feedback for T

29 min

Bk4

Lesson Plan 129

Activity

Notes

6

Book 4, page 129

Q.3 Read: *Practise calculation.*

Let's see how many you can do in 5 minutes! Remember to check your answers! Start . . . now! . . . Stop!

Review with whole class. Ps come to BB to write results, explaining with place-value detail. Class agrees/disagrees. Mistakes discussed and corrected.

Show e) and f) as long multiplication, and g) and h) as long division, if problems.

Who had all 8 correct? Let's give them a round of applause!

Who had 1 mistake (2, 3, 4, more than 4 mistakes)? T notes Ps having difficulty and sets them extra similar calculations for homework.

Solution:

a)
$$\begin{array}{r} 6\,0\,4\,7 \\ 5\,9\,2\,8 \\ +\quad 3\,1\,4 \\ \hline 1\,2\,2\,8\,9 \\ {\scriptstyle 1\quad 1\ \ } \end{array}$$

b)
$$\begin{array}{r} 4\,0\,5.6 \\ 3\,9.2 \\ +\ 1\,0\,0.7 \\ \hline 5\,4\,5.5 \\ {\scriptstyle 1\ 1\ \ \ } \end{array}$$

c)
$$\begin{array}{r} 1\,{}^{10}2\,4\,{}^{10}0\,5 \\ -\ {}_1\ 8\,0_1\,4\,3 \\ \hline 4\,3\,6\,2 \end{array}$$

d)
$$\begin{array}{r} 5\,9.{}^{10}2 \\ -\ 1\,3_1.7 \\ \hline 4\,5.5 \end{array}$$

e)
$$\begin{array}{r} 2\,8\,0\,3 \\ \times\ 6 \\ \hline 1\,6\,8\,1\,8 \\ {\scriptstyle 4\quad 1\ \ } \end{array}$$

f)
$$\begin{array}{r} 9\,9\,9 \\ \times\ 9 \\ \hline 8\,9\,9\,1 \\ {\scriptstyle 8\ 8\ \ \ } \end{array}$$

g)
$$\begin{array}{r} 1\,9\,2\,0 \ \text{r}\,2 \\ 8\,\big)\,1\,5\,3\,6\,2 \\ {\scriptstyle 7\ 1\quad 2} \end{array}$$

h)
$$\begin{array}{r} 6\,1\,5 \ \text{r}\,4 \\ 7\,\big)\,4\,3\,0\,9 \\ {\scriptstyle 1\ 3\ 4} \end{array}$$

Individual work, monitored, (helped)

Drawn on BB or use enlarged copy master or OHP

Reasoning, agreement, self-correction, praising

Evaluation, praising

Feedback for T

38 min

7

Book 4, page 129

Q.4 Read: *A cuboid is built from 20 unit cubes. We know that the lengths of its edges are whole units and more than 1 unit. Work out the answers in your exercise book.*

a) How long are its edges?

b) What is its surface area in unit squares?

Set a time limit. (If Ps are struggling, T gives hint about finding the factors of 20 and about drawing a diagram.)

Review at BB with whole class. Ps come to BB to explain reasoning. Class agrees/disagrees. Mistakes discussed/corrected.

Solution:

a) As $20 = 2 \times 2 \times 5$, and there is no other 3-term multiplication possible, the three edges are:

$a = 2$ units, $b = 2$ units, $c = 5$ units

T could have a large model already prepared as confirmation.

b) $A = 2 \times (2 \times 2) + 4 \times (2 \times 5)$

$= 2 \times 4 + 4 \times 10 = 8 + 40 = \underline{48}$ (unit squares)

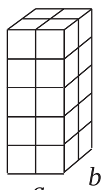
Individual work, monitored, helped

Less able Ps could have 20 unit cubes on desks.

Or ask Ps to think of 20 as the product of 3 numbers.

Discussion, reasoning, checking, agreement, self-correcting, praising

Model, or diagram on BB:



c a b

42 min

Bk4		*Lesson Plan 129*
Activity		***Notes***
8	***Book 4, page 129*** Q.5 Read: *Tom has ducks and pigs on his farm, 8 in total. They have 22 legs altogether.* *How many ducks and how many pigs does Tom have? Work out the answer in yur exercise book.* Set a time limit. Ps can use any method, but encourage Ps to use mathematical reasoning. Review with whole class. If you have an answer, show me . . . now! ($D = 5$, $P = 3$) P answering correctly explains at BB. Who did the same? Who worked it out in a different way? etc. *Solution:* e.g. Let number of pigs be P and number of ducks be D. $P + D = 8$, so $D = 8 - P$ $2 \times D + 4 \times P = 22$ Putting $(8 - P)$ instead of D in equation: $2 \times (8 - P) + 4 \times P = 22$ $16 - 2 \times P + 4 \times P = 22$ $2 \times P = 22 - 16 = 6$ $P = 6 \div 2 = \underline{3}$ and so $D = 8 - P = 8 - 3 = \underline{5}$ *Check:* $5 \times 2 + 3 \times 4 = 10 + 12 = 22$ ✔ *Answer:* Tom has 3 pigs and 5 ducks. *45 min*	Individual work, monitored, helped (or whole class activity if time is short) Discussion, reasoning, agreement, self-correcting, praising Accept any valid method which gives the correct result, including trial and error, but also show the solution opposite. (If no P has correct answer, class solves it with T's help.)

Bk4

R: Mental calculation

C: Revision and practice

E: Problems

Lesson Plan 130

Activity		*Notes*

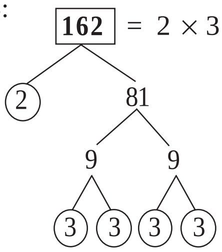
1

Factorising

In your *Ex. Bk*, factorise 162 and then list all its factors.

Review at BB with whole class. Ps come to BB to draw tree diagram, show the numbe as the product of its prime factors and list <u>all</u> its factors. Class agrees/disagrees. Mistakes discussed and corrected.

BB: $\boxed{162} = 2 \times 3 \times 3 \times 3 \times 3$



Factors: 1, 2, 3, 6, 9, 18, 27, 54, 81, 162

Notes: Individual work, monitored, helped

Discussion, reasoning, agreement, self-correction, praising

Ps may use a calculator.

Ps join up the factor pairs.

Feedback for T

4 min

2

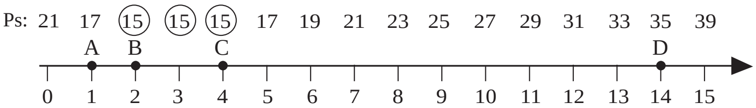
Problem 1

Which point on the line is the shortest total distance from the 4 points, A, B, C and D?

How could we work it out? (Ps might notice the similarity to *Activity 3* in *Lesson 161*, but if not, T reminds Ps about it.)

T points to each number marked on the number line in turn and Ps come to BB or dictate its total distance from the 4 points. Encourage mental calculation if possible. Class points out errors.

BB:



Agree that there are 3 points with the shortest total distance (15) from A, B, C and D: at 2 (B), 3 and 4 (C).

Notes: Whole class activity

Drawn on BB or use enlarged copy master or OHP

Discussion on strategy for solution.

At a good pace

Reasoning, agreement, praising

Feedback for T

9 min

3

Book 4, page 130

Q.1 Read: *Practise calculation. Do the operations in the correct order.*

Revise order of operations first if necessary. Set a time limit. Ps do necessary calculations in *Ex. Bks*, write the interim results above each operation sign and write the answers in *Pbs*.

Review with whole class. Ps come to BB or dictate to T, explaining reasoning. If problems or disagreement, Ps do calculations at side of BB, reasoning with place-value detail. Mistakes discussed and corrected.

What did you notice about the two operations in each part?

Solution:

a) $2756 \overset{1408}{-} 1348 + 220 = \boxed{1628}$ $=$ $2756 - (1348 \overset{1128}{-} 220) = \boxed{1628}$

b) $2756 \overset{11024}{\times} 4 + 1348 \overset{5392}{\times} 4 = \boxed{16416}$ $=$ $(2756 \overset{4104}{+} 1348) \times 4 = \boxed{16416}$

c) $(6315 \overset{4589}{-} 1726) \times 3 = \boxed{13767}$ $=$ $6315 \overset{18945}{\times} 3 - 1726 \overset{5178}{\times} 3 = \boxed{13767}$

d) $10256 \overset{2564}{\div} 4 - 2372 \overset{593}{\div} 4 = \boxed{1971}$ $=$ $(10256 \overset{7884}{-} 2372) \div 4 = \boxed{1971}$

e) $2187 \div (9 \overset{3}{\div} 3) = \boxed{729}$ $>$ $2187 \overset{243}{\div} 9 \div 3 = \boxed{81}$

f) $2187 \overset{19683}{\times} 9 \div 3 = \boxed{6561}$ $=$ $2187 \times (9 \overset{3}{\div} 3) = \boxed{6561}$

Notes: Individual work, monitored, helped

Written on BB or use enlarged copy master or OHP

Differentiation by time limit (or if class is not very able, T chooses only one or two)

Reasoning, agreement, self-correction, praising

Extra praise if Ps noticed that [apart from e)] the calculations on RHS have the same result as on LHS, so they only had to do half of the calculations.

In e), elicit that dividing by 9 and then by 3 is the same as dividing by 27.

27 min

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Bk4

Lesson Plan 130

Activity		*Notes*
4	***Book 4, page 130***	
	Q.2 Read: *Plan, estimate, calculate and check in your exercise book. Write the answers here.*	Individual work, monitored helped
	Deal with one question at a time. Ps read problems themselves, solve in *Ex. Bks*. and write only the answers in *Pbs*.	
	Review with whole class. Ps could write answers on slates or scrap paper and show on command. Ps answering correctly explain at BB to those who were wrong. Who agrees? Who did it a different way? etc. Mistakes discussed and corrected.	Discussion, reasoning, agreement, checking, self-correction, praising
	Solutions:	
	a) *In a large container there are 18 649 litres of water.* *In a smaller container there are 12 450 litres less.* *How much water is in the smaller container?* *Plan:* 18 649 – 12 450 (litres) *E:* 19 000 – 12 000 = 7 000 (litres) *Answer:* There are 6199 litres in the smaller container.	*C:* $\begin{array}{r} 1\,8\,6\,\overset{10}{4}\,9 \\ -\ 1\,2\,{}_{1}4\,5\,0 \\ \hline 6\,1\,9\,9 \\ \hline \end{array}$
	b) *Andrew has £6278 and James has £2327 more.* *How much money will James have left after spending £1796?* *Plan:* £6278 + £2327 – £1796 *E:* £6000 + £2000 – £2000 = £6 000 *Answer:* James will have £6809 left.	*C:* $\begin{array}{r} 6\,2\,7\,8 \\ +\ 2\,3\,2\,7 \\ \hline 8\,6\,0\,5 \\ \hline {\scriptstyle 1\ 1}\ \ \end{array}$ $\quad\begin{array}{r} 8\,\overset{10}{6}\,\overset{10}{0}\,\overset{10}{5} \\ -\ 1\,{}_{1}7\,{}_{1}9\,{}_{1}6 \\ \hline 6\,8\,0\,9 \\ \hline \end{array}$
	c) *A cruise to a certain holiday destination costs £875 per person.*	
	i) *How much would it cost for a group of 4 people?* *Plan:* £875 × 4 *E:* £900 × 4 = £3600 *Answer:* It would cost £3500 for 4 people.	$\begin{array}{r} 8\,7\,5 \\ \times 4 \\ \hline 3\,5\,0\,0 \\ \hline {\scriptstyle 3\ 2}\ \ \ \end{array}$
	ii) *How much would it cost for a group of 8 people?* *Plan:* £875 × 8 (or £3500 × 2) *E:* £900 × 8 = £7200 *Answer:* It would cost £7000 for 8 people.	$\begin{array}{r} 8\,7\,5 \\ \times 8 \\ \hline 7\,0\,0\,0 \\ \hline {\scriptstyle 6\ 4}\ \ \ \end{array}$
	iii) *How much would it cost for each group if they travelled by plane for £400 less each?* 4-group: *Plan:* (£875 – £400) × 4 = £475 × 4 *E:* £500 × 4 = £2000 *Answer:* It would cost £1900 for 4 people.	$\begin{array}{r} 4\,7\,5 \\ \times 4 \\ \hline 1\,9\,0\,0 \\ \hline {\scriptstyle 3\ 2}\ \ \ \end{array}$ (or £3500 – £1600)
	8-group: *Plan:* (£875 – £400) × 8 = £475 × 8 *E:* £500 × 8 = £4000 *Answer:* It would cost £3800 for 8 people.	$\begin{array}{r} 4\,7\,5 \\ \times 8 \\ \hline 3\,8\,0\,0 \\ \hline {\scriptstyle 6\ 4}\ \ \ \end{array}$ (or £1900 × 2) (or £7000 – £3200)

36 min

Bk4

Lesson Plan 130

Activity		*Notes*

5

Book 4, page 130

Q.3 Read: *Where could you put '+' signs among the digits 1 to 7 so that the sum is 100? You must keep the digits in increasing order!)*

T writes the digits 1 to 7 on BB. Allow Ps a couple of mintues to try it in *Ex. Bks.* Who has solved it? Come and show us. Who agrees? Who has found a different solution? etc.

If no P has found an answer, T gives hint about 2-digit numbers and class solves it together. Ps write a solution in *Pbs*.

Solution:

BB: $1 + 2 + 34 + 56 + 7 = 100$

or $1 + 23 + 4 + 5 + 67 = 100$

Notes: Individual trial first, monitored

BB: 1 2 3 4 5 6 7

Reasoning, checking, agreement, praising

Extra praise if Ps found a solution without help from T.

39 min

6

Book 4, page 130

Q.4 Read: *Point A stands for 1 fifth and Point B stands for 7 tenths. Mark the positions of 0 and 1.*

How can we do it? T asks several Ps what they think. Elicit that the distance between A and B is 5 tenths (7 tenths – 2 tenths) of a unit, so if we measure it, we can work out what 1 tenth of a unit is and then where 0 and 1 should be.

Ps measure with rulers and mark the tenths and 0 and 1 in *Pbs.*

Review with whole class. Ps come to BB to explain and mark the tenths with a BB ruler. Class agrees/disagrees.

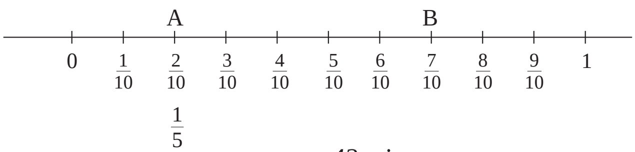
Solution: A to B*:* 5 tenths of a unit $\rightarrow$ 5 cm

1 tenth of a unit $\rightarrow$ 1 cm

0 is 2 tenths of a unit, i.e. 2 cm, to the left of A.

1 is 3 tenths of a unit, i.e. 3 cm, to the right of B.

BB:



Notes: *Ps have rulers on desks.*

Whole class discussion on strategy for solution, then individual work, monitored, helped

Drawn on BB or use enlarged copy master or OHP for demonstration only

Discussion, reasoning, agreement, self-correction, praising

Extra praise If Ps explained how to solve the problem without help from T.

(Ps do not need to mark every tenth in *Pbs*, just 0 and 1)

42 min

7

Book 4, page 130, Q.5

Read: *Check the results and correct the answer if it is wrong.*

What should we do first? (Change the Roman numerals into Arabic numbers.) Revise Roman numerals if necessary.

Ps come to BB or dictate what T should write. Class agrees/disagrees.

In the case of b), which is wrong, Ps suggest how to correct it.

Solution:

a) CLXXXVI ÷ III = LXII

186 ÷ 3 = 62 ✔

b) MMII – MCMXCIX = V

2002 – 1999 = 5 ✕

Correction: e.g.

MMII – MCMXCIX = III

or MMII – MCMXCVII = V

or MMIV – MCMXCIX = V

or MMII – MCMXCIX ≠ V, etc.

Notes: Whole class activity

Written on BB or SB or OHT

Involve several Ps.

Reasoning, agreement, correcting, praising

a) C = 100,

LXXX = 50 + 30 = 80

VI = 5 + 1 = 6

100 + 80 + 6 = <u>186</u>

b) MMII = 2000 + 2 = <u>2002</u>

M = 1000

CM = 1000 – 100 = 900

XC = 100 – 10 = 90

IX = 10 – 1 = 9

1000 + 900 + 90 + 9 = <u>1999</u>

45 min

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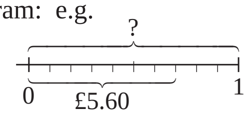
Bk4	R: Mental calculation **C: Revision and practice** *E: Problems*	*Lesson Plan 131*
Activity		***Notes***
1	**Factorising** Let's factorise 163 and then list all its factors. Ps dictate or come to BB to try each of the prime numbers, 2, 3, 5, 7 and 11 as divisors, using 'quick' methods where possible. Should we try dividing by 13? (No, as $13 \times 13 = 169 > 163$) Elicit that 163 is a <u>prime number</u>, and its factors are 1 and 163. *4 min*	Whole class activity At a good pace Ps explain reasoning or do divisions at side of BB. Class agrees/disagrees Praising
2	***Book 4, page 131*** Q.1 Read: *In your exercise book, write 2-term additions using the numbers in Set A.* BB: $A = \{-3, 2, 1, 0, -5, 6\}$ What could we do first to make the task easier? (Put them in increasing order.) Ps dictate to T who writes on BB and Ps write in *Pbs*. Let's see how many you can write and solve in 5 minutes! Start . . .now! . . . Stop! Review with whole class. Ps dictate additions and T writes on BB in a logical order. Class points out errors in solution or additions missed. Accept what Ps dictate for the moment. a) Read: *How many additions are possible?* Elicit that for each of the 6 possible 1st terms, there are 5 possible 2nd terms, i.e. $6 \times 5 = \underline{30}$ possible additions, <u>but</u> as the terms of an addition are inter-changeable, e.g. 2 + 1 = 1 + 2, we must divide 30 by 2, so <u>15</u> different additions are possible. Ps check that there are 15 additions on BB and dictate any missing. BB: $-5 + (-3) = -8$, $-5 + 0 = -5$, $-5 + 1 = -4$, $-5 + 2 = -3$, $-5 + 6 = 1$; $-3 + 0 = -3$, $-3 + 1 = -2$, $-3 + 2 = -1$, $-3 + 6 = 3$; $0 + 1 = 1$, $0 + 2 = 2$, $0 + 6 = 6$; $1 + 2 = 3$, $1 + 6 = 7$; $2 + 6 = 8$ b) Read: *How many results are* *i) positive* (8, but only 6 <u>different</u> results) *ii) negative?* (7, but only 6 <u>different</u> results) *14 min*	Individual work, monitored, helped Written on BB or SB or OHT BB: $-5, -3, 0, 1, 2, 6$ Differentiation by time limit. Reasoning, agreement, self-correction, praising Whole class acitivty T asks several Ps what they think. T gives hints if necessary. Agreement, checking, praising Ps shout out numbers in unison. Elicit how many <u>different</u> results there are.

Bk4

Lesson Plan 131

Activity		Notes
3	***Book 4, page 131*** Q.2 Read: *Solve this problem in your exercise book. Write only the answer here.* Ps read problem themselves and solve it in *Ex. Bks.* Set a time limit. Remind Ps to check their answers! Review with whole class. Ps could show answer on scrap paper or slates on command. P answering correctly explains at BB to those who were wrong. Mistakes discussed and corrected. *Solution:* *If my father takes 20 paces forward, he covers a distance of 16 m. If I take 10 paces forward, I cover a distance of 7 m.* *How much longer is one of my father's paces than one of mine?* BB: e.g. F: 20 paces $\rightarrow$ 16 m 10 paces $\rightarrow$ 8 m Me: 10 paces $\rightarrow$ 7 m Difference in 10 paces: 8 m – 7 m = 1 m = 100 cm Difference in 1 pace: 100 cm $\div$ 10 = <u>10 cm</u> *Answer:* The father's pace is 10 cm longer than his child's pace. *19 min*	Individual work, monitored, helped Reasoning, agreement, self-correction, praising Check in the context of the question. Or F: 1 pace $\rightarrow$ 0.8 m = 80 cm M: 1 pace $\rightarrow$ 0.7 m = 70 cm *D*: 80 cm – 70 cm = <u>10 cm</u> T chooses a P to give the answer in a sentence.
4	***Book 4, page 131, Q.3*** Read: *The price of 0.7 litres of syrup is £5.60. How much would 1 litre of syrup cost?* Ps decide what to do first, then how to continue. Ps come to BB to explain reasoning. Class points out errors in calculations or reasoning or suggests another way to solve it. T intervenes and helps only when necessary. BB: e.g. 0.7 litres $\rightarrow$ £5.60 0.1 litres $\rightarrow$ £5.60 $\div$ 7 = £0.80 1 litre $\rightarrow$ £0.80 $\times$ 10 = <u>£8.00</u> or 0.7 litres = 70 cl $\rightarrow$ £5.60 = 560 p 10 cl $\rightarrow$ 560 p $\div$ 7 = 80 p 100 cl $\rightarrow$ 80 p $\times$ 10 = 800 p = <u>£8</u> *Answer:* 1 litre of syrup would cost £8. *24 min*	Whole class activity (or individual work if Ps wish, monitored, helped and reviewed by Ps showing answer on scrap paper or slates in unison on command) Ps might suggest drawing a diagram: e.g. BB:  Discussion, reasoning, agreement, (self-correction), praising Ps write agreed answer in *Pbs*.
5	***Book 4, page 131, Q.4*** Read: *8 = 2 × 4 and 8 + 4 = 12 is exactly divisible by 3, as 3 × 4 = 12* *14 = 2 × 7 and 14 + 7 = 21 is exactly divisible by 3, as 3 × 7 = 21* *Is this statement true or false? Give a reason for your answer.* *If we add a natural number and its double, then the sum is exactly divisible by 3.* T gives Ps time to think about it, discuss with neighbours and try to find a counter example. Show me what you think . . now! (T) **A**, why do you think so? Who agrees? Who can give another reason? e.g. $2 \times 4 = \underline{8} = 4 + 4$, $\underline{8} + 4 = (4 + 4) + 4 = \underline{3} \times 4$ $2 \times 7 = \underline{14} = 7 + 7$, $\underline{14} + 7 = (7 + 7) + 7 = \underline{3} \times 4$ Adding a natural number to its double means that you have 3 times the number, so the sum must be a multiple of 3. *29 min*	Whole class activity T explains statment if Ps do not understand. Ps try out other examples in *Ex. Bks*, then show responses on slates or by agreed actions. T shows the general solution: Let <u>any</u> natural number be *n*: $n + 2 \times n = n + n + n$ $= 3 \times n$ which is divisible by 3. Ps write agreed answer in own words in *Pbs*.

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Bk4

Lesson Plan 131

Activity		Notes

6

Book 4, page 131

Q.5 Read: *Factorise these numbers.*

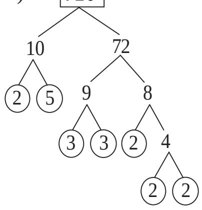
What will you have to do in b) and c)? (Do the calculation first, then factorise the result.)

Ps try out prime numbers as divisors and draw tree diagrams in *Ex. Bks*, then write the number as the product of its prime factors in *Pbs*. Set a time limit or deal with one part at a time.

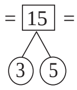
Review with whole class. Ps come to BB to draw tree diagrams and write the multiplications. Class agrees/disagrees. Mistakes discussed and corrected.

Solution:

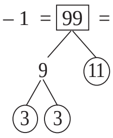
a) $\boxed{720} = 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 5$



b) $8 \times 8 - 7 \times 7 = 64 - 49 = \boxed{15} = 3 \times 5$



c) $10 \times 10 - 1 = 100 - 1 = \boxed{99} = 3 \times 3 \times 11$



34 min

Notes: Individual work, monitored, helped

Reasoning, agreement, self-correction, praising

Ps may use a calculator.

Feedback for T

7

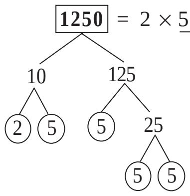
Book 4, page 131

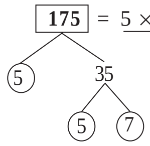
Q.6 a) Read: *Factorise 1250 and 175 in your exercise books.*

Set a time limit. Review with whole class. Ps come to BB to draw tree diagrams and write the multiplications. Class agrees/disagrees. Mistakes discussed and corrected.

Solution:

$\boxed{1250} = 2 \times \underline{5 \times 5} \times 5 \times 5$ $\quad$ $\boxed{175} = \underline{5 \times 5} \times 7$





i) Read: *What is the greatest natural number which is a factor of both numbers?*

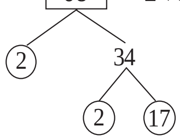
Show me . . . now! (25) Ps come to BB to point to 5×5.

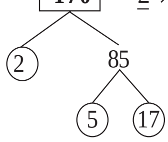
ii) Read: *What is the smallest natural number which is a factor of both numbers?*

Show me . . . now! (1)

b) As in a) above.

Solution: $\boxed{68} = 2 \times \underline{2 \times 17}$ $\quad$ $\boxed{170} = \underline{2} \times 5 \times \underline{17}$





i) Greatest factor of both 68 and 170 is <u>34</u> (2×17)

ii) Smallest factor of both 68 and 170 is <u>1</u>.

Tell class that factors of more than one number are <u>common</u> factors.

42 min

Notes: Individual work in factorising, monitored, helped

(or whole class activity if time is short)

Reasoning, agreement, self-correcting, praising

Whole class activity

On scrap paper or slates in unison

In unison

Individual work, monitored, (helped)

Reasoning, agreement self-correciton, praising

Whole class activity

Agreement, praising

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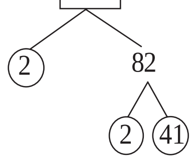
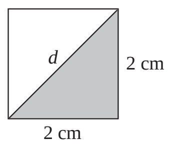
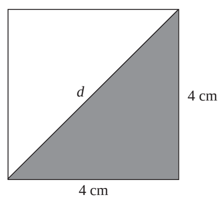
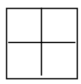
Bk4		*Lesson Plan 131*
Activity		***Notes***
8	**Problem** T sticks these number cards on BB: $\boxed{1}$ $\boxed{7}$ $\boxed{7}$ $\boxed{1}$ How many different 4-digit numbers can be made with these number cards? Ps come to BB or dictate numbers to T. Agree that there are 6 possible different 4-digit numbers BB: 1177, 1717, 1771, 7117, 7171, 7711 *45 min*	Whole class activity (or individual work in *Ex. Bks.* if Ps prefer) Agreement, (self-correcting) praising

Bk4

R: Calculations
C: Revision and practice
E: Problems

Lesson Plan 132

Activity		*Notes*
1	**Factorising** In your *Ex. Bk*, factorise 164 and list all its factors. Review at BB with whole class. Ps come to BB to draw tree diagram, show the number as the product of its prime factors and list <u>all</u> its factors. Class agrees/disagrees. Mistakes discussed and corrected. BB: $\boxed{164} = 2 \times 2 \times 41$  Factors: 1, 2, 4, 41, 82, 164 *5 min*	Individual work, monitored, helped Discussion, reasoning, agreement, self-correction, praising Ps may use a calculator. Feedback for T
2	**Plane shapes** Ps work in pairs and each pair has the same set of three different sizes of squares on desk. T has larger set for demonstration only. a) Take one of the <u>small</u> squares BB:  • Measure its sides. • Calculate its perimeter and area. • Measure its diagonals. Agree that the 2 diagonals of a square are equal. Ps calculate in *Ex. Bks.* then dictate measurements to T. b) Take one of the <u>middle-sized</u> squares BB:  • Measure its sides. • Calculate its perimeter and area. • Measure its diagonals. Ps dictate measurements to T. • Can you tile over (<u>tessellate</u>) this square with the small squares? (Yes, 4 small squares cover it exactly) 	Paired work, monitored, helped but class kept together on tasks. Use copy master, copied onto coloured paper or card and squares cut out. Ps follow T's instructions. BB: $P = 4 \times 2$ cm $= \underline{8\text{ cm}}$ $A = 2$ cm $\times$ 2 cm $= \underline{4\text{ cm}^2}$ $d \approx \underline{2.8\text{ cm}}$ BB: $P = 4 \times 4$ cm $= \underline{16\text{ cm}}$ $A = 4$ cm $\times$ 4 cm $= \underline{16\text{ cm}^2}$ $d \approx \underline{5.6\text{ cm}}$ BB: <u>tessellate</u> to cover with congruent tiles so that there are no gaps and no overlaps
Extension	Think of a number line which is endless in 2 directions. Who remembers the mathematical name for endless or never ending? (<u>infinite</u>) Now think of the plane (flat surface) that the square is on and imagine it being infinite and spreading out wider and wider in all 4 directions. Could you use the small or middle-sized squares to tessellate the whole plane so that there are no gaps and no overlaps? Ask several Ps what they think and why. There are two arguments, e.g. P_1: No, the plane is endless, so we would never be able to finish tiling. P_2: Yes, we could tile the plane using equal (congruent) squares in any of the 4 possible directions but we would need an infinite number of squares. Praise both arguments but T supports P_1, as in practice nobody could ever tessellate an infinite plane!	Whole class discussion (N, S, E, W) Reasoning, agreement, praising

Bk4

Lesson Plan 132

Activity		*Notes*

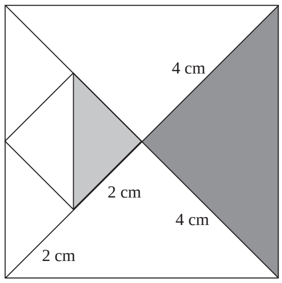
2

(Continued)

c) Take one of the <u>large</u> squares BB:

- Measure its sides.
- Calculate its perimeter and area. (For the area, T advises changing the lengths to mm, then Ps can do long multiplication, or $56 \times 7 \times 8$)
- Measure its diagonals.

Ps dictate measurements to T.



- Can you tessellate this square with the small or middle-sized squares? (No)

  If we cut the squares in half along a diagonal, could we tessellate the large square with the small or the middle-sized half squares? (i.e. right-angled triangles)

  Ps try it out and confirm that it can be done. T shows it on diagram or model on BB (as in diagram above).

Notes:

Measurements of sides need only be approximte.

BB: $a \approx 5.6$ cm

$P \approx 4 \times 5.6 \text{ cm} = \underline{22.4 \text{ cm}}$

$A \approx 5.6 \text{ cm} \times 5.6 \text{ cm}$
$= 56 \text{ mm} \times 56 \text{ mm}$
$= 3136 \text{ mm}^2 = \underline{31.36 \text{ cm}^2}$

(as $100 \text{ mm}^2 = 1 \text{ cm}^2$)

$d = \underline{8 \text{ cm}}$

Discussion, demonstration, agreement, praising

20 min

3

Book 4, page 132

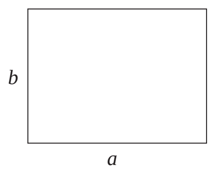
Q.1 Read: *The rectangle is the plan of a garden.*
1 mm on the diagram means 1 m in real life.
Measure the sides and complete the table.

Agree on values of *a* and *b* first before Ps continue with table.

Review with whole class. Ps come to BB to complete the table, explaining reasoning and showing calculations on BB. Class agrees/disagrees. Mistakes discussed and corrected.

Solution:

	On diagram	*In real life*
Side *a*	40 mm	40 m
Side *b*	30 mm	30 m
Perimeter	140 mm	140 m
Area	1200 mm^2	1200 m^2



Notes:

Individual work, monitored, helped

Drawn on BB or use enlarged copy master or OHP

Discussion, reasoning, agreement, self-correction, praising

BB: $P = 2 \times (40 + 30)$
$= 2 \times 70 = \underline{140}$ (mm)

$A = 30 \times 40 = \underline{1200}$ (mm^2)

25 min

4

Book 4, page 132

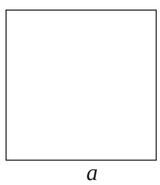
Q.2 Read: *The square is the plan of a table.*
1 mm on the diagram means 3 cm in real life.
Measure the sides and complete the table.

Agree on values of *a* and *b* first before Ps continue with table.

Review with whole class. Ps come to BB to complete the table, explaining reasoning and showing calculations on BB. Class agrees/disagrees. Mistakes discussed and corrected.

Solution:

	On diagram	*In real life*
Side *a*	30 mm	90 cm
Perimeter	120 mm	360 cm
Area	900 mm^2	8100 cm^2



Elicit that if the lengths of the sides of a square are increased by 3 times, the area increases by $3 \times 3 = \underline{9}$ times.

Notes:

Individual work, monitored, helped

Drawn on BB or use enlarged copy master or OHP

Discussion, reasoning, agreement, self-correction, praising

BB: $P = 4 \times 30$ mm
$= \underline{120 \text{ mm}}$

$A = 30 \times 30 = \underline{900}$ (mm^2)

BUT in real life:

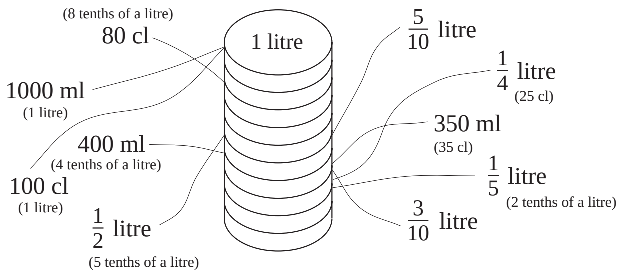
$A = 90 \text{ cm} \times 90 \text{ cm}$
$= \underline{8100 \text{ cm}^2}$

30 min

Bk4

Lesson Plan 132

Activity		*Notes*
5	***Book 4, page 132, Q.3*** Read: *On the outside of a measuring cylinder, there are marks at every 10 cl. Join up the quantities to the corresponding marks.* Who can explain the diagram? (The cylinder has been divided up into 10 equal parts, with a mark at every 1 tenth of a litre, so if you pour in 1 tenth of a litre of water, it will be level with the first mark.) How many cl (ml) are in 1 tenth of a litre? (10 cl, 100 ml) Ps come to BB to choose a quantity, convert to litres if necessary and join up to appropriate mark on diagram. Class agrees/disagrees. Ps draw joining lines in *Pbs* too. *Solution:*	Whole class activity (or individual work if Ps prefer) Drawn on BB or use enlarged copy master or OHP Initial discussion and revision of capacity. T could have cylinder to show to class. Elicit that its base is a circle. At a good pace Reasoning, agreement, (self-correction), praising Feedback for T Discuss why a cylinder is a good shape for measuring liquid. (It is the same width at any point along its height.)



35 min

6	***Book 4, page 132*** Q.4 Read: *Change the units of measure, then round them to the nearest whole unit required.* Do a) i) with the whole class first if necessary as an example for the class to follow. Set a time limit. T writes an extra question iv) for each part on BB for Ps who finish early.* Review with whole class. Ps dictate to T or come to write on BB, explaining reasoning. Class agrees/disagrees. Mistakes discussed and corrected *Solution:* a) i) 678 m = 0 km 678 m ≈ 1 km ii) 15 240 m = 15 km 240 m ≈ 15 km iii) 5648 mm = 5 m 648 mm ≈ 6 km * iv) 5648 cm = 56 m 48 cm ≈ 56 m b) i) 3518 ml = 3 litres 518 ml ≈ 4 litres ii) 3518 cl = 35 litres 18 cl ≈ 35 litres iii) 18 450 ml = 18 litres 450 ml ≈ 18 litres * iv) 18 450 cl = 184 litres 50 cl ≈ 185 litres	Individual work, monitored, helped Written on BB or SB or OHT Differentiation by time limit. Discussion, reasoning, agreement, self-correction, praising Elicit that: 5 rounds up to nearest 10, 50 rounds up to nearest 100, 500 rounds up to nearest 1000.

40 min

7	**Mental practice** a) T says an amount in kg and Ps change it to grams. e.g. 1 tenth of a kg (= 100 g), 1 fifth of a kg (= 200 g), 0.1 of a kg (= 100 g), 3 tenths of a kg (= 300 g), 3 fifths of a kg (= 600 g), 0.3 of a kg (= 300 g), etc. b) T says an amount in g and Ps give it in kg (fraction or decimal). (Ps can say the amounts in g too and choose Ps to convert it to kg.)	Whole class activity T chooses Ps at random. At speed Class points out errors. In good humour! Praising, encouragement only

45 min

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Bk4

R: Calculations
C: Revision and practice
E: Problems

Lesson Plan
133

Activity		*Notes*

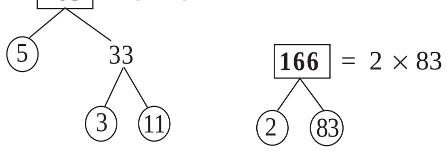
1

Factorising

In your *Ex. Bk*, factorise 165 and 166 and then list all their factors.

Review at BB with whole class. Ps come to BB to draw tree diagrams, show the numbers as the product of their prime factors and list all their factors. Class agrees/disagrees. Mistakes discussed and corrected.

BB: $\boxed{\mathbf{165}} = 3 \times 5 \times 11$ $\boxed{\mathbf{166}} = 2 \times 83$



Factors:

165: 1, 3, 5, 11, 15, 33, 55, 165

166: 1, 2, 83, 166 (It is a nice number!)

Notes: Individual work, monitored, helped

Discussion, reasoning, agreement, self-correction, praising

Ps may use a calculator.

Feedback for T

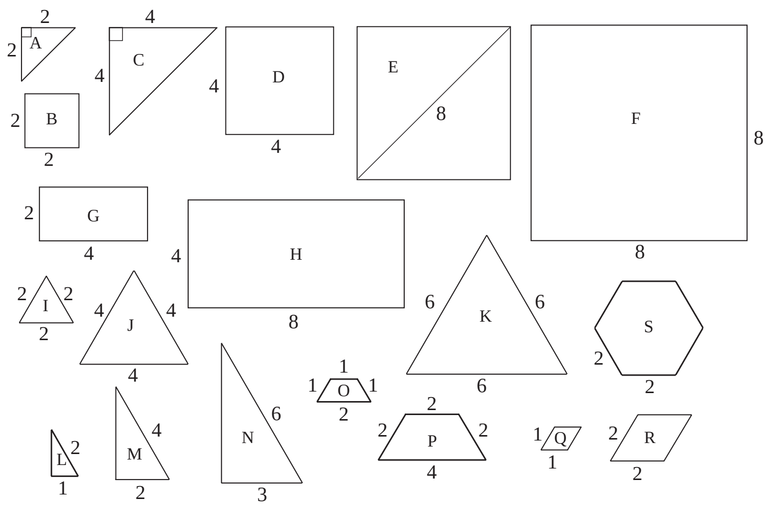
6 min

2

Plane shapes

Pairs of Ps each have the same type and number of plane shapes on desks and T has larger version of the same set for demonstration.

BB: e.g.



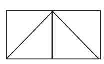
What name could you give to all these shapes? (polygons, i.e. plane shapes with many straight sides) T chooses Ps to hold up a shape and say what they know about it. (e.g. name, number of sides, types of angles, etc.) Elicit that acute angle < right angle (90°) < obtuse angle

Which shapes are similar (congruent)? (e.g. A ~ C, L ~ M ~ N, etc. but none are congruent)

a) Let's measure the sides of some of these shapes (T writes letters on BB) and calculate their perimeters and areas. Ps dictate to T.

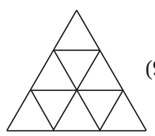
b) Let's tile (tessellate) some of the larger shapes with the smaller shapes. Ps come to BB to show class when they have found shapes which can be tessellated.

e.g. G with A



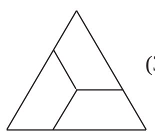
(4A = G)

K with I



(9I = K)

K with P



(3P = K)

Notes: Whole class activity to start

Use copy master copied on to card and either kept as a sheet for Ps, or cut out.

(T's version enlarged and stuck on BB.)

(If class is not very able, T can choose which shapes to deal with.)

[Ps and T should have extra copies of some of the smaller shapes cut out for tessellation in b).]

Initial discussion to revise plane shapes.

(Extra praise for clever facts, e.g. 2-dimensional)

Praising, encouragement only

Paired work in measuring, whole class calculation

Paired work, monitored, helped, then demonstration and discussion with large models with whole class

Agreement, praising

20 min

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Bk4

Lesson Plan 133

Activity		*Notes*
3	***Book 4, page 133*** Q.1 Read: *A gang of workmen repaired 5 km 300 m of road in the 1st week of March, 8 km 60 m in the 2nd week and 4 km 700 m in the 3rd week.* *What length of road did the gang repair in the 3 weeks?* Write a plan in your *Pbs*, do the calculation in your *Ex. Bks*, then write the answer in the box in your *Pbs*. Remember to estimate before doing the calculation and then to check it. Set a time limit. Review with whole class. Ps could show responses on scrap paper or slates in unison on command. Ps responding correctly explain at BB to those who were wrong. Who agrees? Who did it another way, etc. Mistakes discussed and corrected. *Solution:* *Plan*: 5 km 300 m + 8 km 60 m + 4 km 700 m *E*: 5 km + 8 km + 5 km = 18 km *Answer*: The gang repaired 18 km 60 m of road in 3 weeks. *25 min*	Individual work, monitored, helped Make sure that Ps do not miss out any of these steps. Discussion, reasoning, agreement, self-correction, praising *C*: e.g. $\begin{array}{r} 5300 \\ 8060 \\ +\ 4700 \\ \hline 18060 \\ {}^{1}\quad\ \ \end{array}$ (m) = 18 km 60 m P gives answer in a sentence.
4	***Book 4, page 133*** Q.2 Read: *There were 5 litres 400 ml of syrup in a container. Another 680 ml were poured in. How much syrup is in the container now?* T elicits or tells what syrup is (liquid sugar or a mixture of sugar and water as in tins of fruit or a fruit salad). Set a time limit. Review with whole class. Ps could show responses on scrap paper or slates in unison on command. Ps responding correctly explain at BB to those who were wrong. Who agrees? Who did it another way? etc. Mistakes discussed and corrected. *Solution:* *Plan*: 5 litres 400 ml + 680 ml *E*: 5 litres + 1 litre = 6 litres *Answer*: The container now holds 6 litres 80 ml of syrup. *29 min*	Individual work, monitored, helped T could have samples to show to class. Make sure that Ps do not miss out any steps for solution. Discussion, reasoning, agreement, self-correction, praising *C:* e.g. $\begin{array}{r} 5400 \\ +\ \ 680 \\ \hline 6080 \\ {}^{1}\quad\ \ \end{array}$ (ml) = 6 litres 80 ml P gives answer in a sentence.
5	***Book 4, page 133*** Q.3 Read: *In a granary, there are 14 650 kg of grain. 8750 kg is wheat, 230 kg is rye and the rest is oats.* *How many kg of oats are in the granary?* Elicit or tell what a granary is. T could have samples or pictures of the different grains or plants to show to class. Set a time limit. Review with whole class. **A**, come and show us what you did. Who agrees? Who did it another way, etc. Mistakes discussed and corrected. *Solution:* *Plan*: 14 650 kg – (8750 kg + 230 kg) (or 14650 – 8750 – 230) *E*: 1500 kg – (9000 kg + 0 kg) = 6000 kg *Answer*: There are 5670 kg of oats in the granary. *34 min*	Individual work, monitored, helped Initial discussion to clarify the context Remind Ps to do all the steps. Discussion, reasoning, agreement, self-correction, praising *C:* e.g. $\begin{array}{r} 8750 \\ +\ \ 230 \\ \hline 8980 \end{array}$ (kg) $\begin{array}{r} {}^{10\,10} \\ 14650 \\ -\ 8_{1}9_{1}80 \\ \hline 5670 \end{array}$ (kg) P gives answer in a sentence.

Bk4		*Lesson Plan 133*

Activity		***Notes***

6

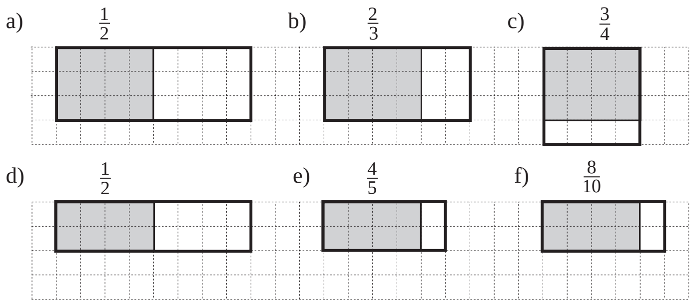
Book 4, page 133

Q.4 Read: *Draw around the whole rectangle if the shaded area is this fracion of the whole rectangle.*

T explains task, or does part a) with the whole class first if Ps are unsure what to do. Set a time limit.

Review with whole class. Ps come to BB to show solutions, explaining reasoning. Class agrees/disagrees. Mistakes discussed and corrected. Elicit equivalent fractions.

Solution: e.g.



39 min

Notes:

Individual work, monitored, helped

Drawn on BB or use enlarged copy master or OHP

Reasoning, agreement, self-correction, praising

BB: $\frac{4}{5} = \frac{8}{10}$

(Accept any solution with the correct area in grid squares.)

Feedback for T

7

Book 4, page 133

Q.5 Read: *Fill in the missing numbers.*

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 to T, explaining reasoning. Class agrees/disagrees. Mistakes discussed and corrected. If Ps did not finish the questions, complete with the whole class. Ps show each answer on diagram on BB or on model or real clock.

Solution:

1 hour = $\boxed{60}$ minutes

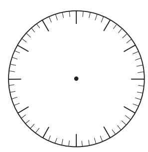
a) $\frac{1}{4}$ hour = $\boxed{15}$ minutes $\frac{3}{4}$ hour = $\boxed{45}$ minutes

b) 0.5 hour = $\boxed{30}$ minutes 0.7 hour = $\boxed{42}$ minutes

c) $\frac{1}{3}$ hour = $\boxed{20}$ minutes $\frac{2}{3}$ hour = $\boxed{40}$ minutes

d) $\frac{1}{6}$ hour = $\boxed{10}$ minutes $\frac{5}{6}$ hour = $\boxed{50}$ minutes

e) $\frac{1}{5}$ hour = $\boxed{12}$ minutes 0.6 hour = $\boxed{36}$ minutes



45 min

Notes:

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

BB: e.g. reasoning:

$0.7 = \frac{7}{10}$, $\frac{1}{10}$ hour $= 6$ min

$\frac{7}{10}$ hour $= 6$ min $\times 7$

$= \underline{42}$ min, etc.

Extra praise if Ps answered all correctly in the time limit.

Bk4

R: Calculations
C: Revision and practice
E: Problems

Lesson Plan 134

Activity		*Notes*
1	**Factorising** Let's factorise 167 and then list all its factors. Ps dictate or come to BB to try each of the prime numbers, 2, 3, 5, 7 and 11 as divisors, using 'quick' methods where possible. Should we try dividing by 13? (No, as $13 \times 13 = 169 > 167$) Elicit that 167 is a prime number, and its factors are 1 and 167.	Whole class activity At a good pace Ps explain reasoning or do divisions at side of BB. Class agrees/disagrees Praising

6 min

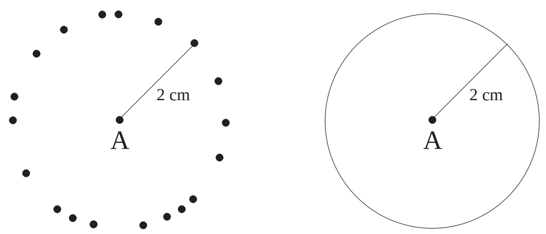
2 **Loci**

a) Draw a dot in your *Ex. Bks*. (in the middle of the page)

Draw dots which are 2 cm away from it. Try to draw dots in several different places. How could we show all the dots possible? (Join up all the dots to show the complete set.) Elicit that the shape is a circle.

(If Ps have compasses, T demonstrates how to use them with BB compasses to make it easier to draw the circles, otherwise once Ps know the shape is a circle, Ps draw it freehand as best they can.)

BB:

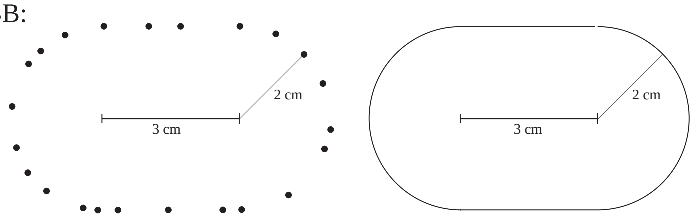


b) In your *Ex. Bks*. draw a straight line 3 cm long.

Draw dots which are 2 cm from the line. Try to draw dots in several different places. Draw the whole set when you are sure of the shape that the line will form.

(Ps use compasses if they have them to draw the semi-circles at each end of the line, otherwise Ps draw them freehand as best they can.)

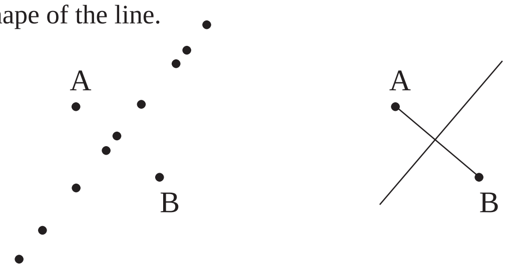
BB:



c) In your *Ex. Bks*. mark two dots A and B, in similar positions to these two dots. (T draws them on BB.)

Draw dots which are an equal distance from A and B. Try to draw dots in several different places. Draw the whole set when you are sure of the shape of the line.

BB:



Notes:

Ps have rulers and if possible, compasses, on desks.

Individual work, but Ps kept together and follow T's instructions.

Ps should use well-sharpened pencils!

Discussion on shape formed by dots

Once Ps have agreed on shape, T confirms on BB.

(Extra praise if a P thinks of a point being outside the plane, i.e 3-dimensional. In such a case, the set of points would form the surface of a sphere.)

If Ps find only the points parallel to the 3 cm line, i.e. above and below it, T gives hint about the sides too.

Agree that the shape is a straight line but then discuss how long it should be.

Extra praise if Ps suggest a never-ending (infinite) line.

16 min

Bk4

Lesson Plan 134

Activity | **Notes**

3

Book 4, page 134

Q.1 Read: *Do the calculations in your exercise book. Write the answers here.*

Set a time limit. Review at BB with whole class.

Ps could show responses on scrap paper or slates on command. Ps answering correctly explain with place-value detail to Ps who were wrong, Mistakes discussed and corrected.

Solutions:

a) *1 m of material costs £6.70. How much do 8 m cost?*

Plan: £6.70 × 8 or 670 p × 8

E: £7 × 8 = £56 or 700 p × 8 = 5600 p

Answer: The cost of 8 m of material is £53.60.

b) *7 kg of apples cost £13.30. How much does 1 kg cost?*

Plan: £13.30 ÷ 7 or 1330 p ÷ 7

E < £14 ÷ 7 = £2 or *E* < 1400 p ÷ 7 = 200 p

C:

$$7\,\overline{)\,13.30}\ (£) = 1.90 \quad \text{or} \quad 7\,\overline{)\,1330}\ (\text{p}) = 190$$

(carry: 6)

Answer: The cost of 1 kg is £1.90.

c) *5 litres of oil cost £16.50. How much do 7 litres cost?*

Plan: £16.50 ÷ 5 × 7 or 1650 p ÷ 5 × 7

E: > £15 ÷ 5 × 7 = £21 or *E* > 1500 p ÷ 5 × 7 = 2100 p

C:

$$5\,\overline{)\,16.50}\ (£) = 3.30 \quad \text{or} \quad 5\,\overline{)\,1650}\ (\text{p}) = 330$$

(carry: 1)

$$\begin{array}{r} £3.30 \\ \times\ 7 \\ \hline £23.10 \\ {\scriptstyle 2} \end{array} \quad \text{or} \quad \begin{array}{r} 330 \\ \times\ 7 \\ \hline 2310 \\ {\scriptstyle 2} \end{array}\ (\text{p})$$

Answer: The cost of 7 litres of oil is £23.10.

Notes:

Individual work, monitored, helped

In unison

Reasoning, agreement, self-correcting, praising

C:

$$\begin{array}{r} £6.70 \\ \times\ 8 \\ \hline £53.60 \\ {\scriptstyle 5} \end{array} \quad \text{or} \quad \begin{array}{r} 670 \\ \times\ 8 \\ \hline 5360 \\ {\scriptstyle 5} \end{array}\ (\text{p})$$

It is easier to estimate here by taking the nearest known multiple of 7.

It is easier to estimate here by taking the nearest known multiple of 5.

22 min

4

Book 4, page 134

Q.2 Read: *Kate had 360 pennies. On Friday, she spent 7 ninths of them on stamps.*

a) How much did the stamps cost?

b) What part of her money was left?

Review with whole class. Ps come to BB to show their solution, explaining reasoning and referring to the diagram. Class agrees or disagrees. Mistakes discussed and corrected.

Solution: e.g.

a) *Plan:* 360 p ÷ 9 × 7 = 40 p × 7 = <u>280 p</u>

Answer: The stamps cost 280 p.

b) *Plan:* $1 - \frac{7}{9} = \frac{9}{9} - \frac{7}{9} = \frac{2}{9}$

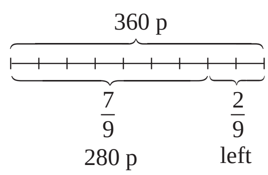
Answer: Kate had 2 ninths of her money left.

Notes:

Individual work, monitored, helped

Discussion, reasoning, agreement, self-correction, praising

BB: e.g.



26 min

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Bk4

Lesson Plan 134

Activity		*Notes*

5

Book 4, page 134

Q.3 Read: *Danny has already run 900 m, which is 3 fifths of the distance he has to run.*

a) What distance is he running?

b) i) What part of the distance does he still have to run?

ii) How many metres does he still have to run?

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

Review whole class. Ps come to BB to show their solution, explaining reasoning and referring to the diagram. Class agrees.disagrees. Mistakes discussed and corrected.

Solution: e.g.

a) *Plan:* 900 m $\div 3 \times 5 = 300$ m $\times 5$ = <u>1500 m</u>

Answer: Danny is running 1500 m.

b) i) *Plan:* $1 - \frac{3}{5} = \frac{5}{5} - \frac{3}{5} = \frac{2}{5}$

Answer: He still has 2 fifths of the distance to run.

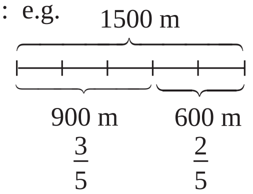
ii) *Plan:* 1500 m – 900 m = <u>600 m</u>

Answer: He still has 600 m to run.

Notes: Individual work, monitored, helped

Discussion, reasoning, agreement, self-correction, praising

BB: e.g.



(or $\frac{2}{5}$ of 1500 m = <u>600 m</u>)

30 min

6

Book 4, page 134

Q.4 Deal with one at a time or set a time limit.

Review at BB with whole class. Ps could show answers on scrap paper or slates on command.

P answering correctly explains at BB to Ps who were wrong. Who did the same? Who did it a different way? etc. Mistakes discussed and corrected

a) Read: *How much does Peter have if half of his money is 50 p more than 1 quarter of it?*

Solution:

$\frac{1}{2} - \frac{1}{4} = \frac{2}{4} - \frac{1}{4} = \frac{1}{4} \rightarrow$ 50 p, or $\frac{1}{2} = \frac{2}{4} \underset{50\text{ p}}{>} \frac{1}{4}$

So $\frac{4}{4} \rightarrow$ 50 p $\times$ 4 = 200 p = <u>£2</u>

Answer: Peter has £2.

b) Read: *2 fifths of Veronica's money is 120 p less than 3 fifths of it. How much money does Veronica have?*

Solution: e.g.

$\frac{3}{5} - \frac{2}{5} = \frac{1}{5} \rightarrow$ 120 p, so $\frac{5}{5} \rightarrow$ 120 p $\times$ 5 = 600 p = <u>£6</u>

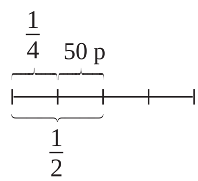
Answer: Veronica has £6.

Notes: Individual work, monitored, helped

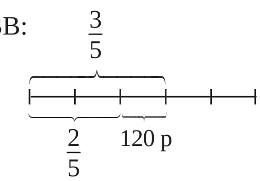
(or whole class activity if time is short)

Discussion, reasoning, agreement, checking, self-correction, praising

BB:

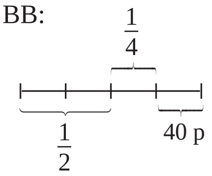


BB:



Bk4

Lesson Plan 134

Activity		*Notes*
6	(Continued) c) Read: *Wendy spent half of her money on Monday, half of what was left on Tuesday and she had 40 p left.* *How much money did Wendy have at first?* *Solution:* e.g. Monday: part spent: $\frac{1}{2}$, part left: $\frac{1}{2}$ Tuesday: part spent: $\frac{1}{2}$ of $\frac{1}{2} = \frac{1}{4}$ Part spent altogether: $\frac{1}{2} + \frac{1}{4} = \frac{2}{4} + \frac{1}{4} = \frac{3}{4}$ Part left: $1 - \frac{3}{4} = \frac{1}{4} \rightarrow 40$ p, so $\frac{4}{4} \rightarrow 40$ p $\times$ 4 = 160 p = <u>£1.60</u> *Answer:* Wendy had £1.60 at first.	BB:  (Or part left: $1 - \frac{1}{2} - \frac{1}{4} = \frac{1}{4}$)
	40 min	
7	***Book 4, page 134, Q.5*** Read: *Solve these equations in your exercise book.* Deal with one at a time. Ps decide what to do first and how to continue. Ps work on BB and rest of class in *Ex. Bks*. Calculations done at side of BB if necessary. Class checks that the solution is correct by inserting values in original statements. T helps with d) and shows on number line. BB: a) $3 \times a - 410 = 4690$ $3 \times a = 4690 + 410 = 5100$ $a = 5100 \div 3 = \underline{1700}$ b) $4 \times b + 40 = 3 \times b + 110$ $4 \times b = 3 \times b + 70$ $\underline{b = 70}$ c) $5 \times c + 2000 < 7400$ $5 \times c < 5400$ $\underline{c < 1080}$ d) $87 < 6 \times d - 320 < 113$ $407 < 6 \times d < 433$ $67 < d < 73$ or <u>d: 68, 69, 70, 71, 72</u>	Whole class activity (or individual work if Ps wish) Written on BB or SB or OHT Discussion, reasoning, checking, agreement, (self-correction), praising Accept trial and error too. BB: d) $407 \div 6 = 67$, r 5 (4 5) $433 \div 6 = 72$, r 1 (1 1) (If d is a natural number)
	45 min	

Bk4

R: Calculations
C: Revision and practice
E: Problems

Lesson Plan
135

Activity		*Notes*

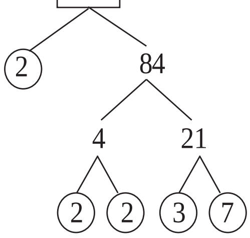
1

Factorising

In your *Ex. Bk,* factorise 168 and list all its factors.

Review at BB with whole class. Ps come to BB to draw tree diagram, show the number as the product of its prime factors and list <u>all</u> its factors. Class agrees/disagrees. Mistakes discussed and corrected.

BB: $\boxed{\mathbf{168}} = 2 \times 2 \times 2 \times 3 \times 7$



Factors: 1, 2, 3, 4, 6, 7, 8, 12, 14, 21, 24, 28, 42, 56, 84, 168

Notes: Individual work, monitored, helped

Discussion, reasoning, agreement, self-correction, praising

Ps may use a calculator.

Ps join up the factor pairs.

Feedback for T

7 min

2

Points on a plane

a) Draw a dot A in your *Ex. Bks*. (in the middle of the page)

Draw dots on the same plane which are <u>not more than</u> 2 cm away from it. How could we show <u>all</u> the dots possible? (Colour over them) Let's colour the area covering the complete set of dots *green.* What shape have you made? (a circular plane shape)

Now let's find dots which are <u>more than</u> 2 cm away from point A. Let's colour this part *red*. What colour should the points which are exactly 2 cm away from A be? (*green*, as not more than 2 cm)

T tells class that the points in the plane less than 2cm from A are called the <u>inside points</u>, the points exactly 2 cm away from A are the <u>border points</u> and the points more than 2 cm away from A are the <u>outside</u> points. Elicit that the *red* area covers the whole plane to infinity in all directions, <u>except for</u> the *green* circular plane shape.

b) In your *Ex. Bks*. draw a straight line 3 cm long.

Find dots in the same plane which are <u>less than</u> 2 cm from the line. Try to draw dots in several different places. How can we show all the dots possible? (Colour over them.) Let's colour the area covering all these points *red*. Should the the border points be *red*? (No)

Let's colour the points on the plane which are <u>exactly</u> 2 cm from the line in *yellow*. (border points)

Colour the dots on the plane which are <u>more than</u> 2 cm from the line segment in *green*. Elicit that these are the outside points.

c) In your *Ex. Bks*. mark three dots A, B and C in similar positions to these dots. (T draws them on BB.)

Find dots on the same plane which are an equal distance from A and B. Colour them *red*. (Elicit that they form a straight line.) How long is the line? (it is never-ending or <u>infinite</u>.)

Find dots on the plane which are an equal distance from A and C. Colour the set of dots *blue*. (Elicit that they form a straight line.)

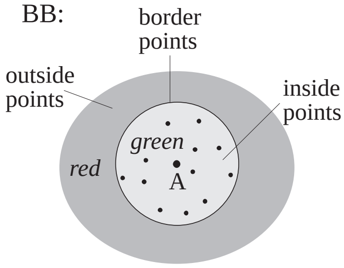
Find dots on the plane which are an equal distance from A, B and C. How many dots did you find? (one) Where is it? (At the point where the *red* and *blue* lines cross over each other)

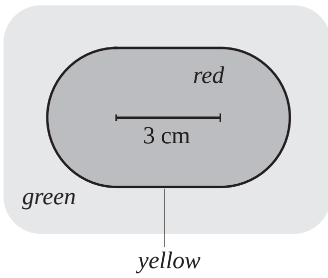
Notes: *Ps have rulers and if possible, compasses, on desks.*

Individual work, but Ps kept together and follow T's instructions.

Discussion on, reasoning, agreement, praising

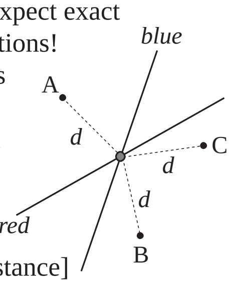
BB:





T works on BB and Ps copy what T does in *Ex. Bks.*

Do not expect exact constructions! Allow Ps to draw freehand too.



[*d* = distance]

19 min

Bk4

Lesson Plan 135

Activity		***Notes***

3

Book 4, page 135

Q.1 Read: *What rule has been used to group the natural numbers? Write these numbers in the correct set.*

10, 72, 38, 13, 54, 96, 61, 87, 75, 49, 172, 359, 648, 975, 831, 570, 903, 184, 657

Notes: Individual work, monitored, helped

Drawn on BB or use enlarged copy master or OHP

Set a time limit. Ps decide on a rule to use and fill in the numbers in the sets. Advise Ps to write lightly at first in case they want to change their minds.

Review with whole class. **A**, tell us the rules you used. Who agrees? Who thought of them in a different way? e.g.

Notes: Discussion, reasoning, agreement, self-correction, praising

P_1: In the 1st set, I put numbers with units digit 5 or 0;
in the 2nd set, I put numbers with units digit 1 or 6;
in the 3rd set, I put numbers with units digit 2 or 7;
in the 4th set, I put numbers with units digit 3 or 8;
in the 5th set, I put numbers with units digit 4 or 9.

P_2: I put numbers exactly divisible by 5 in the 1st set, then in the next sets, numbers with remainders 1, 2, 3 and 4 after dividing by 5.

Solution:

5, 25, 100, **10, 75, 975, 570**	1, 6, 21, 1201, 66, **96, 61, 831**	2, 7, 42, 5317, **72 87, 172, 657**	3, 8, 63, 4218, **38, 13, 648, 903**	4, 9, 99, 1644 **54, 49, 359, 184**

Notes: **Bold** numbers are added.

25 min

4

Book 4, page 135

Q.2 Read: *Write the numbers 1, 2, 3, 6 , 9 and 18 in the suitable circles if the arrows point towards the multiples.*

Complete the missing arrows.

Notes: Individual trial first, monitored, helped.

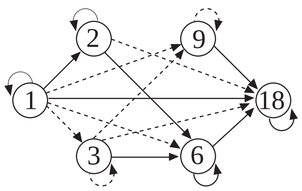
Drawn on BB or use enlarged copy master or OHP

Let's see if you can do it withour help first. (If T sees that majority of Ps are struggling, T gives hint, e.g. Which is the biggest number? Where are most of the arrows pointing?
If Ps are still struggling, stop the individual work and continue as a whole class activity.)

Review with whole class. Ps come to BB to to write numbers and draw the missing arrows, explaining reasoning. Class agrees/ disagrees. Mistakes discussed and corrected.

Notes: Discussion, reasoning, agreement, self-correction, praising

Solution:



Notes: Elicit that each number is also a multiple of itself.

Broken arrows are missing.

30 min

Bk4

Lesson Plan 135

Activity		Notes
5	***Book 4, page 135***	
	Q.3 Read: *It takes 45 minutes for 7200 litres of water to flow out of the dam.* *How much water would flow out after these times? Fill in the missing numbers.*	Individual work, monitored, helped Written on BB or SB or OHT
	What is a dam? Why do we build them? Who has seen one? (T has picture to show if possible.)	Initial discussion to clarify the context. Involve several Ps.
	Set a time limit, Ps can do necessary calculations in *Ex. Bks*. and write only answers in *Pbs*.	Differentiation by time limit
	Review with whole class. Ps come to BB or dictate to T, explaining reasoning. Class agrees/disagrees. Mistakes discussed and corrected.	Reasoning, agreement, self-correction, praising
	Solution: e.g. a) 15 minutes: 7200 litres ÷ 3 = <u>2400</u> litres b) 5 minutes: 2400 litres ÷ 3 = <u>800</u> litres c) 3 minutes: 2400 litres ÷ 5 = <u>480</u> litres d) 1 minute: 480 litres ÷ 3 = <u>160</u> litres e) 30 minutes: 2400 litres × 2 = <u>4800</u> litres f) 1 hour: 4800 litres × 2 = <u>9600</u> litres	Show calculations in detail on BB if problems. Ps might show other ways to calculate, e.g. 5 min: 7200 ℓ ÷ 9 = 800 ℓ Feedback for T
	35 min	
6	***Pb Y4b, page 135***	
	Q.4 Deal with one question at a time. Ps read question themselves, work out the answer in *Ex. Bks*, check it and and write only the numerical solution in *Pbs*.	Individual work, monitored, helped (or whole class activity if time is short)
	Ps write answer on scrap paper or slates and show to T in unison on command. P responding correctly explains at BB to Ps who were wrong. Mistakes discussed and corrected.	Reasoning, agreement, self-correction, praising
	Solutions: a) *Lennie Lion eats about 16 kg of meat every day. About how much meat does Lennie Lion eat in a year?* *Plan:* 365 × 16 kg = 730 × 8 kg *E:* 700 × 8 kg = 5600 kg *Answer: Lennie Lion* eats about 5840 kg of meat in a year.	*C:* $\begin{array}{r} 730 \\ \times 8 \\ \hline 5840 \\ {\scriptstyle 2} \end{array}$ or T might show: $\begin{array}{r} 365 \\ \times 16 \\ \hline 2190 \\ +3650 \\ \hline 5840 \\ {\scriptstyle 1} \end{array}$
	b) *In one year, Ellie Elephant drinks about 150 times. Each time, she drinks about 200 litres of water. How much water does Ellie Elephant drink in a year?* *Plan:* 150 × 200 litres = 300 × 100 litres = 3000 × 10 litres = <u>30 000 litre</u> *Answer: Ellie Elephant* dinks about 30 000 litres in 1 year.	T chooses Ps to say answers in sentences. [Familiarisation with large numbers.]
	c) *Daisy Dragonfly flies around for 2 and a half hours. How far does she fly if she covers 625 m per min?* *Plan:* 2 and a half hours = 60 + 60 + 30 = 150 (minutes) 625 × 150 = 6250 × 15 = 62 500 + 6250 × 5 = 62 500 + 31 250 = <u>93 750</u> (m) *Answer: Daisy Dragonfly flies 93 km 750 m in 2.5 hours.*	*C:* $\begin{array}{r} 6250 \\ \times 5 \\ \hline 31250 \\ {\scriptstyle 12} \end{array}$ or T might show: $\begin{array}{r} 6250 \\ \times 15 \\ \hline 31250 \\ +62500 \\ \hline 93750 \end{array}$
	45 min	

Bk4

R: Calculations

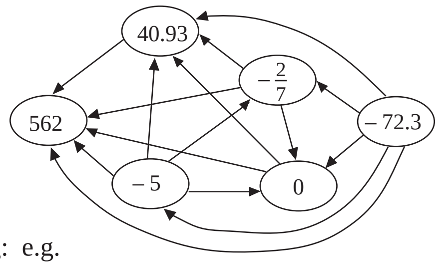
C: Revision and practice

E: Problems

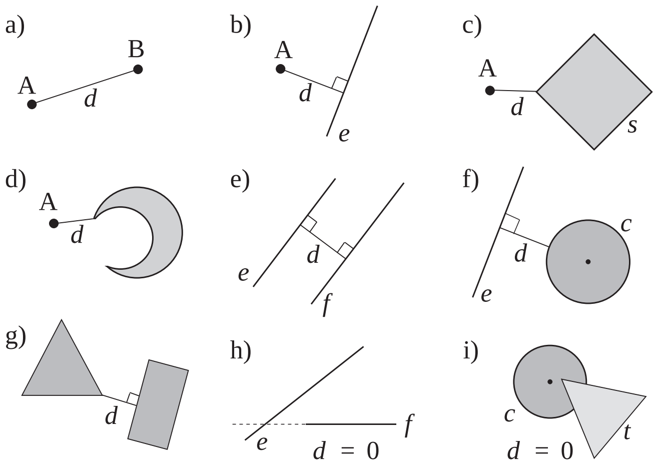
Lesson Plan 136

Activity		*Notes*
1	**Factorising** Let's factorise 169 and then list all its factors. Ps try the prime numbers 2, 3, 5, 7 and 11 in turn, using quick methods where they can. Should we try 13? (Yes) BB: $13 \times 13 = 130 + 39 = 169$, So $169 = 13 \times 13$ (It is a <u>square</u> number). Its factors are 1, 13, 169	Whole class activity Extra praise if Ps remember $169 = 13 \times 3$ from the trials of previous numbers. Reasoning, agreement, praising BB: 13, 13, $\boxed{169}$

5 min

2	**Missing numbers** Where should these numbers go in the diagram if the arrows are pointing towards the greater number? BB: -5, 40.93, 0, $-\frac{2}{7}$, 562, -72.3 Who knows where one of the numbers should go? Why? Ps come to BB to write a number and explain their thinking. Class agrees/ disagrees. BB:  Reasoning: e.g. • The circle with no arrows pointing towards it must contain the smallest number, which is -72.3. • The circle with 5 arrows pointing towards it and none away from it must be the biggest number, which is 562. • The circle with 4 arrows pointing towards it and only one away from it must be the 2nd greatest number, which is 40.93. etc.	Whole class activity Drawn on BB or use enlarged copy master or OHP Discussion, reasoning, agreement, praising At a good pace T helps with wording of reasoning where necessary.

10 min

3	**Shortest distance** Where should we measure how far apart one element is from the other? Ps come to BB to say what the two elements are, then to show where they would measure their distance apart. Class agrees/disagrees. Ps draw the measuring line using BB ruler (with T's help). Let's label the distance between them *d*. BB: 	Whole class activity Drawn on BB or use enlarged copy master or OHP Ps could have rulers and copies of copy master too. Discussion, reasoning, agreement, praising Elicit that the shortest distance between: • 2 points is a straight line; • 2 lines is the perpendicular distance between them; • 2 shapes is the distance between the 2 closest points. Point out that lines, e.g. *e* and *f* in h) can be extended to infinity and if not parallel will cross one other eventually, but that line segments, e.g. AB, have a finite length.

16 min

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Bk4

Lesson Plan 136

Activity		*Notes*

4

Book 4, page 136

Q.1 Read: *Solve the problems in your exercise book.*

Deal with one part at a time. Ps read problem themselves and write a plan and do the calculation in *Ex. Bks*. Set a time limit.

Review with whole class. Ps who have found an answer could show results on scrap paper or slates on command. P answering correctly explains at BB to Ps who were wrong. Mistakes discussed and corrected.

Solutions:

a) *A point on the Equator turns on the Earth's axis at a speed of 465 metres per second.*

How many metres does it turn every minute?

Plan: 1 minute = 60 seconds

1 second $\rightarrow$ 465 m

60 seconds $\rightarrow$ 465 m $\times$ 60 = 4650 m $\times$ 6

= $\underline{27\ 900 \text{ m}}$

Answer: It turns 27 900 m every minute.

b) *During a thunderstorm, 30 mm of rain fell. It means that 30 litres of rain fell on an area of 1 square metre.*

After the same thunderstorm, how many litres of rain fell on a rectangular garden which is 30 m wide and 50 m long?

Plan: Area of garden: 30 m $\times$ 50 m = 300 m $\times$ 5 m

= $\underline{1500 \text{ m}^2}$

1 m^2 $\rightarrow$ 30 litres

1500 m^2 $\rightarrow$ 1500 $\times$ 30 litres = 15 000 $\times$ 3 litres

= $\underline{45\ 000 \text{ litres}}$

Answer: 45 000 litres of rain fell on the garden.

c) *One centimetre cube of gold has mass 19.3 g. What would be the mass of a cuboid made of gold if it is 20 cm long, 10 cm wide and 9 cm high?*

Plan: Volume of cuboid = 20 cm $\times$ 10 cm $\times$ 9 cm

= $\underline{1800 \text{ cm cubes}}$ (or cm^3)

1 cm cube $\rightarrow$ 19.3 g

1800 cm cubes $\rightarrow$ 19.3 g $\times$ 1800 = 193 g $\times$ 180

= 1930 g $\times$ 18 = 3860 g $\times$ 9

= 34 740 g = $\underline{34 \text{ kg } 740 \text{ g}}$

Answer: The mass of the cuboid would be 34 kg 740 g.

25 min

Notes

Individual work, monitored, helped

Discussion, reasoning, agreement, self-correction, praising

T could have a globe to show the position of the Equator and to clarify the context.

C:
$$\begin{array}{r} 4\,6\,5\,0 \\ \times\,6 \\ \hline 2\,7\,9\,0\,0 \\ \hline {}_{3\ 3} \end{array}$$

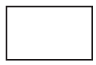
(= 27 km 900 m per minute

= 1674 km per hour

≈ 40 000 km per day)

Ps might tell class of own experiences of thunderstorms and what happened to their gardens.

BB:

30 m 

50 m

Revise notation for metre square (m^2) if necessary.
T could show similar notation for 'cm cube' in c). (cm^3)

Whole class activity

Ps suggest what to do first and how to continue. Class agrees/ disagrees.

T helps with the calculation if necessary.

C:
$$\begin{array}{r} 3\,8\,6\,0 \\ \times\,9 \\ \hline 3\,4\,7\,4\,0 \\ \hline {}_{7\ 5} \end{array} \qquad \begin{array}{r} 1\,9\,3\,0 \\ \times\,1\,8 \\ \hline 1\,5\,4\,4\,0 \\ +\,1\,9\,3\,0\,0 \\ \hline 3\,4\,7\,4\,0 \\ \hline \end{array}$$

or T shows: $\underline{3\,4\,7\,4\,0}$

Bk4

Lesson Plan 136

Activity		*Notes*
5	***Book 4, page 136*** Q.2 Read: *Practise calculation.* Let's see how many of these you can do in 4 minutes! Remember to check your calculations. Start . . . now! . . . Stop! Review with whole class. Ps come to BB or dictate to T, explaining reasoning (with place-value details if problems). Class agrees/disagrees. Who made a mistake? What was your mistake? Deal with all types of errors made. Stand up if you had all 8 correct. Let's give them a clap! *Solution:*	Individual work, monitored, helped Written on BB or use enlarged copy master or OHP Differentiation by time limit. Reasoning, agreement, self-correction, praising In unison

Solution:

a) $\begin{array}{r} 12435 \\ +\ 3072 \\ \hline 15507 \\ {\scriptstyle 1} \end{array}$

b) $\begin{array}{r} 23\overset{10}{4}08 \\ -\ 10_{1}507 \\ \hline 12901 \end{array}$

c) $\begin{array}{r} 8253 \\ \times\ 8 \\ \hline 66024 \\ {\scriptstyle 2\ 4\ 2} \end{array}$

d) $28218 \div 6 = 4703$, remainders ${\scriptstyle 4\ \ 1}$

e) $\begin{array}{r} 10956 \\ \times\ 7 \\ \hline 76692 \\ {\scriptstyle 6\ 3\ 4} \end{array}$

f) $\begin{array}{r} 87\overset{10}{4}30 \\ -\ 23_{1}510 \\ \hline 63920 \end{array}$

g) $\begin{array}{r} 26100 \\ \times\ 3 \\ \hline 78300 \\ {\scriptstyle 1} \end{array}$

h) $87903 \div 9 = 9767$, remainders ${\scriptstyle 6\ 6\ 6}$

31 min

6	***Book 4, page 136*** Q.3 Read: *List the natural numbers about which this statement is true.* *It is a multiple of 8, the sum of its digits is 7 and the product of its digits is 6.* Allow Ps a couple of minutes to try it out in *Ex. Bks.* **X**, what number have you found? Let's check it. e.g. BB: <u>16</u>: multiple of 8, $1 + 6 = 7$, $1 \times 6 = 6$ ✔ Who has found another such number? (Class checks it if Ps have found one but it is unlikely that they will find 1312 and 3112 without help from T.) T gives hints or tells class about 1312 and asks Ps to check it. BB: $1312 \div 8 = 164$ (remainders ${\scriptstyle 5\ 3}$) $1 + 3 + 1 + 2 = 7$, $1 \times 3 \times 1 \times 2 = 6$ ✔ How could you rearrange these digits to form another multiple of 8? (3112)	Individual trial first, monitored Reasoning, checking, agreement, praising Extra praise if they have found another number. Or ask Ps to think of factors of 6, then form numbers and check to see if they are divisible by 8. Ps may use a calculator. *Check:* $3112 \div 8 = 389$ (remainders ${\scriptstyle 7\ 7}$)

35 min

Bk4

Lesson Plan 136

Activity		Notes

Activity 7

Book 4, page 136, Q.4

Read: *Three travellers met on a road. One of them had 3 loaves of bread, another had 5 loaves of bread and the third had no food at all. They shared the bread equally.*

The third person then offered 8 coins to the others to pay for his food.

How can the other two travellers share the money fairly?

Allow Ps time to think about it and discuss with their neighbours.

Ps come to BB to explain their reasoning. Class points out errors or suggests improvements to the method of solution. T helps where necessary.

Solution: e.g. Let the travellers be A, B and C

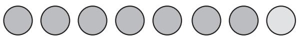
Each person ate: $8 \div 3 = 6 \div 3 + 2 \div 3 = 2 + \dfrac{2}{3} = 2\dfrac{2}{3}$ (loaves)

BB: *Bread*

A gave $2\dfrac{1}{3} = \dfrac{7}{3}$ to C, B gave $\dfrac{1}{3}$ to C, so $A : B = \dfrac{7}{3} : \dfrac{1}{3} = 7 : 1$

So the coins should also be in the ratio 7 : 1

BB: *Coins*



Answer: Traveller C should give 7 coins to Traveller A and 1 coin to Traveller B.

40 min

Notes:

Whole class activity

(or individual work if Ps wish)

Diagram drawn on BB or use enlarged copy master or OHP or stick the 'bread' and 'coins' on BB.

Ps give their ideas and findings.

(If no P has an idea, T chooses 3 Ps to come to BB to colour their loaves of bread.)

Discussion, reasoning, agreement, praising

Or amount of bread given by

A: $5 - 2\dfrac{2}{3} = 3 - \dfrac{2}{3} = 2\dfrac{1}{3}$

B: $3 - 2\dfrac{2}{3} = 1 - \dfrac{2}{3} = \dfrac{1}{3}$

Ps colour diagrams in *Pbs* too.

T chooses a P to say the answer in a sentence.

Activity 8

Book 4, page 136, Q.5

Read: *27 players took part in a knockout singles tennis competition.*

The winner from each pair went through to the next round and the person without an opponent qualified automatically.

How many matches were played before the winner was decided?

T gives Ps a couple of minutes to think about it and discuss with their neighbours if they wish. Who has an idea what to do? Who agrees? Who would do it another way? etc.

Ps suggest what to do first and how to continue. T gives hints or helps only if Ps are stuck.

Solution: e.g.

1st round:	13 matches	$\rightarrow$	13 winners + 1 = 14 players
2nd round:	7 matches	$\rightarrow$	7 winners
3rd round:	3 matches	$\rightarrow$	3 winners + 1 = 4 players
4th round:	2 matches	$\rightarrow$	2 winners
5th round:	1 match	$\rightarrow$	1 winner
Total:	26 matches		

Or the simplest solution:

If there were 27 players and only 1 winner, there were 26 losers, so 26 matches must have been played.

Answer: After 26 matches the winner was decided.

45 min

Notes:

Whole class activity

(or individual work if Ps prefer)

Praise all positive contributions.

Discussion, reasoning, agreement, praising

T explains if no P has thought of it.

T chooses a P to say the answer in a sentence.

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Bk4

R: Calculations

C: Puzzles and challenges

E: Problems

Lesson Plan 137

Activity		*Notes*

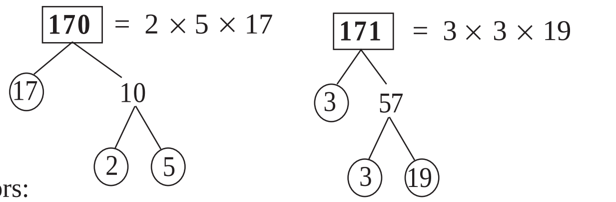
1

Factorising

In your *Ex. Bk*, factorise 170 and 171 and then list all their factors.

Review at BB with whole class. Ps come to BB to draw tree diagrams, show the numbers as the product of their prime factors and list <u>all</u> their factors. Class agrees/disagrees. Mistakes discussed and corrected.

BB: $\boxed{170} = 2 \times 5 \times 17$ $\quad\quad$ $\boxed{171} = 3 \times 3 \times 19$



Factors:

170: 1, 2, 5, 10. 17, 34, 85, 170 $\quad\quad$ 171: 1, 3, 9, 19, 57, 171

Notes: Individual work, monitored, helped

Discussion, reasoning, agreement, self-correction, praising

Ps may use a calculator.

Feedback for T

6 min

2

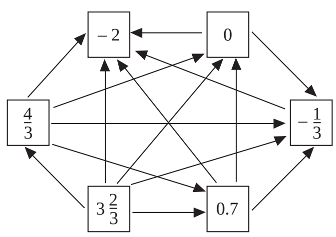
Missing numbers

Where should these numbers go in the diagram if the arrows are pointing towards the smaller number?

BB: $3\frac{2}{3}$, -2, 0, $-\frac{1}{3}$, 0.7, $\frac{4}{3}$

Who knows where one of the numbers should go? Why? Ps come to BB to write a number and explain their thinking. Class agrees/ disagrees.

BB:



Reasoning: e.g.

- The smallest number (– 2) has all the arrows pointing towards it.
- The largest number ($3\frac{2}{3}$) has all the arrows pointing away from it.
- The 2nd smallest number ($-\frac{1}{3}$) has 4 arrows pointing towards it and only one arrow away from it.

Notes: Whole class activity

Drawn on BB or use enlarged copy master or OHP

Ps might suggest putting the numbers in order first.

Discussion, reasoning, agreement, praising

At a good pace

T helps with wording of reasoning if necessary.

11 min

3

Book 4, page 137

Q.1 Read: *How many routes lead from A to K, L, M, N and O if you can only move down to the left or to the right?*

Let's see how many ways you can find in 4 minutes!

Review a BB with whole class. Ps dictate to T. Class agrees/ disagrees. Omissions added and mistakes corrected.

Solution:

A to K: 1 route (ABDGK)

A to L: 4 routes (ABDGL, ABDHL, ABEHL, ACEHL)

A to M: 6 routes (ABDHM, ABEHM, ABEIM, ACEHM, ACEIM, ACFIM)

A to N: 4 routes (ABEIN, ACEIN, ACFIN, ACFJN)

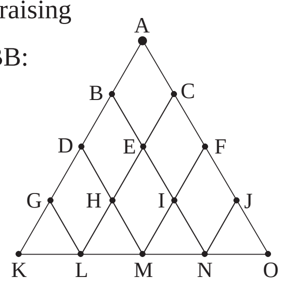
A to O: 1 route (ACFJO)

Notes: Individual work, monitored, <u>helped</u>

Drawn on BB or use enlarged copy master or OHP

Agreement, self-correction, praising

BB:



Bk4		*Lesson Plan 137*

Activity		*Notes*

3
Extension

(Continued)

Let's write how many routes lead to each letter. Ps dictate to T and T writes on BB in same pattern as the letters.

BB: A to A:
B: 1 route
C: 1 route
D: 1 route
E: 2 routes (1 + 1)
F: 1 route
G: 1 route, etc.

1
1 1
1 2 1
1 3 3 1
1 4 6 4 1

What do you notice about the numbers in the pattern? (Each number is the sum of the two numbers directly above it in the previous row.)

T tells class that this formation of numbers is called <u>Pascal's Triangle</u>, named after the mathematician who first discovered it.

What would the next row in the triangle be? (1, 5, 10, 10, 5, 1)

17 min

Notes: Whole class activity. At a good pace. Agreement, praising. Extra praise if Ps notice the pattern without help. Ps dictate in unison. Praising

4

Book 4, page 137

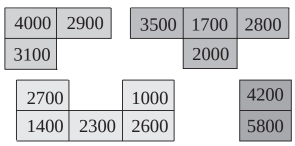
Q.2 Read: *Colour the shapes on the grid and fill in the missing numbers if the sum of the numbers in each shape is 10 000.*

T explains task. Ps first find the relevant numbers, write them in the shape, then colour the shape and its position in the grid in the same colour. 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:

4000	2900	3500	1700	2800	1700
3100	2600	5100	2000	4300	4200
4400	2700	9300	1000	1200	5800
3500	1400	2300	2600	2800	3900



23 min

Notes: Individual work, monitored, (helped). Drawn on BB or use enlarged copy master or OHP. Discussion, reasoning, agreement, self-correction, praising

5

Book 4, page 137

Q.3 Read: *Write the missing numbers in the puzzles if the sum of the 3 numbers along each side is 15 000.*

Choose from:

a) 4200. 4000. 5200, 5400, 5600, 5800

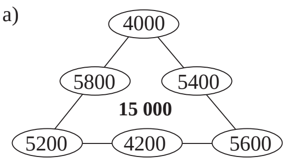
b) 5400, 5600, 5800, 4800, 5000, 5200, 4000, 4600

Deal with one part at a time. Set a time limit. Encourage logical thinking rather than trial and error.

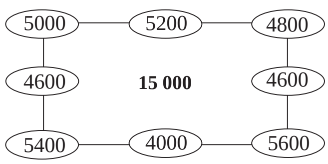
Review with whole class. Ps come to BB or dictate to T. Class checks that they are correct. Ps explain how they solved it.

Solution:

a)



b)



31 min

Notes: Individual trial first, monitored, helped

(or whole class activity if time is short)

Drawn on BB or use enlarged copy master or OHP

Discussion, reasoning, agreement, self-correction, praising

Strategy for solution: e.g.

Find sets of 3 numbers which sum to 1500. e.g.

a) <u>4000</u> + *5200* + 5800
4200 + *5200* + **5600**
<u>4000</u> + 5400 + **5600**

Numbers occurring twice must be the corner numbers.

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Bk4

Lesson Plan 137

Activity | ***Notes***

6

Book 4, page 137

Q.4 Read: *Fill in the missing numbers.*

Set a time limit. Review with whole class.

Ps come to BB to fill in numbers and explain their reasoning in detail. Who did the same? Who did it a different way? etc.

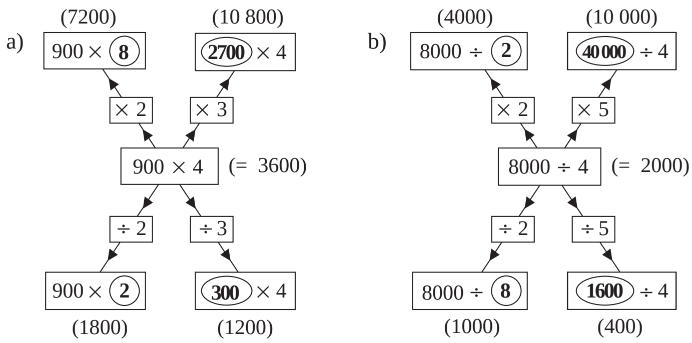
e.g. P_1: $900 \times 4 = 3600$, so $3600 \times 2 = 7200$,

then $7200 \div 900 = 72 \div 9 = \underline{8}$

P_2: $(900 \times 4) \times 2 = 900 \times \underline{8}$ etc.

T shows the 2nd strategy if no P used it. Mistakes discussed and corrected.

Solution:



Notes:

Individual work, monitored, helped

Drawn on BB or use enlarged copy master or OHP

Differentiation by time limit.

Discussion, reasoning, agreement, self-correction, praising

Extra praise for Ps who noticed 'quick' ways.

(Or could be done as a competition between 2 teams of 4 Ps.

T times how long it takes each team to reason aloud to class and fill in missing numbers. Class points out errors and Ps have to start their reasoning all over again if incorrect.

Team finished correctly in the quickest time is the winner.

Let's give them three cheers!)

39 min

7

Combinatorics

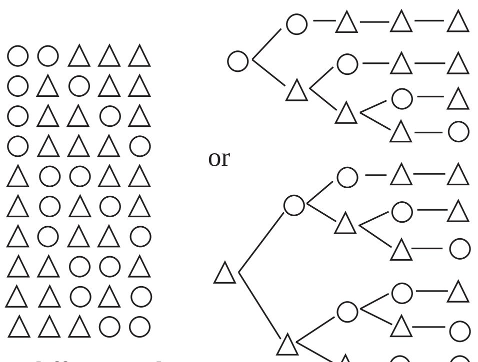
In how many ways can you put 2 circles and 3 triangles in order?

Ps draw the different orders in *Ex. Bks* and/or have shapes or shape cards on desks to manipulate. Set a time limit.

Show me the most number of ways that you found . . . now! (10)

Ps with the correct answer explain how they worked it out. T gives extra praise for a systematic method of solution. e.g.

BB:



10 different orders

Notes:

Individual or paired work, monitored

(or whole class activity if time is short and Ps come to BB tor dictate to T)

Responses shown on scrap paper or slates in unison.

Discussion, reasoning, agreement, praising

T might show the tree diagram if no P has thought of it.

45 min

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Bk4

R: Calculations

C: Puzzles and challenges

E: Problems

Lesson Plan 138

Activity		*Notes*

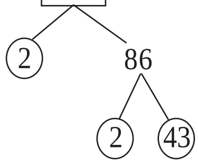
1

Factorising

In your *Ex. Bks.* factorise 172 and then list all its factors.

Review at BB with whole class. Ps come to BB to draw a tree diagram show the number as the product of its prime factors, and list all its factors. Class agrees/disagrees Mistakes discussed and corrected.

BB: $\boxed{172} = 2 \times 2 \times 43$



Factors: 1, 2, 4, 43, 86, 172

Notes: Individual work, monitored

Discussion, reasoning, agreement, self-correction, praising

Ps may use a calculator.

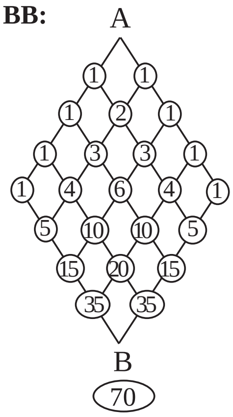
5 min

2

Combinatorics

In how many ways can we get to B from A?

BB:



Let's choose some interim steps first.

In how many ways can we get from A to here? (T points to a grid point.)

Ps come to BB to show the different routes. Class agrees/disagrees. Ps write number of ways in the appropriate circle.

Repeat for one or two other grid points until Ps realise that the number of ways for any grid point is the sum of the 2 numbers directly above it in the previous row. e.g. 15 = 10 + 5

Agree that the number of different ways from A to B is <u>70</u>.

Notes: Whole class activity

Drawn on BB or use enlarged copy master or OHP

At a good pace

Involve several Ps

Reasoning, agreement, praising

Extra praise if Ps realise from the beginning that they should add the 2 numbers in the row above.

Elicit that the shape forms part of <u>Pascal's Triangle</u>.

10 min

3

Book 4, page 138, Q.1

Read: *a) List the natural numbers up to 100 which have an odd number of factors.*

b) What are these numbers called?

Let's do it logically. What is the first natural number? (1) How many factors does it have? (1, which is an odd number)

Ps factorise the following natural numbers in *Ex. Bks*, then come to BB to show the next appropriate numbers and list their factors as a check. Class agrees/disagrees. (It will be rather slow at first until Ps realise that the numbers they are looking for are square numbers.)

Solution:

1 4 (1, 2, 4) 9 (1, 3, 9) 16 (1, 2, 4, 8, 16) 25 (1, 5, 25) 36 (1, 2, 3, 4, 6, 9, 12, 18, 36)

49 (1, 7, 49) 64 (1, 2, 4, 8, 16, 32, 64) 81 (1, 3, 9, 27, 81) 100 (1, 2, 4, 5, 10, 20, 25, 50, 100)

Notes: Whole class activity

(or individual work if Ps wish)

At a good pace

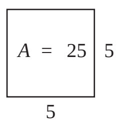
Reasoning, agreement, praising

Extra praise for the first P to realise that the numbers are square numbers.

What is a <u>square</u> number?

(A number which is formed by multiplying another number by itself.) Elicit that it can form a square.

BB: e.g.



15 min

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Bk4		*Lesson Plan 138*

Activity		***Notes***

4

Book 4, page 138

Q.2 Read: *a) How many zeros are at the end of the number which is the result of* **:** *10 × 11 ×12 × 13 × 14 × 15?*

Set a time limit. Ps may discuss with their neighbours if they wish. Trials can be done on slates or scrap paper or in *Ex. Bks.*

Show me how many zeros there are at the end . . . now! (2)

Ps answering correctly explain how they worked out the answer. Who did the same? Who did it a different way? etc. If no P had the right answer, class solves it under T's direction.

Solution: e.g.

- Multiply out all the numbers. (Difficult without a calculator!)
- Factorise the numbers, and count how many pairs of (2×5) there are, as $2 \times 5 = 1\underline{0}$

  $10 \times 11 \times 12 \times 13 \times 14 \times 15$

  $= \underline{2} \times \underline{5} \times 11 \times \underline{2} \times 2 \times 3 \times 13 \times 2 \times 7 \times 3 \times \underline{5}$

  $= (10 \times 10) \times (11 \times 2 \times 3 \times 13 \times 2 \times 7 \times 3)$

  $= 100 \times$ (a number which is not a whole ten)

  So there must be 2 zeros at the end of the number.

- $10 \times 11 \times 12 \times 13 \times 14 \times 15$

  $= \underline{10} \times 11 \times 12 \times 13 \times 7 \times \underline{2} \times 3 \times \underline{5}$

  $= 100 \times (11 \times 12 \times 13 \times 21)$

  which has units digit 6, so is not a whole 10.

  So the number must be a whole 100, i.e. 2 zeros at the end.

Read: *b) Check your answer on a calculator.*
Write the product in words.

Ps work out the product and dictate digits to T who writes on BB. T points to each digit in turn and Ps say its place-value.

BB: 3 603 600

(= 3M + 6HTh + 0TTh + 3Th + 6H + 0T + 0U)

If Ps say the 1st '3' as 3ThTh, T asks who knows what 1000 thousands is called? (1 <u>million</u>) T writes word on BB.

T chooses Ps to read the number aloud. Let's see if you can write the number in words in your *Pbs*. T writes it on BB too so that Ps can correct their spelling mistakes.

BB: 3 million, six hundred and three thousand, six hundred

T points out that it is usual to leave a gap (or write a comma) between every 3 digits to make the number easier to read.

20 min

Notes:

Individual trial first, monitored, helped

Do not allow Ps to use calculators until part b)!

In unison

Discussion, reasoning, agreement, self-correcting, praising

Whole class activity or individual work if Ps have a calculator each.

Agreement, praising

In unison

BB: 1000 Th = 1 <u>million</u>

Individual work in *Pbs*, monitored, helped, corrected

Bk4

Lesson Plan 138

Activity		Notes

5

Book 4, page 138

Q.3 Read: *The product of the ages of my children is 1664. The youngest is half the age of the oldest. I am 50 years old. How many children do I have and what are their ages?*

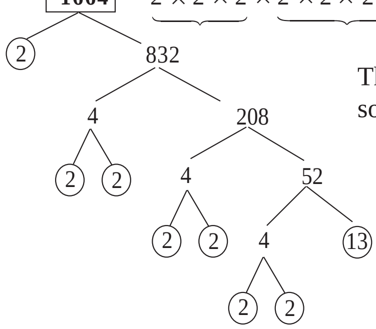
Allow Ps time to think about it and discuss with their neighbours. Ps can do calculations and checks in *Ex. Bks*. If Ps are struggling, T could give a hint about factorising 1664.

Who thinks that they have an answer? Ps tell their ideas and findings to class. If no P knows what to do, class solves it together with T's help.

Solution:

First factorise 1664. Then try to form numbers with the prime factors which fulfil the conditions.

BB: $\boxed{1664} = \underbrace{2 \times 2 \times 2} \times \underbrace{2 \times 2 \times 2 \times 2} \times \underbrace{13}$



The only possible solution is 8, 13 and 16.

Answer: I have 3 children aged 8 years, 13 years and 16 years.

25 min

Notes: Individual trial first, monitored, helped

(or whole class activity)

Discussion, reasoning, agreement, checking, praising

(Ps might try various combinations before they reach the solution.)

Praise all positive contributions.

Extra praise if Ps solved it without help from T.

6

Book 4, page 138, Q.4

Read: *Two positive whole numbers have these factors in common: 1, 2, 3 and 6.*

If we combine their factors, we get this set:

{1, 2, 3, 4, 6, 9, 12, 18}

Write the factors in the correct set if:

A = {factors of the 1st number}

B = {factors of the 2nd number}

Which factors should we write in first? (the common factors)
P comes to BB to write 1, 2, 3, and 6 in intersection of the two sets.

Which set should the other factors be in? Ask several Ps what they think and why. Class agrees/disagrees. Ps fill in diagram in *Pbs* too.

What are the two numbers? (12 and 18) Let's check their factors.

Factors of 12: 1, 2, 3, 4, 6, 12 ✔ Factors of 18: 1, 2, 3, 6, 9, 18 ✔

30 min

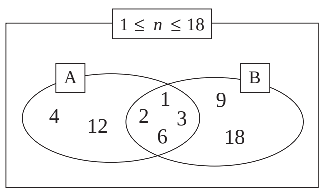
Notes: Whole class activity

(or individual trial first, monitored, helped)

Drawn on BB or use enlarged copy master or OHP

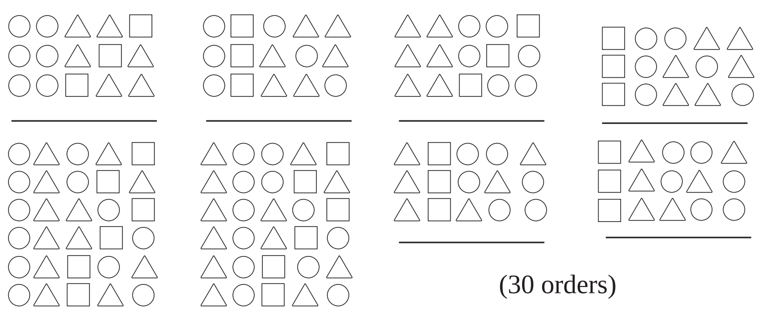
Discussion, reasoning, agreement, (self-correction), praising

BB:



Bk4

Lesson Plan 138

Activity		***Notes***
7	***Book 4, page 138*** Q.5 Read: *List all the positive integers up to 100 which are exactly divisible by 2, 3, 4 and 5.* Think carefully before you start! Set a time limit. Review with whole class. Elicit that only one number is possible: <u>60</u>. Ps explain how they worked out the answer. *Reasoning:* e.g. It must be an even number as it is divisible by 2, and it must be a whole 10 if it also divisible by 5. The only whole ten divisible by both 3 and 4 is 60. *34 min*	Individual work, monitored but <u>not</u> helped Ps could show solution on scrap paper or slates in unison on command. Reasoning, agreement, self-correction, praising Agree that the dotted lines allowed in the *Pbs* are deliberately misleading!
8	***Book 4, page 138*** Q.6 Read: *I am thinking of a positive number. Its half is 15 more than its third and its quarter is 15 more than its sixth. What is the number?* Ps use the diagrams to help them and do any necessary calculations in *Ex. Bks.* Set a time limit. Remind Ps to check their solutions in the context of the question. Review with whole class. Who found an answer? Let's check it. Elicit that such a number is impossible! *Reasoning:* e.g. Using 1st clue: $(\frac{1}{2} - \frac{1}{3})$ of n = $(\frac{3}{6} - \frac{2}{6})$ of n = $\frac{1}{6}$ of n = 15 So $n = 15 \times 6 = \underline{90}$ <u>But</u> if we check it with the other clue: $(\frac{1}{4} - \frac{1}{6})$ of n = $(\frac{3}{12} - \frac{2}{12})$ of n = $\frac{1}{12}$ of $n \neq 15$ So the number is impossible or the clues are wrong! *34 min*	Individual work, monitored (Do not allow Ps to spend too long on it if they do not realise that the clues are impossible!) Reasoning, agreement, praising In good humour! (This book is trying to catch us out today! **Extension** Ps could amend the clues so that the number is possible.
9	***Book 4, page 138, Q.7*** Read: *In how many different orders can you put these shapes?* T starts, then Ps come to BB or dictate what T should write once they can see the pattern. Class points out errors or duplications. Agree that <u>30</u> different orders are possible. *Solution:* e.g.  (30 orders) *45 min*	Whole class activity (or individual trial first under a time limit if Ps wish. T could have solutions already prepared so that Ps can check their results – see copy master) Shapes drawn (stuck) on BB Encourage a logical listing and patience! At a good pace Agreement, praising

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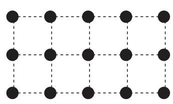
Bk4

R: Calculations

C: Puzzles and challenges

E: Problems

Lesson Plan 139

Activity		*Notes*
1	**Factorising** Let's factorise 173 and then list all its factors. Ps dictate or come to BB to try each of the prime numbers, 2, 3, 5, 7, 11 and 13 as divisors, using 'quick' methods where possible. Should we try dividing by the next prime number, 17? (No, as $17 \times 17 = 289 > 173$) Elicit that 173 is a prime number, and its factors are 1 and 173. *6 min*	Whole class activity At a good pace Ps explain reasoning or do divisions at side of BB or use a calculator. Class agrees/disagrees Praising
2	**Game of 20** a) Let's play a game. Two players, A and B, start from zero and take turns to count in steps of 1 or 2 up to 20. e.g. A says 2, B says 5, A says 6, B says 8, and so on. The first player to reach '20' is the winner. Play the game in pairs and keep a record of the steps on scrap paper or in your *Ex. Bks*. e.g A: 2 6 . . . (T shows on BB.) B: 5 8 . . . Ps take turns to be *Player A*, i.e. start the game. Ps play the game several times and note the winner each time. What did you find? (Hopefully, *Player B* won more often.) b) T plays the game in front of whole class with one one or two Ps. Who thinks that they can beat me? If T is *Player A*, T exploits B's possible weaknesses, but if T is *Player B*, T always wins the game. Who has noticed a strategy for playing the game so that you always win? Ask several Ps what they think. *Strategy:* e.g. To get to 20, I have to say 16, as then the other player cannot reach 20. In order to say 16, I have to say 12 the turn before. etc. The best strategy is to be *Player B* and to say 4, 8, 12, 16, 20. c) If we changed the rules and the person who reaches 20 is the loser, what would the winning strategy be? (To be *Player A* and say: 3, 7, 11, 15, 19, so B has to reach 20.) *19 min*	Paired work, monitored T walks round listening to the games. Ask several pairs of Ps about their matches, e.g. how many games they played, who won most often and what position they went in when they won. Whole class activity In good humour! Discussion, reasoning, agreement, praising T calls two Ps to front of class to try out the strategy. Ps think of a strategy first, then T calls two Ps to front of class to try it out.
3	**Problem** T has BB already prepared. BB: D I V I S / I V I S O / V I S O R *In how many ways could we read the word divisor on this diagram?* Ps come to BB to point out different routes and write them on the BB. Let's think of each letter as a point on a grid and write the number of possible routes to each point. Ps come to BB or dictate to T. BB:  1 1 1 1 1 1 2 3 4 5 1 3 6 10 15 Agree that the number of different ways is 15. *24 min*	Whole class activity Written on BB or SB or OHT BB: e.g. D / I / V I S O R D I V / I / S O R etc. At a good pace Agreement, praising

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Bk4		*Lesson Plan 139*

Activity

Notes

4

Book 4, page 139

Q.1 Read: *The perimeter of a triangle is 10 cm and the length of each side is a whole cm.*

Are these statements true or false? Write a tick if true and a cross if false.

Ps can draw diagrams or do calculations in *Ex. Bks*. Set a time limit. Review with whole class. T (P) reads each question and Ps show responses by writing T or F on scrap paper or slates or by pre-agreed actions, and show on command.

T asks Ps with different viewpoints to explain their reasoning and class decides on correct answer. Mistakes corrected.

Solutions:

a) *The triangle has only one side which is 1 cm long.* (F)

If $a = 1$, then possible values for b and c are:

b	2	3	4
c	7	6	5

but $1 + 2 < 7$, $1 + 3 < 6$, $1 + 4 = 5$, which are impossible. (In a triangle the sum of the 2 shorter sides must be more than the longest side.)

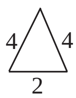
b) *The triangle could have only one side which is 2 cm long.* (T)

If $a = 2$, then possible values of b and c are:

b	3	4
c	5	4

The first column is impossible as $2 + 3 = 5$, but the 2nd column is possible.

The sides are 2 cm, 4 cm and 4 cm.



c) *The triangle has only one side which is 3 cm long.* (F)

If $a = 3$, the two other sides must be 3 and 4 but then there would be two sides which are 3 cm long!

d) *The triangle has only one side which is 5 cm long.* (F)

The sum of the other two sides must be 5, which is not more than 5, so the triangle is impossible.

Notes:

Individual work, monitored, helped

T gives hints about the lengths of the sides of a triangle if Ps are struggling.

Discussion, reasoning, agreement, self-correcting, praising

T helps with wording of reasoning and suggests showing possible values in a table.

Ps might use the first style of reasoning as a model to follow and T gives less help and hints thereafter.

(as 6 and 1, and 5 and 2 are impossible)

30 min

5

Book 4, page 139

Q.2 Read: *We want to rearrange some books on two bookshelves.*

At the moment, there are 156 books on the bottom shelf and on the top shelf there are 30 books more than there are on the bottom shelf.

Rearrange the books so that there are:

a) the same number of books on both shelves,

b) one shelf has twice as many books as the other.

Ps draw diagrams or do calculations in *Ex. Bks*. then write only the numbers of books on each shelf in *Pbs*. Set a time limit.

Review with whole class. Ps come to BB to show their solutions and explain reasoning. Class agrees/disagrees. Mistakes corrected.

Solution: a) 171 and 171 b) 228 and 114 (or vice versa)

Notes:

Individual work, monitored, helped

Discussion, reasoning, agreement, self-correction, praising

a) $(186 - 156) \div 2 = \underline{15}$

186	$\downarrow 15$	171
156		171

b) $(186 + 156) \div 3 = \underline{114}$

186	$\downarrow 72$	114
156		228

or

186		228
156	$\uparrow 42$	114

35 min

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Bk4

Lesson Plan 139

Activity		Notes

6

Book 4, page 139

Q.3 Ps read questions themselves, write a plan, do the calculations and write the answer as a sentence in *Pbs.* Set a time limit.

Review at BB with whole class. Ps could show numerical solutions on scrap paper or slates on command. Ps responding correctly explain to those who were wrong. Mistakes discussed and corrected.

Solutions:

The children are making up gift boxes for a large party.

a) *If they put 4 sweets in each box, they can make 139 boxes and 2 sweets will be left over.*

How many sweets did they have?

Plan: $139 \times 4 + 2$

E: $140 \times 4 = 400 + 160 = 560$

C: $\begin{array}{r} 1\,3\,9 \\ \times\,4 \\ \hline 5\,5\,6 \\ {\scriptstyle 1\,3} \end{array} + 2 = 558$

Answer: They had 558 sweets.

b) *How many gift boxes would they make if they put 9 sweets in each box?*

Plan: $558 \div 9$

E: $540 \div 9 = 60$

C: $9 \,\overline{)\,5\,5\,8}\,$ = 6 2 (remainder written 1)

Answer: They would make 62 gift boxes, with no sweets over.

Notes: Individual work, monitored, (helped)

Differentiation by time limit.

Reasoning, agreement, self-correction, praising

Feedback for T

Estimate here by taking the nearest known multiple of 9.

40 min

7

Book 4, page 139, Q.4

Read: *Three children in a family made a flower garden, 6 m wide and 12 m long.*

What was the area of the garden? Ps come to BB to draw a diagram and work out the area. Class agrees/disagrees.

Read: *David said that he would look after 3 times more of it than his younger sister, Ann.*

George, who was the eldest, said that he would work on as much of the garden as his brother and sister together.

What area of the garden did each child take care of?

Who has an idea of how we can work out the fractions? Ps come to BB to explain reasoning, Who agrees? Who thinks something else? e.g.

BB:. A + D = G, so George must take care of <u>half</u> of the garden

D = 3 × A, so the other half has to be divided into 4 equal parts.

A: $\frac{1}{4}$ of $\frac{1}{2} = \frac{1}{8}$; D: $3 \times A = 3 \times \frac{1}{8} = \frac{3}{8}$

Now we can work out the area that they looked after.

Ps come to BB or dictate to T, explaining reasoning. Class agrees/disagrees.

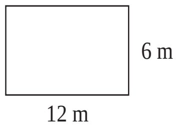
BB: Ann: $\frac{1}{8}$ of $72\text{ m}^2 = 72\text{ m}^2 \div 8 = \underline{9}\text{ m}^2$

David: $\frac{3}{8}$ of $72\text{ m}^2 = 72\text{ m}^2 \div 8 \times 3 = 9\text{ m}^2 \times 3 = \underline{27}\text{ m}^2$

George: $\frac{1}{2}$ of $72\text{ m}^2 = 72\text{ m}^2 \div 2 = \underline{36}\text{ m}^2$

Notes: Whole class activity

BB:



$A = 6\text{ m} \times 12\text{ m} = \underline{72}\text{ m}^2$

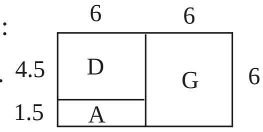
Discussion, reasoning, agreement, praising

T helps where necessary but allow Ps to do most of the work.

How could we show the areas in the diagram?

Ps come to BB to show each child's area of the garden on the diagram. (Need only be rough!)

BB: e.g.



45 min

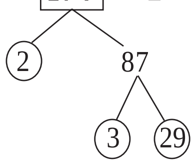
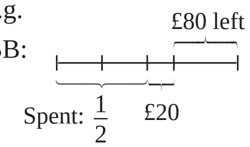
Bk4

R: Calculations

C: Puzzles and challenges

E: Poblems

Lesson Plan 140

Activity		*Notes*
1	**Factorising** In your *Ex. Bks.* factorise 174 and then list all its factors. Review at BB with whole class. Ps come to BB to draw a tree diagram, show the number as the product of its prime factors, and list all its factors. Class agrees/disagrees. Mistakes discussed and corrected. BB: $\boxed{174} = 2 \times 3 \times 29$  Factors: 1, 2, 3, 6, 29, 58, 87, 174 *5 min*	Individual work, monitored Discussion, reasoning, agreement, self-correction, praising Ps may use a calculator. Ps join up the factor pairs. Feedback for T
2	**Game of 21** a) Let's play a game which is similar to the one we played yesterday. Two players, A and B, start from zero and take turns to count in steps of 1, 2, 3 or 4 up to 21. e.g. A says 1, B says 5, A says 8, B says 11, and so on. The first player to reach '21' is the winner. Play the game in pairs and keep a record of the steps on scrap paper or in your *Ex. Bks*. Ps take turns to be *Player A*, i.e. start the game. Ps play the game several times and note the winner each time. What did you find? (Hopefully, *Player A* won more often.) b) T plays the game in front of the whole class with two Ps (one P as *Player A* and the other as *Player B*). If T is *Player B*, T exploits P's possible weaknesses, but if T is *Player B*, T wins the game. Who has noticed a strategy for playing the game so that you always win? Ask several Ps what they think. *Strategy:* Be *Player A* and say 1, 6, 11, 16, 21. *13 min*	Paired work, monitored T walks round listening to the games. Ask several pairs of Ps about their matches, e.g. how many games they played, who won most often and what position they went in when they won. Whole class activity In good humour! Discussion, reasoning, agreement, praising T calls 2 Ps to front of class to try out the strategy.
3	***Book 4, page 140*** Q.1 Read: *Sue spent half of her money. Then she spent another £20 and had £80 left.* *How much money did Sue have at first?* Ps solve problem in *Ex. Bks*. then write the answer as a sentence in *Pbs*. Set a time limit. Review at BB with whole class. Ps could show result on scrap paper or slates on command. P answering correctly explains at BB to those who were wrong. Who agrees? Who did it in a different way? etc. Mistakes discussed and corrected. *Solution:* e.g. Do the reverse operations in the opposite order: *Plan*: $(£80 + £20) \times 2 = £100 \times 2 = \underline{£200}$ or $\frac{1}{2}$ of $S - £20 = £80$, so $\frac{1}{2}$ of $S = £80 + £20 = £100$ So $S = £100 \times 2 = \underline{£200}$ (where S = Sue's money) *Answer:* Sue had £200 at first. *17 min*	Individual work, monitored, helped Discussion, reasoning, agreement, checking, self-correction, praising Deal with all methods used. e.g. BB:  *Check:* 200 – 100 – 20 = 80 ✔

Bk4

Lesson Plan 140

Activity		***Notes***

4

Book 4, page 140

Q.2 Read: *Which positive integer can be written instead of the letter x so that the inequality is true?*

BB: $48 + x < 52 - x$

Let's see if you can solve it without any help. Set a time limit.

Review with whole class. Ps could write solution on scrap paper or slates and show in unison on command. Ps answering correctly explain their reasoning. Who did the same? Who did it a different way? etc. Mistakes discussed and corrected.

Solution: e.g.

- Trial and error:

  If $x = 1$, then $48 + 1 < 52 - 1$, and $50 < 51$, so $x = 1$ ✔
  If $x = 2$, then $48 + 2 < 52 - 2$, but $50 \nless 50$, so $x \neq 2$ ✗

  Ps might have tried 3, 4, 5, . . . to confirm that the only possible solution is $\underline{x = 1}$

- By calculation: (T might show this method)

  $48 + x < 52 - x$ (subtract 48 from each side of inequality)
  $x < 4 - x$ (add x to each side of inequality)
  $x + x < 4$
  $x < 2$
  So $\underline{x = 1}$ (as x is a positive, whole integer)

- or $2 \times x < 52 - 48 = 4$
  $x < 4 \div 2 = 2$
  so $\underline{x = 1}$

Notes:

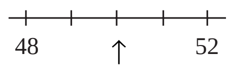
Individual work, monitored

T notes the methods that Ps are using.

Ps try it out in *Ex. Bks.* or on scrap paper then write only the solution in *Pbs*.

Discussion, reasoning, agreement, checking, self-correcting, praising

Or draw a diagram:



If $48 + x = 52 - x$,
$x = 2$

But $x < 2$, so $x = 1$

21 min

5

Book 4, page 140

Q.3 Read: *An antiques dealer bought a vase for £700, then sold it for £800. Then he bought the vase back again for £900 and sold it for £1000.*

Did the antiques dealer make a profit or a loss?

Ps write a plan and do calculations in *Ex. Bks.* then write the answer as a sentence in *Pbs*. Set a time limit.

Stand up if you think that the antiques dealer made a profit . . .now!

A, tell us why you think so. **X**, tell us why you think he did not.

Class listens to their reasoning and decides who is correct.
What did **X** do wrong? Who made the same mistake? etc.

Solution: e.g.

Plan: $-700 + 800 - 900 + 1000 = 1800 - 1600 = \underline{200}$ (£)

or $-£700 + £800 = £100$ and $-£900 + £1000 = £100$,
$£100 + £100 = \underline{£200}$

Answer: The antiques dealer made a profit of £200.

Notes:

Individual work, monitored, helped

Initial discussion about antiques and dealers and auctions to clarify the context.

In unison

Discussion, reasoning, agreement, self-correcting, praising

Feedback for T

26 min

6

Book 4, page 140, Q.4

Read: *What is half of double the greatest 2-digit number?*

Show me . . . now! (99) P responding correctly explains to class.

The greatest 2-digit number is 99, and half of its double is itself!

Notes:

Whole class activity

Responses show on slates or scrap paper in unison.

Reasoning, agreement, praising

29 min

Bk4		Lesson Plan 140
Activity		***Notes***
7	***Book 4, page 140, Q.5*** Read: *On a sheet of paper there are these 4 statements. Tick the only true one.* BB: *1. On this sheet there is exactly one false statement.* *2. On this sheet there are exactly two false statements.* *3. On this sheet there are exactly three false statements.* *4. On this sheet there are exactly four false statements.* Allow Ps time to think about it and discuss with their neighbours first. Who thinks that Statement 1 is true? Why do you think so? Who disagrees? Why? Class agrees that it is not the true one. Deal with each statement in turn in the same way, involving as many Ps as possible in the discussions. *Solution:* 1. If this statment is true, then 2, 3 and 4 are false, which makes 3 false statements, so it is a contradiction and <u>cannot</u> be true. 2. If this statement is true, then 1, 3 and 4 are false, which makes 3 false statements, so it is a contradiction again and <u>cannot</u> be true. 3. If this statement is true, then 1, 2 and 4 are false, which makes 3 false statements, so it is true. ✔ 4. If this statement is true, than all the others including itself are false, which is a contradiction again, so it <u>cannot</u> be true. *Answer:* Statement 3 is the only true one. *35 min*	Whole class activity Written on BB or use enlarged copy master or OHP Whole class discussion. T helps with wording of reasoning if necessary but makes no comment on whether Ps are correct – let the class decide. Reasong, agreement, praising In good humour! T gives class a clap if they decide on the correct statement, otherwise T explains as opposite.
8	***Book 4, page 140*** Q.6 Read: *At the market in Hobbitland, they offered 4 roosters for 2 geese or 2 roosters for 4 chickens.* *How many roosters did Mrs Hobbit get for 1 goose and 2 chickens?* Ps work out solution in *Ex. Bks* and write the answer as a sentence in *Pbs*. Set a time limit. Remind Ps to check their solution in the context of the question. If you have found the answer, show me . . .now! (3) P with correct answer explains at BB to Ps who were wrong. Who agrees? Who did it another way? etc. Mistakes discussed and corrected. If no P found the answer, T helps class to solve it. *Solution:* 4R = 2G → 1G = 2R 2R = 4C → 2C = 1R So 1G + 2C = 2R + 1R = 3R *Answer:* Mrs Hobbit got 3 roosters for 1 goose and 2 chickens. *40 min*	Individual work, monitored, helped (or whole claass activity if time is short) In unison Reasoning, agreement, self-correction, praising

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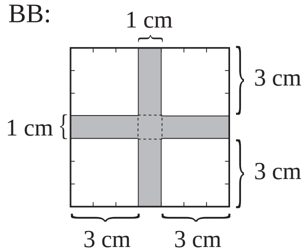
Bk4		*Lesson Plan 140*
Activity		***Notes***
9	***Book 4, page 140, Q.7*** Read: *We want to cut out a cross from a square piece of material which has sides of length 7 cm. The width of each arm of the cross is 1 cm.* *How much material will be wasted?* Who thinks that they know how to work it out? Who agrees? Who can think of another way to solve it? etc. Ps come to BB to explain, giving their reasoning in detail, writing calculations on BB and referring to the diagram where relevant. Class points out errors. *Solution:* e.g. Area of the cross: $(7 \times 1) + (7 \times 1 - 1)$ [as middle square is included in both arms] $= 7 + 6$ $= \underline{13}$ cm^2 Area of material: 7 cm $\times$ 7 cm = 49 cm^2 Area wasted: 49 cm^2 – 13 cm^2 = $\underline{36}$ cm^2 Or taking the 4 pieces wasted: Area wasted: $4 \times (3 \times 3) = 4 \times 9 = \underline{36}$ (cm^2) Or putting the waste material together: $6 \times 6 = \underline{36}$ (cm^2) *Answer:* The amount of material wasted is 36 cm^2.	Whole claass activity (or individual trial first if Ps wish) Drawn on BB or use enlarged copy master or OHP Discussion, reasoning, agreement, praising BB:  Ps write answer as a sentence in *Pbs.*

45 min