Bk5

R: Mental calculations

C: Hundredths and percentage. Multiplication of fractions by natural numbers

E: Ratio and percentage

Lesson Plan
89

Activity

1

Hundredths and percentage

Ps each have a 10 cm by 10 cm square grid on desks and T has larger version for demonstration. T asks some questions about the square and writes Ps' answers on BB.

What length are the edges of the square? Ps measure with rulers. (10 cm)

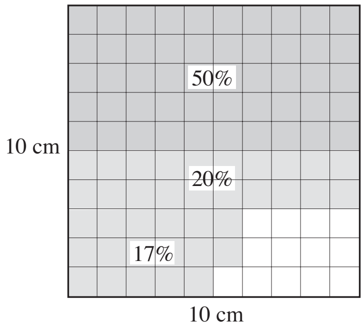
What is the area of the square? ($A = 10\text{ cm} \times 10\text{ cm} = 100\text{ cm}^2$)

What is the area of 1 grid square? (1 cm^2)

If we think of the area of the large 10 cm square as 1 unit, what part of the unit is the area of each grid square? (1 hundredth)

BB:

[Percentages added later – see below]



a) Colour *blue* 1 half of the area of your large square.
   How many grid squares have you coloured *blue*? (50)
   What area have you coloured *blue*? (50 cm^2)
   How many hundredths have you coloured *blue*? (50 hundredths)
   T writes an equation to show the equivalent fractions. (BB)

b) Colour *red* 1 fifth of the area of your large square.
   How many grid squares have you coloured *red*? (20)
   What area have you coloured *red*? (20 cm^2)
   How many hundredths did you colour *red*? (20 hundredths) Who can write an equation to show the equivalent fractions? (BB)

c) Colour *green* an area of 17 cm^2.
   How many grid squares have you coloured *green*? (17)
   How many hundredths did you colour *green*? (17 hundredths) Who can write it as a fraction? (BB)

d) What part of the large square have you coloured altogether?
   What operation should we write? (addition) P comes to BB or dictates to T. Agree that 100 should be the common denominator. What area have you coloured altogether? ($A = 87\text{ cm}^2$)
   What part of the square is not coloured? (BB) *[$A = 13\text{ cm}^2$]*

T: We also call 1 hundredth one percent and write it like this. (BB)

Who can write the coloured parts of the square as percentages?

Ps come to BB to write percentages on diagram (as above). Class points out errors.

What percentage is the area of the whole unit square? (100%)

T: 'Per cent' means 'out of 100', so when we talk about percent we mean that the whole unit has been divided into 100 equal parts, so each part is 1 hundredth or 1 out of 100 or 1 percent.'

10 min

Notes

Whole class activity but individual colouring

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

Ps should have accurate 10 cm squares on desks (or use copy master)

Discussion, agreement, praising

BB: $A = 100\text{ cm}^2 = 1$ unit

Area of grid square $= 1\text{ cm}^2$

$1\text{ cm}^2 = \dfrac{1}{100}$ of 1 unit

Ps shout out in unison or T chooses Ps at random.

BB: $\dfrac{1}{2} = \dfrac{50}{100}$

$\dfrac{1}{5} = \dfrac{20}{100}$

BB: $\dfrac{17}{100}$

BB: Part coloured:

$$\frac{50}{100} + \frac{20}{100} + \frac{17}{100} = \frac{87}{100}$$

BB: Part not coloured:

$$\frac{100}{100} - \frac{87}{100} = \frac{13}{100}$$

BB: 1 percent: 1%

$$\frac{1}{100} \rightarrow 1\%$$

$$1 \text{ unit} = \frac{100}{100} \rightarrow 100\%$$

Bk5

Lesson Plan 89

Activity

2

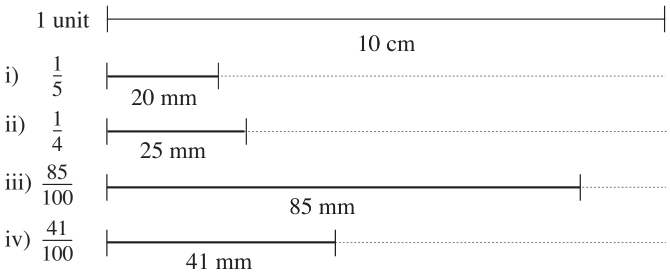
Book 5, page 89

Q.1 a) Read: *Use a ruler to draw the required parts of this 10 cm line.*

Deal with one part at a time or set a time limit. Elicit that BB: 10 cm = 100 mm. Ps calculate lengths, measure, draw and write lengths below line segments.

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

Solution:



b) Read: E*xpress the fractions in hundredths and percentages*.

Ps come to BB to fill in boxes, explaining reasoning, with T's help in converting the fifth and quarter to hundredths. Ps work in *Pbs* too. Elicit that the number of hundredths (i.e. the number of mm) is the same as the percentage.

Solution:

i) $\frac{1}{5} = \frac{20}{100} \rightarrow \underline{20\%}$ ii) $\frac{1}{4} = \frac{25}{100} \rightarrow \underline{25\%}$

iii) $\frac{85}{100} \rightarrow \underline{85\%}$ iv) $\frac{41}{100} \rightarrow \underline{41\%}$

Notes

Individual work, monitored, helped, corrected

Drawn on BB or use enlarged copy master (demonstration only)

Agreement, self-correction, praising

(or T has solution already prepared and uncovers each line segment as it is dealt with)

BB: 10 cm = 100 mm

i) 100 mm ÷ 5 = <u>20 mm</u>

ii) 100 mm ÷ 4 = <u>25 mm</u>

iii) 85 hundredths: <u>85 mm</u>

iv) 41 hundredths: <u>41 mm</u>

Whole class activity

(or individual trial first if Ps wish)

Reasoning, agreement, praising

T: To change a fraction to a percentage, we first <u>expand</u> it to hundredths.

Extension

Let's write additions and subtractions using these fractions. Ps come to BB or dictate to T, explaining reasoning. Class points out errors. What is the result as a percentage?

BB: e.g.

$$\frac{1}{5} + \frac{1}{4} = \frac{4+5}{20} = \frac{9}{20} = \frac{45}{100} \rightarrow 45\%$$

$$\frac{85}{100} - \frac{1}{4} = \frac{85-25}{100} = \frac{60}{100} \rightarrow 60\% \quad (= \frac{3}{5}) \quad \text{etc.}$$

Whole class activity

At a good pace

Involve several Ps.

Reasoning, agreement, praising

16 min

3

Problem

Listen carefully, do the calculation in your *Ex. Bks* and show me the answer when I say.

a) T*here are 100 pupils in Year 5 and 27 of them wear glasses. What percentage of pupils in Y5 do* <u>*not*</u> *wear glasses?*

Show me the answer . . . now! (73%)

P answering correctly explains at BB to Ps who were wrong. Mistakes discussed and corrected.

$$\text{BB: } 1 - \frac{27}{100} = \frac{100}{100} - \frac{27}{100} = \frac{73}{100} \rightarrow 73\%$$

Whole class activity but individual calculation

T repeats slowly to give Ps time to think.

In unison on slates or scrap paper

Reasoning, agreement, praising

Activity ***Notes***

3

(Continued)

b) *If the names of all the pupils were put into a bag and one name was taken out at random, which outcome has more chance of happening:*

1) the pupil wears glasses; or 2) the pupil does not wear glasses?

Show me . . . now! (2)

P answering correctly explains to Ps who were wrong. T helps with wording if necessary.

Probability of the outcome:

1) the P wears glasses: 27 out of 100 or $\frac{27}{100}$ (or 27%)

2) the P does <u>not</u> wear glasses: 73 out of 100 or $\frac{73}{100}$ (or 73%)

T: We say that outcome 1) has a probability of 27% and outcome 2) has a probability of 73%.

20 min

T repeats slowly to give Ps time to think.

In unison

Reasoning, agreement, praising

Elicit that if an outcome is:

- <u>certain</u> to happen, its probability is 1 → 100%;
- <u>impossible</u>, its probability is 0 → 0%.

4

Multiplication of fractions

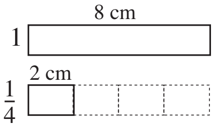
a) Here is an 8 cm strip and here is a 2 cm strip.

How many times is 2 cm contained in 8 cm? (4 times)

If we think of 8 cm as 1 unit, what part of the unit is 2 cm? $\left(\frac{1}{4}\right)$

So how many times is 1 quarter contained in 1? (4 times)

BB:

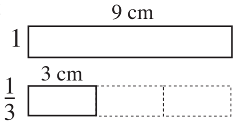


b) Here is an 9 cm strip and here is a 3 cm strip.

How many times is 3 cm contained in 9 cm? (3 times)

If we think of 9 cm as 1 unit, what fraction of the unit is:

BB:



i) a 3cm strip $\left(\frac{1}{3}\right)$ ii) two 3 cm strips $\left(\frac{2}{3}\right)$

iii) three 3 cm strips $\left(\frac{3}{3} = 1\right)$ iv) five 3 cm strips? $\left(\frac{5}{3} = 1\frac{2}{3}\right)$

c) Let's write these additions as multiplications.

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

i) $\frac{1}{4} + \frac{1}{4} = \frac{1}{4} \times 2 = \frac{2}{4}$ $\left(= \frac{1}{2}\right)$, $\frac{1}{4} + \frac{1}{4} + \frac{1}{4} = \frac{1}{4} \times 3 = \frac{3}{4}$,

$\frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} = \frac{1}{4} \times 4 = \frac{4}{4} = 1$, etc.

ii) $\frac{1}{3} + \frac{1}{3} = \frac{1}{3} \times 2 = \frac{2}{3}$, $\frac{1}{3} + \frac{1}{3} + \frac{1}{3} = \frac{1}{3} \times 3 = \frac{3}{3} = 1$

$\frac{1}{3} + \frac{1}{3} + \frac{1}{3} + \frac{1}{3} = \frac{1}{3} \times 4 = \frac{4}{3} = 1\frac{1}{3}$, etc.

iii) $\frac{2}{9} + \frac{2}{9} = \frac{2}{9} \times 2 = \frac{4}{9}$, $\frac{2}{9} + \frac{2}{9} + \frac{2}{9} = \frac{2}{9} \times 3 = \frac{6}{9} = \frac{2}{3}$

26 min

Whole class activity

Strips stuck on BB (or use Cuisennaire rods or multilink cubes)

T writes $\frac{1}{4}$ beside 2 cm strip on BB.

Agreement, praising

Ps dictate fractions to T who writes on BB.

Written on BB or SB or OHT

At a good pace

Agreement, praising

Rest of Ps write operations in *Ex. Bks*. at the same time.

Let's see if you can calculate the multiplication <u>without</u> writing the addition?

BB: $\frac{2}{9} \times 4 = \left(\frac{8}{9}\right)$

$\frac{2}{9} \times 5 = \left(\frac{10}{9} = 1\frac{1}{9}\right)$

Bk5

Lesson Plan 89

Activity		***Notes***

5

Book 5, page 89

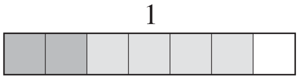
Q.2 Read: *Use the diagrams to help you do the calculations.*

Set a time limit. Ps colour the fractions on the grids first, then do the mulitplications (with or without writing the matching additions).

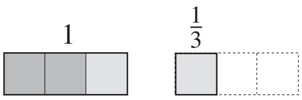
Review with whole class. Ps come to BB to colour diagrams and complete the multiplications, explaining reasoning. Class agrees/ disagrees. If problems or disagreement, write as an addition.

Solution:

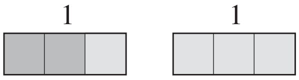
a) $\frac{2}{7} \times 3 = \frac{6}{7}$



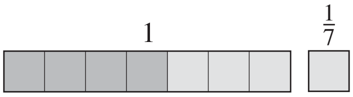
b) $\frac{2}{3} \times 2 = \frac{4}{3} = 1\frac{1}{3}$



c) $\frac{2}{3} \times 3 = \frac{6}{3} = 2$



d) $\frac{4}{7} \times 2 = \frac{8}{7} = 1\frac{1}{7}$



31 min

Individual work, monitored, helped

Grids drawn on BB or SB or OHT

Ps colour each fraction in a different colour (as in diagrams).

Discussion, reasoning, agreement, self-correction, praising

Extra praise for Ps who realised that they needed to draw another grid square in part d).

Feedback for T

6

Book 5, page 89

Q.3 Read: *In your exercise book, write each sum as a multiplication, then do the calculation.*

Set a time limit. Ps can draw digrams to help them.

Review with whole class. Ps come to BB or dictate to T, saying the whole equation. Class agrees/disagrees. T helps Ps to draw diagrams on BB as a check. Mistakes discussed and corrected.

Solution:

a) $\frac{1}{2} + \frac{1}{2} + \frac{1}{2} = \frac{1}{2} \times 3 = \frac{3}{2} = 1\frac{1}{2}$

b) $\frac{2}{7} + \frac{2}{7} + \frac{2}{7} + \frac{2}{7} + \frac{2}{7} = \frac{2}{7} \times 5 = \frac{10}{7} = 1\frac{3}{7}$

c) $\frac{3}{8} + \frac{3}{8} + \frac{3}{8} + \frac{3}{8} + \frac{3}{8} + \frac{3}{8} = \frac{3}{8} \times 6 = \frac{18}{8} = \frac{9}{4} = 2\frac{1}{4}$

d) $\left(-\frac{1}{3}\right) + \left(-\frac{1}{3}\right) = -\frac{1}{3} \times 2 = -\frac{2}{3}$

35 min

Individual work, monitored, helped

Written on BB or SB or OHT

Differentiation by time limit

Reasoning, agreement, self-correction, praising

Elicit that if the numerator and denominator are divided by the same number, the value of the fraction does not change.

Feedback for T

Bk5

Lesson Plan 89

Activity

Notes

7

Book 5, page 89

Q.4 Read: *In your exercise book, write each multiplication as an addition, then do the calculation.*

Set a time limit. Review with whole class. Ps come to BB or dictate to T, saying the whole equation. Class agrees/disagrees or points out further simplification where possible. Mistakes discussed and corrected.

Solution:

a) $\frac{3}{4} \times 4 = \frac{3}{4} + \frac{3}{4} + \frac{3}{4} + \frac{3}{4} = \frac{12}{4} = 3$

b) $\frac{2}{3} \times 5 = \frac{2}{3} + \frac{2}{3} + \frac{2}{3} + \frac{2}{3} + \frac{2}{3} = \frac{10}{3} = 3\frac{1}{3}$

c) $\frac{4}{7} \times 6 = \frac{4}{7} + \frac{4}{7} + \frac{4}{7} + \frac{4}{7} + \frac{4}{7} + \frac{4}{7} = \frac{24}{7} = 3\frac{3}{7}$

d) $\frac{2}{9} \times 3 = \frac{2}{9} + \frac{2}{9} + \frac{2}{9} = \frac{6}{9} = \frac{2}{3}$

Individual work, monitored (helped)

Written on BB or SB or OHT

Reasoning, agreement, self-correction, praising

Show on diagrams or models or number line if problems or disagreement.

Feedback for T

e) $\frac{7}{6} \times 12 = \frac{7}{6} + \frac{7}{6} + \frac{7}{6}$

$+ \frac{7}{6} + \frac{7}{6} + \frac{7}{6} + \frac{7}{6} + \frac{7}{6} + \frac{7}{6}$

$+ \frac{7}{6} + \frac{7}{6} + \frac{7}{6} = \frac{84}{6} = \underline{14}$

40 min

8

Book 5, page 89, Q.5

Read: *In your exercise book, calculate the sums and differences in two different ways.*

Let's look crefully at part a). What do you notice? (Denominators are equal so only the numerators need to be dealt with.)

If the calculation was

BB: $(3 + 7) \times 2$

which two ways could we do it? Two Ps come to BB to show them.

BB: 1) $(3 + 7) \times 2 = 10 \times 2 = \underline{20}$

or 2) $(3 + 7) \times 2 = 3 \times 2 + 7 \times 2 = 6 + 14 = \underline{20}$

Agree that that both are correct.

Let's calculate the fractions in these two different ways.

Ps come to BB to or dictate what T should write (with T's help where needed). Class agrees/disagrees. Ps write the two ways in *Ex. Bks*.

Solution: e.g.

a) 1) $\left(\frac{3}{5} + \frac{7}{5}\right) \times 2 = \frac{10}{5} \times 2 = 2 \times 2 = \underline{4}$

2) $\left(\frac{3}{5} + \frac{7}{5}\right) \times 2 = \frac{3}{5} \times 2 + \frac{7}{5} \times 2 = \frac{6}{5} + \frac{14}{5} = \frac{20}{5} = \underline{4}$

b) 1) $\left(\frac{6}{7} - \frac{5}{3}\right) \times 3 = \frac{18 - 35}{21} \times 3 = -\frac{17}{21} \times 3 = -\frac{51}{21} = -\frac{17}{7}$

2) $\left(\frac{6}{7} - \frac{5}{3}\right) \times 3 = \frac{6}{7} \times 3 - \frac{5}{3} \times 3 = \frac{18}{7} - 5 = \frac{18 - 35}{7} = -\frac{17}{7}$

c) 1) $\left(\frac{1}{2} + \frac{7}{3}\right) \times 6 = \frac{3 + 14}{6} \times 6 = \frac{17}{\cancel{6}_1} \times \cancel{6}^1 = \frac{17}{1} = \underline{17}$

2) $\left(\frac{1}{2} + \frac{7}{3}\right) \times 6 = \frac{1}{2} \times 6 + \frac{7}{3} \times 6 = \frac{6}{2} + \frac{42}{3} = 3 + 14 = \underline{17}$

Whole class activity

Written on BB or SB or OHT

Discussion on what the different ways could be.

(operation in brackets first)

(multiplication done first)

Reasoning, agreement, praising

Accept any valid method.

T might show:

b) $-\frac{17}{\underset{7}{\cancel{21}}} \times \cancel{3}^1 = -\frac{17}{7}$

and ask if it is correct.

$= -\underline{2\frac{3}{7}}$

$= -\underline{2\frac{3}{7}}$

T shows how to cancel out the two sixes.

45 min

Bk5

R: Mental calculations

C: Multiplication and division of fractions by natural numbers

E: Noticing and formulating rules

Lesson Plan 90

Activity

Notes

1

Multiplication and division of fractions

a) Who can show $\frac{1}{4} \times 3$ on each of these diagrams?

Ps come to BB to colour appropriate number of parts and explain reasoning. Class agrees/disagrees. We can check by writing the multiplication as an addition. Ps dictate what T should write.

BB: $\frac{1}{4} + \frac{1}{4} + \frac{1}{4} = \frac{1}{4} \times 3 = \boxed{\frac{3}{4}}$

b) If this is 1 unit (T points), who can change the diagram to show 5 halves? Who can show $\frac{5}{2} \times 3$?

P comes to BB to amend diagram, with T's help, explaining reasoning. Class agrees or disagrees. Let's write an addition and a multiplication about it. Ps come to BB or dictate what T should write.

BB: $\frac{5}{2} + \frac{5}{2} + \frac{5}{2} = \frac{5}{2} \times 3 = \boxed{\frac{15}{2}}$ $(= 7\frac{1}{2})$

What method have we been using to multiply a fraction by a natural number? Ps explain in own words and T says it more clearly if needed.

- *We multiply the numerator by the natural number and do not change the denominator.*

c) Let's write this addition in a shorter way. Ps come to BB or dictate to T, explaining reasoning. Class agrees/disagrees.

BB: $\frac{5}{8} + \frac{5}{8} + \frac{5}{8} + \frac{5}{8} = [\ \frac{5}{8} \times 4 = \frac{20}{8} = \boxed{\frac{5}{2}}\ (= 2\frac{1}{2})\ ]$

Who can show it in this diagram? Ps come to BB to shade each '5 eighths' in a different colour.. T explains the result being a different denominator in another way, referring to the diagram

BB: $\frac{1}{2} = 4 \times \frac{1}{8}$, so $\frac{5}{2} = 4 \times \frac{5}{8}$

What other way have we used to multiply a fraction by a natural number? Ps explain in own words and T repeats more clearly .

- *We divide the denominator by the natural number and do not change the numerator.*

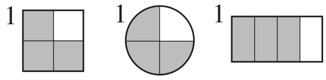
What is necessary before we can use this method? (The denominator must be exactly divisible by the natural number.)

Notes:

Whole class activity

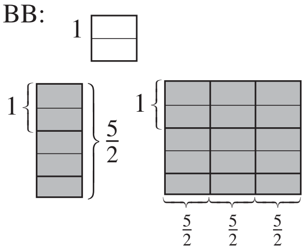
Drawn on BB or SB or OHT.

BB:



Ps write calculation in *Ex. Bks*.

BB:



Ps write calculation in *Ex. Bks*.

Agreeement, praising

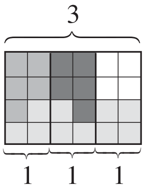
Class repeats in unison.

Reasoning, agreement, praising

Ps write calculation in Ex. *Bks*.

Rectangle already drawn on BB or SB or OHT:

BB:



$\frac{5}{2} = 2\frac{1}{2}$ is coloured

Class repeats it in unison.

Extra praise if a P thinks of this.

6 min

2

Book 5, page 90

Q.1 Read: *Calculate the products, reducing them to their simplest form where relevant.*

Set a time limit. Encourage Ps to check each multiplication with an addition (mentally or in *Ex. Bks*. or on scrap paper).

Review with whole class. Ps come to BB or dictate to T, explaining reasoning with addition or using one of the 'rules'. Class agrees/disagrees. Mistakes discussed and corrected.

T shows how the denominator and multiplier can be reduced first (by dividing by a common factor) to make the calculation easier instead of simplifying at the end.

Notes:

Individual work, monitored, helped

Written on BB or SB or OHT

Discussion, reasoning (pointing out the method used), agreement, self-correction, praising

Draw diagrams if problems or disagreement.

Ps write this form in *Ex.Bks*.

Bk5

Lesson Plan 90

Activity

Notes

2

(Continued)

Solution:

a) $\frac{4}{5} \times 2 = \frac{8}{5} = 1\frac{3}{5}$

b) $\frac{3}{8} \times 4 = \frac{12}{8} = \frac{3}{2} = 1\frac{1}{2}$

or $\frac{3}{8} \times 4 = \frac{3}{2} = 1\frac{1}{2}$

T shows $\frac{3}{\cancel{8}_2} \times \cancel{4}^1 = \frac{3}{2} = 1\frac{1}{2}$

c) $\frac{3}{4} \times 8 = \frac{24}{4} = 6$; T shows: $\frac{3}{\cancel{4}_1} \times \cancel{8}^2 = \frac{6}{1} = 6$

d) $\frac{5}{12} \times 8 = \frac{40}{12} = \frac{10}{3} = 3\frac{1}{3}$; or T: $\frac{5}{\cancel{12}_3} \times \cancel{8}^2 = \frac{10}{3} = 3\frac{1}{3}$

e) $\frac{5}{8} \times 12 = \frac{60}{8} = \frac{15}{2} = 7\frac{1}{2}$; or T: $\frac{5}{\cancel{8}_2} \times \cancel{12}^3 = \frac{15}{2} = 7\frac{1}{2}$

f) $\frac{5}{11} \times 0 = 0$ (As <u>any</u> number multiplied by zero is zero.)

Accept any valid method.

(Multiplying the numerator by the natural number.)

(Dividing the denominator by the natural number)

(Dividing the denominator and the natural number by a common factor.)

T points out that this last method is used when the denominator is not exactly divisible by the natural number but they have factors in common.

Ps say which method thy like best.

12 min

3

Solving equations

Let's find the numbers which can be written instead of the letters to make the equation is true.

Ps come to BB or dictate to T, explaining reasoning by showing that their result is correct by substitution. Class agrees/disagrees.

BB:

a) $\frac{2}{7} \times a = \frac{10}{7}$; $a = \underline{5}$, as $\frac{2}{7} \times \underline{5} = \frac{10}{7}$

b) $\frac{3}{5} \times b = 3 \ (= \frac{15}{5})$; $b = \underline{5}$, as $\frac{3}{5} \times \underline{5} = \frac{15}{5} = 3$

c) $c \times 4 = \frac{12}{17}$; $c = \frac{3}{17}$, as $\frac{3}{17} \times 4 = \frac{12}{17}$

Whole class activity

At a good pace

Reasoning, agreeement, praising

Accept trial and error too: e.g

a) $\frac{2}{7} \times a = \frac{10}{7}$

If $a = 4$, $\frac{2}{7} \times 4 = \frac{8}{7} < \frac{10}{7}$

so 4 is too small, etc.

Have no expectations yet about Ps using division, but give extra praise if they do.

17 min

4

Book 5, page 90

Q.2 Read: *Fill in the missing numbers. Check that they make the statements true.*

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

Review with whole class. Ps come to BB or dictate to T, explaining how they worked out the missing number. Class agrees/disagrees. Mistakes discussed and corrected.

Solution:

a) $\frac{2}{5} \times \boxed{2} = \frac{4}{5}$ b) $\boxed{3} \times \frac{5}{9} = \frac{15}{9} \ (= \frac{5}{3} = 1\frac{2}{3})$

c) $\frac{3}{10} \times \boxed{10} = \frac{30}{10} = 3$ d) $\frac{5}{8} \times \boxed{2} = \frac{5}{4} \ (= 1\frac{1}{4})$

e) $\frac{\boxed{5}}{6} \times 4 = \frac{10}{3} \ (= \frac{20}{6} = 3\frac{1}{3})$ f) e.g. $\frac{5}{\boxed{3}} \times \boxed{6} = 10$

Individual work, monitored

Written on BB or use enlarged copy master or OHP

Reasoning, agreement, self-correction, praising

Accept trial and error, but encourage Ps to reason in a mathematical way.

In f), many solutions are possible, e.g.

$\frac{5}{2} \times 4$, $\frac{5}{4} \times 8$, $\frac{5}{5} \times 10$, etc.

(i.e. any natural number as the denominator and twice that number as the multiplier)

22 min

Bk5

Lesson Plan 90

Activity		***Notes***

5

Book 5, page 90

Q.3 Read: *Write each calculation in different ways.*

Set a time limit. Ask Ps to write at least 2 different ways.

Review at BB with whole class. **A**, come and show us one way. Who agrees? Who can show us another way? etc. In a), T shows the calculation using 'cancellation' if no P has shown it and asks Ps if it is correct. Ps write it in *Ex. Bks*. Mistakes discussed and corrected.

Solution: e.g.

a) $\left(\frac{3}{2} + \frac{1}{3}\right) \times 12 = \frac{9+2}{6} \times 12 = \frac{11}{6} \times 12 = \frac{132}{6} = \underline{22}$

or $\left(\frac{3}{2} + \frac{1}{3}\right) \times 12 = \frac{3}{2} \times 12 + \frac{1}{3} \times 12 = \frac{36}{2} + \frac{12}{3}$

$= 18 + 4 = \underline{22}$

or $= \frac{3 \times \overset{6}{\cancel{12}}}{\underset{1}{\cancel{2}}} + \frac{1 \times \overset{4}{\cancel{12}}}{\underset{1}{\cancel{3}}} = 18 + 4 = \underline{22}$

b) $\left(\frac{4}{5} - \frac{2}{3}\right) \times 4 = \frac{12-10}{15} \times 4 = \frac{2}{15} \times 4 = \underline{\frac{8}{15}}$

or $\left(\frac{4}{5} - \frac{2}{3}\right) \times 4 = \frac{4}{5} \times 4 - \frac{2}{3} \times 4 = \frac{16}{5} - \frac{8}{3}$

$= \frac{48-40}{15} = \underline{\frac{8}{15}}$

26 min

Individual work, monitored, helped

Written on BB or SB or OHT

Discussion, reasoning, agreement, self-correction, praising

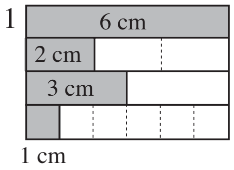
Accept and praise any correct method.

Feedback for T

6

Fraction of a fraction

This 6 cm strip is 1 unit. BB:



a) What part of the unit is the 2 cm strip? (1 third)

b) What part of the unit is the 3 cm strip? (1 half)

c) What length is half of the 2 cm strip? (1 cm)

What part of the unit is half of the 2 cm strip? BB: $\frac{1}{2}$ of $\frac{1}{3} = \frac{1}{6}$

T: We can write it as a division like this: BB: $\frac{1}{3} \div 2 = \frac{1}{6}$

d) What length is 1 third of the 3 cm strip? (1 cm)

What part of the unit is 1 third of the 3 cm strip? BB: $\frac{1}{3}$ of $\frac{1}{2} = \frac{1}{6}$

T: We can write it as a division like this. BB: $\frac{1}{2} \div 3 = \frac{1}{6}$

e) What part of the unit is 4 cm? (2 thirds)
What length is 1 quarter of 2 thirds? (1 cm)
What fraction of a unit is 1 quarter of 2 thirds? (1 sixth)

Who can write a division about it? BB: $\frac{2}{3} \div 4 = \frac{1}{6} \quad \left(= \frac{2}{12}\right)$

31 min

Whole class activity

Strips drawn (stuck) on BB or use Cuisenaire rods or multi-link cubes

Discussion, reasoning, agreement, praising

T chooses Ps ar random, or class shouts out in unison.

Ps write divisions in *Ex. Bks*.

T writes:

BB: $\frac{2}{3} \div 4 = \frac{4}{6} \div 4 = \frac{1}{6}$

and asks Ps what they think of it.

Bk5

Lesson Plan 90

Activity

Notes

7

Book 5, page 90

Q.4 Read: *Answer each question by writing a division. Use the diagram to help you.*

What can you tell me about the diagram? (The long rectangle is 1 unit; the unit is divided into 12 equal parts, so each small square is 1 twelfth of a unit.)

Set a time limit (or deal with one at a time if Ps are not very able).

Review at BB with whole class. Ps could show results on scrap paper or slates on command. Ps responding correctly explain at BB to those who were wrong. Class agrees or disagrees. Mistakes discussed and corrected.

Solution:

a) *What is half of a third?* Elicit that 1 third is 4 grid squares.

BB: $\frac{1}{2}$ of $\frac{1}{3} = \frac{1}{3} \div 2 = \frac{1}{6}$ (2 grid squares)

b) *What is a third of a quarter?* (1 quarter: 3 grid squares)

BB: $\frac{1}{3}$ of $\frac{1}{4} = \frac{1}{4} \div 3 = \frac{1}{12}$ (1 grid square)

c) *What is a quarter of a third?* (1 third: 4 grid squares)

BB: $\frac{1}{4}$ of $\frac{1}{3} = \frac{1}{3} \div 4 = \frac{1}{12}$ (1 grid square)

d) *What is a fifth of 10 twelfths?* (10 twelfths: 10 grid squares)

BB: $\frac{1}{5}$ of $\frac{10}{12} = \frac{10}{12} \div 5 = \frac{2}{12}$ $(= \frac{1}{6})$ (2 grid squares)

e) *What is a third of 3 quarters?* (3 quarters: 9 grid squares)

BB: $\frac{1}{3}$ of $\frac{3}{4} = \frac{3}{4} \div 3 = \frac{1}{4}$ (3 grid squares)

f) *What is a quarter of 16 twelfths?* (16 twelfths: 16 grid squares)

BB: $\frac{1}{4}$ of $\frac{16}{12} = \frac{16}{12} \div 4 = \frac{4}{12}$ $(= \frac{1}{3})$ (4 grid squares)

Individual work, monitored, helped

Strips drawn (stuck) on on BB or use Cuisennaire rods or multilink cubes.

Differentiation by time limit

Discussion, reasoning, agreement, self-correction, praising

Elicit or point out the two different ways in which we can divide a fraction.

1) We divide the <u>numerator</u> by the divisor and leave the denominator unchanged. [as in d) to f)]
2) We multiply the <u>denomimator</u> by the divisor and leave the numerator unchanged. [as in a) to c)]

but do not expect Ps to learn them yet.

Extra praise if Ps point out the fractions which can be simplified.

38 min

8

Book 5, page 90, Q.5

a) Read: *One third of the unit has been divided into 5 equal parts.*

Write a division about the part which has been shaded twice.

What part of the unit has been shaded twice? (1 fifteenth, as 1 unit has been divided into 15 equal parts, so each part is 1 fifteenth)

Who can write a division about it? P comes to BB or dictates to T. Class agrees/disagrees. Ps write division in *Pbs* too.

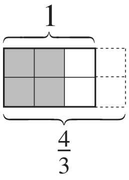
b) Read: *Do the division and show it on the diagram in a).*

Ps come to BB to shade 2 thirds on the diagram, colour 1 fifth of the shaded part and complete the division. Class agrees/disagrees.

c) Read: *Do the division. Amend the diagram to show it.*

Ps come to BB to write the division and explain reasoning by drawing another column and shading. Who can think of another way to write the division? T shows it if no P can think of it.

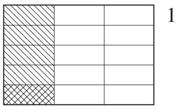
BB:



Whole class activity

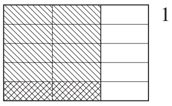
(or individual trial first if Ps wish)

Diagrams drawn on BB or SB or OHT



$\frac{1}{3} \div 5 = \frac{1}{15}$

$\frac{2}{3} \div 5 = \frac{2}{15}$



$\frac{4}{3} \div 2 = \frac{4 \div 2}{3} = \frac{2}{3}$, or

$\frac{4}{3} \div 2 = \frac{4}{3 \times 2} = \frac{4}{6} = \frac{2}{3}$

45 min

Bk5

R: (Mental) calculation

C: Practice with fractions. Division of fractions by natural numbers

E: Sequences. Equations and inequalities

Lesson Plan 91

Activity

Notes

1

Fractions practice 1

Study these fractions. Which ones are equal to a whole number?
Ps come to BB to circle them, write the whole number below and say the whole equation. Class agrees/disagrees.

BB: $$\frac{4}{50}\quad \underset{10}{\enclose{circle}{\frac{50}{5}}}\quad \frac{7}{5}\quad \frac{19}{4}\quad \underset{16}{\enclose{circle}{\frac{48}{3}}}\quad \frac{15}{4}\quad \underset{13}{\enclose{circle}{\frac{91}{7}}}\quad \frac{15}{9}\quad \frac{8}{9}\quad \underset{7}{\enclose{circle}{\frac{91}{13}}}$$

Let's write an inequality about each of the other fractions, showing the next nearest whole number greater than and less than the fraction.

Ps come to BB to write inequalities, explaining reasoning. Class agrees/disagrees.

To which whole number is the fraction closest? Ps underline the relevant number. Class agrees/disagrees.

BB: $\underline{0} < \frac{4}{50} < 1$; $\underline{1} < \frac{7}{5} < 2$; $4 < \frac{19}{4} < \underline{5}$; $3 < \frac{15}{4} < \underline{4}$;

$1 < \frac{15}{9} < \underline{2}$; $0 < \frac{8}{9} < \underline{1}$

Whole class activity

Written on BB or SB or OHT

At a good pace

Reasoning, agreement, praising

BB: $7 \times 13 = 13 \times 7 = 91$

(Ps may write inequalities in *Ex. Bks* first.)

Show on number line or change to equivalent fractions with common denominators if problems or disagreement.

Feedback for T

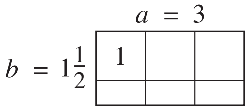
5 min

2

Fractions practice 2

Let's work out the perimeter and area of this rectangle.

BB:



Ps come to BB or dictate what T should write.
Class points out errors or suggests another way to do the calculation.

BB: e.g.

$$P = (a + b) \times 2 = (3 + 1\frac{1}{2}) \times 2 = 4\frac{1}{2} \times 2 = 8 + 1 = \underline{9}\text{ (units)}$$

$$A = a \times b = 3 \times 1\frac{1}{2} = 3 \times (1 + \frac{1}{2}) = 3 + \frac{3}{2} = 3 + 1 + \frac{1}{2} = 4\frac{1}{2}$$

$$\text{or } 3 \times 1\frac{1}{2} = 3 \times \frac{3}{2} = \frac{9}{2} = 4\frac{1}{2}\text{ (sqare units)}$$

Whole class activity

Drawn on BB or SB or OHT

Elicit the general formula for perimeter and area first, then Ps replace the letters with numbers.

Agreement, praising

Feedback for T

10 min

3

Fractions practice 3

If possible, T has a piece of exciting ribbon to show to class!

If 1 metre of this ribbon costs £$\frac{3}{4}$, how much would these amounts cost?

Ps come to BB to write a multiplication, or dictate to T, explaining reasoning. Class points out errors.

How can we write the result as a decimal? (Change to hundredths first, as there are 100 p in £1.)

BB: e.g.

a) 2 metres: $£\frac{3}{\cancel{4}_2} \times \overset{1}{\cancel{2}} = £\frac{3}{2} = £1\frac{1}{2}$ [$= £1 + £\frac{50}{100} = \underline{£1.50}$]

b) 3 metres: $£\frac{3}{4} \times 3 = £\frac{9}{4} = £2\frac{1}{4}$ [$= £2 + £\frac{25}{100} = \underline{£2.25}$]

c) 4 metres: $£\frac{3}{\cancel{4}_1} \times \overset{1}{\cancel{4}} = £3$ [$= \underline{£3.00}$]

Whole class activity

Resoning, agreement, praising

(Once Ps understand what to do, responses could be written on scrap paper or slates and shown in unison.)

Reasoning, agreement, praising

Elicit that:

$£\frac{3}{4} = £\frac{75}{100} = £0.75$

Extra praise if Ps notice relationships: e.g.

c) 2 m → £1.50

4 m → £1.50 × 2 = $\underline{£3.00}$

Bk5

Lesson Plan 91

Activity | ***Notes***

3

(Continued)

d) 5 metres: $£\frac{3}{4} \times 5 = £\frac{15}{4} = £3\frac{3}{4}$ [$= £3 + £\frac{75}{100} = \underline{£3.75}$]

e) 6 metres: $£\frac{3}{\cancel{4}_2} \times \overset{3}{\cancel{6}} = £\frac{9}{2} = £4\frac{1}{2}$ [$= £4 + £\frac{50}{100} = \underline{£4.50}$]

f) 20 metres: $£\frac{3}{\cancel{4}_1} \times \overset{5}{\cancel{20}} = £15$; or $£\frac{3}{4} \times 20 = £\frac{60}{4} = £15$ [$= \underline{£15.00}$]

15 min

or

e) 3 m → £2.25

6 m → £2.25 × 2 = <u>£4.50</u>

f) 4 m → £3

20 m → £3 × 5 = <u>£15</u>

4

Problems

Listen carefully, note the data and do the calculation in your *Ex. Bks* then show me the result when I say. Ps answering correctly explain at BB to Ps who were wrong. Who agrees? Who did it another way? etc. Mistakes discussed and corrected.

a) *If 6 kg of potatoes cost* $£2\frac{2}{5}$*, what does 1 kg of potatoes cost?*

Show me . . . now! (40 p or £0.40)

BB: $£2\frac{2}{5} \div 6 = £\frac{12}{5} \div 6 = £\frac{2}{5} = £\frac{40}{100} = £0.40 = \underline{40\text{ p}}$

Answer: 1 kg of potatoes costs 40 p.

b) *If 4 m of wire cost* $£1\frac{4}{5}$*, what does 1 m of wire cost?*

Show me . . . now! (45 p or £0.45)

BB: $£1\frac{4}{5} \div 4 = £\frac{9}{5} \div 4 = £\frac{9}{20} = £\frac{45}{100} = £0.45 = \underline{45\text{ p}}$

Answer: 1 m of wire costs 45 p.

20 min

Whole class activity but individual calculation, monitored, helped

T repeats slowly and asks a P to repeat in own words to give Ps time to think and calculate.

Responses shown in unison.

Reasoning, agreement, self-correction, praising

Class says answer in a sentence.

(Or a) done with whole class, then b) as individual trial)

5

Book 5, page 91

Q.1 Read: *Do the calculations.*

Let's see how much you have learned about doing calculations with fractions. Set a time limit.

Review with whole class. Ps could show results on scrap paper or slates on command. Ps responding correctly explain at BB, explaining reasoning . Who did the same? Who did it a different way? etc. Mistakes discussed and corrected.

Solution:

a) $\frac{3}{4} + \frac{5}{6} = \frac{9 + 10}{12} = \frac{19}{12} = 1\frac{7}{12}$

b) $\frac{4}{5} - \frac{3}{10} = \frac{8 - 3}{10} = \frac{5}{10} = \frac{1}{2}$

c) $\frac{2}{5} \times 10 = \frac{20}{5} = 4$ or $\frac{2}{\cancel{5}_1} \times \overset{2}{\cancel{10}} = \frac{4}{1} = 4$

d) $\frac{5}{8} \div 4 = \frac{5}{8 \times 4} = \frac{5}{32}$

24 min

Individual work, monitored (helped)

Written on BB or SB or OHT

Discussion, reasoning, agreement, self-correction, praising

Ps state the rule and/or show in a diagram or with a model (e.g. multilink cubes)

or $\frac{3}{4} + \frac{5}{6} = \frac{9}{12} + \frac{10}{12} = \frac{19}{12}$

or $\frac{4}{5} - \frac{3}{10} = \frac{8}{10} - \frac{3}{10} = \frac{5}{10}$

or $\frac{2}{5} \times 10 = \frac{2 \times 10}{5} = \frac{20}{5}$

T notes which Ps have problems with which operations.

Bk5

Lesson Plan 91

Activity

6

Book 5, page 91

Q.2 Read: *Solve the equations and inequality. Check your solutions.*

What does solve mean? (Work out which numbers the letters represent to make the statement true.)

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

Review with the whole class. Ps could show results on scrap paper or slates on command. Ps answering correctly come to BB or dictate to T, explaining reasoning and checking by substitution. Who thought the same? Who worked it out in a different way? etc. Mistakes discussed and corrected.

Solution: ✓

a) $x \times 4 = \frac{3}{4}$; $x = \frac{3}{4} \div 4 = \frac{3}{16}$; *Check*: $\frac{3}{16} \times 4 = \frac{12}{16} = \frac{3}{4}$

(The unknown factor of a product can be calculated by dividing the product by the known factor.)

b) $y + 5 \times y = \frac{12}{5}$; $6 \times y = \frac{12}{5}$, so $y = \frac{12}{5} \div 6 = \frac{2}{5}$

Check: $\frac{2}{5} + 5 \times \frac{2}{5} = \frac{2}{5} + \frac{10}{5} = \frac{12}{5}$ ✓

(Reasoning as for a), or as opposite. Stress that whatever we do to one side of an equation we must also do to the other side to keep the equation true.)

c) $6 \times z - z < \frac{5}{8}$; $5 \times z < \frac{5}{8}$, so $z < \frac{5}{8} \div 5$; $z < \frac{1}{8}$

Check: If we think of the inequality as an equation:

BB: $5 \times z = \frac{5}{8}$, $z = \frac{1}{8}$

So five times a number which is <u>less</u> than 1 eighth must be <u>less</u> than 5 eighths. ✓

Notes

Individual work, monitored, <u>helped</u>

Written on BB or SB or OHT

Discussion, reasoning, agreement, self-correction, praising

Accept any valid reasoning, including trial and error but also show methods below.

N.B. T should write each line of calculation vertically on BB, with '=' and '<' signs lined up one below the orther.

or

If we divide <u>each</u> side of the equation by 6, the equation still remains true.

BB: $6 \times y \div 6 = \frac{12}{5} \div 6$

$y = \frac{2}{5}$

or if we divide each side of the inequality by 5, the inequality still remains true.

BB: $5 \times z \div 5 < \frac{5}{8} \div 5$

$z < \frac{1}{8}$

30 min

7

Book 5, page 91

Q.3 Read: *The 4th, 5th and 6th terms of a sequence are given. Complete the sequence so that the first 10 terms are listed.*

How many terms must you write before (after) the 3 given? (3 before and 4 after, as 3 + 3 + 4 = 10)

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

Review with whole class. Ps come to BB or dictate terms to T, stating the rule they used. Class agrees/disagrees. Mistakes discussed and corrected.

Solution:

a) $(\frac{1}{6}, \frac{1}{3}, \frac{2}{3}), \frac{4}{3}, \frac{8}{3}, \frac{16}{3}, (\frac{32}{3}, \frac{64}{3}, \frac{128}{3}, \frac{256}{3},)$ [× 2]

b) $(-\frac{1}{7}, \frac{0}{7}, \frac{1}{7}), \frac{2}{7}, \frac{3}{7}, \frac{4}{7}, (\frac{5}{7}, \frac{6}{7}, \frac{7}{7}, \frac{8}{7},)$ [$+ \frac{1}{7}$]

c) $(\cancel{-\frac{1}{0}}, \frac{0}{1}, \frac{1}{2}), \frac{2}{3}, \frac{3}{4}, \frac{4}{5}, (\frac{5}{6}, \frac{6}{7}, \frac{7}{8}, \frac{8}{9},)$

Individual work, monitored, helped

Given terms written in middle of BB or SB or OHT

Discussion, reasoning, agreement, self-correction, praising

Extra praise if Ps notice that:

- $\frac{0}{7} = \frac{0}{1} = 0$

and in c):

- there is <u>no</u> 1st term, as it is impossible to divide a number by zero
- *Rule:* numerators and denominators increasing by 1
- $0 \le$ any term < 1

Activity

Notes

7

(Continued)

d) $(\frac{486}{5}, \frac{162}{5}, \frac{54}{5}), \frac{18}{5}, \frac{6}{5}, \frac{2}{5}, (\frac{2}{15}, \frac{2}{45}, \frac{2}{135}, \frac{2}{405},)$ [÷ 3]

e) $(4, 2, 1), \frac{1}{2}, \frac{1}{4}, \frac{1}{8}, (\frac{1}{16}, \frac{1}{32}, \frac{1}{64}, \frac{1}{128},)$ [÷ 2]

Elicit that when dividing a fraction by a natural number, either the numerator decreases or the denominator increases.

36 min

8

Book 5, page 91

Q.4 Read: *The area of a rectangle is* $\frac{80}{3}$ *m²*. *The length of a side is 6 m.*

a) What length is the adjacent side of the rectangle?

b) Calculate the perimeter of the rectangle.

First elicit the general rule for area and perimeter of a rectangle.

BB: $A = a \times b$, $P = (a + b) \times 2$

Deal with one part at a time or set a time limit. Ps write a plan then do the calculation and check the answer in a) by substituting the values for the letters in the general formula.

Review with whole class. Ps come to BB or dictate to T, explaining reasoning. Who agrees? Who did it another way? etc. Mistakes discussed and corrected. T chooses a P to say the answer in a sentence.

Solution:

a) $b = A \div a = \frac{80}{3} \div 6 = \frac{80}{18} = \frac{40}{9} = \underline{4\frac{4}{9}}$ (m)

Answer: The length of the adjacent side of the rectangle is 4 and 4 ninths metres.

b) $P = (6 + 4\frac{4}{9}) \times 2 = 10\frac{4}{9} \times 2 = 20 + \frac{8}{9} = \underline{20\frac{8}{9}}$ (m)

or $P = (6 + \frac{40}{9}) \times 2 = \frac{54 + 40}{9} \times 2 = \frac{94}{9} \times 2$

$= \frac{188}{9} = \underline{20\frac{8}{9}}$ (m)

Answer: The perimeter of the rectangle is 20 and 8 ninths metres.

Idividual work, monitored, helped

(or whole class activity, with Ps suggesting what to do first and how to continue)

Drawn on BB or SB or OHT

BB: $\boxed{A = \frac{80}{3}\text{ m}^2}\ b$

$a = 6$ m

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

Check: $4\frac{4}{9} \times 6 = \frac{40}{\cancel{9}_3} \times \cancel{6}^2$

$= \frac{80}{3}$ ✓

or $P = (6 + 4\frac{4}{9}) \times 2$

$= 12 + 8 + \frac{8}{9}$

$= \underline{20\frac{8}{9}}$ (metres)

Feedback for T

41 min

9

Book 5, page 91

Q.5 Read: *Find a rule and complete the table. Write the rule in different ways.*

Set a time limit of 2 minutes. Review with whole class. Ps come to BB or dictate to T. Class agrees/disagrees.

Who can write the rule? Who agrees? Who can show another way to write it? Mistakes discussed and corrected.

Solution:

a	$\frac{15}{3}$	10	$\frac{1}{7}$	$\frac{2}{9}$	$\frac{3}{10}$	$\mathbf{\frac{3}{2}}$	$\mathbf{\frac{1}{3}}$	$\frac{10}{9}$
b	1	2	$\frac{1}{35}$	$\mathbf{\frac{2}{45}}$	$\mathbf{\frac{3}{50}}$	$\frac{3}{10}$	$\frac{1}{15}$	$\mathbf{\frac{2}{9}}$

Individual work, monitored, helped (or whole class activity if time is short)

Drawn on BB or use enlarged copy master or OHP

Discussion, reasoning, agreement, self-correction, praising

Rule: $a = b \times 5$, $b = a \div 5$,

or $b \div a = 5$, $a \div b = \frac{1}{5}$

45 min

Bk5

R: (Mental) calculation

C: Practice with fractions

E: Problems

Lesson Plan 92

Activity

Notes

1

Ordering fractions

Let's form as many fractions as we can using only the digits 3, 4 or 6.

Ps come to BB or dictate to T, simplifying fractions where possible. Encourage a logical listing so that none will be missed.

BB: $\frac{3}{3}, \frac{3}{4}, \frac{3}{6}, \frac{4}{3}, \frac{4}{4}, \frac{4}{6}, \frac{6}{3}, \frac{6}{4}, \frac{6}{6}$

$(1 \qquad \frac{1}{2} \quad 1\frac{1}{3} \quad 1 \quad \frac{2}{3} \quad 2 \quad 1\frac{1}{2} \quad 1)$

Let's write the fractions in increasing order. What should we do first to make it easier to compare them? (Change to a common denominator.) What is the lowest common multiple of 3, 4 and 6? (12)

Ps dictate the fractions as twelfths and T writes on BB above original fractions, then Ps dictate the fractions in decreasing order.

BB: $\frac{12}{12}, \frac{9}{12}, \frac{6}{12}, \frac{16}{12}, \frac{12}{12}, \frac{8}{12}, \frac{24}{12}, \frac{18}{12}, \frac{12}{12}$

$\frac{3}{6} < \frac{4}{6} < \frac{3}{4} < \frac{3}{3} = \frac{4}{4} = \frac{6}{6} < \frac{4}{3} < \frac{6}{4} < \frac{6}{3}$

Whole class activity

At a good pace

BB: 3, 4, 6

Agreement, praising

Ps write fractions in *Ex. Bks.* too

Agreement, praising

Ps write comparison in *Ex. Bks.* too.

5 min

2

Fractions on the number line

This number line has only 2 numbers marked.

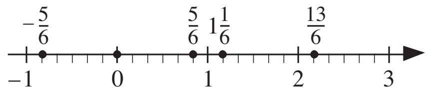
BB:

How can we mark the positions of these numbers? (BB)

Ps suggest what to do (e.g. divide the space between – 1 and 3 into 4 equal sections and mark the units 0, 1 and 2; then divide each unit into sixths).

Ps come to BB to measure and draw ticks, using a BB ruler and/or BB compasses, with T's help. Then other Ps come to BB to mark and label the required numbers. Class points out errors.

BB:



Extension Ps think of additions and subtractions to write about the fractions.

Whole class activity

Drawn on BB or SB or OHT

BB: $-\frac{5}{6}, 0, \frac{5}{6}, \frac{13}{6}, 1\frac{1}{6}$

Discussion, agreement, praising

Rest of Ps can draw number line in *Ex. Bks.* too

At a good pace

Agreement, praising

Show them on the number line.

10 min

3

Adding and subtracting fractions

These calculations are very long! How could we group the terms to make it easier for us? Ps come to BB to explain and show their ideas. Class agrees on the simplest way. Ps write simplest way in *Ex. Bks.*

BB:

a) $\frac{1}{\underset{\sim}{3}} + \frac{2}{\underline{4}} + \frac{5}{\underset{\sim}{3}} - \frac{2}{6} + \frac{1}{\underline{4}} - \frac{2}{\underline{4}} - \frac{6}{\underset{\sim}{3}} + \frac{1}{\underline{4}}$

$= \underbrace{\left(\frac{1}{3} + \frac{5}{3} - \frac{6}{3}\right)}_{0} + \underbrace{\left(\frac{2}{4} - \frac{2}{4} + \frac{1}{4} + \frac{1}{4}\right)}_{0} - \frac{2}{6}$

$= \frac{2}{4} - \frac{2}{6} = \frac{6-4}{12} = \frac{2}{12} = \boxed{\frac{1}{6}}$

Whole class activity

Written on BB or SB or OHT

Discussion, reasoning, agreement, praising

e.g. Collect fractions with equal denominators and do these calculations first.

Bk5

Lesson Plan 92

Activity

Notes

3

(Continued)

b) $$-\underset{\sim}{\frac{4}{5}}+\underline{\frac{2}{3}}+\underset{\sim}{\frac{3}{5}}-\frac{1}{15}+\underline{\left(-\frac{2}{3}\right)}+\frac{3}{5}-\underset{\sim}{\left(-\frac{1}{5}\right)}$$

$$=\underbrace{\left(-\frac{4}{5}+\frac{3}{5}+\frac{1}{5}\right)}_{0}+\underbrace{\left(\frac{2}{3}-\frac{2}{3}\right)}_{0}+\frac{3}{5}-\frac{1}{15}$$

$$=\frac{3}{5}-\frac{1}{15}=\frac{9\ -1}{15}=\boxed{\frac{8}{15}}$$

Extra praise for Ps who suggest collecting fractions with equal denominators which add up to zero.

Agree that $-\left(-\frac{1}{5}\right)=+\frac{1}{5}$

15 min

4

Book 5, page 92

Q.1 Read: *Practise calculation. Write details in your exercise book.*

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

Review with whole class. Ps come to BB or dictate results, explaining reasoning. Who agrees? Who did it in a different way? etc. Mistakes discussed and corrected.

Solution:

a) $\frac{5}{8}+\frac{3}{16}=\frac{10+3}{16}=\frac{13}{16}$

b) $\frac{3}{15}+\frac{7}{10}=\frac{1}{5}+\frac{7}{10}=\frac{2}{10}+\frac{7}{10}=\frac{9}{10}$ (Simplify $\frac{3}{15}$ first)

c) $\frac{3}{7}+\frac{1}{8}=\frac{24+7}{56}=\frac{31}{56}$ d) $\frac{3}{4}-\frac{5}{8}=\frac{6-5}{8}=\frac{1}{8}$

e) $\frac{12}{15}-\frac{2}{5}=\frac{4}{5}-\frac{2}{5}=\frac{2}{5}$ (Simplify $\frac{12}{15}$ first)

f) $\frac{3}{8}-\frac{3}{12}=\frac{3}{8}-\frac{1}{4}=\frac{3}{8}-\frac{2}{8}=\frac{1}{8}$ g) $\frac{5}{\cancel{6}_1}\times\overset{1}{\cancel{6}}=5$

h) $\frac{4}{\cancel{9}_3}\times\overset{2}{\cancel{6}}=\frac{8}{3}=2\frac{2}{3}$ i) $\frac{5}{\cancel{8}_2}\times\overset{1}{\cancel{4}}=\frac{5}{2}=2\frac{1}{2}$

j) $\frac{6}{7}\div 3=\frac{2}{7}$ k) $\frac{5}{7}\div 5=\frac{1}{7}$ l) $\frac{5}{6}\div 4=\frac{5}{24}$

(Divide numerator and leave denominator unchanged, or multiply denominator and leave numerator unchanged.)

Individual work, monitored, helped

Written on BB or use enlarged copy master or OHP

Differentiation by time limit.

Discussion, reasoning, agreement, self-correction, praising

Draw diagrams on BB or use models or show on the number line if problems or disagreement.

Accept any valid method of calculation.

e.g. f):

$\frac{3}{8}-\frac{3}{12}=\frac{9-6}{24}=\frac{3}{24}=\frac{1}{8}$

h) $\frac{4}{9}\times 6=\frac{24}{9}=\frac{8}{3}=2\frac{2}{3}$

Reiterate the 2 methods for dividing a fraction by a natural number, as opposite.

23 min

5

Book 5, page 92

Q.2 Read: *Practise calculation. Write details in your exercise book.*

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

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. Deal with all methods Mistakes discussed and corrected.

Solution:

a) $\frac{5}{6}+\frac{1}{4}-\frac{2}{3}=\frac{10+3-8}{12}=\frac{5}{12}$

Individual work, monitored helped

(or whole class activity if Ps had difficulties in Q.1)

Written on BB or SB or OHT

Discussion, reasoning, agreement, self-correction, praising

Feedback for T

Activity ***Notes***

5

(Continued)

b) $\frac{9}{6} \div 6 \times 4 = \frac{9}{36} \times 4 = \frac{9}{9} = 1$

c) $\frac{7}{6} \times (7 - 4) = \frac{7}{6} \times 3 = \frac{7}{2} = 3\frac{1}{2}$

d) $\frac{8}{3} - \frac{3}{\cancel{4}_2} \times \cancel{6}^3 = \frac{8}{3} - \frac{9}{2} = \frac{16 - 27}{6} = -\frac{11}{6} = -1\frac{5}{6}$

28 min

6

Book 5, page 92, Q.3

Read: *Solve the problems in your exercise book.*
Write the answers here.

Deal with one question at a time. Allow Ps a minute to read the problem themselves and to work out the answer if they can.

Who has an answer? Come and show us what you did. Who agrees? Who did it a different way? etc. If no P has an answer, class solves it together, with hints from T where necessary.

Solution: e.g.

a) *How many hours are in 3 fourteenths of a week*

BB: 1 week = 7 days = 7 × 24 h = 140 h + 28 h = 168 hours

$\frac{3}{14}$ of 168 hours = 168 h ÷ 14 × 3 = 12 h × 3 = <u>36 (h)</u>

b) *What part of a week is half a day?*

BB: 1 week = 7 days = 14 half days

So 1 half day is $\frac{1}{14}$ of a week.

c) *How many days is twenty-four thirds of an hour?*

BB: 1 day = 24 hours

$\frac{24}{3}$ hours = 8 hours = $\frac{8}{24}$ of a day = $\frac{1}{3}$ of a day

Whole class activity (with short individual trial first)

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

Accept any valid method of solution. e.g.

a) $\frac{3}{14}$ of 7 days

= 7 ÷ 14 × 3 (days)

= $\frac{7}{14} \times 3 = \frac{21}{14}$ (days)

= $\frac{3}{2}$ days = $1\frac{1}{2}$(days)

= 24 h + 12 h = <u>36 hours</u>

Ps who could not work out the answer in the allotted minute could write the solution they understand best in *Ex. Bks.*

34 min

7

Book 5, page 92

Q.4 Read: *Which natural numbers could be written instead of each of the shapes?*

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

Solution:

a) $\frac{\square}{9} < \frac{11}{9}$ b) $\frac{5}{53} < \frac{\triangle}{53} < \frac{10}{53}$ c) $\frac{7}{3} - \frac{\bigcirc}{3} > 1$

□: 10, 9, 8, 7, 6, 5, 4, 3, 2, 1

△: 6, 7, 8, 9

○: 1, 2, 3

Individual work, monitored, (helped)

Written on BB or SB or OHT

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

Check by writing extremes of the range of possible numbers instead of the shapes to see if they make the inequality true.

38 min

Bk5

Lesson Plan 92

Activity		*Notes*

8

Book 5, page 92

Q.5 Read: *Solve the problem in your exercise book.*

A 10 cm cube can hold 1 litre of water. What height would the water level be in the cube if we pour into it:

a) half a litre b) 3 quarters of a litre

c) 25 cl d) 800 cm^3?

If possible T has a 10 cm × 10 cm × 10 cm cube to show to class (ideally glass or plastic and hollow), otherwise draw on BB.

If we filled it with 1 litre of water, how high would the water level be? (It would reach the top, i.e. 10 cm high)

If we poured in only half a litre, which dimension would change? (Agree that the area of the base would be the same, so only the height would change.)

Set a time limit of 2 minutes. Review with whole class.
Ps could show results on scrap paper or slates on command.
Ps answering correctly explain to Ps who were wrong, referring to the cube (or a digram drawn on BB). Class agrees/ disagrees. Mistakes discussed and corrected.

Solution:

a) 1 litre → 10 cm high;

$\frac{1}{2}$ a litre → 10 cm ÷ 2 = <u>5 cm</u> high

b) $\frac{3}{4}$ of a litre → 10 cm ÷ 4 × 3 = 2.5 cm × 3 = <u>7.5 cm</u>

c) 25 cl = $\frac{25}{100}$ litre = $\frac{1}{4}$ litre

$\frac{1}{4}$ of a litre → 10 cm ÷ 4 = <u>2.5 cm</u> (or 25 mm)

c) V = 800 cm^3 = 10 cm × 10 cm × <u>8 cm</u>

Level of water: <u>8 cm</u>

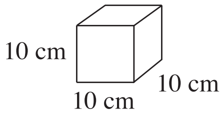
42 min

Notes:

Individual work, monitored, helped

(or whole class activity if time is short)

BB:



Discussion, agreement, (demonstration if time), praising

Reasoning, agreement, self-correction, praising

Accept any valid reasoning and method of calculation.

or 10 cm = 100 mm
100 mm ÷ 4 × 3
= 25 mm × 3 = <u>75 mm</u>

(as 10 cm × 10 cm is the area of the base and 8 cm is the height of the water)

9

Book 5, page 92, Q.6

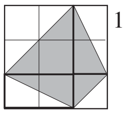
Read: *What part of the whole unit is shaded? Write the fraction in different forms in your exercise book.*

What do you think we should do first to make it easier for ourselves? (Divide the shapes into equal parts using the marks provided)

Elicit that part a) should be divided into equal squares and b) into equal triangles. Ps come to BB to draw grid lines and rest of Ps work in *Pbs*. Agree on the number of equal parts and how many are shaded. [In a), 9 equal squares, 4 and a half squares shaded; i.e. half of the unit is shaded]

Tell me the fraction in different forms. Ps dictate to T, explaining what they have done to numerator and denominator. Class points out errors.

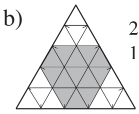
Solution: a)



9 equal parts
4 and a half parts shaded
i.e. <u>1 half</u> is shaded

$$\frac{1}{2} = \frac{2}{4} = \frac{3}{6} = \frac{9}{18} \ldots$$

b)



25 equal parts
13 parts shaded

$$\frac{13}{25} = \frac{26}{50} = \frac{39}{75} \ldots$$

45 min

Notes:

Whole class activity

(or a 1 minute individual trial first if Ps wish and there is time)

Drawn on BB or use enlarged copy master or OHP

Discussion, reasoning, agreement, praising

At speed round class

Praising, encouragement only

Elicit that such fractions of equal value are called <u>equivalent</u> fractions.

Feedback for T

Bk5

R: Fractions. Tenths, hundredths

C: Reading and writing decimals. Place value

E: Comparing decimals

Lesson Plan
93

Activity

Notes

1

Revision of decimals

T has 3 amounts in decimal form written on BB.

What kind of numbers are these? (decimals) Let's read them together. (fourteen point nine nine pounds; two hundred and thirty point four metres; seven point six litres)

What does the decimal point show? (It separates the whole units from the parts of a unit.) Let's think about what the decimal number really means. Ps come to BB to write other forms of the numbers. Class agrees/disagrees.

BB:

a) £14.99 = £14 99 p = £$\left(14 + \frac{99}{100}\right)$

b) 230.4 m = 230 m 40 cm = $\left(230 + \frac{4}{10}\right)$ m

c) 7.6 litres = 7 litres 60 cl = $\left(7 + \frac{6}{10}\right)$ litres

T points to certain digits and Ps say its digit value, place value and real value. (e.g. 230.<u>4</u> m: digit value: 4, place value: 4 t real value: $\frac{4}{10}$)

4 min

Whole class activity

Written on BB or SB or OHT

BB: <u>decimals</u>

In unison

Involve several Ps.

Agreement, praising

Feedback for T

2

Place value 1

Study this place value table. What does the thick vertical line show? (It separates the whole numbers from the parts and is where the decimal point would be written.)

BB:

Thousands Th	Hundreds H	Tens T	Units U	tenths t	hundredths h	thousandths th
			5	0	3	
				7	2	
		5	0	2	6	
	4	0	0	9		
1	0	0	0	0	5	

Let's write each number in the place value table as an addition, then as a single fraction, then in decimal form. Ps come to BB or dictate to T. Class points out errors. (If Ps write on BB, ask them to <u>say</u> the numbers too. e.g. 5 plus 3 hundredths; 503 hundredths; 5 point zero 3)

BB:

a) $5 + \frac{3}{100} = \frac{503}{100} = 5.03$

b) $0 + \frac{72}{100} = \frac{72}{100} = 0.72$

c) $50 + \frac{26}{100} = \frac{5026}{100} = 50.26$

d) $400 + \frac{9}{10} = \frac{4009}{10} = 400.9$

e) $1000 + \frac{5}{100} = \frac{100\,005}{100} = 1000.05$ ('1 hundred thousand and 5 hundredths')

10 min

Whole class activity

Drawn on BB or use enlarged copy master or OHP

Involve several Ps.

At a good pace

Agreement, praising

Activity | *Notes*

3

Place value 2

Let's change these numbers to decimals first, then write them in the place-value table. Ps come to BB to convert numbers to decimals and write digits in appropriate column in table, explaining reasoning. Class points out errors.

BB:

a) $\frac{4}{10}$ [= 0.4] b) $\frac{5}{100}$ [= 0.05]

c) $47 + \frac{3}{100}$ [= 47.03] d) 17.92

e) $5 + \frac{7}{100}$ [= 5.07]

f) $\frac{450}{100}$ [= $4 + \frac{50}{100}$ = 4.50]

	Th	H	T	U	t	h	th
a)				0	4		
b)				0	0	5	
c)			4	7	0	3	
d)			1	7	9	2	
e)				5	0	7	
f)				4	5	0	

What is the place value of the digit 4 (7, 5) in the different numbers?

Ps come to BB to point them out and say the place value. Class agrees/disagrees.

15 min

Whole class activity

Numbers written on BB.

Table drawn on BB or use enlarged copy master or OHP

At a good pace

Reasoning, agreement, praising

Feedback for T

4

Number line 1

What can you tell me about this segment of the number line? (Ranges from – 2 to 2.4 or 2 and 4 tenths; there is a tick at every tenth)

BB:

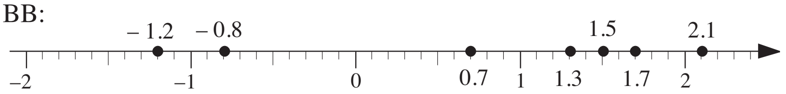
Let's change all these numbers to decimals and mark them on the number line.

BB: 0.7, 1.3, $\frac{15}{10}$, – 1.2, $-\frac{8}{10}$, $\frac{21}{10}$, $1 + \frac{7}{10}$

1.5 – 0.8 2.1 1.7

Ps come to BB to choose a number, convert to a decimal if necessary and mark and label it on the number line. Class agrees/disagrees.

BB:



20 min

Whole class activity

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

At a good pace

Reasoning, agreement, praising

T could also ask Ps to show the positive numbers by colouring a 10 cm by 10 cm grid (use copy master from *LP89/1*)

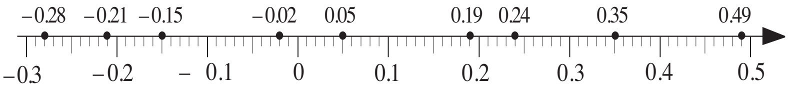
5

Number line 2

What can you tell me about this segment of the number line? (ranges from – 0.3 to 0.5; the ticks show hundredths)

Let's read and write the numbers marked. Ps come to BB to choose a dot, say the number and write it as a decimal. Class agrees/disagrees. What is the number as a fraction?

BB:



25 min

Whole class activity

Drawn on BB or use enlarged copy master or OHP

At a good pace

Reasoning, agreement, praising

(Ps could also colour the positive numbers on a 10 cm by 10 cm grid.)

Bk5

Lesson Plan 93

Activity

Notes

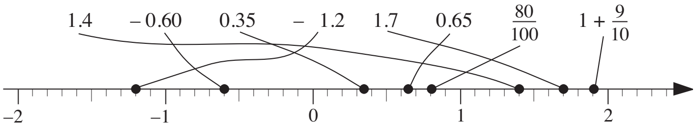
6

Book 5, page 93

Q.1 Read: *Join the numbers to the corresponding points on the number line.*

Set a time limit. Review with whole class. Ps come to BB to draw dots and joining lines, explaining reasoning (and saying the decimals as fractions and the fractions as decimals). Class agrees/disagrees. Mistakes discussed and corrected.

Solution:



Let's say the numbers as:

a) decimals in increasing order,

b) fractions in decreasing order.

Individual work, monitored, helped

Drawn on BB or use enlarged copy master or OHP

Differentiation by time limit

Discussion, reasoning, agreement, self-correction, praising

Elicit that:

$-\ 0.60 = -\ 0.6$

$\frac{80}{100} = \frac{8}{10} = 0.80 = 0.8$

$1 + \frac{9}{10} = 1\frac{9}{10} = \frac{19}{10} = 1.9$

29 min

7

Book 5, page 93

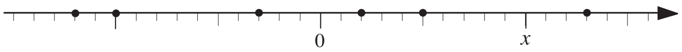
Q.2 Read: *List the marked numbers in order if:*

a) $x = 10$, *b)* $x = 1$, *c)* $x = 0.1$

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

Review at BB with whole class. P says what each tick on the number line represents. T points to each dot in turn and a P says the number. Class agrees/disagrees. Mistakes discussed and corrected.

Solution:



a) $x = 10$: $-\ 12 < -\ 10 < -\ 3 < 2 < 5 < 13$

b) $x = 1$: $-\ 1.2 < -\ 1 < -\ 0.3 < 0.2 < 0.5 < 1.3$

c) $x = 0.1$: $-\ 0.12 < -\ 0.1 < -\ 0.03 < 0.02 < 0.05 < 0.13$

Individual work, monitored, helped

Drawn on BB or use enlarged copy master or OHP

Discussion, reasoning, agreement, self-correction, praising

(a tick at every '1')

(a tick at every 'tenth')

(a tick at every 'hundredth')

33 min

8

Book 5, page 93

Q.3 Read: *List the fractions as decimals in increasing order. Write < or = signs between them.*

What is the easiest way to compare them? (Change the tenths to hundredths first.) 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. Show in a place-value table or on a number line drawn on BB if problems or disagreement.

Solution:

$$\frac{3}{10}, \frac{1}{100}, \frac{27}{100}, \frac{30}{100}, \frac{84}{100}, \frac{70}{100}, \frac{16}{10}, \frac{160}{100}, \frac{7}{10}$$

$$\frac{30}{100} \qquad \frac{160}{100} \qquad \frac{70}{100}$$

$0.01 < 0.27 < 0.3 = 0.30 < 0.70 = 0.7 < 0.84 < 1.6 = 1.60$

Individual work, monitored, helped

Drawn on BB or SB or OHT

Discussion, reasoning, agreement, self-correction, praising

Feedback for T

37 min

Bk5

Lesson Plan 93

Activity

9

Book 5, page 93

Q.4 Read: *Write the decimals as fractions, or as the sum of a whole number and a fraction.*

Write them in the place-value table.

Do part a) with the whole class first if necessary. Set a time limit.

Review with whole class. Ps come to BB to write additions and fill in the table. Class agrees/disagrees. Mistakes discussed and corrected.

Extension

Let's look more carefully at the fractions Can the fraction be simplified? Can it be written as a mixed number? Who can write the mixed number as a single fraction? Ps come to BB to write these additional forms (shown in brackets below). Class agrees/ disagrees.

Solution:

a) $3.02 = 3 + \frac{2}{100} \quad (= 3 + \frac{1}{50} = 3\frac{1}{50} = \frac{151}{50})$

b) $0.7 = 0 + \frac{7}{10} = \frac{7}{10}$ (No more can be done with it.)

c) $30.46 = 30 + \frac{46}{100} \quad (= 30 + \frac{23}{50} = 30\frac{23}{50} = \frac{1523}{50})$

d) $500.8 = 500 + \frac{8}{10} \quad (= 500 + \frac{4}{5} = 500\frac{4}{5} = \frac{2504}{5})$

e) $100.09 = 100 + \frac{9}{100} \quad (= 100\frac{9}{100} = \frac{10\,009}{100})$

Notes

Individual work, monitored helped

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

Discussion, reasoning, agreement, self-correction, praising

Whole class activiry

First let Ps to suggest what more could be done with the fractions. T suggests anything not mentioned by Ps.

Reasoning, agreement, praising

Ps could write extra forms in *Pbs* too if they have room.

BB:

	H	T	U	t	h
a)			3	0	2
b)			0	7	
c)		3	0	4	6
d)	5	0	0	8	
e)	1	0	0	0	9

42 min

10

Book 5, page 93, Q.5

Read: *Write the quantities in different units.*

Elicit that the example shown uses all the units of measure for length.

For each part, first elicit the type of measure (e.g. capacity in b), then Ps say the quantity in other units which can be used to measure it and T writes them on BB. Encourage a logical listing. Class points out errors or omissions.

Solution:

a) 4.6 litres = 4 litres 60 cl = 460 cl = 4600 ml

b) 3.067 km = 3 km 67 m = 3067 m = 306 700 cm = 3 067 000 mm

c) 151.4 litres = 151 litres 40 cl = 15140 cl = 151 400 ml

d) 65.2 kg = 65 kg + 200 g = 65 200 g [= 0.0652 tonnes]

Whole class activity

Written on BB or SB or OHT

T chooses Ps at random.

At a good pace

In good humour

Agreement, praising

Ps write quantities in *Pbs* at same time.

Extra praise if a P suggests tonnes.

BB: 1 tonne = 1000 kg

1 kg = 0.001 tonne

45 min

Bk5

R: Mental calculation
C: Comparison of decimals. Rounding decimals
E: Quantities

Lesson Plan
94

Activity | ***Notes***

1

Exact measures

a) A line segment is exactly 15 cm long. Tell me different ways to write its length. Ps dictate to T. Class points out errors.

BB: e.g. 15 cm = 150 mm = 15.0 cm = 0.15 m = 0.150 m

$$\text{or} = \frac{15}{100}\text{ m} = \frac{150}{1000}\text{ m, etc.}$$

b) If a stick is exactly 15 cm 2 mm long, in which different ways could we write its length? Ps dictate to T. Class points out errors

BB: e.g. 15 cm 2 mm = 152 mm = 15.2 cm = 0.152 m

$$\text{or} = 15\frac{2}{10}\text{ cm} = \frac{152}{1000}\text{ m, etc.}$$

c) We have two sticks, one is 1.6 m long and the other is 1.49 m long. Which is longer? Let's compare them in different ways. T starts each comparison and Ps continue it.

BB: e.g.

1.6 m = 1 m 60 cm = 160 cm > 1.49 m = 1 m 49 cm = 149 cm

$$1.6 = \frac{16}{10} = \frac{160}{100} > 1.49 = \frac{149}{100}$$

$$1.6 = 1.60 > 1.49$$

Elicit that 1.6 = 1.60 = 1.600 = 1.6000 . . . (i.e. any number of zeros can be written after the decimal point but the value doesn't change.

5 min

Whole class activity

Involve as many Ps as possible.

If Ps cannot think of many, T makes suggestions and asks Ps if they are correct.

Agreement, praising

Ps could write the different forms in *Ex. Bks*.

Feedback for T

Discussion, agreement, praising

2

Rounding 1

a) Measure the width of your Practice Book. T asks 3 or 4 Ps for their measurements and writes them on BB. e.g.

BB: 208 mm, 20 cm 9 mm, 21 cm, 211 mm, etc.

T: I measured it as 20 cm 9 mm but I am not sure that it is exact. What I <u>can</u> say is that the width is 20 cm 9 mm, <u>to the nearest mm</u>.

If I call the width w, I can write it mathematically like this.

BB: 20 cm 8.5 mm ≤ w < 20 cm 9.5 mm
or in cm: 20.85 cm ≤ w < 20.95 cm

Let's show it on the number line. Ps dictate what T should draw and write. If necessary, remind Ps about the notation for showing inequalities on the number line. [A closed (*black*) circle means the number is included; an open (*white*) circle means the number is <u>not</u> included; horizontal line joining the circles covers all the possible numbers.]

b) The length of a stick was measured as approximately 1.6 m. What does it really mean? Ps come to BB or dictate what T should write. Class agrees/disagrees.

BB: 1.55 m ≤ length < 1.65 m or 155 cm ≤ length < 165 cm

c) Another person measured the same stick and gave its measurement as approximately 1.60 m. What did they really mean? Ps come to BB or dictate to T. Class agrees/disagrees.

BB: 1.595 m ≤ length < 1.605 m or 159.5 cm ≤ length < 160.5 cm

Agree that 1.60 m is a more exact measurement than 1.6 m.

10 min

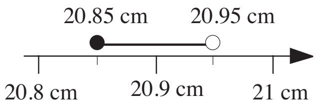
Whole class activity

Ps use rulers.

(If first 4 Ps all had the same, T asks who had different measurements.)

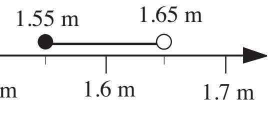
T explains and Ps listen.

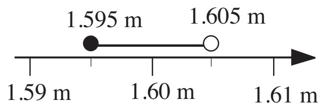
BB:



Discussion, reasoning, agreement, praising

BB:





Activity

3

Rounding 2

a) T has numbers written on BB:

BB: 6318, 6518, 6358, 6315

Let's round each number to the nearest 10, 100 and 1000.

Ps come to BB to write approximations, explaining reasoning. Class agrees/disagrees.

BB:
$$\begin{aligned} 6318 &\approx 6320 \approx 6300 \approx 6000 \\ 6518 &\approx 6520 \approx 6500 \approx 7000 \\ 6358 &\approx 6360 \approx 6400 \approx 6000 \\ 6315 &\approx 6320 \approx 6300 \approx 6000 \end{aligned}$$

b) Let's round these quantities to the nearest 10 units and convert them to larger units of measure.

Deal with one at a time. T writes quantity on BB and Ps come to BB or dictate what T should write. Class agrees/disagrees.

BB: e.g.

i) 438 cm $\approx$ 440 cm = 4.4 m

ii) 3846 mm $\approx$ 3850 mm = 385 cm = 3.85 m

iii) 2641 g $\approx$ 2640 g = 2.64 kg

iv) 555 g $\approx$ 560 g = 0.56 kg

v) 835 m $\approx$ 840 m = 0.84 km, etc.

Notes

Whole class activity

Revise rounding if necessary:

to nearest 10: 5 rounds <u>up</u>
to nearest 100: 50 rounds <u>up</u>
to nearest 1000: 500 rounds <u>up</u>

Reasoning: e.g. <u>6318</u>

'18 is nearer 20 than 10'
'318 is nearer 300 than 400',
'6318 is nearer 6000 than 7000',
etc.

Agreement, praising

At a good pace

Reasoning, agreement, praising

Ps write approximations in *Ex. Bks*. at same time.

Ps can suggest some quantities too.

T notes Ps having difficulties.

15 min

4

Book 5, page 94

Q.1 Read: *Convert each pair of fractions so that they have equal denominators. Compare them.*

Set a time limit. Ps convert mentally or write beside relevant fraction in *Pbs,* then fill in the missing sign.

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

Solution:

a) $\frac{6}{10}\left(=\frac{60}{100}\right)\boxed{>}\frac{50}{100}$ b) $\frac{7}{10}\left(=\frac{70}{100}\right)\boxed{>}\frac{14}{100}$

c) $\frac{5}{100}\boxed{<}\frac{20}{100}$ d) $\frac{9}{10}\left(=\frac{90}{100}\right)\boxed{=}\frac{90}{100}$

e) $\frac{5}{10}\left(=\frac{50}{100}\right)\boxed{<}\frac{51}{100}$ f) $\frac{161}{1000}\boxed{>}\frac{16}{100}\left(=\frac{160}{1000}\right)$

Extension

T points to some of the inequalities and asks Ps to say them in decimal form (e.g. 0.6 > 0.50; 0.05 < 0.20, etc.)

Notes

Individual work monitored, helped

Written on BB or SB or OHT

Differentiation by time limit

Discussion, reasoning, agreement, self-correction, praising

Feedback for T

20 min

Bk5		*Lesson Plan 94*
Activity		***Notes***
5	***Book 5, page 94*** Q.2 Read: *Convert the decimal numbers to hundredths and compare them.* Set a time limit. Ps write extra zeros in hundredths column where appropriate and fill in the missing signs. 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) $0.6\underline{0} > 0.06$ b) $0.7\underline{0} = 0.70$ c) $0.11 > 0.1\underline{0}$ d) $0.03 < 0.7\underline{0}$ e) $0.07 < 0.3\underline{0}$ f) $0.4\underline{0} > 0.39$ *25 min*	Individual work, monitored, helped Written on BB or SB or OHT Discussion, reasoning, agreement, self-correction, praising Underlined zeros not given in *Pbs*.
6	***Book 5, page 94*** Q.3 Read: *Write three numbers betwen the two decimals.* T also asks Ps to compare the 3 numbers by writing appropriate sign between each pair. Set a time limit. Review at BB with whole class. Ps come to BB or dictate to T. Who agrees? Who wrote different numbers? Deal orally with all cases. Mistakes discussed and corrected. *Solution:* e.g. a) $3.4 < \underline{3.45} < \underline{3.53} < \underline{3.59} < 3.6$ b) $5.2 < \underline{5.21} > \underline{5.25} < \underline{5.28} < 5.3$ c) $-0.2 < \underline{-0.1} < \underline{0} < \underline{0.08} < 0.1$ d) $2.9 < \underline{2.91} < \underline{2.92} < \underline{2.93} < 3$ *30 min*	Individual work, monitored, helped Written on BB or SB or OHT Reasoning, agreement, self-correction, praising Show on number line if problems or disagreement. Feedback for T
7	***Book 5, page 94*** Q.4 Read: *Write the next nearest whole number less than and greater than the decimal number.* Set a time limit. Ask Ps to underline the nearest whole number. Review with whole class. Ps come to BB or dictate numbers to T. Class agrees/disagrees. Mistakes discussed and corrected. Show on relevant segment of number line drawn on BB if problems or disagreement. *Solution:* a) $4 < 4.7 < \underline{5}$ b) $\underline{7} < 7.26 < 8$ c) $\underline{0} < 0.09 < 1$ d) $99 < 99.99 < \underline{100}$ e) $\underline{101} < 101.01 < 102$ f) $\underline{2} < 2.306 < 3$ *35 min*	Individual work, monitored, helped Written on BB or SB or OHT Reasoning, agreement, self-correction, praising Feedback for T

Bk5

Lesson Plan 94

Activity

Notes

8

Book 5, page 94

Q.5 Read: *Write the next nearest tenths less than and greater than the decimal number.*

Set a time limit. Ask Ps to underline the nearest tenth.

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

Solution:

a) $\underline{5.2} < 5.21 < 5.3$ b) $3.8 < 3.85 < \underline{3.9}$

c) $21.0 < 21.06 < \underline{21.1}$ d) $\underline{0.4} < 0.44 < 0.5$

e) $\underline{5} < 5.01 < 5.1$ f) $0.9 < 0.97 < \underline{1}$

40 min

Individual work, monitored, helped

Written on BB or SB or OHT

Reasoning, agreement, self-correction, praising

Show on number line if problems or disagreement.

Feedback for T

9

Book 5, page 94, Q.6

a) Read: *Round the decimals to the nearest whole number.*

P comes to front of class to read each decimal. Ps show nearest whole number on slates or scrap paper on P's command.

T (P) chooses Ps with different answers to explain their reasoning and class decides who is correct. Ps refer to number line if necessary.

Solution:

$2.4 \approx \underline{2}$, $6.8 \approx \underline{7}$, $43.5 \approx \underline{44}$, $59.9 \approx \underline{60}$, $99.65 \approx \underline{100}$

b) Read: *Round the decimals to the nearest tenth.*

A different P comes to front of class. Repeat as for a).

Solution:

$6.34 \approx \underline{6.3}$, $5.56 \approx \underline{5.6}$, $8.4 = \underline{8.4}$, $10.20 \approx \underline{10.2}$,

$5.076 \approx \underline{5.1}$

c) Read: *A melon weighed 3 kg on scales which are accurate to the nearest tenth of a kg.*
Write an inequality for the actual mass of the melon.

If the weight of the melon is accurate to the nearest tenth of a kg, what place value do we need to consider? (hundredths)

What is the lightest weight it could be? (2.95 kg) What is the heaviest weight it could be? (3.05 kg) Who can write an inequality about it? P comes to BB. Who agrees? Who thinks something else?

If we want to note down the weight of the melon shown on the scales, what would we write? Class applauds P who writes it correctly. (BB)

45 min

Whole class activity

(or individual work in *Pbs* if Ps prefer and there is time, reviewed with whole class)

Responses shown in unison.

Reasoning, agreement, (self-correction), praising

[T could have a real (3 kg) melon to show to class and share among Ps afterwards as a reward for working so hard!]

BB: $2.95 \text{ kg} \le m < 3.05 \text{ kg}$

$m = 3.0 \text{ kg}$
(to the nearest tenth of a kg)

Bk5

R: Mental calculation

C: Addition and subtraction of decimals

E: Pencil and paper calculation

Lesson Plan 95

Activity | ***Notes***

1

Puzzle

Let's solve this puzzle and find the word in the thick vertical box which will make us better at mathematics!

T reads out the clues <u>across</u> in numerical order and Ps suggests words to try. Ask Ps for examples (or further examples) as each clue is found.

(1) An example is $\frac{4}{7}$. (fraction)

(2) The upper number in a fraction. (numerator)

(3) The lower number in a fraction. (denominator)

(4) This is what we do when we multiply the upper and lower numbers in a fraction by the same number. (expand)

(5) This what we do when we divide the upper and lower numbers in a fraction by the same number. (simplify)

(6) The next place-value smaller than units. (tenths)

(7) An adjective which describes fractions with the same value. (equivalent)

What should we do to make us better at mathematics? (practise!)

We did not have a clue for row 8. Who can think of one?

5 min

Whole class activity

Drawn on BB or use enlarged copy master or OHP

Ps could have copies on desks too.

Involve as many Ps as possible.

Agreement, praising

BB:

							^{8}p							
			^{2}n	u	m	e	r	a	t	o	r			
				^{4}e	x	p	a	n	d					
				^{1}f	r	a	c	t	i	o	n			
							^{6}t	e	n	t	h	s		
		^{3}d	e	n	o	m	i	n	a	t	o	r		
							^{5}s	i	m	p	l	i	f	y
^{7}e	q	u	i	v	a	l	e	n	t					

T helps with the spelling where needed.

Class shouts out in unison.

(e.g. plan, perimeter, polygon, probability, prime, etc.)

2

Addition of decimals 1

Let's add these fractions, then write the addition with decimals and fill in the place-value table. Ps come to BB to write additions and fill in the table. Class points out errors.

BB:

$$\frac{3}{10} + \frac{57}{100} + \frac{40}{100} = \frac{30 + 57 + 40}{100} = \frac{127}{100} = 1 + \frac{27}{100}$$

0.3 + 0.57 + 0.40 = <u>1.27</u>

	U	t	h
		3	
		5	7
+		4	0
	1	2	7

10 min

Whole class activity

Table drawn on BB or SB or OHT

At a good pace

Reasoning, agreement, praising

Repeat with other fractions which have denominators of 10 and 100, suggested by Ps.

3

Problem

Listen carefully to this problem and tell me the operation you would use to solve it.

We need four lengths of cord to tie up some parcels . The lengths we need are 2 m 75 cm, 380 cm, 405 cm and 3 m 66 cm. What length of cord do we need altogether?

What operation would you use? (addition)

Let's write the lengths in this table, then add them up.

Ps come to BB or dictate what T should write.

Elicit that, e.g. 16 cm = 1 × 10 cm + 6 cm, etc.

BB:

	10 m	1 m	10 cm	1 cm
		2	7	5
		3	8	(0)
		4	0	5
+		3	6	6
		①2	②1	①6
	1	4	2	6

If we change all the lengths to <u>cm</u>, we can add up in the normal way like this.

Ps come to BB or dictate what T should write.

BB:

In cm:

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

$$\begin{array}{r} 2\;7\;5 \\ 3\;8\;0 \\ 4\;0\;5 \\ +\,3\;6\;6 \\ \hline 1\;4\;2\;6 \\ \hline 2\;1\;\; \end{array} \text{ (cm)}$$

Whole class activity

Tables drawn on BB or use enlarged copy masteror OHP

T repeats slowly to give Ps time to note the data in *Ex. Bks*.

BB: 2 m 75 cm + 380 cm + 405 cm + 3 m 66 cm = ?

Reasoning, with T's help if necessary, agreement, praising

Place-value table completed first, then vertical addition written as normal.

Ps write the addition in *Ex. Bks*.

Bk5

Lesson Plan 95

Activity		*Notes*

3 (Continued)

If we choose <u>1 m</u> as the unit, then our table looks like this.

Ps come to BB or dictate to T.

If we use this table, we can write the addition with decimals.

Ps dictate what T should write.

BB: In m:

	T	U	t	h
		2	7	5
		3	8	
		4	0	5
+		3	6	6
	1	4	2	6
		2	1	

$$\begin{array}{r} 2.75 \\ 3.80 \\ 4.05 \\ +\,3.66 \\ \hline 14.26 \\ {\scriptstyle 2\ 1} \end{array} \text{ (m)}$$

Reasoning with place-value detail, agreement, praising

Ps write addition with decimals in *Ex. Bks*.

If we use 1 m as the unit, we could also write an addition with fractions like this. T starts calculation and Ps continue when they understand.

BB:

	2	. 7	5	$= 2 + \frac{7}{10} + \frac{5}{100} = 2 + \frac{75}{100}$
	3	. 8	0	$= 3 + \frac{8}{10} + \frac{0}{100} = 3 + \frac{80}{100}$
	4	. 0	5	$= 4 + \frac{0}{10} + \frac{5}{100} = 4 + \frac{5}{100}$
+	3	. 6	6	$= 3 + \frac{6}{10} + \frac{6}{100} = 3 + \frac{66}{100}$
1	4	. 2	6	$= 12 + \frac{226}{100} = \boxed{14 + \frac{26}{100}}$ (m)

Reasoning, agreement, praising

Ps write addition in *Ex. Bks*.

Agree that: BB: $14 + \frac{26}{100}$ m = 14.26 m = 1426 cm

Answer: The total length of cord needed is 14.26 m.

Which method do you like best? Why?

T chooses a P to say the answer in a sentence.

20 min

4 ***Book 5, page 95***

Q.1 Read: *We had 30 m 58 cm of parcel tape and used 14 m 26 cm. How much parcel tape do we have left? Write the subtraction in the tables.*

Individual work, monitored, helped

Drawn on BB or use enlarged copy master or OHP

Elicit that 30 m 58 cm = 3058 cm and 14 m 26 cm = 1426 cm.

Set a time limit. (If majority of Ps are struggling, stop individual work and continue as a whole class activity.)

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

Discussion, reasoning, agreement, self-correction, praising

Solution:

	10 m	1 m	10 cm	1 cm
	3	0	5	8
–	1	4	2	6
	1	6	3	2

In cm:

	Th	H	T	U
	3	0	5	8
–	1	4	2	6
	1	6	3	2

In m:

	T	U	t	h
	3	0	5	8
–	1	4	2	6
	1	6	3	2

Let's write subtractions in cm and in metres.

$$\begin{array}{r} 3058 \\ -\,1426 \\ \hline 1632 \\ \hline \end{array} \text{ (cm)} \qquad \begin{array}{r} 30.58 \\ -\,14.26 \\ \hline 16.32 \\ \hline \end{array} \text{ (m)}$$

Ps come to BB or dictate what T should write.

Rest of Ps write in *Ex. Bks*.

25 min

Bk5

Lesson Plan 95

Activity

Notes

5

Book 5, page 95

Q.2 Read: *Write each decimal as the sum of units, tenths and hundredths, then do the subtraction in decimal form and fractional form.*

Deal with one step at a time or set a time limit. (Ps might find it easier to do the addition with fractions first.)

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

Solution:

$$\begin{array}{rrrrl} & 2 & 0 . 4 & 8 & = 20 + \frac{4}{10} + \frac{8}{100} = 20 + \frac{48}{100} \\ - & 1 & 4 . 1 & 6 & = 14 + \frac{1}{10} + \frac{6}{100} = 14 + \frac{16}{100} \\ \hline & & 6 . 3 & 2 & = 6 + \frac{32}{100} \end{array}$$

Individual work, monitored, helped

Written on BB or use enlarged copy master or OHP

Reasoning, agreement, self-correction, praising

Feedback for T

29 min

6

Book 5, page 95

Q.3 Read: *Do the subtractions, then check them with additions.*

Deal with one at a time. Set a time limit. Ps fill in place-value table first, then do decimal subtraction, then check with a decimal addition. (If majority of Ps have difficulties, stop individual work and continue as a whole class activity.)

Review at BB with whole class. Ps come to BB to complete table and subtraction and write an addition, explaining reasoning with place-value detail. Class agrees/disagrees. Mistakes discussed and corrected.

Solution:

a)

$$\begin{array}{rr} & 22.83 \\ - & 13.00 \\ \hline & 9.83 \end{array} \longleftarrow$$

	T	U	t	h
	2	$^{10}2$	8	3
−	1_1	3	0	0
		9	8	3

Check:

$$\begin{array}{rr} & 9.83 \\ + & 13.00 \\ \hline & 22.83 \end{array} \checkmark$$

b)

$$\begin{array}{rr} & 22.00 \\ - & 18.43 \\ \hline & 3.57 \end{array} \longleftarrow$$

	T	U	t	h
	2	$^{10}2$	$^{10}0$	$^{10}0$
−	1_1	8_1	4_1	3
		3	5	7

Check:

$$\begin{array}{rr} & 3.57 \\ + & 18.43 \\ \hline & 22.00 \end{array} \checkmark$$

Individual work, monitored, helped

Drawn on BB or use enlarged copy master or OHP

Reasoning, agreement, self-correction, praising

How else could we have checked the subtraction?

(Subtract the difference from the reductant to give the subtrahend.)

Feedback for T

33 min

Bk5

Lesson Plan 95

Activity

Notes

Q.4 Read: *Estimate the result here by rounding each decimal to the nearest whole number, then do the calculation acurately in your exercise book.*

Ps round all the numbers first in *Pbs*, then review.

Ps dictate rounding to T, explaining reasoning. Ps correct any mistakes before they do the calculations.

Set a time limit for the calculations. Ps could write place-value labels above each column to help them.

Review with whole class. Ps come to BB to write calculations and explain reasoning with place-value detail. Mistakes discussed and corrected.

Solution:

a) $2.24 + 21.56 + 0.75 \approx 2 + 22 + 1 = 25$

$$\begin{array}{r} 2.24 \\ 21.56 \\ +\ 0.75 \\ \hline 24.55 \\ \hline {}^{1}\ \ {}^{1}\ \ \end{array}$$

b) $31 + 3.1 + 0.31 + 0.031 \approx 31 + 3 + 0 + 0 = 34$

$$\begin{array}{l} 31 \\ \ \ 3.1 \\ \ \ 0.31 \\ +\ 0.031 \\ \hline 34.441 \\ \hline \end{array}$$

c) $26.68 - 19.35 \approx 27 - 19 = 8$

$$\begin{array}{r} 2\overset{10}{6}.68 \\ -\ 1_1 9.35 \\ \hline 7.33 \\ \hline \end{array}$$

d) $37.5 - 8.37 \approx 38 - 8 = 30$

$$\begin{array}{r} 3\overset{10}{7}.5\overset{10}{\ } \\ -\ {}_1 8.3_1 7 \\ \hline 29.13 \\ \hline \end{array}$$

Individual work, monitored, helped

Written on BB or SB or OHT

Reasoning: e.g.

'2.24 is approximately equal to 2, as 2 and 24 hundredths is nearer 2 than 3')

Agreement, self-correction, praising

Feedback for T

40 min

8

Book 5, page 95, Q.5

Read: *Solve the problem in your exercise book.*

Dad bought a water melon which weighed 6.5 kg.
At lunch, Mum ate 500 g, Irene ate 3 quarters of a kg, Steve ate 1.2 kg and Dad ate 1.5 kg.

How much was left for dinner?

X, how would you solve it. Who would do the same? Who would do it a different way? etc. Accept any correct method of solution. Ps come to BB to write a plan, estimate the result and do the calculations, with T's help where necessary. Class agrees/disagrees.

Solution: e.g.

Data: mass of melon: 6.5 kg M: 500 g, I: $\frac{3}{4}$ kg, S: 1.2 kg, D: 1.5 kg

Plan: 6.5 kg – (0.5 + 0.75 + 1.2 + 1.5) kg

E: $7 - (1 + 1 + 1 + 2) = 7 - 5 = 2$ (kg)

Check: $2.55 + 0.5 + 0.75 + 1.2 + 1.5 = 6.5$ (kg) ✓

C:

$$\begin{array}{r} 0.5\ \ \\ 0.75 \\ 1.2\ \ \\ +\ 1.5\ \ \\ \hline 3.95 \\ \hline {}^{1}\ \ \ \ \ \ \ \end{array} \qquad \begin{array}{r} 6.\overset{10}{5}\overset{10}{\ } \\ -\ 3_1.9_1 5 \\ \hline 2.55 \\ \hline \end{array}\ \text{(kg)}$$

T chooses a P to say the answer in a sentence.

Answer: There was 2.55 kg of melon left for dinner.

Whole class activity

(or individual trial first if Ps wish and there is time, with Ps showing results on scrap paper or slates on command)

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

or in grams:

$6500 - (500 + 750 + 1200 + 1500)$

C:

$$\begin{array}{r} 500 \\ 750 \\ 1200 \\ +\ 1500 \\ \hline 3950 \\ \hline {}^{1}\ \ \ \ \ \ \ \ \ \end{array}\ \text{(g)} \qquad \begin{array}{r} 6\overset{10}{5}\overset{10}{0}0 \\ -\ 3_1 9_1 50 \\ \hline 2550 \\ \hline \end{array}\ \text{(g)}$$

Using fractions of a kg is also possible but is rather difficult!

45 min

Bk5

R: (Mental) calculations
C: Addition and subtraction of decimals
E: Problems

Lesson Plan 96

Activity		*Notes*

1

Sequences

T says the first 3 terms of a sequence and Ps continue it, then give the rule. Class points out errors.

a) 1.2, 1.4, 1.6, (1.8, 2, 2.2, 2.4, 2.6, . . .) [+ 0.2]

b) 3.5, 2.9, 2.3, (1.7, 1.1, 0.5, – 0.1, – 0.7, – 1.3, . . .) [– 0.6]

c) 10.24, 5.12, 2.56, (1.28, 0.64, 0.32, 0.16, 0.08, 0.04, 0.02, 0.01, 0.005, . . .) [÷ 2]

etc.

Whole class activity

At speed in order round class

If a P makes a mistake, the next P must correct it.

In good humour!

Praising, encouragement only

(Ps start off additional sequences if there is time.)

6 min

2

Comparison of decimals

In each pair of decimals, which is more? How many more? Ps come to BB to write appropriate sign between each pair and the difference below the sign, explaining reasoning. Class agrees/disagrees. Ps show calculation on BB or demonstrate on number line if problems or disagreement.

BB:

a) 0.25 ☐ 0.8(0) (0.55)
b) 6.2 ☐ 4.9 (1.3)
c) 2.03 ☐ 2.3(0) (0.27)
d) 0.303 ☐ 0.33(0) (0.027)
e) – 0.3 ☐ 0.9 (1.2)
f) 0.4 ☐ – 0.4 (0.8)

Whole class activity

Written on BB or SB or OHT

At a good pace

Reasoning, agreement, praising

Feedback for T

BB: e.g.

$$\begin{array}{c|c|c|c|c} & 0. & 3 & 3 & \overset{10}{0} \\ - & 0. & 3 & 0_1 & 3 \\ \hline & 0. & 0 & 2 & 7 \\ \hline \end{array}$$

12 min

3

Find the mistake

What do you think of these calculations. Are they correct?

Ps come to BB to estimate result by rounding and write a tick or a cross. If incorrect, Ps say what mistake has been made and write the calculation again correctly. Class agrees/disagrees.

BB: *Mistake:* *Correction:*

a)
$$\begin{array}{r} 4.56 \\ 300 \\ +\ 32 \\ \hline 7.88 \\ \hline \end{array} \times$$

Equal place values are not lined up.

$$\rightarrow \quad \begin{array}{r} 4.56 \\ 300 \\ +\ 32 \\ \hline 336.56 \\ \hline \end{array}$$

E: 5 + 300 + 32 = 337

b)
$$\begin{array}{r} 2.37 \\ 84.5 \\ +\ 321 \\ \hline 14.03 \\ \hline \end{array} \times$$

Again, equal place values are not lined up.

$$\rightarrow \quad \begin{array}{r} 2.37 \\ 84.5 \\ +\ 321 \\ \hline 407.87 \\ \hline \end{array}$$

E: 2 + 84 + 321 = 407

c)
$$\begin{array}{r} 4.67 \\ -\ 6.04 \\ \hline 2.65 \\ \hline \end{array} \times$$

We usually subtract the smaller number from the greater number but the answer is wrong anyway.

$$\rightarrow \quad \begin{array}{r} 6.\overset{10}{0}\,\overset{10}{4} \\ -\ 4_1.6_17 \\ \hline 1.37 \\ \hline \end{array}$$

Check:

$$\begin{array}{r} 1.37 \\ +\ 4.67 \\ \hline 6.04 \\ \hline {}_1\ \ {}_1 \end{array}$$

E: 5 – 6 = – 1

4.67 – 6.04 = – 1.37

Whole class activity

Written on BB or SB or OHT

Discussion, reasoning, agreement, correcting, praising

Elicit that when doing vertical calculation with decimals, we must write the digits with the same place-value one below the other:

- units below units,
- decimal point below decimal point,
- tenths below tenths,
- hundredths below hundredths,

etc.

18 min

Activity

Notes

4

Number line

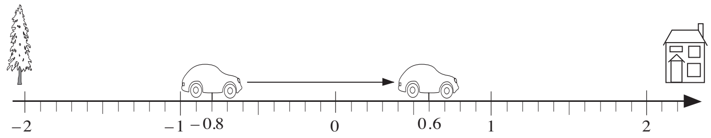
T has car model drawn (stuck) on BB. If possible, Ps have smaller version on desks. Let's play the car game.

Revise the 'rules' first.

- When the car faces the house it means a positive number is added or subtracted.
- When the car faces the tree it means a negative number. is added or subtracted.
- When the car moves forward we have to add.
- When the car reverses we have to subtract,

T describes how the car moves and Ps come to BB to show it, then write an operation about it. Class agrees/disagrees. Ps write operation in E*x*. *Bks*. too.

BB:



a) i) The car is at – 0.8 and faces the house. It moves forward 1.4 units.

BB: $-\ 0.8 + (+\,1.4) = +\,0.6$ or $-\ 0.8 + 1.4 = 0.6$

ii) The little car is at 1.6 and faces the house. It reverses 2.1 units.

BB: $+\,1.6 - (+\,2.1) = -\ 0.5$ or $1.6 - 2.1 = -\,0.5$

b) T writes additions or subtractions on BB and Ps come to BB to show the motion of the car, describe it in words and say the result.

e.g. $-\ 0.2 + (-\ 0.7)$, $0.9 + 1.1$, $-\ 1.4 - (-\,0.5)$, $0.3 - (-\ 0.2)$, etc.

Whole class activity

(but individual manipulation if Ps have smaller version of model on desks)

Use enlarged copy master or OHP and toy car

Discussion on the rules

Reasoning agreement, praising

Elicit that positive signs can be omitted, as any number without a sign is a positive number.

e.g. $-\ 0.2 + (-\,0.7) = -\ 0.9$

'The car is at $-\,0.2$ and faces the tree. It moves forward 0.7 units.'

24 min

5

Book 5, page 96

Q.1 Read: *Estimate first by rounding to the nearest tenth, then do the calculations accurately.*

Ps round all the numbers first, then review and correct any mistakes before doing the calculations.

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

Solution:

a) $4.12 + 29.35 + 0.87$

$\approx\ 4.1 + 29.4 + 0.9 = 34.4$

$$\begin{array}{rr} & 4.12 \\ & 29.35 \\ + & 0.87 \\ \hline & 34.34 \\ & {}_{1\ \ 1\ \ 1\ \ } \end{array}$$

b) $7.05 + 27.6 + 6.715 + 37.17$

$\approx\ 7.1 + 27.6 + 6.7 + 37.2 = 78.6$

$$\begin{array}{rl} & \ \ 7.05 \\ & 27.6 \\ & \ \ 6.715 \\ + & 37.17 \\ \hline & 78.475 \\ & {}_{2\ \ 1} \end{array}$$

c) $34.67 - 25.58$

$\approx\ 34.7 - 25.6 = 9.1$

$$\begin{array}{rr} & 3\overset{10}{4}.6\overset{10}{7} \\ - & 2_{1}5.5_{1}8 \\ \hline & 9.09 \end{array}$$

d) $85.49 - 16$

$\approx\ 85.5 - 16 = 69.5$

$$\begin{array}{rl} & 8\overset{10}{5}.49 \\ - & 1_{1}6 \\ \hline & 69.49 \end{array}$$

Individual work, monitored, helped

Written on BB or use enlarged copy master or OHP

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

Check by comparing with estimate and by adding in opposite direction for addition, or using reverse addition for subtraction.

Feedback for T

30 min

Bk5

Lesson Plan 96

Activity

Notes

6

Book 5, page 96

Q.2 Read: *Practise addition.*

Remind Ps to estimate mentally first by rounding, then to check sums by adding in opposite direction. Set a time limt.

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

Solution:

a) $$\begin{array}{rcccc} & 5 & 6. & 3 & \\ & & 2. & 8 & 4 \\ + & & 0. & 9 & 1 \\ \hline & 6 & 0. & 0 & 5 \\ \hline & {\scriptstyle 1} & {\scriptstyle 2} & & \end{array}$$

b) $$\begin{array}{ccccc} & 1 & 3. & 0 & \\ & 8 & 4. & 5 & 6 \\ + & & 7. & 4 & \\ \hline 1 & 0 & 4. & 9 & 6 \\ \hline {\scriptstyle 1} & {\scriptstyle 1} & & & \end{array}$$

c) $$\begin{array}{rcccc} & 5 & 0. & 0 & \\ & & 0. & 7 & \\ + & & 6. & 0 & 3 \\ \hline & 5 & 6. & 7 & 3 \end{array}$$

d) $$\begin{array}{rcccc} & 1 & 0. & 5 & 6 \\ & & 0. & 0 & 4 \\ + & & 5. & 3 & \\ \hline & 1 & 5. & 9 & 0 \\ \hline & & & {\scriptstyle 1} & \end{array}$$

Extension

- Round each result to the nearest tenth (whole number).
- What is the sum of the 4 results?

35 min

Individual work, monitored, (helped)

Written on BB or use enlarged copy master or OHP

Reasoning, agreement, self-correction, praising

Feedback for T

Extra work in *Ex. Bks.* for quicker Ps.

7

Book 5, page 96

Q.3 Read: *Practise subtraction. Check with addition.*

Encourage Ps to estimate the result mentally first by rounding. Set a time limit.

Review with whole class. Ps come to BB or dictate to T, explaiing reasoning with place-value detail. Class agrees/ disagrees. Mistakes discussed and corrected.

Solution:

a) $$\begin{array}{rcccc} & 9 & 4. & 6 & 5 \\ - & 6 & 1. & 3 & 2 \\ \hline & 3 & 3. & 3 & 3 \end{array} \qquad \begin{array}{rcccc} & 3 & 3. & 3 & 3 \\ + & 6 & 1. & 3 & 2 \\ \hline & 9 & 4. & 6 & 5 \end{array} \checkmark$$

b) $$\begin{array}{rcccc} & 2 & {}^{10}4. & {}^{10}1 & 5 \\ - & {\scriptstyle 1} & 9_1. & 8 & \\ \hline & 1 & 4. & 3 & 5 \end{array} \qquad \begin{array}{rcccc} & 1 & 4. & 3 & 5 \\ + & & 9. & 8 & \\ \hline & 2 & 4. & 1 & 5 \\ \hline & {\scriptstyle 1} & {\scriptstyle 1} & & \end{array} \checkmark$$

c) $$\begin{array}{rcccc} & 6 & {}^{10}1. & 6 & 4 \\ - & 3_1 & 4_1. & 8 & \\ \hline & 2 & 6. & 8 & 4 \end{array} \qquad \begin{array}{rcccc} & 2 & 6. & 8 & 4 \\ + & 3 & 4. & 8 & \\ \hline & 6 & 1. & 6 & 4 \\ \hline & {\scriptstyle 1} & {\scriptstyle 1} & & \end{array} \checkmark$$

d) $$\begin{array}{rcccc} & 4 & {}^{10}0. & {}^{10}0 & {}^{10} \\ - & 2_1 & 5_1. & 3_1 & 5 \\ \hline & 1 & 4. & 6 & 5 \end{array} \qquad \begin{array}{rcccc} & 1 & 4. & 6 & 5 \\ + & 2 & 5. & 3 & 5 \\ \hline & 4 & 0. & 0 & 0 \\ \hline & {\scriptstyle 1} & {\scriptstyle 1} & {\scriptstyle 1} & \end{array} \checkmark$$

40 min

Individual work, monitored, helped

Written on BB or use enlarged copy master or OHP

Reasoning, agreement, self-correcting, praising

Feedback for T

Extension (for quicker Ps)

How much needs to be added to each difference to make the next greater whole ten?

8

Book 5, page 96, Q.4

Read: *Answer each question by writing an equation.*

T (P) reads each question. Ps show result on scrap paper or slates on command. Ps answering correctly explain at BB to Ps who were wrong, writing an equation (i.e. calling the unknown number a letter) or an operation. Class agrees/disagrees. Ps write equations in *Pbs* too. Show calculation details if problems or disagreement.

Solution:

a) *What should be added to 1.2 to get 1.7?* (0.5)

b) *What should be subtracted from 3.5 to get 3.50?* (0)

c) *What should be sutracted from 3.58 to get 3.08?* (0.50)

d) *What should be added to 1.25 to get 1.35?* (0.10)

e) *If I add 13.48 to a number, the sum is 72.25.*
What is the number? (58.77)

$$\begin{array}{rcccc} & 7 & {}^{10}2. & {}^{10}2 & {}^{10}5 \\ - & 1_1 & 3_1. & 4_1 & 8 \\ \hline & 5 & 8. & 7 & 7 \end{array}$$

f) *If I subtract 18.6 from a number, the result is 3.1.*
What is the number? (21.7)

45 min

Whole class activity
(or individual work under a time limit if Ps prefer)

Responses shown in unison.

Reasoning, agreement, (self-correction), praising

BB: e.g.

a) $1.2 + a = 1.7$
$a = 1.7 - 1.2 = \underline{0.5}$

b) $3.5 - b = 3.50$
$b = 3.5 - 3.50 = \underline{0,}$ etc.

or in one line:

c) $c = 3.58 - 3.08 = \underline{0.5}$

d) $d = 1.35 - 1.25 = \underline{0.1}$

e) $e = 72.25 - 13.48 = \underline{58.77}$

f) $f = 18.6 + 3.1 = \underline{21.7}$

Bk5

R: (Mental) calculation

C: Problems in context. Measures with decimals. Reading scales

E: Accuracy of measurement

Lesson Plan 97

Activity

Notes

1

Time

What do these units measure? (time) Let's fill in the missing numbers. Ps come to BB to write numbers, explaining reasoning. Class points out errors. Ask Ps to say the decimal answers as fractions too.

BB:

a) 1 hour = $\boxed{60}$ min	b) 0.1 of an hour = $\boxed{6}$ min
c) 0.2 of an hour = $\boxed{12}$ min	d) 0.9 of an hour = $\boxed{54}$ min
e) 1.3 hours = $\boxed{78}$ min	f) 2.5 hours = $\boxed{150}$ min
g) 6 min = $\boxed{0.1}$ of an hour	h) 18 min = $\boxed{0.3}$ of an hour
i) 90 min = $\boxed{1.5}$ hours	j) 3 min = $\boxed{0.05}$ of an hour
k) 9 min = $\boxed{0.15}$ of an hour $(= \frac{15}{100}\text{ h} = \frac{3}{20}\text{ h})$	l) 45 min = $\boxed{0.75}$ of an hour $(= \frac{75}{100}\text{ h} = \frac{3}{4}\text{ h})$

Whole class activity

Written on BB or SB or use enlarged copy master or OHP

Reasoning, agreement, praising

Encourage Ps to look for relationships to make the calculations easier. e.g.

$$0.1 \text{ of an hour } = \frac{1}{10} \text{ of } 60 \text{ min} = \underline{6 \text{ min}}$$

$$0.9 \text{ of an hour } = 6 \text{ min} \times 9 = \underline{54 \text{ min}}$$

$$6 \text{ min} = \underline{0.1} \text{ of an hour}$$

$$3 \text{ min} = 0.1 \div 2 = \underline{0.05} \text{ (h)}$$

$$9 \text{ min} = 0.05 \times 3 = \underline{0.15} \text{ (h)}$$

5 min

2

Problem

Listen carefully, note the data in your *Ex. Bks* and think about how you would work out the answer.

I worked in the garden for 2.4 hours then I sat on the grass to rest for 15 minutes. After that I continued working for another 1.8 hours,

a) For how many hours did I rest?

Who thinks they know what to do? Come and show us. Who agrees? Who can think of another way to do it? T helps where necessary.

BB: e.g. $15 \text{ min} = \frac{15}{60}\text{ h} = \frac{5}{20}\text{ h} = \frac{1}{4}\text{ h} \quad (= \frac{25}{100}\text{ h} = 0.25 \text{ h})$

<u>or</u> $6 \text{ min} = 0.1 \text{ of an hour}$

$3 \text{ min} = 0.1 \div 2 = 0.05 \text{ (h)}$

$15 \text{ min} = 0.05 \times 5 = \underline{0.25 \text{ (h)}}$

Answer: I rested for a quarter (or 0.25) of an hour.

b) For how many minutes did I work in the garden?

BB: e.g. $2.4 \text{ h} + 1.8 \text{ h} = 4.2 \text{ h} = 4 \times 60 \text{ min} + \frac{2}{10} \text{ of } 60 \text{ min}$

$= 240 \text{ min} + 12 \text{ min} = \underline{252 \text{ min}}$

<u>or</u> $2.4 \text{ h} + 1.8 \text{ h} = (120 + 24) \text{ min} + (60 + 48) \text{ min}$

$= 144 \text{ min} + 108 \text{ min} = \underline{252 \text{ min}}$

Answer: I worked for 252 minutes in the garden.

c) How much time did I spend in the garden altogether?

BB: $(2.4 \text{ h} + 1.8 \text{ h}) + 15 \text{ min} = 252 \text{ min} + 15 \text{ min} = 267 \text{ min}$

$= \underline{4 \text{ hours } 27 \text{ minutes}}$

Answer: I spent 4 hours 27 minutes in the garden altogether.

Discuss how time is usually expressed. (Not normally as decimals.)

Whole class activity

T repeats slowly to give Ps time to think.

(Or at each part, Ps who have an answer show it on scrap paper or slates in unison.

Ps with correct answers explain reasoning at BB.)

Discussion, reasoning, agreement, praising

T chooses a P to say the answer in a sentence.

or

0.1 of an hour = 6 min, so

0.2 of an hour = 12 min

as 0.4 of an hour = 24 min,

0.8 of an hour = 48 min

Extra praise if Ps notice that they can use the answer in b).

Would we normally be so accurate in real life?

(No, we would say that we had spent about 4 and a half hours in the garden.)

13 min

Bk5

Lesson Plan 97

Activity | *Notes*

3

Measurements

T chooses Ps to measure certain things with the appropriate measuring tools. Ps write measures on BB.

After each type of measurement, class discusses how accurate the tools can be and how accurate the written measures are.

a) T (Ps) uses a stop-watch to time Ps running to touch the BB and back to their seats.

BB: e.g 22 seconds (to the nearest second)

b) Ps weigh objects (e.g. book, pencil, ball) on scales in grams.

BB: e.g. Book: 232 g (to nearest g) ≈ 230 g (to nearest 10 g)

c) Ps measure length or width or height of objects with ruler or ruler and compasses.

BB: e.g. thickness of a book: 2.38 cm ≈ 2.4 cm = 24 mm

d) Ps measure angles with a protractor. (Revise degrees and angle minutes first if necessary.)

BB: e.g. $31° \; 17'$ (read as '31 degrees and 17 angle minutes', to the nearest angle minute)

≈ 31° (to the nearest degree)

Whole class activity

Involve as many Ps as possible in measuring and writing measures on BB and in the discussion following.

In good humour!

(to nearest mm)

BB: 1 whole turn = 360°
$1° = 60'$

22 min

4

Angles

What is the biggest unit we use to measure angles? (degrees) What is the next smaller unit? (angle minutes)

Can you guess what the next smaller unit is? (angle seconds)
How many angle seconds do you think are in an angle minute? (60)

Angle seconds are so tiny that we cannot see them and this unit is only used by scientists in written calculations.

It is possible to measure angle minutes with very precise equipment but we do not have it in the classroom! We must imagine each degree on the protractor divided into 60 equal parts, each part 1 angle minute.

Let's fill in the missing numbers. Ps come to BB to write numbers and explain reasoning. Class agrees/disagrees.

BB:

a) $1° = \boxed{60}\,'$ $\quad 0.1° = \boxed{6}\,'$ $\quad 0.2° = \boxed{12}\,'$

$0.9° = \boxed{54}\,'$ $\quad 1.3° = \boxed{78}\,'$ $\quad 2.5° = \boxed{150}\,'$

b) $6\,' = \boxed{0.1}\,°$ $\quad 18\,' = \boxed{0.3}\,°$ $\quad 90\,' = \boxed{1.5}\,°$

Whole class activity

BB: $1' = 60''$
(1 angle minute = 60 angle seconds)

Extra praise for Ps who guessed correctly.

Written on BB or SB or OHT

At a good pace

Reasoning, agreement, praising

Note similarity with time.

26 min

Activity | ***Notes***

5

Book 5, page 97

Q.1 Read: *A chemist was making up some medicine and measured out 3 different liquids very carefully in these quantities: 28 ml, 2.4 cl and 20.5 cl.*

How much liquid did he measure out altogether?

Set a time limit of 1 minute. Ps write a plan, do the calculation and write the answer as a sentence

Review with whole class. Ps come to BB to write operation and result. Who agrees? Who did it a different way? etc.
Mistakes discussed and corrected.

Solution:

Plan: 28 ml + 24 ml + 205 ml = 257 ml = <u>25.7 cl</u>

or 2.8 cl + 2.4 cl + 20.5 cl = <u>25.7 cl</u>

Answer: The chemist measured out 25.7 cl of liquid altogether.

Individual work, monitored, helped

(If possible, T has different coloured liquids already measured out to ive Ps an idea of the quantities involved.)

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

Reasoning, agreement, self-correction, praising

T chooses a P to read out the answer in a sentence.

29 min

6

Book 5, page 97

Q.2 Read: *Sally went shopping for an outfit for a wedding and made a list of what she had spent.*

Who has been to a wedding? Who was married? What did you wear? Did you buy anything new? If no P has, T tells briefly of own experience. (Show a photograph if possible!)

Deal with one part at a time or set a time limit. Ps read questions themselves and do what is asked.

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

Solution:

a) *Write the amounts in the place-value table and grid.*

BB:

1 hat: £38 99 p
1 dress: £40.50
1 pair of shoes: £26 70 p
1 handbag: £34.50

	H	T	U	t	h
		3	8	9	9
		4	0	5	0
		2	6	7	0
+		3	4	5	0
(£)	1	4	0	6	9
		2	2		

		3	8.	9	9
		4	0.	5	0
		2	6.	7	0
	+	3	4.	5	0
(£)	1	4	0.	6	9
		2	2		

b) *How much did Sally spend altogether?* (bottom row of table)

Answer: She spent £140.69 altogether.

c) *If Sally had £200 in her bank account at the start of her shopping trip, how much did she have left at the end?*

Plan: £200 – £140.69 =<u>£59.31</u> *C:*

		10	10	10	10
	2	0	0.	0	0
–	1_1	4_1	0_1.	6_1	9
		5	9.	3	1

Answer: Sally had £59.31 left at the end.

Individual work, monitored, (helped)

Initial brief discussion to set thescene. Involve several Ps.

Drawn on BB or use enlarged copy master or OHP

Discussion, reasoning, agreeement, self-correction, praising

Feedback for T

Extension

T points to each item in turn and Ps say its price in pence, then how many pence spent altogether and how many pence are left.

34 min

Activity

Notes

7

Book 5, page 97

Q.3 Read: *Use the diagram to help you do this addition in different ways. Calculate using:*

a) fractions, b) decimals, c) percentages.

BB: $\frac{1}{5} + 0.3 + \frac{17}{100} + \frac{1}{10} + 0.21$

If possible, less able Ps have larger 10 by 10 grid on desks so that they can colour the parts more easily. Deal with one part at a time and set a time limit.

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

Solution:

a) <u>Fractions</u>:

$$\frac{1}{5} + \frac{3}{10} + \frac{17}{100} + \frac{1}{10} + \frac{21}{100} = \frac{20 + 30 + 17 + 10 + 21}{100}$$

$$= \underline{\frac{98}{100}}$$

b) <u>Decimals</u>: 0.2 + 0.3 + 0.17 + 0.1 + 0.21 = 0.6 + 0.38 = <u>0.98</u>

c) <u>Percentages</u>: 20% + 30% + 17% + 10% + 21% = <u>98%</u>

Extension

If we colour all the parts mentioned, what part of the square is left uncoloured? Ps give the answer in the 3 forms.

Uncoloured: $1 - \frac{98}{100} = \frac{2}{100}$ $\left(= \frac{1}{50}\right)$

$1 - 0.98 = \underline{0.02}$

$100\% - 98\% = \underline{2\%}$

Individual work, monitored helped

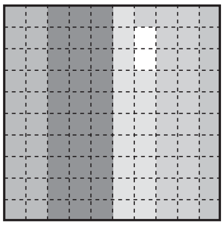
Grid squares drawn on BB or use enlarged copy master from *LP 89/1b*,

Use copy master for *LP 89/1a*

Reasoning (referring to diagram), agreement, self-correction, praising

(Add terms in groups of tenths and hundredths)

BB:



39 min

8

Book 5, page 97, Q.4

Read: *Solve the problems in your exercise book. Write only the answers here.*

Deal with one part at a time. T chooses a P to read the problem and Ps come to BB to draw a diagram (with T's help), write a plan and calculate the result. Who agrees? Who would do it another way? etc.

T chooses Ps to say the answers in a sentence.

Solution:

a) *A rectangular games court has sides of length 45.8 m and 15.6 m. How long is the fence around it if the gate is 2.2 m wide?*

BB: (45.8 m + 15.6 m) × 2 – 2.2 m

= 61.4 m × 2 – 2.2 m

= 122.8 m – 2.2 m = <u>120.6 m</u>

or Perimeter: (45.8 m + 15.6 m) × 2 = 61.4 m × 2 = 122.8 m

Length of fence: 122.8 m – 2.2 m = <u>120.6 m</u>

Answer: The length of the fence is 120.6 m.

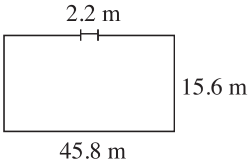
Whole class activity

(or individual trial first if Ps wish and there is time)

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

Ps could write solutions in *Ex. Bks.* at the same time.

BB:



$$\begin{array}{r} 45.8 \\ +\ 15.6 \\ \hline 61.4 \\ {\scriptstyle 1\ 1\ \ } \end{array}$$

Bk5		*Lesson Plan 97*
Activity		***Notes***
8	(Continued) b) *The price of a bottle of medicine is £11.80, which includes the cost of the bottle If the bottle costs £5.20 less than the medicine, how much are you paying for:* *i) the medicine ii) the bottle?* BB: e.g. B + M = £11.80, B = M – £5.20 We replace B in the first formula with B = M – £5.20 to give (M – £5.20) + M = £11.80 Adding £5.20 to both sides of the equation gives (M – £5.20) + M + £5.20 = £11.80 + £5.20 giving M + M = £17.00 i) M = £17.00 ÷ 2 = <u>£8.50</u> ii) B = £8.50 – £5.20 = <u>£3.30</u> *Answer:* You are paying £8.50 for the medicine and £3.30 for the bottle.	Let the bottle be B and the medicine be M. T helps with the calculations and reasoning. Ps write the method they understand best in *Ex. Bks*. *Check:* £8.50 – £3.30 = £5.20 ✓ £8.50 + £3.30 = £11.80 ✓
	45 min	

Bk5

R: Whole numbers, fractions and decimals

C: Multiplying and dividing by 10 or 100

E: Multiplying or dividing by 1000

Lesson Plan 98

Activity

Notes

1

Sequences

T writes the first 3 terms of a sequence on BB. Ps dictate the following terms, calculating on scrap paper or slates if they cannot do it mentally. T decides when to stop and asks final P to give the rule.

BB:

a) 1.2, 2.4, 3.6, (4.8, 6, 7.2, 8.4, 9.6, 10.8, 12, . . .) [+ 1.2]

b) 1.2, 2.4, 4.8, (9.6, 19.2, 38.4, 76.8, 153.6, . . .) [× 2]

c) $\frac{1}{10\,000}$, $\frac{1}{1000}$, $\frac{1}{100}$, ($\frac{1}{10}$, 1, 10, 100, 1000, . . .) [× 10]

d) 58 600, 5860, 586, (58.6, 5.86, 0.586, 0.0586, . . .) [÷ 10]

Whole class activity

T chooses Ps at random.

In good humour!

At fast pace

Agreement, praising

Feedback for T

5 min

2

Decimals and fractions

a) Let's write this decimal as the sum of a whole number and fractions before we do the multiplication, then change it back to a decimal.

Ps come to BB or dictate what T should write. Class points out errors. Before Ps do the multiplication, ask them to estimate first.

$$\text{BB: } 3.497 \times 100 = \left(3 + \frac{4}{10} + \frac{9}{100} + \frac{7}{1000}\right) \times 100$$

$$= 300 + 40 + 9 + \frac{7}{10} = \underline{349.7}$$

Let's compare 3.497 and 349.7. What do you notice? (Each digit has moved 2 place-values to the left.)

b) Let's write this decimal as the sum of whole numbers and a fraction before we do the division. Ps come to BB or dictate what T should write. Class points out errors. Before doing the division, ask Ps to estimate result first.

$$\text{BB: } 6082.5 \div 100 = \left(6000 + 80 + 2 + \frac{5}{10}\right) \div 100$$

$$= 60 + \frac{8}{10} + \frac{2}{100} + \frac{5}{1000} = \underline{60.825}$$

Let's compare 6082.5 and 60.825. What do you notice? (Each digit has moved 2 place-values to the right.)

Whole class activity

BB: 3.497 × 100 =

Reasoning, agreement, praising

E: 3.5 × 100 = 350

Multiply each term of the addition by 100.

Check result against estimate.

Show in a place-value table.

BB: 6082.5 ÷ 100

E: 6000 ÷ 100 = 60

Divide each term of the addition by 100.

Check result against estimate.

Show in a place-value table.

10 min

3

Quantities

Let's fill in the missing numbers. Ps come to BB to write numbers, explaining reasoning. Class agrees/disagrees.

a) 26150 mm = $\boxed{2615}$ cm = $\boxed{26.15}$ m (= 0.02615 km)

b) 789 ml = $\boxed{78.9}$ cl = $\boxed{0.789}$ litres

c) 6370 g = $\boxed{6.370}$ kg

d) 1.843 kg = $\boxed{1843}$ g

e) 4.518 m = $\boxed{451.8}$ cm = $\boxed{4518}$ mm

f) 3.601 litres = $\boxed{360.1}$ cl = $\boxed{3601}$ ml

g) 5.8 m = $\boxed{580}$ cm = $\boxed{5800}$ mm

Whole class activity

(or Ps write in *Ex. Bks* first, then review with whole class)

Written on BB or use enlarged copy master or OHP

At a good pace

Reasoning, agreement, praising

Note how the digits move to greater and lower place-values.

If problems or disagreement, show in a place-value table drawn on BB.

Feedback for T

18 min

Bk5

Lesson Plan 98

Activity

Notes

4

Book 5, page 98

Q.1 Read: *Write each addition as a multiplication and calculate the result.*

Set a time limit of 2 minutes. Review with whole class. Ps come to BB or dictate to T. Class agrees/disagrees. Mistakes discussed and corrected.

Solution:

a) 0.3 + 0.3 + 0.3 + 0.3 + 0.3 + 0.3 + 0.3 + 0.3 + 0.3 + 0.3

[= 0.3 × 10 = <u>3</u>]

b) 15.7 + 15.7 + 15.7 + 15.7 + 15.7 + 15.7 + 15.7 + 15.7 + 15.7 + 15.7

[15.7 × 10 = <u>157</u>]

Individual work, monitored

Written on BB or SB or OHT

Reasoning, agreement, self-correction, praising

Elicit that when a number is multiplied by 10, each of its digits moves to the next greater place-value.

21 min

5

Book 5, page 98

Q.2 Read: *If a sheet of paper is 0.12 mm thick, what is the thickness in mm of these amounts of paper? Write the measures in the place-value table.*

Set a time limit. Ps write operations and write results in table.

Review with whole class. Ps come to BB or dictate to T, explaining reasoning. Class agrees/disagrees. Mistakes discussed and corrected. Elicit how the digits have moved columns.

(When a number is multiplied by 10, each of its digits is moved to the next <u>greater</u> place-value.)

Solution:

		Th	H	T	U	t	h
a 10 sheet notepad:	0.12 × 10 = 1.2 (mm)				1	2	
a 100 leaf exercise book:	0.12 × 100 = 12 (mm)			1	2		
a 1000 leaf encyclopaedia:	0.12 × 1000 = 120 (mm)		1	2	0		
a 10 000 sheet pack of paper:	0.12 × 10 000 = 1200 (mm)	1	2	0	0		

Individual work, monitored, helped

Drawn on BB or use enlarged copy master or OHP

Reasoning, agreement, self-correction, praising

Extension

What are the thicknesses in cm (m)?

(e.g. 1.2 mm = 0.12 cm)

26 min

6

Book 5, page 98

Q.3 Read: *100 equal-sized pearls weigh 480 g. How much do 10 such pearls weigh? How much does 1 such pearl weigh? Write the weights in the table, then write divisions about them.*

Set a time limit. Ps complete table and write operations.

Review with whole class. Ps come to BB or dictate to T, explaining reasoning. Class agrees/disagrees. Mistakes discussed and corrected. Elicit how the digits have moved columns.

(When a number is divided by 10, each of its digits is moved to the next <u>smaller</u> place-value.)

Solution:

	H	T	U	t	h	
100 pearls:	4	8	0			480 ÷ 1 = 480 (g)
10 pearls:		4	8			480 ÷ 10 = 48 (g)
1 pearl:			4	8		480 ÷ 100 = 4.8 (g)

Extension

If we change the unit of measure to kg, what would the place-value table look like then? Ps come to BB to draw and complete new table, with help of rest of class.

Individual work, monitored, helped

Drawn on BB or use enlarged copy master or OHP

(T could have real pearls to show to class and discuss briefly how they are made and collected.)

Discussion, reasoning, agreement, self-correction, praising

BB:

In kg:

	U	t	h	th	t th
100 pearls:	0	4	8		
10 pearls:	0	0	4	8	
1 pearl:	0	0	0	4	8

31 min

Activity *Notes*

7

Book 5, page 98, Q.4

T reads out one question at a time. Ps calculate mentally or on scrap paper or slates, then show result on command. P answering correctly explains to Ps who were wrong by writing an operation on BB. Mistakes discussed. Ps write correct numbers in boxes in *Pbs*.

Solution:

a) i) 70 p = £0.7

$£0.7 \times 10 = \underline{£7}$, $£0.7 \times 100 = \underline{£70}$, $£0.7 \times 1000 = \underline{£700}$

or $70\text{ p} \times 10 = 700\text{ p} = \underline{£7}$, etc.

ii) £2 70 p = £2.70

$£2.70 \times 10 = \underline{£27}$, $£2.70 \times 100 = \underline{£270}$,

$£2.70 \times 1000 = \underline{£2700}$

b) i) $£630 \div 10 = \underline{£63}$, $£630 \div 100 = \underline{£6.30}$,

$£630 \div 1000 = \underline{£0.63}$

ii) £47 50 p = £47.50

$£47.50 \div 10 = \underline{£4.75}$, $£47.50 \div 100 = \underline{£0.475}$

Elicit that in real life £0.475 is impossible. It can only be £0.47 or £0.48, i.e. 47 p or 48 p, as 1 p is the smallest coin. Which do you think it is? (48 p, as 5 rounds up to next greater place value)

$£47.50 \div 1000 = \underline{£0.0475}$

Again, elicit that in real life it can only be be £0.04 or £0.05, i.e. 4 p or 5 p. Which do you think it is? (It rounds up to 5 p.)

Whole class activity but individual calculation

(or individual trial first under a time limit, reviewed with whole class)

Written on BB or use enlarged copy master or OHP

Responses shown in unison.

Reasoning, agreement, (self-correction), praising

Show in a place value table if problems or disagreement.

Extra praise if Ps point this out, otherwise T asks what coins would make up the amount.

Discussion, agreement, praising

39 min

8

Book 5, page 98

Q.5 Read: *Practise calculation.*

How many calculations are there? ($3 \times 4 = \underline{12}$)

Let's see how many you can do in 3 minutes!
Start . . . now! . . . Stop!

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

Stand up if you had all 12 correct! Let's give them 3 cheers!

Solution:

a) $0.3 \times 100 = \underline{30}$ b) $3.45 \times 10 = \underline{34.5}$

c) $605 \div 100 = \underline{6.05}$ d) $574 \div 10 = \underline{57.4}$

e) $0.87 \times 10 = \underline{8.7}$ f) $0.303 \times 100 = \underline{30.3}$

g) $1.39 \div 10 = \underline{0.139}$ h) $45.7 \div 100 = \underline{0.457}$

i) $0.07 \times 10 = \underline{0.7}$ j) $0.05 \times 100 = \underline{5}$

k) $0.81 \div 10 = \underline{0.081}$ l) $30.06 \div 10 = \underline{3.006}$

Individual work, monitored

Written on BB or use enlarged copy master or OHP

Differentiation by time limit.

Reasoning, e.g.

a) '100 times 3 tenths
= 300 tenths = 30'

or 'To multiply 0.3 by 100, I move each digit 2 place-values to the left.'

Agreement, self-correction, praising

Show in a place-value table if problems or disagreement.

Feedback for T

45 min

Bk5

R: Mental and written procedures
C: Multiplying a decimal by a natural number
E: Problems in context

Lesson Plan 99

Activity | *Notes*

1

Multiplication

Let's think of different ways to calculate these sums Ps suggest ways.

a) BB: $5.3 + 5.3 = (10.6)$

or $5.3 \times 2 = (5 + \frac{3}{10}) \times 2 = 10 + \frac{6}{10} = \underline{10.6}$

$$\begin{array}{r} 5.3 \\ +\,5.3 \\ \hline 10.6 \end{array}$$

T: If the amount was 5.3 cm, we could change it to mm and do the multiplication with natural numbers, then change back to cm.

BB: 5.3 cm = 53 mm

$$\begin{array}{r} 53 \\ \times\,2 \\ \hline 106 \end{array} \text{ (mm)} = \underline{10.6 \text{ cm}}$$

T: Or we could multiply with decimals like this.

BB:

$$\begin{array}{r} 5.3 \\ \times\,2 \\ \hline 10.6 \end{array}$$

2 times 3 tenths = <u>6</u> tenths
I write 6 in the tenths column in the answer
2 times 5 units = 10 units, so I write 0 in the units column and 1 in the tens column.

b) Let's do this sum in the same kinds of ways.

BB: $5.3 + 5.3 + 5.3 + 5.3 + 5.3 = (26.5)$

or $5.3 \times 5 = (5 + \frac{3}{10}) \times 5 = 25 + \frac{15}{10} = 26 + \frac{5}{10} = \underline{26.5}$

or 5.3 cm = 53 mm or multiplying with decimals:

$$\begin{array}{r} 53 \\ \times\,5 \\ \hline 265 \\ {\scriptstyle 1} \end{array} \text{ (mm)} = \underline{26.5 \text{ cm}} \qquad \begin{array}{r} 5.3 \\ \times\,5 \\ \hline 26.5 \\ {\scriptstyle 1} \end{array}$$

Whole class activity

T gives hints if Ps cannot think of any.

Reasoning, agreement, praising

Ps dictate what T should write, reasoning with place-value detail.

T starts reasoning and Ps continue it.

T points out that the product should have the same number of digits after the decimal point as the multiplicand.

BB:

$$\begin{array}{r} 5.3 \\ 5.3 \\ 5.3 \\ 5.3 \\ +\,5.3 \\ \hline 26.5 \\ {\scriptstyle 1} \end{array}$$

T helps where necessary.

5 min

2

Mental multiplication

Let' see if you can do these calculations mentally. Ps come BB to write products, reasoning loudly with place-value details. Class agreesdisagrees.

BB:

a) $21 \times 4 = \underline{84}$
$2.1 \times 4 = \underline{8.4}$

b) $63 \times 2 = \underline{126}$
$6.3 \times 2 = \underline{12.6}$

c) $2 \times 4 = \underline{8}$
$0.2 \times 4 = \underline{0.8}$

d) $43 \times 4 = \underline{172}$
$4.3 \times 4 = \underline{17.2}$

e) $7 \times 9 = \underline{63}$
$0.09 \times 7 = \underline{0.63}$

f) $9 \times 6 = \underline{54}$
$0.09 \times 6 = \underline{0.54}$

g) $203 \times 4 = \underline{812}$
$2.03 \times 4 = \underline{8.12}$

h) $11 \times 11 = \underline{121}$
$0.11 \times 11 = \underline{1.21}$

Who can explain how to multiply a decimal by a natural number?
T asks several Ps what they think, then repeats in a clear way.

'We multiply a decimal number by a natural number in the same way as we multiply a natural number by a natural number. Then we must mark the decimal point so that there is the same number of decimal digits in the product as there is in the multiplicand.'

Whole class activity

Written on BB or use enlarged copy master or OHP

Reasoning, e.g. 6.3×2:
2 times 6 is 12, 2×0.3 is 0.6, $12 + 0.6 = \underline{12.6}$'

Agreement, praising

Discussion, agreement, praising

Elicit that the <u>multiplicand</u> is the number being multiplied.

Class repeats in unison.

15 min

Bk5

Lesson Plan 99

Activity | **Notes**

3

Book 5, page 99

Q.1 Read: *Write each operation in a shorter way and calculate the result.*

Elicit that the shorter way is multiplication. Set a time limit.

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

Solution:

a) $2.7 + 2.7 + 2.7 + 2.7 = 2.7 \times 4$

$= 2 \times 4 + 0.7 \times 4 = 8 + 2.8 = \underline{10.8}$

or $2.7 \times 4 = (2 + \frac{7}{10}) \times 4 = 8 + \frac{28}{10} = 10 + \frac{8}{10} = \underline{10.8}$

b) $13.26 + 13.26 + 13.26 + 13.26 + 13.26 = 13.26 \times 5$

$= 13 \times 5 + 0.26 \times 5 = 65 + (\frac{26}{100} \times 5)$

$= 65 + \frac{130}{100} = 66 + \frac{30}{100} = \underline{66.3}$

or
$$\begin{array}{r} 13.26 \\ \times\ 5 \\ \hline 30 \\ 10 \\ 15 \\ +\ 5 \\ \hline 66.30 \end{array}$$

or
$$\begin{array}{r} 13.26 \\ \times\ 5 \\ \hline 66.30 \\ {\scriptstyle 1\ 3} \end{array}$$

'5 times 6h = 30h = 3t + 0h

I write 0 in the hundredths column and write 3 below the tenths column.' etc.

c) $0.83 + 0.83 + 0.83 = 0.83 \times 3 = \frac{8}{10} \times 3 + \frac{3}{100} \times 3$

$= \frac{24}{10} + \frac{9}{100} = 2 + \frac{4}{10} + \frac{9}{100} = \underline{2.49}$

If problems or disagreement, check by doing the addition.

Check:
$$\begin{array}{r} 0.83 \\ 0.83 \\ +\ 0.83 \\ \hline 2.49 \end{array}$$

23 min

Individual work, monitored, helped

Written on BB or SB or OHT

Reasoning, agreement, self-correction, praising

Accept any correct form of multiplication but also show the vertical form with decimals as shown below.

or
$$\begin{array}{r} 2.7 \\ \times\ 4 \\ \hline 10.8 \\ {\scriptstyle 2} \end{array}$$

Reasoning: e.g.

'4 times 7t = 28t = 2U + 8t

I write 8 in the tenths column and write 2 below the units column.

4 times 2U = 8U;

8U + 2U = 10U = 1T + 0U

I write 0 in the units column and 1 in the tens column.

As 2.7 has 1 decimal digit, I mark the decimal point between the 0 and the 8 in the product.'

or
$$\begin{array}{r} 0.83 \\ \times\ 3 \\ \hline 9 \\ +\ 24 \\ \hline 2.49 \end{array}$$

or
$$\begin{array}{r} 0.83 \\ \times\ 3 \\ \hline 2.49 \end{array}$$

4

Book 5, page 99

Q.2 Deal with one part at a time or set a time limit. Ps read problems themselves, write an operation and calculate the result.

Review with whole class. Ps could show result 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 a different way? etc. Mistakes discussed and corrected.

Solution: e.g.

a) *The length of each side of a square is 52.4 cm. Write the length of its perimeter in cm, mm and metres.*

$P = 52.4 \text{ cm} \times 4 = \underline{209.6 \text{ cm}} = \underline{2096 \text{ mm}} = \underline{2.096 \text{ m}}$

b) *The length of the sides of a rectangle are $b = 6.42$ cm and $a = 2 \times b$. What is the length of its perimeter?*

$P = (6.42 \text{ cm} + 12.84 \text{ cm}) \times 2 = 19.26 \text{ cm} \times 2 = \underline{38.52 \text{ cm}}$

or $P = (a + b) \times 2 = 3a \times 2 = 6a = 6.42 \text{ cm} \times 6 = \underline{38.52 \text{ cm}}$

29 min

Individual work, monitored, helped

Diagrams drawn on BB.

Reasoning, agreement, self-correction, praising

Accept any valid method.

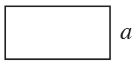
BB:

a)

$a = 52.4$ cm

$$\begin{array}{r} 52.4 \\ \times\ 4 \\ \hline 209.6 \\ {\scriptstyle 1} \end{array}$$

b)



$b = 2a$

$$\begin{array}{r} 19.26 \\ \times\ 2 \\ \hline 38.52 \\ {\scriptstyle 1\ \ \ 1} \end{array}$$

or
$$\begin{array}{r} 6.42 \\ \times\ 6 \\ \hline 38.52 \\ {\scriptstyle 2\ 1} \end{array}$$

Activity

Notes

5

Book 5, page 99

Q.3 Read: *Calculate the products. Estimate the result mentally first.*

Ps write estimates (rounding to the nearest whole number) above calculations in *Pbs* and check results against them.
Set a time limit

Review with whole class. Ps come to BB to show solutions, reasoning with place-value detail. Class agrees/disagrees. Mistakes discussed and corrected.

What do you notice about the mulipliers? (Not in their correct place-value column) T tells Ps that it is not necessary to write the multiplier in the correct place-value column, as we are not adding or subtracting and it does not affect the result. T shows the multiplications written with multipliers in correct column. Ps decide which version they find easier to work with.

Solution:

E: 8 × 3 = 24 *E:* 6 × 5 = 25 *E:* 15 × 7 = 105 *E:* 102 × 11 = 1122

a) $\begin{array}{ccc} & 8. & 1\\ & \times & 3\\ \hline 2 & 4. & 3\\ \hline \end{array}$ b) $\begin{array}{cccc} & 5. & 6 & 2\\ & & \times & 5\\ \hline 2 & 8. & 0 & 0\\ \hline & 3 & 1 & \end{array}$ c) $\begin{array}{ccccc} & 1 & 5. & 0 & 6\\ & & & \times & 7\\ \hline 1 & 0 & 5. & 4 & 2\\ \hline & 3 & & 4 & \end{array}$ d) $\begin{array}{cccccc} & 1 & 0 & 2. & 1 & 0\\ & & & \times & 1 & 1\\ \hline 1 & 1 & 2 & 3. & 1 & 0\\ \hline & & 2 & 1 & & \end{array}$

or with multipliers in corresponding place-value columns:

a) $\begin{array}{ccc} & 8. & 1\\ \times & 3 & \\ \hline 2 & 4. & 3\\ \hline \end{array}$ b) $\begin{array}{cccc} & 5. & 6 & 2\\ \times & 5 & & \\ \hline 2 & 8. & 0 & 0\\ \hline & 3 & 1 & \end{array}$ c) $\begin{array}{ccccc} & 1 & 5. & 0 & 6\\ & \times & 7 & & \\ \hline 1 & 0 & 5. & 4 & 2\\ \hline & 3 & & 4 & \end{array}$ d) $\begin{array}{cccccc} & 1 & 0 & 2. & 1 & 0\\ & \times & 1 & 1 & & \\ \hline 1 & 1 & 2 & 3. & 1 & 0\\ \hline & & 2 & 1 & & \end{array}$

34 min

Individual work, monitored, helped

Written on BB or use enlarged copy master or OHP

Reasoning, agreement, self-correction, praising

Feedback for T

Discussion on layout of multiplications.

Reiterate that when multiplying a decimal number by a natural number, the product must have the same number of decimal digits as the multiplicand.

6

Book 5, page 99

Q.4 Read: *Which is more? Calculate in your exercise book, then fill in the missing signs.*

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

Review with whole class. Ps come to BB to write values of LHS and RHS of inequality, then to write the missing sign. Class agrees/disagrees. Mistakes discusssed and corrected.

Show details of calculations if problems or disagreement.

Solution:

a) 43 times 2.5 m $\boxed{<}$ 25 times 5.3 m

$\begin{array}{cccc} & & 2. & 5\\ & \times & 4 & 3\\ \hline & & 7 & 5\\ 1 & 0 & 0 & 0\\ \hline 1 & 0 & 7. & 5\\ \hline \end{array}$ (m) $\begin{array}{cccc} & & 5. & 3\\ & \times & 2 & 5\\ \hline & 2 & 6 & 5\\ 1 & 0 & 6 & 0\\ \hline 1 & 3 & 2. & 5\\ \hline & 1 & & \end{array}$ (m)

b) 0 times 197 kg $\boxed{=}$ 197 times 0 kg

(0 kg) (0 kg)

c) 12 times 4.8 litres $\boxed{=}$ 48 times 1.2 litres

$\begin{array}{ccc} & 4. & 8\\ \times & 1 & 2\\ \hline & 9 & 6\\ 4 & 8 & 0\\ \hline 5 & 7. & 6\\ \hline 1 & & \end{array}$ (litres) $\begin{array}{ccc} & 1. & 2\\ \times & 4 & 8\\ \hline & 9 & 6\\ 4 & 8 & 0\\ \hline 5 & 7. & 6\\ \hline 1 & & \end{array}$ (litres)

39 min

Individual work, monitored, helped

(or whole class activity if time is short)

Written on BB or SB or OHT
Discussion, reasoning, agreement, self-correction, praising

Extra praise if Ps reason correctly without doing the calculations in c):

4.8 × 12 = 1.2 × 48

(as 48 × 12 = 12 × 48, and products on LHS and RHS both have 1 digit after the decimal point)

Bk5

Lesson Plan 99

Activity

7

Book 5, page 99

Q.5 Read: *Solve the problems in your exercise book and write the answers in a sentence here.*

Deal with one at a time or set a time limit. Review with whole class. Ps could write answers on slates or scrap paper and show on command.

A, tell us how you worked it out. Who did the same? Who did it a different way? etc. Mistakes discussed and corrected.

T chooses a P to read the answer in a sentence.

Solution: e.g.

a) *Pete has £36 50 p. Olivia has twice as much and Sue has 3 times as much as Pete.*

If they all put all their money together, do they have enough to buy a television which costs £210?

P: £36.50, O: £36.50 × 2 = £73, S: £36.50 × 3 = £109.50

P + O + S: £36.50 + £73 + £109.50 = £219.00,

£219 > £210

or P + O + S = P + P × 2 + P × 3 = P × 6

£36.50 × 6 = £219.00, £219 > £210

Answer: Yes, they have enough to buy a television set.

b) *The units of measure used when measuring angles are degrees and minutes.*

If 1 degree equals 60 minutes, how many degrees is 6 times 12° 30 '?

Plan: $(12° + 30') \times 6 = 72° + 180' = 72° + 3° = 75°$

or $12°\ 30' = 12.5°,\ 12.5° \times 6 = 75°$

Answer: Six times 12 degrees 30 minutes is 75 degrees.

45 min

Notes

Individual work, monitored, helped

(or whole class activity, with Ps suggesting what to do first and how to continue)

Responses shown in unison (or can use pre-agreed actions for a))

Discusison, reasoning, agreement, self-correction, praising

BB:

$$\begin{array}{rr} & 109.50 \\ & 73.00 \\ + & 36.50 \\ \hline (£) & 219.00 \\ & {\scriptstyle 1\ 1\ 1\ \ \ \ \ } \end{array}$$

$$\begin{array}{rr} & 36.50 \\ & \times\ 6 \\ \hline (£) & 219.00 \\ & {\scriptstyle 3\ 3\ \ \ \ \ } \end{array}$$

$$\begin{array}{rl} 12.5 & \\ \times\ 6 & \\ \hline 75.0 & (°) \\ {\scriptstyle 1\ 3\ \ } & \end{array}$$

Bk5

R: (Mental) calculation

C: Multiplying decimals by natural numbers

E: Problems. Equations, inequalities

Lesson Plan 100

Activity

Notes

1

Sequences

Here are 3 terms of a sequence. Continue it for 3 more terms in either direction. Ps calculate mentally (or in *Ex. Bks* or on scrap paper or slates if necessary) and dictate terms to T. Class agrees/disagrees. What is the rule?

a) $(1.1,\ 1.8,\ 2.5),\ 3.2,\ 3.9,\ 4.6,\ (5.3,\ 6,\ 6.7)$ [+ 0.7]

b) $(14.4,\ 7.2,\ 3.6),\ 1.8,\ \frac{9}{10},\ \frac{9}{20},\ (\frac{9}{40},\ \frac{9}{80},\ \frac{9}{160})$ [÷ 2]

Elicit decimal forms too: 0.9, 0.45, (0.225, 0.1125, 0.05625)

c) $(\frac{3}{1000},\ \frac{9}{1000},\ \frac{27}{1000}),\ \frac{81}{1000},\ \frac{243}{1000},\ \frac{729}{1000},\ (\frac{2187}{1000},\ \frac{6561}{1000},\ \frac{19\,683}{1000})$ [× 3]

Elicit the decimal forms too:

0.003, 0.009, 0.027, 0.081, 0.243, 0.729, 2.187, 6.561, 19.683

Whole class activity

Given terms written in middle of BB or SB or OHT

(Terms given by Ps shown brackets)

At a good pace

Reasoning, agreement, praising

Feedback for T

6 min

2

Solving equations

Deal with one at a time. Pupils copy equation in *Ex. Bks* and try to solve it, checking that their solution makes the equation true. When Ps have an answer, they come to BB to explain to class. Class checks that they are correct. Elicit the general rule for solving such equations. Ask several Ps what they think, then repeat it more clearly if necessary.

BB:

a) $2 \times 0.9 - x = 0.7$

$1.8 - x = 0.7$

$x = 1.8 - 0.7 = \underline{1.1}$

Check: $\overset{1.8}{2 \times 0.9} - \underline{1.1} = 0.7$ ✓

To get the unknown subtrahend, subtract the difference from the reductant.

b) $y - 2.7 \div 3 = 1.5$

$y - 0.9 = 1.5$

$y = 1.5 + 0.9 = \underline{2.4}$

Check: $\underline{2.4} - \overset{0.9}{2.7 \div 3} = 1.5$ ✓

To get the unknown reductant, add the subtrahend to the difference.

c) $(u + 2.5) \div 3 = 5.9$

$u + 2.5 = 5.9 \times 3 = 17.7$

$u = 17.7 - 2.5 = \underline{15.2}$

Check: $\overset{17.7}{(\underline{15.2} + 2.5)} \div 3 = 5.9$ ✓

or $(15 + 2.7) \div 3 = 5 + 0.9 = 5.9$

Whole class activity

Written on BB or SB or OHT

Allow Ps 2 minutes for each part.

Encourage a logical solution rather than trial and error.

If several Ps have an answer, they could show to T on scrap paper or slates in unison on command.

Reasoning, agreement, praising

Generalise the rules. e.g.

If $a \div b = c$, then $a = b \times c$

If $a + b = c$, then $a = c - b$

14 min

3

Parts of quantities

a) *Let's calculate 0.7 of 63 kg.*

How could we do it? Ps come to BB or dictate to T.

BB: $0.7 \text{ of } 63 \text{ kg} = \frac{7}{10} \text{ of } 63 \text{ kg} = \boxed{63 \text{ kg} \div 10 \times 7}$

$= 6.3 \text{ kg} \times 7$

$= 42 \text{ kg} + 2.1 \text{ kg} = \underline{44.1 \text{ kg}}$

or using direct proportion:

$0.1 \text{ of } 63 \text{ kg} \rightarrow 63 \text{ kg} \div 10 = 6.3 \text{ kg}$

$0.7 \text{ of } 63 \text{ kg} \rightarrow \boxed{63 \text{ kg} \div 10 \times 7} = 6.3 \text{ kg} \times 7 = \underline{44.1 \text{ kg}}$

Whole class activity

Allow Ps to suggest methods of calculation.

Class agrees/disagrees.

T intervenes only if necessary.

Reasoning, agreement, praising

T highlights the important part of the operation.

Activity

Notes

3

(Continued)

b) *Let's multiply 63 by 0.7.*

Ps come to BB to write the calculation, explaining reasoning with place value detail. Class points out errors.

T: When we multiply a decimal by a natural number or a natural number by a decimal, we calculate as if both are natural numbers, then we mark the decimal point in the product so that it has the same number of decimal digits as the original decimal.

What do you notice about the result? [Same result as a)]

BB:

$$\begin{array}{r} 0.7 \\ \times\ 6\ 3 \\ \hline 2\ 1 \\ +\ 4\ 2\ 0 \\ \hline 4\ 4.1 \end{array} \quad \text{or} \quad \begin{array}{r} 6\ 3 \\ \times\ 0.7 \\ \hline 4\ 4.1 \\ {\scriptstyle 2}\ \ \end{array}$$

c) *Let's calculate 70% of 63 kg.*

Ps come to BB or dictate what T should write. T helps where necessary. Agree that 70% means 70 hundredths.

$$70\% \text{ of } 63 \text{ kg} = \frac{70}{100} \text{ of } 63 \text{ kg} = \boxed{63 \text{ kg} \div 100 \times 70}$$

$$= 0.63 \text{ kg} \times 70 = \underline{44.1 \text{ kg}}$$

or using direct proportion:

1% of 63 kg $\rightarrow$ $63 \text{ kg} \div 100 = 0.63 \text{ kg}$

70% of 63 kg $\rightarrow$ $63 \text{ kg} \div 100 \times 70 = 0.63 \text{ kg} \times 70 = \underline{44.1 \text{ kg}}$

or 10% of 63 kg $\rightarrow$ $63 \text{ kg} \div 10 = 6.3 \text{ kg}$

70% of 63 kg $\rightarrow$ $\boxed{63 \text{ kg} \div 10 \times 7} = 6.3 \text{ kg} \times 7 = \underline{44.1 \text{ kg}}$

What do you notice about the 3 results? Elicit that :

BB: 0.7 of $63 = 63 \times 0.7 = 70\%$ of $63 = 44.1$

19 min

BB:

$$\begin{array}{r} 0.6\ 3 \\ \times\ 7\ 0 \\ \hline 0\ 0\ 0 \\ +\ 4\ 4\ 1\ 0 \\ \hline 4\ 4.1\ 0 \end{array}$$

(as $\frac{70}{100} = \frac{7}{10}$) $\quad \begin{array}{r} 6.3 \\ \times\ 7 \\ \hline 4\ 4.1 \\ {\scriptstyle 2}\ \ \end{array}$

Agreement, praising

4

Inequalities

Which numbers could be written instead of the shapes? Accept and praise any valid numbers suggested by Ps, then T helps to find the whole solution. Class checks that the solution is correct.

BB:

a) $5 \times \square \leq 4$ (Ps might suggest 0, – 1, 0.1, 0.5, etc.)

$\square \leq 4 \div 5$ $\left(4 \div 5 = \frac{4}{5} = \frac{8}{10} = 0.8\right)$

$\square \leq \underline{0.8}$ *Check*: $5 \times 0.8 = 4$ ✓

b) $1.2 \times \bigcirc > 6$ (Ps might suggest 6, 7, 8, etc.)

$\bigcirc > 6 \div 1.2$ $(6 \div 1.2 = 60 \div 12 = 5)$

$\bigcirc > \underline{5}$ *Check:* $1.2 \times 5 = 6$ ✓

c) $9 < 3.2 \times \triangle < 33$ (Ps might suggest 3, 4, 5. etc.)

Lowest value: If $\triangle = 3$, $3.2 \times 3 = 9.6 > 9$

Greatest value: If $\triangle = 10$, $3.2 \times 10 = 32 < 33$

So $3 < \triangle < 10$

$\triangle$: 3, 4, 5, 6, 7, 8, 9, 10 (If $\triangle$ is a whole number)

25 min

Whole clas activity

Written on BB or SB or OHT

Discussion, reasoning, agreement, checking, praising

Involve as many Ps as possible.

(So any multiplier < 0.8 results in a product < 4.)

(So any multiplier > 5 results in a product > 6.)

This is best done by trial and error, as dividing 9 and 33 by 3.2 is too difficult at this stage, but if Ps suggest it, T could use a calculator and round appropriately: e.g.

$2.81 < \triangle < 10.31$

(correct to 2 decimal places)

Bk5

Lesson Plan 100

Activity

Notes

5

Book 5, Page 100

Q.1 Read: *Calculate the products.*

What do you notice about the multipliers here? (They are written in the appropriate place-value columns.)

Remind Ps to do each calculation as if the two numbers were both natural numbers, then to mark the decimal point in the product so that it has the same number of decimal digits as the multipliplicand. What should you do first? (Estimate the result as a check.) Set a time limit.

Review with whole class. Ps come to BB to estimate, do the calculations and explain reasoning with place-value details. Class agrees/ disagrees. Mistakes discussed and corrected.

Solution:

a) *E:* 3 × 3 = 9

$$\begin{array}{ccc} & 2. & 8 \\ \times & 3 & \\ \hline & 8. & 4 \\ \hline & 2 & \end{array}$$

b) *E:* 4 × 5 = 20

$$\begin{array}{cccc} & 4. & 3 & 6 \\ \times & 5 & & \\ \hline 2 & 1. & 8 & 0 \\ \hline & 1 & 3 & \end{array}$$

c) *E:* 20 × 7 = 140

$$\begin{array}{cccc} & 2 & 0. & 3 \\ & \times & 7 & \\ \hline 1 & 4 & 2. & 1 \\ \hline & & 2 & \end{array}$$

d) *E:* 30 × 60 = 1800

$$\begin{array}{cccccc} & & & 2 & 8. & 1 \\ & & \times & 5 & 9 & \\ \hline & & 2 & 5 & 2 & 9 \\ + & 1 & 4 & 0 & 5 & 0 \\ \hline & 1 & 6 & 5 & 7. & 9 \\ \hline \end{array}$$

e) *E:* 0.1 × 50 = 5

$$\begin{array}{ccccc} & & 0. & 0 & 6 \\ \times & 5 & 4 & & \\ \hline & & & 2 & 4 \\ + & & 3 & 0 & 0 \\ \hline & & 3. & 2 & 4 \\ \hline \end{array}$$

f) *E:* 24 × 100 = 2400

$$\begin{array}{ccccccc} & & & 2 & 4. & 3 & 2 \\ & \times & 1 & 0 & 9 & & \\ \hline & & 2 & 1 & 8 & 8 & 8 \\ + & 2 & 4 & 3 & 2 & 0 & 0 \\ \hline & 2 & 6 & 5 & 0. & 8 & 8 \\ \hline & & & 1 & & & \end{array}$$

Individual work, monitored, helped

Written on BB or use enlarged copy master or OHP

Differentiation by time limit.

Discussion, reasoning, agreement, self-correction, praising

Ask Ps what they think of this layout of multiplications. (Most Ps will probably find it easier to write the multiplier at the RHS.)

Agree that the result is the same in both cases, so it does not really matter – Ps should use the easiest layout.

31 min

6

Book 5, page 100

Q.2 Ps read problems themselves, then calculate in *Pbs* or in *Ex. Bks*. Set a time limit.

Review with whole class. Ps could show results on slates or scrap paper on command. Ps answering correctly show operation on BB. Class agrees/disagrees. Mistakes discussed and corrected.

Agree that: $\frac{3}{5} = \frac{6}{10} = 0.6 = \frac{60}{100} = 60\%$,

so all the questions are really the same!

Solution: (In one line as below, or in two steps as opposite)

a) $\frac{3}{5}$ of 840 m = 840 m ÷ 5 × 3 = 168 m × 3 = $\underline{504\text{ m}}$

b) 0.6 of 840 m = 840 m ÷ 10 × 6 = 84 m × 6 = $\underline{504\text{ m}}$

c) 60% of 840 m = 840 m ÷ 100 × 60 = 8.4 m × 60

= 84 m × 6 = $\underline{504\text{ m}}$

Individual work, monitored, helped

Responses shown in unison.

In good humour!

Reasoning, agreement, self-correction, praising

Extra praise for Ps who realised this!

a) $\frac{1}{5}$ of 840 m = 840 m ÷ 5

= 168 m

$\frac{3}{5}$ of 840 m = 168 m × 3

= $\underline{504\text{ m}}$

35 min

Activity ***Notes***

7

Book 5, page 100, Q.3

Read: *Which number am I thinking of? Write a plan and do the calculation.*

Deal with one part at a time. T chooses a P to read out the question. Rest of Ps write a plan and do calculation in *Ex. Bks,* then show their result on command. Ps answering correctly explain their reasoning to Ps who were wrong. Who did the same? Who did it a different way? etc. Ps who were wrong write correct plan and result in *Pbs*.

Solution:

a) *Half of the number I am thinking of is 2.3 more than 3.8. What is my number?*

Plan: $x \div 2 = 3.8 + 2.3 = 6.1$ or $\overset{6.1}{(3.8 + 2.3)} \times 2 = \underline{12.2}$

$x = 6.1 \times 2 = \underline{12.2}$

Check: Half of $\underline{12.2} = (12 + \frac{2}{10}) \div 2 = 6 + \frac{1}{10} = 6.1$

$6.1 - 2.3 = 3.8$ ✓

b) *If I subtract 10.4 from the number I am thinking of, the difference is 3 times 1.2. What is my number?*

Plan: $y - 10.4 = 1.2 \times 3 = 3.6$ or $\overset{3.6}{1.2 \times 3} + 10.4 = \underline{14}$

$y = 3.6 + 10.4 = \underline{14}$

Check: $14 - 10.4 = 3.6$, $3.6 \div 3 = 1.2$ ✓

c) *If I add 4.3 to the number I am thinking of, the sum is 5 times 2.3. What is my number?*

Plan: $z + 4.3 = 2.3 \times 5 = 11.5$ or $\overset{11.5}{2.3 \times 5} - 4.3 = \underline{7.2}$

$z = 11.5 - 4.3 = \underline{7.2}$

Check: $7.2 + 4.3 = 11.5$, $11.5 = 5 \times 2.3$ ✓

Whole class activity but individual calculation

P at front of class acts as the T, giving the command for Ps to show their results and choosing Ps with correct answer to explain their solutions.

Use a different P for each question.

T intervenes only if necessary.

In good humour!

Reasoning, agreement, self-correction, praising

Feedback for T

41 min

8

Book 5, Page 100, Q.4

Read: *Find a rule and complete the table. Write the rule in different ways.*

Agree on one form of the rule using the completed columns. Ps come to BB to choose a column and fill in the missing number, explaining reasoning. Class agrees/disagrees. Ps fill in table in *Pbs* too.
Who can write the rule in a mathematical way? Who can think of another way to write it? etc. Class checks rules mentally with values from table.

Solution:

a	0.4	1	$\frac{1}{3}$	4	$\mathbf{\frac{1}{7}}$	$\frac{2}{9}$	**0.7**	10.1	0.9	$-\frac{1}{2}$
b	2.4	6	2	**24**	$\frac{6}{7}$	$\mathbf{\frac{12}{9}}$	4.2	**60.6**	**5.4**	**– 3**

Rule: $b = 6 \times a$, $a = b \div 6$, $b \div a = 6$, $a \div b = \frac{1}{6}$

Whole class activity

(or individual trial first if Ps wish and there is time)

Drawn on BB or use enlarged copy master or OHP

Bold numbers are missing.

Reasoning, agreement, praising

(or Ps could write other forms of the rule for homework)

45 min

Bk5

R: Mental calculation

C: Dividing decimals by natural numbers

E: Pencil and paper procedures

Lesson Plan 101

Activity | *Notes*

1

Missing values

Study this table and think about what the rule could be. When they know the rule, Ps come to BB to choose a column and fill in the missing number but do not say the rule yet. Class agrees/disagrees.

BB:

a	0.4	30	2.1	$\frac{4}{5}$	**3**	**1.1**	$\mathbf{\frac{3}{20}}$	2.9	**0.2**	0.8
b	1.6	120	8.4	$\mathbf{3\frac{1}{5}}$	12	4.4	$\frac{3}{5}$	**11.6**	0.8	**3.2**

Who can write the rule? Who can write the rule another way? Class checks that the rule is correct by inserting values from the table.

BB: *Rule*: $b = 4 \times a$, so $a = b \div 4$, $b \div a = 4$, so $a \div b = \frac{1}{4}$

When checking, Ps might choose 'difficult' columns, e.g.

$b = 4 \times a$: $\frac{4}{5} \times 4 = \frac{16}{5} = 3\frac{1}{5}$; $a = b \div 4$: $\frac{3}{5} \div 4 = \frac{3}{20}$

T: Because we know that the rules are true, we can write the answers to these calculations even though we have not yet learned yet how to do them. Ps shout out the answers.

BB: $3\frac{1}{5} \div \frac{4}{5} = \frac{16}{5} \div \frac{4}{5} = (4)$ or $2.9 \div 11.6 = (\frac{1}{4})$

5 min

Whole class activity

Drawn on BB or use enlarged copy master or OHP

At a good pace

Discussion, reasoning, agreement, praising

Feedback for T

T helps if necessary.

Extra praise for Ps who are correct.

2

Sequence

Here are the first 3 terms of a sequence. What are the following terms? Ps try it in *Ex. Bks.* first them come to BB or dictate to T. Class agrees/disagrees. What rule did you use? Who agrees? Who used a different rule?

BB: 641.6, 320.8, 160.4, (80.2, 40.1, 20.05, 10.025, . . .)

Rule: Each following term is half of the previous term. [÷ 2]

Let's think about how we actually did the division. T starts first calculation and Ps continue it and do the others, explaining reasoning.

BB: $80.2 \div 2 = (80 + \frac{2}{10}) \div 2 = 80 \div 2 + \frac{2}{10} \div 2 = 40 + \frac{1}{10} = \underline{40.1}$

$40.1 \div 2 = (40 + \frac{1}{10}) \div 2 = 20 + \frac{1}{20} = 20 + \frac{5}{100} = \underline{20.05}$

$20.05 \div 2 = (20 + \frac{5}{100}) \div 2 = 10 + \frac{5}{200} = 10 + \frac{25}{1000} = \underline{10.025}$

10 min

Whole class activity

Terms wrtten on BB or SB or OHT

At a good pace

Reasoning, agreeement, praising

Ps come to BB or dictate what T should write.

Ps could copy in *Ex. Bks.* too.

Elicit that to divide a fraction by a natural number, either divide the numerator or multiply the denominator.

3

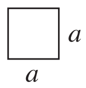
Problem

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

The length of the fence around a square garden is 612.8 m. How long is each side of the garden?

Ps come to BB to draw a diagram and to write a plan. Then Ps suggest different ways to do the calculation. (e.g. breaking up the number into easy mutliples of 4, or using fractions.) Class points out errors.

BB: e.g.



$P = 612.8 \text{ m} = 4 \times a$

$a = 612.8 \text{ m} \div 4 = (400 + 200 + 12 + 0.8) \div 4$

$= 100 + 50 + 3 + 0.2 = \underline{153.2}$ (m)

Whole class activity

T repeats slowly and a P repeats in own words to give class time to think.

Discussion, reasoning, agreement, praising

or BB:

$(612 + \frac{8}{10}) \div 4 = 153 + \frac{2}{10}$

$= \underline{153.2}$

Bk5

Lesson Plan 101

Activity

Notes

3

(Continued)

T suggests changing lengths to cm, thus doing a vertical division with natural numbers in the normal way, then changing the result back to m.

BB: 612.8 m = 61280 cm

15320 cm = <u>153.2 m</u>

$$\begin{array}{r|l} & 1\,5\,3\,2\,0 \text{ (cm)} \\ 4 & 6\,1\,2\,8\,0 \text{ (cm)} \\ & \;\;\,2\;\,1 \end{array}$$

Let's try to do the division in this way, but keeping the decimal point where it is. T starts explaining reasoning with place-value detail and Ps continue it when they understand. Ps write the division in *Ex. Bks*.

BB:

$$\begin{array}{r|l} & 1\,5\,3.2 \\ 4 & 6\,1\,2.8 \text{ (m)} \\ & \;\;\,2\;\,1 \end{array}$$

Check:

$$\begin{array}{r} 1\,5\,3.2 \\ \times\;\;4 \\ \hline 6\,1\,2.8 \text{ (m)} \;\checkmark \\ 2\;\,1\;\;\;\;\;\; \end{array}$$

Reasoning: e.g.

'6H ÷ 4 = <u>1H</u>, and 2H remain
2H + 1T = 21T
21T ÷ 4 = <u>5T</u> , and 1T remains
1T + 2U = 12U; 12U ÷ 4 = <u>3U</u>
8t ÷ 4 = <u>2t</u>'
and there is no remainder'

Answer: Each side of the garden is 153.2 m long.

Extra praise if a P suggests it!

Ps come to BB or dictate to T. Class points out errors.

Involve as many Ps as possible.

T writes 1 in the hundreds column in the answer and 2 below the hundreds column in the dividend. Ps follow the T's example.

Class says answer in a sentence in unison.

15 min

4

Book 5, page 101

Q.1 Read: *Practise mental division.*

Set a time limit of 3 minutes. Encourage Ps to check their results mentally with multiplication.

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

Solution:

a) i) 36 ÷ 9 = <u>4</u>, ii) 3.6 ÷ 9 = <u>0.4</u>, iii) 0.36 ÷ 9 = <u>0.04</u>
b) i) 56 ÷ 7 = <u>8</u>, ii) 5.6 ÷ 7 = <u>0.8</u>, iii) 0.56 ÷ 7 = <u>0.08</u>
c) i) 48 ÷ 6 = <u>8</u>, ii) 4.8 ÷ 6 = <u>0.8</u>, iii) 0.48 ÷ 6 = <u>0.08</u>
d) i) 96 ÷ 8 = <u>12</u>, ii) 9.6 ÷ 8 = <u>1.2</u> iii) 0.96 ÷ 8 = <u>0.12</u>

Individual work, monitored

Written on BB or SB or OHT

Differentiation by time limit

Reasoning, agreement, self-correction, praising

T asks Ps to show some divisions in fractional form. too. e.g.

BB: $\dfrac{48}{100} \div 6 = \dfrac{8}{100}$ (= 0.8)

20 min

5

Money model

T has appropriate amounts of model money on desk.

Let's stick 8 £10 notes, 1 £1 coin and 7 10 p coins on the BB.
How much money do they make up altogether?(£81 70 p)
What is the amount in £s? (£81.70 or £81.7)

Let's divide it into 5 equal parts. How could we do it? Ps suggest ways. T directs Ps thinking if necessary. (Start with the largest place-value, i.e. tens, divide them by 5, then change any remaining tens into the the next smallest place-value, i.e. units, etc.)

T (P) manipulates money on BB (Ps do the same on desks if possible), then T writes calculation on BB, explaining with place-value detail.

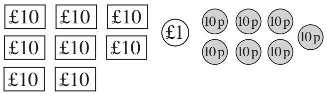
BB: 8 tens ÷ 5 = <u>1 ten</u> (1 £10 note moved into each of 5 groups, or given to each of 5 Ps)
– 5 tens (5 £10 notes used altogether)
3 tens (3 £10 notes remain)

We can change the 3 tens remaining into 30 units (£1 coins), add to the unit already there to make 31 units, then continue the division.

Whole class activity

Coins needed for the activity:
£10 (8); £1 (31); 10 p (17);
1 p (20) (or use copy master)

BB:



Ideally, Ps have model money on desks too and work in pairs.

If Ps have no ideas, T starts and Ps continue, following the T's example.

Discussion, reasoning, demonstration, agreement, praising

Bk5

Lesson Plan 101

Activity | **Notes**

5

(Continued)

BB: 31 units ÷ 5 = <u>6 units</u> (6 £1 coins put in each of the 5 groups)
– 30 units (30 £1 coins used altogether)
1 unit (1 £1 coin remains)

We can change the 1 unit remaining into 10 tenths (10 p), add to the 7 tenths aleady there to make 17 tenths and continue the division.

BB: 17 tenths ÷ 5 = <u>3 tenths</u> (3 10 p coins in each of the 5 groups)
– 15 tenths (15 10 p coins used altogether)
2 tenths (2 10 p coins remain)

We can change the 2 tenths remaining into 20 hundredths (1 p) and continue the division.

BB: 20 hundredths ÷ 5 = <u>4 hundredths</u> (4 1 p coins in each group)
– 20 hundredths (20 1 p coins used altogether)
0 hundredths (and no 1 p coins remain)

How much is in each group? (£16 34 p) How many pounds are in each group? (1 ten + 6 units + 3 tenths + 4 hundredths, i.e. (£) 16.34.

If we think of the amount as a decimal number rather than an amount of money, how would we write the division? (BB)

Let's write this calculation vertically as a long and a short division. What should we do first? (Estimate the result as a check)

Ps come to BB to estimate by rounding to nearest whole number, to write the long and short divisions , reasoning with place-value detail, and to check with a multiplication. Class points out errors.

BB: *Long division:*

	1	6.	3	4
5	8	1.	7	(0)
–	5			
	3	1		
–	3	0		
		1	7	
	–	1	5	
			2	0
		–	2	0
				0

81.7 ÷ 5 = <u>16.34</u>

E: 80 ÷ 5 = 16

Short division:

	1	6.	3	4
5	8	1.	7	0
	3	1	2	

Check:

1	6.	3	4	
×	5			
8	1.	7	0	✓
3	1	2		

At a quicker pace as Ps begin to understand the concept.

Each group:

BB: £81.70 ÷ 5 = <u>£16.34</u>

BB: 81.70 ÷ 5 = <u>16.34</u>
or 81.7 ÷ 5 = <u>16.34</u>

Ps suggest what to do and how to continue.

Grids drawn on BB or use enlarged copy master or OHP

Reasoning (with T's help where necessary), agreement, correcting, praising

Ps could write the divisions in *Ex. Bks* too.

Extension

Who can think of other ways to do the division? Ps suggest ways (or T gives hints or shows on BB if Ps cannot think of any and then asks if it is correct). e.g.

- Change the pounds to pence, do the division in the normal way, then change back to pounds (as opposite).
- Use fractions:

$$81.7 \div 5 = \left(81 + \frac{7}{10}\right) \div 5 = \left(80 + \frac{17}{10}\right) \div 5 = 16 + \frac{17}{10} \div 5$$

$$= 16 + \frac{17}{50} = 16 + \frac{34}{100} = \underline{16.34}$$

- $81.7 \div 5 = 817 \div 50 = (500 + 300 + 17) \div 50 = 10 + 6 + \frac{17}{50} \rightarrow$

Whole class activity

BB: £81.7 = 8170 p

In pence:

	1	6	3	4
5	8	1	7	0
	3	1	2	

1634 p = <u>£16.34</u>

$$= 16 + \frac{34}{100} = \underline{16.34}$$

26 min

Bk5

Lesson Plan 101

Activity

Notes

6

Book 5, page 101

Q.2 Read: *Estimate the result, do the division in two ways and check with a multiplication.*

Set a time limit. Ps estimate, do the long and short divisions, check with multiplication, compare with estimate, then write the result in the horizontal division and underline it.

Review with whole class. Ps come to BB to explain reasoning. Class agrees/disagrees. Mistakes discussed and corrected.

Solution:

Long division:

		1	8.	5
7	1	2	9.	5
–		7		
		5	9	
	–	5	6	
			3	5
		–	3	5
				0

129.5 ÷ 7 = $\underline{18.5}$

E: 140 ÷ 7 = 20 (known multiple of 7)

or 126 ÷ 7 = (70 + 56) ÷ 7 = 10 + 8 = 18

Short division:

			1	8.	5
	7	1	2	9.	5
			5	3	

Check:

	1	8.	5
	×	7	
1	2	9.	5
	5	3	

Who can explain how to divide a decimal by a natural number? T repeats in a clearer way if necessary. e.g.

'We divide a decimal by a natural number in the same way as we divide a natural number by a natural number but when we reach the decimal point in the dividend, we also mark it in the quotient.'

Individual work, monitored, helped

Drawn on BB or use enlarged copy master or OHP

If majority of Ps are struggling, stop individual work and continue as whole class activity.

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

Extension

(Extra work for quicker Ps.)

Do the division with fractions.

BB: $(129 + \frac{1}{2}) \div 7$

$= (70 + 56 + 3\frac{1}{2}) \div 7$

$= 10 + 8 + \frac{7}{2} \div 7$

$= 18 + \frac{1}{2} = \underline{18.5}$

30 min

7

Book 5, page 101, Q.3

Read: *Estimate the result, do the division in two ways and check with a multiplication.*

What do you notice about this division? (Almost the same as Q.2 but the dividend is 1 tenth more, so estimate can be the same.)

Ps come to BB to do long division, explaining with place-value detail. Class points out errors. When Ps have calculated the tenths and have a remainder of 1, T asks what the 1 actually means. (1 tenth) We could stop here and write BB: 129.6 ÷ 7 = 18.5, r 1 tenth

What else could we do? (Change the tenth to hundredths.) Elicit that 1 tenth = 10 hundredths, and there are no hundredths in the dividend to add on.)

Ps continue the division until there are 3 hundredths remaining. What could we do now? (Change the 3 hundredths to 30 thousandths.)

We could continue like this to the next smaller and smaller place-values until there is no remainder but we do not have time. Let's stop at the hundredths. Is it correct to say that the quotient is 18.51? (No, it is 18.51 and 3 hundredths.)

Let's do the short division and stop at the hundredths too. Ps come to BB or dictate to T, explaining reaosning with place-value detail. Class points out errors.

Ps then check result against estimate and by doing the muliplication and addition.

Whole class activity

(or individual trial first to see what Ps do with the remainder)

Drawn on BB or use enlarged copy master or OHP

At a good pace

Reasoning, agreement, praising

Discussion, agreement, praising

Ps write calculations in *Pbs* at the same time.

Activity

Notes

7

(Continued)

Solution:

Long division:

		1	8.	5	(1)
7	1	2	9.	6	(0)
–		7			
		5	9		
	–	5	6		
			3	6	
		–	3	5	
				①	0
			–		7
					③ . . .

129.6 ÷ 7 = <u>18.5</u>, r 1 tenth

or 129.6 ÷ 7 = <u>18.51</u>, r 3 hundredths

E: 140 ÷ 7 = 20

or 126 ÷ 7 = (70 + 56) ÷ 7 = 10 + 8 = 18

Short division:

		1	8.	5	1
7	1	2	9.	6	0 . . .
		5	3	1	③

Check:

		1	8.	5	1
		×	7		
	1	2	9.	5	7
+			0.	0	3
	1	2	9.	6	0 ✓

Agree that 18.51 is more accurate than 18.5.

Agree that 3 hundredths is 0.03.

We can say that: 129.6 ÷ 7 is 18.51, r 3 hundredths,

or 129.6 ÷ 7 is 18.51, to the nearest 100th,
(as 18.51 + 3 hundredths is nearer 18.51 than 18.52)

or 129.6 ÷ 7 is 18.51, to 2 decimal places,
(as there are 2 decimal digits after the decimal point.)

Which answer is <u>exact</u>? (129.6 ÷ 7 = 18.51, r 3 hundredtedths)
Agree that the other 2 answers are approximate.

Do not expect Ps to learn this vocabulary for approximation yet – just to start to become familiar wth it.

36 min

8

Book 5, page 101

Q.4 Read: *Do the divisions in your exercise book. Continue each division until the result is 0.*

Deal with one row at a time. Set a time limit. Ps estimate result mentally first, then write long or short divisions in squared *Ex. Bks.* and check with multiplications.

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

Solution:

a) i) $\begin{array}{r} 474 \\ 4\overline{)1896} \\ 21 \end{array}$ ii) $\begin{array}{r} 47.4 \\ 4\overline{)189.6} \\ 21 \end{array}$ iii) $\begin{array}{r} 4.74 \\ 4\overline{)18.96} \\ 21 \end{array}$ iv) $\begin{array}{r} 0.474 \\ 4\overline{)1.896} \\ 21 \end{array}$

b) i) 600 ÷ 8 ii) 60 ÷ 8 iii) 6 ÷ 8 iv) 0.6 ÷ 8

$\begin{array}{r} 75 \\ 8\overline{)600} \\ 4 \end{array}$ $\begin{array}{r} 7.5 \\ 8\overline{)60.0} \\ 4 \end{array}$ $\begin{array}{r} 0.75 \\ 8\overline{)6.00} \\ 4 \end{array}$ $\begin{array}{r} 0.075 \\ 8\overline{)0.600} \\ 4 \end{array}$

Extension

Ps say the quotients as fractions or <u>mixed numbers</u> (i.e. whole numbers and fractions.

Individual work, monitored, helped

(or do part a) i) with whole class first if Ps are unsure)

Written on BB or SB or OHT

Reasoning , agreement, self-correction, praising

Agree that as there are no remainders, the quotients are exact.

Feedback for T

40 min

9

Book 5, page 101

Q.5 Read: *Write a plan, estimate, calculate, check and write the answer in a sentence.*

A 2.88 m length of ribbon is cut into 3 equal parts. How long is each part?

Set a time limit. Review with whole class. Ps could show result on scrap paper or slates on command. P answering correctly explains solution at BB. Who agrees? Who did it a different way? etc. Mistakes discussed and corrected.

T chooses a P to say the answer in a sentence.

Individual work, monitored

Reasoning, agreement, self-correction, praising

Accept any valid method.

Solution: e.g.

Plan: 2.88 m ÷ 3 ≈ 1 m

C:

	0.	9	6	(m)	(or change
3	2.	8	8	(m)	to cm first)
		1			

Answer: Each part is 0.9.6 m.

45 min

Bk5

R: (Mental) calculation with whole numbers and decimals

C: Dividing decimals by natural numbers

E: Calculating the mean value

Lesson Plan
102

Activity

1

Fractions, decimals and percentages

Ps have two 10 cm by 10 cm square grids on desks and T has large versions for demonstration.

a) Colour 3 twentieths of the grid *red*, then 0.2 of the grid *green*, then 36% *yellow* but do not colour any grid squares more than once.

i) What part of the square have you coloured altogther? Ps come to BB to write an addition, explaining reasoning. Class agrees/disagrees. Who can think of another way to write it?

BB: Part coloured:

e.g. $\frac{3}{20} + 0.2 + 36\% = \frac{15}{100} + \frac{20}{100} + \frac{36}{100} = \frac{71}{100}$

or $\frac{3}{20} + 0.2 + 36\% = 0.15 + 0.2 + 0.36 = \underline{0.71}$

or $15\% + 20\% + 36\% = \underline{71\%}$

i) What part of the square is <u>not</u> coloured?

Ps come to BB or dictate what T should write, using fractions, decimals and percentages. Class agrees/ disagrees.

BB: Part <u>not</u> coloured:

e.g. $1 - \frac{71}{100} = \frac{100}{100} - \frac{71}{100} = \frac{29}{100} = 0.29 = 29\%$

b) Use a new grid to colour 0.17 of the grid 5 times, each time using a different colour.

i) What part of the grid have you coloured this time?

ii) What part is <u>not</u> coloured?

Ps come to BB or dictate what T should write. Who can write it another way? etc. Class agrees/disagrees.

Notes

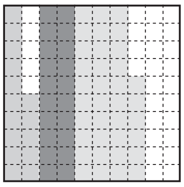
Whole class activity

Use copy masters from *LP 89/1*.

P finished first colours grid on BB too (or T has solution already prepared)

BB:

e.g.



(or Ps can write operations in *Ex.Bks* first before coming to BB)

Reasoning, agreement, (self-correction), praising

BB:

b) i) Part coloured:

$0.17 \times 5 = \underline{0.85}$

or $\frac{17}{100} \times 5 = \frac{85}{100}$

or $17\% \times 5 = \underline{85\%}$

ii) Part <u>not</u> coloured: e.g.

$1 - 0.85 = \underline{0.15} = \frac{15}{100} = \underline{15\%}$

5 min

2

Comparison

Which side is greater? How much greater? Ps come to BB to calculate each side mentally or to write calculations on BB, explaining reasoning with place-value detail. Then Ps fill in the missing signs and calculate the differences. Clas agrees/disagrees.

BB:

a) $13 + 1.7 - \frac{3}{2} \enclose{circle}{=} 40 - 27\frac{5}{2} + 2.7$

(13.2) (13.2)

LHS: $14.7 - 1.5 = \underline{13.2}$

RHS: $13 - 2.5 + 2.7 = \underline{13.2}$

b) $(2 + \frac{3}{4}) \times 5 \enclose{circle}{<} 25 - 14.8 \div 5$

$(13\frac{3}{4})$ 8.29 (22.04)

LHS: $10 + \frac{15}{4} = 10 + 3\frac{3}{4} = 13\frac{3}{4}$

RHS: $25 - 2.96 = \underline{22.04}$

c) $(0.31 + 0.69) \div 5 \enclose{circle}{<} 18.3 \div 3 - 4.9$

1

$(1 \div 5 = \frac{1}{5} = \frac{2}{10} = \underline{0.2})$

$(6.1 - 4.9 = \underline{1.2})$

Whole class activity

Written on BB or SB or OHT

At a good pace

Reasoning, agreement, praising

Feedback for T

BB:

b) $13\frac{3}{4} = 13\frac{75}{100} = 13.75$

$$\begin{array}{r|l} & 2.96 \\ \hline 5 & 14.80 \\ & 4\;3 \end{array}$$

$$\begin{array}{cr} & {}^{10}\;{}^{10}\;{}^{10} \\ & 2\,2.0\,4 \\ - & 1_1\,3_1.7_1\,5 \\ \hline & 8.2\,9 \end{array}$$

11 min

Activity

Notes

3

Mean height

T puts Ps into groups and they measure their heights with a measuring tape or against a vertical scale or using a metre rule and note their heights to the nearest cm. Do this under a time limit.

T makes two tally charts, as below, one for the girls and one for the boys. Ps dictate their heights and T chooses a boy and a girl to keep a tally.

How can we work out the average height of the girls and the boys? (Add up all the heights, then divide by the number of girls or boys.)

T writes heights in a column as dictated by Ps (or Ps might suggest using multiplication for multiple tally marks). Ps add up the heights and dictate sum to T, then do long division in *Ex. Bks* (or T might allow Ps to use calculators). Ps need only calculate to 2 decimal places.

BB: e.g. Girls (and similarly for boys)

Tally Chart

139 cm	|
140 cm	||
141 cm	|
142 cm	|||
143 cm	
144 cm	𝍸
145 cm	||
146 cm	
147 cm	
148 cm	
149 cm	|
150 cm	|

$$\begin{array}{rl}
139\text{ cm} & \\
\left.\begin{array}{r}140\text{ cm}\\140\text{ cm}\end{array}\right\} & 280\text{ cm}\\
141\text{ cm} & \\
\left.\begin{array}{r}142\text{ cm}\\142\text{ cm}\\142\text{ cm}\end{array}\right\} & 426\text{ cm}\\
\left.\begin{array}{r}144\text{ cm}\\144\text{ cm}\\144\text{ cm}\\144\text{ cm}\\144\text{ cm}\end{array}\right\} & 720\text{ cm}\\
\left.\begin{array}{r}145\text{ cm}\\145\text{ cm}\end{array}\right\} & 290\text{ cm}\\
149\text{ cm} & \\
+\ 150\text{ cm} & \\ \hline
2295\text{ cm} & \\ \hline
\end{array}$$

$$\begin{array}{cc|cccccc}
 & & & 1 & 4 & 3. & 4 & 3 \\ \cline{3-8}
1 & 6 & 2 & 2 & 9 & 5. & 0 & 0 \\
 & - & 1 & 6 & & & & \\
 & & & 6 & 9 & & & \\
 & & - & 6 & 4 & & & \\
 & & & & 5 & 5 & & \\
 & & & - & 4 & 8 & & \\
 & & & & & 7 & 0 & \\
 & & & & - & 6 & 4 & \\
 & & & & & & 6 & 0 \\
 & & & & & - & 4 & 8 \\
 & & & & & & \multicolumn{2}{c}{\boxed{1\ 2}}
\end{array}\quad \text{(cm)}$$

Average height ≈ 143.4 cm
(to nearest tenth of a cm, or mm)

Agree on the average height of the girls (boys) in the class. T shows that to be accurate to the nearest whole number, we should calculate to tenths and to be accurate to the nearest tenth we must calculate to hundredths, etc. i.e. we must calculate to the next smaller place-value column than the one we wish to stop at.

T: Who remembers the name we give to the average value in a set of data? (the mean)

e.g. Girls' heights: Mean ≈ 143.4 cm
Boys' heights: Mean ≈ 142.9 cm

What do the mean values for boys and girls tell us? (e.g. In this class, the girls are on average taller than the boys.)

Whole class activity

(The number of groups and thus the number in each group will depend on how many measuring tools are available – the more tools, the faster the data can be collected!)

BB: average height

First discuss what average means. Ps generally will have some knowledge or idea about its meaning (from home, TV, radio, newspapers, etc.) or might remember from previous work in Book 4.)

Involve several Ps in the discussion.

If all boys or all girls in class, divide the class into 2 groups.

Ps may use calculators to check the calculations.

At a fast pace

In good humour!

Agreement, praising

(as 143.43 is nearer 143.4 than 143.5)

BB: mean = average value

What is the rule for calculating the mean of a set of data?

(Add up all the values, then divide the sum by the number of values.)

21 min

4

Mean ages

T divides Ps into groups of 5 or 6. Within each group, each child works out his or her age in months, then the group calculates their mean age. Discuss and agree beforehand how accurate they should be (e.g. to the nearest month or to tenths or hundredths of a month)

The groups dictate their data and mean when they have finished and T writes on BB. Class checks that they are correct (using calculators).

What can you say about the data? (e.g. Group A is on average older than Group B, or Group A is about the same age as Group C, etc.)

Group work in collecting data and calculating the means

Monitored, helped, corrected

Whole class checking and discussion of the results.

Ps may use calculators for the addition and for checking the division.

25 min

Bk5

Lesson Plan 102

Activity		*Notes*

5

Book 5, page 102

Q.1 Read: *A group of 6 children weighed themselves and these were the results.*

32.5 kg, 31.0 kg, 32.0 kg, 31.0 kg, 30.5 kg, 33 kg

What do they each weigh on average? Calculate the mean value to the nearest 10 g.

How can we work out the mean? (Add up all the weights, then divide by 6.) Elicit that calculating to the nearest 10 g means to the nearest hundredth or 0.01 kg, so there should be 2 digits after the decimal point in our answer. Therefore we need to calculate as far as the thousandths column, i.e. grams.

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

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

Solution:

e.g. Total weight of 6 children:

$$32.5 + 31.0 + 32.0 + 31.0 + 30.5 + 33 = \underline{190.0\ (\text{kg})}$$

$$\begin{array}{r} 32.5 \\ 31.0 \\ 32.0 \\ 31.0 \\ 30.5 \\ +\ 33.0 \\ \hline \underline{190.0} \end{array}\ (\text{kg})$$

Mean mass: 190.0 kg ÷ 6

$\approx \underline{31.67}$ kg

$$\begin{array}{r|l} & 3\ 1.6\ 6\ 6 \\ \hline 6 & 1\ 9\ 0.0\ 0\ 0 \\ & 1\ \ 4\ \ 4\ \ 4\ \ ④ \end{array}$$

Agree that 31.666 is nearer 31.67 than 31.66, so the answer is 31.67 kg (to the nearest 10 g, or 0.01 kg, or 2 decimal places)

T shows how the 2 calculations can be written in one line:

$$\text{Mean} = \frac{32.5 + 31.0 + 32.0 + 31.0 + 30.5 + 33}{6} = \frac{190.0}{6} \approx \underline{31.67}\ (\text{kg})$$

Extension

T points out (or Ps might notice) that if the division is continued to 10 thousands, 100 thousandths, etc, there will always be a remainder of 4 in each place-value column, so there will always be the digit 6 in the next place-value column in the quotient. We could go on and on to infinity without ever reaching a remainder of zero.

We call such decimals <u>recurring decimals</u> and to save writing the same digit lots of times, we write a dot above the decimal digit which keeps recurring. We can write the division without rounding like this (BB) and say '31.6 recurring', meaning 31.666666 . . . to infinity.

Elcit that we can round it to:

- 32, to the nearest whole number,
- 31.7, to the nearest 10th, or to 1 decimal place
- 31.67, to the nearest 100th, ot to 2 decimal places
- 31.667, to the nearest 1000th, or to 3 decimal places, etc.

30 min

Notes

Individual work, monitored, helped

or whole class activity, with Ps doing the calculations individually in *Ex. Bks*.

Discussion, reasoning, agreement, self-correction, praising

Show that if fractions are used instead of decimals, the answer will be completely accurate:

BB: $190 \div 6 = \frac{190}{6} = 31\frac{4}{6} = 31\frac{2}{3}$ (kg)

Point out that $\frac{190}{6}$ is a fraction and also a divison: 190 ÷ 6

Whole class activity

T explains and Ps listen.

BB: <u>recurring decimal</u>

$190 \div 6 = 31.\dot{6}$

Agreement, praising

Extra praise if Ps notice that:

$31.\dot{6} = 31 + \frac{2}{3}$ (see above)

so $\frac{2}{3} = 0.\dot{6}$ and $\frac{1}{3} = 0.\dot{3}$

Activity

Notes

6

Book 5, page 102

Q.2 Read: *A group of 5 pupils were asked their ages and these were the results in months.*

110 months, 121 months, 113 months, 116 months, 117 months

What is the mean value of their ages?

Set a time limit. Ps write operation in one line in *Pbs*, do the addition and division in *Ex. Bks.* and write the result in *Pbs*.

Review with the whole class. Ps come to BB to show solution, explaining reasoning. Who agrees? Who did it a different way? Discuss whether the answer is exact or approximate. Mistakes discussed and corrected.

Solution:

Mean age: $\dfrac{110 + 121 + 113 + 116 + 117}{5} = \dfrac{577}{5}$ (months)

$= \underline{115.4 \text{ months}}$ ($\approx$ 115 months)

$$\begin{array}{r|rrrr} & 1 & 1 & 5. & 4 \\ \hline 5 & 5 & 7 & 7. & 0 \\ & & 2 & 2 & \end{array}$$

35 min

Individual work, monitored, helped

Discussion, reasoning, checking with a calculator, agreement, self-correction, praising

Accept fractions too.

e.g. $\dfrac{577}{5} = 115 + \dfrac{2}{5}$

$= 115 + \dfrac{4}{10} = \underline{115.4}$

Agree that in real life we would say that the average age of the group is 'about 9 years 7 months'.

7

Book 5, page 102

Q.3 Read: *Calculate the mean age of each family and then compare them.*

Set a time limit, or deal with one part at a time. Ps write operation in one line in *Pbs*, do calculations in *Ex. Bks* and write result in *Pbs*.

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

Solution:

a) *The Cabbage family:*

Mean age: $\dfrac{1 + 2 + 11 + 33 + 35 + 59 + 65}{7} = \dfrac{206}{7}$

$\approx \underline{29.4}$ (years)

b) *The Sprout family*

Mean age: $\dfrac{10 + 11 + 16 + 19 + 21 + 42 + 44}{7} = \dfrac{163}{7}$

$\approx \underline{23.3}$ (years)

Agree that the average age of the *Cabbage* family is older than that of the *Sprout* family, although there are 2 very young children.

Discuss what the relationships in each family might be. e.g. 2 grandparents, Mum and Dad and their 3 children in the *Cabbage* family and Mum and Dad and their 5 children in the *Sprout* family.

Read: *Which family has more people able to work in their garden?*

Write C or S on your slates and show me . . . now! (S)

T asks Ps with different responses to explain their reasoning. Class decides who is correct. (In the *Sprout* family, 7 people could do some gardening but in the *Cabbage* family, only 5 people could do the work and one of these would have to look after the two young children.)

41 min

Individual work, monitored, helped

Discussion, reasoning, agreement, (checking on calculator), self-correction, praising

BB:

a)

$$\begin{array}{r} 1 \\ 2 \\ 11 \\ 33 \\ 35 \\ 59 \\ +\ 65 \\ \hline 206 \\ \hline {\scriptstyle 2} \end{array} \qquad \begin{array}{r|rrrrr} & & 2 & 9. & 4 & 2 \\ \hline 7 & 2 & 0 & 6. & 0 & 0 \\ & & 6 & 3 & 2 & \textcircled{6} \end{array}$$

$$\begin{array}{r} 10 \\ 11 \\ 16 \\ 19 \\ 21 \\ 42 \\ +\ 44 \\ \hline 163 \\ \hline {\scriptstyle 2} \end{array} \qquad \begin{array}{r|rrrrr} & & 2 & 3. & 2 & 8 \\ \hline 7 & 1 & 6 & 3. & 0 & 0 \\ & & 2 & 2 & 6 & \textcircled{4} \end{array}$$

[NB If T allows Ps to use calculators for the calculations, the results could be:

C $\approx$ $29.\overline{428571}$;

S $\approx$ $23.\overline{285714}$

T explains that the block of digits below the bar keeps repeating to infinity. e.g.

29.428571428571428571 . . .

It is another type of <u>recurring decimal.</u>]

Bk5

Lesson Plan 102

Activity

8

Book 5, page 102, Q.4

a) Read: *Find a rule and complete the table. Write the rule in different ways.*

Agree on one form of the rule in words using the given completed columns. Ps come to BB to choose a column and fill ithe missing numbers, explaining reasoning. Class agrees/disagrees.
Who can write the rule in a mathematical way? Who can write it a different way? etc. Class checks the rules using values from table.

Solution:

a	1	1	3	5	2	**6**	12	2.4	**20**	**16**	5
b	3	4	3	2	7	4	**8**	3.6	40	10	**5.2**
c	2	2.5	3	3.5	**4.5**	5	10	**3**	30	13	5.1

Rule: $c = \frac{a + b}{2}$; $a = 2 \times c - b$; $b = 2 \times c - a$

(or *c* is the <u>mean</u> of *a* and *b*)

Homework

b) Read: *In your exercise book, calculate the mean values for a, b and c.*

Set as homework and review before the start of *Lesson 103*.

(Ps might be allowed to check their calculations with calculators.)

45 min

Notes

Whole class activity

(or individual trial first if Ps wish and there is time)

Drawn on BB or use enlarged copy master or OHP

At a good pace

Discussion, reasoning, agreement, praising

Bold numbers are missing.

Extra praise if Ps notice that *c* is the mean of *a* and *b*, otherwise T points it out.

Solution:

Mean of $a = 6.6\overline{72} \approx 6.67$

Mean of $b = 8.1\overline{63} \approx 8.16$

Mean of $c = 7.4\overline{18} \approx 7.42$

Bk5

R: (Mental) calculation

C: Decimal form of fractions. The quotient as a fraction and a decimal

E: Recurring decimals

Lesson Plan 103

Activity

Notes

1

Review

T dictates a number and Ps write it in *Ex. Bks* with digits.

Review quickly with whole class. P comes to BB to write and say the number. Class agrees/disagrees. Mistakes discussed and corrected.

e.g.

a) one million, fifty-six thousand, one hundred and seven (1 056 107)

Remind Ps that a space between every group of 3 digits from the right makes the number easier to read.

b) One whole unit and 51 hundredths of a unit (1.51 or $1\frac{51}{100}$)

c) Two point five zero two (2.502)

d) Eight thirteenths ($\frac{8}{13}$)

etc.

Whole class activity

(or Ps write numbers on slates or scrap paper and show in unison on command)

At a good pace

Agreement, self-correction, praising

Ps can think of numberts to say too.

5 min

2

Rounding

T says a number and asks P_1 to round it to the nearest unit, P_2 to round it to the nearest ten and P_3 to round it to the nearest tenth.

e.g. 3, 1.2, 11.9, 23.5, 18.08, 15.48, 15.0

to nearest unit	to nearest ten	to nearest tenth
3 = 3	3 ≈ 0	3 = 3 (or 3.0)
1.2 ≈ 1	1.2 ≈ 0	1.2 = 1.2
11.9 ≈ 12	11.9 ≈ 10	11.9 = 11.9
23.5 ≈ 24	23.5 ≈ 20	23.5 = 23.5
18.08 ≈ 18	18.08 ≈ 20	18.08 ≈ 18.1
15.48 ≈ 15	15.48 ≈ 20	15.48 ≈ 15.5
15.0 = 15	15.0 ≈ 20	15.0 = 15.0

Whole class activity

Orally at speed round class

Ps say the whole equation or inequality and the accuracy of the rounding,

e.g. '1.2 is approximately equal to 1, to the nearest unit'

Agreement, praising

Stress that the complete number should be rounded (not one digit at a time).

Feedback for T

10 min

3

Calculation practice

T says and writes an operation on BB. Ps calculate mentally if possible (or on scrap paper or in *Ex. Bks*.) and show the result on slates on command. Ps responding correctly who did it mentally say how they did it. Ps show calculations in vertical form on BB if problems or disagreement and check result with a calculator.

a) 45 + 2.7 + 6.1 + 9.8 = (63.6) [e.g. 62 + 1.6]

b) 100 – 0.54 = (99.46) [e.g. 99.5 – 0.4]

c) 4.5 × 7 = (31.5) [e.g. 28 + 3.5]

d) 9 ÷ 4 = (2.25 or $2\frac{1}{4}$) [e.g. 8 ÷ 4 + 1 ÷ 4]

Whole class activity but individual calculation

Reasoning, agreement, praising

Feedback for T

or BB: $$\begin{array}{r|l} & 2.25 \\ \hline 4 & 9.00 \\ & \;\;{}_{1\;\;2} \end{array}$$

15 min

Activity *Notes*

4

Fractions of numbers

a) What part of 24 is:

i) 1 $\left(\frac{1}{24}\right)$ ii) 3 $\left(\frac{3}{24} = \frac{1}{8}\right)$ iii) 12 $\left(\frac{12}{24} = \frac{1}{2}\right)$

iv) 15 $\left(\frac{15}{24} = \frac{5}{8}\right)$ v) 36 $\left(\frac{36}{24} = \frac{3}{2} = 1\frac{1}{2}\right)$

Extension

What part of 24 is the <u>mean</u> of the five numbers? How can we do it? Ps suggest what to do first and how to continue. T helps or gives hints where necessary.

Mean of numbers: $1 + 3 + 12 + 15 + 36 = 67;\ 67 \div 5 = 13\frac{2}{5}$

Part of 24: $\dfrac{13\frac{2}{5}}{24} = 13\frac{2}{5} \div 24 = \frac{67}{5} \div 24 = \frac{67}{5 \times 24} = \underline{\frac{67}{120}}$

or Mean of parts:

$$\left(\frac{1}{24} + \frac{3}{24} + \frac{12}{24} + \frac{15}{24} + \frac{36}{24}\right) \div 5 = \frac{67}{24} \div 5 = \frac{67}{24 \times 5} = \underline{\frac{67}{120}}$$

b) What is the complete number if 1 fifth of it is:

i) 1 $(1 \times 5 = \underline{5})$ ii) 3 $(3 \times 5 = \underline{15})$ iii) 12 $(12 \times 5 = \underline{60})$

iv) $\frac{1}{10}$ $\left(\frac{1}{10} \times 5 = \frac{5}{10} = \underline{\frac{1}{2}}\right)$ v) 20 $(20 \times 5 = \underline{100})$

Whole class activity

Ps show parts on scrap paper or slates in unison on command.

Ps answering correctly explain at BB to Ps who were wrong.

Elicit that reducing numerator and denominator by the same number of times does not change its value.

Discussion, reasoning, agreement, praising

Review how to divide a fraction by a natural number:

- divide the numerator by the divisor; or
- multiply the denominator by the divisor.

Ps show numbers on scrap paper or slates in unison.

Ps answering correctly explain reasoning.

Agreement, praising

20 min

5

Book 5, page 103

Q.1 Let's see how many calculations you can do in 3 minutes!
Start . . . now! . . . Stop!

Ps come to BB or dictate to T, explaining reasoning. Class agrees or disagrees. Mistakes discussed and corrected.

Who had all 7 correct or made just 1 mistake? Let's give them a clap!

Solution:

a) i) $\frac{1}{2}$ of $36 = 36 \div 2 = \underline{18}$ ii) $\frac{2}{2}$ of $36 = \underline{36}$

iii) $\frac{3}{2}$ of $36 = 36 \div 2 \times 3 = 18 \times 3 = \underline{54}$

b) i) $\frac{1}{2}$ of $25 = 25 \div 2 = \underline{12.5}$

ii) $\frac{2}{5}$ of $25 = 25 \div 5 \times 2 = 5 \times 2 = \underline{10}$

iii) $\frac{7}{5}$ of $25 = 25 \div 5 \times 7 = 5 \times 7 = \underline{35}$

iv) $\frac{7}{10}$ of $25 = 25 \div 10 \times 7 = 2.5 \times 7 = \underline{17.5}$

Individual work, monitored, helped

Written on BB or SB or OHT

Reasoning, agreement, self-correction, praising

Feedback for T

or $\frac{7}{5}$ of $25 = 1\frac{2}{5}$ of 25
$= 25 + 10 = \underline{35}$

25 min

Activity | *Notes*

6

Book 5, page 103

Q.2 a) Read: *Write the decimals as fractions.*

Set a time limit. Review at BB with whole class.

Ps dictate fracitons to T, explaining reasoning. Class agrees or disagrees. Mistakes discussed and corrected.

Solution:

i) $0.1 = \frac{1}{10}$ ii) $0.5 = \frac{5}{10} = \frac{1}{2}$

iii) $1.2 = 1\frac{2}{10} = 1\frac{1}{5}$ iv) $0.01 = \frac{1}{100}$

v) $0.35 = \frac{35}{100} = \frac{7}{20}$ vi) $3.05 = 3\frac{5}{100} = 3\frac{1}{20}$

vii) $0.001 = \frac{1}{1000}$

b) Read: *Express the quotient of 5 divided by 8 as a fraction and as a decimal.*

Ps come to BB to write fraction and do the short division, explaining with place-value detail, to calculate the decimal. Class points out errors. Rest of Ps write in *Pbs* too.

Soltuion: $5 \div 8 = \frac{5}{8} = \underline{0.625}$

$$\begin{array}{c|cccc} & 0. & 6 & 2 & 5 \\ \hline 8 & 5. & 0 & 0 & 0 \\ & & 2 & 4 & \end{array}$$

c) Read: *Express the quotient of 15 divided by 9 as a fraction and as a decimal.*

Ps come to BB to write the fraction and do the short division, explaining with with place-value detail, to calculate the decimal. Class points out errors. Rest of Ps write in *Pbs* too.

Soltuion: $15 \div 9 = \frac{15}{9} = 1\frac{6}{9} = 1\frac{2}{3} = 1.666\ldots$ (to ∞)

T tells/elicits that a decimal which has a digit repeating endlessly to infinity is called a <u>recurring decimal</u> and is written with a dot above the recurring digit.

BB: $1.666\ldots = 1.\dot{6}$ (read as 'one point six recurring')

Notes:

Individual work, monitored, helped

Written on BB or SB or OHT

Differentiation by time limit

Reasoning, agreement, self-correction, praising

Feedback for T

Whole class activity

T has grids already prepared on BB or SB or OHT.

Discussion, reasoning, agreement, praising

Elicit that: $\frac{5}{8} = \frac{625}{1000}$,
as $5 \times \underline{125} = 625$, and
$8 \times \underline{125} = 1000$.

Extra praise if Ps realise that however many smaller place-values they use, there will never be a remainder of zero.

BB: <u>recurring decimal</u>

Who can work out what 2 thirds (1 third) is as a decimal? $(0.\dot{6},\ 0.\dot{3})$

31 min

7

Decimal form of fractions

Let's write these fractions as decimals. How can we do it? Ps come to BB or dictate what T should write, explaining reasoning. Who agrees? Who can think of another way to do it? etc.

BB:

a) $\frac{1}{2} = \frac{5}{10} = \underline{0.5}$; $\frac{2}{2} = \underline{1}$; $\frac{3}{2} = \frac{15}{10} = \underline{1.5}$; $\frac{4}{2} = \underline{2}$; $\frac{5}{2} = \frac{25}{10} = \underline{2.5}$

or $\frac{3}{2} = 1\frac{1}{2} = 1.5$ $\frac{5}{2} = 2\frac{1}{2} = 2.5$

or

$$\begin{array}{c|cc} & 1. & 5 \\ \hline 2 & 3. & 0 \\ & 1 & \end{array} \qquad \begin{array}{c|cc} & 2. & 5 \\ \hline 2 & 5. & 0 \\ & 1 & \end{array}$$

Notes:

Whole class activity but individual calculation in *Ex. Bks.* too

Discussion, reasoning, agreement, praising

Elicit the 'rules' for changing a fraction to a decimal:

- express the fraction as 10ths (100ths, 1000ths, etc); or
- divide the numerator by the denominator (using vertical decimal division).

Bk5

Lesson Plan 103

Activity

Notes

7

(Continued)

b) $\frac{1}{5} = \frac{2}{10} = \underline{0.2}$; $\frac{2}{5} = \frac{4}{10} = \underline{0.4}$; $\frac{3}{5} = \frac{6}{10} = \underline{0.6}$;

or $\begin{array}{c|cc} & 0. & 2 \\ \hline 5 & 1. & 0 \\ & {\scriptstyle 1} & \end{array}$ $\begin{array}{c|cc} & 0. & 4 \\ \hline 5 & 2. & 0 \\ & {\scriptstyle 2} & \end{array}$ $\begin{array}{c|cc} & 0. & 6 \\ \hline 5 & 3. & 0 \\ & {\scriptstyle 3} & \end{array}$

$\frac{4}{5} = \frac{8}{10} = \underline{0.\ 8}$; $\frac{5}{5} = 1$; $\frac{6}{5} = \frac{12}{10} = \underline{1.2}$ (or $= 1\frac{1}{5} = 1.2$)

or $\begin{array}{c|cc} & 0. & 8 \\ \hline 5 & 4. & 0 \\ & {\scriptstyle 4} & \end{array}$ $\begin{array}{c|cc} & 1. & 2 \\ \hline 5 & 6. & 0 \\ & {\scriptstyle 1} & \end{array}$

c) $\frac{1}{4} = \frac{25}{100} = \underline{0.25}$; $\frac{2}{4} = \frac{1}{2} = \underline{0.5}$; $\frac{3}{4} = \frac{75}{100} = \underline{0.75;}$

or $\begin{array}{c|ccc} & 0. & 2 & 5 \\ \hline 4 & 1. & 0 & 0 \\ & {\scriptstyle 1} & {\scriptstyle 2} & \end{array}$ $\begin{array}{c|ccc} & 0. & 7 & 5 \\ \hline 4 & 3. & 0 & 0 \\ & {\scriptstyle 3} & {\scriptstyle 2} & \end{array}$

$\frac{4}{4} = \underline{1}$; $\frac{5}{4} = \frac{125}{100} = \underline{1.25}$ (or $= 1\frac{1}{4} = 1.25$) or $\begin{array}{c|ccc} & 1. & 2 & 5 \\ \hline 4 & 5. & 0 & 0 \\ & {\scriptstyle 1} & {\scriptstyle 2} & \end{array}$

36 min

8

Book 5, page 103

Q.3 Read: *Write the fractions as decimals. Do the divisions in the grids.*

Set a time limit. Review with whole class. Ps come to BB to write divisions, explaining reasoning with place-value detail. Class agrees/disagrees. Mistakes discussed and corrected.

Ask Ps to show the other method too.

Solution:

a) $\frac{1}{2} = \frac{5}{10} = \underline{0.5}$ b) $\frac{7}{2} = 3\frac{1}{2} = \underline{3.5}$ c) $\frac{3}{5} = \frac{6}{10} = \underline{0.6}$

$\begin{array}{c|ccc} & 0. & 5 & \\ \hline 2 & 1. & 0 & \end{array}$ $\begin{array}{c|ccc} & 3. & 5 & \\ \hline 2 & 7. & 0 & \\ & {\scriptstyle 1} & & \end{array}$ $\begin{array}{c|ccc} & 0. & 6 & \\ \hline 5 & 3. & 0 & \\ & {\scriptstyle 3} & & \end{array}$

d) $\frac{11}{5} = \frac{22}{10} = \underline{2.2}$ e) $\frac{1}{4} = \frac{25}{100} = \underline{0.25}$

$\begin{array}{c|ccc} & & 2. & 2 \\ \hline 5 & 1 & 1. & 0 \\ & & {\scriptstyle 1} & \end{array}$ $\begin{array}{c|ccc} & 0. & 2 & 5 \\ \hline 4 & 1. & 0 & 0 \\ & {\scriptstyle 1} & {\scriptstyle 2} & \end{array}$

f) $\frac{3}{4} = \frac{75}{100} = \underline{0.75}$ g) $\frac{7}{4} = 1\frac{3}{4} = 1\frac{75}{100} = \underline{1.75}$

$\begin{array}{c|ccc} & 0. & 7 & 5 \\ \hline 4 & 3. & 0 & 0 \\ & {\scriptstyle 3} & {\scriptstyle 2} & \end{array}$ $\begin{array}{c|ccc} & 1. & 7 & 5 \\ \hline 4 & 7. & 0 & 0 \\ & {\scriptstyle 3} & {\scriptstyle 2} & \end{array}$

41 min

Individual work, monitored, helped

Written on BB or use enlarged copy master or OHP

Make sure that divisons in previous activity are not visible!

Differentiation by time limit

Reasoning, agreement, self-correction, praising

Ask Ps which method they like best (decimal division or expressing fraction as tenths or hundredths) and why.

Bk5

Lesson Plan 103

Activity

9

Book 5, page 103, Q.4

Read: *Write the fractions as decimals. Do the divisions in the grids.*

Ps come to BB to do the divisions, explaining reasoning with place-value detail. Some Ps might remember that thirds form recurring decimals before doing the division. If not, Ps should realise after the calculation. Ask Ps to write each result with ellipses (i.e. . . .) and then as an exact decimal (i.e. with a dot above the repeating digit).

T reads part d) and Ps shout out the missing word in unison.

P comes to BB to write it, class checks spelling, then rest of Ps write it in *Pbs*.

Solution:

a) $\dfrac{1}{3} = 0.333\ldots = 0.\dot{3}$

	0.	3	3	3	3	. . .
3	1.	0	0	0	0	. . .
	1	1	1	1	1	

b) $\dfrac{2}{3} = 0.666\ldots = 0.\dot{6}$

	0.	6	6	6	6	. . .
3	2.	0	0	0	0	. . .
	2	2	2	2	2	

c) $\dfrac{5}{6} = 0.8333\ldots = 0.8\dot{3}$

	0.	8	3	3	3	. . .
6	5.	0	0	0	0	. . .
	5	2	2	2	2	

d) *Decimals in which the last digit is repeated endlessly are called* <u>recurring</u> *decimals.*

45 min

Notes

Whole class activity

(or individual trial first if Ps wish and there is time)

Written on BB or use enlarged copy master or OHP

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

Extension

Ps round each recurring decimal to the nearest 10th, 100th, 1000th and 10 000th.

Bk5

R: Mental calculation

C: Practice: fractions and decimals

E: Converting fractions of quantities to decimals

Lesson Plan
104

Activity

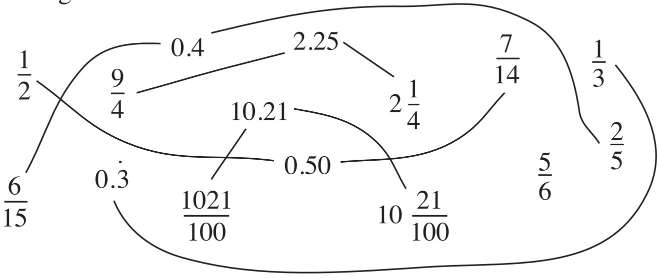
Notes

1

Equal numbers

Let's join up the decimals to the equal fractions and mixed numbers. Ps come to BB to draw joining lines, explaining reasoning. Class agrees/disagrees.

BB:



Whole class activity

Written on BB or use enlarged copy master or OHP

At a good pace

Reasoning, agreement, praising

Feedback for T

5 min

2

Converting fractions to decimals 1

Let's convert (i.e. change) these fractions to decimals. For each fraction, a different P comes to work on BB while rest of class works in *Ex. Bks*. Ps might remember some recurring decimals without needing to do the division. Class points out errors or suggest other methods of calculation. T or Ps check results on a calculator.

BB:

a) i) $\frac{1}{6} = 1 \div 6 = 0.1\dot{6}$

$$\begin{array}{c|cccc} & 0. & 1 & 6 & 6\;\ldots \\ \cline{2-5} 6 & 1. & 0 & 0 & 0\;\ldots \\ & {\scriptstyle 1} & {\scriptstyle 4} & {\scriptstyle 4} & {\scriptstyle 4} \end{array}$$

ii) $\frac{2}{6} = \frac{1}{3} = 0.\dot{3}$

$$\begin{array}{c|cccc} & 0. & 3 & 3 & 3\;\ldots \\ \cline{2-5} 3 & 1. & 0 & 0 & 0\;\ldots \\ & {\scriptstyle 1} & {\scriptstyle 1} & {\scriptstyle 1} & {\scriptstyle 1} \end{array}$$

iii) $\frac{3}{6} = \frac{1}{2} = 0.5$

iv) $\frac{4}{6} = \frac{2}{3} = 0.\dot{6}$

× 2

b) i) $\frac{1}{8} = \frac{125}{1000} = 0.125$

or

$$\begin{array}{c|cccc} & 0. & 1 & 2 & 5 \\ \cline{2-5} 8 & 1. & 0 & 0 & 0 \\ & {\scriptstyle 1} & {\scriptstyle 2} & {\scriptstyle 4} & \end{array}$$

ii) $\frac{2}{8} = \frac{1}{4} = \frac{25}{100} = 0.25$

or

$$\begin{array}{c|ccc} & 0. & 2 & 5 \\ \cline{2-4} 4 & 1. & 0 & 0 \\ & {\scriptstyle 1} & {\scriptstyle 2} & \end{array}$$

iii) $\frac{3}{8} = 3 \div 8 = 0.375$

$$\begin{array}{c|cccc} & 0. & 3 & 7 & 5 \\ \cline{2-5} 8 & 3. & 0 & 0 & 0 \\ & {\scriptstyle 3} & {\scriptstyle 6} & {\scriptstyle 4} & \end{array}$$

iv) $\frac{4}{8} = \frac{1}{2} = 0.5$

v) $\frac{5}{8} = 5 \div 8 = 0.625$

$$\begin{array}{c|cccc} & 0. & 6 & 2 & 5 \\ \cline{2-5} 8 & 5. & 0 & 0 & 0 \\ & {\scriptstyle 5} & {\scriptstyle 2} & {\scriptstyle 4} & \end{array}$$

vi) $\frac{6}{8} = \frac{3}{4} = 0.75$

c) i) $\frac{1}{9} = 1 \div 9 = 0.\dot{1}$

$$\begin{array}{c|cccc} & 0. & 1 & 1 & 1\;\ldots \\ \cline{2-5} 9 & 1. & 0 & 0 & 0\;\ldots \\ & {\scriptstyle 1} & {\scriptstyle 1} & {\scriptstyle 1} & {\scriptstyle 1} \end{array}$$

ii) $\frac{2}{9} = 2 \div 9 = 0.\dot{2}$

$$\begin{array}{c|cccc} & 0. & 2 & 2 & 2\;\ldots \\ \cline{2-5} 9 & 2. & 0 & 0 & 0\;\ldots \\ & {\scriptstyle 2} & {\scriptstyle 2} & {\scriptstyle 2} & {\scriptstyle 2} \end{array}$$

iii) $\frac{3}{9} = \frac{1}{3} = 0.\dot{3}$

(Ps might know this now.
If not, do the division.)

iv) $\frac{4}{9} = 4 \div 9 = 0.\dot{4}$

$$\begin{array}{c|cccc} & 0. & 4 & 4 & 4\;\ldots \\ \cline{2-5} 9 & 4. & 0 & 0 & 0\;\ldots \\ & {\scriptstyle 4} & {\scriptstyle 4} & {\scriptstyle 4} & {\scriptstyle 4} \end{array}$$

Whole class activity

Written on BB or SB or OHT

At a good pace

Reasoning, agreement, praising

Extra praise if Ps notice relationships which make the calculation easier.

v) $\frac{5}{6} = 5 \div 6 = = 0.8\dot{3}$

$$\begin{array}{c|cccc} & 0. & 8 & 3 & 3\;\ldots \\ \cline{2-5} 6 & 5. & 0 & 0 & 0\;\ldots \\ & {\scriptstyle 5} & {\scriptstyle 2} & {\scriptstyle 2} & {\scriptstyle 2} \end{array}$$

or

iii)
$$\begin{array}{cccc} 0. & 1 & 2 & 5 \\ & & \times & 3 \\ \hline 0. & 3 & 7 & 5 \\ & & {\scriptstyle 1} & \end{array}$$

v)
$$\begin{array}{cccc} 0. & 1 & 2 & 5 \\ & & \times & 5 \\ \hline 0. & 6 & 2 & 5 \\ & {\scriptstyle 1} & {\scriptstyle 2} & \end{array}$$

vii) $\frac{7}{8} = 8 \div 7 = 0.875$

$$\begin{array}{c|cccc} & 0. & 8 & 7 & 5 \\ \cline{2-5} 8 & 7. & 0 & 0 & 0 \\ & {\scriptstyle 7} & {\scriptstyle 6} & {\scriptstyle 4} & \end{array}$$

or

$$\begin{array}{cccc} 0. & 1 & 2 & 5 \\ & & \times & 7 \\ \hline 0. & 8 & 7 & 5 \\ & {\scriptstyle 1} & {\scriptstyle 3} & \end{array}$$

After calculating 4 ninths as a decimal, Ps might notice the pattern and deduce the remaining recurring decimals without calculation.

v) $\frac{5}{9} = 0.\dot{5}$ vi) $\frac{6}{9} = 0.\dot{6}$

vii) $\frac{7}{9} = 0.\dot{7}$ viii) $\frac{8}{9} = 0.\dot{8}$

15 min

Activity **Notes**

3

Converting fractions to decimals 2

Let's convert sevenths to decimals. Do you think we could do it easily by changing the denominator to 10ths, 100th or 1000ths? (No, as they are not multiples of 7) Agree that the only way is division.

Let's continue doing the division until we get a remainder of zero, or until we know that we will keep getting the same remainder if we continue.

Ps come to BB to write and explain the division with place-value detail. Rest of Ps do division in *Ex. Bks* too and point out any errors made on BB.

Use calculators to check the results (If possible, Ps have one each, T explains how to input the division, then Ps compare their results with the calculated quotients.) What do you notice?

BB:

a) $\frac{1}{7} = 1 \div 7 = 0.\dot{1}4285\dot{7} = 0.\overline{142857}$

$$\begin{array}{c|cccccccccc} & 0. & 1 & 4 & 2 & 8 & 5 & 7 & 1 & 4 & \ldots \\ \cline{2-10} 7 & 1. & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \ldots \\ & 1 & 3 & 2 & 6 & 4 & 5 & 1 & 3 & 2 & \end{array}$$

b) $\frac{2}{7} = 2 \div 7 = 0.\dot{2}8571\dot{4} = 0.\overline{285714}$

$$\begin{array}{c|cccccccccc} & 0. & 2 & 8 & 5 & 7 & 1 & 4 & 2 & 8 & \ldots \\ \cline{2-10} 7 & 2. & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \ldots \\ & 2 & 6 & 4 & 5 & 1 & 3 & 2 & 6 & 4 & \end{array}$$

c) $\frac{3}{7} = 3 \div 7 = 0.\dot{4}2857\dot{1} = 0.\overline{428571}$

$$\begin{array}{c|cccccccccc} & 0. & 4 & 2 & 8 & 5 & 7 & 1 & 4 & 2 & \ldots \\ \cline{2-10} 7 & 3. & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \ldots \\ & 3 & 2 & 6 & 4 & 5 & 1 & 3 & 2 & 6 & \end{array}$$

d) $\frac{4}{7} = 4 \div 7 = 0.\dot{5}7142\dot{8} = 0.\overline{571428}$

$$\begin{array}{c|cccccccccc} & 0. & 5 & 7 & 1 & 4 & 2 & 8 & 5 & 7 & \ldots \\ \cline{2-10} 7 & 4. & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \ldots \\ & 4 & 5 & 1 & 3 & 2 & 6 & 4 & 5 & 1 & \end{array}$$

e) $\frac{5}{7} = 5 \div 7 = 0.\dot{7}1428\dot{5} = 0.\overline{714285}$

$$\begin{array}{c|cccccccccc} & 0. & 7 & 1 & 4 & 2 & 8 & 5 & 7 & 1 & \ldots \\ \cline{2-10} 7 & 5. & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \ldots \\ & 5 & 1 & 3 & 2 & 6 & 4 & 5 & 1 & 3 & \end{array}$$

f) $\frac{6}{7} = 6 \div 7 = 0.\dot{8}5714\dot{2} = 0.\overline{857142}$

$$\begin{array}{c|cccccccccc} & 0. & 8 & 5 & 7 & 1 & 4 & 2 & 8 & 5 & \ldots \\ \cline{2-10} 7 & 6. & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \ldots \\ & 6 & 4 & 5 & 1 & 3 & 2 & 6 & 4 & 5 & \end{array}$$

Whole class activity

T could have grids already prepared to make it easier for Ps to do the calculations.

At a good pace

Reasoning, agreement, praising

Extra praise if Ps notice that in each case, the pattern of 6 digits will keep repeating to infinity, so the decimal is a recurring decimal.

T shows two ways of writing recurring decimals:

- with a dot above the first and last digit in the repeating group, or
- with a horizontal bar above all the digits in the group (as on some calculators).

Ps might also notice (or T points it out if they don't) that the same 6 digits appear in the same order in each decimal, and that the smallest decimal starts with the smallest digit, the next biggest decimal starts with the next biggest digit, etc.

25 min

4

Book 5, page 104

Q.1 Read: *Write the fractions as decimals. Do necessary calculations in your exercise book.*

First review the different methods. (Change to an equivalent fraction with denominator 10 or 100 or 1000, or do a division until there is no remainder or until a digit or group of digits repeats itself.) Set a time limit.

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 worked it out a different way? etc. Mistakes discussed and corrected.

Solution: e.g.

a) $\frac{3}{2} = \frac{15}{10} = \underline{1.5}$ b) $\frac{13}{5} = \frac{26}{10} = \underline{2.6}$

c) $\frac{6}{15} = \frac{2}{5} = \frac{4}{10} = \underline{0.4}$ d) $\frac{13}{20} = \frac{65}{100} = \underline{0.65}$

e) $\frac{9}{8} = 1 + \frac{1}{8} = 1 + \frac{125}{1000} = \underline{1.125}$ or

$$\begin{array}{c|cccc} & 1. & 1 & 2 & 5 \\ \cline{2-5} 8 & 9. & 0 & 0 & 0 \\ & 1 & 2 & 4 & \end{array}$$

Individual work, monitored, helped

Written on BB or SB or OHT

Differentiation by time limit

Responses shown in unison.

Reasoning, agreement, self-correction praising

Accept any valid method.

a) or $\frac{3}{2} = 1\frac{1}{2} = \underline{1.5}$

b) or $\frac{13}{5} = 2\frac{3}{5} = 2\frac{6}{10} = \underline{2.6}$

f) $\frac{11}{50} = \frac{22}{100} = \underline{0.22}$

30 min

Activity *Notes*

5

Book 5, page 104, Q.2

Read: *Write the fractions as decimals. Do necessary calculations in your exercise book.*

Which of these fractions are you sure forms a <u>finite</u> decimal wnd which do think forms a recurring decimal? Let's see if you are right!

Ps come to BB to write decimals directly for those they remember, or to do divisions. T helps with long divisions, expecially in b). Class agrees/ disagrees and writes agreed decimals in *Pbs*.

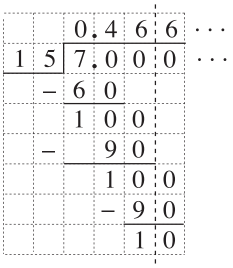
Solution:

a) $\frac{2}{3} = 0.\dot{6}$ (by memory)

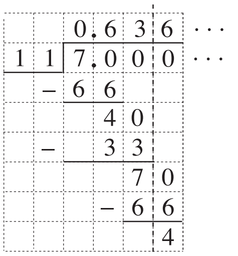
b) $\frac{5}{13} = 5 \div 13 = 0.\dot{3}8461\dot{5}$

c) $\frac{15}{6} = \frac{5}{2} = 2\frac{1}{2} = 2.5$

d) $\frac{7}{15} = 7 \div 15 = 0.4\dot{6}$



e) $\frac{7}{11} = 7 \div 11 = 0.\dot{6}\dot{3}$



f) $\frac{8}{9} = 0.\dot{8}$ (by memory or by division)

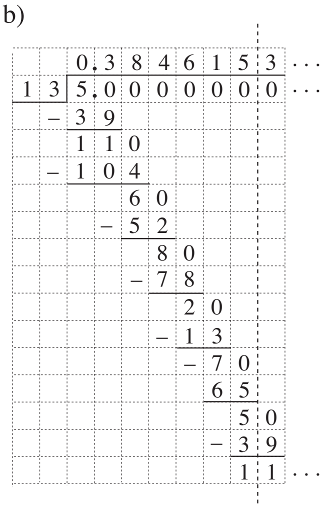
Whole class activity

(or individual work, monitored, helped, with b) done with whole class or only by more able Ps)

Written on BB or SB or OHT

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

b)



35 min

6

Book 5, page 104

Q.3 Read: *Without doing divisions, circle the fractions which have a **finite** decimal form.*

We have learned that recurring decimals are not exact – the recurring digits repeat and repeat to infinity. What do you think <u>finite</u> decimals are? T asks several Ps what they think. (Decimals which are <u>exact</u>, or have a definite end point, or when the nominator of the corresponding fraction is divided by the denominator, a remainder of zero is reached eventually)

Set a time limit. Review with whole class. Ps come to BB to circle fractions or dictate which fractions T should circle, explaining reasoning. Who agrees? Who disagrees? Why?

T uncovers already prepared solution, with corresponding decimals written beside fractions. Ps correct their mistakes.

What do you notice about the uncircled fractions? (e.g. their denominators cannot be expanded to 10, 100, 1000, etc.)

Solution:

a) $\boxed{\frac{7}{2}}$ $(= 3\frac{1}{2} = 3.5)$

b) $\frac{4}{3}$ $(= 1\frac{1}{3} = 1.\dot{3})$

d) $\boxed{\frac{18}{20}}$ $(= \frac{9}{10} = 0.9)$

e) $\boxed{\frac{12}{15}}$ $(= \frac{4}{5} = \frac{8}{10} = 0.8)$

g) $\boxed{\frac{15}{12}}$ $(= \frac{5}{4} = 1\frac{1}{4} = 1.25)$

h) $\boxed{\frac{17}{25}}$ $(= \frac{68}{100} = 0.68)$

i) $\boxed{\frac{80}{125}}$ $(= \frac{16}{25} = \frac{64}{100} = 0.64)$

j) $\frac{10}{225}$ $(= \frac{2}{45} = 0.0\dot{4})$

Individual trial first, monitored

Written on BB or SB or OHT

Initial discussion on the two types of decimals:

BB: <u>recurring decimals</u>
<u>finite decimals</u>

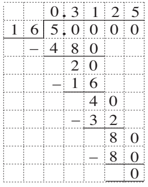
Ps expand or simplify fractions as necessary in *Ex. Bks.*

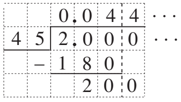
Discussion, reasoning, checking, agreement, self-correction, praising

Show divisions in detail only if necessary, e.g. in f) and j).

c) $\frac{20}{18}$ $(= \frac{10}{9} = 1\frac{1}{9} = 1.\dot{1})$

f) $\boxed{\frac{21}{16}}$ $(= 1\frac{5}{16} = 1.3125)$





40 min

Activity		*Notes*
7	***Book 5, page 104, Q.4***	Whole class activity (or individual work, monitored helped if Ps wish and there is time) Written on BB or use enlarged copy master or OHP At a good pace Discussion, reasoning, agreement, (self-correction), praising Extra praise if Ps notice relationships which make the calculation easier. Feedback for T

Read: *Fill in the missing numerators, denominators or numbers.*

Ps come to BB to fill in missing numbers, explaining reasoning. Class agrees/disagrees. Ps write in *Pbs* too.

Agree that the easiest way to convert fractions to decimals is to express it as 10ths, 100ths or 1000ths, if possible.

Discuss how such times would be described in real life (not normally as decimals – more likely to be fractions).

Solution:

a) 3 minutes = $\frac{3}{\boxed{60}}$ hour = $\frac{\boxed{1}}{\boxed{20}}$ hour = $\frac{\boxed{5}}{100}$ hour = $\boxed{0.05}$ hour

b) 15 minutes = $\frac{15}{\boxed{60}}$ hour = $\frac{\boxed{1}}{\boxed{4}}$ hour = $\frac{\boxed{25}}{100}$ hour = $\boxed{0.25}$ hour

c) 63 minutes = $\frac{63}{\boxed{60}}$ hour = $\frac{\boxed{21}}{\boxed{20}}$ hour = $\frac{\boxed{105}}{100}$ hour = $\boxed{1.05}$ hours

d) 6 hours = $\frac{\boxed{6}}{24}$ day = $\frac{1}{\boxed{4}}$ day = $\boxed{0.25}$ day

÷ 2

e) 3 hours = $\frac{3}{\boxed{24}}$ day = $\frac{1}{\boxed{8}}$ day = $\boxed{0.125}$ day

× 5

f) 15 hours = $\frac{\boxed{15}}{24}$ day = $\frac{\boxed{5}}{8}$ day = $\boxed{0.625}$ day

45 min

Bk5

R: Fractions

C: Ratio. Percentage. Chance or probability of certain events

E: Probability as a percentage

Lesson Plan 105

Activity

Notes

1 Defining numbers

T writes the number 131 on the BB. Tell me different ways of describing this number exactly so that it could not possibly be any other number.

(e.g. 13 tens and 1 unit; 1 hundred and 13 units; 60 less than 200; 3-digit number between 130 and 140 which has the same digit in the hundreds and units column; half of 262, etc.)

T: We say that such examples define the number.

If Ps suggest a general description such as:

prime number; gives a remainder of 2 after division by 3; odd number, etc, T asks rest of class if the description could be applied to other numbers too and if so, Ps give examples. What additional information do we need so that the description can apply only to 131?

(e.g. the next prime number after 127; gives a quotient of 43 and a remainder of 2 after division by 3; the next nearest odd number greater than 129, etc.)

8 min

Whole class activity

Encourage creativity

At a good pace

Class checks the responses.

BB: to define

to describe exactly

Reasoning, agreement, praising

2 Numbers Venn diagram

T has Venn diagram and numbers already on BB.

Let's writethese numbers in the correct set. Ps come to BB to write (place) numbers in appropriate sets, saying what type of number it is. Class agrees/disagrees.

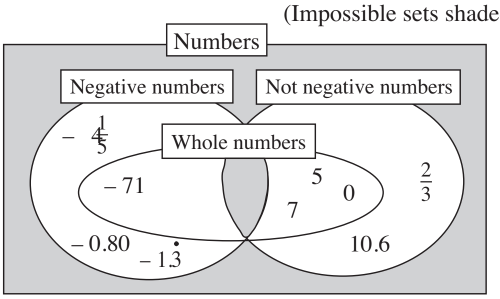
BB:

$5,\ \frac{2}{3},\ 10.6,\ -\ 71,$

$--4\frac{1}{5},\ 0,\ -\ 0.80,$

$\frac{70}{10},\ -\ 1.333\ldots$

(Impossible sets shaded)



What do you notice about the diagram? (Two sets are empty because they are impossible; e.g. a number is either negative or not negative, it can't be both; there is no number which is neither negative nor not negative.) Who can draw a better diagram without these impossible sets? P comes to BB to draw new diagram (with T's help).

14 min

Whole class activity

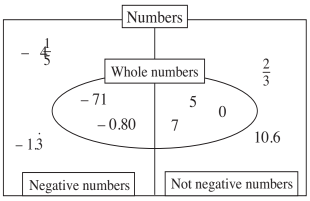
Drawn/written on BB or use enlarged copy master or OHT (or numbers written on cards and stuck to side of BB for ease of manipulation)

Discussion, reasoning, agreement, praising

Elicit that:

$\frac{70}{10} = 7, \quad -1.333\ldots = -1.\dot{3}$

BB: e.g.



3 Ratio

Study these shapes. BB: ○ ○ ○ □ □ □ □ □

a) What part of the shapes are circles? (3 out of 8, so $\frac{3}{8}$)

b) What part of the shapes are squares? (5 out of 8, so $\frac{5}{8}$)

c) What is the ratio of circles to squares? (3 to 5)

d) What is the ratio of squares to circles? (5 to 3)

How do we write ratios? Ps come to BB or T reminds Ps if necessary.

We can also write the ratios using fractions, like this. (BB) Both ways mean the same.

18 min

Whole class activity

Drawn (stuck) on BB

T chooses Ps to respond to questions. Class agrees or disagrees. Praising

BB: C : S = 3 : 5

C : S = 5 : 3

or $\frac{C}{S} = \frac{3}{5}$ (Ratio of no. of circles to no. of squares is 3 fifths, etc.)

$\frac{S}{C} = \frac{5}{3}$

Bk5

Lesson Plan 105

Activity

Notes

4

Book 5, page 105

Q.1 Read: *In a group of children, there are 8 boys and 12 girls.*
Write the parts and ratios required.

Deal with one part at a time. Ps read the questions themselves and write the ratio or fraction.

Review with whole class. Ps could show results on scrap paper or slates on command. Ps responding correctly explain to Ps who were wrong. Mistakes discussed and corrected. Elicit the simplified forms.

What would the parts and ratios be as percentages? Ps do calculations in *Ex. Bks*. then dictate to T. Class agrees/disagrees.

T asks Ps to put the percentages into a sentence to make sure that they understand what they mean. (e.g. 40% of the group are boys.' or 'The number of boys is about 66.7% of the number of girls.')

Solution:

a) *What is the ratio of boys to girls?* (B : G = 8 : 12 = 2 : 3)

b) *What part of the goup is boys?* $\left(\frac{8}{20} = \frac{2}{5}\right)$

c) *What is the ratio of girls to boys?* (G : B = 12 : 8 = 3 : 2)

d) *What part of the group is girls?* $\left(\frac{12}{20} = \frac{3}{5}\right)$

24 min

Whole class activity

Drawn on BB or use enlarged copy master or OHP

At a good pace

Reasoning, agreement, self-correction, praising

[Extension

Tell me other ratios from the picture in your *Pbs*.
(e.g. girls with spotted dresses, boys with black shorts, etc.)]

[= $\frac{2}{3} \rightarrow 0.\dot{6} \rightarrow$ 66.7%]

[= $\frac{40}{100} \rightarrow$ 40%]

[= $1\frac{1}{2} \rightarrow$ 150%]

[= $\frac{60}{100} \rightarrow$ 60%]

5

Probability

T puts 4 *white* marbles, 1 *red* marble and 5 *blue* marbles into an opaque bag and shakes the bag so that the marbles are mixed up.

T chooses 6 Ps to come to front of class one a time to take a marble out of the bag with their eyes closed. Before they do so, they predict the colour of the marble. If correct, class gives them a clap. Each P puts the marble back in the bag and shakes the bag again before the next P makes a prediction and repeats the procedure.

Let's see what you think about these questions.

a) *Is it possible that the red marble could be taken out 5 times in a row?*

(Yes, it is possible but it would have a very small chance of happening.)

b) *Which colour of marble do you think has the greater chance of being taken out?*

(A *blue* marble has more chance of being taken out, as there are more of them.)

c) *Can you be certain that out of 10 experiments, a blue marble would be taken out most frequently?*

(No, it is not certain, as the *red* marble or a *white* marble could be chosen each time but *blue* is the most likely.)

d) *After 10 experiments, which colour do you think will be taken out more frequently, a red or a white marble?*

(A *white* marble, as there are more of them.)

Whole class activity

Elicit that there are 10 marbles in the bag altogether and each marble has an equal chance of being picked. (i.e. they are the same size and mass, so the different colours cannot be identified by touch).

Discussion, reasoning, agreement, praising

Ps could show what they think by writing appropriate responses on scrap paper or slates, or by pre-agreed actions, and Ps with different responses explain reasoning.

Class decides who is correct.

Bk5

Lesson Plan 105

Activity

Notes

5

(Continued)

e) *If we repeated the experiment 1000 times, about how many times would you expect to take out a white marble?*

Show me . . . now! (400 times)

P responding correctly explains reasoning to class, with T's help if necessary. (e.g. The number of *white* marbles is 4 tenths of the total number of marbles in the bag, so after 1000 experiments we would expect to take out a *white* marble 4 tenths of 1000 times, which is 400 times.)

What percent of times would you expect to take out a *white* marble? (40%)

f) *How many marbles do we need to take out of the bag* *without putting any back* *to be certain of taking out at least one white marble?*

Show me . . .now! (7)

Ps responding correctly explain reasoning to class. (The first 5 marbles could all be *blue* and the next marble could be the *red* one, but the 7th marble must be *whit*e, as only *white* marbles are left in the bag.)

In unison, on scrap paper/slates

BB:

$$\frac{4}{10} \text{ of } 1000 = 1000 \div 10 \times 4$$
$$= 100 \times 4 = \underline{400}$$

BB: $\frac{4}{10} = \frac{40}{100} \rightarrow 40\%$

Extra praise for Ps who respond correctly.

Demonstrate the experiment if necessary.

34 min

6

Book 5, page 105

Q.2 Read: *Answer the questions by writing a ratio or a fraction, as required.*

Deal with one block of questions at a time. Ps read questions themselves and write answer in *Pbs*. Set a time limit.

Review with whole class. Ps could show results on scrap paper or slates on command. Ps with different responses explain reasoning. Class decides who is correct. Mistakes discussed and corrected.

Extension

T could ask more able Ps for parts and ratios as percentages too.

Solution:

In a group of students at a youth camp, 3 are Americans, 4 are British and 1 is Greek.

a) i) What part of the group is:

American $\left(\frac{3}{8}\right)$ $[= \frac{375}{1000} = \rightarrow 37.5\%]$

British $\left(\frac{4}{8} = \frac{1}{2}\right)$ $[= \frac{50}{100} \rightarrow 50\%]$

Greek $\left(\frac{1}{8}\right)$ $[= \frac{125}{1000} \rightarrow 12.5\%]$

British or Greek? $\left(\frac{5}{8}\right)$ $[= \frac{625}{1000} \rightarrow 62.5\%]$

b) *What is the ratio in the group of:*

i) American students to British students (3 : 4)
ii) American students to Greek students (3 : 1)
iii) British students to American students (4 : 3)
iv) British studemts to Greek students (4 : 1)
v) Greek students to American students (1 : 3)
vi) Greek students to British students? (1 : 4)

Individual work, monitored, helped

Discussion, reasoning, agreement, self-correction, praising

Demonstrate with Ps at front of class (holding cards showing A, B or G) if necessary.

Feedback for T

Other forms for ratios in b):

i) $\frac{A}{B} = \frac{3}{4} = \frac{75}{100} \rightarrow 75\%$

ii) $\frac{A}{G} = \frac{3}{1} = \frac{300}{100} \rightarrow 300\%$

iii) $\frac{B}{A} = \frac{4}{3} = 1\frac{1}{3} \rightarrow$

$(100 + \frac{100}{3})\% = 133\frac{1}{3}\%$

iv) $\frac{B}{G} = \frac{4}{1} = \frac{400}{100} \rightarrow 400\%$

v) $\frac{G}{A} = \frac{1}{3} \rightarrow 33\frac{1}{3}\%$

vi) $\frac{G}{B} = \frac{1}{4} = \frac{25}{100} \rightarrow 25\%$

Activity

Notes

6

(Continued)

c) *The group is going on a trip in a minibus. They get on the bus in a random order. How certain are you of these events occurring?*

If you think that it is certain to happen, write C, if you think that it is possible but not certain, write P and if you think that it is impossible, write I.

Accept and praise good reasoning but extra praise if Ps explain by giving an exact chance or probabilty.

i) *The first 4 students to get on the bus are American.* (I)

(There are only 3 Americans.)

ii) *The last student to get on the bus is American or British or Greek.* (C)

(No other nationality is getting on the bus.)

iii) *The first student to get on the bus is Greek* (P)

(but has a very small chance of happening as only 1 Greek)

[Elicit that the chance is 1 out of 8, or $\frac{1}{8}$ or 0.125%]

iv) *The first 4 students to get on the bus are an American, a Greek, an American and a British student in that order.* (P)

(but a very small chance of happening)

v) *Two Americans, a British and the Greek student are the first four to get on the bus.* (P)

(Again, a very small chance of happening)

Ps might agree that v) has more chance than iv) of occurring. as in v), the order does not matter.

d) i) *Which nationality is the most likely to get on the bus first?*

(*British*, as there are more of them)

[Elicit that the chance is 4 out of 8, or $\frac{4}{8} = \frac{1}{2} \rightarrow$ 50%]

ii) *Is the first student to get on the bus more likely to be Americn or British?*

(*British,* as there are more of them; or as the ratio of B to A is 4 : 3; or

Chance of the student being *American*: $\frac{3}{8}$

Chance of the student being *British*: $\frac{4}{8}$, and $\frac{4}{8} > \frac{3}{8}$

45 min

Bk5

R: Numbers. Calculations

C: Positive and negative numbers. Debt and cash

E: Problems

Lesson Plan 106

Activity — ***Notes***

1

Defining numbers

T writes the number 132 on BB

a) Let's <u>define</u> this number. (i.e. describe it <u>exactly</u>)

T gives an example first if necessary, then Ps dictate their own. Class checks that they are correct and that the description does not fit any other number..

(e.g. 132% of 100; 1 third of 396; 11 × 12; 2 × 2 × 3 × 11; half of 264; 100 + 32; the 133rd number from 0; 1000 – 868, etc.)

Elicit the difference between <u>defining</u> a number (which relates <u>only</u> to that number) and saying a <u>true statement</u> about the number (which can also be true for other numbers too).

b) Tell me true statements about the number 132.

(e.g. It is even. It has 3 digits. It is divisible by 6. It is not a multiple of 5. It is a factor of 396. It is not a prime number. etc.)

8 min

Whole class activity

At a good pace

in good humour!

Reasoning, agreement, praising

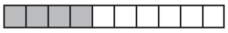
Encourage creativity.

Extra praise for unexpected definitions or statements

Feedback for T.

2

Ratio

What can you tell me about this rectangle? BB: 

(Divided into 10 equal parts; 4 of the parts are shaded.)

Who can write different ratios abour it? Ps come to BB or dictate what T should write, explaining reasoning. (If necessary, T gives first ratio as an example for Ps to follow.)

Ratio of: *Shaded* to *White*: 4 : 6 = 2 : 3 [= $\frac{2}{3}$ = $0.\dot{6}$ → $66\frac{2}{3}$ %

White to *Shaded*: 6 : 4 = 3 : 2 [= $1\frac{1}{2}$ = 1.5 → 150%]

Shaded to the *whole*: 4 : 10 = 2 : 5 [= $\frac{2}{5}$ = 0.4 → 40%]

White to the *whole*: 6 : 10 = 3 : 5 [= $\frac{3}{5}$ = 0.6 → 60%]

12 min

Whole class activity

Drawn (stuck) on BB or SB or OHT

Reasoning, agreement, praising

Feedback for T

[or = 0.666 . . .→ 66.7 %]

Extension

T asks Ps to express the ratio as a fraction, decimal and percentage. Show calculations on BB. e.g.

$$\begin{array}{r|l} & 0.6\;6\;6\ldots \\ \hline 3 & 2.0\;0\;0\ldots \\ & \;\;2\;\,4\;\,4\;\,4 \end{array}$$

3

Book 5, page 106

Q.1 Read: *Write the ratios between the shaded and white parts and the whole square.*

Set a time limit or deal with one at a time. More able Ps can be asked to write the ratios as fractions, decimals and percentages too.

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

Solution:

a) ▨ to ☐ : 34 : 66 = 17 : 33 [= $\frac{17}{33}$ = $0.\dot{5}\dot{1}$ → 52%

b) ☐ to ▨ : 66 : 34 = 33 : 17 [= $\frac{33}{17}$ = $1\frac{16}{17}$ ≈ 1.9412 → 194.1%]

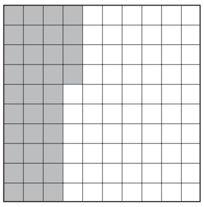
c) ▨ to the whole: 34 : 100 = 17 : 50 [= $\frac{34}{100}$ = 0.34 → 34%]

d) ☐ to the whole: 66 : 100 = 33 : 50 [= $\frac{66}{100}$ = 0.66 → 66%]

18 min

Individual work, monitored, helped

Drawn on BB or use enlarged copy master or OHP

BB: 

Discussion, reasoning, agreement, self-correction, praising

T (Ps) can use a calculator to do difficult divisions.

Activity

Notes

4

Probability

Let's consider whether these events are certain, possible but not certain, or impossible. Show me what you think when I say.

a) *There will be a 29th of February in the year 2004.* (C)

(2004 will be leap year, so will have an extra day)

[Accept possible if a P reasons that the world might end before 29 February 2004!]

b) *More girls than boys will be born next year.* (P)

(Over several years, <u>on average</u>, the same number of boys as girls are born but it might not necessarily happen next year.)

c) *If I throw a dice, I will get a 7.* (I)

(A dice has only the numbers 1 to 6)

d) I*f I take 12 marbles from a bag containing 10 black marbles and 20 white marbles, I will have taken out at least one white marble.* (C)

(The first 10 marbles could all be *black* but the 11th and 12th <u>must</u> be *white*, as only *white* marbles are left in the bag.)

23 min

Whole class activity

Ps could have probability cards on desks, or write C, P or I on slates or scrap paper and show in unison on command.

T asks Ps with different responses to explain their reasoning. Class decides if they are correct or not.

In good humour!

Reasoning, agreement, praising, encouragement only

Feedback for T

5

Book 5, page 106

Q.2 Read: *How certain of these events occurring? Write C for certain, P for possible but not certain, or I for impossible.*

Set a time limit. Ps write appropriate letters in the boxes.

Review with whole class. Ps could show initial letters on scrap paper or slates, or use probability cards. Ps wth different responses explain reasoning. Class decides who is correct. Mistakes discussed and corrected.

Solution:

a) The next Olympic Games will be in the year 2004. (C)

b) The next next time I throw a dice I will get a 5. (P)

c) The next time I throw a dice I will get a 0. (I)

d) Next year, the number of boys born will be twice the number of girls (P)

a) Next year, fewer boys than girls will be bon. (P)

29 min

Individual work, monitored, (helped)

Reasoning, agreement, self-correction, praising

More Ps might write P in a) after the discussion in *Activity 4a*!

but very unlikely!

6

Problem

Listen carefully, note the data and think about how you would solve this problem.

In a bag of marbles, the ratio of red marbles to green marbles is 2 : 5. There are 6 red marbles in the bag.

a) How many green marbles are there?

b) How many marbles are in the bag altogether?

Ps come to BB or dictate to T, explaining reasoning. Who agrees? Who thought of another way to do it? etc. T suggests some ways too.

BB: e.g.

a) $R : G = 2 : 5$, so $R = \frac{2}{5}$ of $G = 6$, $G = 6 \div 2 \times 5 = \underline{15}$

Whole class activity

T repeats slowly and a P repeats in own words to give Ps time to think and write.

Discussion, reasoning, agreement, praising

Ps write the different plans in *Ex. Bks*.

or $R : G = 2 : 5 \overset{(\times 3)}{=} 6 : \underline{15}$

or Ps might draw a diagram, as below, or use algebra.

Activity | ***Notes***

6

(Continued)

b) Total number of *red* and *green* marbles in the bag:

$R + G = 6 + 15 = \underline{21}$

or $\frac{2}{7} \rightarrow 6$; $\frac{1}{7} \rightarrow 3$; $\frac{7}{7} \rightarrow 21$

So there are 21 marbles in the bag if the bag contains <u>only</u> *red* and *green* marbles – but there could be other colours too!

35 min

or BB:

Ⓡ Ⓡ | Ⓖ Ⓖ Ⓖ Ⓖ Ⓖ
Ⓡ Ⓡ | Ⓖ Ⓖ Ⓖ Ⓖ Ⓖ
Ⓡ Ⓡ | Ⓖ Ⓖ Ⓖ Ⓖ Ⓖ
6 | 15
Total: 21

Extra praise if Ps think of this.

7

Book 5, page 106

Q.3 Read: *A group of children is visiting a museum. In the group, there are 12 girls and the ratio of girls to boys is 3 to 2.*

Set a time limit for a) to c). Ps read questions themselves, and solve them. Ps may calculate in *Ex. Bks.* if they need more room.

Review with whole class. Ps come to BB or dictate what T should write, explaining reasoning. Who agrees? Who thinks something else? etc. Mistakes discussed and correted.

Solution:

a) *How many boys are in the group?*

$G : B = 3 : 2 = 12 : \underline{8}$

(or $G = \frac{3}{2}$ of $B = 12$; $B = 12 \div 3 \times 2 = \underline{8}$

b) *How many children are in the group?*

No. of children: $8 + 12 = \underline{20}$

c) *If the children enter the museum in a random order, underline the outcome which you think is more likely to occur.*

i) A boy enters first. *ii)* *<u>A girl enters first.</u>*

(As there are more girls than boys.)

d) *What do you think is the probability of each of the outcomes in c) occurring?*

Elicit /tell Ps that <u>probability</u> means chance. If an outcome is <u>impossible</u> and has no chance of happening, what do you think its probability is? (0) (BB)

If an outcome is <u>certain</u> to happen, what do you think its probability is? (1, as 4 chances out of 4, or 10 chances out of 10, or 100 chances out of 100, etc. is equivalent to 1) (BB)

If an outcome is <u>possible but not certain</u>, how could we write its probability? Ps come to BB or dictate inequality to T.

What kind of numbers are more than 0 and less than 1? (fractions or decimals)

Let's write the probability of each of these outcomes.

i) *A boy enters first.* $p = 8$ chances out of $20 = \frac{8}{20} = \frac{2}{5}$

ii) *A girl enters first.* $p = 12$ chances out of $20 = \frac{12}{20} = \frac{3}{5}$

41 min

a) to c) as individual work, monitored, helped

Discussion, reasoning, agreement, self-correction, praising

or

b) $\frac{3}{2} \rightarrow 12$

$\frac{1}{2} \rightarrow 4$

$\frac{2}{2} \rightarrow \underline{8}$

Whole class activity

Discussion, reasoning, agreement, praising

BB: <u>probability</u> (p)
(chance)

<u>Impossible</u>: $p = 0$

<u>Certain</u>: $p = 1$

<u>Possible</u>: $0 < p < 1$

Elicit that the more (less) chance there is, the nearer the probablity is to 1 (0).

Ps come to BB or dictate to T, explaining reasoning

Rest of Ps write fractions in *Pbs*.

Reasoning, agreement, praising

Bk5

Lesson Plan 106

Activity

8

Book 5, page 106, Q.4

Read: *In a bag there are 50 marbles altogether. The marbles are either black or white. The ratio of black marbles to white marbles is 1 : 4.*

a) *How many marbles are there of each colour?*

How many:

i) *black* marbles are there? Show me . . . now! (10)

(1 out of 5 or $\frac{1}{5}$ is *black*. $\frac{1}{5}$ of $50 = 50 \div 5 = \underline{10}$)

ii) *white* marbles are there? Show me . . . now! (40)

(4 out of 5 or $\frac{4}{5}$ are *white*. $\frac{4}{5}$ of $50 = 50 \div 5 \times 4 = \underline{40}$)

b) *If you take a marble out of the bag with your eyes shut, what is the probability that it will be white?*

Show me . . . now! ($\frac{4}{5}$)

(40 chances out of 50, so 4 chances out of 5)

Elicit the probability as a percentage too.

BB: $P = \frac{4}{5} = \frac{40}{50} = \frac{80}{100} \rightarrow 80\%$

45 min

Notes

Whole class activity but indiividual calculation

(or individual trial first if Ps prefer)

Responses shown on scrap paper or slates in unison,

Ps with different answers explain reasoning to class. Class decides who is correct.

Agree that the ratio

BB: B : W = 1 : 4

means that out of every 5 marbles, 1 will be *black* and 4 will be *white*; i.e. the no. of *black* marbles is 1 quarter of the number of *white* marbles but is 1 fifth of the total number of marbles.

Ps write agreed results in *Pbs*.

Praising

Bk5

R: Fractions, ratio
C: Combinatorics, chance, probability
E: Percentage. Frequency, relative frequency

Lesson Plan 107

Activity | ***Notes***

1

Numbers

T writes the number <u>133</u> on BB.

b) Let's factorise 133.

What does factorise mean? (To break down a number into its prime factors.) What is a factor of a number? (A number which divides into that number exactly) What is a prime factor? (A factor which is a prime number, i.e. is exactly divisible only by itself and 1)

How can we factorise 133? (e.g. 133 is an odd number, so has no even prime factors; there is no 5 or 0 in the units column, so 5 is not a prime factor. Divide by 3, 7, etc. in turn to see if there is a remainder. We do not need to go past 11, as 11 × 12 = 132)

T points out that factors are <u>whole</u> numbers, so we do not continue the division beyond the units column. Elicit or remind Ps that <u>every</u> number has the factors 1 and the number itself.

b) Let's <u>define</u> this number. (i.e. describe it <u>exactly</u>)

Ps dictate definitions and class checks that they are correct and that the description is unique to 133.

(e.g. the 67th positive odd number; 111 × 3 – 200; 1 third of 399; 50% of 266; 133% of 100; 266% of 50; $\frac{1}{10}$ of 1330; 100 × 1.33, etc.)

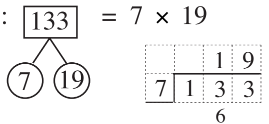
Whole class activity

Quick revision of how to factorise.

Discussion, reasoning, agreement, praising

Ps tell their ideas. T gives hints if Ps have forgotten how to factorise numbers.

BB:



Factors: 1, 7, 19, 133

At a good pace

Encourage creativity

Extra praise for unexpected but correct definitions

8 min

2

Ratio

In this box are 3 *black* pencils, 1 *red* pencil and 4 *green* pencils.
Let's write different ratios about the pencils.

Ps come to BB or dictate what T should write. Class agrees/disagrees. T asks Ps to give the ratios in other forms too.

BB: e.g.

Ratio of: $B : R = 3 : 1$ (= 3 times → 300%)

$B : G = 3 : 4 \; (= \frac{3}{4} = \frac{75}{100} \to 75\%)$

$R : B = 1 : 3 \; (= \frac{1}{3} \to 33\frac{1}{3}\% = 33.\dot{3}\% \approx 33\%)$

$R : G = 1 : 4 \; (= \frac{1}{4} = \frac{25}{100} \to 25\%)$

$G : B = 4 : 3 \; (= \frac{4}{3} = 1\frac{1}{3} \to 133\frac{1}{3}\% = 133.\dot{3}\% \approx 133\%)$

$G : R = 4 : 1$ (= 4 times → 400%)

or, e.g. $B : (R \text{ or } G) = 3 : 5 \; (= \frac{3}{5} = \frac{60}{100} \to 60\%)$

$(R \text{ or } G) : \text{B} = 5 : 3 \; (= \frac{5}{3} = 1\frac{2}{3} \to 166\frac{2}{3}\% = 166.\dot{6}\% \approx 167\%)$

etc

or, e.g. $B : \text{All pencils} = 3 : 8 \; (= \frac{3}{8} = \frac{375}{1000} \to 37.5\%)$

$R : \text{All pencils} = 1 : 8 \; (= \frac{1}{8} = \frac{125}{1000} \to 12.5\%)$, etc.

Whole class activity

T has real pencils to show.

At a good pace

Encourage logical listing.

T could start each new type if Ps do not suggest it and Ps dictate the other similar ratios.

Reasoning, agreement, praising

Ps can work out recurring decimals and percentages with a calculator.

or, e.g.

$(B \text{ or } R) : \text{All} = 4 : 8$

$(= \frac{4}{8} = \frac{1}{2} = 50\%)$

$(B \text{ or } G) : \text{All} = 7 : 8$

$(= \frac{7}{8} = \frac{875}{1000} = 87.5\%)$

or $B : R : G = 3 : 1 : 4$

Agree that a 3-part ratio cannot be given as a fraction, decimal or percentage.

18 min

Bk5

Lesson Plan 107

Activity

Notes

3

Possible outcomes: tossing a coin

If I toss this coin, how many possible outcomes could there be?

Ps come to front of class to toss the coin a few times.

What different outcomes did you see? (The coin landed Head up, or the coin landed Tail up.)

Did anyone's coin land on its edge? (No) Is it possible for a coin to land on its edge? T asks several Ps what they think. Class might agree that you can imagine it happening but in practice it does not happen unless the coin lands leaning against something, which does not count.

Let's assume that tossing a coin always gives either a Head or a Tail, so there are 2 possible outcomes.

What chance do you think these outcomes have? Do they have an equal or unequal chance of happening? Agree that if a normal coin is used, H or T has an equal chance of occurring. (Some Ps might know of <u>biased</u> or <u>unfair</u> coins, which are weighted so that they land more often on one side than on the other.)

T: When we toss a coin, we assume that it is a normal (unbiased or fair) coin and has only 2 possible outcomes, H or T, and each outcome has an <u>equal</u> chance of happening.

Whole class activity

If possible, Ps have coins to toss on desks too.

Discussion, agreement, praising

BB:

2 possible outcomes: H or T

BB:

<u>unbiased</u> coin → fair

<u>biased</u> coin → unfair

(Some Ps might not agree with the T about this!)

22 min

4

Book 5, page 107

Q.1 Read: *Predict the result for each outcome first, then do the experiment. Toss a coin 20 times and note how it lands in this table.*

Elicit/explain what a prediction means. (If you toss the coin 20 times, how many times do you <u>think</u> it will land on a Head and how many times do you <u>think</u> it will land on a Tail?)

Ps fill in their predictions first, then do the experiment, making a tally mark in either the Heads row or the Tails row for each toss. Keep class together on the 20 tosses.

Then Ps count their totals and check that they add up to 20.

e.g.

Outcome	**Prediction**	**Tosses**																				**Totals**
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Head	10	|				|		|	|		|	|		|			|			|		9
Tail	10		|	|	|		|			|			|		|	|		|	|		|	11

Read: *What fraction of your tosses resulted in:*

a) a Head *b) a Tail?*

Ps write fractions in *Pbs*, then T asks some Ps to report on their experiment and to compare their predictions with what actually happened. Agree that the 2 fractions should add up to 1.

Let's collect the data from everyone and write it in this table. How many Ps are in the class? (e.g. 25) If each pupil tossed the coin 20 times, how many tosses were there altogether? (e.g. 25 × 50 = <u>500</u>) Ps fill in appropriate column in table.

T quickly asks each P in turn to say their totals for Heads and Tails and writes it on BB. Ps keep a running total in *Ex. Bks*. (or use a calculator). After checking that the two totals add up to the total number of tosses, Ps write class totals in table in *Pbs*.

Individual prediction and experiment, monitored, (helped)

Tables drawn on BB or use enlarged copy master or OHP

T might ask some Ps for their predictions. (Accept unequal predictions too but say that we will wait for the results of the experiment to see who is correct.)

At a fast pace

P finished first could write his or her data on table on BB.

Individual work, monitored

e.g. Head: $\frac{9}{20}$ Tail: $\frac{11}{20}$

Discussion, reasoning, agreement, praising

Whole class activity

T works on BB, Ps in *Pbs*.

(If totals do not add up correctly, T in good humour says that some one has made a mistake and adusts the figures appropriately.)

Activity

Notes

4 (Continued)

We call the total number of times a Head was tossed its frequency.

BB: frequency

What is the ratio of the frequency of a Head (Tail) to the total number of throws? Ps come to BB or dictate to T.

(e.g. No. of Heads : No. of tosses = 252 : 500
No. of Tails : No. of tosses = 248 : 500

We call this ratio the relative frequency. It means how frequently a Head or Tail was thrown compared with (relative to) the total number of throws.

BB: relative frequency

Write the ratio or relative frequency in the table in your *Pbs* as a fraction and as a percentage. (Ps may use calculators to work out the percentages.)

Whether or not Ps use calculators depends on the difficulty of the division.

[If necessary, calculate the percentages with the whole class, eliciting each step. (Divide the numerator by the denominator, then multiply by 100.).

BB: e.g. $\frac{252}{500} = 252 \div 500 = 2.52 \div 5 = 0.504 = 50.4\%$

$\frac{248}{500} = 248 \div 500 = 248 \div 5 = 0.496 = 49.6\%$]

(Remind Ps that reducing the dividend and divisor by the same number of times does not change the quotient.)

	0.	5	0	4
5	2.	5	2	0
	2		2	

	0.	4	9	6
5	2.	4	8	0
	2	4	3	

Review completed table with whole class. Ps come to BB or dictate to T. Class agrees'disagrees. Mistakes discussed and corrected. What do you notice? (Percentages are almost equal.)

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

BB: e.g.

Outcome	**Number of tosses**	**Totals** *(frequency)*	**Ratio** *(relative frequency)* fraction	percentage
Head	500	252	$\frac{252}{500}$	50.4%
Tail		248	$\frac{248}{500}$	49.6%

(Ps who disagreed before might now agree that throwing a Head and throwing a Tail have an equal chance of happening.)

Read: *What do you think is the **probability** of tossing:*

a) a Head b) a Tail?

Ps could show on scrap paper or slates on command. Ps with different answers explain reasoning. Class decides who is correct. Ps write agreed fractions in *Pbs*.

Reasoning, agreement, praising

(There are only 2 possible outcomes, H or T, and assuming that the coin is unbiased, each outcome will have an equal chance of occurring. So each will have a probability of 1 chance out of 2 or 1 half or 50%.)

BB:

Probability of:

a) Head: $\frac{1}{2}$ b) Tail: $\frac{1}{2}$

If some Ps' individual data and the class data do not match this probability, T points out that the more times the experiment is done, the closer the actual data will get to the calculated probability.

(If possible, use a computer simulation of tossing coins to show that the more times a coin is tossed, the nearer the actual outcomes are to the predicted probability.)

[T might mention that after lots of such experiments using Euros, it was found that the coins were biased, as the relative frequencies of the two sides were never equal!]

32 min

Activity | ***Notes***

5

Possible outcomes: throwing a dice

If we throw a dice, what possible outcomes could there be?

Let's try it! Ps throw a dice several times (on desks and/or at front of class). What different outcomes did you see? (The dice landed showing 1, 2, 3, 4, 5 or 6 facing up.)

Did anyone's dice land on an edge or vertex? (No) Is it possible for a dice to land on an edge or vertex? T asks several Ps what they think. Class might agree that you can imagine it happening but in practice it does not happen unless the dice lands leaning against something, which does not count.

Let's assume that a dice always lands with 1, 2, 3, 4, 5 or a 6 facing up, so there are 6 possible outcomes.

What chance do you think these outcomes have? Do they have an equal or unequal chance of happening? Elicit that as a dice is usually a cube and is symmetrical, each of the numbers should have an equal chance of being thrown.

T: When we throw a dice, we assume that it is a normal (unbiased or fair) dice and has 6 possible outcomes, 1, 2, 3, 4, 5 or 6, and each outcome has an <u>equal</u> chance of occurring.

Whole class activity

If possible, Ps have dice on desks too.

Discussion, agreement, praising

BB: <u>Dice</u>

6 outcomes: 1, 2, 3, 4, 5 or 6

(Again, some Ps might not agree because of their experience of board games where throwing a 6 is required to start or finish, or because they have used an unfair dice.)

35 min

6

Book 5, page 107

Q.2 Read: *Predict the results for each outcome first, then do the experiment. Throw a dice 20 times and note how it lands in this table.*

Ps make predictions (checking that they add up to 20) and throw a dice 20 times. If possible, keep Ps together at each throw. Ps check that they have made 20 tally marks altogether.

Then Ps write totals in frequency column in table and calculate the ratios (relative frequencies) as fractions and percentages.

P finished first could write his or her results in table on BB.

T asks some Ps to report their results to class and to compare their actual results with their predictions.

e.g.

Outcome	**Prediction**	**Tally of 20 throws**	**Totals** *(frequency)*	**Ratio** *(relative frequency)* fraction	percentage
⚀	2	| | | |	4	$\frac{4}{20}$	20%
⚁	4	| | |	3	$\frac{3}{20}$	15%
⚂	3	| | |	3	$\frac{3}{20}$	15%
⚃	3	| | |	3	$\frac{3}{20}$	15%
⚄	4	| | |	3	$\frac{3}{20}$	15%
⚅	4	| | | |	4	$\frac{4}{20}$	20%
	(20)		(20)	($\frac{20}{20}$)	(100%)

Read: *Collect the class data and fill in this table.*

First agree on total number of throws. (e.g. if 25 Ps in class, and 20 throws each, then number of throws: 25 × 20 = <u>500</u>)

Ps dictate their results for each outcome and T writes on BB. Ps keep count in *Ex. Bks* and/or T chooses Ps to keep a running total for each outcome on a calculator as a check. After checking that the 6 totals add up to 500, Ps write agreed frequencies in class data table on BB and in *Pbs*.

Individual work, closely monitored, helped, corrected

Tables drawn on BB or use enlarged copy master or OHP

At a fast pace

Calculations can be done in *Ex Bks*. or Ps may use a calculator for the percentages. T helps where necessary.

Elicit that <u>relative frequency</u> is the ratio of the number of times a certain number is thrown (frequency) compared with (relative to) the total number of throws.

BB: $\dfrac{4}{20} = \dfrac{20}{100} \rightarrow 20\%$, etc.

Praising, encouragement only

Whole class activity

T writes in table on BB and Ps write in *Pbs*.

Deal with one outcome at a time.

At a fast pace.

In good humour!

Activity

6 (Continued)

Calculate the ratios (relative frequencies) as fractions and percentages with the whole class. Ps come to BB or dictate what T should write, explaining reasoning. Class agrees/disagrees. Check on a calculator. Ps fill in table in *Pbs* too. e.g.

BB:

Outcome	**Number of throws**	**Totals** *(frequency)*	**Ratio** *(relative frequency)* fraction	percentage
⚀	500	81	$\frac{81}{500}$	16.2%
⚁		85	$\frac{85}{500}$	17.0%
⚂		82	$\frac{83}{500}$	16.4%
⚃		84	$\frac{84}{500}$	16.8%
⚄		83	$\frac{83}{500}$	16.6%
⚅		85	$\frac{85}{500}$	17.0%
		(500)	($\frac{500}{500}$)	(100%)

What do you notice about the percentages in this table compared with your table? (They are closer together.) Why do you think that is so? (We have collected lots more data.)

Read: *What do you think is the probability of throwing a:*
1, 2, 3, 4, 5 or 6?

Ps write fractions in *Pbs*. **A**, what did you write for each one? Why? Who agrees? Elicit that each number has a probability of <u>1 sixth</u>. (6 possible outcomes, each with an equal chance of happening, so each outcome has a probability of 1 sixth.)

Read: *Divide 100% by 6. What does it have to do with the experiment?*

Ps do the division in *Ex. Bks*. T gives them time to consider the question, then asks several Ps what they think. e.g.

BB: $100\% \div 6 = 16\frac{2}{3}\% = 16.\dot{6}\%$ and $\frac{1}{6} \rightarrow 16.\dot{6}\%$

which is the chance of each outcome. Agree that the percentages in the table are all very close to $16.\dot{6}\%$.

Why do you think that the ratios from our experiment are not <u>exactly</u> $16.\dot{6}\%$ or $\frac{1}{6}$? (We still do not have enough data – we need to do the experiment thousands of times.)

T: The more times we throw the dice, the closer the <u>actual</u> outcomes will be to the outcomes we expect.

45 min

Notes

Elcit that to change a fraction into a percentage, express it as 100ths if possible, or divide the numerator by the denominator and multiply by 100.

If percentages are difficult because of the number of Ps in the class, use a calculator.

Reasoning agreement, praising

At a good pace

Ps check that the total for each column is correct.

Discussion, agreement

Or Ps write fraction on scrap paper or slates and show in unison on command.

Discussion, reasoning, agreement, praising

If Ps do not see the connection, T points it out.

(1 out of 6 tines is the same as 16 and 2 thirds times out of 100.)

If possible, T shows a computer simulation of throwing a dice.

Bk5

R: Fractions, ratio
C: Combinatorics. Chance or probability. Experiments
E: Percentages. Frequency. Relative frequency

Lesson Plan 108

Activity | ***Notes***

1

Numbers

T writes the number <u>134</u> on BB.

a) Let's factorise 134 and list all its factors.

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

BB: <u>134</u> = 2 × 67 (67 is a prime number)
Factors of 134: 1, 2, 67, 134

b) Let's <u>define</u> the number 134.

Ps dictate definitions and class checks that they are correct and that the description is unique to 134.

(e.g. the 67th positive even number; $\frac{402}{3}$; $\frac{399}{3} + 1$; 10 × 13 + 4; 20% of 670; 67% of 200; 200% of 67; 200 – 66, etc.)

8 min

Notes:
Whole class activity
Reasoning, agreement, praising

At a good pace

Encourage creativity

Extra praise for unexpected but correct definitions

2

Problem 1

Listen carefully, note the data and think how you would work out the answer. Do it in your *Ex. Bks* if you have time.

a) *There are 20 marbles in a bag. Some are blue, some are yellow and some are pink. The ratio of blue to yellow to pink marbles is 5 : 2 : 3.*

How many marbles of each colour are in the box?

Who thinks that they know how to do it? P comes to BB to show solution and explain reasoning. Who agrees? Who would do it another way? etc. After agreement, T chooses a P to say the answer in a sentence.

e.g. BB:
Ⓑ Ⓑ Ⓑ Ⓑ Ⓑ | Ⓨ Ⓨ | Ⓟ Ⓟ Ⓟ
Ⓑ Ⓑ Ⓑ Ⓑ Ⓑ | Ⓨ Ⓨ | Ⓟ Ⓟ Ⓟ
10 | 4 | 6
(10 in each row, so 2 rows are needed to make 20 altogether)

or $B : Y : P = 5 : 2 : 3 = \underline{10} : \underline{4} : \underline{6}$ (× 2)

or $B = \frac{5}{10}$ of 20 = <u>10</u>; $Y = \frac{2}{10}$ of 20 = <u>4</u>; $P = \frac{3}{10}$ of 20 = <u>6</u>

Answer: There are 10 *blue* marbles, 4 *yellow* marbles and 6 *pink* marbles in the bag.

b) Show me the answers to these questions when I say. You can do the calculations in your *Ex. Bks* if you cannot do them in your head.

If you take out a marble from the bag with your eyes closed, what is the probability of it being:

i) a blue marble $\left(\frac{10}{20} = \frac{5}{10} = \frac{1}{2} \rightarrow 50\%\right)$

ii) a yellow marble $\left(\frac{4}{20} = \frac{2}{10} = \frac{1}{5} \rightarrow 20\%\right)$

iii) a pink marble $\left(\frac{6}{20} = \frac{3}{10} \rightarrow 30\%\right)$

iv) not blue $\left(\frac{10}{20} = \frac{5}{10} = \frac{1}{2} \rightarrow 50\%, \text{ or } 100\% - 50\%\right)$

v) not yellow $\left(\frac{16}{20} = \frac{8}{10} = \frac{4}{5} \rightarrow 80\%, \text{ or } 100\% - 20\%\right)$

etc.

14 min

Notes:
Whole class activity
T repeats slowly and chooses a P to repeat in own words to give Ps time to think and calculate.

Ps tell class their ideas.
Reasoning, agreement, praising

(as 5 + 2 + 3 = 10, and 10 times <u>2</u> is 20)

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

Ps answering correctly explain reasoning to Ps who were wrong.

Accept any correct form but elicit the simplification and percentage if no P has shown them.

Also ask *yellow or pink* (same as '*not blue*'), etc. and *blue or yellow or pink*.

$\left(\frac{20}{20} = \frac{10}{10} = 1 \rightarrow 100\%\right)$
<u>Certain</u> to happen!

Bk5

Lesson Plan 108

Activity

3

Book 5, page 108

Q.1 Read: *Four children tossed a coin several times and wrote their results in this table. Write the answer to each question in the appropriate part of the table.*

Deal with one part at a time or set a time limit. Ps do necessary calculations in *Ex. Bks* and write results in *Pbs*.

Review with whole class. Ps could show results on scrap paper or slates on command. Ps answering correctly come to BB to fill in table and explain reasoning. Class agrees/disagrees. Mistakes discussed and corrected.

Solution:

a) *How many tosses were there altogether?*

BB: $(24 + 30 + 27 + 20) + (25 + 28 + 31 + 15)$

$= 101 + 99 = \underline{200}$

b) *How many: i) Heads ii) Tails were tossed altogether?*

i) No of Heads: $\underline{101}$ ii) No of Tails: $\underline{99}$

c) *What is the ratio of each outcome to the total number of tosses:*

i) as a fraction $\text{H : All} = \dfrac{101}{200}$; $\text{T : All} = \dfrac{99}{200}$

ii) as a decimal

$$\text{H : Al} = \frac{101}{200} = 101 \div 200 = 1.01 \div 2 = \underline{0.505}$$

$$\text{T : All} = \frac{99}{200} = 99 \div 200 = 0.99 \div 2 = \underline{0.495}$$

iii) as a percentage?

$\text{H : All} = 0.505 \rightarrow \underline{50.5\%}$

$\text{T: : All} = 0.495 \rightarrow \underline{49.5\%}$

Completed table:

Outcome	Alan	Becky	Carol	David	Totals *frequency*	Ratio *relative frequency* fraction	decimal	percentage
Head	24	30	27		**101**	$\frac{101}{200}$	**0.505**	**50.5%**
Tail	25	28	31	15	**99**	$\frac{99}{200}$	**0.495**	**49.5%**
				Total tosses	**200**			

Extension

What chance would you give of tossing a Head (Tail)? ($\frac{1}{2}$ for each, as there are 2 possible outcomes, each with an equal chance of happening)

Which child's outcomes are closest to this prediction? Why?

[Alan, as he threw a coin 49 times, and 24 H and 25 T are each very close to half of 49 which is $\underline{24.5}$; or

Ratio of: a Head: $\dfrac{24}{49} \approx 0.49 \rightarrow 49\%$; a Tail : $\dfrac{25}{49} \approx 0.51 \rightarrow 51\%$

and both are very close to 50%, which is what we would expect; or difference between no. of Heads and no. of Tails is smallest for Alan and we would predict that there should be no difference at all.]

22 min

Notes

Individual work, monitored, helped

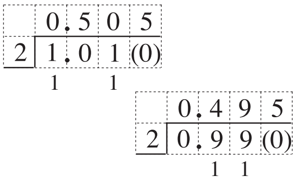
(or whole class activity in calculating the decimals and percentages)

Table drawn on BB or use enlarged copy master or OHP

Ps might be allowed to use calculators in c) ii) if they wish.

Discussion, reasoning, agreement, self-correction, praising

Feedback for T



Whole class activity

T asks several Ps what they think and why.

(or Ps could show initial letters of children's names on slates in unison)

Reasoning, agreement, praising

Who agrees? Who can think of another way to explain it?

Praising, encouragement only

Bk5

Lesson Plan 108

Activity

Notes

4

Possible outcomes

Ps have 3 different coins (real or toy) on desks, e.g. 10 p, 50 p and £1 coins.

a) What different outcomes are possible if we toss 2 different coins (e.g.10 p and £1) at the same time? Ps toss the coins several times and note the outcomes in *Ex. Bks*.

Let's list all the different outcomes you found in this table. Ps come to BB or dictate to T. Class agrees/disagrees or points out any missed. Encourage a logical listing.

Elicit that there are 4 possible outcomes. BB:

Outcome

10 p	£1
H	H
H	T
T	H
T	T

How many outcomes give:

a) 2 Heads	(1)
b) a Head and a Tail	(2)
c) 2 Tails?	(1)

Whole class activity

(If all Ps having coins on desks is not possible, T asks several Ps to come to front of class to toss the coins.)

Tables drawn on BB or use enlarged copy maser or OHP

At a good pace

Agreement, praising

Check: 1 + 2 + 1 = 4 ✓

b) What different outcomes are possible if we toss 3 coins at the same time? Ps toss the coins several times and note the outcomes in *Ex. Bks*.

Let's list all the different outcomes in this table. BB:

Ps come to BB or dictate to T. Class agrees/disagrees or points out any missed.
Encourage a logical listing,

Outcome

10 p	50 p	£1
H	H	H
H	H	T
H	T	H
H	T	T
T	H	H
T	H	T
T	T	H
T	T	T

Elicit that there are 8 possible outcomes.

How many outcomes give:

a) 3 Heads	(1)
b) 2 Heads and a Tail	(3)
b) a Tail and 2 Heads	(3)
c) 3 Tails?	(1)

Use any 3 different coins

Allow a set time for tossing and praise Ps who did the most tosses in the given time.

Check: 1 + 3 + 3 + 1 = 8 ✓

27 min

5

Book 5, page 108

Q.2 Read: *Predict the result for each outcome first, then do the experiment.*

Toss a 10 p coin and a £1 coin at the same time.

Repeat the experiment 24 times and keep a tally of how they land in this table.

Ps write predictions. T asks several Ps what they predicted.

If possible, keep Ps together on the tosses. Ps count their tally marks and write the freqeuncy for each outcome in their table. P finished first could write his or her data in the table on BB.

T chooses some some Ps to report their data to the class and to compare their actual data with their predictions.

Read: *Collect the data for the class and complete the right hand side of the table.*

First agree on total number of tosses. (e.g. if 30 Ps in class, and 24 throws each, then number of throws: 24 × 30 = 720)

Ps dictate their results for each outcome and T writes on BB, while Ps keep a running total for each outcome in *Ex. Bks*..

Individual work, closely monitored, helped, corrected

Table drawn on BB or use enlarged copy master or OHP

Ps check that their predictions add up to 24.

At a fast pace

Ask Ps the reason for their predictions. Extra praise if they give a logical reasoning (4 possible outcomes, each with an equal chance, etc.)

Whole class activity

At a fast pace

4 Ps also keep running totals on calculators.

Bk5

Lesson Plan 108

Activity

Notes

5

(Continued)

After checking that the 4 totals add up to 720, T and Ps write the frequencies in class data part of the table (T on BB and Ps in *Pbs)*.

Calculate the ratios (relative frequencies) as fractions and percentages with the whole class. Ps come to BB or dictate what T should write. Class agres/disagrees. Ps fill in tables in in *Pbs*.

BB: e.g.

e.g. In a class of 30 pupils

Outcome		**Tally of 24 throws**	**Totals** *frequency*		**Ratio** *relative frequency*		
(10p) (£1)			Pupil	Class	fraction	decimal	%
H H	5	𝍸 ||	7	185	$\frac{185}{720}$	≈ 0.26	26%
H T	6	𝍸	5	176	$\frac{176}{720}$	≈ 0.24	24%
T H	5	𝍸 |	6	181	$\frac{181}{720}$	≈ 0.25	25%
T T	8	𝍸 |	6	178	$\frac{178}{720}$	≈ 0.25	25%
	Prediction		**Total throws**	**720**	($\frac{720}{720}$)	(1)	(100%)

Elicit that the probabability of each outcome is 1 quarter (as 4 possible outcomes, each with an equal chance of happening.)

What do you notice about the percentages in the table? (All very close together, and each is almost 25%, which equals 1 quarter.)

Why does it not match up exactly? (Not enough data – we need to do the experiment thousands of times.)

Extension

What was the ratio of throwing 1H + 1T in any order?

BB: Ratio of (1H + 1T) : $\frac{176 + 181}{720} = \frac{357}{720} \approx 0.496 \rightarrow 49.6\%$

Ps use calculators to work out the decimals or T could set some calculations as individual work in *Ex.Bks* and check Ps' results with a calculator.

Reasoning agreement, praising

At a good pace

Ps check that the total for each column is correct.

Discussion, agreement, praising

BB: $\frac{1}{4} = 0.25 \rightarrow 25\%$

[T could show computer simulation.]

Discussion, areasoning, agreement, praising

Elicit all 3 forms.

36 min

6

Book 5, page 108

Q.3 Read: *Repeat the experiment using 3 coins.*

Ps make predictions, throw 3 different coins 24 times, keep a tally of outcomes in table in *Pbs*, write totals in Pupil column and check that they add up to 24. P finished first writes own data on table on BB.

Collect the class data (with 8 Ps keeping count of each outcome on calculators) and check that they total 720. Ps write totals in table in *Pbs*.

Calculate the ratios as fractions, decimals and percentages with the whole class. (Ps may use calculators for the decimals.)

T writes agreed ratio on BB and Ps write it in *Pbs*. e.g.

e.g. In a class of 30 pupils

Outcome		**Tally of 24 throws**	**Totals** *frequency*		**Ratio** *relative frequency*		
(10p) (50p) (£1)			Pupil	Class	fraction	decimal	%
H H H	3	||||	4	88	$\frac{88}{720}$	≈ 0.122	12.2%
H H T	3	||	2	89	$\frac{89}{720}$	≈ 0.124	12.4%
H T H	3	|||	3	91	$\frac{91}{720}$	≈ 0.126	12.6%
H T T	3	|||	3	90	$\frac{90}{720}$	≈ 0.125	12.5%
T H H	3	||	2	88	$\frac{88}{720}$	≈ 0.122	12.2%
T H T	3	𝍸	5	92	$\frac{92}{720}$	≈ 0.128	12.8%
T T H	3	||	2	90	$\frac{90}{720}$	≈ 0.125	12.5%
T T T	3	|||	3	92	$\frac{92}{720}$	≈ 0.128	12.8%
	Prediction		**Total throws**	**720**	($\frac{720}{720}$)	(1)	(100%)

Individual work, monitored, helped, corrected

Table drawn on BB or use enlarged copy master or OHP

Some Ps report their data and compare with their predictions.

Whole class collection of class data and calculation of ratios.

Reasoning, agreement, checking totals, praising

Elicit the expected probability and compare with actual data.

BB: $\frac{1}{8} = 0.125 \rightarrow 12.5\%$

Agree that % ratios in the table are very close to this.

Extension

What is the probability of throwing 1H + 2T in any order?

$(\frac{1}{8} + \frac{1}{8} + \frac{1}{8} = \frac{3}{8} \rightarrow 37.5\%)$

45min

Bk5

R: Fractions, ratio, precentages

C: Combinatorics. Probability. Experiments with 2 dice

E: Frequency, relative frequency

Lesson Plan *109*

Activity

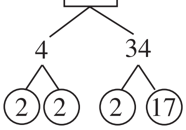
Notes

1

Factorisation

a) Let's factorise 136 and list all its positive factors. Ps come to BB or dictate to T. Class agrees/ disagrees.

BB: $\boxed{136} = 2 \times 2 \times 2 \times 17$ (prime factors)



All positive factors:
1, 2, 4, 8, 17, 34, 68, 136

b) Let's define the number 136.

Ps dictate definitions and class checks that they are correct and that the description is unique to 136.

(e.g. 8×17; 80% of 170; $\frac{17}{100}$ of 800; $-\quad 64+200$, etc.)

8 min

Whole class activity

Ps draw factor tree on BB if necessary, but praise other reasoning too.

(e.g. 2 is a factor as 136 is even; 5 is not a factor as there is no 5 or zero in units column, etc.)

At a good pace

Agreeement, praising

Extra praise for creativity!

2

Problem 1

Listen carefully, note the data and think how you would work out the answer. Do it in your *Ex. Bks* if you have time.

There are 36 marbles in a box. Some are *blue,* some are *yellow* and some are *pink*. The ratio of *blue* to *yellow* to *pink* marbles is 8 : 6 : 4.

a) How many marbles of each colour are in the box?

Who thinks that they know how to do it? P comes to BB to show solution and explain reasoning. Who agrees? Who would do it another way? etc. After agreement, T chooses a P to say the answer in a sentence.

BB: e.g. $B : Y : P = 8 : 6 : 4 = \underline{16} : \underline{12} : \underline{8}$ $(\times\ 2)$

or show in a table:

B	8	4	16
Y	6	3	12
P	4	2	8
Total	18	9	36

↑ (× 4)

or $B = \frac{8}{18}$ of $36 = \underline{16}$; $Y = \frac{6}{18}$ of $36 = \underline{12}$; $P = \frac{4}{18}$ of $36 = \underline{8}$

Answer: There are 16 *blue* marbles, 12 *yellow* marbles and 8 *pink* marbles in the box.

b) Show me the answers to these questions as fractions when I say.

If you take a marble out of the box with your eyes closed, what is the probability of the marble being:

i) *blue* $(\frac{16}{36} = \frac{4}{9})$ ii) *yellow* $(\frac{12}{36} = \frac{1}{3})$

iii) *pink* $(\frac{8}{36} = \frac{2}{9})$ iv) not *blue* $(\frac{20}{36} = \frac{5}{9})$ or $1 - \frac{4}{9} = \frac{5}{9}$

iv) not *yellow* $(\frac{24}{36} = \frac{2}{3})$ v) not *pink* $(\frac{28}{36} = \frac{7}{9})$

or $1 - \frac{1}{3} = \frac{2}{3}$ or $1 - \frac{2}{9} = \frac{7}{9}$

14 min

Whole class activity

T repeats slowly and chooses a P to repeat in own words to give Ps time to think and calculate.

Ps tell class their ideas.

Reasoning, agreement, praising

(as $8 + 6 + 4 = 18$, and 18 times $\underline{2}$ is 36)

(as $\frac{1}{18}$ of $36 = 2$)

Responses shown on scrap paper or slates in unison.

At a fast pace

Ps answering correctly explain to Ps who were wrong.

Reasoning, agreement, praising

Extra praise if Ps give decimals and percentages too.

Feedback for T

Activity

Notes

3

Possible outcomes: 2 dice

Ps have 2 different coloured dice on desks, e.g. 1 *white* and 1 *red*.

a) *What different outcomes are possible if we throw 2 dice at the same time?*

Ps throw the dice several times and note the outcomes.

Let's list all the different possible outcomes in these tables. Ps come to BB or dictate to T. Class agrees/disagrees or points out any missed. Encourage a logical listing, as shown.

Whole class activity

If all Ps having dice on desks is not possible, T asks several Ps to come to front of class to demonstrate.

Tables drawn on BB or use enlarged copy maser or OHP

At a good pace

Agreement, praising

BB:

white	*red*	*white*	*red*	*white*	*red*	*white*	*red*	*white*	*red*	*white*	*red*
1	1	2	1	3	1	4	1	5	1	6	1
1	2	2	2	3	2	4	2	5	2	6	2
1	3	2	3	3	3	4	3	5	3	6	3
1	4	2	4	3	4	4	4	5	4	6	4
1	5	2	5	3	5	4	5	5	5	6	5
1	6	2	6	3	6	4	6	5	6	6	6

Elicit that there are <u>36</u> possible outcomes. (For each of the 6 possible numbers on the *white* dice there are 6 possible numbers on the *red* dice, i.e. $6 \times 6 = \underline{36}$ possible outcomes.)

Discussion, reasoning, agreement, praising

a) How many outcomes give:

i) two 4s (1) ii) one 2 and one 4 (2)

iii) one 1 and one 6 (2) iv) two 1s (1)

v) at least one 5? (11)

Ps shout out in unison.

Agreement, praising

b) *What chance (probability) would you give to each of these outcomes?*

Ps come to BB or dictate to T, explaining reasoning. Class agrees/disagrees. T shows Ps the notation for writing the probability of a certain outcome.

BB:

i) p (two 4s) $= \dfrac{1}{36}$ (as 1 chance out of 36)

ii) p (one 2 and one 4) $= \dfrac{2}{36} = \dfrac{1}{18}$ (as 2 chances out of 36)

iii) p (one 1 and one 6) $= \dfrac{2}{36} = \dfrac{1}{18}$ (as 2 chances out of 36)

iv) p (two 1s) $= \dfrac{1}{36}$ (as 1 chance out of 36)

v) p (at least one 5) $= \dfrac{11}{36}$ (as 11 chances out of 36)

Reasoning, agreement, praising

Point out that notation for probability is a lower case '*p*' (a capital '*P*'is used for 'perimeter').

Ps write probabilities in *Ex. Bks*. too.

Feedback for T

21 min

Bk5

Lesson Plan 109

Activity

4

Book 5, page 109

Q.1 Read: *Predict the result of each outcome first, then do the experiment.*

Throw a white and a red dice at the same time and note how they land in this table. Repeat the experiment 72 times.

What do you notice about this table? (It shows all the 36 outcomes listed in the 6 tables in the previous activity.)

Set at a time limit for predicting, throwing the dice and recording the outcomes. Advise Ps to check that they have 72 tally marks before writing their totals. (P finished first could write his or her data in table on BB.)

T chooses some Ps to report on their predictions and outcomes, (i.e. how many times their outcome matched their prediction).

Read: *Collect the class data and complete the table.*

How many pupils are in the class? (e.g. 20) How many throws have we done altogether? (e.g. $72 \times 20 = 1440$)

Ps dictate their outcomes to T, and class keeps a running total in *Ex. Bks.* (and/or Ps keep running totals on calculators). Ps who did not finish individual experiments do so now (with help of quicker Ps) and dictate their results as they finish.

Check that the class total is correct before writing the ratios.

Ps come to BB or dictate fractions, then calculate the decimals to 4 decimal places with a calculator. The percentages are easily obtained from the decimals by moving each digit 2 place-values to the left. (i.e. multiplying by 100, as % means 'out of 100').

Sample table for a class of 20 Ps is shown on following page.

What probability would you have predicted for each outcome? Ps give it as a fraction, decimal and percentage, explaining reasoning. Class agrees/disagrees.

BB: p (each outcome) $= \dfrac{1}{36} = 0.02\dot{7} \rightarrow \approx 2.78\%$

Hopefully, the class ratios will be very close to this. If not, discuss what the reasons could be for the difference. (e.g. some dice might be biased, or some Ps might have recorded the data inaccurately; or if quite close, not enough data collected)

[If possible, T uses a computer simulation to demonstrate that the more times the experiment is done, the closer the ratios get to the probability.]

Notes

Individual (or paired) work, closely monitored, helped, corrected

Table drawn on BB or use enlarged copy master or OHP

(Slower Ps can finish their experiment during collection of class data.)

Or class compares their data with those in the table on BB.

Whole class collection of class data and calculation of ratios

Reasoning, agreement, checking totals, praising

Hopefully, there will be just a few different frequencies which occur several times, so necessary calculations will be limited.)

Ps write agreed ratios in tables in *Pbs* too (or could be set this work for homework)

Discussion, reasoning, agreement, praising

Compare the <u>actual</u> outcomes with the <u>expected</u> outcomes or probability.

Activity

4

(Continued)

BB: e.g. for a class of 20 Ps

Outcome			**Tally of 72 throws**	**Totals** *frequency*		**Ratio** *relative frequency*		
w ⚀	*r* ⚃			Pupil	Class	fraction	decimal	%
1	1	2		0	41	$\frac{41}{1440}$	0.0285	2.85%
1	2	2	ǀǀǀ	3	40	$\frac{40}{1440}$	0.0278	2.78%
1	3	2	ǀ	1	37	$\frac{37}{1440}$	0.0257	2.57%
1	4	2		0	39	$\frac{39}{1440}$	0.0271	2.71%
1	5	1	ǀ	1	42	$\frac{42}{1440}$	0.0292	2.92%
1	6	3	ǀǀǀ	3	40	$\frac{40}{1440}$	0.0278	2.78%
2	1	2		0	38	$\frac{38}{1440}$	0.0264	2.64%
2	2	2	ǀǀ	2	41	$\frac{41}{1440}$	0.0285	2.85%
2	3	2		0	40	$\frac{40}{1440}$	0.0278	2.78%
2	4	2		0	42	$\frac{42}{1440}$	0.0292	2.92%
2	5	0		0	40	$\frac{40}{1440}$	0.0278	2.78%
2	6	2	ǀǀǀǀ	4	38	$\frac{38}{1440}$	0.0264	2.64%
3	1	4		0	41	$\frac{41}{1440}$	0.0285	2.85%
3	2	2		0	40	$\frac{40}{1440}$	0.0278	2.78%
3	3	2	ǀ	1	41	$\frac{41}{1440}$	0.0285	2.85%
3	4	2		0	43	$\frac{43}{1440}$	0.0299	2.99%
3	5	3	ǀǀ	2	41	$\frac{41}{1440}$	0.0285	2.85%
3	6	2	𝍸	5	39	$\frac{39}{1440}$	0.0271	2.71%
4	1	2	ǀ	1	40	$\frac{40}{1440}$	0.0278	2.78%
4	2	2	ǀǀǀ	3	38	$\frac{38}{1440}$	0.0264	2.64%
4	3	0	ǀǀǀ	3	40	$\frac{40}{1440}$	0.0278	2.78%
4	4	1	ǀǀ	2	39	$\frac{39}{1440}$	0.0271	2.71%
4	5	2		0	38	$\frac{38}{1440}$	0.0264	2.64%
4	6	2	𝍸 ǀ	6	41	$\frac{41}{1440}$	0.0264	2.64%
5	1	2	ǀǀǀǀ	4	38	$\frac{38}{1440}$	0.0264	2.64%
5	2	2	ǀǀ	2	40	$\frac{40}{1440}$	0.0278	2.78%
5	3	2	ǀǀǀǀ	4	40	$\frac{40}{1440}$	0.0278	2.78%
5	4	4	𝍸	5	44	$\frac{44}{1440}$	0.0306	3.06%
5	5	2	ǀǀǀ	3	40	$\frac{40}{1440}$	0.0278	2.78%
5	6	2	ǀ	1	39	$\frac{39}{1440}$	0.0271	2.71%
6	1	2	ǀǀǀǀ	4	40	$\frac{40}{1440}$	0.0278	2.78%
6	2	0	ǀǀǀǀ	4	40	$\frac{40}{1440}$	0.0278	2.78%
6	3	2	ǀǀ	2	38	$\frac{38}{1440}$	0.0264	2.64%
6	4	3	ǀ	1	41	$\frac{41}{1440}$	0.0285	2.85%
6	5	3	ǀǀǀǀ	4	40	$\frac{40}{1440}$	0.0278	2.78%
6	6	2	ǀ	1	41	$\frac{41}{1440}$	0.0285	2.85%
Prediction			(72)	**Total throws** (72)	1440	$(\frac{1440}{1440})$	(1)	(100%)

45 min

Notes

Although Ps might find it rather tedious to toss the dice 72 times and then to collect and calculate so much class data, they should complete the experiment to give them direct experience of what is involved (and to appreciate how much help a computer programme can be).

Encourage Ps to be 'good scientists' and to collect and record the data accurately, otherwise the experiment will not be worth doing!

Bk5

R: Graphs

C: Frequency tables and graphs. Probability

E: Relative frequency

Lesson Plan 110

Activity

Notes

1

Numbers

Let's define the number <u>137</u>.

Ps dictate their definitions. Class agrees/disagrees. T could give some definitions too (some incorrect) and ask Ps if they are correct.

e.g. It is a prime number greater than 131 and less than 139; 140 – 3; 11 × 11 + 16; 1 third of 411; 137% of 100; 1H + 37U; 1.37 × 100; etc.

Whole class activity

At a good pace

In good humour!

Checking, agreeement, praising

Extra praise for creativity!

6 min

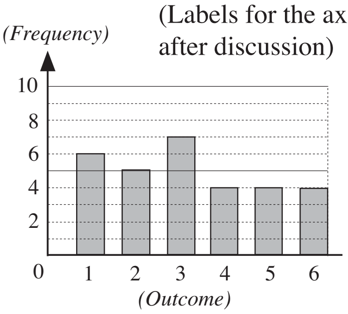
2

Displaying outcomes

Study this bar chart. What do you think it shows?

BB:

(Labels for the axes added after discussion)



Outcome		1	2	3	4	5	6
Frequency		6	5	7	4	4	4
Ratio *relative frequency*	$\frac{a}{b}$	$\frac{6}{30}$	$\frac{5}{30}$	$\frac{7}{30}$	$\frac{4}{30}$	$\frac{4}{30}$	$\frac{4}{30}$
	%	20%	$16\frac{2}{3}$%	$23\frac{1}{3}$%	$13\frac{1}{3}$%	$13\frac{1}{3}$%	$13\frac{1}{3}$%

Whole class activity

Drawn on BB or use enlarged copy master or OHP

Table completed later (see below)

Elicit/tell that the bar chart shows the results obtained after throwing a dice several times. The horizontal axis shows the different *outcomes* and the vertical axis shows how many times they occurred (*frequency*).

How many times was the dice thrown? (6 + 5 + 7 + 4 + 4 + 4 = <u>30</u>)

Let's write the data in the table. Ps come to BB or dictate what T should write, using a calculator to work out the relative frequencies as percentages. (Divide numerator by denominator and multiply by 100). (Change recurring decimals in percentages to fractions so that the relative frequencies are exact and will add up to 100% – it is easier to compare with the probabitiy as a %) Class points out errors.

Are the frequencies in the table what we would expect? T asks several Ps what they think and why. e.g.

[BB: Probability of each outcome: $\frac{1}{6}$ (as 1 chance out of 6)

so we would expect that out of 30 throws, each outcome would occur (30 ÷ 6 = <u>5</u>) times and only the '2' was thrown 5 times.]

Discussion, agreement, praising

T writes agreed labels on bar chart.

Reasoning, agreement, praising

At a good pace

(e.g. $\frac{5}{30} = \frac{1}{6} = 0.1\dot{6}$

$\rightarrow 16.\dot{6}\,\% = 16\frac{2}{3}\%$)

T helps with reasoning if necessary.

Agreement, praising

(but the others are quite close)

Show me the answer to these questions about the actual data when I say.

a) i) What is the *frequency* of an <u>even</u> number? (5 + 4 + 4 = <u>13</u>)

ii) What is the *relative frequency*? $\left(\frac{13}{30}\right)$ [or $43\frac{1}{3}$%]

Are they what you would expect? (No, we would expect :

frequency: 5 + 5 + 5 = <u>15</u>; *relative frequency*: 1 half or <u>50%</u>)

b) i) What is the *frequency* of a number > 2? (7 + 4 + 4 + 4 = <u>19</u>)

ii) What is the *relative frequency*? $\left(\frac{19}{30}\right)$ [or $63\frac{1}{3}$%]

Are they what you would expect? (No, we would expect:

frequency: 5 + 5 + 5 + 5 = <u>20</u>; *relative frequency*: 2 thirds or $66\frac{2}{3}$%)

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

Ps answering correctly explain to Ps who were wrong.

Because in:

a) ii):

p (even number) $= \frac{15}{30} = \frac{1}{2}$

b) ii):

p (number > 2) $= \frac{20}{30} = \frac{2}{3}$

14 min

Bk5

Lesson Plan 110

Activity

3

Book 5, page 110

Q.1 Read: *A dice was thrown 60 times. The number of times (**frequency**) each of the numbers 1 to 6 (**outcome**) was thrown is shown in the chart below.*

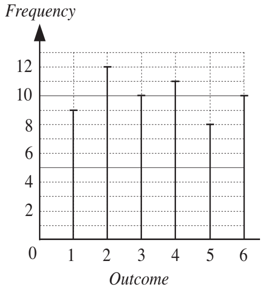
Complete the table and answer the questions.

Talk about the chart and table first to make sure that Ps understand what to do. Set a time limit. Ps read data from the chart and write in correct places in the table.

Review and correct any mistakes in table before allowing Ps to answer the questions. If necessary, calculate the percentages with the whole class (using calculators).

Set another time limit for answering the questions, or deal wth one question at a time and 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:



Outcome		1	2	3	4	5	6
Frequency		9	12	10	11	8	10
Ratio *relative frequency*	$\frac{a}{b}$	$\frac{9}{60}$	$\frac{12}{60}$	$\frac{10}{60}$	$\frac{11}{60}$	$\frac{8}{60}$	$\frac{10}{60}$
	%	15%	20%	$16\frac{2}{3}$%	$18\frac{1}{3}$%	$13\frac{1}{3}$%	$16\frac{2}{3}$%

a) *Which outcome occurred:*

   i) *most frequently* (throwing a 2)

   ii) *least frequently?* (throwing a 5)

b) *Which frequency exactly fits the expected frequency for each outcome?*

   (Expected frequency: 1 sixth of 60 = $\underline{10}$)

c) *What was the frequency of the outcome 'less than 6'?*

   (9 + 12 + 10 + 11 + 8 = $\underline{50}$)

   [Relative frequency: $\frac{50}{60} = \frac{5}{6} \rightarrow 83\frac{1}{3}\%$]

d) *What was the frequency of the outcome 'odd'?*

   (Frequency: 9 + 10 + 8 = $\underline{27}$)

   [Relative frequency: $\frac{27}{60} = \frac{9}{20} \rightarrow 45\%$]

22 min

Notes

Individual work, monitored, helped

Drawn on BB or use enlarged copy master or OHP

Discussion, reasoning, agreement, self-correction, praising

Reasoning, agreement, self-correction, praising

(Changing to percentages makes comparison with the probability easiet and using fractions rather than decimals in the percentages ensures that the relative frequencies add up to 100%.)

b) 3 and a 6 were thrown $\underline{10}$ times.

c) Elicit that this equals the expected frequency and relative frequency.

d) Expected frequency:

10 + 10 + 10 = $\underline{30}$

Expected relative frequency:

$\frac{30}{60} = \frac{1}{2} \rightarrow 50\%$

Activity

Notes

4

Book 5, page 110

Q.2 Read: *Two coins were tossed 60 times. The frequency of each outcome is shown in the table.*

a) Complete the chart.

b) Calculate the ratio for each outcome and complete the table.

c) What is the frequency of tossing a Head ***and*** *a Tail?*

What does the chart have to do with the table? Ps come to BB to explain to class. T helps where necessary.

Deal with one part at a time or set a time limit. More able Ps could also be asked to give the ratios as percentages.

Review with whole class. Ps come to BB to draw horizontal lines on the chart and to write the ratios in the table, explaining reasoning. Class agrees/disagrees. Mistakes discussed and corrected.

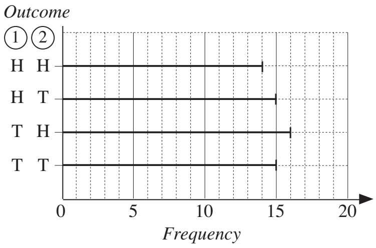
Extension In c), compare the <u>actual</u> outcome with the <u>expected</u> outcome.

Solution:

a)

Outcome ① ②	Frequency	Ratio *relative frequency*
H H	14	$\frac{14}{60}$ (≈ 23.3%)
H T	15	$\frac{15}{60}$ (25%)
T H	16	$\frac{16}{60}$ (≈ 26.7%)
T T	15	$\frac{15}{60}$ (25%)

b)



c) Frequency of a Head and a Tail: 15 + 16 = <u>31</u>

Relative frequency: $\frac{31}{60} \rightarrow \approx 51.7\%$

Expected probability: $p\,(1\text{H} + 1\text{T}) = \frac{2}{4} = \frac{1}{2} \rightarrow 50\%$,

so the actual outcome is very close to what we would expect.

Individual work, monitored closely, <u>helped</u>

Drawn on BB or use enlarged copy master or OHP

Initial discussion to make sure that Ps understand what to do.

Elicit that the horizontal line already drawn in the chart is not long enough and needs to be extended.

(Ps may use calculators to work out the percentages.)

Discussion, reasoning, agreement, self-correction, praising

Extension done as a whole class activity, with Ps saying what to do first and how to continue.

Praising, encouragement only

32 min

5

Fortune wheel

Ideally, T acts as a fortune teller and chooses Ps to come to front of class to spin the wheel. (T could have brief fortunes prepared for each number. e.g. 1: ' you will be happy'; 2: 'you will not be rich'; 3: 'you will have a secret admirer' ; etc. or Ps could make them up beforehand.)

If the pointer comes to rest on a diagonal, the P must spin the wheel again.

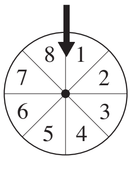
How many possible outcomes are there? (8) What chance would you give to each number? T asks several Ps what they think. Extra praise if Ps give each of them an equal chance.

Let's see if you are right! Ps come to front of class to spin the wheel <u>40</u> times and rest of class keep a tally for each number in *Ex Bks*. Agree on the totals, then write in the table. Then Ps calculate the relative frequencies as fractions, decimals and percentages, using calculators where necessary. Compare the actual with the expected outcomes.

Whole class activity

Wheel made from card (can use copy master) and pinned to BB so that it can turn. Pointer stuck or drawn on BB.

BB:



At a fast pace

In good humour!

Discussion, reasoning, agreement, praising

Bk5

Lesson Plan 110

Activity

Notes

5

(Continued)

BB:
e.g.

Outcome		1	2	3	4	5	6	7	8
Frequency		4	5	3	6	5	6	5	6
Ratio *relative frequency*	fraction	$\frac{4}{40}$	$\frac{5}{40}$	$\frac{3}{40}$	$\frac{6}{40}$	$\frac{5}{40}$	$\frac{6}{40}$	$\frac{5}{40}$	$\frac{6}{40}$
	decimal	0.1	0.125	0.075	0.15	0.125	0.15	0.125	0.15
	%	10%	12.5%	7.5%	15%	12.5%	15%	12.5%	15%

Agree that if the wheel is fair (unbiased) :

BB: probability for each outcome is: $\frac{1}{8} = 0.125 \rightarrow 12.5\%$

Extension

If we assume that the wheel is unbiased, what probability would you give to these outcomes? (Ps could show on slates on command.)

What is the probability of the pointer resting on:

a) an odd number? b) a number less than 6?

$(\frac{4}{8} = \frac{1}{2} = 0.5 \rightarrow 50\%)$ $(\frac{5}{8} = 0.625 \rightarrow 62.5\%)$

Discussion on the data compared with what is expected and what the reasons could be for an outcome not matching the expected probability.

(Unfair, i.e unbalanced or weighted wheel, or if quite close, not enough data.)

[T could show a computer simulation for large number of spins.]

Reasoning, agreement, praising

40 min

6

Book 5, page 110

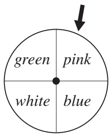
Q.3 Read: *A fortune teller spins her lucky colour wheel 100 times. Complete the table.*

Set a time limit. Ps can use calculators for the decimals and %.

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

Solution:

Outcome		*pink*	*blue*	*white*	*green*	*pink* or *blue*	*p* or *w* or *g*
Frequency		26	23	25	26	49	77
Ratio *relative frequency*	fraction	$\frac{26}{100}$	$\frac{23}{100}$	$\frac{25}{100}$	$\frac{26}{100}$	$\frac{49}{100}$	$\frac{77}{100}$
	decimal	0.26	0.23	0.25	0.26	0.49	0.77
	%	26%	23%	25%	26%	49%	77%



Individual work, monitored, helped

Table drawn on BB or use enlarged copy master or OHP

Differentiation by time limit.

If no P reaches the last two columns, do them with the whole class.

Reasoning, agreement, self-correction, praising

Feedback for T

Extension

Let's compare the actual outcomes with the expected probability.

Elicit that if the wheel is unbiased, each outcome has an equal chance, so the probability for:

- each colour is: $\frac{1}{4} = 0.25 \rightarrow 25\%$
- *pink* <u>or</u> *blue* is: $\frac{2}{4} = \frac{1}{2} = 0.5 \rightarrow 50\%$
- *pink* <u>or</u> *white* <u>or</u> *green*: $\frac{3}{4} = 0.75 \rightarrow 75\%$

Tell me an outcome which would have a probability of 1 (0).

e.g. p (*green* or *pink* or *white* or *blue*) = 1 (<u>Certain</u> to happen)

p (*yellow*) = 0 (Impossible!)

Whole class activity

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

Discussion, reasoning, agreement, praising

In good humour!

Praising

45 min

Bk5

R: Fractions, ratio

C: Frequency, relative frequency

E: Probability scale

Lesson Plan 111

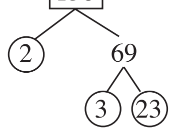
Activity		*Notes*

1

Numbers

a) Let's factorise 138 and list all its positive factors. Ps come to BB or dictate to T. Class agrees/ disagrees.

BB: $\boxed{138}$ = 2 × 3 × 23 (prime factors)



All positive factors:
1, 2, 3, 6, 23, 46, 69, 138

b) Let's define the number 138.

Ps dictate definitions and class checks that they are correct and that the description is unique to 138.

(e.g. 6 × 23; 138% of 100; 13.8 × 10; – 12 + 150, 690 ÷ 5; etc.)

8 min

Notes:

Whole class activity

Ps draw factor tree on BB but praise other reasoning too.

(e.g. 2 is a factor as 138 is even; 5 is not a factor as no 5 or zero in units column, etc.)

At a good pace

Agreeement, praising

Extra praise for creativity!

2

Probability scale

On the radio one morning during the weather forecast, the presenter made these remarks. What did he mean?

a) *There is a 50% chance of rain in the South-West.*

(There is an equal chance of it raining as not raining.)

What other way could you say it? (e.g. half-in-half chance, or fifty-fifty chance, or even chance)

b) T*here is a 20% chance of rain in the South-East.*

(Rain is possible but is rather unlikely.)

c) T*here is an 80% chance of rain in the North.*

(It is very likely to rain, but it is not certain.)

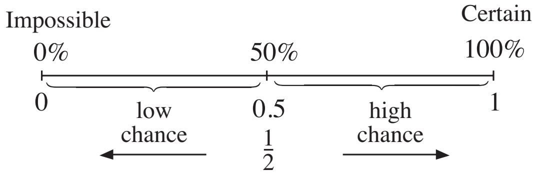
Have you ever heard of a 0% chance of rain, or a 100% chance of rain?

(No, as a 0% chance means that it is impossible for it to rain and a 100% chance means that it is certain to rain – but we cannot control the weather!)

Let's draw a probability scale. T draws a horizontal line on the BB and Ps draw one in *Ex. Bks*. What should we mark on it? (0 at one end and 1 at the other) Should we extend the line below zero and beyond 1? (No, as a probability cannot be less than zero, or more than 1.) What other mark could we make on it? (Half-way mark, where the probabilities of not happening and happening are equal.)

Elicit what each part of the probability scale actually means and that the greater the probability, the more chance something has of happening.

BB:



Ask Ps to think of examples from real life and to show where they would be on the probability scale. (T should also have some in mind in case Ps cannot think of any.) Class agrees/disagrees.

16 min

Notes:

Whole class activity

Discussion involving as many Ps as possible

Elicit alternative statements: e.g.

a) There is a 50% chance of no rain in the South-West.

b) There is an 80% chance of no rain in the South-East.

c) There is a 20% chance of no rain in the North.

Agreement, praising

T works on BB and Ps work in *Ex. Bks.*

While Ps are suggesting examples, T quickly checks all Ps' probability scales, correcting where necessary.

Extra praise for clever examples.

Activity

Notes

3

Probability game

Let's play a game. Everyone stand up! I will say a probability as a ratio or a fraction or a decimal or a percentage and you must show me what it means with actions. e.g.

If you think it is:

- <u>certain</u>, raise both arms above your head
- <u>likely</u> but not certain, hold your ears
- <u>as equally likely as unlikely</u>, bow
- <u>unlikely</u> but possible, fold your arms
- <u>impossible</u>, sit down.

T says a probability, then says, 'Show me . . . now!' Ps with different responses explain reasoning and class decides which response is correct. e.g.

$\frac{1}{10}$ (unlikely), $\frac{70}{100}$ (likely), 1 (certain), 0.26 (unlikely), 85% (likely), 0% (impossible), 50% (equally likely as unlikely), etc.

Whole class activity

Ps could chooses the actions.

T might have actions written on BB as a reminder, or Ps have a short practice first.

At speed, in good humour!

Actions done in unison.

Praising, encouragment only

If problems or disagreement, Ps show on probability scale.

Ps could say some probabilities too!

Feedback for T

22 min

4

Tossing a coin

If we toss an unbiased coin, how many different outcomes are there? (2) What are they? (a head or a tail) Which is more likely? (They each have an equal chance, or are equally likely.)

I will say an outcome and you must show me (on scrap paper or slates) what you think its probability is when I say. e.g.

a) We toss a Head. ($\frac{1}{2}$ or 0.5 or 50%)

b) We toss a Head <u>or</u> a Tail. (1 or 100%) [Certain]

c) We toss neither a Head <u>nor</u> a Tail. (0 or 0%) [Impossible]

d) We toss a Head <u>and</u> a Tail. (0 or 0%) [Impossible]

e) We toss a tail. ($\frac{1}{2}$ or 0.5 or 50%)

Whole class activity

Responses shown in unison.

Demonstrate and/or show on probability scale if necessary.

Elicit the other forms too.

T (Ps) writes each on BB in a mathematical way. e.g.

a) $p\,(\text{H}) = \frac{1}{2} = 0.5 \rightarrow 50\%$

b) $p\,(\text{H } \underline{\text{or}} \text{ T}) = 1 \rightarrow 100\%$

c) $p\,(\text{H } \underline{\text{nor}} \text{ T}) = 0 \rightarrow 0\%$

etc.

27 min

5

Book 5, page 111

Q.1 Read: *When we throw an unbiased dice, there are 6 possible outcomes, each equally likely: 1, 2, 3, 4, 5, or 6.*

Show the probabiltiy of each of these outcomes by joining it to the correct point on the probability scale.

Elicit that the vertical probability scale ranges from 0 to 1 and is divided into 6 equal parts, with a tick at every sixth.

Set a time limit or deal with one at a time. Advise Ps to find the correct point on the scale first then join it to the matching question, rather than the other way round, as it is more accurate.

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

Individual work, monitored, helped

Written on BB or use enlarged copy master or OHP

Differentiation by time limit and extension work.

Discussion, reasoning, agrement, self-correction, praising

Bk5

Lesson Plan 111

Activity

5

(Continued)

Q.1 *Solution:*

a) Throwing a 2

b) Throwing a number less than 3

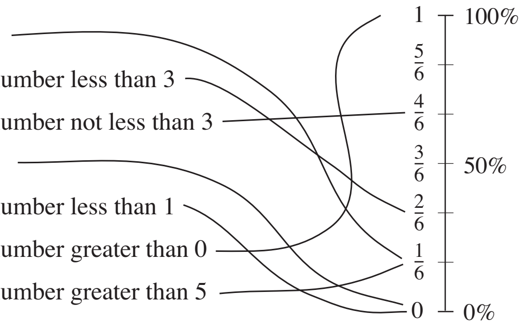
c) Throwing a number not less than 3

d) Throwing a 7

e) Throwing a number less than 1

f) Throwing a number greater than 0

g) Throwing a number greater than 5



T reviews:

When we have 6 possible outcomes, each with equal probability, the sum of their probabilities is the certain outcome, 1.

33 min

Notes

Extension

Elicit decimals and percentages.

a), g) $\frac{1}{6} = 0.1\dot{6} \rightarrow 16\frac{2}{3}\%$

b) $\frac{2}{6} = \frac{1}{3} = 0.\dot{3} \rightarrow 33\frac{1}{3}\%$

c) $\frac{4}{6} = \frac{2}{3} = 0.\dot{6} \rightarrow 66\frac{2}{3}\%$

d), e) $\frac{0}{6} = 0 \rightarrow 0\%$

f) $\frac{6}{6} = 1 \rightarrow 100\%$

Ps repeat in unison.

6

Book 5, page 111

Q.2 Read: *Seven children draw lots in the hope of winning a prize. If each child has an equal chance of winning, what is the probability of each of these outcomes happening?*

Join the outcomes to the matching points on the prabability scale.

Discuss the problem first to ensure that Ps understand the context. Ps give names to the 7 chldren. (e.g. Ann, Bob, Charlie, etc.)

What do you notice about the proabability scale? (Divided into 7 equal parts, with a tick at every seventh)

Set a time limit. Ps find the correct point on the scale and join it to the matching question, writing the fraction too.

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

Solution:

a) C wins.

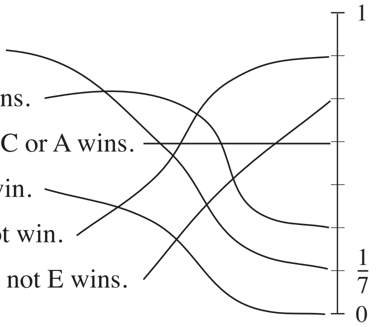
b) A or D wins.

c) G or E or C or A wins.

d) B and F win.

e) G does not win.

f) Neither D not E wins.



T reviews, then Ps repeat in unison.

When we have 7 possible outcomes, each with equal probability, the sum of their probabilities is the certain outcome, 1.

38 min

Individual work, monitored, helped

Written on BB or use enlarged copy master or OHP

Use names of Ps in class if possible.

Discussion, reasoning, agreement, self-correction, praising

Show details on BB:

a) 1 chance out of 7: $\frac{1}{7}$

b) $\frac{1}{7} + \frac{1}{7} = \frac{2}{7}$

c) $\frac{1}{7} + \frac{1}{7} + \frac{1}{7} + \frac{1}{7} = \frac{4}{7}$

d) Impossible, as only one winner!

e) $1 - \frac{1}{7} = \frac{6}{7}$

f) $1 - \frac{2}{7} = \frac{5}{7}$

Bk5

Lesson Plan 111

Activity

Notes

7

***Book 5, page 111*, Q.3**

Read: *Let's suppose that when the fortune teller spins her lucky number wheel, any of the numbers has an equal chance of coming to rest in front of the arrow.*

Also, the wheel has been fixed so that it cannot stop with the arrow pointing to a line between two numbers.

What is the probability of these outcomes happening?

What can you tell me about this wheel? (Divided into 20 equal parts; labelled with the numbers 1 to 20 in a random order.)

Deal with one part at a time. T reads the outcome and Ps show its probability on scrap paper or slates on command. Ps with different responses explain reasoning to class. Class decides who is correct. Ps write agreed fraction in *Pbs*. Elicit decimals and percentages too if no P has shown them.

Solution:

The number is:

a) 17	$\left(\frac{1}{20}\right)\ \left[= \frac{5}{100} = 0.05 \rightarrow 5\%\right]$
b) less than 17	$\left(\frac{16}{20}\right)\ \left[= \frac{4}{5} = \frac{80}{100} = 0.80 \rightarrow 80\%\right]$
c) **not** greater than 17	$\left(\frac{17}{20}\right)\ \left[= \frac{85}{100} = 0.85 \rightarrow 85\%\right]$
d) **not** less than 17	$\left(\frac{4}{20}\right)\ \left[= \frac{1}{5} = \frac{20}{100} = 0.20 \rightarrow 20\%\right]$
e) even	$\left(\frac{10}{20}\right)\ \left[= \frac{1}{2} = 0.5 \rightarrow 50\%\right]$
f) divisible by 4	$\left(\frac{5}{20}\right)\ \left[= \frac{1}{4} = \frac{25}{100} = 0.25 \rightarrow 25\%\right]$
g) **not** divisible by 4	$\left(\frac{15}{20}\right)\ \left[= \frac{3}{4} = \frac{75}{100} = 0.75 \rightarrow 75\%\right]$
h) either even **or** odd	$\left(\frac{20}{20} = 1\right)\ \left[\rightarrow 100\%\right]$ Certain!
i) neither even **nor** odd	$\left(\frac{0}{20} = 0\right)\ \left[\rightarrow 0\%\right]$ Impossible!

Extension

Which outcomes are <u>likely</u> but not certain to happen? [b), c) and g)]

T reviews:

When we have 20 possible outcomes, each with equal probability, the sum of their probabilities is the <u>certain</u> outcome, 1.

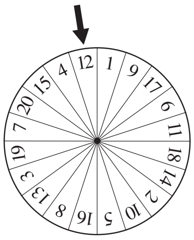
45 min

Whole class activity

(or individua trial first if Ps wish and there is time, monitored, helped)

Drawn on BB or use enlarged copy master or OHP

BB:



Responses shown in unison.

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

Elicit the possible numbers:

- b) 1 to 16
- c) 1 to 17
- d) 17, 18, 19, 20
- e) 2, 4, 6, 8, 10, 12, 14, 16, 18, 20
- f) 4, 8, 12, 16, 20
- g) 1, 2, 3, 5, 6, 7, 9, 10, 11, 13, 14, 15, 17, 18, 19
- h) 1 to 20 (All)
- i) none

Extra praise if a P notices that the probabilities of f) and g) sum to 1.

Agreement, praising

Ps repeat in unison.

Bk5

R: Ratio, percentage

C: Probability scale. Experiments and calculations

E: Problems. Combinatorics

Lesson Plan

112

Activity

Notes

1

Numbers

a) Let's factorise <u>139</u> and list its positive factors.

Ps try the prime numbers in increasing order, explaining reasoning with logic, as below. Class agrees/disagrees.

- <u>2</u> is not a prime factor, as 139 is odd
- <u>3</u> is not a factor, as $139 = 120 + 19$, and 19 is not a multiple of 3
- <u>5</u> is not a factor, as units digit is not 5 or 0.
- <u>7</u> is not a factor, as $139 = 140 - 1$, and 140 is a multiple of 7
- <u>11</u> is not a factor, as $139 = 110 + 29$, and 29 is not a multiple of 11

Elicit that no prime number more than 11 is possible either. e.g. 13:

BB: $13 \times 13 = 130 + 39 = 169$, and $169 > 139$

Agree that 139 is a <u>prime number</u> and its only factors are 1 and 139.

b) Let's <u>define</u> 139 in different ways.

Ps dictate definitions and class checks that they are correct and that the description is unique to 139.

(e.g. $1000 - 961$; 139% of 100; 1.39×100; 1H + 39U, $556 \div 4$; etc.)

Whole class activity

Elicit method for checking prime numbers.

T directs Ps' thinking if necessary.

At a good pace

Agreement, praising

Ps use easy known multiples.

BB: $139 = 1 \times 139$

Checking, agreement

Praising, encouragement only

Extra praise for unexpected definitions

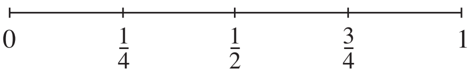
8 min

2

Probability 1

T has probability scale drawn on BB.

BB:



Let's think of outcomes for each of these probabilities. If necessary, T helps with the context, but Ps think of the appropriate outcomes. e.g.

a) In a lottery, one number is drawn from the numbers 1, 2, 3 and 4. Each of the numbers has an equal chance of being drawn.

Ps: The probability of 'drawing 1' is $\frac{1}{4}$. (same for 2, 3 and 4)

The probability of 'drawing 1 <u>or</u> 2' is $\frac{1}{2}$. (or 'an odd number')

The probability of '<u>not</u> drawing 1' is $\frac{3}{4}$. (or '1 <u>or</u> 2 <u>or</u> 3')

The probability of 'drawing 5' is 0. (or 'drawing 1 <u>and</u> 2', etc.)

The probability of 'drawing a number <u>not</u> greater than 4' is 1.

b) In an interntional summer camp, there are 100 children; 25 are from Denmark, 50 are from England, and 25 are from France. All their names are put into a computer and the computer picks 1 name at random for a special task.

Ps: e.g. The probability that the child is:

- Danish is $\frac{1}{4}$ (25%)
- English is $\frac{1}{2}$ (50%)
- <u>not</u> French $\frac{3}{4}$ (75%)
- Russian is 0 (0%)
- Danish or English or French is 1 (100%).

etc.

Whole class activity

Drawn on BB or SB or OHT

Ps could be given time to discuss it with their neighbour first.

T intervenes only if Ps are struggling.

Reasoning, agreement, praising

Extra praise for creativity in contexts and ideas for the probabilities

Encourage Ps to use the logic words:

'and', 'or', 'not', 'nor'

Elicit also if an outcome is impossible, unlikely, likely or certain to happen.

15 min

Bk5

Lesson Plan 112

Activity | *Notes*

3

Probability 2

In a number card game, the numbers 1, 2, 3, 4 and 5 are placed face down on the table and mixed around, then a player picks up 2 cards at random.

Let's suppose that each number has an equal chance of being picked.

a) *How many possible outcomes are there, if the order in which they are picked up does not matter?*

If possible, Ps try it first, either in pairs on desks, or at front of class, and note the different outcomes in their *Ex. Bks*.

Then they dictate the outcomes to T who writes on BB in a logical order. Class points out any missed.

BB:

1, 2	2, 3	3, 4	4, 5
1, 3	2, 4	3, 5	
1, 4	2, 5		
1, 5			

Agree that there are <u>10</u> possible outcomes.

b) *What are the probabilities of these outcomes?*

i) The two numbers picked up are the 5 <u>and</u> the 2. ($\frac{1}{10}$ or 10%)

ii) One of the numbers picked up is the 3. ($\frac{4}{10} = \frac{2}{5}$ or 40%)

iii) One of the numbers picked up is the 5 <u>or</u> the 2 ($\frac{7}{10}$ or 70%)

Extension

What if the order <u>did</u> matter? How many outcomes would there be? What would the probabilities be then?

Elicit that there would be <u>20</u> possible outcomes (the 10 shown above and then each pair reversed) but the probabilities would be the same.

Notes:

Whole class activity

Ideally, Ps have the 5 number cards on desks.

Or T could put the number cards in an opaque bag and Ps draw them out with their eyes closed.

At a good pace

Agreement, praising

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

Ps responding correctly explain to Ps who were wrong.

Discussion, listing of outcomes, then counting the frequency. e.g.

i) p (one card is the 3):

$\frac{8}{20} = \frac{4}{10} \rightarrow$ 40%, etc.

21 min

4

Outcomes

This time, the same cards: 1, 2, 3, 4 and 5 are placed face down on the table and mixed around. Then the player picks up one card at random, notes its number and <u>puts it back</u> face down on the table. The cards are mixed around, then the player picks up the 2nd card at random and notes the number.

a) *How many possible outcomes are there, if the order does not matter?*

Ps try to dictate the different outcomes to T in a logical order without doing the experiment. Class points out any missed.

BB:

1, 1	2, 2	3, 3	4, 4	5, 5
1, 2	2, 3	3, 4	4, 5	
1, 3	2, 4	3, 5		
1, 4	2, 5			
1, 5				

Agree that there are <u>15</u> possible outcomes.

(but <u>not</u> equal probability, as there are two ways of getting, e.g. 1 and 2 (1, 2) and (2, 1) but only one way of getting, e.g. 1, 1))

b) *How many possible outcomes are there if the order <u>does</u> matter?*

BB:

1, 1	2, 1	3, 1	4,1	5, 1
1, 2	2, 2	3, 2	4, 2	5, 2
1, 3	2, 3	3, 3	4, 3	5, 3
1, 4	2, 4	3, 4	4, 4	5, 4
1, 5	2, 5	3, 5	4, 5	5, 5

Agree that there are <u>25</u> possible outcomes.

(and each has equal probability)

Notes:

Whole class activity

T demonstrates while explaining.

At a fast pace

Agreement, praising

[If possible, use a computer simulation.]

To Ts only:

Using the listing in b), where the outcomes have equal probability:

i) p (5 <u>and</u> 2) $= \frac{2}{25} \rightarrow$ 8%

ii) p (one card is 3)

$= \frac{9}{25} \rightarrow$ 36%

iii) p (one card is 5 <u>or</u> 2)

$= \frac{16}{25} \rightarrow$ 64%

27 min

Activity | *Notes*

4

Book 5, page 112

Q.1 Read: *In a lottery game, two numbers are drawn from the numbers 1, 2, 3 and 4.*

Let's suppose that each number has an equal chance of being drawn.

Deal with part a) first, then parts b) and c). Set a time limit.
Ps read questions themselves and write the answers in *Pbs*.

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

Solution:

a) *List the possible outcomes if the order of the two numbers does not matter.*

(1, 2), (1, 3), 1, 4), (2, 3), (2, 4), (3, 4) [6 outcomes]

b) *What is the probability of these outcomes?*

i) The numbers are 1 **and** 3. $\left(\frac{1}{6}\right)$

ii) One of the numbers is 2. $\left(\frac{3}{6} = \frac{1}{2}\right)$

iii) One of the numbers is either 1 **or** 3. $\left(\frac{5}{6}\right)$

c) *List the possible outcomes if the order of the two numbers* ***does*** *matter.*

(1, 2), (1, 3), 1, 4); (2, 1); (2, 3), (2, 4);
(3, 1), (3, 2), (3, 4); (4, 1), (4, 2), (4, 3) [12 outcomes]

Extension

What are the probabilities of the outcomes in b)?

(The same: i) $\frac{2}{12} = \frac{1}{6}$ ii) $\frac{6}{12} = \frac{1}{2}$ iii) $\frac{10}{12} = \frac{5}{6}$)

Individual work, monitored, helped

T stresses that the 2 numbers are drawn at the same time.

Discussion, reasoning, agreement, self-correction, praising

Feedback for T

More able Ps can be asked for decimals and percentages too.

Extension (for quicker Ps)

iv) Neither of the two numbers is 1 or 3.

$(1 - \frac{5}{6} = \frac{1}{6})$

Agreement, praising

33 min

5

Book 5, page 112

Q.2 Read: *This time the numbers 1, 2, 3 and 4 are written on cards and put into a bag.*

A pupil takes out one card with his eyes shut, notes the number and puts it back into the bag again. Then the pupil takes out a 2nd card in the same way and notes the number.

a) List the possible outcomes if the order of the two numbers does not matter.

b) List the possible outcomes if the order of the two numbers ***does*** *matter.*

Deal with one part at a time. Set a time limit. Encourage logical listing.

Review with whole class. Ps come to BB or dictate to T. Class points out any missed combination. Mistakes corrected.

Individual work, monitored, (helped)

Demonstrate the game with a P at front of class if necessary.

Discussion, reasoning, agreement, self-correction, praising

Activity

Notes

5

(Continued)

Solution:

a) 1, 1   2, 2   3, 3   4,4
   1, 2   2, 3   3, 4
   1, 3   2, 4
   1, 4

(<u>10</u> possible outcomes, but <u>not</u> equal probabilities)

b) 1, 1   2, 1   3, 1   4,1
   1, 2   2, 2   3, 2   4, 2
   1, 3   2, 3   3, 3   4, 3
   1, 4   2, 4   3, 4   4, 4

(<u>16</u> possible outcomes, with equal probabilities)

Extension

Using the listing in b), what are the probabilities of these outcomes?

i) The two cards are 1 <u>and</u> 3. $(\frac{2}{16} = \frac{1}{8})$

ii) There is at least one 2. $(\frac{7}{16})$

iii) The two cards are 1 <u>or</u> 3. $(\frac{12}{16} = \frac{3}{4})$

iv) The two cards are 2 and 2. $(\frac{1}{16})$

T elicits/explains the unequal probability in the listing in a).

[There is only one way of getting, e.g. 1 and 1, but there are 2 ways of getting, e.g. 1 and 2 in any order, (1, 2) and (2, 1), so the outcome '1 and 2' is more likely than the outcome '1 and 1'.

[If possible, use a computer simulation to show it.]

Whole class activity

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

Ps with different responses explain reasoning.

Class decides on correct proabability.

Extra praise if Ps give % too.

39 min

6

Book 5, page 112

Q.3 Read: *Eight children have written their names on a wheel of fortune. The fortune teller spins the wheel to see who is to be chosen to have their fortunes told.*

Let's suppose that each letter has an equal chance of coming to rest in front of the arrow and that the wheel cannot stop on the lines between the letters.

What is the probability of each of these outcomes?

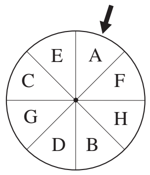
Set a time limit. Review with whole class. Ps could show responses on scrap paper or slates on command. Ps answering correctly explains to Ps who were wrong. Mistakes discussed and corrected.

Individual work, monitored, helped

(or whole class activity)

Drawn on BB or use enlarged copy master or OHP

BB:

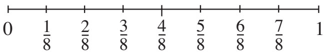


Reasoning, agreement, self-correction, praising

Extension

Show each probabilty on a probability scale and ask Ps to express them as a decimal and percentage too.

Scale drawn on BB or SB or OHT:



Solution:

a) A wins. b) D wins $(\frac{1}{8})$ [= 0.125 → 12.5%]

c) B <u>and</u> G win. (0) [Impossible!]

d) F does <u>not</u> win. $\left(1 - \frac{1}{8} = \frac{7}{8}\right)$ [= 0.875 → 87.5%]

e) C <u>or</u> H wins. $(\frac{2}{8} = \frac{1}{4})$ [= 0.25 → 25%]

f) Neither C <u>nor</u> H wins. $\left(1 - \frac{1}{4} = \frac{3}{4}\right)$ [= 0.75 → 75%]

i) E either wins <u>or</u> doesn't win. (1) [→ 100%] Certain!

The winning name's initial letter comes :

g) <u>after</u> C in the alphabet; (i.e. D, E, F, G, H)

$(\frac{5}{8})$ [= 0.625 → 62.5%]

h) <u>before</u> C in the alphabet. (i.e. A, B)

$\left(\frac{2}{8} = \frac{1}{4}\right)$ [= 0.25 → 25%]

45 min