Lesson Plan

31

Notes

Individual work, monitored
(or whole class activity)
BB: 31, 206, 381, 1031
Calculators allowed
Reasoning, agreement, self-
correction, praising

e.g. \[
\begin{array}{c|ccc}
381 & 3 & 127 & 1 \\
127 & 1 & 37 & 1 \\
\end{array}
\]

Elicit that a prime number has
exactly 2 factors, itself and 1.
(1 is not a prime number as it
has only 1 factor, itself)

Whole class activity
Written on BB or use enlarged
copy master or OHP
Accept any valid diagram
Reasoning, agreement,
praising

Feedback for T

BB: equivalent fractions
equal in value

Individual work, monitored
(helped)
Drawn on BB or use enlarged
copy master or OHP
Reasoning, agreement, self-
correction, praising

Accept any equivalent
fraction but also show the
simplest form.

Whole class revision of the
concept of a fraction.
BB: fraction line → \( \begin{array}{c|c}
5 & \text{numerator} \\
8 & \text{denominator} \\
\end{array} \)

Also, \( \frac{5}{8} = \frac{1}{8} \times 5 = \frac{5}{8} \)
Lesson Plan 31

Notes

Individual work, monitored (helped)
BB: 10 cm = \( \frac{?}{?} \) m
Differentiation by time limit
Discussion, reasoning, agreement, self-correction, praising

Revise the meaning of decimals and mixed numbers.
Elicit that:
- a decimal is a number in which the parts of a unit are written as tenths, hundredths, thousandths, etc. and the decimal point separates the whole number from the parts of a unit;
- a mixed number is made up of a whole number and a fraction. e.g.

BB: \( \frac{1\frac{1}{4}}{4} = 1 + \frac{1}{4} = \frac{5}{4} \)

Elicit (or remind Ps) that:
- the decimal form of a fraction can be calculated by dividing the numerator by the denominator.
- a decimal in which a digit (or set of digits) is repeated to infinity is called a BB: recurring decimal

\( \frac{1}{3} = 1 \div 3 \)

\( = 0.333... \)

\( = 0.\overline{3} \)

(read as 'zero point 3 recurring')

\[ 24 \text{ min} \]
Y6

Activity 5

PbY6a, page 31, Q.3

T asks each part as a question (e.g. A line segment is 36 cm long. How many cm is 1 third of it?). Ps calculate mentally if they can, or in Ex.Bks, then show the amount on slates or scrap paper on command. Ps answering correctly explain at BB to Ps who were wrong, drawing a diagram where necessary and writing the calculation. Mistakes discussed and corrected.

Solution:

a) How many cm are these parts of a 36 cm line segment?

i) \( \frac{1}{3} \) of 36 cm = \( 36 \div 3 = 12 \text{ cm} \)

ii) \( \frac{1}{6} \) of 36 cm = \( 36 \div 6 = 6 \text{ cm} \)

iii) \( \frac{5}{6} \) of 36 cm = \( 36 \div 6 \times 5 = 6 \times 5 = 30 \text{ cm} \)

iv) \( \frac{13}{12} \) of 36 cm = \( 36 \div 12 \times 13 = 3 \times 13 = 39 \text{ cm} \)

v) \( \frac{5}{9} \) of 36 cm = \( 36 \div 9 \times 5 = 4 \times 5 = 20 \text{ cm} \)

b) How long are these parts of a 4 m length of ribbon?

i) \( \frac{1}{8} \) of 4 m = \( \frac{1}{8} \) of 400 cm = \( 400 \div 8 = 50 \text{ cm} \)

ii) \( \frac{1}{4} \) of 4 m = \( 4 \div 4 = 1 \text{ m} \)

iii) \( \frac{3}{4} \) of 4 m = \( 4 \div 4 \times 3 = 1 \times 3 = 3 \text{ m} \)

iv) \( \frac{3}{2} \) of 4 m = \( 4 \div 2 \times 3 = 2 \times 3 = 6 \text{ m} \)

v) \( \frac{5}{8} \) of 4 m = \( 400 \div 8 \times 5 = 50 \times 5 = 250 \text{ cm} = 2.5 \text{ m} \)

vi) \( \frac{8}{5} \) of 4 m = \( 400 \div 5 \times 8 = 80 \times 8 = 640 \text{ cm} = 6.4 \text{ m} \)

(Conver m to cm first.)

vi) \( \frac{8}{5} \) of 4 m = \( 400 \div 5 \times 8 = 80 \times 8 = 640 \text{ cm} = 6.4 \text{ m} \)

(or 2 m 50 cm)

(or 6 m 40 cm)

vi) \( \frac{2}{3} \) of 4 m = \( 4 \div 3 \times 2 = 16 \times 2 = 32 \text{ apples} \)

30 min

Lesson Plan 31

Notes

Whole class activity but individual calculation (or individual work, monitored, helped, under a time limit or dealing with one part at a time, reviewed with whole class)

At a good pace

Responses shown in unison.

Reasoning, agreement, (self-correction), praising
### Y6

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**Q.4 a)** Read: **Draw a 3 by 3 square in your exercise book.**

- **Colour** \( \frac{2}{3} \) of its area in yellow, then **colour** \( \frac{2}{3} \) of the yellow part in red.

  What part of the whole area is the red part?

Set a time limit. Review at BB with whole class. Ps show fraction on slates or scrap paper on command. P answering correctly explains and demonstrates on BB to Ps who were wrong. Who did the same? Who did it a different way? etc. Mistakes discussed and corrected.

**Solution:**

\[
\frac{2}{3} \times \frac{2}{3} = \frac{4}{9} \]

or \( 9 \div 3 \times 2 = 3 \times 2 = 6 \) (grid squares)

\[
6 \div 3 \times 2 = 2 \times 2 = 4 \rightarrow \frac{4}{9} \text{ of square}
\]

**b)** Read: **Draw a 6 by 5 rectangle in your exercise book.**

- **Colour** \( \frac{4}{5} \) of its area in green, then **shade** \( \frac{2}{3} \) of the green part in blue.

  What part of the whole area is the blue part?

Deal with part b) in a similar way to a).

**Solution:**

\[
\frac{3}{5} \times \frac{4}{5} = \frac{12}{25} \times 2 = \frac{8}{15} \]

or \( 30 \div 5 \times 4 = 6 \times 4 = 24 \) (grid squares)

\[
24 \div 3 \times 2 = 8 \times 2 = 16 \rightarrow \frac{16}{30} = \frac{8}{15}
\]

### Lesson Plan 31

#### Notes

- Individual work, monitored, (helped)
- Ps use squared Ex. Bks or more able Ps could measure in cm with rulers on plain paper.
- Responses shown in unison. Reasoning, agreement, self-correction, praising
- Accept correct answers obtained by Ps counting the squares but also show the calculation on BB and ask such Ps to write it in Ex. Bks.
- Elicit/Remind Ps that to divide a fraction by a natural number:
  - multiply the denominator by the number; or
  - divide the numerator by the number.

Extra praise if Ps notice that the numerator (denominator) in the result is the product of the two numerators (denominators) of the fractions in the question.

- If nobody notices, T draws Ps’ attention to it.

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**Q.5 a)** Read: **Convert these fractions to 24ths and write them in increasing order in your exercise book.**

What does convert mean? (Change to another form.)

How can we convert the fractions into 24ths? (Multiply the denominator by a number so that their product is 24, then multiply the numerator by the same number.) Elicit that increasing the numerator and denominator of a fraction by the same number of times does not change the value of the fraction.

Set a time limit. Review with whole class. Ps come to BB or dictate what T should write, explaining reasoning. Class agrees/disagrees. Mistakes discussed and corrected.

Let’s show them on the number line. Ps come to BB to mark and label the fractions. Class points out errors.
Activity

7

(Continued)

Q.5 a) Solution:

\[
\begin{align*}
\frac{3}{4} &< \frac{2}{3} < \frac{1}{2} < \frac{5}{10} (= \frac{1}{2}) < \frac{9}{6} (= \frac{3}{2}) < \frac{4}{5} < \frac{4}{3} < \frac{3}{2} \\
\frac{12}{16} &< \frac{12}{24} < \frac{12}{15} < \frac{12}{14} < \frac{12}{10} < \frac{12}{9} < \frac{12}{8} = \frac{12}{8}
\end{align*}
\]

In order:

\[
\frac{3}{4}, \frac{2}{3}, \frac{1}{2}, \frac{5}{10} (= \frac{1}{2}), \frac{9}{6} (= \frac{3}{2}), \frac{4}{5}, \frac{4}{3}, \frac{3}{2}
\]

If we are comparing two fractions, how can we decide which is greater? Ps say what they think and T repeats more clearly if necessary. e.g.

- Among positive fractions with equal denominators, the greater fraction has the greater numerator.
- Among positive fractions with equal numerators, the greater fraction has the smaller denominator.
- If fractions have unequal numerators and denominators, first change them to equivalent fractions which have equal numerators or denominators, then compare them.

b) Read: Convert each fraction to an equivalent fraction with numerator 12.

Write them in increasing order in your exercise book.

What are equivalent fractions? (Fractions which have the same value.) How can we do the conversion? (Work out what number the numerator needs to be multiplied by to result in 12, then multiply the denominator by that same number.) Elicit that increasing (or reducing) the numerator and denominator of a fraction by the same number of times does not change the value of the fraction.

Set a time limit and continue as in a) but without drawing a number line and simply listing the fractions in order.

Solution:

\[
\begin{align*}
\frac{3}{4} &< \frac{2}{3} < \frac{1}{2} < \frac{5}{10} (= \frac{1}{2}) < \frac{9}{6} (= \frac{3}{2}) < \frac{4}{5} < \frac{4}{3} < \frac{3}{2} \\
\frac{12}{16} &< \frac{12}{24} < \frac{12}{15} < \frac{12}{14} < \frac{12}{10} < \frac{12}{9} < \frac{12}{8} = \frac{12}{8}
\end{align*}
\]

If we are comparing two fractions, how can we decide which is greater? Ps say what they think and T repeats more clearly if necessary. e.g.

- Among positive fractions with equal denominators, the greater fraction has the greater numerator.
- Among positive fractions with equal numerators, the greater fraction has the smaller denominator.
- If fractions have unequal numerators and denominators, first change them to equivalent fractions which have equal numerators or denominators, then compare them.

Notes

Number line drawn on BB or use enlarged copy master or OHP

Elicit that 1\(\frac{5}{12}\) is a mixed number.

Individual work, monitored, helped (or whole class activity)

Written on BB or SB or OHT

Initial discussion to agree on the strategy for solution.

Differentiation by time limit

(If majority of Ps are stuck at what to do with 1\(\frac{5}{10}\), T asks if anyone knows what to do, or gives a hint about changing to another equivalent fraction first.)

Reasoning, agreement, self-correction, praising

Whole class discussion about ‘rules’ for comparing fractions

Involve several Ps.

Praising, encouragement only

Inequalities

T has inequalities already written on BB. Show me a number which would make the inequality true. Ps show numbers on scrap paper or slates on command. Class decides which are valid and which are not. (If many Ps showed the same number, elicit other numbers too.)

BB: a) \(\frac{3}{4} < \square < 1\)  b) \(1 < \square < 1\frac{1}{2}\)  c) \(0 < \square < \frac{1}{4}\)

e.g. \(\frac{4}{5}, \frac{7}{8}, \frac{9}{11}\)

Whole class activity

Written on BB or SB or OHT

Responses shown in unison.

Agreement, praising. Extra praise for unexpected numbers (e.g. decimals)

d) \(1\frac{2}{3} < \square < 2\frac{1}{3}\)

\(\frac{1}{8}, \frac{1}{9}, 2, 2\frac{1}{5}, \text{ etc.}\)
MEP: Primary Project

Lesson Plan

32

Notes

Individual work, monitored
(or whole class activity)
BB: 32, 207, 382, 1032
Calculators allowed
Reasoning, agreement, self-correction, praising
Whole class listing of the factors of 1032 (vertically as shown or Ps join factor pairs)

e.g. 207 3 1032 2
     69 3 516 2
     23 23 258 2
     1 129 3

8 min

R: Fractions
C: Relationships between fractions. Fractions multiplied and divided by a natural number
E: Explaining the rules

Y6

Activity

1

Factorisation

Factorise these numbers in your exercise book and list their positive factors. T sets a time limit of 6 minutes.

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

Elicit that:

• \(32 = 2 \times 2 \times 2 \times 2 \times 2 = 2^5\) Factors: 1, 2, 4, 8, 16, 32
• \(207 = 3 \times 3 \times 23 = 3^2 \times 23\) Factors: 1, 3, 9, 23, 69, 207
• \(382 = 2 \times 191\) (nice) Factors: 1, 2, 191, 382
• \(1032 = 2 \times 2 \times 2 \times 3 \times 43 = 2^3 \times 3 \times 43\)
  Factors: 1, 2, 3, 4, 6, 8, 12, 24, 1032, 516, 344, 258, 172, 129, 86, 43

8 min

2

PbY6a, page 32

Q.1 Read: a) Step along the number line by \(\frac{1}{3}\) from –2.
   Label the numbers that you land on.
   b) Step along the number line by \(\frac{3}{5}\) from –2.
   Label the numbers that you land on.

Deal with one part at a time. Set a time limit. Ps draw curved arrows and write fractions.

Review with whole class. Ps come to BB or dictate to T. Class agrees/disagrees. Mistakes corrected. Elicit different forms of the fractions where relevant.

What do you notice? (Each positive fraction has an opposite negative fraction and vice versa.)

Solution:

a) \(\frac{1}{3}, \frac{4}{3}, \frac{7}{3}, \frac{10}{3}, \frac{13}{3}, \frac{0}{3}, \frac{3}{3}, \frac{4}{3}, \frac{5}{3}, \frac{6}{3}, \frac{7}{3}, \frac{8}{3}, \frac{9}{3}\)

b) \(\frac{-10}{3}, \frac{-7}{3}, \frac{-4}{3}, \frac{-1}{3}, \frac{0}{3}, \frac{1}{3}, \frac{2}{3}, \frac{5}{3}, \frac{8}{3}, \frac{11}{3}, \frac{14}{3}\)

13 min

Individual work, monitored, (helped)
Drawn on BB or use enlarged copy master or OHP
Ensure that Ps have sharp pencils.
Fractions should be small and neat.

Discussion, agreement, self-correction, praising

Feedback for T

Bold numbers were given.
### Lesson Plan 32

**Notes**

Individual work, monitored

P comes to BB to do the multiplication, then T elicits (or points out) that the result is the same as if the whole fraction had been multiplied.

Discussion, reasoning, agreement, self-correction, praising

Accept any valid sentence.

(Demonstrate with a model or draw a diagram if necessary.)

Ps who did not write a sentence or who prefer the agreed sentence write it in *Ex. Bks*.

\[ (= \frac{3}{4}) \]

\[ (= 1) \]

or 'When you multiply the numerator of a fraction, you are multiplying the whole fraction.'
### Lesson Plan 32

#### Activity 4

**PbY6a, page 32**

**Q.3** Let's see how many of these multiplications you can do in 3 minutes! Start . . . now! . . . Stop!

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

**Solution:**

- a) \(\frac{1}{8} \times 7 = \frac{7}{8}\)
- b) \(\frac{1}{5} \times 8 = \frac{8}{5} = \frac{3}{5}\)
- c) \(\frac{1}{5} \times 13 = \frac{13}{5} = \frac{3}{4}\)
- d) \(\frac{3}{8} \times 2 = \frac{6}{8} = \frac{3}{4}\)
- e) \(\frac{4}{5} \times 3 = \frac{12}{5} = \frac{2}{5}\)
- f) \(\frac{5}{6} \times 7 = \frac{35}{6} = \frac{5}{6}\)
- g) \(\frac{7}{10} \times 4 = \frac{28}{10} = \frac{28}{4} = \frac{7}{2} = \frac{9}{20}\)
- h) \(\frac{3}{20} \times 3 = \frac{9}{20}\)

Who can explain how to multiply a fraction by a whole number?

'Multiply the numerator but do not change the denominator.'

---

#### Activity 5

**PbY6a, page 32**

**Q.4**

a) Read: *Divide the numerator of \(\frac{6}{8}\) by 2, 3, and 6 in your exercise book. Write a sentence about how the value of the fraction changes.*

Do first division with whole class on BB as a model for Ps to follow. Set a time limit. Ps write divisions and a sentence in Ex. Bks.

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

T chooses 3 or 4 Ps to read out their sentences and class decides which is the clearest statement.

**Solution:**

- i) \(\frac{6}{8} \div 2 = \frac{3}{8} = \frac{6}{8} \div 2\)
- ii) \(\frac{6}{8} \div 3 = \frac{2}{8} = \frac{6}{8} \div 3\)

e.g. BB: [Diagram]

iii) \(\frac{6}{8} \div 6 = \frac{1}{8} = \frac{6}{8} \div 6\)

BB: [Diagram]

---

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**Lesson Plan 32**

### Activity 5

(Continued)

b) Read: **Divide the numerator of \( \frac{12}{25} \) by 2, 3, 6 and 12 in your exercise book.**

Write a sentence about how the value of the fraction changes.

Set a time limit and review with the whole class as in a).

**Solution:**

i) \( \frac{12 \div 2}{25} = \frac{6}{25} = \frac{12}{25} \div 2 \)

ii) \( \frac{12 \div 3}{25} = \frac{4}{25} = \frac{12}{25} \div 3 \)

iii) \( \frac{12 \div 6}{25} = \frac{2}{25} = \frac{12}{25} \div 6 \)

iv) \( \frac{12 \div 12}{25} = \frac{1}{25} = \frac{12}{25} \div 12 \)

e.g. ‘When the numerator of a fraction is decreased by a certain number of times, the value of the whole fraction has been decreased by that number of times.’

---

### Notes

Individual work, monitored

Differentiation by time limit

Discussion, reasoning, agreement, self-correction, praising

Demonstrate with models or draw diagrams if there are problems or disagreement.

Ps who did not write a sentence or who prefer the agreed sentence write it in Ex. Bks.

---

### Activity 6

**PbY6a, page 32**

Q.5 Let’s see if you can do these divisions in 2 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. Use models or draw diagrams if necessary.

**Solution:**

a) \( \frac{6}{7} \div 2 = \frac{3}{7} \)  
b) \( \frac{9}{10} \div 3 = \frac{3}{10} \)  
c) \( \frac{8}{9} \div 4 = \frac{2}{9} \)

d) \( \frac{21}{8} \div 7 = \frac{3}{8} \)  
e) \( \frac{32}{35} \div 8 = \frac{4}{35} \)  
f) \( \frac{18}{7} \div 9 = \frac{2}{7} \)

Who can explain how to divide a fraction by a whole number? e.g.

‘If the numerator is a multiple of the divisor we can divide the numerator and leave the denominator unchanged.’

---

Individual work, monitored, helped

Written on BB or SB or OHT

Discussion, reasoning, agreement, self-correction, praising

Ask several Ps what they think. Agree that this method is difficult to use if the numerator is not a multiple of the divisor.
Lesson Plan 32

Notes

Individual work, monitored

P comes to BB to do the multiplication, then T elicits (or points out) that the result is the same as if the whole fraction had been divided.

Discussion, reasoning, agreement, self-correction, praising

Accept any valid sentence and type of diagram.

Ps who did not write a sentence or who prefer the agreed sentence write it in Ex. Bks.

Differentiation by time limit

Reasoning, agreement, self-correction, praising

Use models or draw diagrams on BB if problems or disagreement.

e.g.

\[
\begin{align*}
\text{BB:} & \quad \frac{2}{3} \div 3 = \frac{2}{9} \\
\text{BB:} & \quad \frac{4}{5} \div 5 = \frac{4}{25} \\
\text{BB:} & \quad \frac{3}{4} \div 2 = \frac{3}{8}
\end{align*}
\]

Praising only

T could have the 2 rules for dividing fractions written on SB or OHT and Ps say then in unison and/or copy in Ex. Bks.
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<td>Individual work, monitored (or whole class activity)</td>
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</table>
| Factorise these numbers in your exercise book and list their positive factors. T sets a time limit of 6 minutes.  
Review with whole class. Ps come to BB or dictate to T, explaining reasoning. Class agrees/disagrees. Mistakes discussed and corrected.  
Elicit that:  
• \( \frac{33}{1} = 3 \times 11 \) (nice)  
Factors: 1, 3, 11, 33  
• \( \frac{208}{1} = 2 \times 2 \times 2 \times 2 \times 13 = 2^4 \times 13 \)  
Factors: 1, 2, 4, 8, 13, 16, 26, 52, 104, 208  
• \( \frac{383}{1} \) is a prime number  
Factors: 1, 383  
(as not exactly divisible by 2, 3, 5, 7, 11, 13, 17 and 19 and \( 23 \times 23 > 383 \))  
• \( \frac{1033}{1} \) is a prime number  
Factors: 1, 1033  
(as not exactly divisible by 2, 3, 5, 7, 11, 13, 17, 19, 23, 29 and 31 and \( 37 \times 37 > 1033 \))  
8 min | BB: 33, 208, 383, 1033  
Calculators allowed  
Reasoning, agreement, self-correction, praising  
Whole class listing of the factors of 208.  
e.g. \[ \begin{array}{c|c} 208 & 2 \\ 104 & 2 \\ 52 & 2 \\ 26 & 2 \\ 13 & 13 \\ 1 & 1 \end{array} \]  
Extra praise if Ps notice that a fraction can be simplified or changed to a mixed number. If no P notices, T asks if the fraction could be shown in a simpler form. Mistakes discussed and corrected.  
Ps say what they did to calculate each row.  
**Solution:**  
a) i) \( \frac{1}{6} \times 5 = \frac{5}{6} \)  
ii) \( \frac{1}{6} \times 3 = \frac{3}{6} = \frac{1}{2} \)  
iii) \( \frac{1}{6} \times 11 = \frac{11}{6} = \frac{5}{3} = 1 \frac{2}{3} \)  
v) \( \frac{5}{6} \times 2 = \frac{10}{6} = \frac{5}{3} = 1 \frac{2}{3} \)  
e.g. To multiply a fraction by a natural number, multiply the numerator but leave the denominator unchanged. |

| **2** **Concept of a fraction** | Whole class activity  
Involve several Ps.  
Reasoning, agreement, praising only  
Feedback for T  
BB: \[ \begin{array}{c} 1 \\ 1 \end{array} \] \[ \begin{array}{c} 1 \\ 1 \end{array} \] \[ \begin{array}{c} 1 \\ 1 \end{array} \] \[ \begin{array}{c} 1 \\ 1 \end{array} \]  
Extra praise for unexpected but correct definitions. |
| **Concept of a fraction** | | |
| Who can explain what \( \frac{3}{8} \) eighths means?  
Ps say what they know and if necessary T prompts or asks questions to elicit other meanings too. e.g.  
• \( \frac{3}{8} \) means that 1 unit has been divided into 8 equal parts and we have taken 3 of the parts.  
• \( \frac{3}{8} \) is \( \frac{1}{8} \) of 3 units. We have 3 units and have divided each of them into 8 equal parts, then we have taken 1 part from each unit.  
• \( \frac{3}{8} \) = 3 times \( \frac{1}{8} \); or \( \frac{3}{8} = \frac{1}{8} + \frac{1}{8} + \frac{1}{8} = \frac{1}{8} \times 3 \); or \( \frac{3}{8} = 3 \div 8 \)  
11 min | |

| **3** **PbY6a, page 33** | Individul work, monitored, helped  
Written on BB or use enlarged copy master or OHP  
Discussion, reasoning (with model or diagrams if needed), agreement, self-correction, praising  
T helps with wording if necessary. |
| **PbY6a, page 33** | | |
| Q.1 Deal with one row at a time. Ps write calculations in *Ex. Bks* if they need more space. Set a short time limit for each row.  
Review with whole class. Ps come to BB to write calculations, explaining reasoning and drawing diagrams if problems or disagreement. Class agrees/disagrees. Extra praise if Ps notice that a fraction can be simplified or changed to a mixed number. If no P notices, T asks if the fraction could be shown in a simpler form. Mistakes discussed and corrected.  
Ps say what they did to calculate each row.  
**Solution:**  
a) i) \( \frac{1}{6} \times 5 = \frac{5}{6} \)  
ii) \( \frac{1}{6} \times 3 = \frac{3}{6} = \frac{1}{2} \)  
iii) \( \frac{1}{6} \times 11 = \frac{11}{6} = \frac{5}{3} = 1 \frac{2}{3} \)  
v) \( \frac{5}{6} \times 2 = \frac{10}{6} = \frac{5}{3} = 1 \frac{2}{3} \)  
e.g. To multiply a fraction by a natural number, multiply the numerator but leave the denominator unchanged. |
Lesson Plan 33

Notes

[or use method in ii)]

[or use method in i)]

T asks Ps which method they like best.

(First method is usually easier.)

To divide a fraction by a natural number which is not a factor of its numerator, multiply the denominator by that number.

d) i) \( \frac{4}{9} \div 5 = \frac{4}{45} \)  

ii) \( \frac{25}{4} \div 3 = \frac{25}{12} = 2 \frac{1}{12} \)

To divide a fraction by a natural number which is not a factor of its numerator, multiply the denominator by that number.

Q.2  a) Read: Divide the denominator of \( \frac{1}{6} \) by 2 and by 3 in your exercise book.

Draw a diagram to show each division.

Write a sentence about how the value of the fraction changed as its denominator decreased.

Deal with one step at a time or set a time limit, (or do as a whole class activity if Ps are not very able, with Ps working on BB with help and prompts from T, while rest of Ps work in Ex. Bks.)

Review with whole class. Ps come to BB to write divisions and explain reasoning by drawing diagrams. Ps say what they noticed. Who thought the same thing? Who drew a different diagram? Deal with all cases. Class agrees/disagrees. Mistakes discussed and corrected.

Agree that dividing the denominator by 2 or by 3 has the same result as if the whole fraction had been multiplied by 2 or by 3.

Individual work, monitored, helped in drawing diagrams [or whole class activity for a)]

T could ask Ps what they think will happen to the value of the fractions before they do the divisions.

Who thinks the value of each fraction will increase (decrease, stay the same)?

Discussion, reasoning, agreement, self-correction, praising

Extra praise for unexpected but correct diagrams

Ps who did not write a sentence, write it now in Ex. Bks after the outcome has been discussed and agreed.
### Lesson Plan 33

#### Activity 4 (Continued)

**Solution:**

- **a)**
  1. \( \frac{1}{6} \div 2 = \frac{1}{3} = \frac{1}{6} \times 2 \)
  2. \( \frac{1}{6} \div 3 = \frac{1}{2} = \frac{1}{6} \times 3 \)

  **e.g.** If the denominator of a fraction is reduced by 2 or by 3 times, the value of the whole fraction increases by 2 or by 3 times.

- **b)** Let's see if the same thing occurs with other natural numbers.
  
  Set a time limit. Ps read question themselves, write calculations and draw suitable diagrams in Ex. Bks.

  Review as for a) and agree that the same thing happens with any natural number. Ps formulate a general statement, with T's help if necessary, and write it in Ex. Bks.

  **Solution:**

  - i) \( \frac{1}{4} \div 2 = \frac{1}{2} = \frac{1}{4} \times 2 \)
  - ii) \( \frac{1}{9} \div 3 = \frac{1}{3} = \frac{1}{9} \times 3 \)
  - iii) \( \frac{1}{10} \div 5 = \frac{1}{2} = \frac{1}{10} \times 5 \)

  **General rule or law**
  
  *If the denominator of a fraction is divided by any natural number, the value of the whole fraction is multiplied by that number.*

#### Activity 5

**PbY6a, page 33**

Q.3 Deal with one row at a time or set a time limit. Ps do calculations mentally, write results in Pbs and write sentences for c) in Ex. Bks.

Review with whole class. Ps come to BB or dictate to T, explaining reasoning. Who did the same? Who calculated in a different way? etc. If problems or disagreement, draw diagrams on BB or write as an addition. Mistakes discussed and corrected.

T asks 2 or 3 Ps to read out their sentences. Who agrees? Who wrote something different? T repeats more clearly if necessary.

**Solution:**

- **a)**
  \( \frac{2}{5} \times 5 = \frac{2 \times 5}{5} = \frac{10}{5} = 2 \) or \( \frac{2}{5} \times 5 = \frac{2}{5} \div 5 = \frac{2}{1} = 2 \)

  or
  \( \frac{2}{5} \times 5 = \frac{2}{5} + \frac{2}{5} + \frac{2}{5} + \frac{2}{5} = \frac{10}{5} = 2 \)

  Similarly for: \( \frac{1}{6} \times 3 = \frac{1}{2} \), \( \frac{2}{4} \times 2 = \frac{3}{2} = 1 \frac{1}{2} \),

  \( \frac{9}{10} \times 5 = \frac{9}{2} = 4 \frac{1}{2} \), \( \frac{7}{12} \times 6 = \frac{7}{2} = 3 \frac{1}{2} \)

---

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### Y6

#### Activity

<table>
<thead>
<tr>
<th>5</th>
<th>(Continued)</th>
</tr>
</thead>
</table>
| b) i) $1 \frac{1}{2} \times 2 = 2 + \frac{2}{2} = 2 + 1 = 3$, or $1 \frac{1}{2} + 1 \frac{1}{2} = 2 + 1 = 3$  
  or $1 \frac{1}{2} \times 2 = \frac{3}{2} \times 2 = \frac{6}{2} = 3$.  
  or $1 \frac{1}{2} \times 2 = \frac{3}{2} \times 2 = \frac{3}{2} + 2 = \frac{3}{1} = 3$  
  ii) $3 \frac{5}{8} \times 4 = 12 + \frac{5}{2} = 12 + 2 \frac{1}{2} = 14 \frac{1}{2}$,  
  or $ = 12 + \frac{20}{8} = 12 + 2 \frac{4}{8} = 14 + \frac{1}{2} = 14 \frac{1}{2}$  
  iii) $2 \frac{2}{3} \times 2 = 4 + \frac{4}{3} = 4 + 1 \frac{1}{3} = 5 \frac{1}{3}$ |
| c) i) If the denominator of a fraction is multiplied by a natural number, the value of the fraction is divided by that number.  
  ii) If the denominator of a fraction is divided by a natural number, the value of the fraction is multiplied by that number. |

#### Notes

| 30 min |

---

### Lesson Plan 33

#### Notes

Extra praise if a P notices that in iii) the denominator is not a multiple of the divisor, so the method of dividing the denominator by the multiplier cannot be used.

---

### Q.4

a) Read: Multiply the numerator and denominator of $\frac{2}{3}$ by 2, 3 and 5. How did the value of the fraction change? Draw diagrams to show it.

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

Review with whole class. Ps come to BB to write multiplications and explain reasoning. Ps say what they noticed. Who thought the same thing? Who can draw a diagram to show it? Ps come to BB and T helps where necessary. Class points out any errors.

Agree that increasing the numerator and denominator by the same number of times does not change the value of the fraction.

T: When we multiply the numerator and denominator of a fraction by the same natural number, we say that we are **expanding** the fraction.

**Solution:**

\[
\frac{2}{3} = \frac{2 \times 2}{3 \times 2} = \frac{4}{6} = \frac{2 \times 3}{3 \times 3} = \frac{6}{9} = \frac{2 \times 5}{3 \times 5} = \frac{10}{15}
\]

e.g.  

<table>
<thead>
<tr>
<th>1</th>
<th>1</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>=</td>
<td>=</td>
<td>=</td>
</tr>
</tbody>
</table>

BB: **expanding**

\[
\frac{2}{3} = \frac{6}{9} = \frac{8}{12} = \frac{20}{30}, \text{ etc.}
\]

Ps give other examples of expanding 2 thirds orally.
### Lesson Plan 33

#### Activity

<table>
<thead>
<tr>
<th>6</th>
<th>(Continued)</th>
</tr>
</thead>
<tbody>
<tr>
<td>b) Read: Divide the numerator and the denominator of ( \frac{12}{30} ) by 2, 3 and 6. How did the value of the fraction change? Draw diagrams to show it.</td>
<td></td>
</tr>
<tr>
<td>Deal with b) in a similar way to a) but this time T helps Ps to draw the diagrams on BB with the whole class. Agree that reducing the numerator and denominator by the same number of times does not change the value of the fraction.</td>
<td></td>
</tr>
<tr>
<td>T: When we divide the numerator and denominator of a fraction by the same natural number, we say that we are simplifying the fraction.</td>
<td></td>
</tr>
</tbody>
</table>
| Solution: \[
\frac{12}{30} = \frac{12 \div 2}{30 \div 2} = \frac{6}{15} \quad \frac{12 \div 3}{30 \div 3} = \frac{4}{10} \quad \frac{12 \div 6}{30 \div 6} = \frac{2}{5} \\
\]
| e.g. \[
\begin{array}{c|c|c|c}
\hline
\text{10ths} & \text{20ths} & \text{30ths} \\
\hline
\text{8} & \text{16} & \text{24} \\
\hline
\end{array}
\]
| Who can put both our findings into one sentence? Ps suggest sentences and T repeats in a clearer way if necessary.) e.g. |
| If the numerator and denominator of a fraction are increased or reduced by the same number of times, the value of the fraction does not change. |

#### Notes

Discussion, reasoning, agreement, self-correction, praising

BB: simplifying

\[
\frac{12}{30} = \frac{6}{15} = \frac{4}{10} = \frac{2}{5}
\]

Ps give examples of simplifying other fractions. e.g. \( \frac{4}{8} = \frac{2}{4} = \frac{1}{2} \)

Elicit that fractions which have equal value are called equivalent fractions.

Ps could write the sentence in Ex. Bks.

---

### Activity

<table>
<thead>
<tr>
<th>7</th>
<th>Expanding and reducing decimals</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Let's write 4.3 as a fraction in tenths, hundredths and thousandths.</td>
<td></td>
</tr>
<tr>
<td>Ps come to BB to write the fractions or dictate to T. Class agrees/disagrees. Elicit that 430 hundredths as a decimal is written as 4.30 and 4300 thousandths as a decimal is written as 4.300.</td>
<td></td>
</tr>
<tr>
<td>BB: ( 4.3 = \frac{43}{10} = \frac{430}{100} = \frac{4300}{1000} ) Agree that all these forms are equal in value.</td>
<td></td>
</tr>
<tr>
<td>( = 4.30) ( = 4.300)</td>
<td></td>
</tr>
<tr>
<td>T: When we write additional zeros at the RHS of a decimal, we say that we are expanding the decimal but its value stays the same.</td>
<td></td>
</tr>
<tr>
<td>b) Let's write 2.700 as a fraction in thousandths, hundredths and tenths.</td>
<td></td>
</tr>
<tr>
<td>Ps come to BB to write the fractions. Class agrees/disagrees.</td>
<td></td>
</tr>
<tr>
<td>Who could write the 10ths and 1000ths as decimals?</td>
<td></td>
</tr>
<tr>
<td>BB: ( 2.700 = \frac{2700}{1000} = \frac{270}{100} = \frac{27}{10} ) Agree that all these forms are equal in value.</td>
<td></td>
</tr>
<tr>
<td>( = 2.70) ( = 2.7)</td>
<td></td>
</tr>
<tr>
<td>T: When we leave off the zeros at the RHS of a decimal, we say that we are simplifying the decimal but its value stays the same.</td>
<td></td>
</tr>
</tbody>
</table>

---

Whole class activity

At a good pace

Agreement, praising

Allow Ps to try to explain the 'rule' in their own words before T states the 'rule' in a clear way.

Ps suggest their own examples of expanding or simplifying decimals.
PbY6a, page 33

Q.5 Read: Fill in the missing digits.

What can you say about the fractions and decimals in each row? (They are equal because there is an 'equals' sign between each pair.) What name do we give to fractions which have the same value? (Equivalent fractions.)

Deal with one row at a time. Set a time limit.

Review with whole class. Ps come to BB or dictate to T, explaining reasoning by saying what has been done to the original fraction to form the equivalent fraction. Class agrees or disagrees. Mistakes discussed and corrected.

Stress that when the fraction in a mixed number is expanded or simplified, the whole number is not affected.

Solution:

a) \( \frac{3}{4} = \frac{6}{8} = \frac{12}{16} = \frac{15}{20} = \frac{21}{28} = \frac{48}{64} = \frac{30}{40} = \frac{75}{100} = \frac{750}{1000} = 0.75 \)

b) \( \frac{4}{7} = \frac{8}{14} = \frac{40}{70} = \frac{16}{28} = \frac{32}{56} = \frac{20}{35} = \frac{28}{49} = \frac{120}{210} \)

c) \( \frac{1}{10} = \frac{3}{30} = \frac{300}{100} = \frac{10000}{10000} = 0.30 = 0.3 \)

d) \( \frac{4}{5} = \frac{8}{10} = \frac{28}{35} \)

T points to pairs of fractions and asks what has been done to the first fraction to form the 2nd equivalent fraction.

Who can explain the rules for expanding and simplifying fractions? T asks several Ps to explain in their own words, then T states the 'laws' in a clear way and Ps repeat them in unison.

Expanding fractions
If both the numerator and the denominator of a fraction are multiplied by the same non-zero number, then the value of the fraction does not change.

Simplifying fractions
If both the numerator and the denominator of a fraction are divided by the same non-zero number, then the value of the fraction does not change.

Individual work, monitored, helped
Written on BB or use enlarged copy master or OHP
BB: equivalent fractions (fractions with equal value)
Differentiation by time limit
Discussion, reasoning, agreement, self-correction, praising
Feedback for T
Use different forms of words (nouns, verbs, particles) to familiarise Ps with the two concepts.

45 min
### Activity 1

#### Factorisation

Factorise these numbers in your exercise book and list their positive factors. T sets a time limit of 6 minutes.

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

Elicit that:

- \( \frac{34}{2} = 2 \times 17 \) (nice)  
Factors: 1, 2, 17, 34

- \( \frac{209}{11} = 19 \) (nice)  
Factors: 1, 11, 19, 209

- \( \frac{384}{2} = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 = \frac{2^7 \times 3}{3} \)  
Factors: 1, 2, 3, 4, 6, 8, 12, 16, 384, 192, 128, 64, 48, 32, 24

- \( \frac{1034}{2} = 2 \times 11 \times 47 \)  
Factors: 1, 2, 11, 22, 47, 94, 517, 1034

18 min

### Activity 2

#### Equivalent fractions

T asks a question about equivalent fractions. Ps say the answer. T asks Ps to write an equation on the BB. Class agrees/disagrees. If problems or disagreement, show it with a model (e.g. using multilink cubes) or by drawing a diagram on BB.

- **a)** How many halves form a whole unit (5 units, 7 units)? [2, 10, 14]
  
  BB: [2, 10, 14]

- **b)** How many thirds are in 1 (2, 5, 7)? [3, 6, 15, 21]
  
  BB: [3, 6, 15, 21]

- **c)** How many fifths are in 1 (2, 6, 1 and 3 fifths)? [5, 10, 30, 8]
  
  BB: [5, 10, 30, 8]

- **d)** How many eighths do you need to make 1 and a half? [12]
  
  BB: 1 [12], 1 [4] = [3, 6, 12]

- **e)** How many sixteens are in 1 unit (a quarter, a third)? [12, 3, 4]
  
  BB: [12, 3, 4]

- **f)** How many fifteens are in 1 fifth (3 fifths, 7 fifths)? [4, 4, 31]
  
  BB: [3, 9, 21]

- **g)** How many tenths are in 2 (5, 3 fifths)? [20, 50, 6]
  
  BB: [20, 50, 6]

- **h)** How many hundredths are in 4 tenths (2 and 5 tenths)? [40, 250]
  
  BB: [40, 250]

\(40 = 0.4 \quad 2.5 = 1.25 \times 0.5\)

- **18 min**
Lesson Plan 34

Activity

3  PbY6a, page 34

Q.1  Read:  
   a) Circle the numbers which are less than 1.  
      Tick the numbers which equal 1.
   b) Convert the numbers greater than 1 to mixed numbers 
      in your exercise book.

   What does convert mean? (Change to another form.) Set a time 
   limit of 3 minutes.

   Review with whole class. Ps come to BB to circle and tick, 
   explaining reasoning and writing relevant fractions as a mixed 
   number. Class agrees/disagrees. Mistakes discussed/corrected.

   Elicit that a fraction where the numerator is: 
   • less than the denominator is less than 1, 
   • the same as the denominator is equal to 1, 
   • greater than the denominator is greater than 1 and can be 
     written as a mixed number.

   Solution:
   a) \[
   \begin{array}{c}
   \frac{3}{4} \\checkmark \\
   \frac{32}{5} \\
   \frac{12}{7} \\checkmark \\
   \frac{92}{9} \\checkmark \\
   \frac{7}{8} \\
   \frac{9}{10} \\
   \end{array}
   \]
   b) \[
   \begin{array}{c}
   \frac{32}{5} = 6 \frac{2}{5} \\
   \frac{92}{9} = 1 \frac{33}{36} \\
   \frac{9}{2} = 4 \frac{1}{2} \\
   \frac{9}{8} = 1 \frac{1}{8} \\
   \end{array}
   \]

   22 min

4  PbY6a, page 34

Q.2  Read:  Fill in the missing digits.

   What kind of fractions are in each row? (equivalent fractions)

   Deal with one row at a time. Set a time limit.

   Review with whole class. Ps come to BB or dictate to T, 
   explaining reasoning by saying what has been done to the original 
   fraction to form the equivalent fraction. Class agrees/disagrees. 
   (If problems or disagreement, show with a model or by drawing a 
   diagram on BB.) Mistakes discussed and corrected.

   Solution:
   a) \[
   \begin{array}{c}
   \frac{2}{5} = \frac{14}{35} = \frac{18}{45} = \frac{40}{100} = \frac{30}{75} = \frac{200}{1000} \\
   \end{array}
   \]
   b) \[
   \begin{array}{c}
   \frac{14}{10} = \frac{7}{5} = \frac{42}{30} = \frac{7}{10} = \frac{40}{50} = \frac{7}{10} = \frac{1}{10} \\
   \end{array}
   \]
   c) \[
   \begin{array}{c}
   2.03 = 2 \frac{9}{10} = 2 \frac{90}{100} = \frac{203}{100} = \frac{2}{100} = \frac{203}{100} \\
   \end{array}
   \]
   d) \[
   \begin{array}{c}
   \frac{60}{72} = \frac{30}{36} = \frac{20}{24} = \frac{18}{20} = \frac{75}{90} = \frac{75}{72} \\
   \end{array}
   \]

   27 min

Extension

What is the simplest form of the number in each row?

   a) \[
   \frac{2}{5} \]
   b) \[
   \frac{7}{10} \]
   c) \[
   \frac{3}{100} \]
   d) \[
   \frac{5}{6} \]

   In d), what steps could we take to get from the 1st fraction to 
   its simplest form? Ps come to BB to show them. (See above.)

   How could we do it in just one step? (Divide numerator and 
   denominator by 12.) T shows it on BB.

   Whole class activity

   Discussion, reasoning, 
   agreement, praising 

   BB: \[
   \frac{60}{72} = \frac{5}{6} \div 12
   \]

Notes

Individual work, monitored  
(helped)

Written on BB or SB or OHT

Reasoning, agreement, self- 
correction, praising

Feedback for T

Can you see any equivalent 
fractions among them?

\( \frac{7}{7} = \frac{16}{16} \)
Q.3 Read: Calculate the sums and differences in your exercise book.

Ask Ps to simplify their results as far as possible.

Set a time limit for each row. Review with whole class. Ps could show each sum or difference on scrap paper or slates on command. Ps answering correctly explain at BB to Ps who were wrong. Mistakes discussed and corrected.

Do the first addition in row c) with the whole class. What is different about the fractions in this addition? (They have different denominators.) We cannot add the two fractions in these forms, so what could we do? (Change the half to 2 quarters.)

BB:

\[
\frac{1}{2} + \frac{1}{4} = \frac{2}{4} + \frac{1}{4} = \frac{3}{4}
\]

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

T: We say that we have changed the 2 different denominators to a common denominator. In this case, one of the denominators (4) is a multiple of the other (2), so the lowest common denominator is the same as the lowest common multiple of 2 and 4, which is 4.

Ps do each of the other calculations one at a time in Ex. Bks, then show result on scrap paper or slates on command. Ps with different answers come to BB to explain reasoning. Class decides who is correct. Mistakes discussed and corrected.

Solution:

a) i) \(\frac{1}{8} + \frac{5}{8} = \frac{6}{8} = \frac{3}{4}\) ii) \(\frac{2}{10} + \frac{7}{10} + \frac{3}{10} = \frac{12}{10} = \frac{6}{5} = \frac{1}{5}\)

iii) \(\frac{6}{7} - \frac{2}{7} = \frac{4}{7}\) iv) \(\frac{4}{5} + \frac{7}{5} - \frac{9}{5} = \frac{2}{5}\)

b) i) \(\frac{4}{5} + 2\frac{1}{5} + 8\frac{3}{5} = 11 + \frac{8}{5} = 11 + \frac{3}{5} = 12\frac{3}{5}\)

ii) \(3 - \frac{7}{12} = \frac{2}{4}\)

iii) \(\frac{24}{9} + \frac{2}{9} - \frac{5}{9} = 1 + \frac{4 + 2 - 5}{9} = 1 + \frac{1}{9} = \frac{1}{1}\)

iv) \(\frac{5\frac{3}{8} - \frac{3}{5}}{8} = 2 + \frac{3 - 5}{8} = 2 - \frac{2}{8} = \frac{16}{8} = \frac{1}{4}\)

or \(\frac{5\frac{3}{8} - \frac{3}{5}}{8} = \frac{41}{8} - \frac{35}{8} = \frac{1}{8} = \frac{1}{4}\)

iv) \(\frac{3}{10} + \frac{4}{5} - \frac{3}{2} = \frac{13}{10} + \frac{8}{10} - \frac{15}{10} = \frac{6}{10} = \frac{3}{5}\)

Individual work for a) and b) (one row at a time), monitored. Written on BB or SB or OHT. Responses shown in unison. Reasoning, agreement, self-correction, praising.

If problems or disagreement, draw diagrams on BB. Whole class discussion. Allow Ps to suggest what to do if they can, otherwise T prompts. Agreement, praising.

BB: common denominator

\[
\downarrow
\]

common multiple of the denominators

Individual trial, monitored. Responses shown in unison. Reasoning, agreement, self-correction, praising.

Elicit or show Ps that:

• to add or subtract mixed numbers, add or subtract the whole numbers first, then the fractions;

• instead of writing the common denominator lots of times, we can write the denominator once below the fraction line and write the numerators and operation signs above it. (Ps could use this notation for the remaining calculations if they wish.)

• in b) iv), there are two methods of subtracting mixed numbers where the fractional part of the subtrahend is smaller than that of the reductant;

• in each part of c), one of the two denominators is a multiple of the other, so that multiple is the lowest common denominator.
Q.4 Read: Convert the fractions to a common denominator, then do the calculation.

Deal with one at a time to start with. Ps try each calculation in Ex. Bks then show result on scrap paper or slates on command. Ps answering correctly explain at BB to Ps who were wrong. Mistakes discussed and corrected.

Extension

Which calculations can easily be written in decimal form? Ps come to BB or dictate to T. Class agrees/disagrees. (See below.)

Solution:

a) i) \( \frac{13}{5} + \frac{3}{2} = \frac{26}{10} + \frac{15}{10} = \frac{41}{10} = 4\frac{1}{10} \)

(or \( = 2.6 + 1.5 = 4.1 \))

ii) \( \frac{1}{2} - \frac{4}{5} = \frac{5}{10} - \frac{8}{10} = -\frac{3}{10} \)

(or \( = 0.5 - 0.8 = -0.3 \))

iii) \( \frac{2}{3} + \frac{7}{8} = \frac{16}{24} + \frac{21}{24} = \frac{37}{24} = 1\frac{13}{24} \)

iv) \( \frac{1}{7} - \frac{1}{8} = \frac{8}{56} - \frac{7}{56} = \frac{1}{56} \)

v) \( \frac{7}{9} - \frac{2}{1} = \frac{14}{18} - \frac{9}{18} = \frac{5}{18} \)

(or \( = 1 + \frac{14 - 9}{18} = 1 + \frac{5}{18} = 1\frac{5}{18} \))

b) i) \( \frac{3}{4} + \frac{5}{6} = \frac{9}{12} + \frac{10}{12} = \frac{19}{12} = 1\frac{7}{12} \)

ii) \( \frac{7}{10} - \frac{1}{4} = \frac{14}{20} - \frac{5}{20} = \frac{9}{20} \)

iii) \( \frac{1}{6} + \frac{3}{8} = \frac{3 + 4 + 9}{24} = \frac{3 + 13}{24} = \frac{3}{24} \frac{13}{24} \)

iv) \( \frac{5}{20} - \frac{5}{12} = \frac{3 + 15 - 25}{60} = \frac{3 - 10}{60} = \frac{3 - 1}{6} = \frac{2}{6} \)

Whole class activity

Elicit (or point out) that in:

a) the 2 denominators in each part are relative primes, i.e. they have only one common factor, 1; so their lowest common multiple (and thus the lowest common denominator of the 2 fractions) is their product;

b) the two denominators are not relative primes and neither denominator is a multiple of the other, so their lowest common multiple is taken as the common denominator of the two fractions.

Would it be wrong to use as the common denominator a common multiple which was not the smallest possible?

E.g.

BB: \( \frac{7}{10} - \frac{1}{4} = \frac{28 - 10}{40} = \frac{18}{40} = \frac{9}{20} \)

(Not wrong, but uses greater numbers in the calculation than are necessary and the result needs to be simplified.)

41 min
Activity

7  PbY6a, page 34

Q.5 Read: Write a plan, do the calculation and write the answer in your exercise book.

Set a time limit. Ps read problems themselves and solve them.
Review with whole class. Ps could show results on scrap paper or slates in unison. Ps answering correctly explain at BB to Ps who were wrong, saying why they chose that common denominator. Class agrees/disagrees. Mistakes discussed and corrected.
T chooses a P to say the answer in a sentence.

Solutions:

a) Yesterday I bought ¾ of a kg of potatoes and today I bought ½ a kg of potatoes. How many kg of potatoes did I buy altogether?

Plan: \[
\frac{3}{4} + \frac{1}{2} = \frac{3}{4} + \frac{2}{4} = \frac{5}{4} = 1\frac{1}{4} \text{ kg}
\]

[4 is a multiple of 2, so 4 is the lowest common denominator]

Answer: I bought 1 and a quarter kg of potatoes altogether.

b) A family took ¾ of a kg of grapes on a picnic. How many kg of grapes did they bring home if they ate ¾ of a kg during the picnic?

Plan: \[
\frac{3}{4} - \frac{3}{5} = \frac{15}{20} - \frac{12}{20} = \frac{3}{20} \text{ kg}
\]

[4 and 5 are relative primes, so lowest common denominator is their product.]

Answer: They brought home 3 twentieths of a kg of grapes.

c) Two friends decide to walk to the beach which is 2¾ and 3 quarter kilometres from their camp site. They walk 1⅕ sixths kilometres, then have a rest. How far do they still have to go?

Plan: \[
\frac{3}{4} - 1\frac{5}{6} = 1 + \frac{9}{12} - \frac{10}{12} = 1 - \frac{1}{12} = \frac{11}{12} \text{ km}
\]
or \[
1\frac{7}{4} - 1\frac{5}{6} = \frac{7}{4} - \frac{5}{6} = \frac{21}{12} - \frac{10}{12} = \frac{11}{12} \text{ km}
\]

[4 and 6 are not relative primes and neither is a multiple of the other, so the lowest common denominator of the two fractions is the lowest common multiple of 4 and 6, i.e. 12]

Answer: They still have to walk 11 twelfths of a kilometre.

Notes

Individual work, monitored, helped
Differentiation by time limit.
Responses shown in unison.
Discussion, reasoning, agreement, self-correction, praising

Extra praise if Ps use the short notation correctly:

\[\frac{3}{4} + \frac{1}{2} = \frac{3 + 2}{4} = \frac{5}{4}\]

T repeats explanations more clearly if necessary.
Feedback for T

45 min
### Activity

Factorising 35, 210, 385 and 1035. Revision, activities, consolidation

**PbY6a, page 305**

#### Solutions:

Q.1  a) \( \frac{4}{5} < \boxed{1} < \frac{5}{7} \)  
    e.g. \( \boxed{\frac{9}{10}, \frac{13}{15}, \frac{14}{15}} \) etc.

b) \( 2 < \boxed{\frac{1}{3}} < \frac{3}{5} \) 
    e.g. \( \boxed{\frac{2}{4}, \frac{2}{6}, \frac{2}{9}} \) etc.

c) \( 1 \frac{3}{4} < \boxed{\frac{1}{2}} < 2 \frac{1}{4} \)  
    e.g. \( \boxed{\frac{7}{8}, \frac{2}{3}, \frac{1}{8}} \) etc.

Q.2  a) \( \frac{1}{9} \times 9 = 1 \) 
    b) \( \frac{1}{6} \times 1 = \frac{1}{6} \) 
    c) \( \frac{1}{11} \times 5 = \frac{5}{11} \)

    d) \( \frac{4}{7} \times 7 = 4 \) 
    e) \( \frac{3}{4} \times 2 = \frac{3}{2} = \frac{1}{2} \)

    f) \( \frac{7}{8} \times 4 = \frac{7}{2} = 3 \frac{1}{2} \) 
    g) \( \frac{5}{12} \times 3 = \frac{5}{4} = \frac{1}{4} \)

    h) \( \frac{7}{20} \times 10 = \frac{7}{2} = 3 \frac{1}{2} \) 
    i) \( \frac{1}{4} \times 3 = 9 \frac{3}{4} \)

    j) \( 6 \frac{1}{3} \times 6 = 36 + \frac{6}{3} = 36 + 2 = 38 \)

    k) \( 8 \frac{1}{2} \times 9 = 72 + \frac{1}{2} = 76 \frac{1}{2} \) 
    l) \( \frac{13}{10} \times 3 = \frac{39}{10} = 3 \frac{9}{10} \)

    m) \( \frac{3}{8} \div 3 = \frac{1}{8} \) 
    n) \( \frac{2}{13} \div 2 = \frac{1}{13} \) 
    o) \( \frac{13}{20} \div 4 = \frac{13}{80} \)

    p) \( \frac{3}{5} \div 6 = \frac{3}{30} = \frac{1}{10} \) 
    q) \( \frac{21}{20} \div 7 = \frac{3}{20} \)

    r) \( \frac{21}{20} \div 4 = \frac{21}{80} \) 
    s) \( \frac{17}{33} \div 11 = \frac{17}{363} \) 
    t) \( \frac{28}{35} \div 7 = \frac{4}{35} \)

Q.3  a) i) \( 9.3 = \frac{930}{100} = \frac{9300}{1000} = 9.3 \) 
    ii) \( 4.75 = \frac{475}{100} = \frac{4750}{1000} = 4.75 \)

    iii) \( 0.3 = \frac{30}{100} = \frac{300}{1000} = 0.3 \) 
    iv) \( 0.05 = \frac{5}{100} = \frac{50}{1000} = 0.05 \)

    v) \( 1.0 = \frac{100}{100} = \frac{1000}{1000} = 1.0 \)

b) i) \( \frac{136}{10} = 13.6 \) 
    ii) \( 5 \frac{31}{100} = 5.31 \) 
    iii) \( 10 \frac{1}{100} = 10.01 \)

    iv) \( \frac{583}{1000} = 0.583 \) 
    v) \( \frac{27}{1000} = 0.027 \)
### Activity

**Q.4**

a) \( \frac{4}{5} = \frac{8}{10} = \frac{12}{15} = \frac{20}{25} = \frac{48}{60} = \frac{60}{75} = \frac{88}{110} = \frac{80}{100} = \frac{16}{20} \)

b) \( \frac{7}{4} = \frac{14}{8} = \frac{28}{16} = \frac{49}{28} = \frac{147}{84} = \frac{210}{120} = \frac{175}{100} = \frac{750}{500} \)

c) \( 8.16 = 8.160 = 8.1600 = \frac{816}{100} = \frac{816}{100} = \frac{816}{100} \)

**Q.5**

Part written on M, T and W:

\[
\frac{1}{3} + \frac{2}{8} + \frac{1}{6} = \frac{1}{3} + \frac{1}{4} + \frac{1}{6} = \frac{4 + 3 + 2}{12} = \frac{9}{12} = \frac{3}{4}
\]

Part remaining: \( 1 - \frac{3}{4} = \frac{1}{4} \rightarrow 27 \text{ cards} \)

\[
\frac{4}{4} \rightarrow 27 \times 4 = 108 \text{(cards)}
\]

*Answer:* I sent 108 Christmas cards.

### Notes

or \( 1 - \left( \frac{1}{3} + \frac{1}{4} + \frac{1}{6} \right) \rightarrow 27 \)

\( 1 - \frac{4 + 3 + 2}{12} \rightarrow 27 \)

\( 1 - \frac{9}{12} \rightarrow 27 \)

\( \frac{3}{12} \rightarrow 27 \)

\( \frac{1}{12} \rightarrow 9 \)

\( \frac{12}{12} \rightarrow 108 \)
Activity 1

Factorisation
Factorise these numbers in your exercise book and list their positive factors. T sets a time limit of 6 minutes.

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

Elicit that:

- \(36 = 2 \times 2 \times 3 \times 3 = 2^2 \times 3^2\)  
  Factors: 1, 2, 3, 4, 6, 9, 12, 18, 36  
  (square number)

- \(211\) is a prime number  
  Factors: 1, 211
  (as not exactly divisible by 2, 3, 5, 7, 11 and 13, and \(17 \times 17 > 211\))

- \(386 = 2 \times 193\)  
  Factors: 1, 2, 193, 386
  (193 is not exactly divisible by 2, 3, 5, 7, 11, 13; \(17 \times 17 > 193\))

- \(1036 = 2 \times 2 \times 7 \times 37 = 2^2 \times 7 \times 37\)  
  Factors: 1, 2, 4, 7, 14, 28, 37, 74, 148, 259, 518, 1036

6 min

2

Concept of a fraction
T asks a question. Ps come to BB or dictate what T should write or draw. Class agrees/disagrees or suggests alternatives. T helps or prompts when necessary.

a) Who can explain what 3 sevenths means? e.g.

- 1 unit is divided into 7 equal parts and we take 3 of the parts.

  BB: \(\frac{3}{7} = 1 \div 7 \times 3\)

- 3 units are each divided into 7 equal parts, and we take 1 part from each unit.

  BB: \(\frac{3}{7} = 3 \div 7\)

b) Who can explain what 7 thirds means? e.g.

- 1 unit is divided into 3 equal parts and we take 7 of the parts.

  BB: \(\frac{7}{3} = 1 \div 3 \times 7\)

- 7 units are each divided into 3 equal parts, and we take 1 part from each unit.

  BB: \(\frac{7}{3} = 7 \div 3\)

c) Let’s expand these fractions to tenths, then write in decimal form.

  BB: i) \(\frac{1}{2} = \left(\frac{5}{10} = 0.5\right)\) ii) \(\frac{3}{5} = \left(\frac{6}{10} = 0.6\right)\) iii) \(\frac{3}{4} = \) (does not expand to tenths; 10 is not a multiple of 4)
d) Let's expand these fractions to hundredths, then write in decimal form.

BB: i) \[
\frac{31}{50} = \left( \frac{62}{100} \right) = \frac{0.62}{1}
\]

iii) \[
\frac{17}{20} = \left( \frac{85}{100} \right) = \frac{0.85}{1}
\]

iv) \[
\frac{3}{7} = \text{[Impossible, as 100 is not a multiple of 7]}
\]

How could we work out the decimal form of 11 sixteenths? (Divide the numerator by the denominator.)

BB: 
\[
\frac{11}{16} \times 625 = 0.6875 \quad \text{or} \quad \frac{11}{10000} = 0.6875
\]

(Ps do division on BB or use a calculator.)

f) Let's write each of these numbers as a fraction in different forms.

BB: 
\[
3 = \left( \frac{3}{1} = \frac{6}{2} = \frac{18}{6} = \frac{9}{3} = -\frac{15}{-5} = \ldots \right)
\]

\[
-\frac{5}{2} = \left( -\frac{10}{4} = -\frac{15}{6} = \frac{20}{8} = -2 \frac{1}{2} = \ldots \right)
\]

\[
0 = \left( -\frac{0}{1} = \frac{0}{2} = \frac{0}{10} = \frac{0}{-5} = \ldots \right)
\]

T: Any number which can be written as a fraction using 2 whole numbers, and where the denominator of the fraction is not zero, is called a rational number. (BB)

So all fractions are rational numbers but note that equivalent fractions are different forms of the same rational number.

g) Do you think that 5 is a rational number? (Yes, as it can be written in fraction form.)

T: 5 can also be written as a decimal number. (BB) So are decimal numbers also rational numbers? (Yes, if they can be written in fraction form)

What about zero (1 and 3 quarters, – 3 fifths)? Ps dictate what T should write. We say that these are finite decimals, as they have a definite end point. Agree that finite decimals are rational numbers.

What about recurring decimals? T elicits the meaning and shows an example on BB. Ps could suggest others that they know.

Elicit that they are equivalent fractions, i.e. have equal value.

BB: rational numbers

\[
e.g. \quad \frac{3}{4} = \frac{6}{8}
\]

\[
5 = \frac{5}{1} = 5.0
\]

\[
0 = \frac{0}{1} = 0.00
\]

\[
\begin{align*}
\frac{1}{4} & = \frac{7}{4} = 1.75 \\
-\frac{3}{5} & = -0.6
\end{align*}
\]

Finite decimals

Recurring decimals e.g.

T: \[
\frac{8}{11} = 8 \div 11 = 0.727272 \ldots = 0.72
\]

Ps: e.g. \[
0.3 = \frac{1}{3}, \quad 0.1 = \frac{1}{9}
\]

T writes this recurring decimal if no P suggests it and asks Ps what it is in fraction form.

BB: \[
0.142857 = \left( \frac{1}{7} \right)
\]

or \[
0.142857
\]

Praising only
**Activity 3**  
_PbY6a, page 36_  

**Q.1** Read: **Simplify these fractions and mark them on the number line.**

What does simplify mean? (Reduce the numerator and denominator by the same number of times so that the fraction is in its simplest form.)

Deal with one at a time or set a time limit. Ps calculate in steps in _Ex. Bks_ if they wish, write simplified fraction in _Pbs_ and mark with a dot and label it (or join fraction to corresponding point) on the number line.

Review with whole class. Ps come to BB to explain reasoning. Who did the same? Who did it another way? etc. Mistakes discussed and corrected.

**Solution:**

a) e.g. \[
\frac{160}{240} = \frac{16}{24} = \frac{4}{6} = \frac{2}{3} \quad \text{or} \quad \frac{160}{240} = \frac{2}{3}
\]

T: We say that as 160 = 2 \times 80 and 240 = 3 \times 80, the greatest common factor of 160 and 240 is 80.

b) e.g. \[
\frac{240}{160} = \frac{24}{16} = \frac{3}{2} = 1 \frac{1}{2} \quad \text{or} \quad \frac{240}{160} = \frac{3}{2}
\]

c) e.g. \[
\frac{72}{12} = \frac{36}{6} = \frac{6}{1} = -6 \quad \text{or} \quad \frac{72}{12} = \frac{6}{1}
\]

d) \[
\frac{-12}{72} = -\frac{1}{6}
\]

\[
\begin{array}{cccccccc}
-6 & -5 & -4 & -3 & -2 & -1 & 0 & 1 & 2 \\
\hline
& & & & & & & & \\
\end{array}
\]

\(20 \text{ min}\)

**Notes**

Individual work, monitored, (helped)

Number line drawn on BB or use enlarged copy master/OHP

Ensure that Ps know what 'simplify' means.

Ps decide which method of marking they use.

Discussion, reasoning, agreement, self-correction, praising

Elicit/show the simplification in 1 step on BB if no P did it.

BB: Greatest common factor

(as greatest common factor of 240 and 160 is 80)

(as greatest common factor of 72 and 12 is 12)

(as greatest common factor of 12 and 72 is 12)

---

**Activity 4**  
_PbY6a, page 36_  

**Q.2** Read: **Write a plan, do the calculation, check the result and write the answer in a sentence.**

Deal with one at a time. Set a time limit. Ps read question themselves and solve it in _Ex. Bks._

Review with whole class. Ps show results on scrap paper or slates on command. Ps answering correctly explain at BB to Ps who were wrong. Who agrees? Who did it a different way? etc. Mistakes discussed and corrected.

**Solutions:**

a) A farmer had 3 beehives. He collected 2 and 4 fifths kg of honey from one of the beehives and 3.2 kg of honey from another. If he collected 9 and 2 fifths kg of honey altogether, how much honey did he collect from the 3rd beehive?

Plan: \[9 \frac{2}{5} - (2 \frac{4}{5} + 3.2) = 9.4 - (2.8 + 3.2) = 9.4 - 6 = 3.4 \text{ (kg)}\]

**Answer:** He collected 3.4 kg of honey from the 3rd beehive.

Individual work, monitored, (helped)

Responses shown in unison.

Discussion, reasoning, agreement self-correction, praising

Feedback for T

or \[9 \frac{2}{5} - (2 \frac{4}{5} + 3 \frac{2}{10}) = 9 \frac{2}{5} - (5 + \frac{4}{5} + \frac{1}{5}) = 9 \frac{2}{5} - 6 = 3 \frac{2}{5} \text{ kg}\]

Check: 2.8 + 3.2 + 3.4 = 9.4 ✓
b) Two cyclists started at the same time from either end of an 80.4 km journey and cycled towards each other. They both had a rest break at the same time.

By then, one cyclist had covered 20 and 3 quarters km and the other had covered 21.5 km.

How far apart were they when they stopped to rest?

**Diagram:**

```
80.4 km
20 3/4 km
?
21.5 km
```

**Plan:**

\[
80.4 - (20 \frac{3}{4} + 21.5) = 80.4 - (20.75 + 21.5) = 80.4 - 42.25 = 38.15 \text{ (km)}
\]

**Check:**

\[
38.15 \text{ km} + 20.75 \text{ km} + 21.5 \text{ km} = 80.4 \text{ km}
\]

**Answer:** The two cyclists were 38.15 km apart when they stopped to rest.

c) Mum bought 1200 g of grapes. Andy ate 1 fifth of them, Betty ate 1 quarter of them and Charlie ate 1 third of them. Dad ate the rest.

What amount of grapes did each of them eat?

- e.g. A: \(1200 \div 5 = 240\) g
- B: \(1200 \div 4 = 300\) g
- C: \(1200 \div 3 = 400\) g
- D: \(1200 - (240 + 300 + 400) = 1200 - 940 = 260\) g

**Check:** \(260 \text{ g} + 400 \text{ g} + 300 \text{ g} + 240 \text{ g} = 1200 \text{ g} \)

**Answer:** Andy ate 240 g, Betty ate 300 g, Charlie ate 400 g and Dad ate 260 g of grapes.

d) Kate gathered 45.6 kg of strawberries in 12 hours. Julie worked for 10 hours but collected 18 and 4 fifths of a kg less than Kate.

What amount of strawberries did Julie gather?

**Plan:**

\[
J: 45.6 \text{ kg} - 18 \frac{4}{5} \text{ kg} = 45.6 \text{ kg} - 18 \frac{8}{10} \text{ kg} = 26.8 \text{ kg}
\]

**Check:**

\[
45.6 \text{ kg} - 26.8 \text{ kg} = 18.8 \text{ kg} = 18 \frac{4}{5} \text{ kg}
\]

**Answer:** Julie gathered 26.8 kg of strawberries.

---

Elicit that the times worked are not needed for the answer.
### Lesson Plan 36

#### Activity

**PbY6a, page 36**

**Q.3** Read: Practise addition and subtraction in your exercise book. 
Deal with one row at a time. Set a time limit.
Review with whole class. Ps come to BB to write and explain the calculations. Who did the same? Who did it a different way? etc. Mistakes discussed and corrected.

**Solution:**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a)</td>
<td>[ \frac{1}{2} - \left( \frac{1}{8} + \frac{1}{4} \right) = \frac{4}{8} - \left( \frac{1}{8} + \frac{2}{8} \right) = \frac{4}{8} - \frac{3}{8} = \frac{1}{8} ]</td>
</tr>
<tr>
<td>b)</td>
<td>[ \frac{2}{5} - \left( \frac{1}{10} - \frac{1}{20} \right) = \frac{8 - (2 - 1)}{20} = \frac{8 - 1}{20} = \frac{7}{20} ]</td>
</tr>
<tr>
<td>c)</td>
<td>[ \frac{2}{6} - \left( \frac{1}{2} - \frac{2}{3} \right) = \frac{2}{6} - \left( \frac{3}{6} - \frac{4}{6} \right) = \frac{2}{6} - \frac{5}{6} = -\frac{1}{2} ]</td>
</tr>
<tr>
<td>d)</td>
<td>[ 3.16 - (1.2 + 0.5) = 3.16 - 1.7 = 1.46 ]</td>
</tr>
<tr>
<td>e)</td>
<td>[ 4.03 - (2.1 - 0.8) = 4.03 - 1.3 = 2.73 ]</td>
</tr>
<tr>
<td>f)</td>
<td>[ 3.18 - (0.6 - 1.2) = 3.18 - (-0.6) = 3.18 + 0.6 = 3.78 ]</td>
</tr>
<tr>
<td>g)</td>
<td>[ \frac{3}{2} + \left( -\frac{5}{2} \right) = \frac{3}{2} - \frac{5}{2} = -\frac{2}{2} = -1 ]</td>
</tr>
<tr>
<td>h)</td>
<td>[ \frac{5}{8} - \left( -\frac{1}{4} \right) = \frac{5}{8} + \frac{1}{4} = \frac{5}{8} + \frac{2}{8} = \frac{7}{8} ]</td>
</tr>
<tr>
<td>i)</td>
<td>[ -\frac{4}{9} - \left( -\frac{2}{3} \right) = -\frac{4}{9} + \frac{2}{3} = -\frac{4}{9} + \frac{6}{9} = \frac{2}{9} ]</td>
</tr>
</tbody>
</table>

40 min

**Q.4** Read: Write a plan, do the calculation and write the answer in your exercise book. 
Deal with one question at a time. Set a time limit.
Review with whole class. Ps show result on scrap paper or slates on command. Ps responding correctly explain at BB to Ps who were wrong. Who did the same? Who did it another way? etc. Mistakes discussed and corrected.

**Solution:**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a)</td>
<td>One side of a rectangle is ( \frac{3}{4} ) m long and the other side is ( \frac{2}{3} ) m long. What length is its perimeter? [ P = \left( \frac{3}{4} + \frac{2}{3} \right) \times 2 = \frac{9 + 8}{12} \times 2 = \frac{17}{6} \times 2 = \frac{17}{6} = 2 \frac{5}{6} \text{ m} ] Answer: The length of the perimeter is 2 and 5 sixths metres.</td>
</tr>
<tr>
<td>b)</td>
<td>The side of a square is ( \frac{3}{4} ) cm long. What length is its perimeter? [ P = 4 \times \frac{3}{5} = 4 + \frac{12}{5} = 16 + \frac{2}{5} = 18 \frac{2}{5} \text{ cm} ] Answer: The length of the perimeter is 18 and 2 fifths centimetres.</td>
</tr>
</tbody>
</table>

45 min

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R: Ordering decimals and fractions  
C: Fractions and decimals in calculations: addition, subtraction  
E: Rational numbers. Problems

**Activity 1**

**Factorisation**

Factorise these numbers in your exercise book and list their positive factors. T sets a time limit of 6 minutes. 

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

Elicit that:
- 37 is a prime number Factors: 1, 37
- 212 = \(2 \times 2 \times 53\) = \(2^2 \times 53\) Factors: 1, 2, 4, 53, 106, 212
- 387 = \(3 \times 3 \times 43\) = \(3^2 \times 43\) Factors: 1, 3, 9, 43, 129, 387
- 1037 = \(17 \times 61\) (nice) Factors: 1, 17, 61, 1037

**Activity 2**

**Fractions and decimals**

a) Let’s mark these rational numbers on the number line. Ps come to BB to draw dots and label them. Class points out errors.

BB: + 3, 0, – 2.25, \(\frac{5}{2}\), – 3, \(\frac{7}{4}\), \(\frac{5}{2}\), + \(\frac{3}{4}\)

Let’s list them in increasing order. Ps dictate to T.

BB: – 3 < – \(\frac{5}{2}\) < – 2.25 < 0 < \(+\frac{3}{4}\) < \(+\frac{7}{4}\) < \(\frac{5}{2}\) < + 3

Which numbers form opposite pairs? (– 3 and + 3, – \(\frac{5}{2}\) and \(\frac{5}{2}\))

Agree that every positive number (integer, fraction and decimal) has an opposite negative number which is the same distance from zero. What do we call the distance of a number from zero? (its absolute value) Who remembers how to write it mathematically? Ps come to BB or T reminds Ps if necessary.

b) Let’s mark \(\frac{5}{9}\) and \(\frac{6}{9}\) on the number line. Ps come to BB to draw dots and label them. Class agrees/disagrees.

Let’s think of a rational number which is greater than \(\frac{5}{9}\) but less than \(\frac{6}{9}\). A makes a suggestion (e.g. \(\frac{11}{18}\)) and class agrees.

Who can write an inequality about A’s number? T helps P to write and explain his or her reasoning. Who can think of other numbers?

BB: e.g. \(\frac{5}{9} = \frac{15}{27} < \frac{17}{27} < \frac{18}{27} = \frac{6}{9}\) (or \(\frac{16}{27}\) or \(\frac{23}{36}\) or . . .)

or \(\frac{5}{9} = 0.5 < 0.56 < 0.57 < 0.63 < 0.634 < 0.6\), etc.

Agree that the decimals could be increased to the next and next greater place value so the number of possible numbers which are greater than 5 ninths and less than 6 ninths is endless or infinite.

Individual work, monitored (or whole class activity) 

BB: 37, 212, 387, 1037 Calculators allowed for 1037.

Reasoning, agreement, self-correction, praising

<table>
<thead>
<tr>
<th>37</th>
<th>212</th>
<th>387</th>
<th>1037</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>3</td>
<td>3</td>
<td>17</td>
</tr>
<tr>
<td>129</td>
<td>43</td>
<td>3</td>
<td>61</td>
</tr>
<tr>
<td>53</td>
<td>1</td>
<td>61</td>
<td>1</td>
</tr>
</tbody>
</table>

Whole class activity

Written/drawn on BB or use enlarged copy master or OHP

First elicit what a rational number is. (A number which can be written as a fraction using 2 whole numbers, but with a non-zero number as the denominator.)

Agreement, praising

Discussion, agreement, praising

BB: absolute value

\(|- \frac{5}{2}| = |\frac{5}{2}| = \frac{5}{2}\)

\(|-3| = |3| = 3\)

BB:

\(\frac{5}{9} = \frac{10}{18} < \frac{11}{18} < \frac{12}{18} = \frac{6}{9}\)

T suggests the decimal form if Ps do not and elicits Ps’ help incalculating the decimals and writing the inequality:

BB: \(5 \div 9 = 0.555\ldots = 0.5\)

\(6 \div 9 = 0.666\ldots = 0.6\)
### Activity 2

T: There is an infinite number of rational numbers between any two different rational numbers, so the number of rational numbers on the whole number line is also infinite.

There is also an infinite number of numbers which are not rational numbers. We call them **irrational** numbers.

This number (T writes on BB) is irrational, as there is no fraction which has a whole number as its numerator and a whole non-zero number as its denominator which is equal to it.

What do you notice about it? (It has no definite endpoint so is not a finite decimal and no single digit or group of digits is repeated in order so it is not a recurring decimal either.) So there are infinite decimals which are **not** rational numbers.

**c)** How can we show all the rational numbers less than 2.5 on the number line? Ps come to BB to show and explain if they can.

**BB:**

Elicit (or remind Ps) what the notation means:
- all the numbers below the arrow line are included in the set;
- the numbers in the set extend to infinity in the direction of the arrowhead;
- an open (white) circle above a number means that the number is **not** included in the set;
- a closed (black) circle means that the number is included.

T explains and Ps listen.

**BB:** **irrational number**
cannot be written as a fraction
e.g. 3.12122122212222...

Agreement, praising

Number line drawn on BB or use enlarged copy master or OHP
Reasoning, agreement, praising
Extra praise for Ps who remember and can explain

Who can write an inequality about it?

**BB:** $x < 2.5$

Ps suggest values for $x$. e.g. $2, \frac{3}{7}, 0, -0.2, -\frac{21}{5}$, etc.

<table>
<thead>
<tr>
<th>$x$</th>
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<tr>
<td>$a)$</td>
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### Notes

- **Lesson Plan 37**
- **T** explains and Ps listen.
- **BB**: **irrational number**
cannot be written as a fraction
e.g. 3.12122122212222...

Agreement, praising

Number line drawn on BB or use enlarged copy master or OHP
Reasoning, agreement, praising
Extra praise for Ps who remember and can explain

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Lesson Plan 37

**Notes**

- Individual work, monitored and helped
- Number lines drawn on BB or use enlarged copy master or OHP
- Differentiation by time limit
- Reasoning, agreement, self-correcting, praising
- Feedback for T
- BB: \(-1.5 \leq x < 2\)
- Ps shout Yes or No in unison.
- Ps with opposing views explain at BB and class decides who is correct.

Agree that dots should be used here, not arrows and circles.

Accept reasoning using example and counter example: e.g.
- \(-2\) is no good, as \(-(-2) = 2\), and \(2 > 1.2\)
- \(-1\) is o.k. as \(-(-1) = 1\), and \(1 < 1.2\), etc.

Individual work, monitored, helped
- Written on BB or use enlarged copy master or OHP
- (Allow Ps to use calculators for the decimals.)
- Reasoning, agreement, self-correction, praising
- Ps who make a mistake mark the error in red and write the calculation again correctly.

Feedback for T
Activity 5 (Continued)

b) i) \( \frac{2}{5} + \frac{4}{15} = \frac{6}{15} + \frac{4}{15} = \frac{10}{15} = \frac{2}{3} = 0.6 \)

ii) \( \frac{5}{28} + \frac{2}{7} - \frac{3}{14} = \frac{5}{28} + \frac{8}{28} - \frac{6}{28} = \frac{7}{28} = \frac{1}{4} = 0.25 \)

iii) \( \frac{3}{8} - \frac{7}{4} = \frac{3}{8} - \frac{13}{4} = \frac{5}{8} - \frac{6}{8} = \frac{1}{8} \)

or \( = 1 + \frac{13}{8} - \frac{6}{8} = 1 + \frac{7}{8} = \frac{7}{8} \)

iv) \( 4 - \frac{5}{9} = 2 - \frac{5}{9} = \frac{4}{9} = 1.4 \)

c) i) \( 13.4 - (10.25 - 5.6) = 13.4 - 4.65 = 8.75 = 8 \frac{3}{4} \)

ii) \( 13.4 - 10.25 + 5.6 = 19 - 10.25 = 8.75 \)

d) i) \( -5.6 - (+3.1) + (-4.5) - (-2.7) = -5.6 - 3.1 - 4.5 + 2.7 \)

\( = -13.2 + 2.7 = -10.5 \)

ii) \( -5.6 - 3.1 - 4.5 + 2.7 = -10.5 \)

Lesson Plan 37

Notes

Accept any valid method of calculation.

In c) and d), both parts are the same calculation written in 2 different ways.

\( = -10 \frac{1}{2} \)

6 PbY6a, page 37

Q.4 Read: Write a plan, calculate, check and write the answer as a sentence in your exercise book.

Set a time limit or deal with one question at a time.

Review with whole class. Ps could show results on scrap paper or slates on command. Ps answering correctly explain at BB to Ps who were wrong. Who did the same? Who did it another way? etc. Mistakes discussed and corrected. T chooses a P to say the answer in a sentence.

Solution:

a) Tommy Tortoise took 1 hour to move \( 65 \frac{3}{4} \) metres.

This was \( 6 \frac{5}{6} \) metres more than the distance covered by

Timmy Tortoise in the same time.

What distance did Timmy Tortoise move in an hour?

Solution: e.g.

Plan: \( 65 \frac{3}{4} - 6 \frac{5}{6} = 59 + \frac{9}{12} - \frac{10}{12} = 59 - \frac{1}{12} = 58 \frac{11}{12} \) (m)

or \( = 59 \frac{9}{12} - \frac{10}{12} = 58 \frac{21}{12} - \frac{10}{12} = 58 \frac{11}{12} \) (m)

Answer: Timmy Tortoise moved 58 and \( 11 \) twelfths metres in 1 hour.

Check:

\( 58 \frac{11}{12} + 6 \frac{5}{6} = 64 \frac{11}{12} + \frac{10}{12} \)

\( = 64 \frac{21}{12} - 65 \frac{9}{12} = 65 \frac{3}{4} \)  

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(Continued)

b) Jenny cut 3 pieces from a 20.8 m length of ribbon.

The lengths of the 3 pieces were \(5 \frac{1}{2}\) m, 7.2 m and \(2 \frac{2}{5}\) m.

Could Jenny cut another piece 6.5 m long from the ribbon that is left?

Plan: 
\[
20.8 - (5 \frac{1}{2} + 7.2 + 2 \frac{2}{5}) = 20.8 - (5.5 + 7.2 + 2.4) = 20.8 - 15.1 = 5.7 \text{ (m)}
\]

5.7 m < 6.5 m

Answer: No, Jenny could not cut another piece 6.5 m long, as there is not enough ribbon left.

c) The sum of two fractions is \(\frac{5}{8}\). One fraction is 1 greater than the other fraction. What are the two fractions?

Let the smaller fraction be \(x\), so the larger fraction is \(x + 1\).

Plan: 
\[
x + (x + 1) = \frac{5}{8}
\]

\[
2 \times x + 1 = \frac{5}{8}
\]

\[
2 \times x = \frac{5}{8} - 1 = -\frac{3}{8}
\]

\[
x = -\frac{3}{8} \div 2 = -\frac{3}{16} \text{ (smaller fraction)}
\]

So greater fraction is \(-\frac{3}{16} + 1 = \frac{13}{16}\)

Check: 
\[
-\frac{3}{16} + \frac{13}{16} = \frac{10}{16} = \frac{5}{8} \checkmark
\]

Answer: The two fractions are \(-\frac{3}{16}\) and \(\frac{13}{16}\).
**Weekly Plan**

**Lesson Plan**

**38**

**Week 8**

**Y6**

**Activity**

1. **Factorisation**

   Factorise these numbers in your exercise book and list their positive factors. T sets a time limit of 6 minutes.

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

   Elicit that:
   - \(38 = 2 \times 19\) (nice) Factors: 1, 2, 19, 38
   - \(213 = 3 \times 71\) Factors: 1, 3, 71, 213
   - \(388 = 2 \times 2 \times 97 = 2^2 \times 97\) Factors: 1, 2, 4, 97, 194, 388
   - \(1038 = 2 \times 374 \times 173\) Factors: 1, 2, 3, 6, 173, 346, 519, 1038

2. **Fractions and decimals**

   a) T says a decimal and chooses a P to write it as a fraction or mixed number on BB while rest of class write it in Ex. Bks. Ps point out any errors made on BB or when a fraction could be simplified.

   BB:
   
   \[
   \begin{align*}
   0.1 &= \frac{1}{10}, \\
   0.31 &= \frac{31}{100}, \\
   0.6 &= \frac{3}{5}, \\
   0.48 &= \frac{24}{100} = \frac{12}{50} = \frac{6}{25}, \\
   15.3 &= \frac{153}{10} = \frac{3419}{100} = \frac{3419}{10000}, \\
   -4.96 &= -\frac{96}{100} = -\frac{496}{10000} = -\frac{124}{25}, \\
   0.33333\ldots &= \frac{1}{3}, \\
   0.6 &= \frac{2}{3}.
   \end{align*}
   \]

   Elicit that 0.3333... is a recurring decimal where the digit below the dot is endlessly repeated.

   b) T says a fraction and chooses a P to write it (doing a division on BB or changing to a suitable equivalent fraction if they do not know it) as a decimal number while rest of class writes it in Ex. Bks. Ps point out errors made on BB or help Ps who are stuck.

   BB:
   
   \[
   \begin{align*}
   \frac{1}{2} &= 0.5, \\
   \frac{2}{2} &= 1.0 (= 1) \quad \frac{3}{2} = 1 \frac{1}{2} = 1 \frac{5}{10} = 1.5, \\
   \frac{13}{20} &= 0.65, \\
   \frac{31}{25} &= 1.24, \\
   \frac{1}{3} &= 0.333\ldots = 0.\overline{3}, \\
   \frac{2}{3} &= 0.6 (= 2 \div 3 = 0.666\ldots) \\
   \frac{4}{3} &= 1 \frac{1}{3} = 1.3, \\
   \frac{2}{9} &= 0.2, \\
   \frac{4}{9} &= 0.4, \\
   \frac{5}{9} &= 0.5, \\
   \frac{11}{18} &= 0.6111\ldots = 0.\overline{1}, \\
   \frac{1}{11} &= 0.09 \text{ or } 0.090909\ldots.
   \end{align*}
   \]

   Elicit that 0.3333... is a recurring decimal.

   Whole class activity

   Involve a different P at BB for each decimal.

   Ps at BB explain reasoning to class.

   At a good pace

   Reasoning, agreement, praising

   Agree on the general ‘rule’ for fractions:

   BB: \( \frac{a}{b} = a \div b \)

   or \( 3 \div 2 = 1.5 \)

   

   BB:

   \[
   \begin{align*}
   \frac{1}{2} &= 0.5, \\
   \frac{2}{2} &= 1.0 (= 1) \quad \frac{3}{2} = 1 \frac{1}{2} = 1 \frac{5}{10} = 1.5, \\
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   BB: \( \frac{a}{b} = a \div b \)

   or \( 3 \div 2 = 1.5 \)

   

   BB:
**Activity 3**

*PbY6a, page 38*

Q.1 Read: *Convert the decimals to fractions. Simplify where possible.*

Set a time limit or deal with parts a), b) and c) one at a time.

(Simplification can be done in easy steps if necessary.)

Review at BB with whole class. Ps come to BB or dictate to T.

Class agrees/disagrees. Mistakes discussed and corrected.

Solution:

a) i) \(0.27 = \frac{27}{100}\)

ii) \(0.46 = \frac{46}{100} = \frac{23}{50}\)

iii) \(10.35 = 10 \frac{35}{100} = 10 \frac{7}{20}\)

iv) \(103.5 = 103 \frac{1}{2}\)

b) i) \(0.25 = \frac{25}{100} = \frac{1}{4}\)

ii) \(0.50 = \frac{50}{100} = \frac{1}{2}\)

iii) \(0.75 = \frac{75}{100} = \frac{3}{4}\)

iv) \(7.25 = 7 \frac{25}{100} = 7 \frac{1}{4}\)

<table>
<thead>
<tr>
<th>Number</th>
<th>Fraction</th>
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<tbody>
<tr>
<td>0.27</td>
<td>(\frac{27}{100})</td>
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</tr>
<tr>
<td>7.25</td>
<td>7 (\frac{1}{4})</td>
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</table>

26 min

**Activity 4**

*PbY6a, page 38*

Q.2 Read: *Convert the fractions to decimals.*

Set a time limit or deal with one row at a time.

(Ps can do necessary calculations in *Ex. Bks* or on scrap paper.)

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

Solution:

a) \(\frac{1}{2} = 0.5\)

\(\frac{2}{2} = 1\)

\(\frac{3}{2} = 1.5\)

\(\frac{5}{2} = 2.5\)

\(-16\frac{1}{2} = -16.5\)

b) \(\frac{1}{4} = 0.25\)

\(\frac{2}{4} = 0.5\)

\(\frac{3}{4} = 0.75\)

\(\frac{4}{4} = 1\)

\(\frac{135}{4} = 33\frac{3}{4} = 33.75\)

c) \(\frac{1}{8} = 0.125\)

\(\frac{3}{8} = 0.375\)

\(\frac{5}{8} = 0.625\)

\(\frac{6}{8} = \frac{3}{4} = 0.75\)

\(\frac{7}{8} = 0.875\)

d) \(\frac{1}{5} = 0.2\)

\(\frac{2}{5} = 0.4\)

\(\frac{3}{5} = 0.6\)

\(\frac{4}{5} = 0.8\)

\(\frac{9}{5} = 1\frac{4}{5} = 1.8\)
**Y6**

**Activity**

4 (Continued)

e) \( \frac{1}{3} = 0.3, \quad \frac{2}{3} = 0.6, \quad \frac{3}{3} = 1, \quad \frac{4}{3} = 1 \frac{1}{3} = 1.3, \quad \frac{2}{3} = 2.3 \)

f) \( \frac{1}{6} = 0.16, \quad \frac{2}{6} = \frac{1}{3} = 0.3, \quad \frac{3}{6} = \frac{1}{2} = 0.5, \quad \frac{4}{6} = \frac{2}{3} = 0.6, \quad \frac{5}{6} = 0.83 \)

d) \( \frac{1}{9} = 0.1, \quad \frac{2}{9} = 0.2, \quad \frac{4}{9} = 0.4, \quad \frac{5}{9} = 0.5, \quad \frac{7}{9} = 0.7 \)

What about \( \frac{8}{9} \) and \( \frac{9}{9} \)?
Elicit that: \( \frac{8}{9} = 0.8 \) but \( \frac{9}{9} = 1, \) not 0.9.

**Extension**

What about \( \frac{8}{9} \) and \( \frac{9}{9} \)?

Individual trial first, monitored (or whole class activity, with Ps suggesting what to do)

Written on BB or SB or OHT

Responses shown in unison.

Discussion, reasoning, agreement, self-correction, praising

Agree that it is very difficult to do the calculation without simplifying first!

Ps who did not obtain an answer or were wrong, write the calculation correctly in Ex. Bks.

Solution:

a) \( \frac{63}{84} + \frac{45}{75} - \frac{72}{90} = \frac{3}{4} + \frac{3}{5} - \frac{4}{5} = \frac{15 + 12 - 16}{20} = \frac{11}{20} \)

(or \( \frac{63}{84} = 63 \div 84 = 9 \div 12 = 3 \div 4 = 0.75 \)

\( \frac{45}{75} = 45 \div 75 = 9 \div 15 = 3 \div 5 = 0.6 \)

\( \frac{72}{90} = 72 \div 90 = 8 \div 10 = 4 \div 5 = 0.8 \)

\( 0.75 + 0.6 - 0.8 = 1.35 - 0.8 = 0.55 \)

b) \( \frac{45}{35} + \frac{20}{16} - \frac{15}{35} + \frac{20}{28} = \frac{9}{7} + \frac{5}{4} - \frac{3}{7} + \frac{5}{7} = \frac{11}{7} + \frac{5}{4} \)

\( = \frac{1}{4} + \frac{1}{4} = 2 + \frac{16 + 7}{28} = 2 \frac{23}{28} \)

Q.3 Read: *Do the calculations in your exercise book.*

Deal with one part at a time. Set a short time limit of 1 minute.

Review with whole class. Ps who have an answer show result on scrap paper or slates on command. Ps with different answers explain reasoning on BB. Class decides who is correct. Who had the correct answer but did it a different way?

Give extra praise to Ps who realised that it is easier to simplify each fraction before calculating.

Ps who did not obtain an answer or were wrong, write the calculation correctly in Ex. Bks.

Solution:

\[ \frac{63}{84} + \frac{45}{75} - \frac{72}{90} = \frac{3}{4} + \frac{3}{5} - \frac{4}{5} = \frac{15 + 12 - 16}{20} = \frac{11}{20} \]

\[ \frac{45}{75} = \frac{9}{15} = \frac{3}{5} \]

\[ \frac{72}{90} = \frac{8}{10} = \frac{4}{5} \]

\[ \frac{63}{84} = 63 \div 84 = 9 \div 12 = 3 \div 4 = 0.75 \]

\[ \frac{45}{75} = 45 \div 75 = 9 \div 15 = 3 \div 5 = 0.6 \]

\[ \frac{72}{90} = 72 \div 90 = 8 \div 10 = 4 \div 5 = 0.8 \]

\[ 0.75 + 0.6 - 0.8 = 1.35 - 0.8 = 0.55 \]

\[ \frac{45}{35} + \frac{20}{16} - \frac{15}{35} + \frac{20}{28} = \frac{9}{7} + \frac{5}{4} - \frac{3}{7} + \frac{5}{7} = \frac{11}{7} + \frac{5}{4} \]

\[ = \frac{1}{4} + \frac{1}{4} = 2 + \frac{16 + 7}{28} = 2 \frac{23}{28} \]

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PbY6a, page 38

Q.4 Read: Solve the problems and equations in your exercise book.
Deal with one at a time. Set a time limit.

Review with whole class. Ps who have an answer show results on
crap paper or slates on command. Ps answering correctly explain
reasoning at BB. Who agrees? Who did it another way? etc.
Mistakes discussed and corrected.
Ps who could not solve a question write solution in Ex. Bks.
Solution:

a) If I add 1 to a number, the sum is \(\frac{27}{48}\). What is the number?

Plan: \(x + 1 = \frac{27}{48}\), so \(x = \frac{27}{48} - 1 = -\frac{7}{16}\)

Check: \(-\frac{7}{16} + 1 = \frac{9}{16} = \frac{27}{48}\)

Answer: The number is \(-\frac{7}{16}\).

b) If I subtract 3 from a number, the result is \(1\frac{1}{8}\).

What is the number?

Plan: \(x - 3 = 1\frac{1}{8}\), so \(x = 1\frac{1}{8} + 3 = 4\frac{1}{8}\)

Check: \(4\frac{1}{8} - 3 = 1\frac{1}{8}\)

Answer: The number is \(4\frac{1}{8}\).

c) \(\frac{x}{75} + \frac{11}{15} = \frac{18}{25}\)

\(x = \frac{18}{25} \times \frac{15}{11} = \frac{54}{75} - \frac{55}{75} = -\frac{1}{75}\)

\(d) \frac{25}{14} - \frac{d}{70} = \frac{21}{10}\)

\(\frac{d}{70} = \frac{25}{14} - \frac{21}{10} = \frac{125}{70} - \frac{147}{70} = -\frac{22}{70} = -\frac{7}{14} = -\frac{1}{2}\)

\(\frac{25}{14} - \left(-\frac{22}{70}\right) = \frac{25}{14} + \frac{22}{70} = \frac{125}{70} + \frac{22}{70} = \frac{147}{70} = \frac{21}{10}\)

- 25 = 5 × 5, and 15 = 3 × 5, so lowest common
  multiple of 25 and 15 is \(3 \times 5 \times 5 = 75\).
- 14 = 2 × 7, and 10 = 2 × 5, so lowest common
  multiple of 14 and 10 is \(2 \times 5 \times 7 = 70\).
**Lesson Plan**

### Week 8

#### Activity 1

**Factorisation**

Factorise these numbers in your exercise book and list their positive factors. T sets a time limit of 6 minutes.

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

- **39** = $3 \times 13$ (nice) Factors: 1, 3, 13, 39
- **214** = $2 \times 107$ (nice) Factors: 1, 2, 107, 214
- **389** is a prime number Factors: 1, 389
  (as not exactly divisible by 2, 3, 5, 7, 11, 13, 17 and 19, and $23 \times 23 > 389$)
- **1039** is a prime number Factors: 1, 1039
  (as not exactly divisible by 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, and $37 \times 37 > 1039$)

#### Activity 2

**Multiplication of fractions**

a) What does $\frac{2}{5} \times 3$ mean? Ps say what they know. e.g.

\[
BB: \quad \frac{2}{5} \times 3 \quad \frac{2}{5} + \frac{2}{5} + \frac{2}{5} = \frac{6}{5} = 1\frac{1}{5}
\]

or $\frac{2}{5}$ multiplied by 3

Let's calculate $\frac{2}{5}$ of 3 units. How could we do it?

Ps come to BB or dictate to T. e.g.

\[
BB: \quad \frac{2}{5} \text{ of } 3 = \frac{3}{5} \times 2 = \frac{6}{5} = 1\frac{1}{5}
\]

b) Let's calculate $\left(-\frac{7}{12}\right) \times 4$. Ps come to BB or dictate to T.

\[
BB: \quad \left(-\frac{7}{12}\right) \times 4 = -\frac{28}{12} = -2\frac{4}{12} = -2\frac{1}{3}
\]

or $-\frac{7}{3} = -2\frac{1}{3}$

Who can explain how to multiply a fraction by a natural number?

'Multiply the numerator or, where possible, divide the denominator.'

<table>
<thead>
<tr>
<th>3</th>
<th>16</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\frac{3}{16} \times -1 = \left(-\frac{3}{16}\right)$</td>
<td>$\frac{3}{16} \times -2 = \left(-\frac{3}{8}\right)$</td>
</tr>
<tr>
<td>$\left[-\frac{3}{16} \times -8 = -\frac{3}{2} = -1\frac{1}{2}\right]$</td>
<td>$\frac{3}{16} \times -16 = -3$,</td>
</tr>
</tbody>
</table>

**Notes**

Individual work, monitored (or whole class activity)

BB: 39, 214, 389, 1039

Calculators allowed.

Reasoning, agreement, self-correction, Praising

e.g.

\[
\begin{array}{c|c|c}
214 & 2 & 107 \\
\hline
107 & 107 & 1
\end{array}
\]

Whole class activity

Reasoning, agreement, Praising

T helps with drawing diagrams.

What do you notice?

BB: $\frac{2}{5}$ of $3 = \frac{2}{5} \times 3$

Reasoning, agreement, Praising

First 3 operations written on BB. Ps write results then continue the pattern.

What do you notice?

(Sequence is being multiplied by 2 but it is decreasing.)

Show on the number line.
d) Let's continue this pattern. Ps come to BB or dictate to T.

BB: \[ \frac{-3}{16} \times 3 = \left( -\frac{9}{16} \right), \quad -\frac{3}{16} \times 2 = \left( -\frac{3}{8} \right), \quad -\frac{3}{16} \times 1 = \left( -\frac{3}{16} \right), \]

\[ -\frac{3}{16} \times 0 = 0, \quad -\frac{3}{16} \times -1 = \frac{3}{16}, \quad -\frac{3}{16} \times -2 = \frac{6}{16} = \frac{3}{8}. \]

\[ -\frac{3}{16} \times -3 = \frac{9}{16}, \ldots \]

Who can explain what happens when a number is multiplied by \(-1\)? (Multiplying by \(-1\) results in the opposite number.)

11 min

Q.1 Read: In your exercise book, calculate each product in two ways.

Deal with part a) first, then part b). Set a time limit. Ps write the whole equation in Ex. Bks. and underline the result.

Review with whole class. Ps come to BB or dictate to T, explaining reasoning. Class agrees/disagrees. Mistakes discussed and corrected. (Ask able Ps for the decimal form too.)

Solution:

a) i) \[ \frac{5}{8} \times 4 = \frac{5 \times 4}{8} = \frac{20}{8} = \frac{5}{2} = 2 \frac{1}{2} (= 2.5) \]

ii) \[ \frac{7}{10} \times 2 = \frac{7 \times 2}{10} = \frac{14}{10} = \frac{7}{5} = 1 \frac{2}{5} (= 1.4) \]

iii) \[ \left( -\frac{3}{28} \right) \times 7 = -\frac{3 \times 7}{28} = -\frac{21}{28} = -\frac{3}{4} (= -0.75) \]

iv) \[ \frac{6}{35} \times (-5) = -\frac{6 \times 5}{35} = -\frac{30}{35} = -\frac{6}{7} (= -0.857142) \]

v) \[ \left( -\frac{5}{8} \right) \times (-2) = \frac{5 \times 2}{8} = \frac{10}{8} = \frac{5}{4} = 1 \frac{1}{4} (= 1.25) \]

What do you notice about these fractions? (In each case, the denominator is a multiple of the multiplier.)

How could we write the 'rule' in a general way? Ps explain in own words then T helps Ps to write the algebraic formula. Agree that in such cases, dividing the denominator by the multiplier is quicker and easier.

Let's use just the division method for part b). Set a time limit and review as in a). What do you notice? (In each case, the denominator is the same as the multiplier. Elicit the general rule.

Solution:

b) i) \[ \frac{2}{3} \times 3 = \frac{2 \times 3}{1} = 2 \]

ii) \[ \frac{3}{8} \times 8 = \frac{3 \times 8}{1} = 3 \]

iii) \[ \frac{5}{13} \times 13 = \frac{5 \times 13}{1} = 5 \]

iv) \[ -\frac{7}{9} \times 9 = -\frac{7 \times 9}{1} = -7 \]

v) \[ -\frac{3}{25} \times (-25) = \frac{3 \times 25}{1} = 3 \]

vi) \[ -\frac{8}{17} \times (-17) = 8 \]

24 min

What do you notice about the sequence? (It is increasing, but the multiplier is decreasing.) Show on the number line.

Individual work, monitored, (helped)

Written on BB or use enlarged copy master or OHP

Reasoning, agreement, self-correction, praising

Elicit the general rules.

\[ \frac{a}{b} \times c = \frac{a \times c}{b} = \frac{a}{b} \div c \]

where \( b \) and \( c \) are not zero i.e. \( b \neq 0, \ c \neq 0 \)

General rule

\[ \frac{a}{b} \times b = a \ (b \neq 0) \]

Review that:

\( (+) \times (+) \rightarrow (+) \)

\( (+) \times (-) \rightarrow (-) \)

\( (-) \times (+) \rightarrow (-) \)

\( (-) \times (-) \rightarrow (+) \)
Lesson Plan 39

Notes

Individual work, monitored (helped)
Diagram drawn on BB or SB or OHT
Discussion, reasoning, agreement, self-correction, praising

BB:

\[
\begin{array}{c}
A = 2 \text{ square units} \\
\hline
\hline
1 \\
\hline
2 \\
\hline
\end{array}
\]

BB: \[
\frac{5}{4} \text{ of } 3 \quad \boxed{\frac{5}{4} \times 3}
\]

Individual work, monitored (helped)
Written on BB or SB or OHT
Differentiation by time limit
Reasoning, agreement, self-correction, praising

Agree that in each part, i) = ii)

T: 'A fraction of a number is the same as multiplying that number by the fraction.'

or \[
\frac{20}{\frac{3}{4}} \times \frac{5}{\frac{3}{4}} = 100
\]

or \[
\frac{1}{\frac{6}{3}} \times \frac{11}{\frac{3}{3}} = \frac{11}{3} = \frac{2}{3}
\]

or \[
\frac{3}{\frac{5}{3}} \times \frac{17}{\frac{5}{3}} = 51
\]

or \[
\frac{3}{\frac{5}{3}} \times \frac{17}{\frac{5}{3}} = 51
\]
Lesson Plan 39

**Notes**

Individual work, monitored, helped

Responses shown in unison.

Discussion, reasoning, agreement, self-correction, praising

Accept any correct method of solution but deal with all methods used by Ps.

Draw diagrams on BB if necessary.

Feedback for T

Q.3 Read:  *Solve these problems in your exercise book.*

Deal with one question at a time. Ps read question themselves, write a plan, do the calculation and write the answer in a sentence

Review with whole class. Ps show results on scrap paper or slates on command. Ps answering correctly explain at BB to Ps who were wrong. Who did the same? Who did it another way? etc. Mistakes discussed and corrected. T chooses a P to say the answer in a sentence.

**Solutions:** e.g.

a) *Henry Hedgehog ate \( \frac{4}{13} \) of his 39 apples. How many apples did he have left?*

Apples eaten: \( \frac{4}{13} \) of 39 = \( 39 \div 13 \times 4 = 3 \times 4 = 12 \)

Apples left: \( 39 - 12 = 27 \)

or Part left: \( 1 - \frac{4}{13} = \frac{9}{13} \);

\( \frac{9}{13} \) of 39 = \( 39 \div 13 \times 9 = 3 \times 9 = 27 \) (apples)

Answer: *Henry Hedgehog* had 27 apples left.

b) *Paul had £150. He spent \( \frac{1}{3} \) of £150, then \( \frac{2}{5} \) of £150.*

i) How much did Paul spend?

Spent: \( \frac{1}{3} \) of £150 + \( \frac{2}{5} \) of £150

\( = \frac{5}{15} \times 150 + \frac{6}{15} \times 150 = 50 + 60 = £110 \)

Answer: Paul spent £110.

ii) How much money did he have left?

Plan: £150 – £110 = £40

Answer: Paul had £40 left.

c) *Liz had £150. Then she was given some money by her grandparents so she now has \( \frac{4}{3} \) of her original amount.*

*If she spends \( \frac{1}{4} \) of her money, how much will she have left?*

Now has: \( \frac{4}{3} \) of £150 = \( 150 \div 3 \times 4 = 50 \times 4 = £200 \)

Spends: \( \frac{1}{4} \) of £200 = \( 200 \div 4 = £50 \)

Has left: £200 – £50 = £150

Answer: Liz has £150 left.
### Activity 6 (Continued)

**d) How much money do I have if \( \frac{5}{3} \) of \( \frac{3}{5} \) of it is £480?**

\[
\begin{align*}
\frac{5}{3} \text{ of } \frac{3}{5} & \rightarrow \£480 \\
\frac{1}{3} \text{ of } \frac{3}{5} & \rightarrow \£480 \div 5 = \£96 \\
\frac{3}{5} \text{ of } \frac{3}{5} & = \frac{3}{5} \rightarrow \£96 \times 3 = \£288 \\
\frac{1}{5} & \rightarrow \£288 \div 3 = \£96 \\
\frac{5}{5} & \rightarrow \£96 \times 5 = \£480 \\
\end{align*}
\]

*Answer:* I have £480.

**e) One side of a rectangle is 32 cm long and its adjacent side is \( \frac{3}{4} \) of its length.**

**i) How long is the other side?**

\[
\begin{align*}
\frac{3}{4} \text{ of } 32 \text{ cm} & = \frac{3}{4} \times 32 \text{ cm} = 3 \times 8 \text{ cm} = 24 \text{ cm} \\
\text{Answer:} & \text{ The adjacent side is 24 cm long.}
\end{align*}
\]

**ii) How long is its perimeter?**

\[
P = 2 \times (24 \text{ cm} + 32 \text{ cm}) = 2 \times 56 \text{ cm} = 112 \text{ cm}
\]

*Answer:* Its perimeter is 112 cm.

**iv) What is the area of the rectangle?**

\[
A = 32 \text{ cm} \times 24 \text{ cm} = 64 \text{ cm} \times 12 \text{ cm} = 128 \text{ cm} \times 6 \text{ cm} = 768 \text{ cm}^2
\]

*Answer:* The area of the rectangle is 768 cm².

---

**Notes**

or \((£480 \div 3 \times 5) \div 3 \times 5\)  
\[= (£96 \times 3) \div 3 \times 5\]  
\[= £288 \div 3 \times 5\]  
\[= £96 \times 5 = £480\]

or T might show:  
\[96 \left(480 \times \frac{3}{5}\right) \times \frac{5}{3}\]  
\[= 288 \times \frac{5}{3} = 480\]

Agree that:  
\[\frac{5}{3} \text{ of } \frac{3}{5} = \frac{5}{3} \times \frac{3}{5} = 1\]
Factorising 40, 215, 390 and 1040. Revision, activities, consolidation

PbY6a, page 305

Solutions:

Q.1  a) and b)  

c) – 4.0, – 3.75, – 3.5, – 2.75, – 2.375, – 2.125, – 1.25, 

– 1.0, – 0.625, – 0.125, 0.125, 0.625, 1.0, 1.25, 2.125, 

2.375, 2.75, 3.5, 3.75, 4.0  

d) Sum is zero, as every number and its opposite add up to zero.

Q.2  a) i) \( \frac{4}{9} + \frac{2}{9} = \frac{6}{9} = \frac{2}{3} \) ii) \( \frac{11}{12} - \frac{5}{12} = \frac{6}{12} = \frac{1}{2} \)  

iii) \( \frac{13}{20} + \frac{3}{10} - \frac{21}{20} = \frac{13 + 6 - 21}{20} = -\frac{2}{20} = -\frac{1}{10} \)  

iv) \( \frac{8}{5} - 7 \frac{3}{10} + 2 \frac{1}{2} = 3 + \frac{4 - 3 + 5}{10} = \frac{36}{10} = \frac{3\frac{2}{5}}{5} \)  

b) i) \( \frac{3}{4} + \frac{9}{16} = \frac{12}{16} + \frac{9}{16} = \frac{21}{16} = \frac{5}{16} \)  

ii) \( \frac{3}{100} + \frac{1}{4} - \frac{1}{5} = \frac{3 + 25 - 20}{100} = \frac{8}{100} = \frac{2}{25} \)  

iii) \( 11 \frac{5}{13} - 29 \frac{26}{26} = 11 \frac{5}{13} - \frac{3}{26} = 10 + \frac{10 - 3}{26} = 10 \frac{7}{26} \)  

iv) \( 8 - 3 \frac{5}{7} = 5 - \frac{5}{7} = \frac{42}{7} \)  

c) i) \( 139 - (20.7 - 5.8) = 139 - 14.9 = \frac{134.1}{1} \)  

ii) \( 45.33 - 8.03 + 9.1 = 37.3 + 9.1 = 46.4 \)  

d) i) \( -4.4 - (+5.5) + (-3.3) - (-2.2) \)  

\( = -4.4 - 5.5 - 3.3 + 2.2 = -13.2 + 2.2 = -11.0 \)  

ii) \( -100 - 54.35 - 17.98 + 20.6 = -172.33 + 20.6 \)  

\( = -151.73 \)  

Q.3  a) \( -0.05 \leq x \leq 0.05 \)  

b) \( -0.17 \leq x < 0.05 \)  

c) \( -0.02 < x < 0.18 \)
Activity

Q.4  

a) 1 quarter of a year = \( \frac{3}{4} \) months  

1st month:  
Saved: £50  
Spent: £50 \( \div \) 10 = £5  
Left in savings: £50 – £5 = £45  

2nd month:  
Saved: £45 + £50 = £95  
Spent: £95 \( \div \) 10 = £9.50  
Left in savings: £95 – £9.50 = £85.50  

3rd month:  
Saved: £85.50 + £50 = £135.50  
Spent: £135.50 \( \div \) 10 = £13.55  
Left in savings: £135.50 – £13.55 = £121.95  

Answer: Emma had saved £121.95 by the end of the quarter.  

b) \( \frac{3}{8} \) of \( \frac{2}{3} \)  

\( \frac{1}{8} \) of \( \frac{2}{3} \)  

\( \frac{8}{8} \) of \( \frac{2}{3} \) = \( \frac{2}{3} \)  

\( \frac{3}{3} \)  

\( \frac{3}{3} \) of 1 litre = 30 cl  

2 \( \frac{3}{10} \) of 30 cl = 30 cl \( \div \) 3 \( \times \) 2  

= 10 cl \( \times \) 2 = 20 cl  

Answer: Steve drank 20 cl.  

c) B: \( \frac{7}{10} \) of \( \frac{2}{3} \) of 1 litre;  

BB:  

\[ \text{1 litre} \]  

\[ \text{2 litre} \]  

10 \( \times \) 2 = 20 cl  

or  

\( \frac{3}{10} \) of \( \frac{2}{3} \) = \( \frac{2}{3} \) of \( \frac{3}{10} \)  

\( \frac{3}{10} \) of 1 litre = 30 cl  

\( \frac{2}{3} \) of 30 cl = 30 cl \( \div \) 3 \( \times \) 2  

= 10 cl \( \times \) 2 = 20 cl  

Answer: Steve drank 20 cl.  

d) 1st jump: 2.7 m  

2nd jump: 2.7 m + \( \frac{1}{9} \) of 2.7 m = 2.7 m + 0.3 m = 3.0 m  

3rd jump: 3.0 m – \( \frac{1}{6} \) of 3.0 m = 3.0 m – 0.5 m = 2.5 m  

4th jump: \( \frac{4}{5} \) of 2.5 m = 2.5 m \( \div \) 5 \( \times \) 4 = 2.0 m  

Total distance: 2.7 m + 3.0 m + 2.5 m + 2.0 m = 10.2 m  

Answer: The two bushes were 10.2 m apart.
<table>
<thead>
<tr>
<th>Activity 1</th>
<th>Factorisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factorise these numbers in your exercise book and list their positive factors. T sets a time limit of 6 minutes. Review with whole class. Ps come to BB or dictate to T, explaining reasoning. Class agrees/disagrees. Mistakes discussed and corrected. Elicit that:</td>
<td></td>
</tr>
<tr>
<td>- 41 is a prime number Factors: 1, 41</td>
<td></td>
</tr>
<tr>
<td>- 216 = (2 \times 2 \times 2 \times 3 \times 3 \times 3 = 2^3 \times 3^3 = 6^3) (cubic number) Factors: 1, 2, 3, 4, 6, 8, 9, 12, 216, 108, 72, 54, 36, 27, 24, 18 ↓</td>
<td></td>
</tr>
<tr>
<td>- 391 = 17 \times 23 Factors: 1, 17, 23, 391</td>
<td></td>
</tr>
<tr>
<td>- 1041 = 3 \times 347 Factors: 1, 3, 347, 1041</td>
<td></td>
</tr>
<tr>
<td>8 min</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Activity 2</th>
<th>Shapes</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) T points to an object in the classroom and asks Ps to say what they can about it. (e.g. colour, material, size, shape, what it is used for, plane (flat) or curved surface, etc.) T and Ps choose other objects in the classroom, then real things outside the classroom and describe them in a similar way. T: If we forget about colour, material, size, use and other such features, and just concentrate on the form or shape of an object, we talk about a geometric solid.</td>
<td></td>
</tr>
<tr>
<td>b) T has a variety of geometric solids on desk (see c) for examples) and some matching axonometric diagrams stuck (drawn) on BB. T points to certain diagrams and Ps identify the matching solid. Ps point out the matching faces, edges and vertices on the model and on the diagram as a check.</td>
<td></td>
</tr>
<tr>
<td>c) T asks Ps to come to front of class and show the solids which are: cubes (cuboids, prisms, spheres, cylinders, cones, semi-spheres, pyramids, etc.) Class agrees/disagrees or points out missed solids.</td>
<td></td>
</tr>
<tr>
<td>d) T holds up a solid and asks Ps to name it and say what they know about it. (e.g. triangular prism: 5 faces – 2 congruent, parallel triangles and 3 congruent rectangles; 6 vertices, 9 edges)</td>
<td></td>
</tr>
<tr>
<td>15 min</td>
<td></td>
</tr>
</tbody>
</table>

**Notes**

Individual work, monitored (or whole class activity) BB: 41, 216, 391, 1041 Calculators allowed. Reasoning, agreement, self-correction, praising e.g.

| 216 | 391 | 17 |
| 108 | 23  | 23 |
| 54  | 1   | 1  |
| 27  | 3   | 9  |
| 9   | 1041| 3  |
| 3   | 347 | 347|
| 1   | 1   | 1  |

Whole class activity
At a good pace
In good humour!
Discussion, agreement, praising
[e.g. book, desk, ball, pencil, matchbox, apple, house, tree, boat, bus, mountain, living cell, monument, etc.]

BB: Geometric solid face edge vertex (vertices)
Agreement, praising

N.B. Use only solids which Ps have already learned about.

Ask Ps to write the name of the solid on BB. Class points out missed features. Praising only
Lesson Plan 41

**Y6**

**Activity**

3. **PbY6a, page 41**

Q.1 Read: Which description fits which solids? Write the numbers of the matching solids.

Set a time limit of 5 minutes.

Review with whole class. Ps come to BB or dictate to T. Class agrees/disagrees or points out missed solids. Mistakes and omissions corrected.

**Solution:**

- a) It has only plane faces. 1, 2, 4, 7, 8, 10, 13
- b) It has at least one plane face. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 13, 14
- c) It has at least 2 plane faces. 1, 2, 3, 4, 7, 8, 9, 10, 12, 13, 14
- d) It has perpendicular faces. 2, (3), 4, 7, 8, (9), 13
- e) It has at least one triangular face. 1, 2, 8, 10
- f) It has only rectangular faces. 7, 13
- g) It has at least 2 parallel edges. 1, 2, (3), 4, 7, 8, 9, (12), 13, (14)
- h) It has perpendicular edges. 2, 4, 7, 8, 9, 13

**Extension**

1. Ps name the solids that they know and tell class about their main properties. T reminds Ps of names of solids that they have learned but forgotten.

1: hexagon-based pyramid, 2: triangular prism, 3: cylinder, 4: octahedron or 8-sided polyhedron, 5: hemisphere, 6: cone, 7: cuboid, 8: nonahedron or 9-sided polyhedron, 10: triangular pyramid, 11: sphere, 13: cube (12, 14 not learned)

25 min

4. **PbY6a, page 41**

Q.2 Read: Count the faces, edges and vertices of the above solids which have only plane faces. Complete the table.

Set a time limit of 3 minutes. Review with whole class. Ps come to BB to write numbers in the table, explaining reasoning by referring to diagrams (or if possible to models). Class agrees/disagrees. Mistakes discussed and corrected.

**Solution:**

Do you notice a connection among the number of faces, edges and vertices? T gives a hint or points it out if Ps do not notice. BB: \( f + v = e + 2 \) or \( f + v - e = 2 \)

25 min

**Notes**

Individual work, monitored, helped

Drawn on BB o use enlarged copy master or OHP

(If possible, T also has models for demonstration.)

Differentiation by time limit.

Discussion, agreement, self-correction, praising

Accept the numbers in brackets too.

2. T (Ps) give the numbers of certain shapes and Ps say what they have in common.

(e.g. 2, 3, 9, 12, 14: exactly two faces which are parallel)

Individual work, monitored, helped

Drawn on BB or use enlarged copy master or OHP

Ps first identify the relevant solids (diagrams or models)

Reasoning, agreement, self-correction, praising

Elicit/remind Ps that a solid which has many plane faces is called a polyhedron.

To Ts only:

[Euler's polyhedron theorem]
## Lesson Plan 41

### Activity

#### 5  
**PbY6a, page 41, Q.3**

Read: *Complete the sentences.*

Deal with one part at a time. T chooses a P to read out the sentence, saying ‘something’ instead of the missing word. Ps write the word they think is missing on scrap paper or slates and show on command. Ps with different words explain reasoning to class. Class decides who is correct. Draw diagrams on BB if necessary.

T writes agreed word on BB and Ps write it in *Pbs.* Class reads out the completed sentence, emphasising the word which was missed out.

**Solution:**
- a) When we divide up a surface, the surface pieces are *bounded by lines.*
- b) A line can be *curved or straight.*
- c) When we divide up a line, the segments start and end with *points.*
- d) A point on a straight line divides the line into *two half lines or rays.*
  (Elicit that the two rays are endless in opposite directions.)
- e) The part of a straight line between two different points is called a *segment.*
- f) A straight line in a plane divides that plane into *two half planes.*
- g) Two different parallel lines divide their plane into *three parts.*
- h) Two intersecting lines divide their plane into *four parts.*

**Extension**

- i) A plane divides space into *two half spaces.* (Half spaces are equal.)
- j) Two planes can be *parallel* or intersecting. (Demonstrate with sheets of card.)

#### 6  
**PbY6a, page 41**

Q.4 Set a time limit of 3 minutes. Ps read questions themselves and choose from the points already labelled in the diagram.

Review with whole class. Ps come to BB or dictate to T. Who agrees? Who chose a different point? Mistakes discussed/corrected.

**Solution:**
- a) *Colour red a point on the plane* P. *(A, B, C or D)*
- b) *Colour green a point which is *not* on the plane* P. *(E, F, G or H)*
- c) *Colour yellow an edge which is in the plane* P. *(AB, BC, CD or DA)*
- d) *Colour blue an edge which is *not* in the plane* P. *(EF, FG, GH or HE have no points in plane* P)*

T (or Ps) asks additional questions about the diagram. e.g.
- e) Tell me an edge which *intersects* plane P. *(AE, BF, CG or DH)*
- f) Tell me a face which is *perpendicular* to plane P. *(ABFE, BCGF, CGHD or ADHE)*
- g) Tell me a face which is *parallel* to plane P. *(EFGH)*
- h) Tell me two edges which do *not* intersect each other and are *not* parallel. *(e.g. edges:  EH and CG)*
- i) Tell me two faces which have no common point. *(e.g. ABFE and HGDC, i.e. *parallel* faces)*

**Extension**

Individual work, monitored (or whole class activity)

Drawn on BB or use enlarged copy master or OHP

**BB:** *(Use a model too if possible.)*

Agreement, self-correction, praising

(Also accept correct points which are not already labelled.)

Whole class activity

At a good pace, in good humour!

Extra praise for creativity!

---

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Factorisation

Factorise these numbers in your exercise book and list their positive factors. T sets a time limit of 6 minutes.

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

Elicit that:

- \( 42 = 2 \times 3 \times 7 \) Factors: 1, 2, 3, 6, 7, 14, 21, 42
- \( 217 = 7 \times 31 \) Factors: 1, 7, 31, 217
- \( 392 = 2 \times 2 \times 2 \times 7 \times 7 = 2^3 \times 7^2 \) Factors: 1, 2, 4, 7, 8, 14, 28, 49, 56, 98, 196, 392
- \( 1042 = 2 \times 521 \) Factors: 1, 2, 521, 1042

(521 is not exactly divisible by 2, 3, 5, 7, 11, 13, 17 or 19 and 23? 23 \times 23 = 529 > 521)

Revision: the components of a circle

Ps have plain sheets of paper, rulers, compasses and 4 straws on desks.

a) Mark a point with a cross in the middle of your sheet and label it C. Colour red all the points which are exactly 3 cm from C.

P comes to BB to use BB compasses (with T’s help) or draws on an OHT (or T has diagram prepared). Elicit that they form a circle.

b) Colour blue those points which are less than 3 cm from C.

P comes to BB or OHT to show it (or T has it already prepared).

What is the shape coloured red? (a circle)

What is the name of the shape coloured red or blue? (a circle)

T tells class that the set of red points form a line but the set of points coloured red or blue form a plane shape. Both are called circles. If we are dealing with the circle as a plane shape, what do we call the line enclosing it? (the circumference)

c) Place your 4 straws on your sheet of paper so that they are parallel and are 1 cm, 2 cm, 3 cm and 4 cm from C. T demonstrates on BB.

Lay your ruler along against each straw, remove the straw and draw a line instead. Label the lines \( a, b, c \) and \( d \), with line \( a \) nearest C.

What can you say about the 4 lines? (Parallel, equal distance apart.) How many points does each line have in common with the circumference of the circle? (\( a: 2 \), \( b: 2 \), \( c: 1 \), \( d: 0 \))

T: We call lines such as \( a \) and \( b \) intersectors of the circle.

Intersectors of a circle cross the circumference at 2 points.

We call a line such as \( c \) a tangent to the circle. A tangent meets the circumference of a circle at just 1 point.

d) Mark two different points on the circumference of your circle and label them E and F. Join E and F to C.

What do we call the line segments CE and CF? (Each is a radius of the circle, or both are radii of the circle.)

Who can explain what a radius of a circle is? (A straight line joining the centre of a circle to a point on the circumference)

e) What does the broken line ECF form? (2 angles at centre of circle)

f) What do we call the plane shape ECF? (sector of a circle)
**Activity 3**

*PbY6a, page 42, Q.1*

Read: *Complete the sentences about circles.*

T chooses a P to read each sentence. Ps show the word they think is missing on scrap paper or slates on command. After discussion and references to the relevant diagram drawn on BB, class agrees on correct word (or T reminds them if necessary). T writes agreed word on BB and Ps write it in *Pbs.*

**Solution:**

a) *The line segment joining the centre of a circle (C) and a point (D) on its circumference is called the radius.*

Elicit the names of the radii in the diagram (CD, CB, CA) and that they are of equal length, *r.* (Ps could draw others.)

b) *A section between two points on the circumference is called an arc.*

Elicit the names of some arcs in diagram. (AE, EF, FB, BD, DA, etc.) If we join up two points on the circumference with a *straight* line, what do we call the line segment? (a *chord* of the circle, e.g. EF, AB)

c) *A chord which lies on the centre of the circle is called the diameter.*

Elicit that the diameter in the diagram is AB and its length is *d.*

d) *Two points on the circumference divide it into two arcs.* (AB, BA)

e) *Two radii of a circle divide the circle into two sectors.*

Ps come to BB to show the two sectors. Elicit that a sector is part of the circle plane bounded by 2 radii and an arc.

f) *A chord divides the circle into two segments.*

P comes to BB to draw a chord on the diagram (e.g. AB, or any 2 points on circumference.

g) *Line f is an intersector and line t is a tangent of the circle.*

Elicit that an intersector *crosses* the circumference at two points but a tangent *touches* the circle at just one point.

What other information does the diagram show us? (*r* is the radius; *r* and *t* have one common point, T, and are *perpendicular*)

Do you think any radius and any tangent with a common point on the circumference of the circle will be perpendicular? Ps try it in on BB or on scrap paper or in Ex. Bks.

Agree that a tangent is always perpendicular to the radius which meets it at a common point on the circumference.

---

**Notes**

Whole class activity

Drawn/written on BB or use enlarged copy masters or OHP

Responses shown in unison.

Discussion, agreement, praising

Elicit or tell additional details where appropriate.

**BB:**

(A diameter is also a chord.)

T explains that in diagrams of circles, we usually call the length of the radius *r* and the length of the diameter *d.*

Elicit that *d* = 2 × *r*

---

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**Lesson Plan 42**

**Notes**

Whole class activity (or individual trial first)

Drawn/written on BB or use enlarged copy master or OHP

Discussion, agreement, (self-correction), praising

BB:

![Diagram of angles]

Ask Ps to give examples of specific angles for the inequalities.

T helps with pronunciation of Greek letters and Ps repeat in unison.

Elicit that:
- a null angle is no turn at all
- a right angle is a quarter of a turn
- a straight angle is half a turn. (i.e. 2 right angles)
- a whole angle is a complete turn (i.e. 4 right angles)

Feedback for T

Extra praise for unexpected criteria

**Activity 4**

*PbY6a, page 42*

Q.2 Read: *Fill in the missing items about angles.*

Talk about angles first. Ps say what they know with prompting from T if necessary. [Angles formed when 2 half lines or rays meet or when they are turned around a centre point as on a clock face. Angles are measured with protractors (T could show one to class) in degrees. An angle is identified with an arc to show the turn and is often labelled with a Greek letter, etc.]

Let’s see if we can fill in what is missing.

Deal with one part at a time. Ps come to BB or dictate to T, referring to the diagram where necessary. e.g. In a), C is the centre of a circle and e and f are 2 half lines (or rays) extending to infinity.)

Who agrees? Who thinks something else? Teacher prompts or guides as necessary. After agreement, Ps write missing word or number in *Pbs.*

**Solution:**

a) The two half lines (e and f) form two angles.

b) C is the vertex and e and f are the arms of the angle \( \alpha \).

c) null angle acute angle right angle obtuse angle

\[
\begin{array}{c}
\text{null angle} \\
\alpha \\
0^\circ < \alpha < 90^\circ \\
\text{(alpha)}
\end{array}
\quad
\begin{array}{c}
\text{acute angle} \\
\beta \\
90^\circ < \beta < 180^\circ \\
\text{(beta)}
\end{array}
\quad
\begin{array}{c}
\text{right angle} \\
\gamma \\
90^\circ \\
\text{(gamma)}
\end{array}
\quad
\begin{array}{c}
\text{obtuse angle} \\
\delta \\
180^\circ < \delta < 360^\circ \\
\text{(delta)}
\end{array}
\]

straight angle reflex angle whole angle

\[
\text{straight angle} \\
\pi = 180^\circ \\
\text{(pi)}
\quad
\text{reflex angle} \\
180^\circ < \gamma < 360^\circ \\
\text{(gamma)}
\quad
\text{whole angle} \\
360^\circ \\
\]

**Plane shapes**

What do these shapes have in common? (They are all plane shapes.)

Let’s put them into sets in different ways. I will describe a set and you must tell me the numbers of the shapes which match the description.

BB:

![Diagram of shapes]

a) It is enclosed by a single line. 

b) It is enclosed by a single curved line.

c) It is enclosed only by straight lines

d) It is a polygon.

e) It is concave.

f) It is enclosed by exactly 3 lines.

Who can think of other ways to put them into sets? Ps make suggestions and choose other Ps to list the set. e.g.

d) It is a polygon. 

(1, 2, 3, 4, 5, 7)

e) It is concave. 

(1, 2, 3, 4, 6)

f) It is enclosed by exactly 3 lines.

(3, 7), etc.

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### Activity 6

**PbY6a, page 42**

Q.3 Read: Which description fits which polygons? Write the numbers of the matching polygons.

#### BB:

What is a polygon? (A plane shape enclosed by many straight sides but with only 2 sides meeting at a vertex.) Set a time limit. Review with whole class. T chooses a P to read each description, then Ps come to BB to write list and point out the relevant shapes and criteria. Class agrees/disagrees. Mistakes discussed and corrected.

#### Solution:

a) **It has only acute angles.** (7)

b) **It has no angle greater than 90°.** (3, 4, 7)

Elicit that it has acute angles and/or right angles.

c) **It has more than 3 diagonals.** (1, 5, 6, 9)

Elicit that a diagonal is a straight line joining one vertex to another vertex which is not adjacent to it.

d) **It can be divided into more than 2 parts by one straight cut.** (6, 9)

Elicit that these are concave polygons.

#### Extension

T points to each polygon in turn and chooses Ps to say what they know about it. (e.g. name, parallel/perpendicular/equal sides, concave/convex, symmetry, types of angles, regular/irregular, etc.)

---

### Activity 7

**Ps have rulers, protractors and compasses on desks.**

Deal with one part at a time. T dictates the names of polygons and Ps draw them in Ex. Bks. T monitors closely, correcting where necessary. Review the important properties of each polygon with the whole class.

a) Draw an acute-angle, an obtuse-angled and a right-angled triangle.

**BB:** e.g. [diagram of triangles]

b) Draw an isosceles triangle and an equilateral triangle.

**BB:** e.g. [diagram of triangles] (Elicit that a triangle with no equal sides is a scalene triangle.)

c) Draw a square, a rectangle which is not a square, a rhombus which is not a square, and a parallelogram which is not special.

**BB:** e.g. [diagram of shapes]

d) Draw a trapezium which is not a parallelogram and a deltoid which is not a rhombus.

**BB:** e.g. [diagram of shapes] convex or concave

---

**Notes**

Individual work, monitored, (less able Ps helped)

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

Discussion, reasoning, agreement, self-correction, praising

Feedback for T

**Extension**

1: hexagon (regular, convex)
2: parallelogram
3: triangle (right-angled, scalene)
4: square
5: pentagon (regular, convex)
6: hexagon (irregular, concave)
7: triangle (equilateral)
8: trapezium (convex)
9: duodecagon (regular, concave) (12-sided polygon)

Individual drawing but class kept together on each task. T monitors, helps, corrects

If time is short, Ps can just draw rough sketches and mark the important criteria.

T could have polygons already prepared on BB or SB or OHT. Elicit/remind Ps how to mark equal sides and angles, parallel and perpendicular sides.

Quick discussion on properties, agreement, self-correction, praising only

Feedback for T
## Y6

<table>
<thead>
<tr>
<th>Activity</th>
<th>Lesson Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factorisation</td>
<td><strong>43</strong></td>
</tr>
<tr>
<td>Factorise these numbers in your exercise book and list their positive factors. T sets a time limit of 5 minutes. Review with whole class. Ps come to BB or dictate to T, explaining reasoning. Class agrees/disagrees. Mistakes discussed and corrected. Elicit that:</td>
<td></td>
</tr>
<tr>
<td>- <strong>43</strong> is a prime number</td>
<td>Factors: 1, 43</td>
</tr>
<tr>
<td>- <strong>218</strong> = 2 × 109</td>
<td>Factors: 1, 2, 109, 208</td>
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<td>- <strong>393</strong> = 3 × 131</td>
<td>Factors: 1, 3, 131, 393</td>
</tr>
<tr>
<td>- <strong>1043</strong> = 7 × 149</td>
<td>Factors: 1, 7, 149, 1043</td>
</tr>
</tbody>
</table>

**Notes**

Individual work, monitored (or whole class activity) BB: 43, 218, 393, 1043

Calculators allowed. Reasoning, agreement, self-correction, praising e.g.

| 1043 | 7 |
| 149  | 149 |

Ps have sharp pencils, rulers and set squares (or 2 rulers), on desks.

Whole class activity but individual drawing T leads brief discussion after each drawing. Praising, encouragement only BB: e.g.

a) ![Curved line](image)

b) ![Straight line](image)

c) ![Ray (half line)](image)

d) ![Line segment](image)

e) ![Perpendicular Lines](image) (f is perpendicular to e)

Individual work, monitored (or whole class activity) BB: 43, 218, 393, 1043

Calculators allowed. Reasoning, agreement, self-correction, praising e.g.

| 1043 | 7 |
| 149  | 149 |

Ps have sharp pencils, rulers and set squares (or 2 rulers), on desks.

Whole class activity but individual drawing T leads brief discussion after each drawing. Praising, encouragement only BB: e.g.

a) ![Curved line](image)

b) ![Straight line](image)

c) ![Ray (half line)](image)

d) ![Line segment](image)

e) ![Perpendicular Lines](image) (f is perpendicular to e)
Lesson Plan 43

Activity

2 (Continued)

f) Perpendicular distance

Draw another line e. Mark any point P which is not on the line. Draw line f perpendicular to line e and passing through point P. (Similar to i) but with vertical edge of set square against point P.)

How far is point P from line e? Ps measure as accurately as they can and write it below their diagram.

T: When we want to find the distance between a point and a line, we always measure the perpendicular distance between them.

g) Intersecting lines

Draw 2 lines e and f which cross one another. Label the point where they cross A. T: We say that lines e and f intersect at point A.

How many angles do they form? (4) What do you notice about them? (Opposite angles are equal.) How do we mark it? (T reminds Ps if necessary.) Let's mark them and label one pair α and the other pair β.

What can we say about all the angles? (The 4 angles form a whole turn, or whole angle of 360°.) Who could write an equation about it?

P comes to BB and class writes equation below diagram in Ex. Bks.

\[ 2 \times \alpha + 2 \times \beta = 360^\circ \]

or \[ 2 \times (\alpha + \beta) = 360^\circ \]

Notes

BB: e.g.

Perpendicular distance of P from e is 2.8 cm.

Elicit that this is the shortest distance.

Notation for equal angles:
1 arc for 1st equal pair;
2 arcs for 2nd equal pair, etc.

\[ 2 \times \alpha + 2 \times \beta = 360^\circ \]

PbY6a, page 43

Q.1 Read: In your exercise book, draw:
    i) a triangle, ii) a quadrilateral, iii) a pentagon.
Complete the sentences.

Ps draw the shapes first and T quickly checks that they are correct. T chooses Ps to draw their shapes on BB.

What name can we give to all 3 shapes? (polygons)
Discuss the usual way of labelling polygons. (Upper case letters for vertices, starting with A at bottom LH vertex and going in an anti-clockwise direction; lower case letters for sides: in triangles, a is opposite vertex A but in other polygons, a is adjacent to vertex A (and on RHS). Ps label their shapes.

Ps read each sentence themselves and write the missing words. Review with whole class. Ps could show words on scrap paper or slates on command. Ps with different words explain reasoning and class decides whether they are valid.

How many diagonals does each shape have? Elicit that a diagonal is a straight line joining vertices which are not adjacent. (triangle: 0, quadrilateral: 2, pentagon: 5)

Solution: e.g. (convex)

\[ \begin{array}{ccc}
\text{i)} & C & \text{b} \\
\text{a} & \text{b} & \text{c} \\
\text{A} & \text{B} & \text{C} \\
\end{array} \]

\[ \begin{array}{ccc}
\text{ii)} & D & \text{c} \\
\text{a} & \text{d} & \text{c} \\
\text{b} & \text{a} & \text{b} \\
\text{C} & \text{D} & \text{C} \\
\end{array} \]

\[ \begin{array}{ccc}
\text{iii)} & E & \text{c} \\
\text{d} & \text{e} & \text{d} \\
\text{b} & \text{a} & \text{b} \\
\text{C} & \text{D} & \text{C} \\
\end{array} \]

\[ \text{a)} \] A polygon is enclosed only by straight sides.
\[ \text{b)} \] A polygon has the same number of vertices as it has sides.
\[ \text{c)} \] Each vertex of a polygon is shared by only 2 sides.
\[ \text{d)} \] The broken line enclosing a polygon is closed and does not cross itself.

Individual work, monitored, helped

Sentences written on BB or SB or OHT

Ps use BB ruler!

Revision. Ps who remember what to do come to BB to explain and demonstrate, or T reminds Ps.

Responses shown in unison.

Agreement, self-correction, praising

Ps come to BB to draw them. Agreement, praising or ii) (concave) iii) (line segments or a broken line)
(or sides and angles)

\[ \text{e.g.} \] is not a polygon
**Activity**

4

**PbY6a, page 43**

Q.2 Read *In your exercise book, draw three separate acute angles.*

Cut the 2 arms of each angle with a straight line so that these triangles are formed:

- a) acute-angled triangle
- b) obtuse-angled triangle
- c) right-angled triangle.

Set a short time limit. T monitors closely. T has 3 acute angles already drawn on BB or SB or OHT and chooses 3 Ps to make them into the 3 different triangles, labelling the vertices and sides appropriately. Class agrees/disagrees.

Ps compare their triangles with those on BB and correct them if necessary.

**Solution:**

![Diagram of triangles](attachment://triangle_diagram.png)

26 min

---

Q.3 Read: *Write the letters of these triangles in the correct part of the set diagram.*

Set a time limit of 2 minutes. Review with whole class. Ps come to BB to write the letters, explaining reasoning. Class agrees/disagrees. Mistakes discussed and corrected.

Elicit that an equilateral triangle has 3 equal sides (and is acute-angled) and an isosceles triangle has at least 2 equal sides (so an equilateral triangle is also an isosceles triangle).

**Solution:**

![Diagram of set diagram](attachment://set_diagram.png)

---

**Extension**

Ps say true statements about the set diagram.

- e.g. No equilateral triangle has an obtuse angle. Every equilateral triangle has 3 acute angles. etc.
- There is an isosceles triangle which has an obtuse angle.

---

**Notes**

Individual work, monitored, (helped)

Angles drawn on BB or SB or OHT

Agreement, self-correcting, praising

Elicit that:

- acute-angled triangle: each angle < 90°
- obtuse-angled triangle: 90° < 1 angle < 180°, 2 angles < 90°
- right-angled triangle: 1 angle = 90°, 2 angles < 90°

---

Individual work, monitored, helped

(or whole class activity)

Drawn on BB or use enlarged copy master or OHP

Reasoning, agreement, self-correction, praising

What kind of triangle is not shown here so its set is empty? (A right-angled, isosceles triangle)

Ps comes to BB to draw a rough sketch of such a triangle but to label its sides correctly. (Ps draw one in space in Pbs too.) Let's call it H.

Ps write H in correct place in set diagram on BB and in Pbs.

Whole class activity

Praising, encouragement only
**Lesson Plan 43**

**Y6**

**Activity**

6  
*PbY6a, page 43*

Q.4  Read: *Write the numbers of these quadrilaterals in the correct part of the set diagram.*

First review the definitions of each type of shape:

- a **quadrilateral** is a 4-sided polygon;
- a **trapezium** is a quadrilateral which has at least 1 pair of parallel sides;
- a **parallelogram** is a quadrilateral which has 2 pairs of parallel (and equal) sides;
- a **rectangle** is a quadrilateral which has opposite sides equal and parallel and adjacent sides perpendicular (or has only right angles);
- a **rhombus** is a quadrilateral which has opposite sides parallel and all its sides equal.

Set a time limit of 2 minutes. Review with whole class. Ps come to BB to write the numbers, explaining reasoning. Class agrees/disagrees. Mistakes discussed and corrected.

**Solution:**

Set diagram with numbers 1-10 assigned to each shape type. Ps fill in the correct spaces, explaining their reasoning.

Ps say true statements about the set diagram.

- Every rhombus is a trapezium.
- There is a rhombus which is also a rectangle.
- Not every parallelogram is a rectangle.

**Extension**

Ps say true statements about the set diagram.

- Every rhombus is a trapezium.
- There is a rhombus which is also a rectangle.
- Not every parallelogram is a rectangle.

35 min

7  
*PbY6a, page 43*

Q.5  Read: *Write the names of the solids below each diagram.*

What is different about these shapes compared with the shapes in the previous questions? (3-dimensional) How do we know? (Edges which would not be visible if we were looking at real solids are shown by dotted lines in the diagrams.)

T: We call such diagrams **axonometric diagrams**.

Set a time limit of 1 minute.

Review with whole class. Ps come to BB to write names and say what they know about the solids. Class agrees/disagrees. Mistakes (including spelling mistakes) discussed and corrected.

**Solution:**

- **sphere**
- **cuboid**
- **cylinder**
- **pyramid**
- **cube**
- **cone**
- **prism**

Whole class activity
Praising, encouragement only

39 min

**Notes**

- Individual work, monitored, helped
- Drawn on BB or use enlarged copy master or OHP
- Quick revision with whole class to start
- Elicit definitions from Ps.

- Reasoning, agreement, self-correction, praising
- What extra labels could we write on the set diagram and where could we put them?
  - **Square**: at intersection of rectangles and rhombi;
  - **Deltoid**: additional set inside quadrilaterals set but outside trapeziums set.

Individual work, monitored, (helped)
Drawn on BB or use enlarged copy master or OHP
BB: **axonometric diagrams**

Discussion, agreement, self-correction, praising
Ps give examples of such shapes in real life. (e.g. ball, matchbox, tin of fruit, dice, clown's hat or traffic cone, Toblerone box)
Extra praise for clever examples
### Activity 7

**Nets**

These diagrams are supposed to be the nets of a cube. Are they correct? (No, they should have 6 faces.) How could we correct them? Ps come to BB to complete the nets. Class imagines the net folded to form a cube and agrees/disagrees. (If disagreement, T could cut the net from squared paper and fold to check.) Who can show the net completed in another way? Agree that several solutions are possible.

BB: e.g. (Possible amendments shown by dotted lines)

- a)
- b)
- c)

3/4 min

**Homework**

Ps note the task in *Ex. Bks*. T quickly revises how to use compasses if necessary. Encourage Ps to have sharp pencils and to measure accurately.

BB: Construct these shapes on plain paper using a ruler and a pair of compasses and label them.

- a) A circle with radius 3 cm
- b) A square with 4 cm sides
- c) A 3 cm by 4.5 cm rectangle
- d) An equilateral triangle with 3 cm sides.

### Notes

- Whole class activity
- Drawn on BB or use enlarged copy master or OHP
- Involve several Ps.
- In good humour!
- Discussion, reasoning, agreement, praising
- Extra praising if Ps suggest a completely different correct net.

**N.B.** Ps should by now have their own sets of instruments (ruler, compasses, protractor, set square) but school should supply them for Ps who do not have them.

Review as Activity 2 in *Lesson 44*. 

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Factorisation

Factorise these numbers in your exercise book and list their positive factors. T sets a time limit of 5 minutes.

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

Elicit that:

- \(44 = 2 \times 2 \times 11 = 2^2 \times 11\) Factors: 1, 2, 4, 11, 22, 44
- \(219 = 3 \times 73\) Factors: 1, 3, 73, 219
- \(394 = 2 \times 197\) Factors: 1, 2, 197, 394
- \(1044 = 2 \times 2 \times 3 \times 3 \times 29 = 2^2 \times 3^2 \times 29\) Factors: 1, 2, 3, 4, 6, 9, 12, 18, 29, 1044, 522, 348, 261, 174, 116, 87, 58, 36

Review of homework

Ps have Ex. Bks open on desks. T does a quick check of all Ps’ work. Deal with one shape at a time in detail. Ps come to BB or dictate what T should do. (If necessary, T demonstrates how to set a pair of compasses to the required length using BB compasses and BB ruler.)

T corrects or adds steps as required, emphasising accuracy. Ps redraw any of their diagrams which are not close to the required dimensions.

BB: (Order of steps shown in diagrams as circled numbers.)

What can you say about the size of the angles in the square (rectangle, triangle)? (Angles in the square and rectangle are all \(90^\circ\). Angles in the equilateral triangle are all \(60^\circ\).)

What can you say about the sum of the angles in the square (rectangle, triangle)? Elicit that:

- sum of the angles in the rectangle (and also in the square) is \(360^\circ\);
- sum of the angles in the triangle is \(180^\circ\).
### Measuring angles

**a)** T: Measurement of angles means making a comparison: how many times more is the angle than the unit angle?

The unit angle used is usually $1^\circ$ (one degree) and is one 360th of a whole angle (or of one complete turn).

Sometimes the unit angle used is the straight angle of $180^\circ$.

We call this unit angle a radian and use the Greek letter, $\pi$, as its symbol.

**e.g.** A right angle is $90^\circ$ or $\frac{\pi}{2}$ (half a radian)

**b)** Let’s remind ourselves how to use a protractor to measure angles using 1 degree as the unit of measure.

T draws an angle on BB and Ps draw one in Ex. Bks. T uses a BB protractor to demonstrate how to measure the angle, while Ps copy the steps with own protractors in Ex. Bks. T draws an arc to show the angle and writes the size of the angle inside it. Ps do the same for their angles.

T asks 3 or 4 Ps what size of angle they drew.

17 min

### Q.1 Read: Measure these angles.

Set a time limit of 5 minutes. T monitors carefully, helping and correcting. Ps finished early help the slower Ps near them.

Review with whole class. Ps come to BB or dictate to T, showing (explaining) how they did the measurement.

Who agrees? Who has a different value? (Accept $\pm 1^\circ$, but Ps who are more inaccurate than that measure the angle again (with the help of a P who was correct).

Let’s add up the angles of the triangle (quadrilateral).

Ps dictate what T should write. Agree that in the triangle, they sum to $180^\circ$ and in the quadrilateral they sum to $360^\circ$.

**Solution:**

\[
\alpha = 63^\circ \\
\beta = 230^\circ \\
\angle A = 60^\circ \\
\angle C = 45^\circ \\
\angle B = 75^\circ \\
\angle K = 60^\circ \\
\angle L = 70^\circ \\
\angle M = 100^\circ \\
\angle N = 130^\circ \\
60^\circ + 45^\circ + 75^\circ = 180^\circ \\
60^\circ + 50^\circ + 120^\circ + 130^\circ = 360^\circ 
\]

25 min
### Y6

#### Activity

**PbY6a, page 44**

**Q.2** Read: *Draw these angles in your exercise book.*

- a) 40°
- b) 116°
- c) 270°

If necessary, T shows the procedure for a) on BB using BB ruler and protractor (or on an OHP with a normal sized protractor), with Ps following each step in *Ex. Bks.* Show Ps how to use their compasses to draw the arc marking the angle.

Set a time limit for the other two angles. T helps, corrects.

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

**Solution:**

a)

![Diagram showing angle a)](image)

b) b

c) c)

![Diagram showing angle c)](image)

Set a time limit for the other two angles. T helps, corrects.

Review with whole class. Ps come to BB to draw the 2 angles using BB instruments and helped by T. Ps label the vertices, angles and rays appropriately. Ps check their neighbour’s drawings. Again accept ±1° accuracy. Ps with wildly inaccurate drawings do them again (with help of nearest P who was correct). What do you notice about c)? (a, b perpendicular)

**Solution:**

a)

![Diagram showing angle a)](image)

b) b

c) c)

![Diagram showing angle c)](image)

**Q.3** Read: *How many degrees are these angles?*

Let’s see if you can work them out *without* using your protractor!

Set a time limit.

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

**Solution:**

**First 3 circles:** \(\frac{1}{6}\) of 360° = 60°, so each sector is 60°

\[60° ÷ 2 = 30°\]

\[60° + 30° ÷ 2 = 75°\]

\[180° + 60° = 240°\]

**Last 3 circles:** \(\frac{1}{8}\) of 360° = 45°, so each sector is 45°

\[45° + 45° ÷ 2 = 67.5°\]

\[90° + 45° = 135°\]

\[180° + 45° = 225°\]

---

**Notes**

- Individual work, monitored, helped, corrected
- Demonstration with whole class first if necessary
- Agreement, checking, self-correction, praising only
- Feedback for T

**Individual work, monitored, helped**

- Drawn on BB or use enlarged copy master or OHP
- Discussion, reasoning, agreement, self-correction, praising
- Extra praise for clever ideas.

**e.g.**

- 2nd circle from LHS:
  - 90° − 15° = 75°

- 3rd circle from RHS:
  - 90° − 22.5° = 67.5°
  - or 22.5° × 3 = 67.5°
### Y6

#### Activity 6 Extension

(Continued)

T draws an angle on BB. How could we halve this angle without drawing a circle and dividing the circle into equal segments?

Ps make suggestions or come to BB to try out their ideas. If no P is on the right track, T gives hint about using compasses. If still no P has the correct idea, T leads Ps through the procedure while Ps follow the steps in Ex. Bks.

1. Set the compasses to a width less than the length of the arms.
2. Place the pointed arm on the vertex of the angle and mark a point on each of the arms by drawing an arc.
3. Keeping the compasses at the same width, place the pointed arm on each of these two marked points in turn and draw an arc.
4. Using a ruler, draw a line from the vertex through the point where the arcs cross.

Ps check that the two angles formed are equal with a protractor.

T: The line we have drawn divides the angle into two equal parts. We say that the line bisects the angle and we call the line the bisector of the angle.

Why do you think that this method works?

**Notes**

Whole class activity
Discussion, demonstration, checking, agreement, praising
Extra praise if a P suggests the correct method without help from T

**Lesson Plan 44**

<table>
<thead>
<tr>
<th>Activity</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 Extension</td>
<td>Whole class activity</td>
</tr>
<tr>
<td>7 PbY6a, page 44, Q.4</td>
<td>Discussion, demonstration, checking, agreement, praising</td>
</tr>
<tr>
<td>a) Read: What is the sum of the angles in this triangle? The shading might help you.</td>
<td>Extra praise if a P suggests the correct method without help from T</td>
</tr>
<tr>
<td>(i) Allow Ps a minute to think about it, then Ps show angle on slates or scrap paper on command. Ps with different angles come to BB to explain their reasoning. Class decides who is correct and Ps write correct angle in Pbs.</td>
<td></td>
</tr>
<tr>
<td>BB:</td>
<td></td>
</tr>
<tr>
<td>Read: Is the sum the same for any other triangle in the grid?</td>
<td>Whole class checking</td>
</tr>
<tr>
<td>Ps show responses on scrap paper or slates (or with pre-agreed actions) on command. Agree that all the triangles in the grid are congruent, so the sum of their angles will be the same: 180°.</td>
<td>(or Ps could also have different triangles on desks and tear and fold individually)</td>
</tr>
<tr>
<td>Will it be the same for any triangle? Who thinks yes (no)?</td>
<td>In good humour!</td>
</tr>
<tr>
<td>Let’s check it. T has different kinds of large triangles cut from paper. Ps come to front of class to choose a triangle. How could we check that their angles sum to 180°? If no P suggests tearing or folding, T suggests it and asks class what they think about it. Ps at front of class demonstrate under T’s guidance.</td>
<td></td>
</tr>
<tr>
<td><strong>Tearing</strong></td>
<td>Agreement, praising</td>
</tr>
<tr>
<td><strong>Folding</strong></td>
<td></td>
</tr>
<tr>
<td>Agree that the sum of the angles of any triangle is 180°. (i.e. They form a straight angle.)</td>
<td></td>
</tr>
</tbody>
</table>

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### Y6

<table>
<thead>
<tr>
<th>Activity</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 (continued)</td>
<td>Individual work, monitored (or continue as whole class activity)</td>
</tr>
<tr>
<td>b) Read: <em>Fill in the missing items.</em></td>
<td>Drawn on BB or use enlarged copy master or OHP</td>
</tr>
<tr>
<td>Allow 1 minute. Review with whole class. Ps show angles on scrap paper or slates on command. Ps answering correctly explain to Ps who were wrong. Mistakes discussed and corrected.</td>
<td>Responses shown in unison.</td>
</tr>
<tr>
<td>Elicit that quadrilateral ABCD is made up of 2 triangles, so its angles sum to $180^\circ \times 2 = 360^\circ$.</td>
<td>Reasoning, agreement, self-correction, praising</td>
</tr>
<tr>
<td><strong>Solution:</strong></td>
<td>BB:</td>
</tr>
<tr>
<td>i) The sum of the angles in triangle $ABC$ is $180^\circ$</td>
<td></td>
</tr>
<tr>
<td>ii) The sum of the angle in triangle $ACD$ is $180^\circ$</td>
<td></td>
</tr>
<tr>
<td>iii) The sum of the angles in $ABCD$ is $360^\circ$</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>8</th>
<th>Lesson Plan 44</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PbY6a, page 44,</strong></td>
<td></td>
</tr>
<tr>
<td>Q.5 Read: <em>Remember that $1^\circ = 60'$ (angle minutes) and $1' = 60''$ (angle seconds)</em></td>
<td></td>
</tr>
<tr>
<td>Set a time limit. Ps read questions themselves, calculate in Ex. Bks and write the result in Pbs.</td>
<td></td>
</tr>
<tr>
<td>Review with whole class. Ps could show answers on scrap paper or slates on command. Ps answering correctly explain at BB to Ps who were wrong. Mistakes discussed and corrected.</td>
<td></td>
</tr>
<tr>
<td><strong>Solution:</strong></td>
<td></td>
</tr>
<tr>
<td>a) Calculate the 3rd angle of a triangle which has angles of $48^\circ 30'$ and $62^\circ 25'$.</td>
<td></td>
</tr>
<tr>
<td><strong>Plan:</strong> $180^\circ - (48^\circ 30' + 62^\circ 25') = 180^\circ - 110^\circ 55'$</td>
<td></td>
</tr>
<tr>
<td>$= 69^\circ 05'$</td>
<td></td>
</tr>
<tr>
<td><strong>Answer:</strong> The third angle of the triangle is $69^\circ 05'$.</td>
<td></td>
</tr>
<tr>
<td>b) What kind of triangle is it? (acute-angled, scalene)</td>
<td></td>
</tr>
<tr>
<td>If no P writes 'scalene', elicit that as all the angles are different sizes, all the sides must be different lengths, so it is also a scalene triangle. T draws rough sketch on BB and Ps label angles, vertices and sides appropriately.</td>
<td></td>
</tr>
</tbody>
</table>

---

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Factorising 45, 220, 395 and 1045. Revision, activities, consolidation

**PbY6a, page 45**

**Solutions:**

Q.1 e.g.

a) 1, 3, 7: It is a polygon.

b) 4, 5, 9: It is enclosed by a single curved line.

c) 2, 4, 5, 6, 8, 9: It has at least 1 curved side.

d) 1, 3, 6, 7, 10: It has at least 1 pair of parallel sides.

e) 1, 3, 7, 10: It has at least 1 pair of perpendicular sides.

f) 3, 4, 6, 8, 9, 10: It is concave.

g) 1, 2, 5, 6, 9: It has line symmetry.

h) e.g. 6, 7, 8: It has 4 sides.

Accept any valid criteria.

Q.2 a) i) $d = 2.2 \text{ cm} + 2.2 \text{ cm} = 4.4 \text{ cm}$

ii) P’s exact measurement.

b) i) $BD \approx 54 \text{ mm}$

ti) $P = 38 \text{ mm} \times 4 = 152 \text{ mm}$

ii) $A = 38 \text{ mm} \times 38 \text{ mm} = 1444 \text{ mm}^2$.

c) i) $AC \approx 7.4 \text{ cm}$

ii) $P = (5.6 + 4.9) \times 2$

$= 10.5 \times 2 = 21 \text{ (cm)}$

$A = 56 \text{ mm} \times 49 \text{ mm}$

$= 2744 \text{ mm}^2 \left( = 27.44 \text{ cm}^2 \right)$

d) i) $P = 10.5 \text{ cm}$

ii) $\angle C = 96^\circ$

iii) Perp. height $= 1.8 \text{ cm}$.

Q.3 a) Accept $\pm 1^\circ$ accuracy.

| & Alpha | Beta | Delta |
|---|---|---|---|
| $\alpha = 20^\circ$ | $\beta = 120^\circ$ | $\delta = 295^\circ$ |

- Acute angle
- Obtuse angle
- Reflex angle

b) i) $32^\circ$

ii) $78^\circ$

iii) $145^\circ$

iv) $290^\circ$
<table>
<thead>
<tr>
<th>Activity</th>
<th>Factorisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factorise these numbers in your exercise book and list their positive factors. T sets a time limit of 6 minutes. Review with whole class. Ps come to BB or dictate to T, explaining reasoning. Class agrees/disagrees. Mistakes discussed and corrected. Elicit that:</td>
<td></td>
</tr>
<tr>
<td><strong>46</strong> = 2 × 23  Factors: 1, 2, 23, 46</td>
<td></td>
</tr>
<tr>
<td><strong>221</strong> = 13 × 17  Factors: 1, 13, 17, 221</td>
<td></td>
</tr>
<tr>
<td><strong>396</strong> = 2 × 2 × 3 × 3 × 11 = 2² × 3² × 11  Factors: 1, 2, 3, 4, 6, 9, 11, 12, 18, 396, 198, 132, 99, 66, 44, 36, 33, 22</td>
<td></td>
</tr>
<tr>
<td><strong>1046</strong> = 2 × 523  Factors: 1, 2, 523, 1046</td>
<td></td>
</tr>
<tr>
<td>(523 not exactly divisible by 2, 3, 5, 7, 9, 11, 13, 17, 19 and 23 × 23 &lt; 523)</td>
<td></td>
</tr>
</tbody>
</table>

**8 min**

<table>
<thead>
<tr>
<th>Extension</th>
<th>Measuring</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Length</td>
<td></td>
</tr>
<tr>
<td>Measure the length and width of your Ex. Bks and write them on each side of your slates (or sheet of scrap paper). Remember to write the unit of measure too!</td>
<td></td>
</tr>
<tr>
<td>Show me the length (width) . . . now! Ps will inevitably have varying degrees of accuracy. How could we write true statements about the length and width? (as inequalities) T and Ps agree on acceptable upper and lower limits in a suitable unit of measure. T chooses 2 Ps to write inequalities on BB. Ps could write them in Ex. Bks too.</td>
<td></td>
</tr>
<tr>
<td>BB: . . . cm &lt; length &lt; . . . cm  . . . cm &lt; width &lt; . . . cm</td>
<td></td>
</tr>
<tr>
<td>Let's list the units of length and write the relationship between them. Ps come to BB or dictate to T. Class agrees/disagrees. Ps write it in Ex. Bks too.</td>
<td></td>
</tr>
<tr>
<td>BB:</td>
<td></td>
</tr>
<tr>
<td>1 mm &lt; 1 cm &lt; 1 m &lt; 1 km</td>
<td></td>
</tr>
<tr>
<td>× 10  × 100  × 1000</td>
<td></td>
</tr>
</tbody>
</table>

**Extension**

[T might mention a light year, which is the unit used to measure the huge distances between suns and galaxies in space. It is the distance light travels in 1 year. BB: 1 light year = 6 million million miles (6 000 000 000 000 miles = 6 × 10¹² miles) Ps might agree that it is easier to write and read a very large number as a power of 10 than to write lots of zeros.]
**Activity**

2 (Continued)

b) **Area**

Some Ps work in pairs to measure and calculate, e.g. the area of their desks, some work individually to measure, e.g. the surface area of an empty matchbox (Ps could have cm grid squares to help them) and some Ps work in a group to measure, e.g. the floor area of the classroom using a measuring tape or metre rule.

Set a time limit of 5 minutes. Ps report their findings to class and show their calculations on BB. Class points out errors.

Let's list the units of area and the relationships between them. Ps come to BB or dictate to T. Ps write it in Ex. Bks. too.

\[
\begin{array}{c}
1 \text{ mm}^2 < 1 \text{ cm}^2 < 1 \text{ m}^2 < 1 \text{ km}^2 \\
\times 100 \quad \times 10000 \quad \times 1000000
\end{array}
\]

T might mention a **hectare** used by farmers to measure the area of their fields.

BB: 1 hectare = 10 000 m\(^2\) (i.e. an area 100 m \times 100 m)

Elicit that 100 hectares = 1 km\(^2\).

c) **Mass**

T has scales and various items on table at front of class. (e.g. glass or bottle of water, bag of sugar, apple, book, feather, button, etc.) Ps come to front of class to choose an item and weigh it. Other Ps give estimates first and T writes them on BB. Then P who did the weighing writes the actual mass on BB. P with nearest estimate is given a clap.

Let's list the units of measure and the relationships between them. Ps come to BB or dictate to T. Class agrees/disagrees.

BB: 

\[
\begin{array}{c}
1 \text{ mg} < 1 \text{ g} < 1 \text{ kg} < 1 \text{ tonne} (< 1 \text{ Megatonne}) \\
\times 1000 \quad \times 1000 \quad \times 1000 \quad \times 1000
\end{array}
\]

Talk about the difference between mass and weight.

If an object has a mass of 1 kg on the Earth, it will also have a mass of 1 kg on the Moon. Mass involves the size of something and how dense the material is which makes it up.

Weight is how heavy something is and involves the force of gravity, which is much greater on the Earth than on the Moon.

BB: weight = mass \times \text{the local force of gravity}

So if something weighs 1 kg on Earth, it will seem much lighter on the Moon. (Ps will no doubt have seen pictures of people and objects floating in space or on space ships.)

T points out that as the force of gravity is constant on Earth, mass and weight is often thought of as being the same thing.

---

**Notes**

Tasks set according to ability of Ps and number of measuring tools available.

Ps could use transparent cm measuring squares (see copy master)

Surface area of a matchbox = sum of areas of its 6 faces

Necessary calculations done in Ex. Bks.

Praising, encouragement only

BB: 1 m\(^2\) > 1 ha < 1 km\(^2\) \times 10000 \times 100

Praising

(Prepared before the lesson)

At a good pace
In good humour!
T helps in reading the scale.

Agreement, praising

[T might mention Megatonne (Mt) which is equal to 1000 tonnes.]

**Extension**

Force of gravity is measured in Newtons (N). 1 N is the force needed to move a mass of 1 kg by 1 m per second every second.

On Earth On the Moon
mass: 1 kg = 1 kg
weight (or gravitational force) for a mass of 1 kg:

\begin{align*}
10 \text{ N} & \quad 1.6 \text{ N}
\end{align*}
**Activity**

2  (Continued)

d) **Capacity**

What is capacity? (The amount of liquid a container can hold.) T has a measuring jug, various containers (e.g. spoon, cup, glass, bottle) and a bucket of water on desk. Ps come to BB to choose a container. Class estimates its capacity first and T writes estimates on BB. P fills the container with water and then pours it into the measuring jug. P reads the scale and writes the capacity on BB. P(s) with nearest estimate is given a pat on the back.

Let's list the units of capacity and the relationships between them. Ps come to BB or dictate to T. Class agrees/disagrees.

If we measured the amount of space each amount of water took up, what would their **volumes** be? T reminds Ps if they have forgotten.

**BB:**

<table>
<thead>
<tr>
<th>1 ml</th>
<th>1 cl</th>
<th>1 litre</th>
</tr>
</thead>
<tbody>
<tr>
<td>× 10</td>
<td>× 100</td>
<td></td>
</tr>
</tbody>
</table>

Volume equivalents: 1 cm$^3$ 1000 cm$^3$ 1000000 cm$^3$ (of water)

e) **Volume**

We can also say that the capacity of a container is the volume of the space inside it. What is volume? (The amount of space something takes up.) Let's list the units of volume. Ps dictate to T.

T reminds Ps or elicits how to write very large numbers in a simpler form as powers of 10. We call this writing a number in **standard form**.

**BB:**

\[
\begin{align*}
1 \text{ mm}^3 &< 1 \text{ cm}^3 < 1 \text{ m}^3 < 1 \text{ km}^3 \\
&\times 1000 \times 1000000 \times 1000000000 \\
(1 \text{ thousand}) (1 \text{ million}) (1 \text{ billion}) \\
&\times 10^3 \times 10^6 \times 10^9
\end{align*}
\]

**Lesson Plan 46**

**Notes**

Whole class demonstration, involving Ps where possible
At a good pace
In good humour!

Agreement, praising

If possible, T shows volume equivalents using multi-link cubes (prepared beforehand).

Elicit that volume is 3-dimensional and is the product of 3 measures: length, width and height.

**BB:** **Standard form**

written as a power of 10
i.e. the 'power' shows the number of times the number has been multiplied by 10, so the number of zeros on RHS.

Individually work, monitored, helped
Written on BB or use enlarged copy master or OHP
Differentiation by time limit.
Discussion, agreement, self-correction, praising
Feedback for T

**Extension**

What other units of **time** do you know? (month, year, decade, century, millennium) Ps say the unit of measure and also its relationship with another unit. e.g.

1 millennium = 1000 years

Which unit is not an exact standard unit of time? (month, year: months vary from 29 to 31 days and a year can be 365 or 366 days)
| Activity | 
|---|---|
| 4 | PbY6a, page 46 |
| Q.2 | Read: Write the missing numbers. |
| | Deal with one row at a time or set a time limit. Ps do necessary calculations in Ex. Bks or on scrap paper or slates. |
| | Review with whole class. Ps come to BB or dictate to T, explaining reasoning. Class agrees/disagrees. Show details of calculations on BB if problems or disagreement. Mistakes discussed and corrected. |
| | Solution: |
| a) | 34.6 m = 3460 cm = 34 600 mm = 0.0346 km |
| b) | 0.6 tonnes = 600 kg = 600 000 g |
| c) | 4567 g = 4.567 kg = 0.004567 tonnes |
| d) | 6282 ml = 628.2 cl = 6.282 litres |
| e) | 3.2 hours = 192 min = 11 520 sec |
| f) | 1.5 m² = 15000 cm² = 1500 000 mm² |
| | Ps could write the large numbers in standard form. |
| Extension | |
| | 31 min |

| 5 | PbY6a, page 46, Q.3 |
| | Deal with one part at a time. T (or P) reads out each part. Ps calculate in Ex. Bks then show result on scrap paper or slates on command. P answering correctly explains at BB to Ps who were wrong. Who agrees? Who did it another way? etc. Mistakes discussed and corrected. |
| | Solution: |
| a) | What is 3 quarters of 1 kg? (750 g) |
| | BB: 1 kg ÷ 4 × 3 = 1000 g ÷ 4 × 3 = 250 g × 3 = 750 g |
| b) | What is 0.7 of 230 m? (161 m) |
| | BB: 230 m ÷ 10 × 7 = 23 m × 7 = 161 m |
| | or 0.7 of 230 m = 230 m × 0.7 = 23 m × 7 = 161 m |
| c) | What is one and two fifths of 120 litres? (168 litres) |
| | BB: 120 + 120 ÷ 5 × 2 = 120 + 24 × 2 = 120 + 48 = 168 (ℓ) |
| d) | What is 3 quarters of 3 quarters of a km? (562.5 m) |
| | BB: 3 4 of 3 4 km = 750 m ÷ 4 × 3 = 187.5 m × 3 = 562.5 m |
| | or 3 4 of 3 4 km = 3 4 km ÷ 4 × 3 = 3 16 km × 3 = 9 16 km |
| | 36 min |
### Lesson Plan 46

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<th>Activity</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
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<td><strong>Y6</strong></td>
<td><strong>Lesson Plan 46</strong></td>
</tr>
<tr>
<td><strong>Activity</strong></td>
<td><strong>Notes</strong></td>
</tr>
<tr>
<td><strong>6</strong></td>
<td>Individual work, monitored, helped</td>
</tr>
<tr>
<td><em>PbY6a, page 46</em></td>
<td>Written on BB or SB or OHT</td>
</tr>
<tr>
<td>Q.4 Read: <em>Calculate the times and angles.</em></td>
<td>Reasoning, agreement, self-correction, praising</td>
</tr>
<tr>
<td>Set a time limit of 3 minutes. Ps write answers in <em>Pb</em>s.</td>
<td>Accept any valid reasoning.</td>
</tr>
<tr>
<td>Review with whole class. Ps come to BB to explain in detail how they did the calculation. Who did the same? Who did it a different way? Mistakes discussed and corrected.</td>
<td></td>
</tr>
<tr>
<td><strong>Solution:</strong></td>
<td></td>
</tr>
<tr>
<td>a) 2 h 15 min 5 sec</td>
<td>d) 4 h 59 min ÷ 2</td>
</tr>
<tr>
<td>+ 1 h 49 min 45 sec</td>
<td>= 2 h 29.5 min</td>
</tr>
<tr>
<td><strong>3 h 64 min 50 sec</strong></td>
<td>= 2 h 29 min 30 sec</td>
</tr>
<tr>
<td>4 h 4 min 50 sec</td>
<td></td>
</tr>
<tr>
<td><strong>= 2 h 29 min</strong></td>
<td></td>
</tr>
<tr>
<td><strong>30 sec</strong></td>
<td></td>
</tr>
<tr>
<td><strong>40 min</strong></td>
<td></td>
</tr>
<tr>
<td><strong>7</strong></td>
<td>Whole class activity</td>
</tr>
<tr>
<td><strong>World Time Zones</strong></td>
<td>T has a globe and Time Zone Map, or use enlarged copy master or OHP.</td>
</tr>
<tr>
<td>The Earth is turning around its own axis. (T demonstrates with a globe.) How long does it take for 1 complete turn? (1 day)</td>
<td>(If possible, Ps have copies on desks too.)</td>
</tr>
<tr>
<td>a) If it takes 24 hours to turn 360°, what angle does it turn every hour?</td>
<td>At a good pace</td>
</tr>
<tr>
<td>P comes to BB or dictates to T. Class agrees/disagrees.</td>
<td>Discussion, reasoning, agreement, praising</td>
</tr>
<tr>
<td>BB: 360° ÷ 24 = 30° ÷ 2 = 15°</td>
<td>BB: 1° → 4 minutes</td>
</tr>
<tr>
<td>b) How long does the Earth take to turn 1°? P comes to BB or dictates what T should write.</td>
<td><strong>Greenwich Meridien</strong></td>
</tr>
<tr>
<td>BB: 15° → 1 hour = 60 minutes</td>
<td>0° → 0 minutes</td>
</tr>
<tr>
<td>1° → 60 min ÷ 15 = 12 min ÷ 3 = 4 min.</td>
<td>Discussion, agreement, praising</td>
</tr>
<tr>
<td>So every 4 minutes the Earth turns 1°. Because of this, all the countries on Earth belong to different time zones. The time zones are counted from the imaginary 0° line of longitude which passes through London. We call it the <strong>Greenwich Meridien</strong>. T shows it on the globe. Here is a map of the world showing the different time zones. The Greenwich Meridien is shown as a dotted line. Why do you think that some of the time zones are zi-zagged? (Because of where the borders of countries are.) Let's fill in the missing times in this sentence. T (Ps) points to the relevant cities on the map (labelled with initial letters and Ps come to BB to work out the times and write them in the boxes. Class agrees/disagrees. BB:</td>
<td></td>
</tr>
<tr>
<td>When it is midnight in Los Angeles, it is 3.00 am in New York, 8.00 am in London, 9.00 am in Budapest and 5.00 pm in Tokyo.</td>
<td></td>
</tr>
<tr>
<td><strong>45 min</strong></td>
<td></td>
</tr>
</tbody>
</table>
Y6

Lesson Plan

47

Week 10

R: Calculations
C: Imperial units and rough equivalents to metric units
E: Word problems

Activity

1

Factorisation
Factorise these numbers in your exercise book and list their positive factors. T sets a time limit of 6 minutes.
Review with whole class. Ps come to BB or dictate to T, explaining reasoning. Class agrees/disagrees. Mistakes discussed and corrected.
Elicit that:

- 47 is a prime number
  Factors: 1, 47

- 222 = 2 × 3 × 37
  Factors: 1, 2, 3, 6, 37, 74, 111, 222

- 397 is a prime number
  Factors: 1, 397
  (as not exactly divisible by 2, 3, 5, 7, 9, 11, 13, 17, 19 and 23 × 23 < 397)

- 1047 = 3 × 349
  Factors: 1, 3, 349, 1047
  (349 is not exactly divisible by 2, 3, 5, 7, 9, 11, 13 and 19, and 19 × 19 < 349)


Notes

Individual work, monitored (or whole class activity)
BB: 47, 222, 397, 1047
Calculators allowed.
Reasoning, agreement, self-correction, praising
e.g.

<table>
<thead>
<tr>
<th>222</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>111</td>
<td>1</td>
</tr>
<tr>
<td>37</td>
<td>1</td>
</tr>
<tr>
<td>37</td>
<td>1</td>
</tr>
<tr>
<td>1047</td>
<td>3</td>
</tr>
<tr>
<td>349</td>
<td>3</td>
</tr>
<tr>
<td>349</td>
<td>1</td>
</tr>
</tbody>
</table>


2

Imperial and Metric units
In this country we used to use only Imperial units for measuring. Who can tell me some Imperial units of measure? (e.g. inches, feet, yards, ounces, pounds, etc.) Which Imperial units do we still use today? (e.g. pints, miles)
Then we changed to using mostly metric units, which are based on powers of 10. Who can tell me some metric units of measure? (e.g. cm, g, litre, etc.)
Let's complete this table and get to know the relationship between the two kinds of measures.
For each set of units, Ps say what type of measure they are.
For each line, Ps say the given approximation in unison, then dictate the appropriate operation and work out the result using calculators to complete the reverse approximations. T helps with rounding appropriately where necessary. T writes agreed value in table on BB and Ps write it in own tables (if they have them).

BB:

<table>
<thead>
<tr>
<th>Length</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1 mm = 0.03937 inch</td>
<td>1 inch = 25.4 mm (1 ÷ 0.03937)</td>
</tr>
<tr>
<td>1 cm = 0.3937 inch</td>
<td>1 inch = 2.54 cm (1 ÷ 0.3937)</td>
</tr>
<tr>
<td>1 m = 39.37 inches</td>
<td>1 yard = 0.914 m (1 ÷ 1.094)</td>
</tr>
<tr>
<td></td>
<td>1.094 yards</td>
</tr>
<tr>
<td>1 m = 3.281 feet</td>
<td>1 foot = 0.3048 m (1 ÷ 3.281)</td>
</tr>
<tr>
<td>1 km = 1093.61 yards</td>
<td>1 mile = 1.6093 km (1 ÷ 0.6214)</td>
</tr>
<tr>
<td></td>
<td>0.6214 mile</td>
</tr>
</tbody>
</table>

Whole class activity
Written on BB or use enlarged copy masters or OHP
(Ps could also have a copy of the sheet to complete and stick in the back of their Pbs.)

At a good pace
Discussion, reasoning, agreement, praising only
T points out the \(\frac{1}{x}\) key on Ps' calculators and shows them how to use it.

[If possible, project calculator from a computer to show the actual results before rounding where necessary.]

Elicit/remind/tell that:
BB: 12 inches = 1 foot
3 feet = 1 yard
1760 yards = 1 mile

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### Activity
2 (Continued)

BB:

#### Area

<table>
<thead>
<tr>
<th>Unit</th>
<th>Conversion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 mm²</td>
<td>0.00155 sq. inch</td>
</tr>
<tr>
<td>1 cm²</td>
<td>0.155 sq. inch</td>
</tr>
<tr>
<td>1 m²</td>
<td>1.196 sq. yards</td>
</tr>
<tr>
<td>1 km²</td>
<td>0.386 sq. miles</td>
</tr>
<tr>
<td>1 km²</td>
<td>247.1 acres</td>
</tr>
</tbody>
</table>

#### Mass

<table>
<thead>
<tr>
<th>Unit</th>
<th>Conversion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 g</td>
<td>0.0353 ounce (oz)</td>
</tr>
<tr>
<td>1 kg</td>
<td>35.27 ounces (oz)</td>
</tr>
<tr>
<td>1 kg</td>
<td>2.205 pounds (lb)</td>
</tr>
<tr>
<td>1 t</td>
<td>2204.62 pounds</td>
</tr>
<tr>
<td>1 t</td>
<td>19.688 hundredweights (cwt)</td>
</tr>
</tbody>
</table>

#### Capacity

<table>
<thead>
<tr>
<th>Unit</th>
<th>Conversion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 ml</td>
<td>0.00176 pint</td>
</tr>
<tr>
<td>1 cl</td>
<td>0.0176 pint</td>
</tr>
<tr>
<td>1 litre</td>
<td>1.76 pints</td>
</tr>
<tr>
<td>1 litre</td>
<td>0.22 gallons</td>
</tr>
</tbody>
</table>

#### Volume

<table>
<thead>
<tr>
<th>Unit</th>
<th>Conversion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 cm³</td>
<td>0.06102 cubic inches</td>
</tr>
<tr>
<td>1 m³</td>
<td>35.315 cubic feet</td>
</tr>
<tr>
<td>1 m³</td>
<td>1.308 cubic yards</td>
</tr>
</tbody>
</table>

#### Temperature

- 17.8°C = 0°F
- 10°C = 50°F
- 40°C = 104°F
- 10°C = 14°F
- 20°C = 68°F
- 100°C = 212°F
- 0°C = 32°F
- 30°C = 86°F
- 36.6°C = 97.8°F

(Normal body temperature)

[T might also mention:

1 are = 100 m²
≈ 0.02471 acre
1 hectare = 100 ares
≈ 2.471 acres]

Elicit/remind/tell that:
BB: 16 oz = 1 lb
(14 lb = 1 stone
8 stones = 1 cwt)
112 lb = 1 cwt

Elicit/remind/tell that:
BB: 8 pints = 1 gallon

[T might also mention:

1 litre ≈ 2.1 US pints
1 US pint ≈ 0.4762 litres]

T shows the formulae for conversion and Ps write them on sheets. Use them to check 2 of the temperatures on BB.

\[
x°C = \frac{9}{5} (y - 32) °F
\]
\[
y°F = \frac{9}{5} (y - 32) °C
\]

3 **PBY6a, page 47**

Q.1 Read:  *Precise measurements are important in design, technology, engineering, chemistry, medicine, etc. In everyday life, it is enough to use rough estimates and conversions.*

*Complete the missing items. Write as fractions and as decimals.*
Activity

Solution:

4 PbY6a, page 47

Q.2 a) Read: On a map of the Balearic Islands, Palma on the island of Majorca is situated at latitude $27^\circ$ East and longitude $39.5^\circ$ North.  Find Palma on your map.

b) If (Ps) explains about the lines of latitude (horizontal and North or South of the Equator) and longitude (vertical and East or West of the Greenwich Meridian).  T points them out on large map and Ps find them on own maps.

c) In large map and Ps find the Balearic Islands on a map of the world first, then on a more detailed map of Spain, identify the island of Majorca, then find Palma.

d) If any P has been to Majorca or Palma, ask them to tell the class about it.  If not, T says something about them.

e) Deal with remaining problems one at a time.  Ps read the question themselves and solve it in Ex. Bks. under a time limit, rounding where necessary, and Ps who have an answer show result on scrap paper or slates on command.  Ps with correct answers explain reasoning at BB, with T's help if necessary.  Class agrees/ disagrees.  Mistakes discussed and corrected.

T chooses a P to say the answer in a sentence.

Solution:  e.g.

b) The area of Majorca is 3640.16 km$^2$.  Convert it to square miles.  [1 square mile $\approx 2.6$ km$^2$]

Plan:  3640.16 $\div$ 2.6 = 1400 (square miles)

Answer:  3640.16 km$^2$ is about 1400 square miles.

c) The length of Majorca's coast is 554.7 km.  Convert it to miles.  [1 km $\approx$ 5 eighths of a mile]

Plan:  554.7 $\times$ $\frac{5}{8}$ = 554.7 $\div$ 8 $\times$ 5 = 346.7 (miles)

Answer:  554.7 km is about 346.7 miles.

d) The annual average temperature in Majorca is 15.8˚ C.  Convert it to degrees Fahrenheit using this formula:

$$x^\circ$C = \left(\frac{9x}{5} + 32\right)^\circ$F
Lesson Plan 47

**Y6**

**Activity**

There is no need to round here, as the given temperature is exact.

Accept any correct rounding (If possible, T projects the calculator on a computer to show the answer to several decimal places, then Ps discuss an acceptable rounding for the answer. It is usual to round to the same number of decimal places as the value given in the question.)

- **Plan:**

  \[ 15.8^\circ C = \left( \frac{9 \times 15.8}{5} + 32 \right)^\circ F \]
  
  \[ = \left( \frac{142.2}{5} + 32 \right)^\circ F \]
  
  \[ = (28.44 + 32)^\circ F \]
  
  \[ = 60.44^\circ F \]

  **Answer:** 15.8°C is the same as 60.44°F.

- **e)** The shortest shipping route between Majorca and Menorca is 34 Miles long and is about 63 km. Is this nautical Mile the same as the usual road mile?

  **Plan:**

  \[ 1 \text{ NM} = 63 \text{ km} \div 34 = 1.85 \text{ km} \]
  
  \[ 1 \text{ mile} \approx 1.6 \text{ km}, \quad 1.6 \text{ km} < 1.85 \text{ km} \]

  **Answer:** No, this nautical Mile is longer than the usual road mile.

- **f)** On the plane to Majorca, the captain informed us that our plane was flying at a height of 30 000 feet. What is the height in metres and kilometres?

  **Plan:**

  \[ 1 \text{ foot} \approx 0.3 \text{ m} \]
  
  \[ 30 \text{ 000 feet} = 0.3 \text{ m} \times 30 \text{ 000} = 9000 \text{ m} = 9 \text{ km} \]

  **Answer:** We were flying at a height of about 9000 metres or 9 kilometres.

- **f)** The captain told us that our plane was flying at a speed of 900 km per hour. Calculate the speed in miles per hour (mph)

  **Plan:**

  \[ 1 \text{ km} = \frac{5}{8} \text{ mile}, \quad 900 \text{ km} = 900 \times \frac{5}{8} = 562.5 \text{ (miles)} \]

  **Answer:** The plane is flying at about 562.5 miles per hour.

**Notes**

There is no need to round here, as the given temperature is exact.

**5**

*PbY6a, page 47*

**Q.3** Read: Solve the problems in your exercise book.

- Deal with one at a time or set a time limit. Ps read the questions themselves, write plans, do the calculations and write the answers in sentences in *Ex. Bks*.

- Review with whole class. Ps could show answers on scrap paper or slates on command. Ps answering correctly come to BB to explain reasoning. Who agrees? Who did it another way? etc. Mistakes discussed/corrected.

- T chooses a P to say the answer in a sentence.

  **Solution:** e.g.

  - **a)** The road sign shows that it is 15 and a half miles to Stanstead Airport. If our coach is travelling at a speed of 96 km per hour, how long will it be before we get there?

    **Plan:**

    \[ 1 \text{ km} = \frac{5}{8} \text{ mile}, \]

    \[ 900 \div \frac{5}{8} = 112.5 \times 5 \]

    \[ = 562.5 \text{ (miles)} \]

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### Activity

96 km = $96 \times \frac{5}{8} = 60$ (miles)

So speed is about 60 miles per hour.

60 miles → 60 minutes
1 mile → 1 minute
15.5 miles → 15.5 minutes

**Answer:** We will get there in about 15 to 16 minutes.

b) **What is 2 thirds of 360 lb in kg?**

**Plan:**

$\frac{2}{3} \times 360 \text{ lb} = 240 \text{ lb}$

1 lb ≈ 0.45 kg

$240 \text{ lb} = 0.45 \times 240 = 4.5 \times 24 = 96 + 12 = 108 \text{ (kg)}$

**Answer:** Two thirds of 360 lb is about 108 kg.

c) **A capacity of 1 litre is practically equivalent to 1000 cm$^3$, and 1 kg of water is close to 1 litre. How many kg is 600 cm$^3$ of water?**

**Plan:**

$1000 \text{ cm}^3 \approx 1 \text{ litre}$

$600 \text{ cm}^3 = \frac{600}{1000} \text{ litre} = \frac{6}{10} \text{ litre} = 0.6 \text{ litre}$

1 litre = 1 kg, so 0.6 of a litre = 0.6 kg

**Answer:** 600 cm$^3$ of water is about 0.6 kg of water.

### Homework (Optional)

In a brewery, yeast is being grown to make beer. At 8.00 am there is 1 mg of yeast but its mass will increase by 10 times every hour.

**How much yeast will there be at 6.00 pm?**

**Solution:** 8.00 am to 6.00 pm is 10 hours. 1 mg = 1 thousandth of a g

Hours: 1 2 3 4 5 6 7 8 9 10
1 mg, 10 mg, 100 mg, 1 g, 10 g, 100 g, 1 kg, 10 kg, 100 kg, 1 t, 10 t

or 1 kg ≈ 2.2 lb

240 kg ÷ 2.2 ≈ 109 (lb)

Accept both answers if reasoned correctly.

Review before the start of **Lesson 48.**

or $1 \text{ mg} \times 10^{10}$

$= 10 \ 000 \ 000 \ 000 \ \text{mg}$

(10 billion milligrams)

**Answer:** At 8.00 pm there will be 10 tonnes of yeast.
### Lesson Plan

#### Activity 1

**Factorisation**
Factorise these numbers in your exercise book and list their positive factors. T sets a time limit of 4 minutes.
Review with whole class. Ps come to BB or dictate to T, explaining reasoning. Class agrees/disagrees. Mistakes discussed and corrected.
Elicit that:

- \(48 = 2 \times 2 \times 2 \times 3 = 2^4 \times 3\)
  - Factors: 1, 2, 3, 4, 6, 8, 12, 16, 24, 48

- \(223\) is a prime number  
  - Factors: 1, 223  
  - (as not exactly divisible by 2, 3, 5, 7, 11, 13, and 17 × 17 > 223)

- \(398 = 2 \times 199\)
  - Factors: 1, 2, 199, 398

- \(1048 = 2 \times 2 \times 2 \times 131 = 2^3 \times 131\)
  - Factors: 1, 2, 4, 8, 131, 262, 524, 1048

**Notes**
Individual work, monitored (or whole class activity)
BB: 48, 223, 398, 1048
Calculators allowed.
Reasoning, agreement, self-correction, praising

### Activity 2

**Measuring**
T poses a problem and asks Ps to suggest what to do. Ps demonstrate the actual measuring in front of the class. T helps where necessary. Class helps with any calculations on BB.

<table>
<thead>
<tr>
<th>a) How could we measure the mass of the water in this jug? e.g.</th>
</tr>
</thead>
<tbody>
<tr>
<td>P₁: Weigh the jug with the water in it on the scales, then pour out the water and weigh the empty jug. The difference in values is the mass of water that was in the jug.</td>
</tr>
<tr>
<td>P₂: Pour the water into a measuring jug to find its volume, then convert it to a mass, as we know that: 1 litre of water → 1 kg water.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>b) How could we measure the volume of this stone? e.g.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pour half a litre of water into a measuring jug. Drop the stone into the jug and note where the level of water is now. The difference between the two levels is the volume of the stone.</td>
</tr>
<tr>
<td>(e.g. A difference of 30 cl: 30 cl = 300 ml → 300 cm³, as 1 ml of water has a volume of 1 cm³.)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>c) How could we measure the height of this pyramid (or cone)? e.g.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stand the pyramid on a table. Lay a sheet of strong card on its point so that the card is parallel to the table and measure the distance between the two planes with a ruler.</td>
</tr>
</tbody>
</table>

Accept and praise any valid method suggested by Ps.

---

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3

**PbY6a, page 48**

**Q.1 Read: Which quantity is more?**

Set a time limit. Ps do necessary calculations in *Ex. Bks*, then circle the greater quantity, or write appropriate sign, in *Pbs*.

Review with whole class. Ps could raise left or right hand to indicate whether quantity on LHS or RHS is greater.

Ps come to BB to explain reasoning. Who thought the same? Who knew the answer without needing to do a calculation? Mistakes discussed and corrected.

**Solution:**

a) \( \frac{3}{4} \) of 500 kg \( \geq \) \( \frac{3}{8} \) of 1 tonne

\[
500 \text{ kg} \div 4 \times 3 = 125 \text{ kg} \times 3 = 375 \text{ kg}
\]

\[
1000 \text{ kg} \div 8 \times 3 = 125 \text{ kg} \times 3 = 375 \text{ kg}
\]

b) 0.4 of £1250 \( \geq \) \( \frac{4}{5} \) of £1250

\[
£1250 \times 0.4 = £125 \times 4 = £500
\]

\[
£1250 \div 5 \times 4 = £250 \times 4 = £1000
\]

c) \( \frac{5}{2} \) of 5700 m² \( \geq \) 2 times 4900 cm²

\[
5700 \text{ m}^2 \div 2 \times 5 = 2850 \text{ m}^2 \times 5 = 14250 \text{ m}^2
\]

\[
4900 \text{ cm}^2 \times 2 = 9800 \text{ cm}^2
\]

25 min

4

**PbY6a, page 48, Q.2**

*If possible, T has the actual coins and notes mentioned in the question to pass round the class.*

First talk about holidays abroad and the different currencies encountered by Ps or T and how the exchange rate varies from day to day.

Let’s think about what the information in your *Pbs* really means.

**BB:** On **12.10.2000:** 1 GBP \( \approx \) 1.46 USD

\[
1 \text{ GBP} \approx 1.69 \text{ EUR}
\]

so 1 EUR \( \approx \) 0.87 USD

**On 12.08.2003:** 1 GBP \( \approx \) 1.60 USD

\[
1 \text{ GBP} \approx 1.42 \text{ EUR}
\]

so 1 EUR \( \approx \) 1.13 USD

T elicits what the dates are (12th October 2000 and 12 August 2003) and makes sure that Ps understand which currency is meant by GBP, EUR, etc.

Deal with one part at a time. T chooses a P to read out the question and Ps come to BB to solve it (with T’s and other Ps’ help where necessary). Ps work in *Ex. Bks* at the same time.

If Ps have no ideas what to do, T gives hints or directs Ps thinking. T uses language associated with currency exchange.

---

**Lesson Plan 48**

**Notes**

Individual work, monitored, helped

Written on BB or SB or OHT

Responses shown in unison. [Both hands raised for a?] Reasoning, agreement, self-correction, praising

Extra praise for Ps who can reason logically, e.g.

a) a certain fraction of a quantity is the same as half the fraction of double the quantity.

b) \( 0.4 = \frac{4}{10}, \frac{4}{5} = \frac{8}{10} \).

and \( \frac{4}{10} < \frac{8}{10} \)

c) 2 and a half times a greater quantity is more than 2 times a smaller quantity.

Whole class activity

(or individual work after initial whole class discussion to clarify the context)

Rates written on BB or SB or OHT

Discussion, reasoning, agreement, praising
Activity

4

(Continued)

Solution:

a) What changes do you notice in the value of:

i) the £ against the $ (£ is worth more $ in 2003)

T: We say that in August 2003, the £ was stronger against the Dollar than it was in October 2000.

ii) the £ against the Euro (£ is worth fewer Euros in 2003)

T: We say that in August 2003, the £ was weaker against the Euro than it was in October 2000.

iii) the Euro against the $? (Euro is worth more $ in 2003)

T: We say that in August 2003, the Euro was stronger against the Dollar than it was in October 2000.

b) How many Dollars and how many Euros were the equivalent of £1500 on each of these two dates?

BB: On 12.10.2000:

£1500 = 1.46$ × 1500 = 2190 $

= 1.69€ × 1500 = 2353 €

BB: On 12.08.2003:

1 GBP = 443 HUF
1 USD = 303 HUF
1 EUR = 263 HUF

c) To which of the 3 currencies was the Hungarian Forint most closely linked?

Ps could show currency on scrap paper or slates on command. Ps with different responses explain reasoning. Class agrees on correct answer.

(The HUF was most closely linked to the Euro, as its value against the Euro showed the least change from 2000 to 2003 compared with other currencies.)

d) How many Hungarian Forints were equivalent to £1500, 1500 $ and 1500 € on each of these two dates?

T draws a table on BB as dictated by Ps. Ps come to BB to do the calculations and fill in the table. Class agrees/disagrees.

BB:

<table>
<thead>
<tr>
<th></th>
<th>£1500 HUF</th>
<th>1500 $ HUF</th>
<th>1500 € HUF</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.10.2000</td>
<td>664 500</td>
<td>454 500</td>
<td>394 500</td>
</tr>
<tr>
<td>12.08.2003</td>
<td>550 500</td>
<td>342 000</td>
<td>388 500</td>
</tr>
</tbody>
</table>

35 min
Lesson Plan 48

Notes

Individual work, monitored, helped
T asks Ps in class if they have any gold jewellery and if they know how many carats it is. (T might have some jewellery to show to class.)
Agree that the higher the carat, the more pure gold there is, so the more expensive it is.
Differentiation by time limit
Responses shown in unison.
Reasoning, agreement, self-correction, praising

Y6

Activity

5 PbY6a, page 48
Q.3 Read: The quality of gold and jewels is measured in carats.
   The carat for gold is different from the carat for diamonds.
The purity of gold is measured in 24ths. For example, a 1-carat gold ring means that one 24th of its mass is pure gold.

   a) How much pure gold is in an 8-carat gold ring which weighs 2 and 2 thirds grams?
   b) How much pure gold is in a 14-carat gold necklace which weighs 4.5 g?

Set a time limit of 3 minutes. Review with whole class. Ps could show results on scrap paper or slates in unison. Ps answering correctly explain at BB to Ps who were wrong. Mistakes discussed and corrected. T chooses a P to say each answer in a sentence.

Solution:

a) Plan: \[
\frac{8}{24} \times \frac{2}{3} \times \frac{1}{3} \times \frac{8}{3} \times \frac{1}{3} = \frac{8}{9} \text{ g}
\]
   Answer: There is 8 ninths of a gram of pure gold in an 8-carat gold ring which weighs 2 and 2 thirds grams.

b) Plan: \[
\frac{14}{24} \times \frac{7}{12} \times \frac{4.5}{7} \times \frac{12}{7} \times 7 = \frac{2.625}{8} \text{ g}
\]
   Answer: There is 2.625 grams of pure gold in a 14-carat gold necklace which weighs 4.5 g.

6 PbY6a, page 48
Q.4 a) Read: What is your mass: i) in grams ii) in tonnes? (Answer to the nearest kg.)
   T has several bathroom scales available for Ps who do not know their mass. Make sure that all Ps have a value in kg before they convert it to grams and tonnes.
   (e.g. 45 kg = 45 000 g = 0.045 tonnes)

b) Read: The weight of any object on the moon would be 1 sixth lighter than it is here on Earth. What would the mass of a 1 kg loaf of bread be on the moon?
   Show me . . . now! (1 kg)
   Elicit that the mass of an object does not change, but weight involves the force of gravity, which is greater on the Earth (10 N) than on the Moon (1.6 N).

c) Read: A plane took off at 8.45 am in Budapest and landed at 12.35 pm in New York. If New York time is 6 hours earlier than Budapest time, how long was the flight?
   Show me . . . now! (9 h 50 min)
   (12h 35 min – 8 h 45 min) + 6 h = 3 h 50 min + 6 h
   = 9 h 50 min)
   Elicit that flying time would be longer on the return flight, as the flight would be in the same direction as the Earth turns.

40 min

45 min
<table>
<thead>
<tr>
<th>Activity 1</th>
<th>Factorisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factorise these numbers in your exercise book and list their positive factors. T sets a time limit of 6 minutes. Review with whole class. Ps come to BB or dictate to T, explaining reasoning. Class agrees/disagrees. Mistakes discussed and corrected. Elicit that:</td>
<td></td>
</tr>
<tr>
<td>• $49 = 7 \times 7 = 7^2$ (square number) Factors: 1, 7, 49</td>
<td></td>
</tr>
<tr>
<td>• $224 = 2 \times 2 \times 2 \times 2 \times 2 \times 7 = 2^5 \times 7$ Factors: 1, 2, 4, 7, 8, 14, 6, 28, 32, 56, 112, 224</td>
<td></td>
</tr>
<tr>
<td>• $399 = 3 \times 7 \times 19$ Factors: 1, 3, 7, 19, 21, 57, 133, 399</td>
<td></td>
</tr>
<tr>
<td>• $1049$ is a prime number Factors: 1, 1049 (as not exactly divisible by 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, and 37 $\times 37 &gt; 1049$)</td>
<td></td>
</tr>
</tbody>
</table>

**8 min**

<table>
<thead>
<tr>
<th>Activity 2</th>
<th>Perimeter and area of a cuboid</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Draw around the faces of each of your cuboids, turning the cuboid over until you have drawn all 6 faces to form a net. Use a different sheet for each net. Measure the sides of the nets and note the lengths on your diagram. e.g. 1) $2 \text{ cm} \times 2.5 \text{ cm} \times 3 \text{ cm}$ 2) $2 \text{ cm} \times 2 \text{ cm} \times 4 \text{ cm}$ 3) $3 \text{ cm} \times 3 \text{ cm} \times 3 \text{ cm}$ T monitors closely and helps or corrects as necessary. T chooses Ps to show their nets on BB, or T has some already prepared. Ps compare their own net shapes with those on BB. e.g. for 1):</td>
<td></td>
</tr>
<tr>
<td>BB:</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>2.5</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>2.5</td>
<td>or</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>(etc. for the same cuboid)</td>
<td></td>
</tr>
<tr>
<td>b) Let's calculate the perimeter of the nets. Deal with one cuboid at a time. Ps come to BB or dictate to T for the nets on BB. Class agrees or disagrees. Ps calculate perimeter of own nets too. e.g. LHS above: $P = (8 \times 2 + 4 \times 2.5 + 2 \times 3) \text{ cm} = 32 \text{ cm}$ RHS above: $P = (8 \times 2.5 + 4 \times 2 + 2 \times 3) \text{ cm} = 34 \text{ cm}$ Who has drawn a net with a different perimeter? Deal with all cases. (max: 38 cm, min: 32 cm) Similarly for the square-based cuboid (min $P$: 32 cm, max $P$: 44 cm) and the cube ($P = 42 \text{ cm}$)</td>
<td></td>
</tr>
<tr>
<td>c) Let's calculate the area of the nets. Deal in a similar way to b) but this time agree that only one value per cuboid is possible. $A_1 = 2 \times (2 \times 2.5 + 2 \times 3 + 2.5 \times 3) \text{ cm}^2 = 2 \times 18.5 \text{ cm}^2 = 37 \text{ cm}^2$ $A_2 = 2 \times (2 \times 2) \text{ cm}^2 + 4 \times (2 \times 4) \text{ cm}^2 = (8 + 32) \text{ cm}^2 = 40 \text{ cm}^2$ $A_3 = 6 \times (3 \times 3) \text{ cm}^2 = 6 \times 9 \text{ cm}^2 = 54 \text{ cm}^2$ Elicit that the area of the nets is the same as the surface area of the matching cuboid, so it is impossible to have different values.</td>
<td></td>
</tr>
</tbody>
</table>

**18 min**

**Lesson Plan**

**Week 10**

**Notes**

Individual work, monitored (or whole class activity) BB: 49, 224, 399, 1049 Calculators allowed. Reasoning, agreement, self-correction, praising e.g.

| 224 | 112 | 399 | 128 |
| 2 | 2 | 3 | 2 |
| 112 | 2 | 133 | 7 |
| 28 | 2 | 19 | 19 |
| 14 | 2 | 1 | |
| 7 | 7 | 1 |

Whole class activity but individual drawing Ps have 3 different cuboids (wood or plastic or made from card, e.g. of the sizes given opposite) and 3 sheets of plain paper on desks.

T could have various nets prepared on SB or OHP for each type of cuboid to save time.

Discussion, reasoning, agreement, praising Ps with different perimeters lengths from those on BB show their nets and calculations to class. Agree that the cube has only one possible value for its perimeter as all sides are equal.

Ps again come to BB or dictate to T, referring to diagrams on BB. Ps calculate areas of own nets too. Agreement, praising
**Activity**

3. **Area of an irregular shape**

Let’s measure part of the floor of the classroom and draw a sketch for it. T chooses an irregular shape (e.g. around cupboards) and organises groups of Ps to do the measuring, drawing and recording (with T’s help). T (Ps) draw a sketch (i.e. a diagram not to scale) on BB. Rest of Ps draw own sketches in Ex. Bks too. e.g.

BB:

<table>
<thead>
<tr>
<th>cupboard</th>
<th>1.5 m</th>
<th>4.5 m</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 m</td>
<td>1 m</td>
<td></td>
</tr>
<tr>
<td>table</td>
<td></td>
<td>7 m</td>
</tr>
</tbody>
</table>

Let’s calculate the perimeter and area of the shaded part. (T suggests dividing the shape into rectangles if no P has an idea how to calculate the area.)

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

Ps write calculations in Ex. Bks. too. e.g.

\[
P = 6 m + 2 m + 1 m + 2.5 m + 5 m + 1.5 m + 2 m + 3 m = 23 m,
\]

or

\[
P = 2 \times (7 + 4.5) m = 2 \times 11.5 m = 23 m\text{ (see opposite)}
\]

\[
A = (2 \times 3) m^2 + (4 \times 4.5) m^2 + (1 \times 2.5) m^2 = (6 + 18 + 2.5) m^2 = 26.5 m^2
\]

or

\[
A = (7 \times 4.5) m^2 - [(2 \times 1.5) m^2 + (2 \times 1) m^2] = (31.5 - 5) m^2 = 26.5 m^2
\]

4. **PbY6a, page 49**

Q.1 Read: *This is the plan of a house and its garden.*

Talk about the plan first and elicit what the scale 1 : 400 means, including what unit of measure is most appropriate to use.

(Elicit that every 1 cm on the plan represents 400 cm in real life.)

a) Read: *Measure on the plan, then calculate the real lengths and widths of:*

i) the house ii) the garage iii) the vegetable plot iv) the whole garden.

Set a time limit. Ps measure with rulers (or compasses and rulers) and write values on plan. Review quickly. Ps re-measure inaccurate measurements.

BB:

Then Ps do calculations in Ex. Bks. Review with whole class. Ps show real lengths on scrap paper or slates on command. Ps answering correctly explain at BB to Ps who were wrong. Mistakes discussed and corrected.

**Notes**

Whole class activity

*T has tape measures available.*

(or Ps can choose it)

Discussion, reasoning, agreement, praising

At a good pace

Extra praise if a P thinks of this without help

Individual work, monitored

Helped

Drawn on BB or use enlarged copy master or OHP

(for reference only)

Agreement, self-correction, praising

Solution:

a) i) house: 16 m by 10 m

ii) garage: 8 m by 4 m

iii) veg. plot: 18 m by 12 m

iv) whole garden: 28 m by 48 m
Activity

4

(Continued)

b) Read: Calculate:
   i) the perimeter of the vegetable plot
   ii) the area of the garden.

Set a time limit. Ps calculate in Ex. Bks and write the answers in sentences.

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

Solution:
   i) \[ P = 2 \times (18 \text{ m} + 12 \text{ m}) = 2 \times 30 \text{ m} = 60 \text{ m} \]

   Answer: The perimeter of the vegetable plot is 60 m.

   ii) \[ A = 28 \text{ m} \times 48 \text{ m} = 1344 \text{ m}^2 \]

   (Also accept area without house and garage:
   \[ 1344 \text{ m}^2 - (160 \text{ m}^2 + 32 \text{ m}^2) = 1344 \text{ m}^2 - 192 \text{ m}^2 \]
   \[ = 1152 \text{ m}^2 \]

   Answer: The area of the garden is 1344 m²,
   (or 1152 m² excluding the house and garage).

Extension

Ps think of other questions to ask about the plan.

32 min

5

PbY6a, page 49

Q.2 Read: These are diagrams of a living cell and a longitudinal section of a bacterium.

Measure the lengths and widths on the diagrams, then calculate their sizes in real life.

What do you think the diagram in a) could be?

Set a time limit. Ps measure with rulers, or compasses and rulers, then write real sizes in Ex. Bks.

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

What do you think a) could be? (an egg)

Solution:

b) In real life:

   \[ \text{Length} = 5 \text{ cm} \div 500 = 5 \text{ mm} \div 50 = 0.5 \text{ mm} \div 5 = 0.1 \text{ mm} \]

   \[ \text{Width} = 1.5 \text{ cm} \div 500 = 1.5 \text{ mm} \div 50 = 0.15 \text{ mm} \div 5 = 0.03 \text{ mm} \]

37 min

Notes

Responses shown in unison
Discussion, agreement, self-correcting, praising

Extra praise if Ps thought of this.
Extra praise for creativity!

Individual work, monitored, helped
Use enlarged copy master or OHP for reference only.

Initial discussion on what is meant by a living cell (the smallest unit which can live independently and which has a nucleus) and a bacterium (an organism which can cause disease but can only be seen under a microscope)

If possible, T has a hard-boiled egg (the yolk is the nucleus of the cell), a microscope and a longitudinal section prepared on a slide for Ps to look at. (Colleagues in the science department at the local high school might help.)

Results shown in unison.
Reasoning, agreement, self-correcting, praising
Extra praise to Ps who realised that the ‘living cell’ is an egg!
**Activity 6**

*PbY6a, page 49*

**Q.3** Read: *Measure the sides of each shape, then calculate its perimeter and area.*

Set a time limit. Ps measure with rulers, or rulers and compasses, and write the lengths on diagrams. Ps then do calculations in *Ex. Bks.* and write results in *Pbs.*

Review with whole class. Ps show perimeters and areas on scrap paper or slates on command. Ps answering correctly explain at BB to Ps who were wrong. Mistakes discussed and corrected.

**Solution:**

a)  
\[
\begin{array}{c}
1 \text{ cm} \\
1 \text{ cm} \\
\hline
1 \text{ cm}
\end{array}
\]

\[
P = 16 \text{ cm} \\
A = 8 \text{ cm}^2
\]

b)  
\[
\begin{array}{c}
1.5 \text{ cm} \\
1 \text{ cm} \\
\hline
1 \text{ cm}
\end{array}
\]

\[
P = 6 \times 1.5 \text{ cm} + 8 \text{ cm} = 17 \text{ cm} \\
A = 3 \times (2 \times 1.5) \text{ cm}^2 = 9 \text{ cm}^2
\]

or \( A = 2 \times 4.5 \text{ cm}^2 = 9 \text{ cm}^2 \) since:

**Problems**

T reads the problem. Ps note the data and calculate in *Ex. Bks.* then show results on scrap paper or slates on command. Ps answering correctly explain at BB to Ps who were wrong.

a) *The area of a rectangle is 4.2 cm\(^2\). If one of its sides is 2 cm long, what length is the adjacent side?*

BB: \( 4 \frac{2}{3} \text{ cm}^2 \div 2 \text{ cm} = 2 \frac{1}{3} \text{ cm} \)

*Answer:* The adjacent side is 2 and 1 third cm long.

b) *The area of a square is 1.44 cm\(^2\). What is the length of each side?*

\[ a \times a = 1.44 \text{ cm}^2 = 144 \text{ mm}^2; \]

But 144 mm\(^2\) = 12 mm \times 12 mm, so \( a = 12 \text{ mm} \) (= 1.2 cm)
**Y6**

**Activity**

Factorising 50, 225, 400 and 1050. Revision, activities, consolidation

*PbY6a, page 50*

**Solutions:**

<table>
<thead>
<tr>
<th>Q.1</th>
<th>3.4 hours</th>
<th>171 days</th>
<th>34045 g</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3 h 24 min</td>
<td>3420 cm</td>
<td>1715000 g</td>
</tr>
<tr>
<td></td>
<td>3.42 litres</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>£340.45</td>
<td>34.2 cl</td>
<td></td>
</tr>
<tr>
<td></td>
<td>34 1/200 p.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>34.045 kg</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Q.2</th>
<th>a) 6 h 53 min 10 sec</th>
<th>b) 12 h 23 min 65 sec</th>
<th>c) 15 h 97 min 29 sec</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>+ 8 h 19 min 55 sec</td>
<td>= 4 h 23 min 17 sec</td>
<td>= 14 h 51 min 6 sec</td>
</tr>
<tr>
<td></td>
<td>15 h 13 min 5 sec</td>
<td>8 h 0 min 48 sec</td>
<td>1 h 46 min 23 sec</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Q.3</th>
<th>a) The Earth takes 24 hours to turn by 360° around its axis. So the Earth turns each hour and takes 4 min to turn 1°.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>b) i) When it is 8.00 am GMT, it is: 3.00 am in New York, 6.00 pm in Sydney, 4.00 pm in Beijing, 11.00 am in Moscow, 8.00 am in London</td>
</tr>
<tr>
<td></td>
<td>ii) When it is 13:30 in Budapest, it is: 12:30 in London, 20:30 in Beijing, 04:30 in San Francisco, 09:30 in Rio de Janeiro</td>
</tr>
<tr>
<td></td>
<td>c) 11 hours + 11 hours – 8 hours = 14 hours It was 14:00 (or 2.00 pm) in San Francisco when the plane landed.</td>
</tr>
<tr>
<td></td>
<td>From 10.00 pm on Sunday to 4.00 am on Monday: 6 hours As Moscow time is 3 hours ahead of London time, actual flying time is 3 hours.</td>
</tr>
<tr>
<td></td>
<td>12 hours – 9.5 hours = 2.5 hours (London time) As Beijing time is 8 hours ahead of London time, the plane took off when it was 10:30 am in Beijing.</td>
</tr>
</tbody>
</table>

---

**Notes**

**50**

Factors: 1, 2, 5, 10, 25, 50

**225** = \(3^2 \times 5^2\) (= 15²)

(square number)

Factors: 1, 3, 5, 9, 15, 25, 45, 75, 225

**400** = \(2^4 \times 5^2\) (= 20²)

(square number)

Factors: 1, 2, 4, 5, 8, 10, 16, 20, 25, 40, 50, 80, 100, 200, 400

**1050** = \(2 \times 3 \times 5^2 \times 7\)

Factors: 1, 2, 3, 5, 6, 7, 10, 14, 15, 21, 25, 30, 35, 42, 50, 70, 75, 105, 150, 175, 210, 350, 525, 1050

(or set factorising as homework at the end of Lesson 49 and review at the start of Lesson 50)