

# Shape and space: (angle and rotation)/Reasoning about shapes

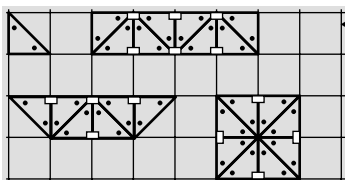
**Objectives** ● To begin to know that angles are measured in degrees and that: one whole turn is  $360^\circ$  or 4 right angles; a quarter turn is  $90^\circ$  or one right angle; half a right angle is  $45^\circ$ . ● To solve mathematical shape problems or puzzles, recognise and explain patterns and relationships, generalise and predict; suggest extensions by asking "What if ... ?" ● To explain methods and reasoning orally and in writing.

**Vocabulary** degree; ruler; set square; angle measurer; angle; right angle; straight angle; straight line

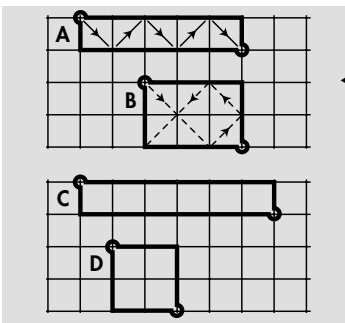
**i** Billiards, a game of skill and mathematics, came to England from France during the reign of Elizabeth I. The rectangular playing surface of a billiard table is formed by joining two perfect squares and thus it is twice as long as it is wide. The skilful player tries to work out the path of the ball before it is hit. He knows that when the ball strikes the cushion (side of the table), it rebounds at the same angle.



An officer serving with the British Army in India during the 19th century is credited with the invention of the game of snooker.



**i** Inform children about the game of billiards and its offspring game, snooker.



## Oral work and mental calculation (about 5 to 10 min)

Choose an activity from Strand 1 or Strand 2.

## Main teaching and pupil activities (about 30 to 40 min)

**Resources** book; scissors; hinged box; geostrip angle; 2m strip of wood or 3m length of wall at floor level; tennis ball; OHT of a squared grid; OHT pens;  $45^\circ$  set square; ruler

- ⇒ Display objects which open. Ask children to select an object and open it to show an angle of about  $45^\circ$ ,  $90^\circ$  and, where practical, a straight angle.
- ⇒ Show a squared grid. Draw children's attention to intersections of rows and columns and recall that four right angles come together to make one whole turn or  $360^\circ$ .
- ⇒ Ask: **What name do we give to the angle made by two right angles?** (straight angle or straight line)
- ⇒ Draw these shapes on a squared grid. Say: **We want to find all the half right angles and straight angles in these shapes.**
- ⇒ Choose children to find and mark appropriately the  $45^\circ$  and  $180^\circ$  angles.
- ⇒ Say: **We are going to look at a game which is all about angles.** Ask a child to roll the tennis ball with sufficient velocity for it to rebound from the wall/strip of wood. Investigate what happens to the ball for different angles of incidence.
- ⇒ Ask: **If you want the ball to come straight back to you, how must you roll it?** (path of ball makes a right angle with wall)
- ⇒ Say: **We are going to begin with some very odd-looking snooker tables so that you can see the mathematics which underpins the game. The rules are:**
  - each table has only two pockets and one white ball.**
  - you hit the ball from the left hand pocket at an angle of  $45^\circ$  to the sides of the table.**
  - you score a pot if the ball drops into the right hand pocket.**
- ⇒ Outline snooker tables A and B on a squared grid. Draw the path of the ball for each table to show that it will pot in table A, but not pot in table B.
- ⇒ Choose children to draw the path of the ball for tables C and D.
- ⇒ Compare and discuss the results.

Pupil Book 3:  
Pot luck

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**Pupil consolidation****Resources** 1 cm squared grid paper; coloured pencil or fine felt tip pen**Refresher**

- 1 Children copy each single width snooker table, draw the path of the ball and write 'pot' if the ball drops into the opposite pocket.
- 2 They use the pattern to predict the outcome for other single width tables.

**Practice**

- 1 As for the Refresher task, children copy and complete snooker tables of one, two and three width units.
- 2 Using the patterns, they design two two-pocket snooker tables where the ball will pot.

**Extension****Resources** 1 cm squared grid paper

-  Children investigate some four-pocket snooker tables. They label the rectangle ABCD. If the ball rolls from A each time, on a  $45^\circ$  path, into which pocket will it drop?

**Plenary** (about 10 to 15 min)

- ➡ Review the answers to the Pupil Book tasks, identifying the snooker tables where a pot was made.
- ➡ Ask: **Can you think of a way of telling in advance on which tables the ball will pot?**
- ➡ Say: **Let's look at a simple case, a table which is one unit wide.**
- ➡ Use the results from the Refresher section and build up this table:
- ➡ Write: **width of one unit**

length in units	1	2	3	4	5	6	7	10	15
pot/miss	✓	✗	✓	✗	✓	✗	✓	✗	✓

- ➡ Ask: **Can you find a rule for one width tables?** (pot on odd numbers)
- ➡ Repeat, as above for a table of width two units and write:

length in units	1	2	3	4	5	6	7	8	9	10
pot/miss	✗	✓	✗	✗	✗	✓	✗	✗	✗	✓

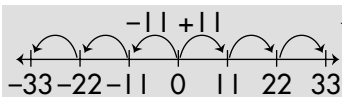
- ➡ Ask: **At which next length will this table pot?** (14)

# Properties of numbers and number sequences

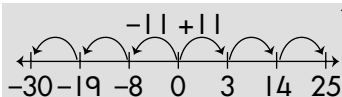
**Objectives** ● To recognise and extend number sequences formed by counting from any number in steps of constant size, extending beyond zero when counting back.

**Vocabulary** number; number names; digits; count; multiple; pattern; sequence; count forwards/ backwards; increase; decrease; predict; continue; count on/back; next; consecutive; rule; relationship; sort; classify; property; integer; positive; negative; minus; above/below zero

**i** Numbers below 0 are referred to as negative numbers and have a minus sign in front of them. When written on a number line they are referred to as “negative one, negative two ...”, however when written on a thermometer they are described as “minus one, minus two ...”



**i** The tens and units increase by 1 each time, except when 11 is added to a number with nine units, the tens digit increases by two, e.g. 59 add 11 equals 70



**i** The tens and units increase by 1 each time, except when 11 is subtracted from a number with nine units, the tens digit increases by two, e.g. -19 subtract 11 equals -30

**↑** Draw children's attention to the number line beginning at -96

## Oral work and mental calculation (about 5 to 10 min)

Choose an activity from Strand 1 Topic 1.2

## Main teaching and pupil activities (about 30 to 40 min)

➡ Draw an empty number line on the board with zero marked in the centre. Indicate a jump of 11 using an arrow, and write 11 on the number line.

➡ Say: **I am going to count in steps of 11 each time, what will the next number be?** (22) Draw another jump on the number line. Continue until 99 is reached. Ask: **What pattern do you notice?** (the tens and units digits are the same; the tens and units increase by 1 each time)

➡ Count forwards and backwards in 11s.

◀➡ Ask: **What happens when we get to zero? Can we go on?** (yes)

◀➡ Ask: **What will the next number in the sequence be?** (-11) Indicate this on the number line. Continue marking jumps of 11 until -99.

➡ Ask: **What do you notice about these numbers?** (they are the same as the multiples of 11 except they are said with 'negative' before them)

➡ Revise counting in 10s from single digit numbers, e.g. 3, 13, ... 93, 103

➡ Draw an empty number line on the board with zero marked in the centre. Mark 3 on the number line.

➡ Ask: **What if I add 11 instead of 10. What will the answer be?** (14)

➡ Say: **To add 11 you add 10 first and then add one more.**

➡ Indicate a jump of 11 using an arrow, and write 14 on the number line. Continue adding 11 each time. Ask: **What will the next number be?** (25) Draw another jump on the number line. Continue until 102 is reached.

➡ Ask: **What pattern do you notice?**

◀➡ Count forwards and backwards in 11s. Ask: **What happens when we get to zero? Can we go on?** (yes) **What will the next number in the sequence be?** (-8) Say: **To count back 11 we need to get to 0 first. How many do I jump to get to 0?** (3) **How many more do I need to jump?** (8) **What number will I finish on?** (-8) Indicate this on the number line. Continue jumps of 11 to -96.

◀➡ Ask: **What pattern do you notice?**

◀➡ Say: **When we are counting forwards in 11s from negative numbers, the tens and units digits generally decrease by 1 each time until 0 is reached, then the tens and units digits increase by 1 each time.** Indicate this on the number line.

➡ Ask: **What happens to the numbers when we count backwards in 11s?**

➡ Compare with the multiples of 11 number line.

Pupil Book 3:  
Number sequences

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**Pupil consolidation****Refresher**

Children copy and complete the number lines by filling in the missing numbers.

**Practice**

**Resources** a hundred square and a 101–200 square per child

Children copy and continue the patterns onto a hundred square and a 101–200 square. Whilst working they should be encouraged to predict subsequent numbers. They record observations about the patterns formed in their books.

**Extension**

In pairs, children continue the patterns formed by predicting the numbers in the sequence between 201–300. Children can further explore counting in steps of 11 or 12 by starting at different numbers and observing whether the patterns remain the same.

Support CM:  
Counting on in 10s,  
11s and 12s

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**Support**

Children count in sequences of 10, 11 and 12 from the start number indicated.

**Plenary** (about 10 to 15 min)

- ➡ Count forwards and backwards in multiples of 11 from 0 to 99 and back to –99.
- ➡ Count in 11s from a variety of starting numbers, e.g. –33 stop at 44; –11 stop at 11.
- ➡ Count backwards in 11s from different starting numbers, e.g. 55 stop at 11; 22 stop at –66.
- ➡ Count in 11s from a variety of starting numbers, e.g. 3, 42, 14. Clap your hands to indicate when to stop.
- ➡ Count backwards in 11s from different starting numbers, e.g. 58, 42, –17.
- ➡ Repeat the above activities counting forwards and back in 12s.

# Properties of numbers and number sequences

**Objectives** ● To recognise and extend number sequences formed by counting from any number in steps of constant size, count on in steps of multiples of 20 to 200, extending beyond zero when counting back, to say, -100.

**Vocabulary** number; number names; digits; count; multiple; pattern; sequence; count forwards/ backwards; increase; decrease; predict; continue; count on/back; next; consecutive; rule; relationship; sort; classify; property; integer; positive; negative; minus; above/below zero

## Oral work and mental calculation (about 5 to 10 min)

Choose an activity from Strand 1 Topic 1.2.

## Main teaching and pupil activities (about 30 to 40 min)

➡ Revise counting in 2s from 0 to 20. Write these numbers on the board.

➡ Remind children that these are the multiples of two.

➡ Count in multiples of 20 up to 200. Using a different colour, write a zero after each multiple of two.

➡ Say: **Look at the multiples of 20. Can you see any pattern?** (children will probably say that one zero has been added. Encourage them to look at the initial number and observe what has happened to its position i.e. it has moved one place to the left as it has increased in value)

➡ Write these numbers on the board.

➡ Draw a vertical number line on the board with zero marked in the centre and equal intervals marked.

➡ Ask: **Who can mark in where 20 would go on the number line?**

➡ Continue to mark in multiples of 20 to 200.

➡ Count backwards in multiples of 20 from 200 to 0, using the number line if necessary.

➡ Ask: **What happens when we get to zero? Can we go on?** (yes) **What will the next number in the sequence be?** (-20)

➡ Continue marking in the negative multiples of twenty to -200.

➡ Ask questions such as: **Who can mark in where -40/-100 would go on the number line? Who can mark in the multiple of 20 that comes before/after, e.g. 120? Where will -200 be written on the number line?**

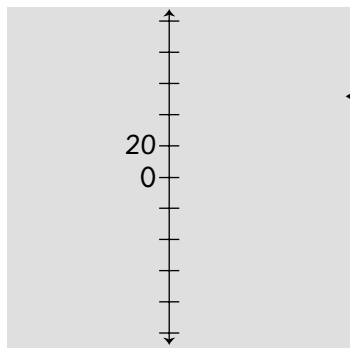
➡ Ask: **What do you notice about the numbers counted?** (they are the same as the multiples of 20 except they are said with negative before them)

➡ Ask questions similar to: **Which number is greater, -20 or 20?** (20) **Which number is greater, -20 or -50?** (-20) **How many multiples of 20 are there between -60 and 60?** (5)

➡ Repeat with either multiples of 3 and 30; 4 and 40; or 5 and 50, depending upon which multiples the children require greater practice in.

20 40 60 80 100  
120 140 160 180 200

↑ Ask: **Who can tell me a number between 200 and 400 that is a multiple of 20?**



**i** A number line showing negative numbers can be drawn horizontally and vertically. Numbers below 0 are referred to as negative numbers and have a minus sign in front of them. When written on a number line they are referred to as “negative one, negative two ...”, however when written on a thermometer they are described as “minus one, minus two ...”

**i** Explain that as the digits in negative numbers get higher, the value of the number gets lower.

Pupil Book 3:  
Mixed multiples

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**Pupil consolidation****Refresher**

Children write the sequence of multiples in the correct order starting and stopping at the numbers indicated.

**Practice**

Children draw 2 number lines in their books. They find the multiples of 20 and 30 on the page and position them in the correct order on each number line.

**Extension**

**Resources** 1 set of multiples of 5 cards (-50 to 50 excluding 0) per pair



Children draw an empty number line in their books, placing 0 in the centre. Shuffle the cards and place them face down on the table. Children take it in turns to select a card and record on the number line the approximate position of each multiple of 5. They check each other's work and discuss any discrepancies.

**Plenary** (about 10 to 15 min)

- ⇒ Count as a class in steps of 20 from -200 to 200.
- ⇒ Write about 10 numbers on the board, in random order, between -200 and 200, including numbers that are multiples of 20 and 30, e.g. 140, -200, -120, 60, -40, 0.
- ⇒ Using two different colours or different criteria such as circle and underline, ask: **Who can circle a number that is a multiple of 20/30?**
- ⇒ Invite individual children to identify the numbers.
- ⇒ Ask questions such as: **How can we be sure these numbers are multiples of 20?** (the numbers follow the same pattern as the multiples of 2)
- ⇒ Point to specific numbers, e.g. -40. Ask questions such as: **What is the multiple of 20 that comes before/after -40?** Repeat with other numbers.
- ⇒ Ask children to put the numbers in order from smallest to largest: **Who can find the smallest number/the largest number?**

# Properties of numbers and number sequences

**Objectives** ● To recognise multiples of 2, 3, 4, 5 and 10, up to the tenth multiple.

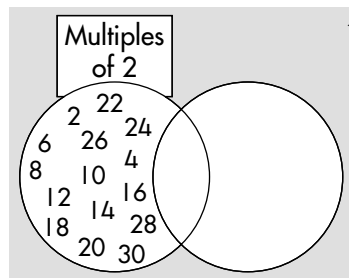
**Vocabulary** number; number names; digits; count; multiple; pattern; sequence; count forwards/backwards; increase; decrease; predict; continue; count on/back

## Oral work and mental calculation (about 5 to 10 min)

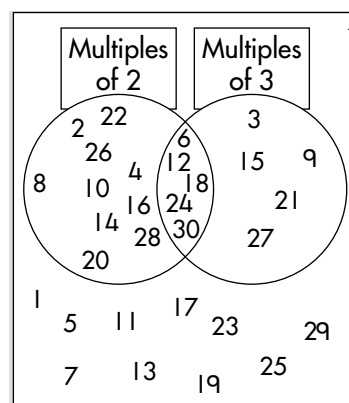
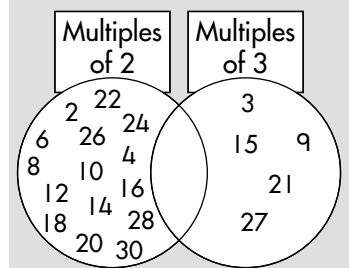
Choose an activity from Strand 1 Topic 1.2.

## Main teaching and pupil activities (about 30 to 40 min)

**Resources** 1–30 number cards; Blu-tack



**i** Children will probably choose only the numbers left on the side of the board and forget about the ones that are in the multiples of 2 set.



**↑** **What do you notice about the numbers that are multiples of both 2 and 3?** (they are multiples of 6) **Can you predict any other numbers that will be both multiples of 2 and 3?** (48, 60 ...) **How do you know?** (they are in the 6 times table)

➡ Blu-tack the 1–30 number cards in random order down one side of the board.

➡ Say: **We are going to sort these numbers into two sets of multiples.**

➡ Draw 2 overlapping circles on the board. Label the first one **Multiples of 2.**

➡ Say: **In the first set we will place all of the numbers that are multiples of 2.**

➡ Ask: **Who can find a number card that is a multiple of 2?**

➡ Invite individual children to select a card and place it inside the circle.

➡ Place all of the multiple of 2 cards in the circle.

➡ Say: **In the second set we will place all of the numbers that are multiples of 3.**

➡ Label the circle **Multiples of 3.**

➡ Ask: **Who can find a number card that is a multiple of 3?**

➡ Invite individual children to select a card and place it inside the circle.

➡ Place all of the multiple of 3 cards in the circle.

➡ Ask: **Are there any other numbers on the board that are multiples of 3?** (6, 12, 18, 24, 30)

➡ Take them from the set of multiples of 2 and place them in the multiples of 3 set.

➡ Discuss the problem that has arisen, i.e. the multiples of 2 set no longer contains all of the multiples of 2.

➡ Ask: **Can anyone remember the way we can include the numbers 6, 12, 18, 24 and 30 in both sets?** (place them in the section where both circles overlap)

➡ Ask: **Where do the remaining numbers belong?** (the remaining numbers belong to the Universal set) Write them outside the overlapping sets.

➡ Ask questions such as: **How many numbers are multiples of 2/3?** **Give me a number that is a multiple of 2/3?** (any numbers contained in the appropriate set) **Which numbers are multiples of both 2 and 3?** (6, 12, 18, 24, 30) **Which numbers are not multiples of 2 or 3?** (any number not included in the circles, e.g. 1, 5, 7, 11 ...)

Pupil Book 3:  
Finding multiples

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**Pupil consolidation****Refresher**

Children sort the numbers into multiples of 2, 3 and 4 and record them in their books.

**Practice**

Children draw their own Venn Diagrams in their exercise books and label them as shown. They write the numbers 1 - 40 in the correct parts of each circle.

Support CM:  
Finding multiples

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**Support**

- 1 Children write the first ten multiples of each of the numbers given.
- 2 Using the numbers from question 1, children answer the questions relating to finding common multiples.

Extension CM:  
Sorting multiples of 2, 3,  
4, 5 and 10

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**Extension**

Children sort and write the numbers into the different pots as indicated by the multiples of signs.



Game 26

**Games Pack 2**

Fruit box bingo

**Plenary** (about 10 to 15 min)

- Review the work completed independently by the children. Draw 2 overlapping circles on the board. Write Multiples of 3 above one circle and Multiples of 4 above the other.
- Ask: **What are the multiples of 3 up to 30?** (3, 6, 9, 12, 15, 18, 21, 24, 27, 30) Write them in the circle.
- Ask: **What are the multiples of 4 up to 40?** (4, 8, 12, 16, 20, 24, 28, 32, 36, 40) Write them in the circle.
- Ask: **Are there any numbers that are multiples of both 3 and 4?** (12, 24)  
**What do you notice about the numbers that are multiples of both 3 and 4?** (they are multiples of 12)
- Ask: **Can anyone tell me another number that would be a multiple of both numbers?** (36, 48 ...) **How can we work it out?** (they are in the 12 times table)
- Ask: **Which numbers would be outside the circles?** (any numbers up to 40 that are not multiples of 3 or 4)

Homework CM:  
Finding multiples

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**Homework** (about 20 min)**Refresher**

Complete each number sequence as indicated by the dice.

**Practice**

Each bag contains at least one marble that does not belong. Children colour all of the multiples that belong in each bag.



## Reasoning about numbers

**Objectives** ● To solve mathematical problems or puzzles, recognise and explain patterns and relationships, generalise and predict. Suggest extensions by asking “What if ... ?” ● To explain methods and reasoning about numbers orally and in writing.

**Vocabulary** number names; multiple; odd; even; add; how many; altogether; total; right; wrong; next; consecutive; rule; relationship; sort; classify; property; how did you work it out?

### Oral work and mental calculation (about 5 to 10 min)

Choose an activity from Strand 3 Topic 3.1, Strand 1 or Strand 2.

### Main teaching and pupil activities (about 30 to 40 min)

**Resources** about 5 mystery puzzles written on card or the board prior to the lesson (see examples in lesson notes); plain paper or exercise books

*I am a multiple of 5  
I am an even number  
I am a number between  
21 and 39  
What number am I?*

- 1 Identify the number range.
- 2 Write down a list of numbers that fit the category that is easiest to work out, e.g. multiples of 5 within the number range.
- 3 Identify a number in the list that fulfils the remaining category, an even number.  
The mystery number is 30.

*There are two of us  
We have a three in the  
tens place  
We are multiples of 4  
What numbers are we?*

- 1 Identify the number range.
- 2 Write down a list of numbers that fit the category that is easiest to work out, e.g. multiples of 4 within the number range.
- 3 Identify a number in the list that fulfils the remaining category, there are two numbers.  
The mystery numbers are 32 and 36.

- ⇒ Read out one of the mystery puzzles to the class.
- ⇒ Some children will be able to work this out quickly in their head.  
Ask: **How did you work it out?** (answers will vary)

- ⇒ Explain to the class a method of working out the answer which will not only help for easy mysteries but also in more complex examples.
- ⇒ Repeat with another harder example.
- ⇒ Once again, some children will be able to work this out quickly in their head. Ask: **How did you work it out?** (answers will vary)
- ⇒ Revise the method of working out the answer.
- ⇒ Repeat with other similar examples involving multiples of 2, 3, 4, 5 and 10. You may wish the children to work independently or in pairs to find the mystery numbers. Review the answers and working.
- ⇒ Repeat with examples that require a different approach to working out the answer.

*I think of a number, add 4  
Then multiply the number by 3  
The answer is 15  
What is my number?*

- ⇒ Once again, some children will be able to work this out quickly in their head. Ask: **How did you work it out?** (answers will vary)
- ⇒ Explain to the class a method of working out the answer which will not only help for easy mysteries but also in more complex examples.
  - 1 Identify the final answer which has been given.
  - 2 Work backwards through the puzzle, i.e. find out which number multiplied by 3 equals 15.
  - 3 Find the number that when 4 is added the answer is 5.  
The mystery number is 1.
- ⇒ Read through the puzzle again substituting the answer from the start to check the answer is correct.
- ⇒ Repeat with other similar puzzles involving multiplication or division of 2, 3, 4, 5 or 10. You may wish the children to work independently or in pairs to find the mystery numbers. Review the answers and working.

Pupil Book 3:  
Mystery numbers



### **Pupil consolidation**

#### *Refresher*

Use the clues given to identify the mystery numbers involving multiples of numbers between 1 and 10. Children write the number and any jottings in their exercise books.

#### *Practice*

Use the clues given to identify the mystery numbers. Children write the number and any jottings in their exercise books.

#### **Extension**



Children work in pairs to make their own Mystery Number puzzles using either of the formats shown in the lesson.

### **Plenary** (about 10 to 15 min)

- ➡ Go through some of the examples the children have worked on independently. Ask children to identify the mystery numbers and explain in full how they worked out the answer.
- ➡ Invite children who devised their own mystery number puzzles to read them out. The remainder of the class work out the answer in their exercise books or on a piece of paper.

## Reasoning about numbers

**Objectives** ● To solve mathematical problems or puzzles, recognise and explain patterns and relationships, generalise and predict. Suggest extensions by asking “What if ... ?” ● To explain methods and reasoning about numbers orally and in writing.

**Vocabulary** number names; multiple; odd; even; add; how many; altogether; total; right; wrong; next; consecutive; rule; relationship; sort; classify; property; how did you work it out?

You may prefer to draw the shapes on the board

$$\bigcirc + \square = \triangle$$

$$\triangle + \triangle = 50$$

$$\triangle + \square = 35$$

$$\bigcirc + \square = 25$$

Answers

$$\triangle = 25 \quad \square = 10 \quad \bigcirc = 15$$

$$\diamond + \diamond + \diamond = 18$$

$$\diamond + \square = 14$$

$$\bigcirc + \diamond = 16$$

$$\square - \diamond = \bigcirc - \square$$

Answers

$$\diamond = 6 \quad \square = 8 \quad \bigcirc = 10$$

Ensure children realise that as only a single digit is being taken away to get the answer 38, the two-digit number is going to be close to 38, therefore a number involving 8 tens or 80 is improbable.

Ensure children realise that they can reach the answer by looking at the units digit first. The units digit is 1 so 2 digits must add to make one, as this is impossible with the numbers given they must find two digits that add to make 11. These are 8 and 3. A total of 80 remains so 4 tens go in the remaining squares.

### Oral work and mental calculation (about 5 to 10 min)

Choose an activity from Strand 3 Topic 3.1, Strand 1 or Strand 2.

### Main teaching and pupil activities (about 30 to 40 min)

**Resources** different shaped card of similar size, e.g. squares, diamonds, triangles... to represent numbers; Blu-tack

⇒ Blu-tack three shapes on the board.

⇒ Say: ***I am thinking of three different numbers, one for each shape.*** Write the equations underneath.

⇒ Say: ***We can find what each of the numbers are by using these clues. Look at the first equation.***

⇒ Ask: ***I am thinking of two numbers that are the same to make this statement true. What are they?*** (25) Write them in the correct place.

⇒ Look at the second statement. Ask: ***Can anyone work out the numbers that go in each of these shapes?*** (25, 10) Write them in the correct place.

⇒ Ask: ***How did you work it out?*** (the triangle is 25 so  $25 + 10 = 35$ )

⇒ Look at the third equation. Ask: ***Can anyone work out the numbers that go in each of these shapes?*** (15, 10) Write them in the correct place.

Ask: ***How did you work it out?*** (the square is 10 so  $15 + 10 = 25$ )

⇒ Look at the original equation, substitute the numbers found for the shapes to check if the statement is correct. Write underneath: ***15 + 10 = 25.***

⇒ Remove all of the shapes. Repeat the process for other examples.

⇒ Blu-tack one of the shapes to the board, e.g. square. Write the numbers 1, 3, 4, 8 on the board beside the shape. Say: ***The square is going to be used to represent any of these digits.*** Write:  $\square \square - \square = 38$ .

⇒ Say: ***You have to replace the squares with any of the digits to make the statement true.*** Ask: ***What numbers could the squares represent?*** (41, 3) Ask: ***How did you work it out?*** (answers will vary)

⇒ Write another example using the same criteria, e.g.  $\square \square + \square \square = 91$ . Ask: ***What numbers could the squares represent?*** (48, 43) Ask: ***How did you work it out?*** (answers will vary)

⇒ Continue with other examples.

**Y4 Solving problems**Suggested order: **Summer Term, Week 7, Lesson 5**Pupil Book 3:  
Missing numbers

35

**Pupil consolidation***Refresher*

Children use the numbers 1–10 to make each statement correct. For each number sentence a different shape indicates a different number. They write the number statements in their exercise books.

*Practice*

Children copy and complete the number statements in their exercise books replacing each circle with one of the digits 1, 4, 5 or 9 to make the statements true.

Extension CM:  
Missing numbers

52

**Extension**

In each sequence, each shape represents one number. Children use the clues given to work out the value of each shape. If children find this too difficult you may wish to give them one of the missing numbers.



Ask children to devise their own number puzzles alone. They then swap and work out the answers, swapping them back again to check.

**Plenary** (about 10 to 15 min)

- Go through some of the examples the children have worked on independently. Ask children to identify the missing numbers and explain in full how they worked the answer out.
- Invite children who devised their own missing number puzzles to read them out. The remainder of the class work out the answer in their exercise books or on paper.

Homework CM:  
Missing numbers

53

**Homework** (about 20 min)*Refresher*

Children use the numbers 1–10 to make each statement correct. For each number sentence a different shape indicates a different number.

*Practice*

Children complete the number statements by replacing each square with one of the digits 1, 5, 6 or 8 to make the statements true.

# Rapid recall of multiplication and division facts/Mental calculation strategies ( $\times$ and $\div$ )/Understanding multiplication and division

**Objectives** ● To derive quickly division facts corresponding to 2, 3, 4, 5 and 10 times tables. ● To use the relationship between multiplication and division. ● To find remainders after division.

**Vocabulary** lots of; groups of; times; multiply; multiplied by; divide; divided by; share; share equally; group; add; subtract; equals; remainder; pounds; pence

## Oral work and mental calculation (about 5 to 10 min)

Choose an activity from Strand 2, Topic 2.4, 2.5 or 2.6.

## Main teaching and pupil activities (about 30 to 40 min)

**Resources** 1–50 number cards

- ➞ Shuffle the number cards 1–20. Hold up one number card at a time, e.g. 17. Ask: **What is the multiple of 2 that is closest to but not over 17?** (16) Ask: **How many remaining?** (1)
- ➞ Repeat with further examples. Shuffle the number cards 1–50. Hold up one number card at a time, e.g. 47 Ask: **What is the multiple of 5 that is closest to but not over 47?** (45) Ask: **How many remaining?** (2)
- ➞ Repeat with further examples. Ask: **What is the multiple of 2/3/4/5/10 that is closest to but not over the number shown?** Hold up a number card, e.g. 20. Write:  $20 \div 3 =$  . Say: **We can work out the answer to  $20 \div 3$  by using our knowledge of multiplication facts.**
- ➞ Ask: **What is the multiple of 3 that is closest to but not over 20?** (18) Ask: **How many threes make 18?** ( $6 \times 3 = 18$ ) Ask: **How many remaining?** (2)
- ➞ Remind children how to write answers when there is a remainder. Say and write:  $20 \div 3 = 6 \text{ r } 2$ .
- ➞ Repeat with other examples.
- ➞ Demonstrate different ways of recording division calculations requiring answers with remainders, e.g.  $28 = (5 \times 5) + \square$ .
- ➞ Ask: **How would we read this calculation?** (twenty eight equals five times five add something)
- ➞ Ask : **How could we find the missing number? What do we need to do first?** (the calculation in the brackets) Ask: **How did you work it out?** ( $5 \times 5 = 25$  add 3 equals 28)
- ➞ Repeat with other examples, e.g.  $97 = (9 \times 10) + \square$ ;  $327 = (3 \times 100) + \square$ ;  $453 = (4 \times \square) + \square$ .

↓ Use division problems that relate to multiplication facts that children know well, e.g.  $36 \div 5 =$  ;  $42 \div 10 =$  ;  $10 \div 3 =$  .

↑ Incorporate division problems that relate to multiplication facts that children have recently covered, e.g.  $50 \div 6 =$  ;  $36 \div 8 =$  ;  $72 \div 5 =$  ;  $728 \div 100 =$  .

Pupil Book 3:  
Finding remainders

36

**Pupil consolidation****Refresher**

Children look at the numbers written and write the multiple of the number indicated on the die that is closest to but not over the number shown.

**Practice**

- 1 For each division problem children write in their books the multiplication fact that helps to answer the problem. They write the answer and any remainder.
- 2 Children copy and complete the calculations given by finding the missing number that makes each calculation correct.

**Extension**

**Resources** (per pair or group) a selection of about twenty 1–40 number cards; a 1–6 die

Children lay the cards face down on the table in rows. They take turns to throw the die, e.g. 5, and turn over one card, e.g. 34. They make a division fact using the number on the die as one of the factors of the number on the card and give the answer with any remainder, e.g.  $34 \div 5 = 6 \text{ r } 4$ . If the answer is correct they keep the card. The person with the most cards at the end is the winner.

Support CM:  
Finding remainders

53

**Support**

- 1 Fill in the multiples for each number shown.
- 2 For each division problem children write the multiplication fact that helps to answer the problem. They write the answer to the calculation and any remainder.



Game 36

**Games Pack 2****Donkey Derby****Plenary** (about 10 to 15 min)

**Resources** 1–50 number cards

- Shuffle the 1–50 number cards. Hold up one number card at a time. Ask: **What is the multiple of 2/3/4/5/10 that is closest to but not over the number shown?** Ask: **How many remaining?**
- Repeat with further examples. Write some division facts on the board, e.g.  $27 \div 4 = \square$ ;  $38 \div 5 = \square$ ;  $58 \div 10 = \square$ . etc.
- Ask questions such as: **How many are we starting with? What are we dividing by/how many groups are we making? What multiplication fact do we need to answer the question? What is the remainder? What is the answer?**
- Repeat with other division facts.

**Software: Rapid Maths 4**

Goo Station

Homework CM:  
Revising multiplication  
and division

54

**Homework** (about 20 min)**Refresher**

Children write the multiple for each set of numbers.

**Practice**

Fill in the missing operation  $\times$  or  $\div$  to make the calculations complete.

# Understanding multiplication and division/ $\times$ and $\div$ /Rapid recall of multiplication and division facts/Problems involving “real life” and money

**Objectives** ● To round up or down after division, depending on the context. ● To derive quickly division facts corresponding to 2, 3, 4, 5 and 10 times tables. ● To use the relationship between multiplication and division. ● To use  $\div$  to solve word problems involving numbers in “real life” using one step.

**Vocabulary** lots of; groups of; times; multiply; multiplied by; divide; divided by; share; share equally; group; add; subtract; equals; remainder; round up; round down

**Year 4 are planning a cake sale for the summer school fete. Parents have volunteered to bake the cakes and the local bakery is to donate boxes. Mrs Smythe is able to bake 34 patty cakes. If one box holds 4 cakes, how many boxes will Mrs Smythe need for her cakes?**

**i** It is important to teach children an approach to solving word problems. This four-step model is used in lessons where word problems are presented:  
1) read the problem and identify any important information; 2) identify the calculation needed; 3) find the answer to the calculation; 4) find the answer to the problem.

**Mrs Joseph donates 48 cream cakes. One box holds 5 cakes. How many boxes can she fill?**

**i** Explain that in some situations involving division, the answer needs to be rounded down to fit the context or idea of the problem.

## Oral work and mental calculation (about 5 to 10 min)

Choose an activity from Strand 2, Topic 2.5 or 2.6.

## Main teaching and pupil activities (about 30 to 40 min)

**Resources** Prepared stories that suggest dividing by known number facts, i.e. 2, 3, 4, 5, 10 with a remainder, written on the board/chart prior to lesson. (Topics should reflect the interests of children in your class.) For more able children/classes the prepared stories might suggest division involving the six and eight times tables

- ➡ Read one problem from the board/chart to the class.
- ➡ Discuss the problem with the children. Tell them to picture the situation in their mind. Ask: **What information is important to working out the answer?** (34 cakes, one box holds 4 cakes, how many boxes?)
- ➡ Underline the relevant words/phrases.
- ➡ Ask: **What maths operation do we need to use to find the answer?** ( $\div$ ) **Which calculation is required?** ( $34 \div 4$ ) **What is the answer?** (8 r 2) **How did you work it out?**
- ➡ Encourage children to refer to their knowledge of multiplication facts when explaining their method, e.g.  $4 \times 8 = 32$  so  $34 \div 4$  is 8 remainder 4; or detail any other strategy used.
- ➡ Explain that we need to re-read the problem. Ask: **What do we need to find out?** (how many boxes will Mrs Smythe need for her cakes?) Say: **Our answer is 8 boxes with a remainder of 2 cakes.** Ask: **How many boxes will she need to hold all of the cakes?** (an extra box for the remaining 2 cakes which makes a total of 9 boxes) Ask: **What is the answer to the problem?** (9 boxes)
- ➡ Explain that in some situations involving division, the answer needs to be rounded up to fit the context or idea of the problem.
- ➡ Continue this process with another problem.
- ➡ Explain that even though the answer to the calculation is 9 remainder 3, to answer the question properly we need to re-read the problem. Ask: **What do we need to find out?** (how many boxes can she fill?) Say: **Our answer is 9 boxes with 3 cakes remaining.**
- ➡ Ask: **How many boxes can she fill?** (she can only fill 9 boxes, the remaining 2 cakes are not enough to fill another box) Ask: **What is the answer to the problem?** (9 boxes)
- ➡ Continue this process with other problems.

Pupil Book 3:  
Rounding remainders

37

**Pupil consolidation****Refresher**

Children copy and complete the division number sentences in their exercise books, writing remainders where necessary.

**Practice**

Children read each story. In their books they write the answer to the division fact and the answer to the problem taking care to round the answer up or down where necessary.

**Extension**

Draw pictures on individual cards, e.g. car, bus, train, helicopter. Place them on the board with one of the numbers 2, 3, 4, 5, 6, 8, or 10 beside each picture, e.g. 6 cars. Children make up division problems that relate to the number of children in the class and have the picture as the answer, e.g. 28 children in the class are going on a trip. Parents have offered to drive. If 5 children can fit in one car, how many cars are needed? (6 cars)



Game 36

**Games Pack 2****Donkey Derby****Plenary** (about 10 to 15 min)

- Read through some of the problems the children have worked on independently.
- Ask children to identify the important words or information from each. Write the calculation required on the board and the answer.
- Ask children to explain their method of working out the answer and the mental strategies used. Emphasise the re-reading of the problem to make sure the answer corresponds to the question asked.
- Ask the children to picture the situation in their mind to help them to decide whether the answers with remainders need to be rounded up or down.
- Remind children that in some situations involving division where there is a remainder, the answer needs to be rounded up or down to fit the context of the problem.

**Software: Rapid Maths 4**

Goo Station

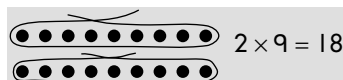


# Rapid recall of multiplication and division facts/Mental calculation strategies ( $\times$ and $\div$ )

**Objectives** ● To begin to know multiplication facts for the 9 times table. ● To use closely related facts (e.g. to multiply by 9, multiply by 10 then adjust).

**Vocabulary** lots of; groups of; times; multiply; multiplied by; multiple; product; double; add; equals

**i** At this stage it is important to establish with the children that it is easier to use facts that they already know to help them with new tables rather than building up a complete new set of facts. Two strategies are used in this lesson to build up the nine times table. The concept of “key facts” beginning 1x, 2x, 5x, 10x (introduced in Year 3) are used to derive the remaining number facts for each multiplication table. The use of closely related facts, i.e. developing the 9x table from the 10x table, is reviewed from Year 4 Spring Term.

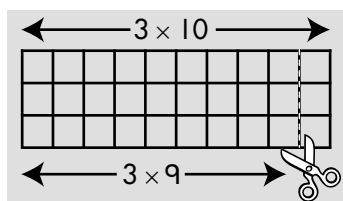


$$2 \times 9 = 18$$



$$9 \times 2 = 18$$

6 x 9: 5 x 9 = 45 so 6 x 9 is 9 more so 6 x 9 equals 54.



**↓** If children find this difficult it is likely they do not have secure knowledge of subtracting single-digit numbers from a multiple of ten. Revise addition and subtraction facts for ten.

## Oral work and mental calculation (about 5 to 10 min)

Choose an activity from Strand 2 Topic 2.4 or 2.6

## Main teaching and pupil activities (about 30 to 40 min)

**Resources** 4 array cards with 1 row of 9, 2 rows of 9, 5 rows of 9, 10 rows of 9; square paper; scissors

- ➞ Place the card with the array showing 2 rows of 9 on the board. Ask: **What multiplication fact can we write for this picture?** ( $2 \times 9 = 18$ ) Draw 2 loops to show.
- ➞ Ask: **Can anyone tell me another multiplication fact for this picture?** ( $9 \times 2 = 18$ ) Draw 9 loops to show.
- ➞ Write both facts on the board. Repeat with the other array cards.
- ➞ Remind children that if they know the fact e.g.  $9 \times 5 = 45$  they also know the answer to the fact  $5 \times 9 = 45$ .
- ➞ Say: **Look carefully at the array cards. Can you tell me something about them?** (they are the key facts for the nine times table) Write down the four key facts on the board leaving appropriate space between them for the remaining facts. Work out the other facts using the key facts to help. When all the facts have been written look at the answers. Count forwards and backwards in nines.
- ➞ Rub out one of the factors e.g. 5. Ask: **How many nines make 45?** (5)
- ➞ Repeat with other numbers.
- ➞ Say: **When there is a missing number we write it like this:**  $\square \times 9 = 45$ . Write other examples on the board for the children to answer.
- ➞ Review how the 10 times table can help to work out the 9 times table. Say: **Another way to work out calculations like this is to use the strategy of multiplying by 10 to help us multiply by 9.** Ask: **Why would 10 help us to multiply by 9?**
- ➞ Say: **When we multiply by 9 we can multiply by 10 first and then subtract the number we are multiplying 9 by.**
- ➞ Start with an easy example to demonstrate the mental process, e.g. Ask: **What is 3 x 9?** (27) Write:  $3 \times 9 = 27$  on the board. Say: **When we see x 9 we can think of x 10.**
- ➞ Demonstrate using the square paper array of 3 x 10. Ask: **What is 3 x 10?** (30) Cut off one row of 3 to show 3 x 9. **How many have I removed?** (3) **How many are left?** (27) Ask: **If I think that 3 lots of 9 is 3 lots of 10, how many extra lots of 3 have I got?** Say: **So 3 x 9 is the same as 3 x 10 (30), take away 3, equals 27.**
- ➞ Repeat with further examples, as required.

Pupil Book 3:  
More about the  
9 times table

38



### Pupil consolidation

#### Refresher

Review with the class the use of key facts by finding the hidden key on the page. Children work out the missing factors or the product. They copy and complete the number sentences in their books.

#### Practice

Children use the 10 times table to help find the answers to the nine times table. They write the number sentence and show the working in their books.

#### Extension



**Resources** 1–12 die per pair

Children take it in turns to throw the die. They multiply the number landed on by 9. The aim is to improve rapid recall so children should be aiming to answer in 3 seconds or less.

#### Plenary (about 10 to 15 min)

- Count up to 90 in 9s. Review using the four key facts to help work out unknown facts as in the main part of the lesson.
- Ask: **What key fact would you use to work out 4 nines/7 times 9/11 multiplied by 9 ...?**
- Ask children to give the answer and explain how they worked it out using the  $\times 10$  and adjust method.
- Ask: **What is  $3 \times 9$ ?** (27) ... etc. **How many nines make 54, 18 ... ?** etc.
- Remind the children that it is useful to know more than one method of working out the answers to multiplication facts, but they should use the strategy they find the easiest and quickest.
- Ask quickfire questions around the class.



#### Software: Rapid Maths 4

Goo Station

# Understanding multiplication and division/Rapid recall of multiplication facts

**Objectives** ● To begin to know multiplication facts for the 7 times table. ● To understand the principles (not the name) of the commutative law as it applies to multiplication.

**Vocabulary** lots of; groups of; times; multiply; multiplied by; multiple; product; double; add; equals

**i** At this stage it is important to establish with the children that it is easier to use facts that they already know to help them with new tables rather than building up a complete new set of facts. Two strategies are used in this lesson to build up the seven times table. The concept of “key facts” beginning 1x, 2x, 5x, 10x (introduced in Year 3) are used to derive the remaining number facts for each multiplication table and the principles of the commutative law, i.e. I know that  $7 \times 3 = 21$  so  $3 \times 7 = 21$ . Children may have also developed other quick and effective strategies, e.g. use  $\times 5$  and  $\times 2$  to work out the answer. These are perfectly acceptable strategies. Remind children that the strategies being taught in this lesson are yet more quick and effective ways of recalling the 7 times table.

Answers will vary but they could include: I know  $5 \times 7 = 35$  and  $2 \times 7 = 14$  so 35 add 14 equals 49.



**↓** If children find this difficult it is likely they do not have secure knowledge of the other times tables. Revise the times tables used for the key facts first and progress onto the 3 and 4 times tables. Children should then revise the 6, 8 or 9 times tables in the order they find easiest.

## Oral work and mental calculation (about 5 to 10 min)

Choose an activity from Strand 2 Topic 2.4 or 2.6

## Main teaching and pupil activities (about 30 to 40 min)

**Resources** 4 array cards with 1 row of 7, 2 rows of 7, 5 rows of 7, 10 rows of 7

- ➞ Place the card with the array showing 2 rows of 7 on the board. Ask: **Which multiplication fact can we write for this picture?**   $2 \times 7 = 14$  (2 x 7 = 14) Draw 2 loops to show.
- ➞ Ask: **Can anyone tell me another multiplication fact for this picture?** ( $7 \times 2 = 14$ ) Draw 7 loops to show.   $7 \times 2 = 14$
- ➞ Write both facts on the board. Repeat with the other array cards.
- ➞ Remind children that if they know the fact e.g.  $7 \times 5 = 35$  they also know the answer to the fact  $5 \times 7 = 35$ .
- ➞ Ask: **Look carefully at the array cards. Can you tell me something about them?** (they are the key facts for the seven times table) Write down the four key facts on the board leaving appropriate space between them for the remaining facts. Work out the other facts using the key facts to help. When all the facts have been written look at the answers. Count forwards and backwards in sevens.
- ➞ Rub out one of the factors e.g. 5. Ask: **How many sevens make 35?** (5)
- ➞ Repeat with other numbers, e.g. 3. Ask: **How many sevens make 21?** (3)
- ➞ Say: **When there is a missing number we write it like this  $\square \times 7 = 35$ .** Write other examples on the board for the children to answer.
- ➞ Repeat with the other seven times tables.
- ➞ Review the multiplication facts covered to date. Ask: **What multiplication facts have we learnt so far?** (2, 3, 4, 5, 6, 8, 9, 10) Say and write one under the other: **We know:  $7 \times 2, 7 \times 3, 7 \times 4, 7 \times 5, 7 \times 6, 7 \times 8, 7 \times 9, 7 \times 10$ .** (leave a space where  $7 \times 7$  should go)
- ➞ Ask children to give the answers to these and write the answer next to the multiplication fact. Say: **We already know all of these facts about seven.**
- ➞ Ask: **What happens if we turn the facts around?** (the answers are the same) Write the multiplication facts for seven beside the matching number fact, i.e.  $2 \times 7, 3 \times 7, 4 \times 7, 5 \times 7, 6 \times 7, 8 \times 7, 9 \times 7, 10 \times 7$ .
- ➞ Ask: **Which multiplication facts for seven haven't we learnt yet?** ( $1 \times 7$  and  $7 \times 7$ )
- ➞ Say:  **$1 \times 7$  is easy.** Ask: **What is  $1 \times 7$ ?** (7) Write this at the top of the 7 times table. Ask: **Who can work out  $7 \times 7$ ?** (49) **How did you work it out?**
- ➞ Say: **The seven times table is easy as you already know most of the answers. The only multiplication fact you need to learn that is new is  $7 \times 7 = 49$ .**

Pupil Book 3:  
Finding out about sevens

39

**Pupil consolidation****Refresher**

Review with the class the use of key facts by finding the hidden key on the page. Children work out the missing factors or the product. They copy and complete the number sentences in their books.

**Practice**

Children use their knowledge of other times tables to find the answers to the seven times table. They write the number sentences and the answers in their books.

Extension CM:  
Simple sevens

53

**Extension**

Resources 36 counters per pair or group



Play the game 'Simple Sevens'. Children have a copy of the ECM between two or three players. Each multiplication fact is covered with a counter. Children take turns to uncover a fact and give the answer. If the answer is correct they keep the counter. If it is incorrect the counter is put back in place. The player with the most counters at the end is the winner.

**Plenary** (about 10 to 15 min)

- ☞ Count up to 70 in 7s. Review using the four key facts to help work out unknown facts as in the main part of the lesson.
- ☞ Ask: **What key fact would you use to work out 6 sevens/9 times 7/11 multiplied by 7 ...?**
- ☞ Ask: **What is  $3 \times 7$ ? (21) ... etc. How many sevens make 56, 49 ... ?** etc.
- ☞ Remind the class that it is useful to know more than one method of working out the answers to multiplication facts, but they should use the strategy they find the easiest and quickest.

**Software: Rapid Maths 4**

Goo Station

Homework CM:  
Simple sevens

55

**Homework** (about 20 min)**Refresher**

Children identify and colour the multiples of seven.

**Practice**

Children answer the multiplication facts they have learnt already. They use these, if necessary, to work out the answers to the seven times table. They draw a line to join the matching facts.

# Understanding multiplication and division/ $\times$ and $\div$ /Rapid recall of multiplication and division facts/Checking results of calculations

**Objectives** ● To understand the principles of the distributive law as it applies to multiplication. ● To know by heart multiplication facts for 2, 3, 4, 5 and 10 times tables. ● To partition (e.g.  $23 \times 4 = (20 \times 4) + (3 \times 4)$ ); multiply TU  $\times$  U, e.g.  $13 \times 3$ . ● To estimate and check by approximating (round to the nearest 10 or 100).

**Vocabulary** lots of; groups of; times; multiply; multiplied by; multiple; product; double; add; equals; approximate; approximately; nearly; round to the nearest ten

**i** Children have been recording multiplication of two-digit numbers by one-digit numbers using both informal and formal paper and pencil methods. These methods have been introduced using smaller numbers in preparation for multiplication of larger numbers. At this stage children should be beginning to carry out these calculations mentally using partitioning and the distributive law, e.g.

$$\begin{aligned} 32 \times 3 \\ = (30 \times 3) + (2 \times 3) \\ = 90 + 6 \\ = 96 \end{aligned}$$

Recording helps children remember the process of working out the answer mentally. Particular emphasis should be placed on the oral explanation of the thinking process involved.

**↑** Calculations might extend to multiplication involving two-digit numbers up to 99.

**i** Children may suggest adding the numbers together to find the total. Although this is correct tell the children that the most efficient method to use is multiplication.

## Oral work and mental calculation (about 5 to 10 min)

Choose an activity from Strand 2 Topic 2.4 or 2.6.

## Main teaching and pupil activities (about 30 to 40 min)

**Resources** individual boxes containing classroom consumable stock, e.g. scissors, pens, pencils, sharpeners, balls, each with a label suggesting the quantity inside, e.g. 46, 34, 28.

- ➞ Use a classroom consumable stock theme to discuss situations, which involve multiplication. Display the boxes of objects with a label showing how many items per box. For these items the number of items to be purchased should be selected so that calculations involve multiplying two-digit numbers up to 50 by a single digit multiple of 2, 3, 4, 5.
- ➞ Select an item with a quantity label, e.g. 46 scissors per box.
- ➞ Say: **I need three boxes of scissors for all the Year 4 classes. How many scissors altogether?** Ask individual children to explain their method of working out the answer.
- ➞ Write: **46  $\times$  3** on the board. Demonstrate how to multiply these numbers mentally by recording the steps on the board, i.e. Ask: **What is 40 times 3?**
- ➞ Write: **40  $\times$  3 = 120**. Ask: **What is 6 times 3?** Write: **6  $\times$  3 = 18**. Ask: **What is 120 add 18?** (138) Say: **So 46  $\times$  3 = 138**.
- ➞ Explain to the class that recording their work helps them to remember the process of working out the answer but they should be working towards working the answer out mentally.
- ➞ Select another item with a different quantity label, e.g. 34 sharpeners per box.
- ➞ Say: **There are 5 boxes of sharpeners remaining in the stock cupboard.** Repeat the process as outlined above.
- ➞ Ask: **What is 30 times 5?** (150) Write: **30  $\times$  5 = 150**. Ask: **What is 4 times 5?** (20) Write **4  $\times$  5 = 20**. Ask: **What is 150 add 20?** (170) Say: **So 34  $\times$  5 = 170**.
- ➞ Continue with other examples re-using the same items but varying the number of items.
- ➞ Invite individual children to the board to record and explain their working to the class.

Pupil Book 3:  
Multiplying larger  
numbers

40

**Pupil consolidation****Refresher**

Children partition each calculation to find the answers. They write the working in their books.

**Practice**

- 1 Children record ten calculations in their books by multiplying two-digit numbers by a single-digit number of their choice from the numbers given.
- 2 They identify the highest score from the calculations recorded and write the calculation.
- 3 They identify the lowest score from the calculations recorded and write the calculation.

Support CM:  
Multiplying larger  
numbers

54

**Support**

For each multiplication calculation, children identify and colour the number they think is closest to the answer. They then partition each two-digit number to work out the answer.

Extension CM:  
Multiplying larger  
numbers

54

**Extension**

- 1 Children approximate the answer to each multiplication calculation and colour or circle the number that is closest to the answer.
- 2 Children work out the answer to each calculation mentally and write the answer in the correct position in each table. They use the back of the sheet for jottings if they need to.



Game 35

**Games Pack 2**

Athletics Arena

**Plenary** (about 10 to 15 min)

- ☞ Write some examples from the Pupil Book page on the board. Invite individual children to the board to record and explain their working to the class.
- ☞ Explain to the class that recording their work helps them to remember the process of working out the answer but they should be aiming to work out the answer mentally.
- ☞ Write further examples on the board one at a time. Ask individual children for the answer mentally. Ask children to explain verbally how they worked out the answer.

**Software: Rapid Maths 4**

Goo Station

# Problems involving “real life” and money/Understanding multiplication and division

**Objectives** ● To use  $\times$  and  $\div$  to solve word problems involving numbers in “real life” and money, using one or more steps. ● To divide a whole number of pounds by 2, 3, 4, 5 or 10 to give £.p. ● To choose and use appropriate number operations and appropriate ways of calculating (mental, mental with jottings, pencil and paper) to solve problems.

**Vocabulary** lots of; groups of; times; multiply; multiplied by; add; divide; divided by; share; share equally; remainder; group; double; half; halve; equals; inverse; times table; product; money; pounds; price; cost; buy; pay; change; how much more/less?; total; amount; calculate; operation; number sentence; answer; reasonable; solve; method; how did you work it out ...?

## Oral work and mental calculation (about 5 to 10 min)

Choose an activity from Strand 3 Topic 3.3, 3.4, Strand 1 or Strand 2.

## Main teaching and pupil activities (about 30 to 40 min)

**Resources** About 5 prepared stories that suggest multiplying and/or dividing a whole number of pounds by 2, 3, 4, 5 or 10 to give £.p, written on the board/chart prior to lesson. (Topics should reflect the interests of children in your class.)

**i** It is important to teach children an approach to solving word problems. This four-step model is used in lessons where word problems are presented: 1) read the problem and identify any important information; 2) identify the calculation needed; 3) find the answer to the calculation; 4) find the answer to the problem.

➡ Read one story problem from the board/chart to the class, e.g. **4 children collected £21 for charity. Each child collected the same amount. How much did each child collect?**

➡ Discuss the problem with the children.

➡ Ask: **What information is important to working out the answer?** (4 children, £21, same amount, how much each?) Underline these.

➡ Ask: **Which maths operation do we need to use to find the answer?** ( $\div$ ) **Which calculation is required?** ( $21 \div 4$ ) Ask: **What is the answer?** (5 r 1) **How did you work it out?** (e.g. I know that  $5 \times 4 = 20$  so  $21 \div 4 = 5$  r 1)

➡ Say: **What do we need to find out?** (How much did each child collect?) Ask: **Can each child collect £5 remainder 1?** (no)

➡ Say: **There is £1 remaining that needs to be divided between the 4 children. So, how much did they collect each?** (25p) **How did you work it out?** ( $100p \div 4 = 25p$ )

**i** At this level children should be expected not only to give a context answer but also to answer the question in a complete sentence.

➡ Ask: **What is the answer to the problem?** (they collected £5.25 each)

➡ Explain that in some situations involving division of pounds, the answer will include a remainder. This remainder needs to be divided by the given number to give an answer in pence. Ask: **How many pence in £1?** (100)

➡ Ask: **What is £1  $\div$  2?** (50p) **How did you work it out?** ( $100p \div 2 = 50p$ ) Ask: **What is £1  $\div$  4?** (25p) **How did you work it out?** ( $100p \div 4 = 25p$ )

➡ Say: **You can count in 25s to remember that  $4 \times 25 = 100$ .**

➡ Ask: **What is £1  $\div$  5?** (20p) **How did you work it out?** ( $100p \div 5 = 20p$ )

Ask: **What is £2  $\div$  4?** (50p) **How did you work it out?** ( $200p \div 4 = 50p$ )

➡ Say: **£2 will not divide evenly into pounds when it is divided by 4 so we convert the £2 into 200. First, work out how many times 4 goes into 100. You can count in 25s to remember that  $4 \times 25 = 100$ . Then multiply your answer by 2 as there are £2,  $4 \times 50 = 200$ . So,  $\pounds 2 \div 4 = 50p$ .**

➡ Repeat with other word problems that involve division of pounds where the answer is a remainder that needs to be divided into pence.

Pupil Book 3:  
Raising money**Pupil consolidation****Refresher**

For each word problem, children decide which operation is required to answer the question. They record this and the approximate answer in their books.

**Practice**

For each word problem, children find the important information, write a division calculation to answer the question and calculate the answer in £.p in their books. They check to see the answer relates to the question.

**Extension**

**Resources** (per group) play money – coins and notes; blank die labelled: 2, 2, 4, 4, 5, 10; cards with 2 of each of the following amounts: £1, £2, £3, £4, £5.

Children take turns to select an amount card and take the required amount from the bank. They roll the die and divide the starting amount by the number on the die, using coins and/or notes from the bank, e.g.  $£3 \div 5$  equals 60p each.



Game 46

**Games Pack 2****Pot of gold****Plenary** (about 10 to 15 min)

- Read through some of the problems the children have worked on independently.
- Ask children to identify the important words or information from each and to identify which operation(s) were needed to carry out the calculations. Write the calculation required on the board, and the answer.
- Ask children to explain their method of working out the answer and the mental strategies used.
- Remind children that in situations involving division of pounds where the answer includes a remainder, this remainder needs to be divided by the given number to give an answer in pence.
- Emphasise the re-reading of the problem to make sure the answer corresponds to the question asked.



# Rapid recall of multiplication and division facts

**Objectives** ● To derive quickly doubles of multiples of 100 to 5000 (e.g.  $3400 \times 2$ ) and the corresponding halves (e.g.  $\frac{1}{2}$  of 6800).

**Vocabulary** lots of; groups of; times; multiply; multiplied by; multiple; product; double; add; equals; two times; double; twice; inverse

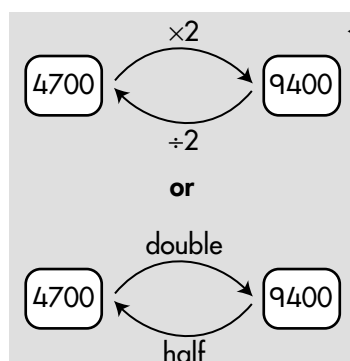
**i** When doubling numbers the strategy taught is: To work out the double in our head we double the numbers in order of significance, i.e. we double the hundreds first, then the tens, then the units and add them together, e.g. double 230 is double 200 (400) add double 30 (60) equals 460.

## Oral work and mental calculation (about 5 to 10 min)

Choose an activity from Strand 2 Topic 2.4, 2.5 or 2.6.

## Main teaching and pupil activities (about 30 to 40 min)

- ➞ Ask: **Who can tell me a multiple of 100 between 100 and 1000?** Write 2 of these on the board, e.g. 300, 700.
- ➞ Ask: **How do you know it is a multiple of 100?** (all multiples of 100 have 0 in the tens and units positions)
- ➞ Ask: **Who can tell me a multiple of 100 between 1000 and 2000?** Write 2 of these on the board, e.g. 1400, 1900.
- ➞ Repeat with multiples of 100 between 2000 and 3000/3000 and 4000/4000 and 5000.
- ➞ Using the numbers written on the board, ask: **What is double 1400?** (2800) Ask: **How do you know the answer to this?**
- ➞ Children should be able to explain an efficient strategy, i.e. I know that  $1000 + 1000 = 2000$  and  $400 + 400 = 800$  so 2000 add 800 equals 2800. ( $1400 \times 2$  is the same as double 1000 which is 2000, add double 400 which is 800, so 2000 add 800 = 2800)
- ➞ Say: **To work out the double of four-digit multiples of 100 in our head we double the thousands digit first then we double the hundreds digit and add them together.**
- ➞ Repeat with the other numbers on the board.
- ➞ Revise halving numbers that are multiples of 100.
- ➞ Ask: **Who can tell me a multiple of 100 between 5000 and 10000?** (e.g. 6200, 9400)
- ➞ Ask: **What is half of 6200?** (3100) Ask children to explain their method of working out the answer, e.g. (half of 6000 is 3000 and half of 200 is 100)
- ➞ Ask: **What is half of 9400?** (4700) **What did you partition 9400 into to work out half?** (9000 and 400)
- ➞ Say: **To work out half of four-digit numbers that are multiples of 100 in our head, we halve the thousands number first then we halve the hundreds number and add them together.**
- ➞ Ask: **What is half of 9000?** (4500) **What is half of 400?** (200) Say: **4500 add 200 equals 4700.** Ask: **How can we check if the answer is correct?** (we can double the answer)
- ➞ Draw a diagram on the board to illustrate the inverse relationship between halving and doubling.
- ➞ Repeat with other numbers used throughout the lesson.



**↑** Include examples where halving the hundreds digit results in a multiple of 50, e.g. 4700, 9500 ... (2350, 4750...)

Pupil Book 3:  
Doubling and halving  
multiples of 100

42

**Pupil consolidation****Refresher**

Children double or halve each number as indicated. They write the answers in their exercise books.

**Practice**

- 1 Children identify and double multiples of 100 from the numbers given. They write an addition and multiplication number sentence to record the answer.
- 2 Children identify and halve multiples of 100 from the numbers given. They write a division and fractional number sentence to record the answer.

**Extension**

**Resources** (per group) a set of 1–10 number cards



Children take it in turns to select a start number from the set of cards. They double the number and keep doubling as far as they can.

**Plenary** (about 10 to 15 min)

**Resources** about 20 multiples of 100 cards up to about 5000

- ➡ Count on and back in multiples of 100 to 5000 as a class.
- ➡ Work around the classroom in clockwise direction doubling and halving in alternation, e.g. one child says a multiple of 100, the next child halves the number. The following child says a multiple of 100 the next child doubles the number, etc. until the last child is reached. Repeat in the other direction so everyone has a chance of doubling and halving.
- ➡ Hold up a multiple of 100 card between 0 and 5000, the class double the number and call out the answer. Repeat asking individual children to answer and explain their strategy.
- ➡ Hold up a multiple of 100 card, the class halve the number and call out the answer. Repeat asking individual children to answer and explain their strategy.

**Software: Rapid Maths 4**

Goo Station

Homework CM:  
Doubling and halving  
multiples of 100

56

**Homework** (about 20 min)**Refresher**

Children double or halve each number as indicated on the tyres.

**Practice**

Children work their way around the race track by doubling the multiples of 100 on the outside track and halving the multiples of 100 on the inside track.

# Mental calculation strategies (x and ÷)

**Objectives** ● To use known number facts and place value to multiply and divide integers, including by 10 and then 100 (whole number answers).

**Vocabulary** lots of; groups of; times; multiply; multiplied by; multiple; equals; divide; divided by; share; share equally

**i** The concepts covered in this lesson are revision of work covered in Year 3 with some extension involving larger numbers. Use the lesson to determine which concepts need further explanation or development.

## Oral work and mental calculation (about 5 to 10 min)

Choose an activity from Strand 2 Topic 2.4, 2.5 or 2.6.

## Main teaching and pupil activities (about 30 to 40 min)

**Resources** a box/bag with a selection of calculations written on cards covering these topics: a) two-, three-digit number  $\times 10$ , 100, e.g.  $327 \times 10$ ,  $54 \times 100$ ; b) four-digit multiples of  $1000 \div 10$ , 100, e.g.  $8000 \div 10$ ,  $3000 \div 100$ ; c) double multiples of 5 up to 100; e.g.  $85 \times 2$ ; d) halves of multiples of 10 to 200, e.g.  $150 \div 2$ ; e) two-digit multiples of 10  $\times 2$ , 3, 4, 5, 10, e.g.  $30 \times 5$ ,  $60 \times 3$ . For more able pupils, extend multiplying two-digit multiples of 10 to include multiplying by 6, 7, 8 and 9, or two-digit numbers  $\times 2$ , 3, 4, 5, crossing the tens boundary.

- ⇒ Shake the bag and select a card, e.g.  $327 \times 10$ . Ask: **Who can tell me the answer to  $327 \times 10$ ?** (3270) **How did you work it out?**
- ⇒ Remind children that the digits move one place to the left when multiplied by 10 and two places to the left when multiplied by 100.
- ⇒ Invite children to select a card from the bag and give the answer to the calculation. Ask each child to explain their method of working out. Use each example to revise strategies for the concepts being covered.
- ⇒ When dividing by 10 or 100, e.g.  $8000 \div 10 = 800$ , ask: **What has happened to the numbers?** Say: **When we multiply by 10 the digits move one place to the left and the zero is put in to hold the place. When we divide by 10, the opposite happens, the digits move one place to the right and the zero is no longer needed.**
- ⇒ Ask: **What happens when we divide by 100?** Say: **When we multiply by 100, the digits move two places to the left and the zeros are put in to hold the place. When we divide by 100, the opposite happens, the digits move two places to the right and the zeros are no longer needed.**
- ⇒ When doubling multiples of 5, e.g.  $85 \times 2$ , ask: **How can we work out the answer to this?**
- ⇒ Say: **To work out the answer double the tens digit first, then double the units digit and add them together.**
- ⇒ When halving multiples of 10, e.g.  $150 \div 2$ , ask: **What is half of 150?**
- ⇒ Ask: **How do you know?** (Children should be able to explain an efficient strategy, i.e. I know that 70 add 70 equals 140 and 5 add 5 equals 10. Say: **To work out the answer halve the most significant digit first.**
- ⇒ When multiplying two-digit multiples of 10 by 2, 3, 4, 5, 10, e.g.  $30 \times 5$ , ask: **What is 3 times 5?** Write:  $3 \times 5 = 15$ . Say: **30 is 10 times larger than 3.** Ask: **What is 15 times 10?** Write:  $30 \times 5 = 150$ .
- ⇒ When multiplying two-digit numbers by 2, 3, 4, 5, e.g.  $27 \times 3$ , ask: **What is 20 times 3?** Write:  $20 \times 3 = 60$ . Ask: **What is 7 times 3?** Write:  $7 \times 3 = 21$ . Ask: **What is 60 add 21?** Write:  $60 + 21 = 81$ .

Pupil Book 3:  
Multiplication and  
division

43

**Pupil consolidation****Refresher**

Children find the incorrect calculations and re-write them correctly into their books.

**Practice**

Children choose the number of calculations as indicated in each set. They record their work in their exercise books.

Support CM:  
Multiplication and  
division mixed bag

55

**Support**

Children write the answer to each set of calculations.

Extension CM:  
Multiplication and  
division

55

**Extension**

Children write the answer to each set of calculations.



Game 39

**Games Pack 2**

Dotty dragon

**Plenary** (about 10 to 15 min)

- ➡ Write some examples from the Pupil Book page on the board. Ask individual children to work out the answer in their head. Ask children to explain verbally how they worked out the answer.
- ➡ Explain that in some situations they may still need to record their working to help them remember the process of working out the answer but they should be aiming towards working the answer out mentally.

**Software: Rapid Maths 4**

Goo Station

# Pencil and paper procedures ( $\times$ and $\div$ )/Checking results of calculations

**Objectives** ● To develop and refine written methods for  $TU \div U$ . ● To estimate and check by approximating (round to the nearest 10 or 100).

**Vocabulary** lots of; groups of; times; multiply; multiplied by; multiple; product; add; equals; two times; double; twice; divide; division; approximate; approximately; nearly; round to the nearest ten

**i** The standard written method of division is introduced at this stage. The layout is very similar to the informal written method introduced in Year 4 Spring Term. An emphasis is placed on the layout and importance of writing it correctly, i.e. where calculations are set out vertically, units under units, tens under tens.

**i** Once children can recognise multiples of 10 times the divisor it is much easier for them to approximate and work out the answer. If children find it difficult to recognise this, it may be easier to recognise doubles of the divisor.

$$78 \div 3 \quad 3 \overline{) 78}$$

$$\begin{array}{r} 78 \div 3 \quad 3 \overline{) 78} \\ - 60 \quad (20 \times 3) \\ \hline 18 \\ - 18 \quad (6 \times 3) \\ \hline 0 \end{array}$$

Answer = 26

**i** Draw children's attention to the layout and discuss the importance of writing it correctly.

**↓** Continue with examples where the multiples of 10 times the divisor can be made and easily recognised.

**↑** Include examples that incorporate 10 times the divisor, using the 6, 7, 8 or 9 times tables.

## Oral work and mental calculation (about 5 to 10 min)

Choose an activity from Strand 2 Topic 2.5 or 2.6

## Main teaching and pupil activities (about 30 to 40 min)

- ⇒ Write:  $48 \div 4$  on the board.
- ⇒ Ask: **Can anyone tell me what the answer could be close to?** Ask children to explain how they worked out the approximate answer.
- ⇒ Say: **It is easy to find the approximate answer by looking to see if you can make 10 groups of 4.**
- ⇒ Ask: **Can 10 groups of 4 be made from 48?** (yes) **What is  $10 \times 4$ ?** (40)
- ⇒ Revise division situations where it is possible to make 10 times the divisor; write examples on the board e.g.  $36 \div 3$ ;  $66 \div 6$ . Include some where it is not possible to make 10 groups, e.g.  $35 \div 5$ ;  $21 \div 3$ . Ask: **Can 10 groups of ... be made from...?**
- ⇒ Give examples where multiples of 10 times the divisor can be made and easily recognised, e.g.  $88 \div 4$ . Ask: **Can we make 10 groups of 4?** (yes) **How many is that?** (40) **Can we make another 10 groups of 4?** (yes) **How many is that altogether?** (80) **How many groups of 4 is that?** (20)
- ⇒ Give other examples where it is possible to make 20 or 30 times the divisor, e.g.  $48 \div 2$ ;  $96 \div 3$ . Include examples that are less obvious, e.g.  $54 \div 2$ ;  $78 \div 3$ . Ask: **Can 10/20/30 groups of ... be made from ...?**
- ⇒ Write one of the previous easier examples on the board, e.g.  $78 \div 3$ . Say: **Another way of writing 78 divided by 3 is used when we record working using a standard written method.**
- ⇒ Ask: **What is the approximate answer?** (20) Write the calculation used to approximate, e.g.  $60 \div 3 = 20$ .
- ⇒ Say: **When we calculate our answer we must check that the answer is somewhere close to our approximate answer.**
- ⇒ Say: **We can record how we worked out the answer like this.**
- ⇒ Show working out on board asking questions such as: **Is it possible to make 10/20 groups of 3?** (yes,  $3 \times 20 = 60$ ) **How many are left?** (18) **How many times does 3 go into 18?** (6) **How many groups of 3 is that?** Ask: **Look at our approximation of 20. Is the answer to  $78 \div 3$  close to 20?** (yes)
- ⇒ Repeat with other examples using 2, 3, 4, 5 up to 99, approximating first.
- ⇒ Invite individual children to record their working on the board.

Pupil Book 3:  
Recording division

44

### **Pupil consolidation**

#### *Refresher*

Children approximate the answer to each division calculation showing which calculation they used to work out the approximate answer.

#### *Practice*

Children find out how many rows of seats are on each plane by dividing the total number of seats by the number of seats in each row. They approximate the answer first and use the standard method of division to record their working.

Support CM:  
Recording division

56

### **Support**

- 1 Children work out the answers to the division facts in their head and write the answers in the boxes.
- 2 Children approximate the answer to each calculation and then use the standard method of division to record their working.

Extension CM:  
Recording division

56

### **Extension**

Children select a starting number from the labels and a divisor from the numbers on the dice. They record two calculations for each set, approximating the answer first.

### **Plenary** (about 10 to 15 min)

- Go through some of the division calculations the children worked on. Approximate the answer first and invite children to explain the working using the standard written method used in the lesson.
- Highlight any problems that may have arisen during the consolidation tasks.



### **Software: Rapid Maths 4**

Base Camp 4

# Problems involving numbers in “real life” and money/Making decisions

**Objectives**

- To use  $\times$  and  $\div$  to solve word problems involving numbers in “real life” and money, using one or more steps.
- To choose and use appropriate number operations and appropriate ways of calculating (mental, mental with jottings, pencil and paper) to solve problems.

**Vocabulary** lots of; groups of; times; multiply; multiplied by; add; divide; divided by; share; share equally; group; double; half; halve; equals; inverse; times table; product; money; pounds; price; cost; buy; pay; change; how much more /less; total; amount; calculate; operation; answer; reasonable; solve; method; how did you work it out...?

**i** It is important to teach children an approach to solving word problems. This four-step model is used in lessons where word problems are presented: 1) read the problem and identify any important information; 2) identify the calculation needed; 3) find the answer to the calculation; 4) find the answer to the problem. At this level children should be expected not only to give a context answer but also to answer the question in a complete sentence.

Encourage children to detail any strategy used, e.g.  $6 \times 10 = 60$  so  $6 \times 9$  is 6 less than 60, which is 54.

**↓** Continue this process with other one-step problems.

**Postage stamps are arranged in rows of 6. Mr Wright buys 6 rows of stamps. Each stamp costs 4p. How much does he spend?**

$$\begin{aligned} 6 \times 6 &= 36 \\ 36 \times 4 &= (30 \times 4) + (6 \times 4) \\ &= 120 + 24 \\ &= 144 \end{aligned}$$

**↑** Include examples of division involving 6, 7, 8 and 9 times tables to make use of paper and pencil methods.

## Oral work and mental calculation (about 5 to 10 min)

Choose an activity from Strand 3 Topic 3.3, 3.4, Strand 1 or Strand 2.

## Main teaching and pupil activities (about 30 to 40 min)

**Resources** About 5 prepared stories that suggest: a) multiplying by 6, 7, 8 and 9; b) multiplying two-digit numbers by 2, 3, 4 or 5; c) division facts corresponding to the 2, 3, 4, 5 and 10 times tables; d) division of two-digit numbers by a single-digit number; written on the board/chart prior to lesson. (Topics should reflect the interests of children in your class.)

⇒ Read one problem from the board/chart to the class, e.g. **Postage stamps are arranged in rows of 6. There are 9 rows of stamps per page. How many stamps altogether on a page?**

⇒ Discuss the problem with the children. Tell them to picture it in their mind.

⇒ Ask questions such as: **What information is important to working out the answer? Which maths operation do we need to use to find the answer? Which calculation is required? What is the answer? How did you work it out? What is the answer to the problem?**

⇒ Say: **These problems are easy because you can work them out in your head. Let's look at another problem and see how to work it out.**

⇒ Read out another problem.

⇒ Follow the same process as outlined above but ask the children to use jottings to help them work out the answer.

⇒ Draw a line down one side of the board. Demonstrate how to use this space to make jottings.

⇒ Ask: **What is the answer to the problem?** Say: **If you are confident at working this type of calculation out in your head, you will not need to use jottings.**

⇒ Read out another problem, e.g. **On Tuesday the Post Office sold £72 worth of £4 stamps for parcels. How many stamps were sold?**

⇒ Follow the same process as outlined above but indicate that in this situation you would like the children to use the paper and pencil method of working out the answer. Demonstrate how you would like children to record their working, i.e.

$$\begin{array}{r} 4 \overline{) 72} \\ \underline{-40} \phantom{0} \\ 32 \\ \underline{-32} \\ 0 \end{array} \begin{array}{l} (10 \times 4) \\ (8 \times 4) \end{array}$$

Answer = 18

⇒ Ask: **What is the answer to the problem?**

⇒ Repeat with other word problems.

Pupil Book 3:  
Problems on safari

45

### **Pupil consolidation**

#### **Refresher**

The question for each of the problems is missing. Children read the problem and make up their own question relevant to the information. They write these in their exercise books.

#### **Practice**

Children read the story problems and decide on the most appropriate method of calculating and recording the answers.

#### **Extension**



Write some multiplication and division calculations on the board, e.g.  $26 \times 6 =$  ,  $85 \div 5 =$  ,  $68 \div 4 =$  ... Children make up their own number stories related to the theme “On Safari” to match each number sentence. They write these in their exercise books or on paper. Children can swap their work with a partner and answer each other’s questions. They then swap back to check their partner’s work.

#### **Plenary** (about 10 to 15 min)

- Read through some of the problems the children have worked on independently.
- Ask children to identify the important words or information from each, and which operation(s) were needed to carry out the calculations. Write the calculation required on the board and the answer.
- Ask children to explain their method of working out the answer and the mental strategies used.
- Remind children of the layout and the importance of writing it correctly, i.e. where calculations are set out vertically, units should line up under units, tens under tens.
- Emphasise the re-reading of the problem to make sure the answer corresponds to the question asked.



# Fractions and decimals

**Objectives** ● To begin to use ideas of simple proportion: for example, 'one for every ...'

**Vocabulary** one, two ... hundred; multiply; divide; division; one in every; one for every; proportion; calculate; table; continue; pattern

## Oral work and mental calculation (about 5 to 10 min)

Choose an activity from Strand 1 Topic 1.3.

## Main teaching and pupil activities (about 30 to 40 min)

**Resources** red and blue interlocking cubes; two opaque containers; five identical packets of food, e.g. crisps

- ➡ Arrange the children so they can see the board. Place the containers side by side.
- ➡ Place two blue cubes in one container, one red cube in the other container as you say: **For every two blue cubes, there is one red cube.**
- ➡ Put in two more blue cubes and ask: **How many red cubes do I need to put in?** (one) Put in a red cube. Put in three lots of two blue cubes and ask: **How many red cubes do I need to put in?** (three) Put in three red cubes. Say: **The number of blue cubes is connected to the number of red cubes. One red cube for every two blue cubes. The number of blue cubes is in proportion to the number of red cubes.**
- ➡ Put in two red cubes and ask: **How many blue cubes do I need to put in?** (four) Put in four blue cubes. Repeat, putting in five red cubes.
- ➡ Ask: **If I put in twelve blue cubes, how many red cubes should I put in?** (six) **How do you know?** (there are six lots of two cubes in twelve cubes, i.e.  $12 \div 2 = 6$ ) Repeat for larger numbers of blue cubes.
- ➡ Empty the container and count the blue cubes. (14) Ask: **How many red cubes are there?** (seven) Check by counting them.
- ➡ Make a quick table on the board. Enter various numbers of red or blue cubes and ask for the corresponding number of blue or red cubes.

blue	red
2	1
4	2
	3
10	9

**i** Two dots : stands for 'to'. So 5 : 1 means '5 to 1' or '5 parts to every 1 part'.

Bought packets	4		16	20		40
Free packets		2			7	8

Number	Cost (£)
3	1
6	2
	3
12	6

- ➡ Repeat, using the ratio blue:red = 5:1.
- ➡ Draw a strip of squares on the board. Colour the fourth square red. Say: **I want one red square for every three white squares. Who can colour the next red square?** Children continue the pattern. Ask: **If a long strip has 30 white squares, how many red squares would it have?** (10) **How do you know?** ( $30 \div 3 = 10$ ) **If it has 7 red squares, how many white squares would it have?** (21) **How do you know?** ( $3 \times 7 = 21$ )
- ➡ Show the class four packets. Say: **If you buy four packets, you get one free.** Place a fifth packet to one side. Ask: **If you buy eight packets, how many free packets will you get?** (two) **How many packets do you need to buy to get five free packets?** (20) Make a quick table as before and add more entries.
- ➡ Say: **Three packets cost £1. How much do six packets cost?** (£2) ... **18 packets cost?** (£6) **How many packets could you buy for £10?** (30) Make a quick table as before.

Pupil Book 3:  
Assorted biscuit problems

46

**Pupil consolidation****Refresher**

- 1 Children calculate the numbers of cherries on biscuits (three cherries per biscuit).
- 2 They copy and complete a table.

**Practice**

**Resources** squared paper

- 1 Children copy and complete a table for the ratio Packets : Free Gifts = 5:1.
- 2 They copy and complete a table for the ratio Packets bought : Free packs = 2:1.
- 3 They copy and complete a table for the cakes bought: Free cakes = 4:1.
- 4 Children calculate the number of biscuit men that can be made using straight and round shapes. (5:1)

**Extension**

Write up ratios involving more complex numbers. Write a table for each ratio for children to complete.

**8 biscuits cost £1**

Number	Cost (£)
8	2
32	7
63	
80	

Repeat for

6 biscuits cost £1

4 biscuits cost 50p

**Plenary** (about 10 to 15 min)

- ⇒ Ask: **How many days do you come to school each week?** (5) **How many in two weeks?** (10) **... in three weeks?** (15) **How many weeks does it take to spend 45 days at school?** (9) Make a quick table and add other entries. Say: **The number of days you come to school is connected to the number of weeks. Five days at school for every week. The number of days at school is in proportion to the number of weeks.**
- ⇒ Repeat for weekends.
- ⇒ Draw seven small circles in a row. Colour the last one red. Say: **There is one red circle for every six white circles. Who can continue the pattern?** Invite children to draw the next 12 circles. Ask: **If we continue the pattern so there are eight red circles, how many white circles will there be?** (48) **How do you know?** ( $8 \times 6 = 48$ ). **If there were 30 white circles, how many red circles would there be?** (5) **How do you know?** ( $30 \div 6 = 5$ )

# Fractions and decimals

**Objectives** ● To begin to use ideas of simple proportion: for example, 'one in every ...'

**Vocabulary** one, two ... hundred; multiply; divide; division; one in every; calculate; table; continue; pattern; sentence; fraction; proportional to

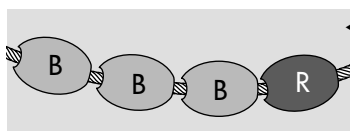
## Oral work and mental calculation (about 5 to 10 min)

Choose an activity from Strand 1 Topic 1.3.

## Main teaching and pupil activities (about 30 to 40 min)

**Resources** red and blue sweets or counters; two white paper bags (approx. A4); labelled bags of sweets/counters; red and blue beads and string for threading

- ➞ Show one red and two blue sweets. Say: **There are three sweets. One is red. One out of three sweets is red.** Hold up a paper bag and say: **Let's fill this bag with sweets so that one in every three is red.** Write on the bag: **1 out of three sweets is red.** Put the three sweets in the bag.
- ➞ Say: **Clara, put three more sweets in the bag. One out of three must be red.** Ask: **How many sweets are in the bag now?** (six) **How many are red?** (two) **One out of three means there will be two out of six.**
- ➞ Write on the board: **1 out of 3 is red, 2 out of 6 are red**
- ➞ Ask another child to put three more sweets in the bag. Write: **3 out of 9 are red.**
- ➞ Hold up one red and two blue sweets and say: **One out of three sweets is red. What fraction is red?** ( $\frac{1}{3}$ ) **One out of three means one third.** Put the sweets in the bag. Ask: **How many sweets are in the bag now?** (12) **What fraction are red?** ( $\frac{1}{3}$ ) **How many are red?** (4) **How do you know?** ( $\frac{1}{3}$  of 12 = 4;  $12 \div 3 = 4$ ) Write: **4 out of 12 are red.** Put in three more sweets and repeat.
- ➞ Say: **One out of three sweets is red. The number of red sweets is proportional to the total number of sweets in the bag.**
- ➞ Ask: **If there were 21 sweets in the bag, how many would be red?** (7) Write: **7 out of 21 are red.** Repeat for 27 sweets.
- ➞ Ask: **If there were 10 red sweets in the bag, how many sweets would there be in the bag altogether?** (30) **How do you know?** ( $3 \times 10 = 30$ ) Write: **10 out of 30 are red.**
- ➞ Write: **1 out of 5 sweets is red** on another paper bag. Invite children to fill the bag, five sweets at a time. Repeat the above activities.
- ➞ Show the class a bag of sweets labelled: **1 out of 4 sweets is red.** Ask: **If this bag contains 12 sweets, how many are red?** (3) **If this bag contains 5 red sweets, how many sweets does it contain altogether?** (25) Write corresponding statements on the board. Repeat using other bags.
- ➞ Thread three blue beads and one red bead onto a string. Say: **One out of four beads is red. Who can put the next four beads on the necklace so that one of four is red?** Children extend the necklace to 12 beads. Ask: **If a necklace has 24 beads, how many will be red?** (6) **If it has nine red beads, how many beads does it have altogether?** (36)
- ➞ Clean the board, ready for the Plenary.



Pupil Book 3:  
Broken parts

47

**Pupil consolidation****Refresher**

- 1 For each picture, children complete statements such as '1 out of ? eggs are cracked'.
- 2 Children continue patterns of eggs (e.g. 1 out of 5 cracked).  
They complete statements such as '1 out of ? eggs are cracked'.

**Practice**

Children copy and complete a series of statements such as '2 in ? plates are broken' and '? in 12 plates are broken'.

Extension CM:  
Heads up

57

**Extension****Resources** coins

Children can use coins as an aid.

- 1 For each picture, children complete a pair of statements such as '1 in 4 coins are heads' and '1 head for every 3 tails'.
- 2-3 Children are given one statement and write the corresponding statement (see question 1).
- 4 Children draw coin patterns for questions 2 and 3.

**Plenary** (about 10 to 15 min)**Resources** blue and yellow interlocking cubes; white paper bags

- ➡ Join one blue and three yellow cubes together. Ask: **What fraction of the cubes are blue?** ( $\frac{1}{4}$ ) **How else can you describe the number of blue cubes?** (one out of four) Write: **1 out of 4 are blue** on the board. Write the same on a paper bag and put in the four cubes. Invite a child to put in the next four cubes. Ask: **Who can write the next sentence on the board?**

⬆ **If we add two more blue cubes, how many yellow cubes do we need to add?** (six)

- ➡ Invite a child to add eight cubes to the bag. Write another statement on the board. Ask: **If the bag contained 16 cubes, how many would be blue?** (4) **If the bag contained 8 blue cubes, how many cubes would it contain altogether?** (32) Repeat for other numbers.
- ➡ Say: **The number of blue cubes is connected to the number of cubes in the bag. One out of four cubes is blue. The number of blue cubes is proportional to the number of cubes in the bag.**
- ➡ Repeat for other fractions, e.g. one out of six are blue.

Homework CM:  
Office parts

57

**Homework** (about 20 min)**Refresher**

For each picture, children complete statements such as '1 out of ?' pins are bent.

**Practice**

Children complete statements such as '? in 2 has a stamp'.

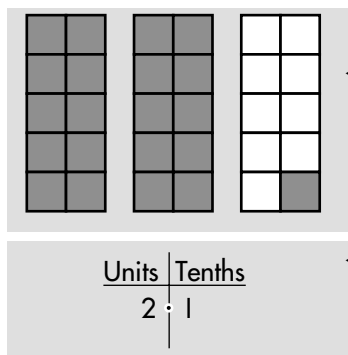
# Fractions and decimals

**Objectives** ● To recognise the equivalence between the decimal and fraction forms of one half and one quarter, and tenths such as 0.3.

**Vocabulary** one, two ... hundred; half; tenth; multiply; divide; division; calculate; fraction; decimal; decimal point; column; order; smallest; largest; centimetre; metre

## Oral work and mental calculation (about 5 to 10 min)

Choose an activity from Strand 1 Topic 1.3.



## Main teaching and pupil activities (about 30 to 40 min)

**Resources** three grids (2 columns, 5 rows); Blu-tack

➡ Draw units and tenths decimal columns. Show the class the filled grid and say: **Let's pretend this is a bar of chocolate.** Produce the second grid and say: **There are two whole bars of chocolate.** Blu-tack the grids to the board and write 2 in the units column.

➡ Blu-tack the empty grid to the board. Colour a square and ask: **What fraction of a chocolate bar is this?** ( $\frac{1}{10}$ ) Write 1 in the tenths column. Ask: **What do we have to put between the units and tenths?** (decimal point) Write the decimal point. Ask: **How do you say this?** (two point one)

➡ Remove one of the filled grids and ask: **How many chocolate bars are there now?** ( $1.1$  or  $1\frac{1}{10}$ ) Replace 2 with 1 in the units column. Remove the other filled grid and ask: **How many chocolate bars are there now?** ( $0.1$  or  $\frac{1}{10}$ ) Replace 1 with 0 in the units column. Write: **0.1 =  $\frac{1}{10}$ .** Point to the decimal and ask: **What kind of number is this?** (decimal fraction)

➡ Colour another square. Write: **0.2 =  $\frac{2}{10}$ .** Repeat for 0.4.

➡ Colour a fifth square and ask: **How many tenths are there?** ( $\frac{5}{10}$ ) **What other fraction is the same as this?** ( $\frac{1}{2}$ ) **What is the decimal fraction?** (0.5) Write: **0.5 =  $\frac{5}{10}$  =  $\frac{1}{2}$ .** Say: **0.5 means  $\frac{5}{10}$  or  $\frac{1}{2}$ .** Continue filling squares and recording the fractions and decimal fractions.

➡ Write decimals greater than 1 and convert them to mixed fractions, e.g. **2.3 =  $2\frac{3}{10}$ .**

**i** Repeatedly emphasise the need to show the number of pence using two decimal places.

➡ Write 10p on the board. Ask: **What fraction of a pound is this?** ( $\frac{1}{10}$ ) **One tenth of a pound is 10p.** Write: **10p =  $\frac{1}{10}$  of £1.** Ask: **How do we write 10p using pounds and pence?** Write: **10p =  $\frac{1}{10}$  of £1 = £0.10** and say: **We always show the number of pence.** Cover the 0 and say: **0.1 means one tenth. One tenth of a pound is 10p.** Uncover the 0.

➡ Write:  **$\frac{3}{10}$  of £1** on the board and ask: **How can we write  $\frac{3}{10}$  of a pound as a decimal?** (£0.30) **How much is this in pence?** (30p) Write: **30p =  $\frac{3}{10}$  of £1 = £0.30.** Repeat for other multiples of 10p.

➡ Write: **230p** on the board and ask: **How many whole pounds in 230p?** (£2) **How many pence left over?** (30p) Write: **230p = £2.30.** Repeat for other amounts, including 207p = £2.07.

**i** Explain that 0.1 m is not written 0.10 m (to show 10 cm). Emphasise that this is only done for money.

➡ Write: **0.1 m** on the board. Ask: **What fraction of a metre is this?** ( $\frac{1}{10}$ ) **How many centimetres in  $\frac{1}{10}$  of a metre?** (10 cm) Write:  **$\frac{1}{10}$  m = 0.1 m = 10 cm.** Repeat for other lengths, e.g. **3.6 m =  $3\frac{6}{10}$  m = 360 cm.**

Pupil Book 3:  
Fractions and decimals

48

**Pupil consolidation****Refresher**

- 1 Children convert between fractions and decimals, e.g.  $\frac{3}{10} = ?$  and  $? = 0.5$ .
- 2 Children convert between fractions and decimals, e.g.  $2\frac{3}{10} = ?$  and  $? = 4.5$ .

**Practice**

- 1 Children convert fractions of £1 to pounds and pence notation.
- 2 Children convert between pounds and pence.
- 3–4 Children convert between centimetres and metres.


Support CM:  
Familiar fractions  
and decimals

57

**Support**

- 1 Children colour a decimal fraction of a grid and write the fraction coloured.
- 2 They join decimal fractions to equivalent fractions.
- 3 They complete a table of fractions and decimal fractions.
- 4 They complete a decimal number line from 0 to 2.

**Extension**

-  Children order amounts or lengths written on the board, e.g. £3.04, 434p, £4.03, £4.30, 343p; 0.7 m, 7 cm, 0.17 m, 71 cm, 0.09 m.



Game 28

**Games Pack 2**

The mad professor

**Plenary** (about 10 to 15 min)

(2.3)

What is  $2\frac{3}{10}$   
as a decimal?

- ➡ Ask: **What is  $\frac{7}{10}$  as a decimal fraction?** (0.7) **What is 0.5 as a fraction?** ( $\frac{1}{2}$  or  $\frac{5}{10}$ )
- ➡ Write: **378p** on the board and ask: **Who can write this using pounds and pence?** (£3.78) **Three pounds and 78 pence.**
- ➡ Write: **370p** and ask: **Who can write this using pounds and pence?** (£3.70) **Three pounds and 70 pence.** Rub out the 0 and ask: **Can we leave off the zero?** (no) Replace the 0 and say: **We always show the total number of pence.**
- ➡ Write: **546 cm** and ask: **How many metres and centimetres is this?** (5m 46 cm) **Who can write this length using decimals?** (5.46 m)
- ➡ Write: **540 cm = 5.40 m** as you ask: **Do we write 540 cm as 5.40 m using decimals?** (no) **We only write a zero for money** (to show 40 pence, not 40 centimetres). Rub out the zero.
- ➡ Write:  **$\frac{4}{10}$  of £1** on the board and ask: **What is this amount in pence?** (40p) **Who can write this using pounds and pence?** (£0.40)
- ➡ Write:  **$\frac{1}{2}$  of £1** on the board and ask: **How much is this?** (50p) **Who can write this amount in pounds and pence?** (£0.50)

# Fractions and decimals

**Objectives** ● To recognise the equivalence between the decimal and fraction forms of one half and one quarter, and tenths such as 0.3.

**Vocabulary** one, two ... hundred; half; quarter; three quarters; tenth; multiply; divide; division; calculate; fraction; decimal; order; smallest; largest; centimetre; metre; convert; machine

## Oral work and mental calculation (about 5 to 10 min)

Choose an activity from Strand 1 Topic 1.3.

## Main teaching and pupil activities (about 30 to 40 min)

Ask: **Who can write  $3\frac{1}{2}$  pounds on the board in pounds and pence?** (£3.50) ...  **$9\frac{3}{4}$  pounds?** (£9.75) ...  **$12\frac{1}{4}$  pounds?** (£12.25) Write various mixed fractions for children to write as decimals, e.g.  $4\frac{1}{2}$ ,  $5\frac{1}{4}$ .

Remind the class that 0.50 is only used for money.

Write:  $\frac{1}{2} =$  on the board and ask: **What decimal fraction is the same as a half?** (0.5) Invite a child to write  $\frac{1}{2} = 0.5$ . Ask: **How many pence in half a pound?** (50p) Write:  $\frac{1}{2}$  of £1 = on the board and ask: **Who can write half a pound using pounds and pence?** ( $\frac{1}{2}$  of £1 = £0.50.) Ask: **How many pence in a quarter of a pound?** (25p) Write:  $\frac{1}{4}$  of £1 = on the board and ask: **Who can write this using pounds and pence?** ( $\frac{1}{4}$  of £1 = £0.25.) Say: **A quarter is the same as the decimal fraction 0.25.** Write:  $\frac{1}{4} = 0.25$ .

Write:  $\frac{3}{4}$  of £1 = . Say: **There are 25 pence in one quarter of a pound. How many pence in three quarters of a pound?** (75p) **How do we write 75p using pounds and pence?** Write:  $\frac{3}{4}$  of £1 = £0.75. Say:  $\frac{3}{4}$  is the same as the decimal 0.75. Write:  $\frac{3}{4} = 0.75$  on the right of the board.

Ask: **How many centimetres in half a metre?** (50 cm) Write:  $\frac{1}{2}m =$  on the board. Ask: **Who can write this as a decimal?** ( $\frac{1}{2}m = 0.5m$ .) Repeat for  $\frac{1}{4}m = 0.25m$  and  $\frac{3}{4}m = 0.75m$ . Write various mixed fraction lengths for children to write using decimals, e.g.  $2\frac{1}{4}m$ ,  $10\frac{3}{4}m$ ,  $25\frac{1}{4}m$ .

Write: **0.25 hours =** and ask: **What fraction of an hour is 0.25?** ( $\frac{1}{4}$ ) **How many minutes in  $\frac{1}{4}$  of an hour?** (15) Write: **0.25 hours =  $\frac{1}{4}$  hour = 15 minutes.** Repeat for 0.5 hour and 0.75 hour.

Ask: **What is  $\frac{1}{10}$  as a decimal fraction?** (0.1) Write:  $\frac{1}{10} = 0.1$ . **What is 0.3 as a fraction?** ( $\frac{3}{10}$ ). Write: **0.1 m =** on the board and ask: **What is this length in centimetres?** (10cm) Write: **0.1 m = 10cm.** Repeat for other decimal fractions. Write: **80p =** and ask: **Who can write this in pounds and pence?** (£0.80) **Remember to show the total number of pence.**

Write: **0.1 hour =** on the board and ask: **What fraction of an hour is this?** ( $\frac{1}{10}$ ) **What is  $\frac{1}{10}$  of an hour?** (6 minutes) Write: **0.1 hour =  $\frac{1}{10}$  hour = 6 minutes.** Repeat for other fractions of an hour.

**i** Emphasise that amounts can only be compared if they have the same units.

Write: **0.3 m,  $\frac{1}{2}m$ , 40cm, 0.25m** on the board. Say: **We are going to put these lengths in order, smallest to largest. Do all the lengths have the same units?** (no) **We must change them to the same units before we can compare them. Let's change them to centimetres. How many centimetres in 0.3m?** Ask: **Which is the smallest length?** (25cm) Repeat for the next smallest and so on.

**↑** Repeat for numbers greater than 1, e.g. 6.3m, 36cm, 0.63m, 6.03 m.

Repeat for other sets of lengths/amounts of money/time.

Pupil Book 3:  
Machine maths

49

**Pupil consolidation****Refresher**

- 1 Children copy and complete a table of decimal fraction equivalents.
- 2 Children write mixed fractions as decimals, e.g.  $3\frac{6}{10} = 3.6$ .
- 3 Children convert fractions of an hour to minutes.

**Practice**

- 1 Children convert fractions of £1 of money to pounds and pence notation, e.g.  $\frac{4}{10}$  of £1 = £0.40.
- 2 Children write amounts in pence as fractions of £1.
- 3 Children convert decimal and fractional lengths to centimetres.
- 4 Children convert decimal amounts of hours to minutes.
- 5 Children order amounts or lengths from smallest to largest, e.g.  $\frac{7}{10}$  of £1, £0.75, 60p. £0.8,  $\frac{1}{2}$  of £1. Remind them to convert amounts and lengths to pence, centimetres or minutes, as necessary.

**Extension**

- 1 Write a set of times for children to convert to minutes, e.g. 2.3 hours, 4.25 hours.
- 2 Write a set of decimal fractions of a kilogram for children to convert to grams, e.g. 0.1 kg, 0.5 kg, 0.25 kg, 2.4 kg. Ask: **How many grams in a kilogram?** (1000g) **What fraction of a kilogram is 0.1 kg?** ( $\frac{1}{10}$ ) **What is  $\frac{1}{10}$  kg in grams?** (100g)
- 3 Write sets of weights and times for children to order, smallest to largest, e.g.  $2\frac{3}{4}$  hours, 140 minutes, 2.4 hours; 1.5 kg, 1300g,  $1\frac{1}{4}$  kg.

**Plenary** (about 10 to 15 min)What is  $1\frac{3}{4}$  as  
a decimal?  
(1.75)

- Ask: **What is  $\frac{3}{4}$  as a decimal fraction?** (0.75) **What is 0.25 as a fraction?** ( $\frac{1}{4}$ )
- Write: **75p** = on the board and ask: **What fraction of £1 is 75p?** ( $\frac{3}{4}$ ) **Who can write 75p using pounds and pence?** Invite a child to write **75p = £0.75**. Repeat for other amounts and lengths, e.g. 80p, 230p, 40 cm, 25 cm, 490 cm.
- Write: **30 minutes** = on the board and ask: **What fraction of an hour is 30 minutes?** ( $\frac{1}{2}$ ) **Who can write this as a decimal?** Invite a child to write **30 minutes = 0.5 hour**. Repeat for 15 minutes, 6 minutes and 45 minutes.
- Write some amounts/lengths/times on the board, e.g. 2.3 m, 240cm,  $2\frac{1}{4}$  m, 2.43 m. Ask: **How can we put these in order, smallest to largest?** (change them to centimetres first) **What is 2.3 m in centimetres? Which is the smallest length?** (225 cm) **Which is the next smallest?** (230 cm) and so on.
- Repeat for other lengths/amounts/times.

90 minutes,  
75 minutesHomework CM:  
Decimal and  
fraction machines

58

**Homework** (about 20 min)**Refresher**

Children convert decimals to fractions and vice versa. They then change times to minutes.

**Practice**

Children write fractions of £1 using pounds and pence. They change lengths in metres to centimetres. They then change times to minutes.



# Fractions and decimals

**Objectives** ● To begin to use ideas of simple proportion: for example, 'one for every ...' ● To recognise the equivalence between the decimal and fraction forms of one half and one quarter, and tenths such as 0.3.

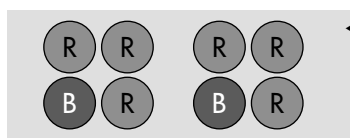
**Vocabulary** one, two ... hundred; half; quarter; three quarters; tenth; multiply; divide; division; calculate; fraction; one in every ...; one for every ...; decimal; decimal fraction

## Oral work and mental calculation (about 5 to 10 min)

Choose an activity from Strand 1 Topic 1.3.

## Main teaching and pupil activities (about 30 to 40 min)

**Resources** red and blue counters (use OHP coloured counters, if available)

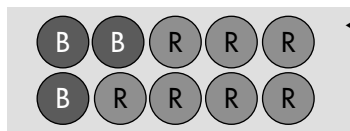


⇒ Arrange the children around a table (or use OHP if available).

⇒ Place one blue and three red counters in a square. Say: **One out of four counters is blue. What fraction is this?** ( $\frac{1}{4}$ ) Write: **1 out of 4 =  $\frac{1}{4}$  = .**  
Ask: **How do we write  $\frac{1}{4}$  as a decimal?** (0.25) Write: **1 out of 4 =  $\frac{1}{4}$  = 0.25.**

⇒ Add an identical square of counters. Say: **Two out of eight counters are blue. What fraction is this?** ( $\frac{1}{4}$ ) **One in every four counters is blue.** Add another square and repeat.

⇒ Repeat for  $\frac{1}{2}$  blue (1 out of 2 =  $\frac{1}{2}$  = 0.5) and  $\frac{3}{4}$  blue (3 out of 4 =  $\frac{3}{4}$  = 0.75).

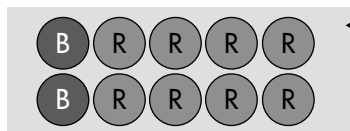


⇒ Make a grid using 3 blue and 7 red counters. Repeat the above, i.e. 3 out of 10 =  $\frac{3}{10}$  = 0.3. Repeat for  $\frac{8}{10}$  blue and  $\frac{5}{10}$  blue (5 out of 10 =  $\frac{5}{10}$  = 0.5 same as  $\frac{1}{2}$  blue).

⇒ Ask: **Who can make a pattern using 12 counters so that one out of four is blue?** Invite a child to do so. Ask: **What fraction is blue?** ( $\frac{1}{4}$ ) **What decimal fraction is blue?** (0.25) **What fraction is red?** ( $\frac{3}{4}$ ) **What decimal fraction is red?** (0.75)

⇒ Ask: **Who can make a pattern using 16 counters so that 0.5 are blue?** **What fraction is blue?** ( $\frac{1}{2}$ ) **What decimal fraction is red?** (0.5)

⇒ Ask: **Who can make a pattern where 0.6 of the counters are blue? What fraction is blue?** ( $\frac{6}{10}$ ) **What decimal fraction is red?** (0.4) Repeat for 0.2 and 0.9.



⇒ Make a grid using two blue and eight red counters. Ask: **What fraction is blue?** ( $\frac{2}{10}$ ) **What other fraction is the same?** ( $\frac{1}{5}$ ) **What decimal fraction is blue?** (0.2) Write:  $\frac{1}{5} = \frac{2}{10} = 0.2$ . Repeat for  $\frac{4}{10}$ ,  $\frac{8}{10}$  and  $\frac{6}{10}$ .

Pupil Book 3:  
Counter fractions and  
decimals

50

**Pupil consolidation****Refresher**

Children write three statements for each counter pattern, e.g. 1 out of 4 are red;  $\frac{1}{4}$  are red; 0.25 are red.

**Practice**

**Resources** bag of red and blue counters, in roughly equal proportions



- 1 Children take turns to withdraw 10 counters from the bag. The other child records the proportion in three ways (see Refresher).
- 2 They repeat question 1 by withdrawing four counters. Note: All four counters may be blue (giving  $\frac{4}{4} = 1$ ) or red (giving  $\frac{0}{4} = 0$ ).
- 3 They repeat question 1 by withdrawing five counters.

Support CM:  
Pearl decimal fractions

58

**Support**

- 1 Children describe the proportion of oysters with pearls, e.g. 1 in every 5.
- 2 They write the fraction of black pearls, e.g.  $\frac{3}{10}$ .
- 3 They join each necklace to the decimal fraction and fraction that describes the number of black pearls.

Extension CM:  
Rugby decimals

58

**Extension**

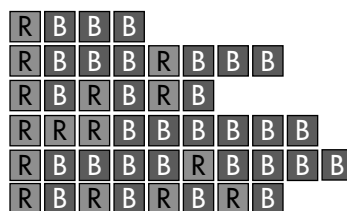
**Resources** red and blue counters as an aid to question 3, if necessary

- 1 Children colour a row of rugby balls for a given proportion, e.g. 1 black for every 3 white.
- 2 They describe each pattern three different ways, e.g. 1 in every 4 are black;  $\frac{1}{4}$  are black; 0.25 are black.
- 3 They write three equivalent statements for each given statement.

**Plenary** (about 10 to 15 min)

**Resources** large red and blue building blocks

- Arrange the children so they can see the board. Place four blocks in a row. Ask: **What fraction is red?** ( $\frac{1}{4}$ ) **What is  $\frac{1}{4}$  as a decimal fraction?** (0.25) **How else can you describe the red cubes?** (1 out of 4 are red; 1 red for every 3 blue) Add four more cubes to repeat the pattern. Repeat the questions.



- Place six blocks in a row. Ask: **What decimal fraction are red?** (0.5) **What fraction are red?** ( $\frac{1}{2}$ ) **How else can you describe the red blocks?** (1 in every 2 are red; 3 out of 6 are red; 1 red for every 1 blue; equal numbers of red and blue)
- Repeat for other rows of blocks.

# Understanding addition and subtraction/Rapid recall of addition and subtraction facts/Mental calculation strategies (+ and -)/Checking results of calculations

**Objectives** ● To derive quickly all number pairs that total 100. ● To consolidate understanding of relationships between addition and subtraction. ● To understand the principle (not the name) of the associative law as it applies of not to addition and subtraction. ● To use known number facts and place value to add or subtract mentally, including any pair of two-digit whole numbers. ● To check the sum of several numbers by adding in reverse order.

**Vocabulary** add; addition; more; plus; sum; total; and; altogether; equals; makes; is the same as; sign; take away; subtract; minus; fewer; less; difference; left; leaves; equals; partitioned

## Oral work and mental calculation (about 5 to 10 min)

Choose an activity from Strand 2 Topic 2.1, 2.2 or 2.3.

## Main teaching and pupil activities (about 30 to 40 min)

⇒ Ask: **What do I need to add to 42 to equal 100?** Invite a child to answer and explain how they worked it out. Say: **You need to work out quickly pairs of numbers that equal 100.** Ask: **What goes with 67 to equal 100? With 51? With 86?**

↓ This calculation involves crossing the tens and the hundreds boundaries. If children are not confident start by adding two two-digit numbers that do not cross these boundaries e.g.  $37 + 52$ ,  $71 + 28$ .

⇒ Write:  $68 + 74 =$  on the board.  
 ⇒ Invite the class to work out the answer. Choose a child to say the answer and explain the method they used.  
 ⇒ Ask: **Did anyone work it out in a different way?** Discuss efficient methods.  
 ⇒ Say: **Now we know 68 plus 74 is 142, what subtraction calculation would reverse this addition?** ( $142 - 68 = 74$  and/or  $142 - 74 = 68$ )  
 ⇒ Say: **Addition and subtraction go together. They are opposite operations. Addition reverses subtraction and subtraction reverses addition.**

↓ This calculation involves crossing the tens boundary. Start with calculations that do not cross this boundary if children are unsure.

⇒ Write:  $94 - 57$  on the board. Invite the class to work out the answer. Choose a child to say the answer and explain the method they used.  
 ⇒ Ask: **Did anyone work it out in a different way?** Discuss efficient methods.  
 ⇒ Say: **Now we know 94 minus 57 is 37, what addition calculation would reverse this subtraction?** ( $57 + 37 = 94$  and/or  $37 + 57 = 94$ )  
 ⇒ Repeat for  $93 + 48$ .

$$57 + 37 = 94$$

odd + odd = even

⇒ Say: **Look at the numbers that we have added and subtracted are they odd or even?**  
 ⇒ Discuss the outcomes of adding and subtracting different combinations of odd and even numbers. Say: **If you know the answer to a calculation should be odd or even you can use this to check the answer you get.**

⇒ Write:  $31 + 23$  on the board. Ask the class to add the two numbers together. Then write  $+15$  on the end. Say: **Now add on the 15.**

⇒ Say: **We added 31 and 23 and the answer was 54, we then added on the 15.** Put brackets around the  $31 + 23$ , i.e.  $(31 + 23) + 15$ .

i Remind the children that addition can be done in any order, and that the answer will always be the same. However, if subtraction is done in a different order the answer will be different.

⇒ Write:  $(15 + 23) + 31$  on the board. Say: **Now add the same numbers together in a different order.** Say: **By adding them in reverse order we are also checking the answer.**

⇒ Write:  $(45 - 12) - 20$  and  $45 - (20 - 12)$ . Say: **Work these out doing the part in the brackets first.** Establish that the answers are different.

Pupil Book 3:  
Adding and subtracting

51

**Pupil consolidation****Refresher**

Children who are experiencing difficulty can first work through this section that involves adding two two-digit numbers only. Children choose the numbers and make up the calculations for themselves.

**Practice**

Children choose three numbers and add them together. They then add them in a different order to check the answer.

**Extension**

**Resources** set of 0–100 cards per pair, 20 counters

Children take it in turns to turn over the top three cards. Before they turn over the cards they must say either addition or subtraction. The child who turns over the cards decides the order in which they should be added or subtracted. When the cards are turned over both players either add or subtract the numbers according to which operation was chosen. The player who correctly works out the answer first takes a counter. The first player with ten counters is the winner.



Game 36; Game 39

**Games Pack 2**

Donkey Derby; Dotty dragon

**Plenary** (about 10 to 15 min)

**Resources** set of 0–100 cards per pair, Blu-tack

- Turn over the top two cards and Blu-tack them to the board. Ask the class to add them together. Say: **Each time you add two two-digit numbers together in your head you must decide the best method to use. This may change according to the numbers involved.**
- Turn over two more cards and Blu-tack them to the board. Ask the class to subtract one from the other.
- Repeat for other cards, deciding whether to ask the children to add or subtract the two numbers.
- Ask: **Will the answer be odd or even if two even numbers are added together?**
- Repeat for other combinations of adding and subtracting odd and even numbers. Record the answers using o for odd and e for even e.g.  $e + e = e$ .

**Software: Rapid Maths 4**

Crushers!

Homework CM:  
Fairground addition  
and subtraction

59

**Homework** (about 20 min)**Refresher**

Children work out addition and subtraction calculations and draw a line between the calculations which go together.

**Practice**

Children add two numbers together then make a subtraction calculation using the same three numbers.

# Rapid recall of addition and subtraction facts/Pencil and paper procedures (+)

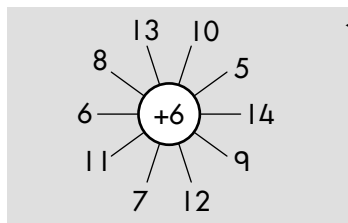
**Objectives** ● To consolidate knowing by heart addition and subtraction facts for all numbers to 20. ● To develop and refine written methods for column addition of two whole numbers less than 1000, and addition of more than two such numbers.

**Vocabulary** add; addition; more; plus; sum; total; and; altogether; equals; makes; is the same as; sign; hundreds; tens; units; ones; column; decimal points

## Oral work and mental calculation (about 5 to 10 min)

Choose an activity from Strand 2 Topic 2.1 or 2.3.

## Main teaching and pupil activities (about 30 to 40 min)



This calculation involves 'carrying' from the units and tens columns. If children are not confident at adding using the standard method start with calculations where only one column requires carrying e.g.  $365 + 427$ ,  $463 + 374$ . If children are not confident carrying two numbers then demonstrate yourself how to do the calculation.

- ☞ Draw this diagram on the board.
- ☞ Say: **When I point to each number I want you to add 6 to it and all say the answer.** Point to different numbers quickly and encourage instant answers. Rub out + 6 and replace with - 7. Replace 5, 6, 7, 8, 9 and 10 with 15, 16, 17, 18, 19 and 20. Repeat the game.
- ☞ Say: **It is important to know your addition and subtraction facts to 20.**
- ☞ Write:  $458 + 285$  horizontally. Invite a child to write the calculation out vertically. Invite another child to work it out and explain what they are doing.
- ☞ Repeat for  $634 + 289$ .
- ☞ Write:  $£2.84 + £3.68$  on the board horizontally. Say: **This method of addition can also be used for money calculations.**
- ☞ Write:  $£2.84 + £3.68$  out vertically. Say: **It is important to make sure that you write the calculation out correctly. The decimal points that divide the pounds and pence must be underneath each other. Then all the numbers will be in the right columns.**
- ☞ Invite a child to work out the calculation explaining what they are doing.
- ☞ Repeat for  $£5.35 + £3.88$ .
- ☞ Write:  $269 + 351 + 294$  on the board horizontally. Say: **This method of addition can also be used to add more than two numbers.**
- ☞ Write the calculation out vertically. Say: **It is written out in the same way keeping the hundreds, tens and units in their columns.**
- ☞ Say: **First I add the units 9 plus 1 plus 4 equals 14. I write the 4 in the units column and carry the 10 to the tens column.**
- ☞ Say: **Now I add the tens. 60 plus 50 plus 90 equals 200. 200 plus the ten that I carried over makes 210. I write the ten, or 1 to represent 1 ten, in the tens column. The 200 I will carry to the hundreds column.**
- ☞ Say: **Now I add the hundreds. 200 add 300 add 200 is 700. 700 plus the 200 that I carried over makes 900. I write 9 in the hundreds column as I know that the 9 represents 900.**
- ☞ Write:  $397 + 286 + 283$  horizontally. Invite a child to write it out vertically. Invite another child to work it out and explain what they are doing.

$$\begin{array}{r} 269 \\ 351 \\ 294+ \\ \hline 914 \\ 21 \end{array}$$

Pupil Book 3:  
Column addition

52

**Pupil consolidation****Refresher**

Children who are experiencing difficulty can first work through this section that starts with calculations that involve carrying the units or the tens. Children copy out the calculations then work them out using the standard vertical method.

**Practice**

**Resources** 2 counters; 1–6 die; paper and pencil per pair

Children play the game in pairs. They need to work out the calculations vertically.

Extension CM:  
Missing numbers

59

**Extension**

This involves working out the missing number using the standard written method.



Game 29

**Games Pack 2**

Patchwork quilt

**Plenary** (about 10 to 15 min)

- Choose one of the calculations from the Extension activity and work it out on the board. Emphasise using your addition facts to work out the missing numbers.
- Choose another calculation and invite a child to work it out, explaining what they are doing.
- Say: ***The written method is good for calculations that you cannot do in your head, including money calculations, adding more than two numbers and finding missing numbers.***
- Finish by playing the addition/subtraction facts game from the main teaching part of the lesson.

**Software: Rapid Maths 4**

Souperbowl

# Rapid recall of addition and subtraction facts/Pencil and paper procedures (–)

**Objectives** ● To derive quickly all pairs of multiples of 50 with a total of 1000. ● To develop and refine written methods for column subtraction of two whole numbers less than 1000, and money calculations.

**Vocabulary** add; addition; more; plus; sum; total; and; altogether; equals; makes; is the same as; sign; hundreds; tens; units; ones; column; decimal point

## Oral work and mental calculation

Choose an activity from Strand 2 Topic 2.2 or 2.3.

## Main teaching and pupil activities (about 30 to 40 min)

➞ Before the lesson write all the multiples of 50 to 1000 randomly on the board.

➞ Say: **I am going to point to the multiples of 50 and I want you to reply with the multiple of 50 that goes with it to make 1000.** Point quickly and encourage rapid responses.

➞ Say: **You can use your knowledge of multiples of 5 that go together to equal 100 to work out pairs of multiples of 50 that equal 1000.**

↓ This calculation involves decomposing the tens and hundreds columns. If children are not confident at subtracting using the standard written method, start with calculations where only one column requires decomposition e.g.  $674 - 348$ ,  $567 - 384$ .

➞ Write:  $573 - 385$  on the board horizontally and vertically.

➞ Say: **First we subtract the units. 3 subtract 5 cannot be done so I will need to borrow from the tens column. I will take ten from 70 and put it with 3 to make it 13.** Cross out the 7 and write 6 above it. Write a small 1 next to 3.

➞ Say: **13 minus 5 is 8.** Write 8 in the appropriate place.

➞ Say: **Now I will subtract the tens. 60 minus 80 cannot be done so I will need to borrow from the hundreds column. I will take a hundred from 500 and put it with 60 to make it 160.** Cross out the 5 and write 4 next to it. Write a small 1 next to the 6.

➞ Say: **160 minus 80 is 80. I will write the 8 to show eight tens in the tens column.**

$$\begin{array}{r} 4\cancel{5}^{16}\cancel{7}^{13} \\ 3\ 8\ 5- \\ \hline 1\ 8\ 8 \end{array}$$

➞ Say: **Now I subtract the hundreds. 400 minus 300 is 100. I will write 1 in the hundreds column to show 100. So the answer to  $573 - 385$  is 188.**

➞ Write:  $728 - 479$  out horizontally on the board.

➞ Invite a child to write the calculation out vertically. Invite another child to work it out. Ask them to explain what they are doing.

➞ Repeat for  $834 - 576$ .

➞ Write:  $£5.36 - £3.59$  on the board horizontally, then write it out vertically.  
Say: **It is important to make sure that you write the calculation out correctly. The decimal points that divide the pounds and pence must be underneath each other. Then all the numbers will be in the right columns.**

➞ Invite a child to work out the calculation explaining what they are doing.

➞ Repeat for  $£8.21 - £4.46$ .

Pupil Book 3:  
Column subtraction

53

**Pupil consolidation****Refresher**

Children who are experiencing difficulty can first work through this section that starts with calculations that involve decomposing the tens or hundreds. It then goes on to calculations that involve decomposing tens and hundreds and money. Children copy out the calculations then work them out using the standard vertical method.

**Practice**

**Resources** 2 counters; 1–6 die; paper and pencil per pair



Children play the game in pairs. They need to work out the calculations vertically.

Support CM:  
It all adds up

59

**Support**

This provides practice in writing calculations vertically.

**Extension**

Children write out 5 HTU – HTU calculations for each other. They keep the answers secret. They then swap and work out the answers to each other's calculations. Children then swap them back to check.

**Plenary** (about 10 to 15 min)

- Invite two children to write a three-digit number on the board. Invite another child to write them out in a subtraction calculation. Choose another child to work out the answer explaining what they are doing.
- Repeat with different children.
- Say: ***This method of subtraction can be used for calculations that you cannot do mentally, including money calculations.***
- Finish by calling out multiples of 50 to 1000. Children reply with the multiple of 50 that goes with it to make 1000.

**Software: Rapid Maths 4**

Souperbowl



## Measures: (time)/Problems involving measures (time)/Making decisions

**Objectives** ● To read simple timetables and use this year's calendar. ● To use all four operations to solve word problems involving measures (time), using one or more steps. ● To choose and use appropriate number operations and appropriate ways of calculating (mental, mental with jottings, pencil and paper) to solve problems. ● To explain and record methods.

**Vocabulary** names of the days of the week, months, seasons; leap year; century; millennium; calendar; date of birth; a.m.; p.m.; noon; midnight; hour; minute; second; how long ago?; how long will it be to?; timetable; arrive; depart

### Oral work and mental calculation (about 5 to 10 min)

Choose an activity from Strand 1 or Strand 2.

### Main teaching and pupil activities (about 30 to 40 min)

**Resources** analogue clockface; train timetable

- ⇒ Ask: **If we have a daily Maths lesson, how long do we spend on mathematics each day? Each week? Can you estimate how much time we spend on mathematics each term? Each year?**
- ⇒ Establish the need to build up a table. Elicit a range of mental strategies used by the children in working out the number of hours per 11/12 week term and 35 week year.

Write: **Time spent on mathematics**

weeks	1	10	5	11	12	30	40
hours							

- ⇒ Say: **Look at the table. How many different ways can we work out how much time we spend on mathematics in a school year of 35 weeks?**
- ⇒ Invite children to record jottings on the board.
- ⇒ Discuss timetables which have significance to the children, e.g. opening hours of library or leisure centre, TV guides, local bus and train times.
- ⇒ Display the timetable and say: **Trains leave Milngavie (pronounced: Milguy) for High Street, Glasgow every half hour. The train takes five minutes between each station.**

**Train timetable:**  
Milngavie to Glasgow

Milngavie	8:22	8:52
Bearsden	8:27	
Anniesland		
Hyndland		
Charing Cross		
High Street		

- ⇒ Invite children to complete the timetable for the 8:22 train and then the 8:52 train. Discuss the patterns in the times between stations, e.g. 2, 7, 2, 7, ... and between trains, i.e. a constant difference of 30 minutes.
- ⇒ Ask: **At what time does the train before the 8.22 leave Milngavie? (7:52) And the next train after the 8:52? (9:22)**  
Write: **7:52 8:22 8:52 9:22**
- ⇒ Pose questions similar to the following, using an analogue clock to check if necessary: **You are at Milngavie station at quarter to nine. Which train will you catch? (8:52) How long will you have to wait? (7 minutes) The 7:52 train is 10 minutes late. At what time does it arrive? The journey to Glasgow High Street takes 25 minutes. You need to be in Glasgow for half past eight. Which train should you take?**

Pupil Book 3:  
Travelling times

54

**Pupil consolidation***Refresher and Practice*

**1–2** Children copy and complete the bus timetable and work out how long it takes to travel to the last village.

*Practice*

**1–3** Children copy and complete an air timetable and solve word problems drawn from the table.

**Extension**

**Resources** local bus or train timetables



Provide each small group with a copy of a local bus or train timetable. Children use the timetable to calculate the travelling time between local stop and town centre/intermediate stops.

**Plenary** (about 10 to 15 min)

- On the board build up the bus timetable from the Pupil Book, discussing counting on/back strategies as applicable.
- Ask questions about the timetable, e.g. **How long does it take to travel from \_\_\_\_\_ to \_\_\_\_\_? You are at the bus stop in \_\_\_\_\_ at \_\_\_\_\_. How long do you wait for a bus?**
- Ask children to show with jottings, how they worked out their answers to questions 2 and 3 of the Practice section.

Homework CM:  
Today's TV guide

60

**Homework** (about 20 min)

**Resources** most children should have access to a newspaper, TV guide or Teletext. You may need to photocopy the TV guide for that day for some children.

*Refresher and Practice*

Children consult a guide to complete the TV programme schedules for the two channels from 5:00 p.m to 7:30 p.m.

*Practice*

Children solve two word problems, drawing from their answers to the programme times.

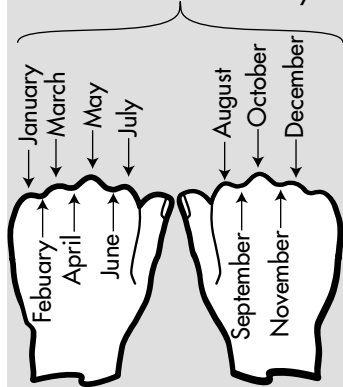
# Measures: (time)/Problems involving measures (time)/Making decisions

**Objectives** ● To read simple timetables and use this year's calendar. ● To use all four operations to solve word problems involving measures (time), using one or more steps. ● To choose and use appropriate number operations and appropriate ways of calculating (mental, mental with jottings, pencil and paper) to solve problems. ● To explain and record methods.

**Vocabulary** names of the days of the week, months, seasons; leap year; century; millennium; calendar; date of birth; a.m.; p.m.; noon; midnight; hour; minute; second; how long ago?; how long will it be to?; timetable; arrive; depart

**i** Early calendars were based on a lunar year. The Babylonians counted 360 days as their year and thus were a month out of line every six years. The Greeks had six months of 30 days, six months of 29 days and an extra month on alternate years. The early Roman calendar had 10 months until 650 BC when they moved to 12 months. However, by 47 BC this calendar had 'lost' 80 days so Julius Caesar decreed a year of 445 days then subsequent years of 365 days which gave a leap year every fourth year.

These months have 31 days.



**i** Display a current calendar and briefly outline its history.

## Oral work and mental calculation (about 5 to 10 min)

Choose an activity from Strand 1 or Strand 2.

## Main teaching and pupil activities (about 30 to 40 min)

**Resources** calendar and year planner for the current year

- ➞ Quickly revise the names of the days of the week and the months of the year.
- ➞ Revise the 'knuckle method' and the traditional rhyme, '30 days hath September' as aids to recalling the number of days in each month.
- ➞ Say: **We now use the 'Gregorian' calendar, introduced in 1582 by Pope Gregory. It is based on a solar year of 365 days, 5 hours, 48 minutes and 46 seconds and adjusts the leap years to those years exactly divisible by 4, e.g. 1988, 1992, 2004 and to centuries exactly divisible by 400, e.g. 1600, 2000.**
- ➞ Ask: **Which century will be the next leap year?** (2400)
- ➞ Show the current month and ask: **Which day of the week is 6/11/22?** (June) **The date of the first Friday/third Thursday?**
- ➞ Point to a gap on the printed page at the end of the month. Ask: **What date is this?** (1st day of next month)
- ➞ Display a current year planner, point to today's date and say: **What day is in five days' time?** Check that children know to count on from today.
- ➞ Ask children who have birthdays in the months May to July to circle the date on the year planner. Discuss ways of working out the number of days from one birthday to another, e.g. the number of days from 25 May to 4 June/from 20 June to 22 April. (10/32)
- ➞ Pose the problem: **Beth is flying to Australia to visit her Uncle Peter. She arrives in Sydney on 24 July and leaves on 4 September. How many weeks does she have in Australia?** (6 weeks)
- ➞ Pose problems similar to above with other start/finish dates, using the year planner to check answers.

Pupil Book 3:  
Calendar counting

55

**Pupil consolidation****Resources** calendar for February and September of current year**Refresher**

- 1 Children copy the current calendar for the month of February and using the 'Opening hours' data, circle dates when the museum is open.
- 2–5 Children solve word problems about the museum's opening hours.

**Practice**

- 1 Children make a copy of the current calendar for the month of September.
- 2 They use this calendar page to work out dates for a possible school visit to the museum.
- 3–4 Children solve problems about leap years.
- 5 Children investigate a problem based on the layout of a calendar month.

**Extension****Resources** a calendar month; calculator (optional)

Set the following problem:

Choose a calendar month and enclose 4 dates in a square.

Multiply diagonally opposite dates.

$$(21 \times 29 = 609, 22 \times 28 = 616)$$

Subtract the smaller product from the larger.

$$(616 - 609 = 7)$$

Repeat for other 2 by 2 squares.

Write what you notice about the difference each time?

*MAY*

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			



Game 44

**Games Pack 2**

Travel on time

**Plenary** (about 10 to 15 min)

- Review the methods used by children to find answers to the Refresher section.
- Discuss the possible dates for the school visit to the museum and which might be most suited to your class' timetable.
- Compare and discuss sets of nine numbers tried by the children. Ask the children to try to explain why the pattern works. (8 added to smallest number gives centre number; application of place value in base 7, i.e. centre number is 1 week and 1 day, or 8 days later than the smallest number in the rectangle)
- Ask children who completed the Extension activity to report on their findings. (as above, the constant difference of 7 is related to place value in base 7)

# Organising and interpreting data

**Objectives** ● To solve a problem by collecting quickly, organising, representing and interpreting data in tables, charts, graphs and diagrams, including those generated by a computer, for example: Venn diagrams (two criteria).

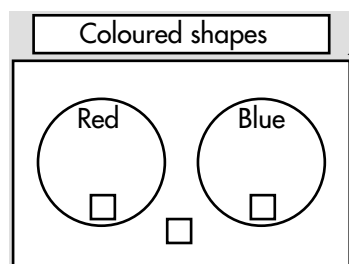
**Vocabulary** number; zero, one, two ... to ten; Venn diagram; sort; set; title; square; quadrilateral; rectangle; triangle; pentagon; hexagon; heptagon; octagon; odd; even; overlap; intersection

## Oral work and mental calculation (about 5 to 10 min)

Choose an activity from Strand 4 Topic 4.1, Strand 1 or Strand 2.

## Main teaching and pupil activities (about 30 to 40 min)

**Resources** coloured paper shapes (3 red triangles, 1 red square; 1 red circle; 2 blue triangles, 2 blue squares, 2 blue rectangles; 2 yellow triangle, 2 yellow hexagons); one non-intersecting and one intersecting Venn diagram (large enough to accommodate paper shapes): see RCM 13, Venn Diagrams; Blu-tack



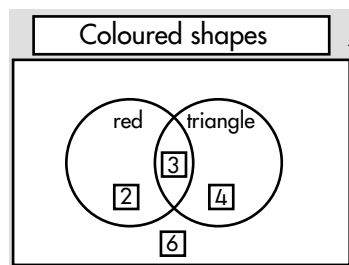
↑ How many shapes are not red/not blue? (10/9) How many shapes are red or blue? (11)

⇒ Arrange the children in a U-shape on the carpet. Place the non-intersecting Venn diagram on the carpet with the coloured shapes to one side.

⇒ Say: **We are going to sort these shapes using a Venn diagram.** Label the circles **Red** and **Blue**. Put a blue shape in the Blue circle and a red shape in the Red circle. Hold up a yellow shape and ask: **Where does this shape go?** (outside the circles) **Shapes that are not red or blue go outside the circles.** Invite children to place the remaining shapes on the Venn diagram.

⇒ Ask: **How many red shapes are there?** (5) Remove the red shapes and write the number in the circle. Repeat for the blue shapes. Ask: **How many shapes are not red or blue?** (4) Remove the remaining shapes and write the number outside the circles. Ask: **How many shapes are there altogether?** (15)

⇒ Blu-tack the Venn diagram to the board.



↑ How many shapes are not triangles/not red? (8/10) Where are they on the Venn diagram? How many shapes are not red triangles? (12)

⇒ Place the intersecting Venn diagram on the carpet. Say: **Let's sort the shapes a different way.** Label the left circle Red and the right circle Triangle. Ask a child to find all the red shapes. Place them in the Red circle, outside the intersection. Ask a child to find all the triangles. Place them in the Triangle circle, outside the intersection.

⇒ Point to the intersection and ask: **Which shapes go in the overlap/intersection?** (red triangles) Move the red triangles to the intersection. Cover the Triangle circle, apart from the intersection, and say: **The red triangles are in the Red circle,** cover the Red circle, apart from the intersection, and say: **... and also in the Triangle circle.**

⇒ Ask: **Where do the other shapes go?** (outside the circles) Ask a child to place the remaining shapes on the Venn diagram. Ask: **How many red triangles are there?** (3) **How many red shapes are not triangles?** (2) **Where are they on the Venn diagram?** **How many triangles are not red?** (4) **Where are they?** **How many shapes are not red and not triangles?** (6) **Where are they?**

⇒ Count the number of shapes in each part of the Venn diagram, remove them and write the totals on the diagram. Blu-tack the Venn diagram to the board.

Pupil Book 3:  
Shapes Venn  
diagrams

56 57

**Pupil consolidation****Resources** RCM 13, Venn Diagrams**Refresher**

- 1 Children copy a non-intersecting Venn diagram with Triangle and Square sets.
- 2 They draw each shape on the diagram.
- 3 They count the shapes in each part of the Venn diagram and write in the totals.
- 4 They answer questions about the shapes.

**Practice****Resources** blue, red, yellow pencils

- 1 Children copy an intersecting Venn diagram with Rectangle and Blue sets.
- 2 They draw each shape on the diagram. Check that children are including squares in the Rectangles set.
- 3 They count the shapes in each part of the Venn diagram and write in the totals.
- 4 They answer questions about the shapes.

Support CM:  
Counter Venn diagrams

60

**Support****Resources** 30 coloured counters (including red and blue)

Children sort the counters into a one-set Venn diagram according to colour. They count the counters and write the totals then answer questions about the counters. They then sort the counters into a non-intersecting Venn diagram according to colour and answer questions about the counters.

**Extension**

- Ask the children to sort the shapes in the Practice section in a different way, using a Venn diagram, e.g. Even number of sides and Red.

**Plenary** (about 10 to 15 min)**Resources** shapes used in the Main teaching activity

- Draw attention to the non-intersecting Venn diagram on the board. Ask: **What is this diagram called?** (Venn diagram) **What does it show?** (colour of shapes) **How many red/blue shapes were there?** (5/6) **How many shapes were a different colour?** (4) **How many shapes were red or blue?** (11) **How many shapes were not red/not blue?** (10/11) **How many shapes were there altogether?** (15)
- Draw attention to the other Venn diagram on the board. Ask: **How many red shapes were there?** (5) **How many triangles were there?** (7) Point to the intersection and ask: **What is this part of the diagram called?** (overlap/intersection) **What does it mean?** (the shapes have both attributes – 3 red triangles) **How many shapes were not triangles or red?** (6) **How many shapes were not red/not triangles?** (10/8)

How many shapes were red or triangle but not both together? (6)

## Organising and interpreting data

**Objectives** ● To solve a problem by collecting quickly, organising, representing and interpreting data in tables, charts, graphs and diagrams, including those generated by a computer, for example: Venn diagrams (two criteria).

**Vocabulary** number; zero, one, two ... to ten; digit; Venn diagram; sort; set; title; odd; even; less than; greater than; overlap; intersection

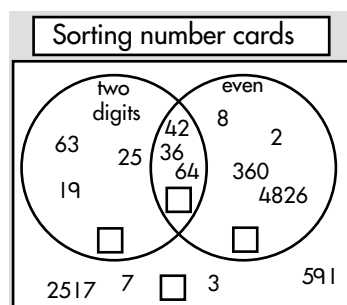
### Oral work and mental calculation (about 5 to 10 min)

Choose an activity from Strand 4 Topic 4.1, Strand 1 or Strand 2.

### Main teaching and pupil activities (about 30 to 40 min)

**Resources** selection of about 20 one-, two-, three- and four-digit number cards (roughly equal distribution of odd and even numbers); intersecting Venn diagram (large enough to accommodate the number cards): see RCM 13, Venn Diagrams; Blu-tack

- ➞ Arrange the children in a U-shape on the carpet. Place a Venn diagram on the carpet with the number cards to one side.
- ➞ Say: **We are going to sort these numbers using a Venn diagram.**
- ➞ Label the left circle **Two digits**. Ask a child to find a two-digit number (e.g. 25) and place it in the left circle.
- ➞ Label the right circle **Even**.
- ➞ Point to the intersection and ask: **Which kind of numbers go in the intersection?** (two-digit, even numbers).



- ➞ Point to 25 and ask: **Does 25 go in the intersection?** (no, because it is not even)
- ➞ Ask a child to find an even number, e.g. 64. Ask: **Where does this number go?** (in the Even set) **Does it go in the intersection? Why/why not?**
- ➞ Repeat, asking children to find a three-digit number and then an odd number.
- ➞ Point to an area of the Venn diagram and ask: **Who can find a number that goes here?** Ask each child to describe the number they choose. Invite children to place the remaining number cards on the Venn diagram.
- ➞ Ask: **How many even/two-digit numbers are there? How many two-digit even numbers are there? Where are they on the Venn diagram?** (intersection) **How many numbers are not even? Where are they?** Point to the numbers outside the sets and ask: **How can you describe these numbers?** (not even and not two-digits)
- ➞ Count the numbers in each part of the Venn diagram, remove them and write the totals on the diagram.
- ➞ Blu-tack the Venn diagram to the board.

↑ **How many two-digit numbers are not even? How many even numbers do not have two digits?**

Pupil Book 3:  
Number Venn  
diagrams

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### Pupil consolidation

**Resources** RCM 13, Venn Diagrams


#### Refresher

- 1 Children copy a non-intersecting Venn diagram with 'Less than 20' and 'Greater than 200' sets. They write each number in the Venn diagram.
- 2 They count the numbers in each part of the Venn diagram and write in the totals.
- 3 They answer questions about the numbers.
- 4 They copy and complete another non-intersecting Venn diagram with 'Two digits' and 'Three digits' sets. They write each number in the Venn diagram.
- 5 They count the numbers in each part of the Venn diagram and write the totals.
- 6 They answer questions about the numbers.

#### Practice

- 1 Children copy an intersecting Venn diagram with 'Less than 50' and 'Even' sets.
- 2 They write each number in the Venn diagram.
- 3 They answer questions about the numbers.
- 4 They copy and complete another intersecting Venn diagram with 'Numbers with 3 tens' and 'Odd' sets.
- 5 They count the numbers in each part of the Venn diagram and write in the totals.
- 6 They answer questions about the numbers.

#### Extension



-  Ask the children to sort the numbers at the top of Practice section a different way, using a Venn diagram, e.g. Greater than 100 and Odd.

### Plenary (about 10 to 15 min)

**Resources** number cards used in the Main Teaching Activity



Point to a set and ask:  
**What kind of numbers go in this set?**  
(two-digit/even)

-  Draw attention to the Venn diagram on the board. Point to the intersection and ask: **What is this part of the diagram called?** (overlap/intersection) **What kind of numbers go in it?** (two-digit, even numbers) Point to the area outside the sets and ask: **What kind of numbers go outside the sets?** (odd numbers that are not two-digit)
-  Ask questions such as: **How many numbers were even/two-digit? How many odd numbers were there? How many even numbers were not two-digit? How many numbers were there altogether?**



# Organising and interpreting data

**Objectives** ● To solve a problem by collecting quickly, organising, representing and interpreting data in tables, charts, graphs and diagrams, including those generated by a computer, for example: Carroll diagrams (two criteria).

**Vocabulary** number; zero, one, two ... to ten thousand; Carroll diagram; row; column; sort; odd; even; sum; heads; tails; least likely; most; record; Blu-tack

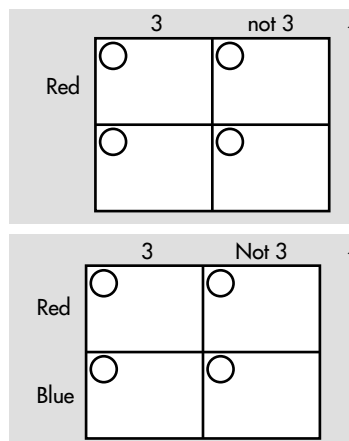
## Oral work and mental calculation (about 5 to 10 min)

Choose an activity from Strand 4, Topic 4.1, Strand 1 or Strand 2.

## Main teaching and pupil activities (about 30 to 40 min)

**Resources** one large blank die labelled 1, 2, 3, 3, 4, 4 in red; one large blank die labelled 1, 3, 3, 3, 3, 4 in blue; large 2 by 2 Carroll diagram, see RCM 14, Carroll diagrams; Blu-tack

- ➡ Arrange the children so they can see the board. Blu-tack the Carroll diagram to the board.
- ➡ Roll the red die a few times. Say: **We are going to record the numbers rolled using this Carroll diagram. The numbers on the die are red.**
- ➡ Write the row heading **Red** on the Carroll diagram. Say: **Some of the numbers are three. Some are not three.** Write the column headings **3** and **Not 3**.
- ➡ Pass the die around for children to roll once each. Invite a child to record each die roll with a tick. Stop after about ten rolls.
- ➡ Produce the blue die. Say: **The numbers on this die are blue. How should we record the numbers rolled with it?** (label the bottom row **Blue**) Write the label. Pass the blue die around and record about ten rolls as before.
- ➡ Give both dice to a child to roll together. Pass them around, recording both numbers at once. Stop when every child has thrown one or two dice.
- ➡ Ask: **How many threes were rolled with the red die?** Write the total in the circle. Repeat for the other categories.
- ➡ Ask questions such as: **How many times was the red/blue die rolled? How many times was a three rolled? How many times was a number other than three rolled? How many numbers were rolled altogether? Which colour die do you think has the most threes on it?** (blue) Allow the class to examine the dice.



Pupil Book 3:  
Coin Carroll  
diagrams



### Pupil consolidation

#### Refresher

**Resources** two one-row Carroll diagrams – use RCM 14, Carroll Diagrams; 1p and 2p coins (one of each per pair)



- 1 Children copy the Carroll diagram.
- 2 One child flips the 1p coin 20 times. The other child records heads or tails using a cross on the Carroll diagram. Note: Children should keep count of their throws.
- 3 They answer questions about their results.
- 4–5 They repeat the activity using the 2p coin, swapping roles.
- 6 They compare the two Carroll diagrams.

#### Practice

**Resources** two one-row Carroll diagrams – use RCM 14, Carroll Diagrams



- 1 Children copy the Carroll diagram.
- 2–4 They take turns to flip both coins together and record the results. Each child flips the coins 20 times.
- 5 They answer questions about the Carroll diagrams.
- 6 They repeat the activity, making a new Carroll diagram.
- 7–8 They answer questions about both Carroll diagrams.

#### Extension

**Resources** Carroll diagram (two rows); two 1–6 dice (per pair)



Children take turns to throw both dice (ten times each). They calculate the sum and record the results in this Carroll diagram. Question children about their results.

	Even sum	Odd sum
Sum less than 7		
Sum 7 or more		

**Variation** Children calculate the difference and record the results in a Carroll diagram with row headings 'Difference is 1' and 'Difference is not 1' and columns headed 'Sum less than 6' and 'Sum is 6 or more'.

### Plenary (about 10 to 15 min)

- ➡ Draw attention to the Carroll diagram from the Main teaching activity. Ask: **What is this diagram called?** (Carroll diagram) **What does it show?** (how many times the red and blue dice showed 3) **If Jason threw a 4 with the red die, where would we tick?**
- ➡ Ask questions such as: **How many times did the blue/red die show a three/not show a three? How many times was the red/blue die rolled? How many times was a three rolled? How many times was a number other than three rolled? If we threw a yellow die as well, how would the diagram change?** (another row)
- ➡ Invite pairs to discuss their Carroll diagrams with the rest of the class. Ask questions about their Carroll diagrams: **How many times did the 1p coin show heads? Which coin came up tails the most? How many tails turned up altogether? How many times was the 2p coin flipped?**



**Which die are you least likely to throw a three with? (red)**  
Why?

# Organising and interpreting data

**Objectives** ● To solve a problem by collecting quickly, organising, representing and interpreting data in tables, charts, graphs and diagrams, including those generated by a computer, for example: Carroll diagrams (two criteria).

**Vocabulary** number; zero, one, two ... to ten thousand; Carroll diagram; row; column; sort; odd; even; sum; greater than; less than; record; range

## Oral work and mental calculation (about 5 to 10 min)

Choose an activity from Strand 4 Topic 4.1, Strand 1 or Strand 2.

## Main teaching and pupil activities (about 30 to 40 min)

**Resources** bingo cards (one teacher set and one for each child) e.g. each bingo card consists of 9 numbers from 0–100;

	1		19	20	3		12		14		2		15	23	5		11		24
34		40		59		17		28	38	37		51		54		30		45	50
	72	90	98		46		65		82		62		70	96	58		66		80

large prepared 2 by 2 Carroll diagram, using RCM 14, Carroll diagrams; Blu-tack

- ➞ Arrange the children so they can see the board. Blu-tack the Carroll diagram to the board.
- ➞ Give each child a bingo card. Tell the children they are going to play a game of bingo. Say: ***I am going to tell you something about a number. Cross off the number if it is on your card. The first person to cross out all their numbers shouts out 'Bingo'.***
- ➞ Choose a number from one of the bingo cards and cross it off. Describe the number, e.g. 26; four tens and 3 units; double 30; half 84; 30 plus 12.
- ➞ Continue until a child (or children) has called out 'Bingo' and you have crossed out all the numbers on one of your bingo cards.
- ➞ Draw attention to the Carroll diagram on the board. Discuss the numbers that go in each part of the diagram.
- ➞ Ask the winners to call out each number on their cards. For each number ask: ***Is it odd or even? Is it between 30 and 60? Where does it go on the Carroll diagram?***
- ➞ Invite a child to the front to record the numbers as crosses. Ask the rest of the class: ***Which other numbers have you crossed out?*** Add these numbers to the Carroll diagram.
- ➞ Ask: ***How many odd numbers were there between 30 and 60?*** Write the total in the circle. Repeat for the other categories.
- ➞ Ask: ***How many odd/even numbers were there? How many numbers were between 30 and 60? How many numbers were there altogether?***



Point to 30 to 60 and ask: ***If this were 30 to 80, how would the totals be different?*** (top row would be bigger, bottom row smaller)

Pupil Book 3:  
Game Carroll  
diagrams

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### Pupil consolidation

#### Refresher

**Resources** two two-row Carroll diagrams – use RCM 14, Carroll Diagrams

- 1 Children copy a Carroll diagram.
- 2–3 They sort bingo numbers using the criteria Red/Blue and Less than 30/30 or more.
- 4 They answer questions about their results.
- 5 Children copy another Carroll diagram.
- 6–7 They sort bingo numbers using the criteria Odd/Even and 20 to 50/Not 20 to 50.
- 8 They answer questions about their results.

#### Practice

**Resources** two two-row Carroll diagrams – use RCM 14, Carroll Diagrams

- 1 Children copy a Carroll diagram.
- 2–3 They sort pairs of domino numbers using the criteria Red/Blue and Even total/Odd total.
- 4 They answer questions about their results.
- 5 Children copy another Carroll diagram. They sort domino numbers using the criteria Double/Not double and Has a 6/Does not have a 6.
- 6 They answer questions about their results.

#### Extension

**Resources** two-row Carroll diagram

- Children copy this Carroll diagram. They sort the domino numbers in the Practice section. Question children about their Carroll diagrams.

	Odd sum	Even sum
Odd product		
Even product		

### Plenary (about 10 to 15 min)

- ➡ Draw attention to the Carroll diagram from the Main teaching activity. Ask: **Where did we record the even numbers between 30 and 60? If the next bingo number was 71, where would we record it?**
- ➡ Ask: **How many odd numbers were between 30 and 60? How many even numbers were there altogether?** Call out a few more numbers and ask individual children to record them with a tick.
- ➡ Invite pairs to discuss their Carroll diagrams with the rest of the class. Ask questions about their Carroll diagrams such as: **How many red bingo numbers are less than 30? (7) How many bingo numbers are 40 or more? (12) How many red dominoes have an odd sum? (5) How many dominoes are doubles? (5)**

# Organising and interpreting data

**Objectives** ● To solve a problem by collecting quickly, organising, representing and interpreting data in tables, charts, graphs and diagrams, including those generated by a computer, for example: Venn and Carroll diagrams (two criteria).

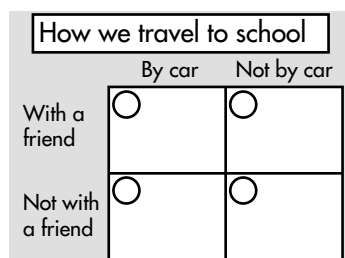
**Vocabulary** number; zero, one, two ... to thirty; Venn diagram; Carroll diagram; row; column; sort; set; record; information

## Oral work and mental calculation (about 5 to 10 min)

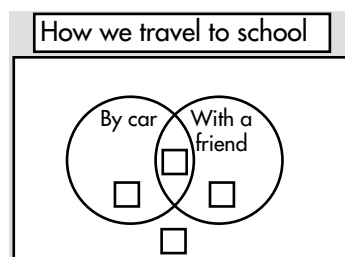
Choose an activity from Strand 4 Topic 4.1, Strand 1 or Strand 2.

## Main teaching and pupil activities (about 30 to 40 min)

**Resources** two large prepared 2 by 2 Carroll diagrams – use RCM 13, Venn diagrams; one large prepared Carroll diagram – use RCM 14, Carroll diagrams; Blu-tack



- ➡ Arrange the children so they can see the board. Blu-tack the Carroll diagram to the board.
- ➡ Say: **We are going to find out how you travel to school. Who travels by car? How else do you travel to school? Who travels to school with a friend? Who travels alone or with a brother or sister?**
- ➡ Point to the top left category and ask: **What is this space for?** (children who travel to school by car with a friend)
- ➡ Repeat for the other categories. Ask the children to tick the Carroll diagram to show how they travel to school.
- ➡ Ask: **How many children travel with a friend by car?** Write the total in the circle. Repeat for the other categories.
- ➡ Ask: **How many children travel by car/do not travel by car? How many children travel with a friend/do not travel with a friend?**



- ➡ Blu-tack the Venn diagram next to the Carroll diagram. Point to the intersection and ask: **What is this part of the Venn diagram for?** (children who travel by car with a friend) **How many children go in here?** (copy from the top left category of the Carroll diagram) Repeat for the other parts of the Venn diagram.
- ➡ Ask: **Do both diagrams show the same information?** (yes) **Which do you find easier to read? Why?**
- ➡ Replace the Carroll diagram with a new one, ready for the Plenary.

Pupil Book 3:  
Travel diagrams

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**Pupil consolidation****Refresher****Resources** two-row Carroll diagram – use RCM 14, Carroll Diagrams

- 1 Children copy a Carroll diagram.
- 2–3 They record each child's name and write the totals in the circles.
- 4 They answer questions about the Carroll diagram.

**Practice****Resources** intersecting Venn diagram – use RCM 13, Venn Diagrams

- 1 Children copy and complete a Venn diagram.
- 2 They answer further questions.

**Extension**

- 1 Children make their own travel Carroll diagram, choosing their own criteria. If necessary, help them choose the Carroll diagram row and column headings.
- 2 They make their own travel Venn diagram, choosing their own criteria. Question the children about their results.

**Plenary** (about 10 to 15 min)

- ➞ Draw attention to the Venn diagram on the board. Ask: **What is this diagram called?** (Venn diagram) **Who can point to the part that shows children who travel by car without a friend? How many children travel to school by car/do not travel by car? How many children travel with a friend/without a friend? How many children travel to school without a friend and not by car?**
- ➞ Point to the new Carroll diagram and ask: **What is this diagram called?** (Carroll diagram) Point to the top left category and ask: **What is this part for?** (children who travel to school by car with a friend) **How many children go in here?** Copy the number from the intersection of the Venn diagram.
- ➞ Repeat for the other categories.
- ➞ Ask: **If everyone travelled with a friend tomorrow, how would the numbers change?** (0 in the bottom two categories; all children in the top two categories)

Extension CM:  
Travel Venn and Carroll  
diagrams

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