

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

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 multiples of 3 cards to 30; multiples of 5 cards to 50; number line up to at least 60 which includes negative numbers

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 etc”. However, when written on a thermometer they are described as “minus one, minus two” etc.

↑ Encourage children to count without looking at the number line. Say: **Picture the numbers and the jumps of three in your head to help you remember the sequence.**

- ⇒ Revise counting in threes from 0 to 30. Remind children that these are the multiples of three.
- ⇒ Select multiple of 3 cards one at a time, e.g. 12.
- ⇒ Ask: **What is the multiple of 3 that comes before this number?** (9)
- ⇒ Shuffle the card set and repeat, asking: **What is the multiple of 3 that comes after this number?**
- ⇒ Display the number line to the class. Record or circle the multiples of 3.
- ⇒ Ask: **What will the next number in the sequence be?** (33) Ask individual children for the next number in the sequence until 60 is reached.
- ⇒ Count backwards in 3s from 60 to 0, using the number line if necessary.
- ⇒ Ask: **What happens when we get to zero? Can we go on?** (yes)
- ⇒ Say: **Numbers below 0 are called negative numbers and we can continue counting back in threes past 0.** Demonstrate this on the number line. Count out aloud in threes starting at 0, finishing at -30.
- ⇒ Say: **All whole numbers, positive and negative, including zero are called integers.**
- ⇒ Ask: **What do you notice about the numbers counted?** (they are the same as the multiples of 3 except they are said with negative before them)
- ⇒ Mark 2 on the number line. Invite children to record jumps of three on the number line. Mark in about 5 jumps of three. Count backwards in threes to 2, using the number line if necessary.
- ⇒ Ask: **What happens when we get to 2? Can we go on?** (yes)
- ⇒ Ask: **What will the next number in the sequence be?** (-1) Demonstrate the jump from 2 back to -1. Continue marking in the jumps of three to around -13. Count from here back to -28.
- ⇒ Ask questions such as: **What integers are between 2 and -1?** (1, 0,) **What number would we land on if we started at 1 and jumped backwards 3?** (-2) **What would the next number in the sequence be?** (-5)

Y4 Numbers and the number systemSuggested order: **Spring Term, Week 7, Lesson 1**Pupil Book 2:
Counting forwards and
backwards

35

Pupil consolidation**Refresher**

Children copy and complete the number sequences into their books.

Practice

Children count forwards and backwards in steps of two, three or four to find various floors/levels in each of the buildings. They record the room name and level/floor in their books.

Support CM:
Counting on the number
line

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Support**Resources** a blank die marked 3, 4, 5, 3, 4, 5; a lead pencil; a coloured pencil

Starting at 0 on the number line, each child throws the die to find the length of each jump. They draw in the jumps both forwards and backwards from 0 to the end of the number line. Then they write the number sequence formed below the number line.

Extension CM:
Counting forwards and
backwards

32

Extension**Resources** a blank die marked 3, 4, 5, 3, 4, 5; a blank die marked +, -, +, -, +, -

Each child throws the die to find out the length of each jump. Starting at the number shown in the first circle, they throw the operation die to determine whether to add or subtract to find subsequent answers.

Plenary (about 10 to 15 min)

- ☞ Count forwards and backwards in multiples of three from 0 to 30 and back to -30.
- ☞ Count in threes from a variety of starting numbers, e.g. 27 stop at 60; -12 stop at 0.
- ☞ Count backwards in threes from different starting numbers, e.g. 36 stop at 15; -9 stop at -30.
- ☞ Count in threes from a variety of starting numbers, e.g. -23, 45, 11. Clap your hands to indicate when to stop.
- ☞ Count backwards in threes from different starting numbers, e.g. 58, 42, -17.

Homework CM:
What's the next number?

33

Homework (about 20 min)**Refresher**

Children fill in the missing numbers by adding or subtracting the number shown.

Practice

Children complete the table by counting forwards or backwards in the steps indicated to make a number sequence.

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 25 to 500, 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

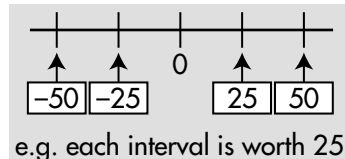
Oral work and mental calculation (about 5 to 10 min)

Choose an activity from Strand 1 Topic 1.2

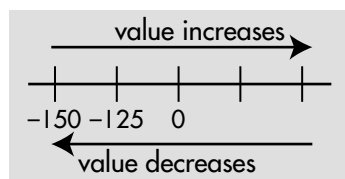
Main teaching and pupil activities (about 30 to 40 min)

Resources a blank number line with marked intervals of 10

Ask: **Who can think of a number greater than 500 that would be a multiple of 25?** (e.g. 800, 675, 725, 950 etc)



i A number line showing negative numbers can be drawn horizontally and vertically. When a number line is vertical the positive numbers are always above zero – going up. The negative numbers are below zero – going down. (Think of a lift or a thermometer.) Use both types of number lines to help children visualise the position of negative numbers.



- ➞ Write on the board multiples of 100, 50 and 25, e.g., **300, 175, 50, 125, 500**. Use different colours to identify various multiples.
- ➞ Ask: **Who can circle a number that is a multiple of 100?** (300, 500) **How do you know?** (they have a zero in the tens and units place)
- ➞ Ask: **Who can circle a number that is a multiple of 50?** (50, 300, 450, 500) **How do you know?** (all multiples of 50 have a zero in the tens and units place or a five in the tens place and a zero in the units place)
- ➞ Ask: **Why do some of the multiples of 50 have the same tens and units digits as the multiples of 100?** (50 is half of 100, or 50 add 50 is 100)
- ➞ Ask: **Who can circle a number that is a multiple of 25?** (50, 125, 175, 300, 450, 500) **How do you know?** (all multiples of 25 have the tens and units digits of 25, 50, 75 or 00)
- ➞ Ask: **Why do some of the multiples of 25 have the same tens and units digits as the multiples of 50 and 100?** (because two lots of 25 is 50 and four lots of 25 is 100)
- ➞ Count in steps of 25 up to 500. Write the numbers on the board.
- ➞ Ask: **Can you see any patterns in the numbers that have been written?** (the tens and units digits have a repeating pattern of 25, 50, 75 and 00)
- ➞ Ask questions such as: **What is the multiple of 25 that comes before/after 400/ 350? What is the number that is 25 more/less than 200?** Ask: **How can we be sure these numbers are multiples of 25?**
- ➞ Count backwards in twenty-fives from 500 to 0.
- ➞ Using a blank number line with 0 written in the middle, suggest to the children that each interval is worth 25.
- ➞ Ask: **Who can mark in where 100/50/75/25 would be?** Count back from 100 to 0 in twenty-fives. Ask: **What happens when we get to zero? Can we go on?** (yes) Ask: **What do you notice about the numbers counted?**
- ➞ Continue counting in steps of 25 until -500 is reached.
- ➞ Demonstrate on the number line that as you move (left or down) away from 0 into negative numbers the numbers become less in value, i.e. -125 is greater than -200, but less than -100.
- ➞ Ask questions: **What is the multiple of 25 that comes before -400?** (-375) **after 400?** (-425) **the number that is 25 more than -200?** (-175) **25 less than -350?** (-375)

Y4 Numbers and the number system

Suggested order: **Spring Term, Week 7, Lesson 2**Pupil Book 2:
Counting in 25s

36

Pupil consolidation*Refresher*

Children copy and complete each table adding or subtracting 25 from the numbers given.

Practice

Children write the sequence of numbers formed by adding or subtracting 25 on their way to the treasure.

Extension CM:
Counting in 25s game

33

**Extension**

Resources 2 playing pieces; a blank die labelled with the numbers +25, -25, +50, -50, 0, 0

In pairs, children place their playing piece in the centre of the board on 0. They move their piece according to the number on the die when thrown, i.e. one place forward for 25 or backwards for -25, two places forward for 50 or two backwards for -50. The first person to reach 300 exactly is the winner.

Plenary (about 10 to 15 min)

- ➡ Write about 20 numbers on the board between -100 and 300, including numbers that are multiples of 25 and some that are not, e.g. **250, -100, 160, 214, -50, 175**. Using two different colours or different criteria such as circle, underline, cross, ask: **Who can circle/colour a number that is a multiple of 25?**
- ➡ Invite individual children to identify numbers.
- ➡ Ask: **How can we be sure these numbers are multiples of 25?** (the numbers have the tens and units digits of 25, 50, 75 or 00; they are also multiples of 50 and 100)
- ➡ Point to specific numbers, e.g. -50. Ask questions such as: **What is the multiple of 25 that comes before/after -50?** Repeat with other numbers. **What is the number that is 25 more than -100?** (-75) **What is the number that is 25 less than 250?** (225)
- ➡ Count as a class in steps of twenty-five from -100 to 500.

Homework CM:
Counting in 25s

34

Homework (about 20 min)*Refresher*

Children complete each table adding or subtracting 25 from the numbers given.

Practice

- 1 Children fill in the missing addition and multiplication facts related to counting in twenty-fives.
- 2 Children fill in the answers to make the number sentences complete.

Reasoning about numbers

Objectives ● To solve mathematical problems or puzzles, recognise and explain patterns and relationships, generalise and predict.
● 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 a number 6 card; exercise books or plain paper

- ➞ Hold up the number 6 card.
- ➞ Write the numbers **1, 2, 3** and **4** on the board.
- ➞ Say: **We are going to investigate how many different ways we can make 6 by using these 4 digits. We can use each of the numbers once only, but we can use any of the four operations: +, −, ×, ÷.**
- ➞ Demonstrate some examples, e.g. $6 = (21 + 3) \div 4$; or $6 = (3 \times 4) \div (1 \times 2)$.
- ➞ Discuss each example and how the answer is 6. Remind children that brackets are put around things that need to be worked out first.
- ➞ Say: **With your partner try using each of the digits 1, 2, 3 and 4 to see if you can find any other ways of making 6. You can use any of the four operations. Do not give your answers to anyone. I will stop you in a few minutes to see what you have found.**
- ➞ Give the children between 5 and 10 minutes to work on this.
- ➞ Draw the children's attention back to the board.
- ➞ Ask: **Can anyone write one of their answers on the board?** (answers will vary)
- ➞ Invite children to write examples on the board, discussing each one as it is written to check the criteria have been met.
- ➞ Say: **We are now going to investigate if it is possible to make totals other than 6 using the same numbers and operations as before. Our task is to see if we can make all of the numbers between 1 and 6.**
- ➞ Write the numbers **1** to **6** one under the other on the board.
- ➞ Say: **With your partner try using each of the digits 1, 2, 3 and 4 to see if you can find any of the numbers we need. You can use any of the four operations. Do not give your answers to anyone. I will stop you in a few minutes to see what you have found.**
- ➞ Give the children between 5 and 10 minutes to work on this.
- ➞ Draw the children's attention back to the board.
- ➞ Ask: **Can anyone write one of their answers on the board?** (answers will vary) Continue until the numbers have been exhausted.
- ➞ Keep these examples for use later in the lesson.

$$(3 + 4 + 1) - 2 = 6$$

$$(4 - 2) + 1 + 3 = 6$$

$$(3 - 2) + 1 + 4 = 6$$

$$(12 \div 4) + 3 = 6$$

$$(3 \times 4 \times 1) \div 2 = 6$$

$$1 = (3 \times 2) - 4 - 1$$

$$2 = (3 + 2 + 1) - 4$$

$$3 = (21 \div 3) - 4$$

$$4 = (14 \div 2) - 3$$

$$5 = (3 \times 4) \div 2 - 1$$

$$6 = (12 \div 4) + 3$$

Y4 Solving problemsSuggested order: **Spring Term, Week 7, Lesson 3**Pupil Book 2:
Number investigations

37

Pupil consolidation**Refresher**

Children copy and complete the number sentences in their books. Remind children that calculations inside brackets are performed first.

Practice

- 1 Investigate how many different ways a total of 6 can be made by using the digits 1, 2, 3 and 4 and any of the 4 operations, $+$ $-$ \times \div .
- 2 Using the numbers 1, 2, 3 and 4 and the 4 operations, children investigate if it is possible to make the totals 7 to 20.

Extension

Continue the investigation started in the Pupil Book extending the range of totals to be found to beyond 20 up to 30 or 40.

Plenary (about 10 to 15 min)

- Go through the questions children have worked on independently.
- Ask children to explain their findings for number patterns using the digits 1, 2, 3 and 4 and any of the 4 operations.
- Write examples on the board for the numbers 7 to 40 (you may prefer to only go through a selection of numbers, as time allows, e.g. numbers to 20, or odd numbers, or numbers at random).

Reasoning about numbers

Objectives

- To solve mathematical problems or puzzles, recognise and explain patterns and relationships, generalise and predict.
- To explain methods and reasoning about numbers orally and in writing.

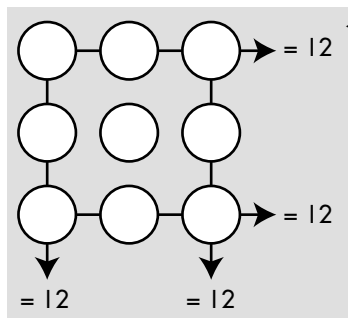
Vocabulary number names; multiple; odd; even; add; how many; altogether; total; right; wrong; next; consecutive; rule; relationship; sort; classify; property; how did you work it out?

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 number cards 1–9



- ➡ Draw the diagram of nine circles (see opposite) on the board.
- ➡ Place the number cards 1 to 9 on the side of the board.
- ➡ Say: **We are going to investigate whether it is possible to place the numbers 1 to 9 in the circles so that each row adds up to 12.**
- ➡ Distribute the 1–9 number cards to each pair. Say: **With your partner, use your number cards 1 to 9 to see if you can find combinations of numbers that total 12. You may only use each number once in a row. Write your combinations down. Do not give your answers to anyone. I will stop you in a few minutes to see what you have found.**
- ➡ Give the children about 5 minutes to work on this.
- ➡ Draw the children's attention back to the board. Ask: **Can anyone place the numbers 1 to 9 in the circles so that the row totals 12?**
- ➡ Invite children to the board to show their answers. Ask them to explain their working out.
- ➡ Explain that it is easier to find the solution if we work in a systematic manner.
- ➡ Say: **Firstly we need to find which combinations of numbers add together to make 12. It is easier if we find all of the combinations that start with number 9 then find all those that begin with number 8 and so on.**
- ➡ Ask: **Which three numbers add together to make 12?** (9, 2, 1; 8, 3, 1; 7, 4, 1; 7, 3, 2; 6, 5, 1; 6, 4, 2; 5, 4, 3) Write these on the board as shown opposite
- ➡ Ask: **Was it possible to use all of the numbers when making a total of 12?** (yes)
- ➡ Repeat the process using another number as the total, e.g. 20. Ask: **Which three numbers add together to make 20?** (9, 8, 3; 9, 7, 4; 9, 6, 5; 8, 7, 5)
- ➡ Ask: **Was it possible to use all of the numbers when making a total of 20?** (no) **Which numbers were not used?** (1, 2)
- ➡ Ask: **Why was it not possible to use these two numbers?** (because 9 and 1 make 10 and an extra number, 10, would have been needed, 8 and 2 make 10 and an extra number, 10, would have again been needed)

921 831 741 651 543
732 642

Pupil Book 2:
Number combinations

38

Pupil consolidation*Refresher*

Children use the numbers 1 to 9 to find combinations of three numbers that make the total 15.

Practice

Children copy the diagrams into their books. They investigate whether it is possible to arrange the numbers 1 to 9 in the circles so that each side of the pentagon makes the total shown in the centre of the pentagon.

Support CM:
Number combinations

33

**Support**

Children use the numbers 1 to 9 to find combinations of two or three numbers that make the totals shown on each lock.

Extension

Children repeat the Practice activity, this time investigating whether it is possible to arrange the numbers 1 to 9 in the circles so that each side of the pentagon makes the total 17.

Plenary (about 10 to 15 min)

- Discuss the questions the children have worked on independently.
- Begin with the rows totalling 15. Ask them to describe any patterns they could see in the layout of the numbers.
- Continue with the Practice activity, this time investigating whether it is possible to arrange the numbers 1 to 9 in the circles so that each side of the pentagon adds to make the total 16. Record on the board the combinations of numbers the children found that added to make 16. Ask them to explain how they used this information to position their numbers in the circles.

Reasoning about numbers

Objectives ● To make and investigate a general statement about familiar numbers by finding examples that satisfy it.

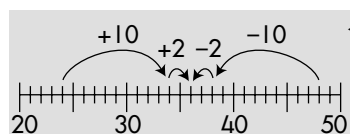
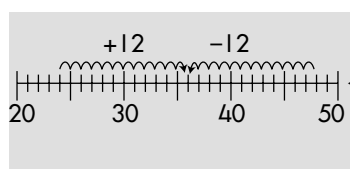
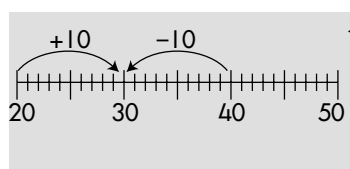
Vocabulary number names; multiple; odd; even; add; how many; altogether; total; right; wrong; how did you work it out?

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 0–100 blank number lines with marked intervals



Ask: **Can anyone think of a quicker or easier way to find the number that is half way between 24 and 48?** (find the difference between the two numbers, i.e. $48 - 24 = 24$. Halve 24 which is 12, so that there is the same number on either side of each number, and add 12 to 24 or subtract 12 from 48. The answer is 36)

i When half of the difference between two even numbers is odd, the middle number will be odd, e.g. differences of 2, 6, 10, 22, 26 etc. will give an odd answer.

Ask: **I have thought of two even numbers, 20 and 40. What number is half way between these two numbers?** (30) **How do you know?**

(because 30 is midway between 20 and 40; if you add 10 to 20 and subtract 10 from 40 the answer is 30)

Say: **To find the number that is half way between or in the middle of 2 numbers there must be the same number of numbers on either side of the middle number.**

Demonstrate using a number line.

Repeat using another two even numbers between 20 and 50, e.g. 24 and 48 (36) Demonstrate using the number line counting in from both ends showing that on either side of 36 there are 12 numbers.

Say: **This has taken a long time to work out. Rather than counting along in ones, try counting in twos or fives if the numbers are quite close together, or tens if they are further apart.**

Ask: **Look at the two middle numbers we have found so far, 30 and 36. Can you tell me something about these numbers that is the same?** (they are multiples of 3 and 6; they are both even numbers)

Say: **We are going to investigate the statement "Half way between all even numbers is an even number".** Write this on the board.

Ask children for two even numbers between 20 and 60. Use the same methods as outlined above depending on the level of understanding of the children.

Include numbers that are close together, e.g. 56 and 58.

Ask: **What number is in the middle or half way between these numbers?** (57) **Is the statement always correct?** (no) **How could we make the statement correct?** (half way between even numbers is an even number except when half of the difference between the two numbers is odd, e.g. half of two numbers with a difference of 6 is 3 [36, 42; the number half way is 39])

Pupil Book 2:
Finding halfway between
two numbers

39

Pupil consolidation**Refresher**

- 1 Children find the number that is halfway between each set of two even numbers given. Half of the difference between the two numbers is even so an even number results.
- 2 Children find the number that is halfway between each set of two even numbers given. Half of the difference between the two numbers is odd so an odd number results.

Practice

Children investigate the statements “Half way between two multiples of 10 is a multiple of 5” and “Half way between two multiples of 8 is a multiple of 4” to see if they are always true. They write a statement about their findings.

Extension

Children can further their investigations to include statements, “Half way between two multiples of 6 is a multiple of 3” and/or “Half way between two multiples of 100 is a multiple of 50”. Ask children to consider and write their conclusions as to whether these statements are true.

Plenary (about 10 to 15 min)

- Choose some of the examples children worked on independently, some easy, some more challenging. Write the statement on the board.
- Ask for examples they found that supported the statement.
- Were there any examples found that did not support the statement? What were they?

Understanding multiplication and division/Rapid recall of multiplication and division facts/Checking results of calculations

Objectives ● To understand the principle (not the name) of the commutative law as it applies to multiplication. ● To know by heart multiplication facts for 2, 3, 4, 5, and 10 times tables. ● To derive quickly division facts corresponding to the 2, 3, 4, 5 and 10 times tables. ● To check with the inverse operation

Vocabulary lots of; groups of; times; multiply; multiplied by; multiple; product; inverse; double; half; halve; divide; divided by; divided into; divisible by; share; share equally; group; factor; remainder; add; subtract; equals

i This lesson provides an opportunity for you to evaluate and assess the children's understanding and mastery of the multiplication and division facts studied so far. Some children will know these facts well, others will need further reinforcement of the mental strategies suggested and further practice. Use the initial part of the lesson to determine which facts need further explanation or development. Refer to previous terms' work for the strategies used to teach the various multiplication and division facts.

↓ To give some children a chance, ask easier questions of those facts you know they have greater knowledge, e.g. x , $\div 2$, 5, 10 or up to 5 times the number fact chosen.

↑ If the two challengers are confident of the number facts x , $\div 2$, 3, 4, 5 and 10, use x and \div involving 6, 7, 8, 9 times these numbers, or use multiplication facts that involve strategies taught last term which involve doubling and halving.

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)

➡ Revise multiplication and division facts for 2,3,4,5 and 10 with the class. Play the game "Round the World". The children are seated at their tables. The challenge is to see if any child can move around the class answering all of the number facts correctly and more quickly than their challenger.

One child stands behind the chair of another who becomes the challenger. Ask a multiplication or division fact. The child who answers correctly in the quickest time is the winner. If the winner is the child who is already standing, he or she moves along behind the next challenger until a new challenger wins. If the challenger wins, the two children swap positions, i.e. the new winner stands while the other child takes their seat. Continue until the game has gone all the way around the class.

➡ Revise those multiplication facts you feel the children need to practise. Encourage the children to use their knowledge of key facts to work out all unknown facts and doubles to work out the 4 times table.

➡ Remind children that if they know the answer to one multiplication fact, e.g. $4 \times 6 = 24$, they also know the answer to $6 \times 4 = 24$. Write some multiplication facts on the board, e.g. **3×5 , 9×4 , 7×3** .

➡ Ask: **Who can tell me the answers to these facts?** (15, 36, 21)

➡ Ask: **Who can tell me the other multiplication fact you know for $9 \times 4 = 36$?** ($4 \times 9 = 36$) etc.

➡ Write some division facts on the board, e.g. **$30 \div 5 =$, $21 \div 3 =$** .

➡ Ask: **Who can tell me the answers to these facts?** (6, 7)

➡ Remind children that they can check if the answer is correct by using the inverse operation. Ask: **What is the inverse of division?** (multiplication)

➡ Ask: **What multiplication fact would you use to answer $30 \div 5 =$ or $21 \div 3 =$?** ($6 \times 5 = 30$; $7 \times 3 = 21$)

Pupil Book 2:
Revising multiplication
and division facts

40

Pupil consolidation**Refresher**

Children write the number sentence and answer to the calculations given. They write the related multiplication and division facts.

Practice

- 1 Children choose a marble from each jar to make multiplication number sentences in their books.
- 2 Children choose a marble from each jar to make division number sentences in their books.

Support CM:
Revising multiplication
and division facts

34

Support

- 1 Children fill in the missing key facts for each number.
- 2 They use the key facts to help them work out the answers to each calculation.

Extension CM:
Revising multiplication
and division facts

34

Extension

- 1 Children use their knowledge of multiplication grids/tables to find the value of each letter.
- 2 They use the letters in the word DINOSAUR to make multiplication calculations by multiplying the numbers that stand for the letters in the words given.



Game 35; Game 36

Games Pack 2

Athletics arena; Donkey Derby

Plenary (about 10 to 15 min)

- Write three numbers on the board that make a number family, e.g. **4, 6, 24**.
Ask: **Who can tell me a multiplication fact using these numbers? Who can tell me a division fact using these numbers? Who can tell me another multiplication/division fact using these numbers?**
- Repeat with other number families, e.g. **8, 5, 40; 3, 7, 21**.
- Write two numbers on the board, e.g. **___, 5, 45**. Ask: **What number can I write to make the number family complete?** (9) Ask: **How do you know?** (because 5×9 equals 45 or $45 \div 5$ equals 9)
- Say: **Remember, we can use multiplication to help us work out our division facts.**

**Software: Rapid Maths 4**

Goo Station

Homework CM:
Revising the facts

35

Homework (about 20 min)**Refresher**

Children cut the puzzle along the dotted lines and jumble the pieces. They put the puzzle back together again by working out the answers to the multiplication facts. Store in an envelope for further practice.

Practice

Children cut the puzzle along the dotted lines and jumble the pieces. They put the puzzle back together again by working out the answers to the multiplication and division facts. Store in an envelope for further practice.

Rapid recall of multiplication and division facts/Checking results of calculations

Objectives ● To derive quickly doubles of multiples of 10 to 500, and the corresponding halves. ● To check with the inverse operation.

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

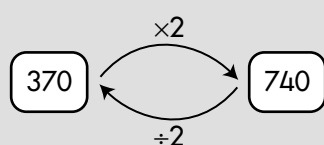
Oral work and mental calculation (about 5 to 10 min)

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

i In previous lessons on doubling numbers up to 50, the strategy taught was: to work out the double mentally we double the tens digit first then we double the units digit and add them together, e.g. double 43 is double 40 (80) add double 3 (6) equals 86. A similar strategy doubling the most significant number first is used to double multiples of 10.

i Another strategy could be 130×2 is the same as double 100 which is 200 add double 30 which is 60 so $200 + 60 = 260$.

↑ Include examples where halving the tens number results in the units digit of 5, e.g. 370 (185); 950 (475).



Draw a diagram on the board to illustrate the inverse relationship between halving and doubling.

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

- ➡ Ask: **Who can tell me a multiple of 10 between 0 and 100?**
- ➡ Write two of these on the board, e.g. **40, 60.**
- ➡ Ask: **How do you know it is a multiple of 10?** (all multiples of 10 have a zero in the units place)
- ➡ Ask: **Who can tell me a multiple of 10 between 100 and 200?**
- ➡ Write two of these on the board, e.g. **130, 180.**
- ➡ Repeat with multiples of 10 between 200 and 300; 300 and 400.
- ➡ Using the numbers written on the board, ask: **What is double 130?** (260)
Ask: **How do you know the answer to this?**
- ➡ Children should be able to explain an efficient strategy. (e.g. I know that $100 + 100 = 200$ and $30 + 30 = 60$ so $200 + 60$ equals 260.)
- ➡ Say: **To work out the double of three-digit multiples of 10 in our head we double the hundreds number first then we double the tens number and add them together.** Repeat with the other numbers on the board.
- ➡ Revise halving numbers that are multiples of 10.
- ➡ Ask: **Who can tell me a multiple of 10 between 500 and 1000?**
- ➡ Ask: **What is half of 620?** (310)
- ➡ Ask children to explain their method of working out the answer. (e.g. half of 600 is 300 and half of 20 is 10)
- ➡ Ask: **What is half of 740?** (370)
- ➡ Ask: **What did we partition 740 into to work out half?** (700 and 40)
- ➡ Say: **To work out half of three-digit numbers that are multiples of 10 in our head we halve the hundreds number first then we halve the tens number and add them together.**
- ➡ Ask: **What is half of 700?** (350). **What is half of 40?** (20) Say: **350 add 20 equals 370.** Ask: **How can we check if the answer is correct?** (we can double the answer: double 370 equals 740)
- ➡ Repeat with other numbers used throughout the lesson.

Pupil Book 2:
Doubles and halves**Pupil consolidation****Refresher**

Children write, in their books, half of each number shown. They check their answers by doubling.

Practice

- 1 Children write, in their books, the double of each number shown.
- 2 Children write, in their books, half of each number shown.

Extension

Resources twenty multiples of 10 cards up to 500, e.g. 30, 70, 190, 320, 460

Cards are placed in a pile face down on the table. Children take turns to turn over a card and say the number that is double the number shown. If they are correct they keep the card. Repeat, this time halving the number shown. A variation for each card is to keep halving the new number as far as possible.

Plenary (about 10 to 15 min)

Resources about 20 multiples of 10 cards up to 500

- Count on and back in multiples of 10 to 500 as a class. Work around the classroom in clockwise direction doubling and halving in alternation, e.g. one child says a multiple of 10, the next child halves the number. The following child says a multiple of 10 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 10 card between 0 and 500. 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 10 card, the class halve the number and call out the answer. Repeat, asking individual children to answer and explain their strategy.

Understanding multiplication and division/Rapid recall of multiplication facts/Mental calculation strategies (x)

Objectives


- To understand the principles (not the names) of the commutative and associative laws as they apply to multiplication.
- To begin to know multiplication facts for the 6 times table.
- To use closely related facts (e.g. develop the x6 table from the x4 and x2 tables).

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


 $2 \times 6 = 12$


 $6 \times 2 = 12$

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 six times table. The concept of “key facts” beginning 1 x, 2 x, 5 x, 10 x (introduced in Year 3) is used to derive the remaining number facts for each multiplication table. The use of closely related facts, i.e. developing the x 6 table from the x 4 and x 2 tables, is introduced. Children may have also developed other quick and effective strategies, e.g. double x 3; or use x 5 and x 1 to work out the answer. These are perfectly acceptable. Remind children that the strategies being taught in this lesson are yet more quick and effective ways of recalling the six times table.

$5 \times 6 =$

 $5 \times 4 + 5 \times 2$

↓ If children find this difficult, it is likely they do not have secure knowledge of the four times table. Revise using the strategy of doubling the two times table.

8×6
 8×4
 8×2
 $32 + 16 = 48$

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 four array cards with 1 row of 6, 2 rows of 6, 5 rows of 6, 10 rows of 6

- ➞ Place the card with the array showing 2 rows of 6 on the board. Ask: **What multiplication fact can we write for this picture?** ($2 \times 6 = 12$) Draw 2 loops to show this and write the fact on the board.
- ➞ Ask: **Can anyone tell me another multiplication fact for this picture?** ($6 \times 2 = 12$) Draw 6 loops to show this and write the fact on the board.
- ➞ Repeat with the other array cards.
- ➞ Remind children that if they know the fact e.g. $6 \times 5 = 30$ they also know the answer to the fact $5 \times 6 = 30$.
- ➞ Ask: **Look carefully at the array cards. Can you tell me something about them?** (they are the key facts for the sixtimes table)
- ➞ Write down the four key facts on the board leaving appropriate space for the remaining facts. Work out the other facts using the key facts to help, e.g. 9×6 : $10 \times 6 = 60$ so 9×6 is 6 less so $9 \times 6 = 54$.
- ➞ When all the facts have been written, look at the answers. Count forwards and backwards in sixes.
- ➞ Rub out one of the factors e.g. 5. Ask: **How many sixes make 30?** (5)
- ➞ Repeat with other numbers, e.g. 10. Ask: **How many sixes make 60?** (10)
- ➞ Say: **When there is a missing number we write it like this:** $\square \times 6 = 30$.
- ➞ Write other examples for the children to answer e.g. $\square \times 6 = 18$.
- ➞ Show the children how the four and two times tables can be used to work out the six times table.
- ➞ Show an array card showing 5×6 , i.e. 5 rows of 6. Demonstrate how this is the same as 5×4 add 5×2 .
- ➞ Ask: **What is 5 times 4?** (20) **What is 5 x 2?** (10)
- ➞ Say: **You think to yourself, 5×6 is the same as $5 \times 4 = 20$ add $5 \times 2 = 10$. $20 + 10 = 30$.**
- ➞ Repeat with the other array cards.
- ➞ Show how the four and two times tables can help work out the six times table, e.g. write 8×6 .
- ➞ Say: **8×6 is 8×4 equals 32 add 8×2 equals 16. 32 add 16 equals 48.**

Pupil Book 2:
Finding out about 6s

42

Pupil consolidation**Refresher**

Using the key facts, children work out the missing factors or the product. They copy and complete the number sentences in their books.

Practice

Children use the strategy $\times 6 = \times 4$ add $\times 2$ to find the answers to the six times table. They write the number sentence and show their working in their books. The pegboards show the thinking strategy and children should be discouraged from counting the pegs to find the answers.

Support CM:
Multiples of 6 game

35

Support

Resources one 1–12 die, 24 counters (two different colours)

Children play the game “Multiples of 6”. They take turns to throw the die and multiply the number by 6. If they answer correctly they place one of their coloured counters on the square. They keep playing until all of the squares have been covered. If a player throws a number that has already been covered the other player has a turn. The player with the most squares in their colour is the winner.

Extension

Resources one 1–12 die



In pairs, children take it in turns to throw the die. They multiply the number landed on by 4. The aim is to improve rapid recall so children should be aiming to answer in three seconds or less.

Plenary (about 10 to 15 min)

☞ Count up to 60 in sixes. Review using the four key facts to help work out unknown facts as in the main part of the lesson.

$$7 \times 6$$

$$7 \times 4 \quad 7 \times 2 \\ 28 + 14 = 42$$

☞ Ask: **What key fact would you use to work out 9 sixes, 7 times 6?**

☞ Ask: **What is 3×6 ? etc** (18 etc) **How many sixes make 54, 24?** etc.

☞ Ask quickfire questions around the class.

☞ Revise the use of the $\times 4$ add $\times 2$ strategy for working out the six times table by writing number facts for 6 on the board one at a time. Ask children to explain how they would use the strategy to work out the answer. Show children that 7×4 is 28 and 7×2 is 14 so $28 + 14$ equals 42 using a diagram.

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Goo Station

Homework CM:
Know your 6 times table

36

Homework (about 20 min)**Refresher**

- 1 Children use the key facts to help fill in the missing multiples of 6.
- 2 Use the key facts to help answer the calculations.

Practice

Children use the strategy $\times 6 = \times 4$ add $\times 2$ to find the answers to the six times table. They write the number sentence and show their working in the spaces provided.

Understanding multiplication and division/Rapid recall of multiplication facts

Objectives ● To understand the principle (not the name) of the commutative law as it applies to multiplication. ● To begin to know multiplication facts for the 8 times table.

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

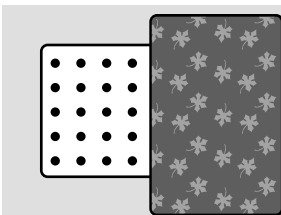
i At this stage, it is important to establish with the children that it is easier to use facts that they already know to help them with new tables rather than building up a complete new set of facts. Two strategies are used in this lesson to build up the eight times table. The concept of “key facts” beginning 1 x, 2 x, 5 x, 10 x (introduced in Year 3) is used to derive the remaining number facts for each multiplication table. The use of doubling the four times table is revised from last term.



$$2 \times 8 = 16$$



$$8 \times 2 = 16$$



↓ If children find this difficult it is likely they do not have secure knowledge of the four-times table. Revise using the strategy of doubling the two times table to obtain the answers to the four-times table.

$$\begin{array}{l} 8 \times 7 \\ 4 \times 7 \quad 4 \times 7 \\ 28 + 28 = 56 \end{array}$$

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 four array cards with 1 row of 8, 2 rows of 8, 5 rows of 8, 10 rows of 8; one piece of blank A4 card

- ➞ Place the card with the array showing 2 rows of 8 on the board.
- ➞ Ask: **What multiplication fact can we write for this picture?** ($2 \times 8 = 16$) Draw 2 loops to show this.
- ➞ Ask: **Can anyone tell me another multiplication fact for this picture?** ($8 \times 2 = 16$) Draw 8 loops to show this. Write both facts on the board.
- ➞ Repeat with the other array cards.
- ➞ Remind children that if they know the fact e.g. $8 \times 5 = 40$ they also know the answer to the fact $5 \times 8 = 40$.
- ➞ Ask: **Look carefully at the array cards. Can you tell me something about them?** (they are the key facts for the eight times table)
- ➞ Write down the four key facts on the board leaving appropriate space for the remaining facts. Work out the other facts using the key facts to help, e.g. 9×8 : $10 \times 8 = 80$ so 9×8 is 8 less so $9 \times 8 = 72$.
- ➞ When all the facts have been written look at the answers. Count forwards and backwards in multiples of 8.
- ➞ Rub out one of the factors e.g. 5. Ask: **How many eights make 40?** (5)
- ➞ Repeat with other numbers, e.g. 10. Ask: **How many eights make 80?** (10)
- ➞ Say: **When there is a missing number we write it like this $\square \times 8 = 40$.**
- ➞ Write other examples on the board for the children to answer e.g. $\square \times 8 = 16$ etc.
- ➞ Show an array card showing e.g. 8 columns of 5 with four columns of 5 covered with blank card.
- ➞ Ask: **What does the picture show?** (4×5 or 4 groups of 5)
- ➞ Ask: **What is 4 times 5?** (20)
- ➞ Remove the card to show 8×5 .
- ➞ Say: **We can work out what 8×5 is by using the four times table and doubling.**
- ➞ Point to the array card and say: **You think to yourself, I know that 4×5 is 20 so 8×5 is double 4×5 . Double 20 is 40.**
- ➞ Repeat with another array card.
- ➞ Reinforce this doubling strategy by writing on the board various times tables involving 8, e.g. 8×7 . Show how the four times table can help.

Pupil Book 2:
The 8-times table

43

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

In their books, children write the multiplication fact for the four times table as indicated. They double their answer to find the answer to the eight times table and write the number fact beside the four times table.

Extension



Resources one 1–12 die

Children take it in turns to throw the die. They multiply the number landed on by 8. The aim is to improve rapid recall.

Plenary (about 10 to 15 min)

- ➡ Count up to 80 in eights. 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 9 eights, 7 times 8, 11 multiplied by 8?**
- ➡ Ask: **What is 3 x 8?** etc (24 etc) **How many eights make 24, 48?** etc.
- ➡ Ask quickfire questions around the class.
- ➡ Revise the use of the double x 4 strategy for working out the eight times table by writing number facts for 8 on the board one at a time. Ask children to explain how they would use the strategy to work out the answer.
- ➡ Show children that 8×7 can be easily worked out by thinking 4×7 is 28 and another 4×7 is 28 so 8×7 is 56 using a diagram as in the main part of the lesson.



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Goo Station

Understanding multiplication and division/Mental calculation strategies (\times and \div)/Problems involving “real life” and money/Checking results of calculations

Objectives ● To divide a whole number of pounds by 2, 3, 4, 5 or 10 to give £. ● To use known number facts and place value to multiply and divide a whole number by 10. ● To use \times and \div to solve word problems involving numbers on “real life” and money, using one or more steps: explain and record methods. ● To check with the inverse operation.

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; 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 or 3.4.

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

Resources about five prepared multi-step word problems written on the board/chart prior to lesson that suggest multiplying and/or dividing a whole number of pounds (money) by 2, 3, 4, 5 or 10. (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.

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

i In this situation there is a lot of irrelevant information. Ensure children realise that some information is helpful to give us a picture but does not necessarily help to work out the answer

i At this level it would be expected that children not only give a context answer but also answer the question in full.

➡ Read a word problem on the board/chart to the class, e.g. **4 children collect £32 for charity. Each child collects the same amount. How much does each child collect?**

➡ 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?** (4 children, £32, same amount, how much each?)

➡ Underline the relevant words/phrases.

➡ Ask: **What maths operation do we need to use to find the answer?** (\div)

➡ Ask: **What calculation is required?** ($32 \div 4$)

➡ Ask: **What is the answer?** (8) **How did you work it out?** Encourage children to detail any strategy used. (e.g. $8 \times 4 = 32$ so $32 \div 4 = 8$)

➡ Explain that to answer the question properly we need to read the problem again.

➡ Say: **What do we need to find out?** (how much each child collected)

➡ Ask: **What is the answer to the problem?** (the children collected £8 each)

➡ Read a problem involving more than one step to the class, e.g. **Sam and his brother get pocket money every week. They both save all of their money. Sam has saved £21 in 7 weeks. His brother has saved £14 in the same time. How much more does Sam get per week than his brother?**

➡ Repeat the above steps.

➡ Ask: **What is the answer to the word problem?** (Sam gets £1 per week more than his brother)

➡ Continue this process with other multi-step word problems.

Pupil Book 2:
Solving word problems



Pupil consolidation

Refresher

For each word problem, children decide which operation is required to answer the question. They calculate the answer for each problem in their books.

Practice

For each word problem, children find the important information, decide which operation is required to answer the question and calculate the answer for each problem in their books. They check to see the answer relates to the question.

Extension CM:
Writing word problems



Extension

Children use the pictures and information provided to write their own division word problems using the numbers 2, 3, 4, 5, and 10. Children can swap their work with a partner and answer each other's questions.



Game 39

Games Pack 2

Dotty dragon

Plenary (about 10 to 15 min)

- Read through some of the word problems the children have worked on independently.
- Ask children to identify the important words or information from each. Ask children 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.
- Emphasise the re-reading of the problem to make sure the answer corresponds to the question asked.

Mental calculation strategies (x)

Objectives ● To use known number facts and place value to multiply whole numbers by 10. ● To use closely related facts (e.g. to multiply by 9, multiply by 10 and adjust).

Vocabulary lots of; groups of; times; multiply; multiplied by; multiple; subtract; equals; product

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

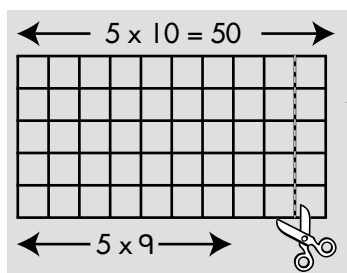
Choose an activity from Strand 2, Topic 2.4 or 2.6.

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

Resources set of about ten multiplying by 10 example cards, e.g. 16×10 ; 24×10 ; large square paper cut into various arrays of 10, e.g. 5 rows of 10, 3 rows of 10

i It is not necessary for children to answer this as most children will not know the answer immediately.

i Both of these methods are effective and children should be praised for using these mental strategies. Remind children that the strategy being taught in this lesson is yet another quick and effective way of working out the answer.



↓ You may like to do another easy $x 9$ facts with the class, e.g. 3×9 using an array of 3×10 to show the process.

- ➡ Revise multiplying by 10.
- ➡ Write e.g. 13 on the board. Ask: **What is 13 times 10?** (130) Write **130** under 13 in the correct columns, i.e. units under units, tens under tens, etc.
- ➡ Ask: **What has happened to the number 13?** (the 13 has moved one place to the left when multiplied by 10)
- ➡ Hold up the example cards one at a time, e.g. 24×10 . Ask the class or individual children to call out the answer.
- ➡ Ask: **Who can work out the answer to 13×9 ?**
- ➡ Children may suggest the following methods: $10 \times 9 = 90$ and $3 \times 9 = 27$, so $90 + 27 = 117$ or $13 \times 10 = 130$, $130 - 13 = 117$.
- ➡ Say: **We need to know of quick ways to work out calculations like this. We are going to use the strategy that uses our knowledge of multiplying by 10 to help us multiply by 9.**
- ➡ Ask: **Why would 10 help us to multiply by 9?** (it is one less than 10; it is close to 10)
- ➡ 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 5×9 ?** (45) Write: **$5 \times 9 = 45$** on the board.
- ➡ Say: **When we see $x 9$ we can think of $x 10$.**
- ➡ Demonstrate, using the square paper array of 5×10 . Ask: **What is 5×10 ?** (50) Cut off one row of 5 to show 5×9 . Ask: **How many have I removed?** (5) **How many are left?** (45)
- ➡ Ask: **If I think that 5 lots of 9 is 5 lots of 10, how many extra lots of 5 have I got?** (1 extra lot of 5)
- ➡ Say: **So 5×9 is the same as 5×10 (50), take away 5, equals 45. Let's try a harder example.** Write: **$15 \times 9 =$** on the board.
- ➡ Say: **We multiply 15 by 10.**
- ➡ Ask: **What do I need to do to the 10 to multiply it by 9?** (subtract 15)
- ➡ Say: **We can write this as $15 \times 9 = (15 \times 10) - 15 = 150 - 15 = 135$.**
- ➡ Say: **$15 \times 9 = 135$.**
- ➡ Repeat the above process with other examples, e.g. 7×9 , 9×9 , 18×9 , 13×9 , 16×9 .

Pupil Book 2:
Finding out about 9

45

Pupil consolidation*Refresher*

Children multiply the number shown on each cash register by 10 and write the answer in their books.

Practice

- 1 Children practice multiplying by 9 using the mental strategy shown. They record the thinking process in their books.
- 2 Children work out the total cost for the tiles used if each tile costs £9. They record the working in their books.

Support CM:
More about nine

36

Support

Children practice multiplying by 9 using the mental strategy shown. They record the thinking process in the space provided on the worksheet.

Extension

Resources approximately twenty number cards between 1 and 50

In pairs, children shuffle the set of number cards and place the cards face down on the table. They take turns to turn over a number card and multiply the number by 9. The partner checks to see if they are correct. The card is kept if the answer is correct and the person with the most cards is the winner.

Plenary (about 10 to 15 min)

- Write some $\times 9$ examples on the board, e.g. 6×9 , 14×9 , 18×9 as in the lesson.
- Ask children to give the answer and explain how they worked it out using the method of $\times 10$ and adjust.

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Goo Station

Homework CM:
Finding out about nine

37

Homework (about 20 min)*Refresher*

Children practice multiplying by 9 using the mental strategy shown. They record the thinking process in the space provided on the worksheet.

Practice

Children use the mental strategy for multiplying by 9 to find their way around the obstacle course. They record the answer only in the space provided.

Mental calculation strategies (x)

Objectives ● To use known number facts and place value to multiply whole numbers by 10. ● To use closely related facts (e.g. to multiply by 11, multiply by 10 and adjust).

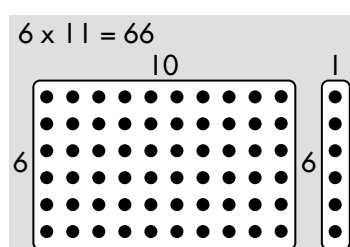
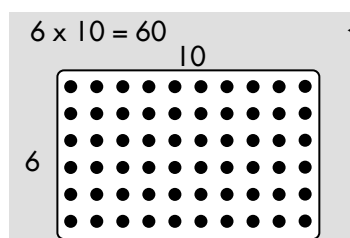
Vocabulary lots of; groups of; times; multiply; multiplied by; multiple; add; equals; product

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

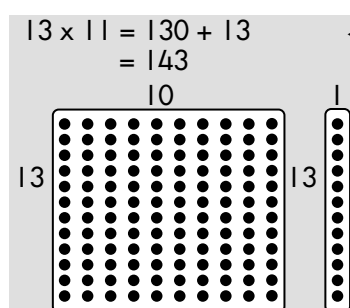
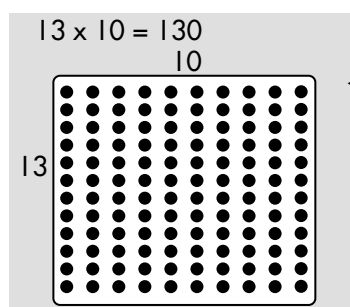
Choose an activity from Strand 2, Topic 2.4 or 2.6.

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

- ➞ Revise multiplying by 10. Ask quickfire questions around the class, e.g. 7×10 , 12×10 , 15×10 , 23×10 , 26×10 .
- ➞ Ask: **What is the answer to 5×11 ?** (55) ... **7×11 ?** (77) ... **9×11 ?** (99)
- ➞ Ask: **How do you know?** Children will probably refer to the pattern of the two digits being the same for the eleven times table.
- ➞ Say: **These are easy to remember because when we multiply a single-digit number by 11, the two digits in the answer are the same.**
- ➞ Ask: **How else could we work it out?** ($10 \times 5 = 50$ and $1 \times 5 = 5$, $50 + 5 = 55$; $10 \times 7 = 70$ and $1 \times 7 = 7$, $70 + 7 = 77$)
- ➞ Ask: **Why would 10 help us to multiply by 11?** (it is one more than 10; it is close to 10)
- ➞ Say: **When we multiply by 11 we can multiply by 10 first and then add the number we are multiplying 11 by.**
- ➞ Start with an easy example to demonstrate the mental process, e.g. Ask: **What is 6×11 ?** Say: **When we see $x \times 11$ we can think of $x \times 10$.**
- ➞ Demonstrate, using a diagram showing an array of 6×10 .
- ➞ Ask: **What is 6×10 ?** (60) Say: **We have 10 sixes. We need 11 sixes.**
- ➞ Ask: **How many more sixes do we need?** (1 more six)
- ➞ Add one more column to the diagram to symbolise 1×6 .
- ➞ Say: **So 6×11 is the same as 6×10 (60), add 1×6 (6), equals 66.**
- ➞ **Let's try a harder example.** Write: $13 \times 11 =$ on the board.
- ➞ Say: **We multiply 13 by 10.** Demonstrate, using a diagram showing an array of 13×10 .
- ➞ Ask: **What is 13×10 ?** (130) Say: **We have 10 lots of 13. We need 11 lots of 13. How many more lots of 13 do we need?** (1 more lot of 13)
- ➞ Add one more column to the diagram to symbolise 1×13
- ➞ Say: **So 13×11 is the same as 13×10 (130), add 1×13 (13), equals $130 + 13 = 143$.**
- ➞ Say: **We can write this as $13 \times 11 = (13 \times 10) + 13 = 130 + 13 = 143$.**
- ➞ Ask: **Is the pattern the same as when multiplying a single-digit number by 11?** (no, the digits in the answer are not the same)
- ➞ Say: **When we multiply larger numbers by 11 we use the strategy of multiplying by 10 to help work out the answer.**
- ➞ Repeat the above process with other examples, e.g. 15×11 , 23×11 .



↓ You may like to do another easy $\times 11$ fact with the class, e.g. 9×11 using an array of 9×10 to show the process.



Pupil Book 2:
Easy elevens

46

Pupil consolidation**Refresher**

- 1 Children multiply the number on each balloon by 10 and write the answer in their books.
- 2 They multiply the number on each balloon by 1 and write the answer in their books.

Practice

Children choose two numbers from each set of numbers shown. They multiply each number by 11, recording the working in their books.

Extension CM:
Easy elevens

36

**Extension**
Resources 18 counters (two different colours)

In pairs, children play the game, “Easy elevens”. They each have 9 counters of the same colour. In turns, each child chooses a number from the left-hand side and multiplies it by 11 using the strategy taught in the lesson. A counter is placed on the number if the calculation is correct. The game then operates on the same basis as “Noughts and Crosses”.

Plenary (about 10 to 15 min)

- ➡ Write some $\times 11$ examples on the board, e.g. 5×11 , 9×11 , 11×11 as in the lesson.
- ➡ Ask children to give the answer and explain how they worked it out using the $\times 10$ and adjust method.

**Software: Rapid Maths 4**

Goo station

Mental calculation strategies (x)/Pencil and paper procedures (x)

Objectives ● To partition (e.g. $23 \times 4 = (20 \times 4) + (3 \times 4)$). ● To develop and refine written methods for TU x U – partitioning.

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

i The standard method of multiplication is introduced at this stage. An emphasis is placed on the layout and importance of writing it correctly. In Year 4, two formal written methods are introduced, however only one method is taught in this lesson. The other formal method used in the NNS Framework is explained in Week 9 Lesson 4. If schools or teachers do not wish to introduce both methods they may choose the method they prefer. The Pupil Book pages of these lessons will provide enough pupil consolidation for the two lessons using the preferred method, as they cover similar mathematical content.

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)

- ➞ Revise the concept of partitioning two-digit numbers when multiplying by a single-digit number.
- ➞ Write 23×5 on the board. Ask: **Can anyone tell me a number that the answer could be close to?** (100) Ask children to explain how they worked out the approximate answer.
- ➞ Say: **To find an approximate answer we round 23 to the nearest 10 and multiply by 5.** Ask: **What is 20×5 ?** (100)
- ➞ Say: **When we calculate our answer, we must check that the answer is somewhere close to our approximate answer, 100.**
- ➞ Say: **Last term we did some work on multiplying larger numbers. We drew a grid diagram to help work out the answer.**
- ➞ Draw a grid on the board beside 23×5 .

20	3
100	15
- ➞ Ask: **Who can remember what we split 23×5 into to make the calculation easy to work out?** (20×5 and 3×5)
- ➞ Record this on the grid and work out the answer, i.e. $20 \times 5 = 100$ add $3 \times 5 = 15$; $100 + 15 = 115$

20	3
100	15
- ➞ Ask: **Look at our approximate answer of 100. Is the answer to 23×5 close to 100?** (yes)
- ➞ Write some other calculations on the board one at a time, e.g. **45×3 .**
- ➞ Ask: **What is the approximate answer for 45×3 ?** ($50 \times 3 = 150$) Write: **150** on the board.
- ➞ Ask: **How can we split 45×3 to make the calculation easy to work out?**
- ➞ Write: **$45 \times 3 = (40 \times 3) + (5 \times 3)$** on the board.
- ➞ Repeat for other examples. It is not necessary to calculate the answers.
- ➞ Draw children's attention back to the example, 23×5 .
- ➞ Say: **Instead of drawing a grid each time, we can record our working like this.** Demonstrate the recording on the board.

(20×5)	100
(3×5)	15
	115
- ➞ Ask: **What is 20×5 ?** (100) **What is 3×5 ?** (15) **100 add 15?** (115)
- ➞ Repeat with the other examples partitioned earlier. Children record their working on the board. Check the answers with the approximations.

↓ Ask: **What multiples of 10 does 23 lie between?** (20, 30) **Which number is 23 closest to?** (20) You may need to draw a simple number line to show the position.

↑ Include examples beyond 50 up to 100 e.g. 84×3 or examples which use two-digit numbers up to 50 multiplied by 6 and/or 8.

↓ If children find this method difficult, they should return to informal expanded methods. Return to formal methods only when they can use the informal method accurately and explain what they are doing.

Pupil Book 2:
Multiplying larger
numbers

47

Pupil consolidation**Refresher**

Children partition or expand each of the multiplication calculations. They do not write the answers.

Practice

Children approximate the answer first and then work out the answers to multiplication calculations using the standard paper and pencil method of recording. Remind children to keep the numbers in the correct columns when recording.


Support CM:
Multiplying larger
numbers

37

Support

- 1 Children write the multiples of 10 that each number lies between and circle the multiple of 10 the number is closest to.
- 2 For each calculation, children approximate the answer first then use the standard method to work out the answer.

Extension

-  Provide some further examples of multiplying two-digit numbers by a single digit on the board for children to record in their books. Ask children to approximate the answer first then use the standard method to record their working.

Plenary (about 10 to 15 min)

- ➡ Go through some of the multiplication calculations the children worked on.
- ➡ Approximate the answer first and invite children to explain the working using the standard method of recording.

**Software: Rapid Maths 4**

Base Camp 4

Homework CM:
Multiplying larger
numbers

38

Homework (about 20 min)**Refresher**

Children partition or expand each of the multiplication calculations. They do not write the answers.

Practice

For each calculation, children approximate the answer first then use the standard method to work out the answer.

Mental calculation strategies (x)/Pencil and paper procedures (x)

Objectives ● To partition (e.g. $23 \times 4 = (20 \times 4) + (3 \times 4)$). ● To develop and refine written methods for $TU \times U$ – partitioning.

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

i The standard method of multiplication is introduced at this stage. An emphasis is placed on the layout and importance of writing it correctly. In Year 4, two formal written methods are introduced, however only one method is taught in this lesson. The other formal method used in the NNS Framework is explained in Week 9 Lesson 3. If schools or teachers do not wish to introduce both methods they may choose the method they prefer. The Pupil Book pages for both lessons will provide enough pupil consolidation for the two lessons using the preferred method, as they cover similar mathematical content.

$$\begin{array}{r} 34 \\ \times 4 \\ \hline (30 \times 4) \quad 120 \\ (4 \times 4) \quad 16 \\ \hline 136 \end{array}$$

$$\begin{array}{r} 34 \\ \times 4 \\ \hline 136 \end{array}$$

↓ If children find this method difficult, they should return to the standard method which uses partitioning of tens and units. Children who make a significant number of errors should return to informal expanded methods. Return to formal methods only when they can use the informal method accurately and explain what they are doing.

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)

- ➡ Write 34×4 on the board.
- ➡ Ask: **Who can give me an approximate answer to this calculation?** (120)
- ➡ Ask: **How did you work it out?** (to find an approximate answer we round 34 to the nearest 10 (30) and multiply by 4)
- ➡ Ask: **Who can remember what we split 34×4 into to make the calculation easy to work out?** (30×4 and 4×4)
- ➡ Say: **One standard method of recording multiplication calculations records all of the working out needed to find the answer.** Demonstrate the vertical method of short multiplication showing partitioning.
- ➡ Say: **There is an even quicker method of recording our working.** Demonstrate the recording of the refined method of short multiplication.
- ➡ Say: **For this method we multiply the units first and then the tens.** Ask: **What is 4×4 ?** (16)
- ➡ Say: **16 is 1 ten and 6 units. We write 6 in the units column and add the 10 after we find the answer to 30×4 . To remind us to add 10 we can write 1 under the tens column.**
- ➡ Ask: **What is 30×4 ?** (120) Say: **120 add 10, from the 4×4 equals 16, is 130.** Ask: **What is 130 add 6?** (136)
- ➡ Say: **34×4 equals 136.** Record the final answer.
- ➡ Compare the two ways of recording with the class showing how the quicker method relies more on children knowing and memorising the answer to each calculation required in the algorithm.
- ➡ Repeat with another example requiring “carrying” of more than 9, e.g. 46×4 .
- ➡ Demonstrate the recording of the refined method of short multiplication on the board.
- ➡ Say: **We multiply the units first and then the tens.** Ask: **What is 6×4 ?** (24) Say: **24 is 2 tens and 4 units. We write 4 in the units column and add the 20 or 2 tens after we find the answer to 40×4 . To remind us to add 20 we can write 2 under the tens column.**
- ➡ Ask: **What is 40×4 ?** Say: **160 add 20, from the 6×4 equals 24, is 180.** Ask: **What is 180 add 4?** (184) Say: **46×4 equals 184.** Record the final answer.
- ➡ Repeat with further examples that do not require “carrying” into the next decade.

Pupil Book 2:
Recording multiplications

48

Pupil consolidation*Refresher*

Children copy each example, write the multiples of 10 that each number lies between and circle the multiple of 10 the number is closest to.

Practice

Children approximate the answer first and then work out the answers to multiplication calculations using the standard paper and pencil method of recording. Remind children to keep the numbers in the correct columns when recording.

Extension CM:
Recording multiplication

37

Extension

Children look at the information presented in the table and use this to help them answer the questions. They approximate the answer first and then work out the answers to multiplication calculations using the standard paper and pencil method of recording. Remind children to keep the numbers in the correct columns when recording.

Plenary (about 10 to 15 min)

- Discuss some of the multiplication calculations the children worked on.
- Approximate the answer first and invite children to explain their working using the standard method of recording.



Software: Rapid Maths 4
Base Camp 4

Problems involving “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. ● To explain and record methods.

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; number sentence; 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.

i At this level it would be expected that children not only give a context answer but also answer the question in full.

$$\begin{aligned} 15 \times 9 &= (15 \times 10) - 15 \\ &= 150 - 15 \\ &= 135 \end{aligned}$$

↑ You may like to include examples of whole numbers up to 100 and multiplication involving the six- and eight-times tables e.g. 58×3 ; 76×6 ; 67×5 , to make the use of paper and pencil methods more applicable for children who can work smaller numbers out mentally.

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

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

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

Resources about five prepared word problems written on the board/chart prior to the lesson that suggest multiplying by 9 or 11 using the $\times 10$ and adjust method and that also suggest multiplying two-digit numbers by 3, 4 or 5. (Topics should reflect the interests of the children.)

➡ Read a story problem from the board/chart to the class, e.g. **There are 6 classes in school that wish to play football. 11 children are required from each class. How many children will play altogether?**

➡ Ask questions such as: **What information is important to working out the answer? What maths operation do we need to use to find the answer?** (x) **What calculation is required?** (6×11) **What is the answer?** (66) **How did you work it out?** Encourage children to detail any strategy used. Ask: **What is the answer to the problem?** (66 children will play football altogether) Continue this process with other word problems.

➡ Say: **These problems are easy to answer because you can work out the answer in your head. Let's look at another problem.**

➡ Read out another problem, e.g. **9 teams have entered into the Regional Rugby Tournament. Each team has signed up 15 players. How many players are there altogether?** Follow the same process as outlined above but say that you would like 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?** (135 players altogether)

➡ Say: **When you are able to work out these calculations in your head, you will not need to use jottings. Let's look at another problem.**

➡ Read out another problem, e.g. **The car park at the local football ground is 4 storeys high. If each storey fits 38 cars, how many cars would completely fill the car park?**

➡ Follow the same process as outlined above. Demonstrate how you would like children to record their working using methods explained in Spring Term, lesson 9, 4.

➡ Ask: **What is the answer to the problem?** (152 cars would fill the car park)

➡ Say: **The written method can help you to work out the answer when you can't do it mentally.** Repeat with other word problems.

Y4 Solving problemsSuggested order: **Spring Term, Week 9, Lesson 5**Pupil Book 2:
Solving word problems

49

Pupil consolidation**Refresher**

Children read the word problems, work out the answer mentally and write the answer.

Practice

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

Extension

Write some multiplication number sentences on the board, e.g. $26 \times 3 =$, $45 \times 5 =$, $68 \times 4 =$. Children make up their own word problems to match each number sentence. They write these in their books. Children can swap their work with a partner and answer each other's questions.

Plenary (about 10 to 15 min)

- Read through some of the word problems the children have worked on independently.
- Ask children to identify the important words or information from each. Ask them 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.
- Emphasise the re-reading of the problem to make sure the answer corresponds to the question asked.

Fractions and decimals

Objectives ● To identify two simple fractions with a total of 1.

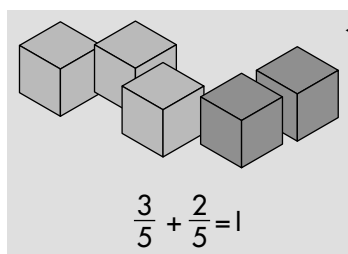
Vocabulary one, two... ten; half; halves; third; quarter; fifth; sixth; seventh; eighth; ninth; tenth; whole; fraction; total; sum

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 coloured building blocks



- ➞ Arrange the children in a U shape on the carpet, near the board.
- ➞ Make a “snake” using five building blocks (3 red, 2 blue). Say: **This is a whole snake. How many blocks is it made of?** (five) **What fraction of the whole snake is one block?** (fifth) **Who can write a fifth on the board using words/numbers?** Explain the notation $\frac{1}{5}$ (one out of five equal parts).
- ➞ Ask: **What fraction of the snake is red/blue?** ($\frac{3}{5}$ and $\frac{2}{5}$) **Who can write $\frac{3}{5}$ and $\frac{2}{5}$ on the board using words/numbers?** Ask the children to explain the notation $\frac{3}{5}$ (three out of five equal parts).
- ➞ Ask: **What do $\frac{3}{5}$ and $\frac{2}{5}$ add up to?** (one, a whole) Write $\frac{3}{5} + \frac{2}{5} = 1$ on the board.
- ➞ Repeat above, using a snake made from four red blocks and one blue block.
- ➞ Make a snake using five red blocks. Ask: **What fraction of the snake is red?** (whole, one, $\frac{5}{5}$) Say: **Five fifths make a whole.** Write $\frac{5}{5} = 1$ on the board.
- ➞ Make a snake using two red and four blue blocks. Ask: **How many blocks is it made of?** (six) **What fraction of the whole snake is one block?** (sixth) **Who can write a sixth on the board using words/numbers?** Continue as before.
- ➞ Repeat, making snakes from 7, 8, 9 and 10 blocks. Then from 4, 3 and 2 blocks.
- ➞ Repeat, using snakes made from three colours, e.g. 2 red, 3 blue and 1 yellow block (giving $\frac{2}{6} + \frac{3}{6} + \frac{1}{6} = 1$).

Pupil Book 2:
Total fractions

50

Pupil consolidation**Refresher**

- 1 Children write one square as a fraction of a diagram made from coloured squares.
- 2 They write the fraction of squares for each colour.

Practice**Resources** interlocking cubes (three colours)

- 1 Children make any shape using up to 10 cubes. They write the fraction of squares for each colour totalling 1, e.g. $\frac{3}{7} + \frac{4}{7} = 1$
- 2 They make five more shapes using three colours.
- 3 Children copy and complete the equations, e.g. $\frac{3}{5} + ? = 1$.

Extension**Resources** selection of fraction cards, e.g. $\frac{2}{5}$, $\frac{6}{9}$, $\frac{1}{3}$; interlocking cubes (two colours)

Children take a fraction card from a pack and construct a snake with that fraction red, the remainder blue. They write the fraction of squares for each colour, totalling 1, e.g. $\frac{3}{7} + \frac{4}{7} = 1$.

Plenary (about 10 to 15 min)**Resources** coloured building blocks

- ➡ Repeat the Main teaching activity using a “snake” of 10 blocks. Invite individual children to make a snake using up to 10 building blocks. Children identify the fraction of each colour and write the sum on the board.



Ask: **What fraction needs adding to $\frac{4}{9}$ to make a whole?** ($\frac{5}{9}$)

- ◀ ➡ Finish off by asking quickfire questions: **How many sixths in one (whole)?**
What fraction needs adding to $\frac{2}{3}$ to make a whole? ($\frac{1}{3}$)

Fractions and decimals

Objectives ● To recognise the equivalence of simple fractions.

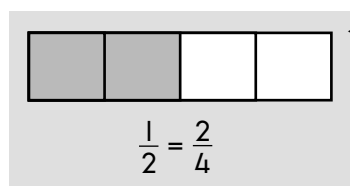
Vocabulary one; two ... ten; half; halves; third; quarter; fifth; sixth; eighth; tenth; fraction

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 RCM 8, Fraction strips, to make strips of paper/thin card divided into equal parts; Blu-tack; large building blocks; scissors; ruler; pen/pencil; highlighter/marker, OHP

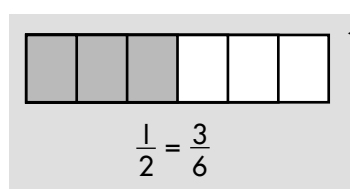


➡ Hold up a strip divided into two parts. Ask: **What fraction is one of these parts?** (half) Write $\frac{1}{2}$ on the board. Ask: **If I cut each part in half, how many parts will there be?** (four) **What fraction will each part be?** (quarter)

➡ Using a ruler, draw lines to divide the strip into quarters.

➡ Ask: **How many quarters in a half?** (two) **Two quarters are the same as one half.** Write $\frac{1}{2} = \frac{2}{4}$ on the board. Colour half the strip and Blu-tack it next to the equivalent fractions.

➡ Repeat, using strips divided into thirds, quarters and fifth, showing that $\frac{1}{3} = \frac{2}{6}$, $\frac{1}{4} = \frac{2}{8}$ and $\frac{1}{5} = \frac{2}{10}$.



➡ Hold up a strip divided into sixths. Ask: **What fraction is one part?** (sixth) Colour three parts. Ask: **What fraction have I coloured?** (half) **What is another way of saying the same fraction?** (three sixths) Write $\frac{1}{2} = \frac{3}{6}$ on the board.

➡ Repeat, using strips divided into eighths and tenths, showing that $\frac{1}{2} = \frac{4}{8}$ and $\frac{1}{2} = \frac{5}{10}$.

➡ Hold up a strip divided into thirds. Colour $\frac{2}{3}$ and ask: **What fraction is coloured?** ($\frac{2}{3}$) Write $\frac{2}{3}$ on the board. Divide the strip into sixths using dotted lines. Ask: **What fraction is coloured?** ($\frac{4}{6}$) **$\frac{2}{3}$ is the same as $\frac{4}{6}$.** Write $\frac{2}{3} = \frac{4}{6}$.

➡ Repeat using other strips, e.g. show that $\frac{3}{4} = \frac{6}{8}$, $\frac{2}{5} = \frac{4}{10}$.

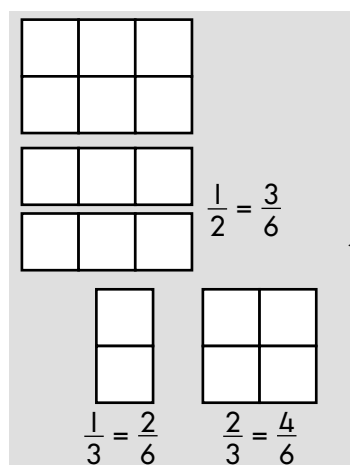
➡ On the OHP, make a rectangle using six building blocks.

➡ Ask: **What fraction is one block?** (sixth) Divide the rectangle in half and ask: **What fraction of the blocks is this?** ($\frac{1}{2}$) **What other fraction is the same?** ($\frac{3}{6}$)

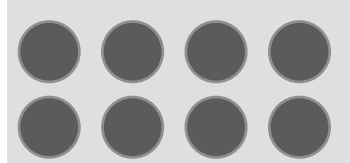
➡ Restore the rectangle. Separate a column of two blocks and ask: **What fraction of the blocks is this?** ($\frac{2}{6}$) **What other fraction is the same?** ($\frac{1}{3}$) Demonstrate thirds by making three columns. Repeat, asking for $\frac{2}{3}$ and $\frac{4}{6}$.

➡ Repeat above for rectangles made from eight and ten blocks.

➡ Rub out the fractions next to the strips, ready for the Plenary session.



i Alternatively, make fractions using large counters



Y4 Numbers and the number system

Suggested order: **Spring Term, Week 10, Lesson 2**Pupil Book 2:
Bottle top fractions

51

Pupil consolidation*Refresher*

Children find equivalent fractions to $\frac{1}{2}$ for the number of red bottle tops in ordered rows.

Practice

Children find two equivalent fractions for the number of red bottle tops in arrays (two rows and varied).

Support CM:
Canned fractions

38

Support

- 1 Children write the fraction of cola cans in a group, e.g. $\frac{5}{8}$.
- 2 They colour half the cans and write an equivalent fraction for $\frac{1}{2}$.
- 3 They colour $\frac{1}{4}$, $\frac{1}{2}$ or $\frac{3}{4}$ of a grid.

Extension CM:
Bottled fractions

38

Extension

Resources counters, if necessary

- 1 Children find two equivalent fractions for the number of opened bottles in an ordered array.
- 2 Children find two equivalent fractions for the number of opened bottles in a random arrangement.
- 3 Children complete a table of equivalent fractions.

Plenary (about 10 to 15 min)

- ➡ Point to a strip on the board and ask: **What fraction is coloured? What other equal fraction is coloured? Who can write these equal fractions?** Invite children to write the equivalent fractions next to the strips, e.g. $\frac{2}{3} = \frac{4}{6}$.

Homework CM:
Melting fractions

39

Homework (about 20 min)*Refresher*

Children write fractions to show half.

Practice

Children write fractions for melting snowballs.

Fractions and decimals

Objectives ● To order simple fractions: for example, decide whether fractions such as $\frac{3}{8}$ or $\frac{7}{10}$ are greater or less than one half.

Vocabulary one, two ... ten; half; halves; third; quarter; fifth; sixth; eighth; tenth; fraction; less than; greater than; division; compare

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

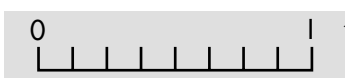
Choose an activity from Strand 1 Topic 1.3.

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

Resources RCM 9, Fraction circles; colouring pencils/markers

- ➡ Arrange the children so they can see the board.
- ➡ Show the class a circle divided into quarters. Ask: **How many parts is this circle divided into?** (four) Colour a quarter of the circle red. Ask: **What fraction of the circle is red?** (quarter) **Is this less than a half or more than a half of the circle?** (less)
- ➡ Make a quick table on the board and write $\frac{1}{4}$ in the left column.
- ➡ Colour another quarter and ask: **How many quarters are red now?** (two) **Is $\frac{2}{4}$ more, less or equal to half the circle?** (equal) Write $\frac{2}{4}$ in the middle column. Repeat for $\frac{3}{4}$.
- ➡ Repeat, using a circle divided into thirds. Repeat, using circles divided into fifths (for $\frac{2}{5}$ and $\frac{4}{5}$), sixths (for $\frac{1}{6}$, $\frac{3}{6}$ and $\frac{5}{6}$), eighths (for $\frac{3}{8}$, $\frac{4}{8}$ and $\frac{5}{8}$) and tenths ($\frac{2}{10}$, $\frac{5}{10}$ and $\frac{8}{10}$)
- ➡ Clean the board. Draw a number line from 0 to 1 with a single division mark for $\frac{1}{2}$. Point to the division mark for $\frac{1}{2}$ and ask: **What is this fraction?** ($\frac{1}{2}$) Label the division. Draw two more division marks for $\frac{1}{4}$ and $\frac{3}{4}$. Ask for their labels and write them in.
- ➡ Draw another number line from 0 to 1, marking divisions for eighths. Ask: **How many spaces are there?** (eight)
- ➡ **What fraction is each space?** (eighth) Label the first division mark $\frac{1}{8}$. Ask the class for the remaining labels. Ask: **Which fractions are less than/equal to/greater than $\frac{1}{2}$?**
- ➡ Repeat, using number lines showing fifths, sixths and tenths.
- ➡ Clean the board, ready for the Plenary.

less than $\frac{1}{2}$	equal to $\frac{1}{2}$	greater than $\frac{1}{2}$
$\frac{1}{4}$	$\frac{2}{4}$	$\frac{3}{4}$



➡ Ask: **Which fractions are less than/equal to/greater than $\frac{1}{4}$ (or $\frac{3}{4}$)?**

Pupil Book 2:
Fraction order

52

Pupil consolidation**Refresher**

- 1 Children fill in the missing fractions on number lines, e.g. $\frac{1}{5}$, $\frac{2}{5}$, $\frac{3}{5}$.
- 2 Children circle the fractions bigger than $\frac{1}{2}$.

Practice**Resources** RCM 9, Fraction circles; squared paper (to aid drawing number lines)

- 1 Children colour fractions of circles, compare them with a half and enter them into a table.
- 2 Children order sets of fractions, smallest to largest, e.g. $\frac{7}{8}$, $\frac{3}{8}$, $\frac{5}{8}$.

Extension**Resources** RCM 9, Fraction circles

Write groups of fractions (some equivalent), including $\frac{1}{2}$, for children to order, from smallest to largest, e.g. $\frac{5}{6}$, $\frac{1}{2}$, $\frac{2}{3}$. Children should use the fraction circle corresponding to the largest numerator, e.g. sixths for this example.

Plenary (about 10 to 15 min)**Resources** RCM 9, Fraction circles; sheet of coloured paper

- Stick one of each fraction circle on the board, for children to refer to.
- Say: ***I am going to say a fraction. You have to say if it is less, greater or equal to a $\frac{1}{2}$ / $\frac{3}{4}$ / $\frac{7}{8}$ / $\frac{3}{6}$ / $\frac{1}{3}$ etc.***

Fractions and decimals

Objectives ● To understand decimal notation and place value for tenths and hundredths, and use it in context. ● To order decimals with one decimal place.

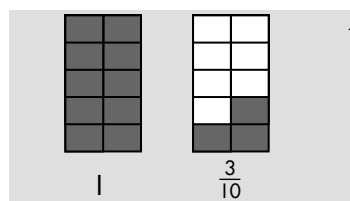
Vocabulary one, two ... hundred; unit; tenth; fraction; decimal fraction; decimal point; column; digit; order; smallest; largest; lightest; heaviest; shortest; longest; less; more

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

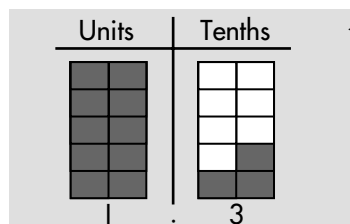
Choose an activity from Strand 1 Topic 1.3.

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

Resources RCM 10, Fraction grids; Blu-tack



➡ Shade one of the grids. Say: **Let's pretend this is a whole bar of chocolate. How many squares does it have?** (10) Blu-tack it to the board. Shade three squares of another grid and ask: **What fraction of a bar is this?** ($\frac{3}{10}$) Blu-tack it next to the other grid. Ask: **How many bars are there altogether?** ($1\frac{3}{10}$) Write $1\frac{3}{10}$ beneath the grids.



➡ Say: **We can also write this fraction a different way.** Draw columns for units and tenths. Say: **This is the units/ones column: it shows how many wholes (bars) there are. This is the tenths column: it shows how many tenths of a whole (bar) there are.** Write **1** in the units column as you say: **One whole chocolate bar ...** Write **3** in the tenths column as you say: **... and three tenths.**

i Explain the meaning of the word “decimal” (decem = 10, deci = $\frac{1}{10}$) and the decimal system (the digit in each column is 10 times the value of the digit in the column to its right).

➡ Draw a decimal point and say: **This is called a decimal point. It is in between the units and the tenths.** Point to 1.3 as you say: **This number is called a decimal. You say: one point three. The 3 stands for the fraction $\frac{3}{10}$, so it is called a decimal fraction.**

➡ Shade one more square of the right grid and ask: **How many chocolate bars are there now?** ($1\frac{4}{10}$) Replace 3 by 4 and ask: **How do you say this number?** (one point four) Repeat for 1.7.

➡ Blu-tack another shaded grid in the units column. Ask: **How many chocolate bars are there now?** ($2\frac{7}{10}$) Rub out 1.7 and ask: **Who can write this as a decimal?** (2.7)

➡ Clear the board. Write **3.4** on the board and ask: **How do you say this decimal?** (three point four) **What does the 4 mean?** ($\frac{4}{10}$) **How many chocolate bars are there altogether?** ($3\frac{4}{10}$) Repeat for other decimals.

➡ Write **0.7** on the board and ask: **How do you say this decimal?** (nought point seven; zero point seven is also acceptable.) **What does the 7 mean?** ($\frac{7}{10}$) **What does the 0 mean?** (no units) **So 0.7 is the fraction $\frac{7}{10}$. 0.7 is a decimal fraction.** Repeat for 0.1 and 0.9. Write $\frac{3}{10}$ on the board and ask: **Who can write this as a decimal fraction?** (0.3)



➡ Draw a number line from 0 to 1 with 10 division spaces. Ask: **How many spaces/divisions are there?** (10) **What fraction is each space?** ($\frac{1}{10}$) Label the divisions $\frac{1}{10}, \frac{2}{10}, \dots$. Point to $\frac{1}{10}$ and ask: **How do we write $\frac{1}{10}$ as a decimal?** (0.1) Write **0.1** below $\frac{1}{10}$. Invite children to continue the numbering.

Pupil Book 2:
Daredevil decimals

53

Pupil consolidation**Refresher**

- 1 Children write fractions as decimals, e.g. $1\frac{4}{10} = 1.4$.
- 2 Children write decimals as fractions.

Practice**Resources** squared paper to aid drawing number lines

- 1–2 Children copy a number line and place six decimals on it.
- 3 They order decimal weights, from smallest to largest.

SupportSupport CM:
Party popper decimals

39

- 1 Children write the number of full boxes as a decimal.
- 2 They colour the given (decimal) number of boxes.
- 3 They complete decimal number lines from 0 to 1 and 1 to 2.

Extension

Write sets of three digits and a decimal point on the board e.g. 2, 3, 5, . Children have to make different numbers with one decimal place and order them from smallest to largest, e.g. 23.5, 25.3, 32.5, 35.2, 52.3, 53.2.



Game 47

Games Pack 2

Rollercoaster ride

Plenary (about 10 to 15 min)**Resources** RCM 10, Fraction grids

- ➡ Hold up a $\frac{6}{10}$ shaded grid and ask: **What fraction is shaded?** ($\frac{6}{10}$) **How do you say $\frac{6}{10}$ as a decimal?** **Who can write it on the board?** (0.6) Repeat for $1\frac{3}{10}$ and $2\frac{1}{10}$ shaded grids.
- ➡ Write 0.2 on the board and ask: **What does the 2 stand for?** ($\frac{2}{10}$) Repeat for other decimals, e.g. **1.7, 23.6, 20.4, 957.1**, asking for the meaning of each digit. Ask: **What kind of number is 0.2?** (decimal fraction)
- ➡ Write $2\frac{3}{10}$ on the board and ask: **How do you say this number?** **How do you say it as a decimal?** **Who can write the decimal?** (2.3)
- ➡ Repeat for other numbers.

Homework CM:
Calculator decimals

40

Homework (about 20 min)**Refresher**

Children write fractions as decimals and decimals as fractions.

Practice

Children write decimals on a number line.

Fractions and decimals

Objectives ● To understand decimal notation and place value for tenths and hundredths, and use it in context. For example: order amounts of money; convert a sum of money such as £13.25 to pence, or a length such as 125 cm to metres.

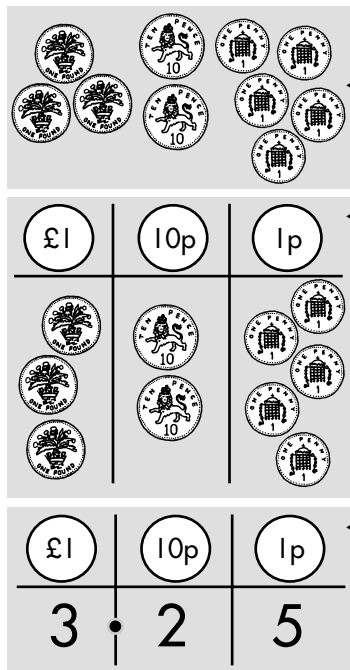
Vocabulary one, two ... thousand; unit; tenth; fraction; decimal fraction; decimal point; column; digit; metre; centimetre; pound; pence; order; smallest; largest; lowest; highest; less; more; least; most

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 £1, 10p and 1p coins



- ➡ Place three £1, two 10p and five 1p coins on a large piece of paper.
Ask: **How many pound coins/10p coins/1p coins are there? How much money is there altogether?** (£3 and 25p)
- ➡ Say: **We can write this amount using decimal columns.** Draw columns enclosing the coins. Head the columns £1, 10p and 1p. Remove the £1 coins and write **3**, say: **There are three £1 coins.** Repeat for other coins.
- ➡ Hold up a 10p coin and £1 coin. Ask: **How many 10p coins are in £1?** (10) **What fraction is a 10p coin of £1?** (tenth) Point to £3.25 and say: **There are three whole pounds (units) and two tenths of a pound. Where does the decimal point go?** (in between the units and tenths columns) Write the decimal point. Point to the tenths column and say: **This is the tenths column, the 10p column.**
- ➡ Hold up a 1p coin and £1 coin. Ask: **How many 1p coins are in £1?** (100) **What fraction is a 1p coin of £1?** (hundredth) **What does the 5 stand for in £3.25?** (5p or five hundredths of a pound) Point to the hundredths column and say: **This is the hundredths column, the 1p column.**
- ➡ Represent other sums of money (coins) using decimal notation, e.g. £4.32, £2.60, £2.06, £5.00, £0.65, £0.80, £0.08. Question children about the meanings of the digits.
- ➡ Write similar amounts on the board and question the children.
- ➡ Write **£2.36** on the board. Cover 36 and ask: **How many pence in £2?** (200) Cover £2 and ask: **How many pence here?** (36) **How many pence altogether?** (236) Write **£2.36 = 236p**. Repeat for other amounts.
- ➡ Write **429p** on the board. Ask: **How many hundreds of pence are there?** (four) **How many pounds is 400 pence?** (£4) **How much money is there altogether?** (£4 and 29p) Write **429p = £4.29**. Repeat for other amounts, e.g. **290p, 407p, 71p, 40p, 7p**.
- ➡ Show the class a metre rule and ask: **How many centimetres in a metre?** (100) **That's like 100 pence in a pound.** Write **6.54 m** on the board. Cover 54 and ask: **How many centimetres in six metres?** (600) Cover 6 and ask: **How many centimetres here?** (54) **altogether?** (654) Write **6.54 m = 654 cm**. Repeat for other lengths.
- ➡ Convert lengths in centimetres to metres, e.g. **351 cm to 3.51 m**.
- ➡ Write **£4.23** and **£2.98** on the board. Ask: **Which amount is larger?** (£4.23) **How do you know?** Repeat for other pairs of amounts, e.g. **£0.76** and **£1.03**; **3.65 m** and **9.06 m**.

Pupil Book 2:
Decimal amounts

54

Pupil consolidation**Refresher**

Children count coins (£1, 10p and 1p) and write the total using pound and pence notation.

Practice

- 1 Children convert decimal prices to pence.
- 2 They convert prices in pence to £.
- 3 They arrange prices in order, highest to lowest.
- 4 They convert lengths in centimetres to metres.
- 5 They order a set of lengths.

Extension CM:
Decimal problems

39

Extension

- 1 Children add two prices together by first changing them to pence.
- 2 They subtract one price from another.
- 3 Children calculate the total lengths of rope by first converting them to centimetres.
- 4 They calculate the remainder when a length of hose pipe is cut from a reel.

Plenary (about 10 to 15 min)

- Write **£7.39** on the board and ask: **What does the 3 stand for?** ($\frac{3}{10}$ of a pound, three 10p coins, 30p) **What does the 9 stand for?** (9 hundredths of a pound, 9p) **What does the 7 stand for?** (£7) **How many pence altogether?** (739)
Repeat for other amounts, e.g. **£6.12**, **£8.09**, **£7.40**, **£0.52**, **£0.30**, **£0.06**.
- Write amounts in pence for children to convert to £, e.g. **528p**, **904p**, **270p**, **74p**, **90p**, **2p**.
- Write **£2.76**, **45p**, **£3** on the board. Ask: **Which is the largest amount?** (£3) **Why?** (it has the most pounds) **Which is the next largest?** (£2.76) **Why?** (it has more pounds than 45p) Write the amounts in order. Repeat for other amounts and lengths.

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: bar charts – intervals labelled in 2s.

Vocabulary number; zero, one, two ... to sixty; table; frequency; label; title; record; data; information; questionnaire; vote; sort; most; least; popular; favourite; bar; bar chart; horizontal axis; vertical axis; axes; diagram; scale; halfway between

i Some of the following software packages may be used in conjunction with this lesson to generate, organise and/or represent data:

Pictogram (CECC)
Counter (Blackcat)
Clipboard (Blackcat)
Information Workshop (RM)
Graph Plot (SEMERC)
Junior Pinpoint (Logotron)
Maths Frame (NW SEMERC)

Questionnaire

1 Which sport do you like best?

Tick ONE box

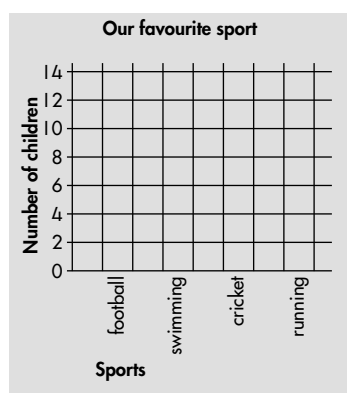
Swimming ☐ Football ☐
Cricket ☐ Running ☐

2 Which subjects do you like best?

Tick TWO boxes

Mathematics ☐ History ☐
English ☐ Science ☐

i Make sure that there is at least one odd and one even frequency. Add your own vote, if necessary.



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

Choose an activity from Strand 4, Topic 4.1.

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

Resources questionnaires (one each); bar chart axes; labels: "football", "swimming", "cricket", "running"; Blu-tack

- ➞ Arrange the children so they can see the board. Give each child a questionnaire.
- ➞ Say: **This is called a questionnaire. There are two questions for you to answer. You have to tick one box for the first question.** Read out the question and demonstrate ticking a box. Say: **You have to tick two boxes for the second question.**
- ➞ Ask someone to collect the questionnaires. While they are doing this, Blu-tack labels "football", "swimming", "cricket", "running" to the board. Say: **Let's find out about your favourite sport in question 1. First, we need to sort out your answers.**
- ➞ Invite a number of children to sort the questionnaires according to favourite sport. Ask: **How can we record this information?** Make a quick table on the board. Ask some children to count the questionnaires for each sport and write them in the table.
- ➞ Ask: **Which is the most/least popular sport?**
- ➞ Ask: **What diagram can we draw to show this data?** (pictogram or bar chart) **Let's draw a bar chart.** Blu-tack the bar chart axes next to the table. Point to the axes and say: **These lines are called axes. They help us draw bar charts. This is the horizontal axis. This is the vertical axis.**
- ➞ Write the sports along the horizontal axis (leave a space between bars). Ask: **What are these called?** (sports) Number the vertical axis in 2s. Ask: **What do these numbers show?** (number of children who chose/voted for a sport) **Why have I numbered them in twos rather than ones?** (because the numbers will go higher; there may be lots of votes for one sport)
- ➞ Choose a sport with an even frequency, e.g. swimming. Ask: **How many children chose swimming?** Count up from the horizontal axis in twos and draw the bar. Choose a sport with an odd frequency, e.g. football. Ask: **How many children chose football?** (e.g. 11) **11 is halfway between 10 and 12.** Count up from the horizontal axis in twos and draw the bar in the appropriate position. Draw the other two bars.
- ➞ Ask: **What is a good title for our bar chart?** (Our favourite sport) **How does the bar chart show the most/least popular sport? More children chose football than running. How many more? How many children chose cricket or swimming? Which sport do, e.g. five children like best?**
- ➞ Rub out the frequencies, ready for the Plenary.

Pupil Book 2: 55
Questionnaire bar charts

Pupil consolidation

Resources RCM 11, Bar charts

Refresher

Children copy an incomplete bar chart using RCM 11, Bar charts.
They draw the missing bar, having been given its frequency.
They answer questions about the bar chart.

Practice

Children draw a bar chart from a frequency table, using RCM 11, Bar charts.
They answer questions about their chart.

Support CM: 40
Holiday bar chart

Support

- 1 Children draw a bar chart for a frequency table showing favourite holidays (even frequencies). They answer questions about their bar chart.

Extension



Resources RCM 4, Tally charts; RCM 11, Bar charts

In groups, children use RCM 4, Tally charts, to record the choices made in question 2 of the questionnaire (see the Main teaching activity). They each draw a bar chart, using RCM 11, Bar charts. Question the group about the results.

Plenary (about 10 to 15 min)

- ➞ Draw attention to the bar chart on the board. Ask: **What is this diagram called?** (a bar chart) **What does it show?** (favourite sports chosen from a list of four) **How did we make it?** (we answered a questionnaire then made a table) **How many children chose swimming?** Write the frequency in the table. Repeat for the other sports.
- ➞ Point to the frequencies and ask: **What are these numbers called?** (frequencies) **What is the second favourite sport? Seven children chose a sport. Which sport?** **How many children chose swimming or cricket? If you had five sports to choose from, instead of four, how would the bar chart be different?** (extra bar, shorter bars)

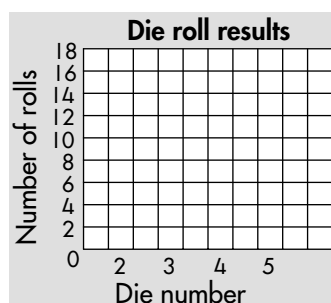
Organising and interpreting data

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: bar charts – intervals labelled in 2s.

Vocabulary number; zero, one, two ... to hundred; table; frequency; label; title; record; data; information; questionnaire; vote; sort; most likely; least likely; bar; bar chart; horizontal axis; vertical axis; axes; diagram; scale; halfway between; tally chart; compare

i Some of the following software packages may be used in conjunction with this lesson to generate, organise and/or represent data:

Pictogram (CECC)
Counter (Blackcat)
Clipboard (Blackcat)
Information Workshop (RM)
Graph Plot (SEMERC)
Junior Pinpoint (Logotron)
Maths Frame (NW SEMERC)



↑ Ask: **Why don't we number the axis 0, 1, 2, 3 etc?** (they won't reach the highest frequency in the table)

↑ Change the die numbers, so that a new digit is most common, e.g. 3. Ask: **If we make another bar chart for this die, how will it look different?** (bars different heights, highest bar will be for 3)

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

Choose an activity from Strand 4 Topic 4.1.

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

Resources blank die numbered 2, 2, 2, 3, 4, 5; bar chart axes; Blu-tack

- ➞ Arrange the children so they can see the board.
- ➞ Roll the die a few times as you say: **We are going to roll this die lots of times. How can we record the numbers it lands on?** (make a tally chart) Make a quick tally chart and invite a child to record the rolls.
- ➞ Invite children to roll the die. Remind children how to group the tally marks in fives. Stop when one of the frequencies is about 17. Ask individuals to count the tally marks in fives and ones. Write in the frequencies. Ask: **What are these numbers called?** (frequencies)
- ➞ Say: **We are going to draw a bar chart to show the results.** Blu-tack the bar chart axes next to the table. Point to the axes and ask: **What are these lines called?** (axes) Point to the horizontal axis and ask: **Which axis is this?** (horizontal) Label the horizontal axis, "Die numbers". Point to the first bar space and ask: **What number goes here?** (2) Complete the numbering.
- ➞ Point to the vertical axis and ask: **What is this axis called?** (vertical axis) Start numbering the axis 0, 2, 4 and ask: **What do these numbers mean?** (number of rolls) Continue the numbering and label the axis "Number of rolls".
- ➞ Choose a die number with an odd frequency, e.g. 15 and ask: **How many times did the die land on this number?** (15) **15 is halfway between 14 and 16.** Count up from the horizontal axis in twos and draw the bar in the appropriate position.
- ➞ Draw the remaining bars. Ask: **What is a good title for our bar chart?** **Which number is the die most/least likely to land on?** (2) **Why? Can you tell this by looking at the die?** (yes)
- ➞ Rub out the tally marks and frequencies, ready for the Plenary.

Y4 Handling data

Suggested order: Spring Term, Week 11, Lesson 2

Pupil Book 2:
Dice bar charts

56 57

Pupil consolidation**Refresher**

- 1 Children answer questions about a bar chart that shows the results of die rolls.
- 2 They copy and complete a tally chart for the bar chart.

Practice**Resources** RCM 11, Bar charts; RCM 4, Tally charts; blank die labelled 1, 2, 2, 2, 3, 4

- 1 One child rolls the die whilst the other records the results in a tally chart using RCM 4, Tally charts. They stop when one number has occurred 15 times.
- 2 They count the tally marks and write the frequencies.
- 3 They draw a bar chart using RCM 11, Bar charts to show their results.
- 4 They answer questions about their chart.
- 5 They answer questions comparing their bar charts with the one shown in Refresher.

Extension**Resources** RCM 11, Bar charts; RCM 4, Tally charts; blank die

Children number their own die using the digits 1, 2, 3, 4. They record die rolls in a tally chart using RCM 4, Tally charts and draw a bar chart using RCM 11, Bar charts. Question the children about the results.

Plenary (about 10 to 15 min)

- Draw attention to the bar chart on the board. Ask: **What does this bar chart show?** (results of rolling a die) **How did we make it?** (we recorded rolls in a tally chart) **How many times did the die land on 2?** Write the frequency in the tally chart. Ask: **Who can draw the tally marks?** Repeat for the other die numbers.
- Ask: **How many times did the die land on 2 or 3? Which number is the die least likely to land on? How does the bar chart show this?**
- Ask: **If we start all over again and make another bar chart, will it look the same?** (no) **Why not?** (we cannot tell which numbers the die will land on but the highest bar will probably be, e.g. 3)



Ask: **How many times did the die not land on 3?**

Homework CM:
Football results bar chart

41

Homework (about 20 min)**Refresher**

- 1–2 Children calculate the total goals scored in each football match and record this in a tally chart.
- 3 They count the tally marks and write the frequencies.

Practice

- 1 Children complete a bar chart for the goal totals.
- 2–5 They answer questions about the bar chart.



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: bar charts – intervals labelled in 5s.

Vocabulary number; zero, one, two ... to hundred; table; frequency; label; title; record; data; information; bar; bar chart; horizontal axis; vertical axis; axes; diagram; scale; halfway between; tally chart; investigate

i Some of the following software packages may be used in conjunction with this lesson to generate, organise and/or represent data:

Pictogram (CECC)
Counter (Blackcat)
Clipboard (Blackcat)
Information Workshop (RM)
Graph Plot (SEMERC)
Junior Pinpoint (Logotron)
Maths Frame (NW SEMERC)

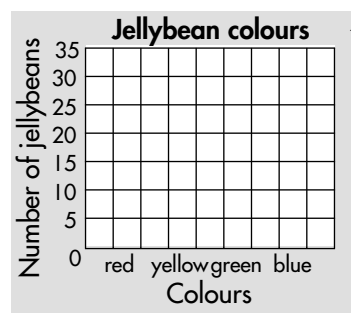
Oral work and mental calculation (about 5 to 10 min)

Choose an activity from Strand 4 Topic 4.1.

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

Resources bag of jelly beans or counters (e.g. 35 red, 25 yellow, 10 green, 20 blue); bar chart axes; Blu-tack

- ➞ Arrange the children so they can see the board.
- ➞ Show the class a bag of jelly beans/counters. Say: **We are going to investigate the colours of these jelly beans.** Distribute the jelly beans/counters. Ask: **Mei Mei, what colours do you have? How can we count the colours of your jelly beans together?** (make a tally chart).
- ➞ Make a quick tally chart. Say: **Hold up your fingers to show how many red jelly beans you have.** Invite a child to make a tally mark for each finger raised. Check that the total is a multiple of five. Repeat for the other colours.
- ➞ Ask: **How many red jelly beans are there?** Count them in fives and write the frequency in the tally chart. Repeat for the other colours.
- ➞ Blu-tack bar chart axes to the board. Point to the horizontal axis and ask: **What goes along this axis?** (colours) Write the colours. Ask: **How high is the bar for red?** (35) **Let's see what happens if we number the vertical axis in twos.** Count up the axis: 0, 2, 4 ... 20. **That's not high enough for the red bar. How should we number the axis?** (in fives) Count: 0, 5, 10 ... 35. Write the numbers on the vertical axis. Draw the bars. Label the axes and give the bar chart a title.
- ➞ Ask: **Which is the most/least common colour?** (red/green) **How many more yellow than blue jelly beans are there?** (five) **How many jelly beans are not red?** (55) **If you each ate one of your jelly beans, how would the bar chart change?** (the bars would be shorter)
- ➞ Rub out the tally marks and frequencies, ready for the Plenary session.



Pupil Book 2:
Sweet shop
bar charts

58 59

Pupil consolidation

Refresher

Resources RCM 4, Tally charts

- 1 Children answer questions about a bar chart that shows the sweets in a packet.
- 2 They copy and complete a tally chart using RCM 4, Tally charts for the bar chart.

Practice

Resources RCM 11, Bar charts

- 1 Children count the sweets in packets and complete a tally chart.
- 2 They draw a bar chart using RCM 11, Bar charts
- 3 They answer questions about their chart.

Extension



Resources RCM 12, Graph paper axes; RCM 4, Tally charts; 100 small objects: four types, e.g. coloured cubes; construction items; ruler

Children record four types of object using RCM 4, Tally charts. They draw a bar chart on graph paper using RCM 12, Graph paper axes. They accurately draw the bars.

Plenary (about 10 to 15 min)

- Draw attention to the bar chart on the board. Ask: **What does this bar chart show?** (jelly bean colours) **How did we make it?** (recorded the colours in a tally chart) **How many blue jelly beans were there?** (20) Write the frequency in the tally chart. Ask: **Who can draw the tally marks?** Repeat for the other colours.
- Ask: **How many red or yellow jelly beans were there?** (35/25) **If we added 10 yellow jelly beans, how would the bar chart change?** (the bar for yellow would equal the bar for red) **If we made a bar chart for another bag of jelly beans, would the highest bar be for red again?** (could be; the manufacturer may believe that children prefer red jelly beans)

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: bar charts – intervals labelled in 10s.

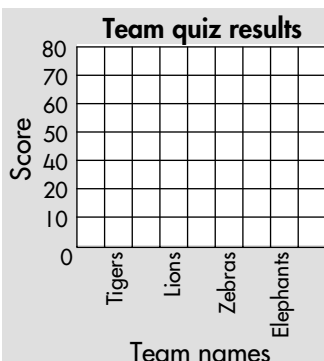
Vocabulary number; zero, one, two ... to a hundred; table; frequency; label; title; record; data; information; bar; bar chart; horizontal axis; vertical axis; axes; diagram; scale; halfway between; tally chart; difference; greatest

i Some of the following software packages may be used in conjunction with this lesson to generate, organise and/or represent data:

Pictogram (CECC)
Counter (Blackcat)
Clipboard (Blackcat)
Information Workshop (RM)
Graph Plot (SEMERC)
Junior Pinpoint (Logotron)
Maths Frame (NW SEMERC)

Team	Scores	Total
Tigers	5 5 5	
Lions	5 5 5 5	
Zebras	5	
Elephants	5 5	

i Ensure that the quickfire questions are facts for which the majority of the class have developed (or are developing) instant recall.



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

Choose an activity from Strand 4, Topic 4. 1

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

Resources 50 prepared quick-fire +, −, ×, ÷ questions; bar chart axes; Blu-tack

- ➞ Arrange the children into four groups of roughly equal ability.
- ➞ Give each group a name, e.g. Tigers, Lions, Zebras, Elephants. Say: **We are going to have a team quiz. Put your hand up as soon as you know the answer. Each correct answer gets five points.** Make a quick table to record the scores.
- ➞ Read out the questions and choose the first raised hand to answer. For a correct answer, write 5 next to the team name. Stop when one team has more than 60 points. Make sure that there is an odd and an even score.
- ➞ Count the points with the class and write the totals in the table. Ask: **Which team has the highest/lowest score? What is the difference between the highest and lowest scores? ... the first and second score? ... the lowest two scores? How many points did the Zebras and Elephants score altogether?**
- ➞ Say: **Let's make a bar chart to show the scores.** Blu-tack bar chart axes to the board. Point to the horizontal axis and ask: **What goes along the horizontal axis?** (team names) Write them in.
- ➞ Write 0 on the vertical axis. Ask: **What will be the tallest bar? How high will it be? Should we number the vertical axis in twos?** (no, the numbers will only reach 20) **... in fives?** (no, the numbers will only reach 50) **... in tens?** (yes, the numbers will reach 100) Number the vertical axis.
- ➞ Choose a team with an even score. Count up the vertical axis in tens and draw the bar. Choose a team with an odd score, e.g. 35. Ask: **Where is 35 on the vertical axis?** (halfway between 30 and 40) Draw the bar. Draw the remaining bars. Label the axes and give the bar chart a title.
- ➞ Ask: **If the Zebras scored 15 more points, what would be their score? If all the teams scored five more points, which team would have the highest score? How many more questions would the Elephants need to get to have the highest score?**
- ➞ Point to the vertical axis and say: **We had to number the vertical axis in tens because the scores were so high. If you only got one point for each question, what would be the tallest bar?** (about 12) **How would you number the vertical axis?** (2s)
- ➞ Rub out the table entries, ready for the Plenary.

Y4 Handling data

Suggested order: Spring Term, Week 11, Lesson 4

Pupil Book 2:
Dog race bar chart**Pupil consolidation****Resources** RCM 11, Bar charts; an ordinary die; a playing counter**Refresher**

- 1 One child copies a score sheet.
- 2 They take turns to roll a die, move a counter along a route and record the score. They calculate the total score for each dog.

Practice

- 1 Children copy and complete a bar chart using RCM 11, Bar charts for their scores.
- 2 They answer questions about their results.

Extension CM:
Estimating bar charts**Extension**

- 1 Children estimate bar heights and complete a table of game scores.
- 2 They sketch a bar chart for another table of scores, using approximate bar heights.

Plenary (about 10 to 15 min)

Ask: **What is the difference between the first and third highest scores?**

- ➡ Draw attention to the bar chart on the board. Ask: **What does this bar chart show?** (team score) **How did we make it?** (we recorded the scores in a table) **What was the score for the Lions/Tigers etc?** Complete the table. Ask: **Which team had the highest score? Which is the second lowest score? If the Tigers answered five more questions correctly, would they have the highest score?**
- ➡ Ask: **If the questions were all very easy, would the bar chart be different?** (the bars may be more equal; the fastest group would be highest)

Homework CM:
Racing game
bar chart**Homework** (about 20 min)

Children complete a tally and bar chart.

Organising and interpreting data

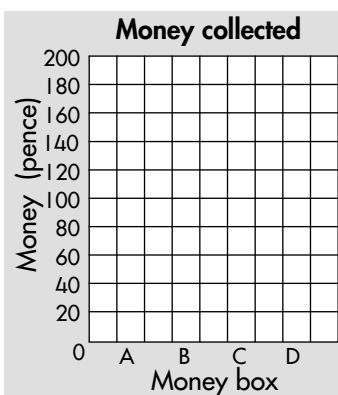
Objectives ● To solve a problem by collecting quickly, organising, representing and interpreting data in tables, charts, graphs and diagrams, including those generated by a computer, for example: bar charts – intervals labelled in 20s.

Vocabulary number; zero, one, two ... to a hundred; table; total; frequency; label; title; record; data; information; bar; bar chart; horizontal axis; vertical axis; axes; diagram; scale; halfway between; tally chart; difference; differ; greatest

i Some of the following software packages may be used in conjunction with this lesson to generate, organise and/or represent data:

Pictogram (CECC)
Counter (Blackcat)
Clipboard (Blackcat)
Information Workshop (RM)
Graph Plot (SEMERC)
Junior Pinpoint (Logotron)
Maths Frame (NW SEMERC)

Money box	Total
A	90p
B	£1.60
C	£1.00
D	£1.50



↑ Ask: **Would it be easier to draw the bars if we only collected 20p coins?** (yes because their tops would all be on a grid line)

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

Choose an activity from Strand 4, Topic 4.1.

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

Resources a total of £5 worth of 10p and 20p coins (an odd number of 10p coins); four money boxes labelled A, B, C, D; bar chart axes; Blu-tack

- ➞ Arrange the children in a U-shape so they can see the board. Distribute the coins.
- ➞ Invite four children to the front and give each a money box. These children circulate the class, collecting money. Invite four more children to count the money, converting to pounds if necessary. Make a quick table and enter the total amounts.
- ➞ Say: **We are going to draw a bar chart to show the money collected.** Blu-tack bar chart axes next to the table. Point to the horizontal axis and ask: **What does the horizontal axis represent?** (money boxes) Write the bar labels A, B, C, D. Point to the vertical axis and ask: **What does the vertical axis represent?** (money collected)
- ➞ Write 0 on the vertical axis. Ask: **What will be the tallest bar? How high will it be? Should we number the vertical axis in twos?** (no, the numbers will only reach 20) **... in fives?** (no, the numbers will only reach 50) **... in tens?** (no, the numbers will only reach 100) **... in twenties?** (yes, the numbers will reach 200) Number the vertical axis, counting in twenties.
- ➞ Choose a money box whose total is a multiple of 20p. Count up the vertical axis in twenties and draw the bar. Choose a money box whose total is not a multiple of 20p, e.g. 90p. Ask: **Where is 90p on the vertical axis?** (half way between 80p and £1) Draw the bar. Draw the remaining bars. Label the axes and give the bar chart a title.
- ➞ Ask: **Which money box had the most/least money? How much more did A have than B? How much money did C and D contain altogether? If we put two more 20p coins in box C, how much would it contain?**
- ➞ Say: **We numbered the vertical axis in twenties.** Ask: **What other ways can you number the vertical axis of a bar chart?** (ones, twos, fives, tens etc.) **When would you number it in ones?** (when the frequencies/totals are small) **If the tallest bar was 40, how would you number the vertical axis?** (in fives: demonstrate by counting up the vertical axis of the bar chart)
- ➞ Rub out the amounts in the table, ready for the Plenary.

Pupil Book 2:
Money box
bar charts

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Pupil consolidation

Refresher

Resources RCM 11, Bar charts

- 1–2 Children count the money four children have (multiple of 20p).
- 3 They copy and complete a bar chart using RCM 11, Bar charts.
- 4 They answer questions about the bar chart.

Practice

Resources RCM 11, Bar charts; RCM 5, Pictograms

- 1 Children draw a bar chart using RCM 11, Bar charts to show the money box totals.
- 2 They answer questions using the bar chart.
- 3 They draw a pictogram using RCM 5, Pictograms to show the same totals, choosing their own picture to represent 20p.

Extension

Resources £5 worth of 10p and 20p coins; RCM 11, Bar charts



Children divide the coins between themselves into roughly equal piles. They count their piles and complete a table. Each child draws a bar chart using RCM 11, Bar charts depending on the number of children in the group. As a variation, some children could draw a pictogram, using RCM 5, Pictograms.

Plenary (about 10 to 15 min)

- ➡ Draw attention to the bar chart on the board. Ask: **What does this bar chart show?** (money box totals) **How much money was in money box A, B, C, D?** Complete the table. Ask: **How could you make the totals for A and C the same?** (add/subtract coins)



Ask: **If we collected 50p and £1 coins, what would we need to change?**

(vertical axis scale, e.g. £0, £1, £2 ...)



- ➡ Ask: **If we used an extra money box E, how would the bar chart change?** (extra bar, shorter bars) **Which two money box totals differ the most? How does the bar chart show this?** (shortest and tallest bars)