

Understanding multiplication and division/Mental calculation strategies (\times and \div)/Rapid recall of division facts/Checking results of calculations

Objectives ● To extend understanding of the operations of \times and \div , and their relationship to each other and to $+$ and $-$.
 ● To derive quickly division facts corresponding to the 2, 3, 4, 5 and 10 times tables. ● To multiply and divide whole numbers by 10. ● To check with an equivalent calculation.

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 1. This lesson provides an opportunity for you to evaluate and assess the children's understanding and mastery of the 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.

2. When multiplying by 10 or 100, it may be easy to say that we simply add one or two zeros to the number. This is not the pattern that should be verbalised. The pattern the children should verbalise is the one for the shift of places. A zero is really not being added. When multiplication of decimal fractions by ten is introduced, errors result if a zero is simply added. Encourage the children to verbalise that the digits are shifting their place values and the zero is put in to hold the place. The opposite occurs when dividing by 10 or 100.

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

Choose an activity from Strand 2, Topics 2.4–2.7.

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

Resources set of cards with a mix of division facts (\div 2, 3, 4, 5, 10); about five large cards with various dot arrays drawn, e.g. 5 by 4, 6 by 3, 3 by 5

- ➡ Shuffle the division facts cards. Ask the class as a whole and individual children to give answers.
- ➡ Show an array card to the class, e.g. 6 rows of 3.
- ➡ Ask: **What two multiplication facts can be written for this array?**
- ➡ Write the multiplication facts on the board. i.e. $3 \times 6 = 18$, $6 \times 3 = 18$
- ➡ Ask: **What are the three numbers that make up this number family?** (3, 6, 18)
- ➡ Ask: **Can anyone tell me the division facts for this array?** ($18 \div 3 = 6$, $18 \div 6 = 3$)
- ➡ Write these on the board. Repeat with another array card.
- ➡ Using other array cards, cover all but one of the rows showing either 2, 3, 4, 5 or 10 dots e.g. array card showing 5 rows of 6.
- ➡ Discuss ways of finding out how many rows there are if the total and the number in each row are known.
- ➡ Say: **There are 5 dots in each row and there are 30 dots in total. We write $30 \div 5 = \square$.** Ask: **How many rows are there?** (6) Say: **I think to myself, I know that 6×5 is 30, so there are 6 rows. So $30 \div 5 = 6$.**
- ➡ Repeat with remaining array cards.
- ➡ Revise multiplying and dividing two- and three-digit numbers by 10.
- ➡ Write e.g. **14** on the board. Ask: **What is 14 times 10?** (140) Write **140** under 14. Say: **Observe what has happened. The 14 has moved one place to the left when multiplied by 10.**
- ➡ Ask: **What is $140 \div 10$?** (14) Say: **Look what has happened. The opposite to multiplication has occurred: the 14 has moved one place to the right and the zero is no longer needed.** Repeat with other numbers.
- ➡ Remind children that knowledge of multiplication helps us find the answer. Ask, e.g. **What number multiplied by 10 gives us 140?** (14)

Pupil Book 1:
Sweet facts

37

Pupil consolidation

Refresher

Children write two multiplication and two division facts for each array picture in their exercise books.

Practice

Children use their knowledge of multiplication facts to help them write a division fact for each picture. They write the related multiplication fact in their exercise books.

Extension CM:
Know your division facts

14

Extension

Resources 36 counters

Children have a copy of ECM 14 between two. They play the game “Know Your Tables”. Each division fact is covered with a counter. The children take turns to uncover a fact and give the answer. If the answer is correct they keep the counter. If it is incorrect the counter is put back in place. The player with the most counters at the end is the winner.



Game 36
Game 45

Games Pack 2

Donkey derby; Happy hundred

Plenary (about 10 to 15 min)

- Write some division facts on the board, e.g. $20 \div 4 = \square$, $35 \div 5 = \square$, $50 \div 10 = \square$.
- Ask questions such as: **How many are we starting with? What are we dividing by? How many groups are we making? What multiplication fact do we need to know to answer the question? What is the answer? What are the numbers in this number family?** Repeat with other division facts.
- Write three numbers on the board that make a number family, e.g. **2, 6, 12**.
- 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. **6, 5, 30; 4, 8, 32**
- Write two numbers on the board, e.g. **___, 5, 35**
- Ask: **What number can I write to make the number family complete?** (7)
- Ask: **How do you know?** (because 5×7 equals 35 or $35 \div 5$ equals 7)
- Say: **We can use known multiplication facts to help us work out our division facts.**



Software: Rapid Maths 4

Goo Station

Mental calculation strategies (x)/Rapid recall of multiplication facts/Pencil and paper procedures (x)

Objectives ● To derive quickly doubles of all whole numbers to 50. ● Approximate first: use informal pencil and paper methods to support, record or explain multiplications. ● To use doubling starting from known facts: double two-digit numbers by doubling the tens first.

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

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

Choose an activity from Strand 2, Topic 2.4, 2.6 or 2.7.

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

⇒ Revise doubling that does not cross a multiple of 10. Ask: **What is double 12?** (24)

⇒ Ask for an explanation of how children worked it out, e.g. $10 + 10 = 20$, add $2 + 2 = 4$, so double 12 is 24; or double both numbers $12 \rightarrow 24$.

⇒ Say: **To work out the double in our head, we can double the tens digit first, then we double the units digit and add them together.**

⇒ Repeat for numbers 21, 43 and 34. ($21 \rightarrow 42$, $43 \rightarrow 86$, $34 \rightarrow 68$)

⇒ Say: **These are easy numbers to double because we do not cross a multiple of ten.**

⇒ Write: 35×2 on the board. Ask: **How can we work out the answer to this?**

⇒ Children should be able to explain an efficient strategy. (e.g. I know that $30 \times 2 = 60$ and $5 \times 2 = 10$, so 60 add 10 equals 70)

⇒ Write: 48×2 on the board.

◀ ⇒ Ask: **Can anyone tell me a number that the answer could be close to?** (100) Ask children how they worked out the approximate answer.

i To get an approximate answer we round the two-digit number to the nearest 10 and then multiply the two numbers together.

↓ Ask: **Which multiples of 10 does 48 lie between?** (40, 50) **Which multiple is 48 closest to?** (50) You may need to draw a simple number line to show the position of the numbers.

◀ ⇒ Say: **To find an approximate answer, we round 48 to the nearest 10 and multiply by 2.** Ask: **What number do we round 48 to?** (50) Ask: **What is 50×2 ?** (100)

⇒ Say: **When we calculate our answer we must check that the answer is somewhere close to our approximate answer, 100.**

⇒ Say: **To make it easier to work out answers to larger multiplication calculations we can partition the larger numbers.** Ask: **What is the value of 4 in 48?** (40) **What is the value of the 8?** (8/8units/8 ones). Say: **We can record our working out like this.**

$$\begin{array}{r} 48 \times 2 \\ 40 \quad 8 \\ 2 \quad \boxed{80} \quad \boxed{16} = 96 \end{array}$$

◀ ⇒ Draw a diagram to show 48×2 . Ask: **What is 40×2 ?** (80) Ask: **What is 8×2 ?** (16) Say and point to the appropriate part of the diagram: **48×2 is the same as 80 add 16.** Ask: **What is 80 add 16?** (96)

⇒ Ask: **Is the answer to 48×2 close to our approximation of 100?** (yes)

↑ Include examples beyond 50, up to 100 e.g. 84×3 ; 63×2 , 85×5 .

◀ ⇒ Repeat with other examples using $\times 2$, $\times 3$, $\times 4$, $\times 5$ up to 50, e.g. 34×4 ; 46×3 ; 37×5 , being sure to approximate the answer first.

⇒ Invite children to record the working on the board.

Pupil Book 1:
Starry doubles

38

Pupil consolidation**Refresher**

Children double each number shown. They write an addition and multiplication number sentence for each.

Practice

- 1 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.
- 2 Children approximate the answer first and then work out the answers to the multiplication calculations using the grid method. They record their answers in their exercise books.


Support CM:
Thinking about
multiplying

15

Support

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

Extension

-  Provide some further examples of multiplying two-digit numbers by a single digit number on the board for children to record in their exercise books. Ask children to either approximate the answer only or approximate first then use the grid 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 grid method.

**Software: Rapid Maths 4**

Base Camp 4

Homework CM:
Informal
multiplications

14

Homework (about 20 min)**Refresher**

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

Practice

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

Pencil and paper procedures (\div)

Objective ● Approximate first: use informal pencil and paper methods to support, record or explain divisions.

Vocabulary lots of; groups of; times; multiply; multiplied by; multiple; add; equals; two times; double; twice; half; halve; divide; divided by; share; share equally; product; inverse; divided into; divisible by; group; factor; remainder; approximate; approximately; nearly; round to the nearest ten

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

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

i The standard method of division is not being taught at this stage. This is an introduction to the layout and importance of writing it correctly. In Year 4, two informal written methods are introduced, however, only the method explained in the main part of the lesson is used in Years 5 and 6. The other informal method used in the National Numeracy Strategy : Framework is as follows:

$$\begin{aligned} 88 \div 4 &= (80 + 8) \div 4 \\ &= 20 + 2 \\ &= 22 \end{aligned}$$

Questioning of the children to develop this method should follow a similar format as suggested for the examples in the lesson. If schools or teachers do not wish to introduce both of these methods they may choose the method they prefer.

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

Choose an activity from Strand 2, Topic 2.5, 2.6 or 2.7

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

- ⇒ Say: **We are going to divide two-digit numbers by 2, 3, 4 and 5.**
- ⇒ Write $36 \div 3$ on the board.
- ⇒ Ask: **Can anyone tell me what the answer could be close to?** Ask children to explain how they worked out the approximate answer.
- ⇒ Say: **It is easy to find the approximate answer by looking to see if you can make 10 groups of 3.**
- ⇒ Ask: **Can 10 groups of 3 be made from 36?** (yes) **What is 10×3 ?** (30)
- ⇒ Write other examples on the board where it is possible to make 10 times the divisor, e.g. $48 \div 4$; $55 \div 5$; $39 \div 3$; $28 \div 2$. Include some examples where it is not possible to make 10 groups, e.g. $45 \div 5$; $27 \div 3$; $32 \div 4$. Ask: **Can 10 groups of be made from ... ?**
- ⇒ Extend this concept to include examples where multiples of 10 times the divisor can be made and easily recognised, e.g. $84 \div 4$.
- ⇒ Ask: **Can we make 10 groups of 4?** (yes) **How many is that?** (40) **Can we make another 10 groups of 4?** (yes) **How many is that altogether?** (80) **How many groups of 4 did we make altogether?** (20)
- ⇒ Write other examples on the board where it is possible to make 20 or 30 times the divisor, e.g. $88 \div 4$; $96 \div 3$; $68 \div 2$. Include examples that are less obvious, e.g. $52 \div 2$; $72 \div 3$; $64 \div 4$. Ask: **Can 10/20/30 groups of ... be made from ...?**
- ⇒ Write one of the previous easier examples on the board, e.g. $88 \div 4$.
- ⇒ Ask: **What is the approximate answer?** (20)
- ⇒ Say: **When we calculate our answer we must check that the answer is somewhere close to our approximate answer.**
- ⇒ Say: **We can record how we worked out the answer like this.**

$$\begin{array}{r} 88 \div 4 = 22 \\ \begin{array}{r} 88 \\ - 80 \quad 20 \times 4 \\ \hline 8 \\ - 8 \quad 2 \times 4 \\ \hline 0 \end{array} \end{array}$$

- ⇒ Show the working out on the board, asking questions such as: **Is it possible to make 10/20 groups of 4?** (yes, $4 \times 20 = 80$) **How many are left?** (8) **How many times can 4 be divided into 8?** (2) **How many groups of 4 did we make altogether?** (22) Ask: **Look at our approximate answer of 20. Is the answer to $88 \div 4$ close to 20?** (yes)
- ⇒ Repeat with other examples using 2, 3, 4, 5 up to 99, e.g. $52 \div 2$, $72 \div 3$, $64 \div 4$, being sure to approximate the answer first.
- ⇒ Invite children to record the working on the board.

Pupil Book 1:
Sports score division

39

Pupil consolidation**Refresher**

Children approximate the answer to each of the calculations by deciding if it is possible to make 10/20/30 groups of the divisor. Children record their working in their exercise books.

Practice

Children use the informal paper and pencil method shown to work out the answer to each calculation. They record their working in their exercise books.

Extension CM:
Recording division
calculations

15

Extension

For each calculation, children write an approximate answer in the space provided. Children use the informal paper and pencil method shown to work out the answer to each calculation.

Plenary (about 10 to 15 min)

- Go through some of the division calculations the children worked on. Approximate the answer first and invite children to explain the working, using the informal method worked on in the lesson.

**Software: Rapid Maths 4**

Base Camp 4

Problems involving numbers in “real life” and money/Making decisions/Checking results of calculations

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 check division with multiplication.

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 2, Topics 2.4–2.7.

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

Resources about five prepared word problems that suggest: multiplying and/or dividing by 2, 3, 4, 5, 10; and doubling whole numbers to 50 and their corresponding halves, written on the board/chart prior to lesson. (Topics should reflect the interests of children in your class.)

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

↓ Continue with more one-step problems.

➡ Read one word problem from the board/chart to the class, e.g. **To cook rice, you need 5 cups of water for every cup of rice. You cook 3 cups of rice. How many cups of water do you need?** Discuss the word problem with the children. Tell them to picture the situation in their mind.

➡ Ask: **What information is important to working out the answer?** Underline the relevant words/phrases.

➡ Ask: **What maths operation do we need to use to find the answer?** (\times)
Ask: **What calculation is required?** (3×5) Ask: **What is the answer?** (15)
How did you work it out?

➡ Say: **To answer the question properly we need to re-read the problem. What do we need to find out?** (how many cups of water you need) Ask: **What is the answer to the problem?** (15 cups of water)

➡ Read a word problem involving more than one step to the class, e.g. **Dave has £60 in the bank. He got half of it for his birthday and he saved the rest from his pocket money over 5 weeks. How much pocket money does he get per week?** Discuss the word problem with the children. Tell them to picture the situation in their mind.

➡ Ask: **What information is important to working out the answer?** Underline the relevant words/phrases.

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

➡ Ask: **What is the first calculation required?** ($60 \div 2$) **What is the answer?** (30) **How did you work it out?** Detail any strategy used, e.g. half of 60 is 30.

➡ Ask: **What calculation do we need to do next?** ($30 \div 5$) **What is the answer?** (6) **How did you work it out?** Encourage children to refer to the multiplication facts when explaining their method. Detail any strategy used.

➡ Ask: **What is the answer to the problem?** (£6 per week)

Pupil Book 1:
A question of sport

40

Pupil consolidation

Refresher

Children observe the items on sale at the pool. None of the prices or amounts are shown so that the children focus entirely on the operation that is required to work out the answer. They write out the question in their exercise books. They record the operation only for each question.

Practice

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

Extension



Write some multiplication and division facts on the board, e.g. 24×2 , 6×4 , $32 \div 4$, $78 \div 2$, etc. Children write their own word problems in their exercise books to match the number facts given.

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 and ÷)/Checking results of calculations

Objectives ● To multiply and divide whole numbers by 10. ● To use doubling or halving, starting from known facts: to multiply by 5, multiply by 10 then halve. ● To check with an equivalent calculation.

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

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

Choose an activity from Strand 2, Topics 2.4–2.7.

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

Resources a set of about ten multiplying by 10 example cards, e.g. 32×10 ; 46×10

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

$$10 \times 5 = (10 \times 10) \div 2 \\ = 100 \div 2 \\ = 50$$

↓ You may like to do another known x 5 fact with the class to show the process.

↑ Try examples using numbers between 20 and 50, e.g. 28×5 ; 36×5 ; 47×5 .

i Children may suggest either of the following methods: $10 \times 5 = 50$ and $8 \times 5 = 40$, so $50 + 40 = 90$; $20 \times 5 = 100$, so 18×5 is 2×5 or 10 less so $100 - 10 = 90$.

↓ Other examples might include concepts covered in Year 3 such as 20×5 ; 30×5 ; 40×5 ; 50×5

⇒ Revise multiplying by 10. Write e.g. **18** on the board. Ask: **What is 18 times 10?** (180) Write 180 under 18.

⇒ Ask: **What has happened to the number 18?** (the 18 has moved one place to the left when multiplied by 10)

⇒ Hold up the example cards one at a time, e.g. 32×10 . Ask the class or individual children to call out the answer.

⇒ Ask: **Who can work out 57×5 by the time I count to 5?**

⇒ Say: **We need to know of quick ways to work out calculations like this. I am going to teach you a quick mental strategy. We are going to use our knowledge of multiplying by 10 to help multiply numbers, particularly larger numbers, by 5.**

⇒ Ask: **Why would 10 help us to multiply by 5?** (it is double 5; or 5 is half of 10) Say: **When we multiply by 5 we can multiply by 10 first and then halve the answer.**

⇒ Start with an easy example to demonstrate the mental process, e.g. Ask: **What is 10×5 ?** (50) Write: **$10 \times 5 = 50$** on the board.

⇒ Say: **We can multiply 10 by 10 and get 100 and halve the answer and get 50.** Ask: **Are the answers the same?** (yes) Say: **We can write it like this: $10 \times 5 = 10 \times 10$.**

⇒ Ask: **What do I need to do to the 10 to make it into 5?** ($\div 2$) Write: $\div 2$ and put the brackets around **(10×10)** . Say: **We put the brackets around the part we do first.** Continue the calculation and write: **$= 100 \div 2 = 50$.**

⇒ Say: **The answers are the same. Let's try a harder example.**

⇒ Write: $18 \times 5 =$ on the board.

⇒ Say: **We multiply 18 by 10.** Ask: **What do I need to do to the 10 to make it into 5?** ($\div 2$) Say: **We can write this as $18 \times 5 = (18 \times 10) \div 2 = 180 \div 2 = 90$.** Say: **$18 \times 5 = 90$.**

⇒ Ask: **Can anyone think of a way to check if this is correct?**

⇒ Repeat the above process with other examples, e.g. 15×5 ; 16×5 ; 17×5 ; 19×5 in random order.

Pupil Book 1:
Fast 5s**Pupil consolidation****Refresher**

Children multiply the number shown on each calculator display by 10 and write the answer in their exercise books.

Practice

Children practice multiplying by 5 using the mental strategy shown. They record the thinking process in their books. Bonus or extra calculations are presented for those children who work quickly.

Support CM:
Fast fives**Support**

Children practice multiplying by 5 using the mental strategy shown. They record the thinking process in the space provided on the worksheet.

Extension CM:
Fast fives**Extension**

Resources ten counters, five each of two different colours

In pairs, children play the game, "Fast fives". They choose a number from the left hand side and multiply it by 5 using the strategy taught in the lesson. The game is played in a similar way to "Noughts and crosses".



Game 43

Games Pack 2

Jungle journey

Plenary (about 10 to 15 min)

Resources set of multiples of 100 cards

- ➡ Count in multiples of 5 to 100 as a class.
- ➡ Work around the classroom in a clockwise direction doubling and halving in alternation, e.g. one child says a multiple of 10 or 100, the next child halves the number, the following child says a multiple of 10 or 100 the next child doubles the number. Continue until the last child is reached. Repeat in the other direction so everyone has a chance of doubling and halving.
- ➡ Count in multiples of 50 to 500 as a class. Hold up a multiple of 100 card, the class halve the number and call out the answer. Repeat asking individual children to answer.
- ➡ Write some $\times 5$ examples on the board, e.g. 14×5 , 30×5 , as in the main part of the lesson.
- ➡ Ask children to explain their answer using the $\times 10$ and halving method.

**Software: Rapid Maths 4**

Base Camp 4

Mental calculation strategies (\times and \div)/Rapid recall of multiplication and division facts/Checking results of calculations

Objectives ● To derive quickly doubles of all whole numbers to 50. ● To use doubling or halving, starting from known facts: to multiply by 20, multiply by 10 then double. ● To check with an equivalent calculation.

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

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

Choose an activity from Strand 2, Topics 2.4–2.7.

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

Resources a selection of number cards up to 50

- ➞ Revise doubling numbers.
- ➞ Ask: **What is double 13?** (26) Ask: **How did you work it out?** (e.g. $10 + 10 = 20$ add $3 + 3 = 6$ so double 13 is 26; or double both numbers $13 \rightarrow 26$.)
- ➞ Say: **To work out the double in our head, we can double the tens digit first, then we double the units digit and add them together.**
- ➞ Ask: **What is double 45?** (90)
- ➞ Ask: **How can we work out the answer to this?**
- ➞ Repeat with other numbers where the answer crosses the tens boundary, e.g. $48 + 48$, asking children to explain their thinking. (48×2 is the same as double 40, which is 80, add double 8, which is 16, so $80 + 16 = 96$)
- ➞ Repeat with other examples up to double 50, e.g. $44 + 44$; $27 + 27$.
- ➞ Hold up number cards one at a time. Ask the class to double the number in their head and call out the number. Quick recall is the aim.
- ➞ Say: **We are going to use our knowledge of doubling and multiplying by 10 to help us multiply numbers, particularly larger numbers, by 20.**
- ➞ Start with an easy example to demonstrate the mental process, e.g. Write: $4 \times 20 =$ on the board. Ask: **What is 4×20 ?** (80)
- ➞ Say: **This is the same as 4 times 10 (40) doubled (80). We can write this as $4 \times 20 = (4 \times 10) \times 2 = 40 \times 2 = 80$.**
- ➞ Write: $16 \times 20 =$ on the board. Say: **This is the same as 16×10 doubled. We can write this as $16 \times 20 = (16 \times 10) \times 2 = 160 \times 2 = 320$.**
- ➞ Ask: **Can anyone think of a way to check if this is correct?** Children may suggest one of the following methods: $16 \times 2 = 32$, so $32 \times 10 = 320$; $20 \times 10 = 200$ and $20 \times 6 = 120$, so $200 + 120$ equals 320. Both of these methods are correct. Remind children that the strategy being taught in this lesson is yet another quick and effective way of working out the answer.
- ➞ Repeat the above process with other examples, e.g. 11×20 , 14×20 , 19×20 , in random order.



Use numbers beyond 50 up to 100.



Other examples might include concepts covered in Year 3 such as multiplying a two-digit multiple of 10 up to 50 by 10, e.g. 20×10 ; 30×10 ; 40×10 ; 50×10 .

Pupil Book 1:
Speedy 20s**Pupil consolidation****Refresher**

Children double each number and write the answer in their books.

Practice

Children practice multiplying by 20 using the mental strategy shown. They record the thinking process in their exercise books. Bonus or extra calculations are presented for those children who work quickly.

Extension

Resources a set of approximately twenty-five number cards between 1 and 100 per pair

Shuffle the set of number cards and place them face down on the table. Children take turns to turn over a number card and multiply the number by 20. The partner checks to see if they are correct. The card is kept if the answer is correct. The person with the most cards is the winner.



Game 43

Games Pack 2

Jungle journey

Plenary (about 10 to 15 min)

- Write some $\times 20$ examples on the board, e.g. 6×20 , 14×20 , 30×20 as in the main part of the lesson.
- Ask children to give the answer and explain how they worked it out using the $\times 10$ and doubling method.

**Software: Rapid Maths 4**

Goo Station

Homework CM:
Multiplying by 20**Homework** (about 20 min)**Refresher**

Children practice multiplying by 20 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 20 to find their way around the racetrack. They record the answers in the space provided.

Mental calculation strategies (x and ÷)


Objective ● To use doubling or halving, starting from known facts: find the 8 times table facts by doubling the 4 times table.

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

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

Choose an activity from Strand 2, Topic 2.4, 2.6 or 2.7.

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

Resources four number cards (numbers 2, 3, 5, 7); array cards showing various four times tables e.g. 4×4 , 4×5 : , 4×6 ; 8×5 ; blank card

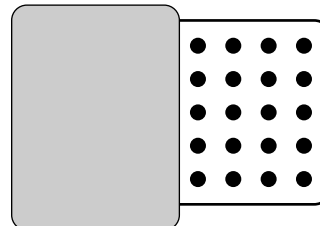
i One method for building up multiplication facts for the four times table is to use the notion of key facts. Another strategy is to use the doubles pattern, e.g. 4×6 is the same as 2×6 doubled, or double 6 then double 6 again. This same double strategy is used to explore the 8 times table, i.e. the 4 times table is doubled to obtain the 8 times table.

➞ Invite a child to choose a number card e.g. 3. Place it on the board. Ask: **What is double 3?** (6) Write **6** beside the 3.

➞ Ask: **What is double 6?** (12) Write **12** beside 6.

➞ Continue doubling until a number close to 100 is reached. Repeat with other number cards.

➞ 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 blank card to show 8×5 . Say: **We can work out what 8×5 is by using the 4 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.**

↓ If children find this difficult, it is likely they do not have secure knowledge of the 4 times table. Revise using the strategy of doubling the 2 times table to obtain the answers to the 4 times table.

➞ Repeat with the other array cards.

➞ Reinforce this doubling strategy by writing on the board various times tables involving 8, e.g. 8×6 . Show how the 4 times table can help work out the 8 times table. Write 4×6 twice under the 8×6 . Circle one of the 4×6 s. Write 24 below. Circle the remaining 4×6 . Write 24 below. Double the 24. Say 8×6 is double 4×6 . Double 24 is 48.

$$\begin{array}{c} 8 \times 6 \\ \swarrow \quad \searrow \\ 4 \times 6 \quad 4 \times 6 \\ 24 \quad + \quad 24 = 48 \end{array}$$

Pupil Book 1:
Easy eights

43

Pupil consolidation**Refresher**

Children determine which of the numbers are multiples of 4 and write out the multiplication fact for each in their exercise books.

Practice

In their exercise books, children write the multiplication fact for the 4 times table as indicated. They double their answer to find the answer to the 8 times table and write the number fact beside the 4 times table.

Support CM:
Easy eights

17

Support

Children write the answer to the multiplication facts for the 4 times table as indicated. They double their answer to find the answer to the 8 times table and write the answer in the box. The dots can be used to help work out the 4 times table but children should not count them to find answers for the 8 times table.

Extension**Resources** a 1–12 die

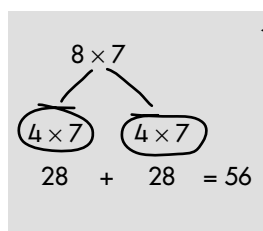
Children take it in turns to throw the die. They multiply the number landed on by 8. The aim is to improve rapid recall so children should be aiming to answer in 3 seconds or less.



Game 43

Games Pack 2

Jungle journey

Plenary (about 10 to 15 min)**Resources** 2 rulers

- ➡ Revise the use of the double $\times 4$ strategy for working out the 8 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 is $4 \times 7 = 28$ and another 4×7 is 28 so 8×7 is 56 using a diagram.
- ➡ Play the game “Gladiators”. Write the multiples of 8 in random order on the board. Two children stand at the board, one on either side each with a ruler. Call out a multiplication fact, e.g. 3×8 . The first child to point to the correct answer remains at the front, and the other child sits down. A second child is chosen to play at the board. The aim is to remain at the front for as long as possible.

**Software: Rapid Maths 4**

Goo Station

Homework CM:
Easy eights

16

Homework (about 20 min)**Refresher**

Children complete each number fact for 4 by doubling and doubling again.

Practice

Children complete each number fact for 8 by multiplying by 4 and doubling the answer.

Mental calculation strategies (\div)/Rapid recall of division facts/Checking results of calculations

Objectives ● To use doubling or halving, starting from known facts: halve two-digit numbers by halving the tens first; find quarters by halving halves. ● To derive quickly halves of all numbers to 100. ● To check with an equivalent calculation.

Vocabulary add; equals; two times; double; twice; half; halve; divide; divided by; share; share equally; product; inverse; divided into; divisible by; group; factor; remainder

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

Choose an activity from Strand 2, Topics 2.4–2.7.

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

⇒ Revise halving numbers by asking quickfire questions such as:

What is half of 10, 20, 50 (i.e. multiples of 10 to 100); **half of 200, 400, 700** (i.e. multiples of 100 to 1000); **48, 74, 56, 82** (i.e. even numbers to 100)?

⇒ Ask children to explain their method of working out the answer, e.g. Ask: **How did you work it out?**

⇒ Remind children: **To work out half of a number in our head we halve the tens digit first then we halve the units digit and add them together.**

⇒ Ask: **What is half of 48?** (24) **What did we split 48 into to work out half?** (40 and 8) Ask: **What is half of 40?** (20) Ask: **What is half of 8?** (4) Say: **So half of 48 equals 24.**

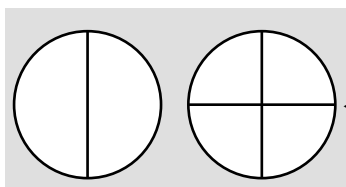
⇒ Ask: **Who can work out the answer to $52 \div 2$?** (26) **What did we split 52 into to work out half?**

⇒ Remind children that an easy way to split 52 into two is to first look for numbers that are 10 or 20 times multiples of 2, e.g. $20 \times 2 = 40$ and then divide the remaining number by 2, i.e. $12 \div 2 = 6$.

⇒ Ask: **What is half of 40?** (20) Ask: **What is half of 12?** (6) Say: **Half of 52 equals 26.**

⇒ Remind children: **Half is the opposite of double. We can check if we are correct by doubling our answer, i.e. $26 + 26 = 52$.**

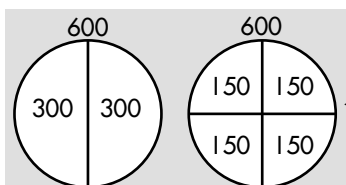
⇒ Draw a large circle on the board. Ask a child to draw a line to show splitting the circle in half. Draw another circle split in half. Ask a child to draw a line to show splitting the circle into quarters.



⇒ Ask: **What happened to the circle that was in half to make it into quarters?**

⇒ Write **600** at the top of the circle split in half. Ask: **What is half of 600?**

⇒ Write **300** in each half of the circle. Ask: **If 300 is half of 600, what would I need to do to find one quarter of 600?** (split 300 in half)



⇒ Ask: **What is half of 300?** (150) Demonstrate this on the circle in quarters.

⇒ Say: **To find quarter of a number we halve the number and then halve the new number.** Write: $\frac{1}{4}$ of 600 = $\frac{1}{2}$ of 600 = 300, $\frac{1}{2}$ again = 150.

↓ Use diagrams if necessary.

⇒ Repeat with other numbers.

Pupil Book 1:
Chocolate egg fractions



Pupil consolidation

Refresher

Children find half of the numbers above each egg and write the calculation in full in their exercise books.

Practice

Children use the halve-and-halve-again strategy to find one quarter of each number. They write the calculations in full in their exercise books.

Extension CM:
Finding quarters



Extension

- 1 Children find one quarter of each number by halving and halving again.
- 2 They complete each number web to find one quarter of the number in the inner square.



Game 43

Games Pack 2

Jungle journey

Plenary (about 10 to 15 min)

- Write some numbers on the board, as in the main part of the lesson, e.g. 600, 140, 460.
- Ask children what one quarter of each number is and to explain how they worked it out using the halve-and-halve-again method.
- Say: **We are going to play a game where we have to halve the number and keep halving the answer until we can't go any further.** Place a starting number on the board, e.g. 80. Ask the children to keep halving the number and write down each answer in turn, e.g. $80 \rightarrow 40 \rightarrow 20 \rightarrow 10 \rightarrow 5$.
- Repeat for other numbers, e.g. 30, 50, 100, 400, 68, 52. Invite children to record their answers on the board.



Software: Rapid Maths 4

Goo Station

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?

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

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

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

Resources about five prepared word problems that suggest: multiplying by 5, 8 and/or 20 using halving and doubling as an aid to developing mental strategies; doubling whole numbers to 50 and their corresponding halves; multiplying two-digit numbers by 3, 4 or 5, written on the board/chart prior to lesson. (Topics should reflect the interests of children in your class.)

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

- ➞ Read one word problem from the board/chart to the class, e.g. **A beetle has 6 legs. How many legs do 5 beetles have?** Discuss the word problem with the children. Tell them to picture the situation in their mind.
- ➞ 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? What calculation is required? What is the answer? How did you work it out?** Encourage children to detail any strategy used. Ask: **What is the answer to the problem?**
- ➞ Continue this process with other story problems.
- ➞ Say: **These stories are easy to answer because you can work out the answer in your head.**
- ➞ Read another problem, e.g. **An aeroplane seats 5 people in a row. How many people can be seated in 24 rows?** Repeat as above but say 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 e.g. $24 \times 5 = (24 \times 10) \div 2 = 240 \div 2 = 120$.
- ➞ Ask: **What is the answer to the problem?** (120 people)
- ➞ Say: **When you become confident at working these type of calculations out in your head, you will not need to use jottings. Let's look at another problem and see how to work it out. Mrs Iris wants to buy a new dress. She is able to save £37 per month. She has to wait for 4 months to purchase the dress. How much does it cost?**
- ➞ Repeat as above but ask children to use the paper and pencil method. Demonstrate how you would like children to record their working.
- ➞ Ask: **What is the answer to the problem?** (the dress costs £148)
- ➞ Say: **Read any word problems very carefully and decide what method to use; mental, mental with jottings or pencil and paper.**

$$\begin{array}{r} 30 \quad 7 \\ \times 4 \quad 120 \quad 28 \\ \hline = 148 \end{array}$$

↑ You may like to include examples of whole numbers up to 100 e.g. 78×2 ; $156 \div 2$; 67×3 to make the use of paper and pencil methods more applicable for children who can work smaller numbers out mentally.

Y4 Solving problemsSuggested order: **Autumn Term, Week 9, Lesson 5**Pupil Book 1:
Musical maths

45

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 and division number sentences on the board, e.g. $26 \times 3 = \square$, $45 \times 5 = \square$, $78 \div 2 = \square$. Children make up their own word problems to match each number sentence. They write these in their exercise books.

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.

Fractions and decimals

Objectives ● To use fraction notation. ● To begin to relate fractions to division. ● To recognise simple fractions that are several parts of a whole, such as $\frac{2}{3}$ or $\frac{5}{8}$ and mixed numbers such as $5\frac{3}{4}$. ● To find fractions such as $\frac{2}{3}$, $\frac{3}{4}$, $\frac{3}{5}$, $\frac{7}{10}$... of shapes.

Vocabulary one, two ... ten; half; halves; third; quarter; fifth; eighth; tenth; whole; fraction; diagram; share; divide; division; figure

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

Choose an activity from Strand 1 Topic 1.3.

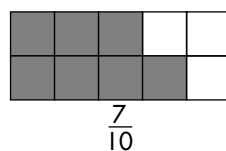
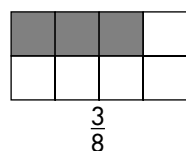
Main teaching and pupil activities (about 30 to 40 min)

Resources five coloured paper circles, with marks for cutting into halves, thirds, quarters (2), fifths; scissors; Blu-tack

- ➞ Arrange the children so they can see the board.
- ➞ Show the class a paper circle. Say: **This is a cake. How can I find a quarter of it? I have to divide it into four equal parts.** Write $1 \div 4$ as you say: **One whole cake divided into four equal parts.** Cut the circle into quarters and Blu-tack three of them to the board.
- ➞ Hold up the remaining quarter and say: **If you divide one whole cake into four equal parts, each part is a quarter.** Stick the last quarter on the board. Ask: **How do you write a quarter using numbers?** Write $1 \div 4 = \frac{1}{4}$. Point to the fraction and say: **One out of four parts is a quarter. Who can write "quarter" in words?**
- ➞ Repeat for $\frac{1}{2}$, $\frac{1}{3}$ and $\frac{1}{5}$.
- ➞ Cut another circle into quarters. Blu-tack three quarters to the board and ask: **What is this fraction of the cake?** ($\frac{3}{4}$) **Who can write three-quarters using numbers? Three out of four parts is three quarters.**
- ➞ Blu-tack the fourth quarter to the board. Ask: **How can we cut this cake to share between eight people?** Cut each quarter in half and Blu-tack to the board. Ask: **What fraction is each piece?** ($\frac{1}{8}$) **Who can write it in numbers/words?** Write $1 \div 8 = \frac{1}{8}$.
- ➞ Draw grids on the board to represent more cakes. Colour one or more squares and ask: **What fraction of this cake has icing? What fraction does not have icing? Who can write this fraction using figures/words?**

↓ Colour $\frac{1}{2}$ of the squares in a grid before asking the questions.

↑ Colour $\frac{5}{8}$ of the squares in an eighths grid before asking the questions.



Pupil Book 1:
Field fractions

46

Pupil consolidation**Refresher**

Children count the parts of a whole field and write the fraction one part is, in words and figures.

Practice**Resources** squared paper

- 1–2 Children write down the fraction of a field that is planted/not planted.
- 3 They match a fraction with a field.
- 4 Children copy field grids and colour the given fraction.

Support CM:
Light bulb fractions

18

Support

- 1 Children write fractions using figures.
- 2 They express one bulb as a fraction of a group, e.g. $\frac{1}{5}$.
- 3 They match fractions, e.g. a fifth, to groups of bulbs.

Extension**Resources** squared paper

Children draw grids and colour them to represent these and other fractions written on the board: $\frac{1}{6}$, $\frac{5}{6}$, $\frac{3}{7}$, $\frac{5}{9}$.



Game 27

Games Pack 2

The Chocolate Monster

Plenary (about 10 to 15 min)**Resources** cards showing various fractions shaded red (half, thirds, quarters, fifths, eighths, tenths) of common shapes (square, circle, rectangle, triangle, kite etc)

- Distribute the fraction cards. Say: **Hold up your card if half/quarter/three quarters/five eighths etc. is red. Who has a square that is two tenths red? Who can write four fifths in words/numbers on the board?**
- Draw a simple shape on the board. Ask: **Who can divide this shape into three equal parts? What fraction is each part called?** (third) Write, for example, $1 \div 3$ and ask: **What does this say?** (one whole divided into three equal parts) Ask: **When you divide one whole into three equal parts, what is each part called?** ($\frac{1}{3}$) Write $1 \div 3 = \frac{1}{3}$.

Fractions and decimals

Objectives ● To use fraction notation. ● To recognise simple fractions that are several parts of a whole, such as $\frac{2}{3}$ or $\frac{5}{8}$ and mixed numbers, such as $5\frac{3}{4}$. ● To find fractions such as $\frac{2}{3}$, $\frac{3}{4}$, $\frac{3}{5}$, $\frac{7}{10}$... of shapes.

Vocabulary one, two ... twenty; half; halves; third; quarter; fifth, eighth, tenth; whole; fraction; mixed fraction: mixed number; share; divide; division; figure

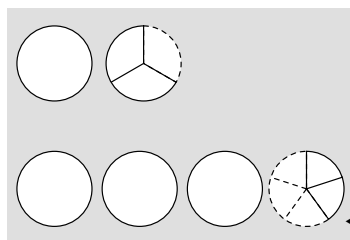
Oral work and mental calculation (about 5 to 10 min)

Choose an activity from Strand 1 Topic 1.3.

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

Resources interlocking cubes; coloured paper circles, some with marks for cutting into halves, thirds, quarters, fifths; scissors

- ➞ Arrange the children in a U-shape on the carpet so they can see the board.
- ➞ Draw a circle on the board and say: **This is a pizza**. Draw another two circles and ask: **How many pizzas now?** (3) Write **3** on the board. Draw half a circle next to the others. Ask: **How many pizzas now?** ($3\frac{1}{2}$) Write **$3\frac{1}{2}$** on the board.
- ➞ Read the fraction several times. Point and say: **This is called a mixed fraction/mixed number. It is a whole number, three, and a fraction, half, mixed together.** Write the fraction in words: **three and a half**.
- ➞ Repeat for $2\frac{3}{4}$ and $5\frac{1}{4}$, inviting children to write the fractions using numbers and words.
- ➞ Repeat for $1\frac{2}{3}$ and $3\frac{2}{5}$. Divide the last circle into equal fifths (to help identify the fraction), then rub out (eat) some of the parts.
- ➞ On the carpet, construct a tower using 10 interlocking cubes. Say: **How many cubes is this tower made from? What fraction of a tower is one cube?** ($\frac{1}{10}$) Construct a second tower of 10 blocks. Ask: **How many towers now?** (2) Construct a third tower using 7 cubes. Ask: **What fraction of a tower is this?** ($\frac{7}{10}$) **How many towers are there altogether?** ($2\frac{7}{10}$) **Who can write this mixed fraction on the board using figures/words?**
- ➞ Repeat for $1\frac{3}{10}$.
- ➞ Choose two children to come to the centre. Give them 5 circles (one marked for cutting into halves) and a pair of scissors. Ask: **How can Beth and Franz share these five biscuits equally?** ($2\frac{1}{2}$ each) Write **$5 \div 2 = 2\frac{1}{2}$** on the board as you say: **Five biscuits divided between two children gives $2\frac{1}{2}$ biscuits each.**
- ➞ Repeat, dividing 5 circles between four children, 7 biscuits between three children etc. (giving a fraction with numerator 1 each time).



➞ For $3\frac{5}{10}$ ask: **What other mixed fraction could you write?** ($3\frac{1}{2}$)

Pupil Book 1:
Lolly fractions

47

Pupil consolidation**Refresher**

Children write the number of lolly packs as a mixed fraction.

Practice

Resources squared paper; counters

- 1 Children match fractions to groups of lolly packs.
- 2 They draw the given number of ice cream packs.

Extension

Resources coloured paper circles marked for cutting into halves, thirds, quarters, fifths; scissors

Give each pair a number of circles (cakes) to divide between a lesser number of children, e.g. for three circles divided between five children, use circles that can be cut into fifths. Children cut the circles into fifths and make five equal piles. They write the fraction each child gets, e.g. $\frac{3}{5}$. Repeat for two other fractions. Children deduce that, if n cakes are divided between m children, each person gets $\frac{n}{m}$ of a cake. Ask the children, "If four cakes were shared between seven people, what fraction of a cake would each receive?" ($\frac{4}{7}$)



Game 27

Games Pack 2

The Chocolate Monster

Plenary (about 10 to 15 min)

Resources interlocking cubes/building blocks

- Construct towers using interlocking cubes, making fractions such as $1\frac{3}{8}$, $2\frac{1}{2}$, $4\frac{3}{5}$, $2\frac{4}{10}$. For the first tower, ask: **How many cubes is this tower made from? What fraction of a tower is one cube?** For the fraction of a tower, ask: **What fraction of a tower is this? How many towers are there altogether? Who can write this mixed fraction on the board using figures/words?**
- Ask: **Who can make $2\frac{3}{4}$ towers?**
- Give 2–5 children some cubes (chocolates) to share equally, with one block left over. Ask: **How many whole chocolates each? How many parts do we have to cut the last one into? What fraction does each person get? How many chocolates does each child get altogether? Who can write this mixed fraction on the board using figures/words?**

Homework CM:
Flower fractions

17

Homework (about 20 min)**Refresher**

Children write down the number of flowers as a mixed fraction in words and numbers.

Practice

- 1 Children write the number of seed trays in flower as a mixed fraction.
- 2 Children match a fraction with a group of flowers.
- 3 They share a number of flowers between a group of rabbits.

Fractions and decimals

Objective ● To begin to relate fractions to division and find simple fractions such as $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$ of numbers or quantities.

Vocabulary one, two ... thousand; half; halves; third; quarter; whole; fraction; share; divide; division; division fact; figure; method; calculate; machine; input; output

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 counters or interlocking cubes; easel

i Display the 2, 3 and 4 times tables, if necessary.

- ➞ Arrange the children in a U-shape on the carpet.
- ➞ Place 8 counters on the carpet. Ask: **How many counters are there?** **Manjit, divide these counters in half. Half of eight is four.** Write $\frac{1}{2}$ of 8 = 4 on the easel. Say: **Manjit divided eight counters into two equal parts.** Write $8 \div 2 = 4$ as you say: **Eight counters divided by two gives four counters in each part.**
- ➞ Place 10 counters on the carpet. Ask: **How many counters are there? If you want to find half of ten, what number must you divide ten by?** (2) Write $10 \div 2 =$. Ask: **What is the answer?** (5) Write the answer. Say: **Jackie, divide the counters in half. Half of ten is five.** Write $\frac{1}{2}$ of 10 = 5.
- ➞ Place 14 counters on the carpet. Ask: **How many counters are there?** Ask: **What number do we divide 14 by, to find half?** (2) Write $\frac{1}{2}$ of 14 = 14 \div 2 =. Ask: **What is the answer?** (7) Write the answer.
- ➞ Place 12 counters on the carpet. Ask: **How many counters are there?** **Carla, divide these counters into thirds. A third of twelve is four.** Write $\frac{1}{3}$ of 12 = 4. Say: **Carla divided twelve counters into three equal parts.** Write $12 \div 3 = 4$ as you say: **Twelve counters divided by three gives four counters in each part.**
- ➞ Place 15 counters on the carpet. Ask: **How many counters are there?** Ask: **What number do we divide 15 by to find a third?** (3) Write $\frac{1}{3}$ of 15 = 15 \div 3 =. **What is the answer?** (5) Write the answer.
- ➞ Repeat, finding a quarter of various numbers.
- ➞ Find fractions of various numbers without using counters, using known division facts. For example, write $\frac{1}{3}$ of 21 = and ask: **Harry, how can you find a third of 21?** (divide 21 by 3) Write the division on the easel: $21 \div 3$. Ask: **What is the answer?** (7)
- ➞ Ask: **If you divide eight sweets between four people, what fraction does each person get?** ($\frac{1}{4}$) **How many sweets does each person get?** (2)
- ➞ Ask: **How many pence in £1?** (100) **What is half a pound?** (50p) Write $\frac{1}{2}$ of £1 = 50p. **How can you find a quarter of £1?** (find half of a half; half of 50p) **What is a quarter of £1?** (25p) Write $\frac{1}{4}$ of £1 = 25p.
- ➞ Repeat for $\frac{1}{2}$ and $\frac{1}{4}$ of 1 m, 1 litre and 1 kg.
- ➞ Ask: **What is half of 38p?** (19p) **... 62cm?** (31 cm) **... 400g?** (200g)

↓ Ask children to find $\frac{1}{2}$ of 6.

↑ Ask children to find $\frac{1}{4}$ of 36; $\frac{1}{2}$ of 94.

Y4 Numbers and the number systemSuggested order: **Autumn Term, Week 10, Lesson 3**Pupil Book 1:
Freaky fraction machines

48

Pupil consolidation**Refresher**

Children practice their division facts ($\div 2$, $\div 3$, $\div 4$), with the aid of their multiplication tables, if necessary and write the calculations as fractions.

Practice

- 1 A machine divides a number of sweets into equal bags. Children write down the fraction that goes into each box and the associated division fact.
- 2 Children calculate fractions of numbers fed into machines.
- 3 Children calculate fractions of quantities fed into machines.

Support CM:
Fraction trays

19

Support**Resources** counters

Children divide a given number of counters into equal piles, using trays, to find fractions.

Extension CM:
Fraction bashers

18

Extension

- 1 Children halve larger numbers.
- 2 They quarter larger numbers by halving twice.
- 3 They find $\frac{1}{16}$ of numbers by quartering twice.

Plenary (about 10 to 15 min)**Resources** number cards from the 2, 3, 4 times tables and even numbers to 100

Use larger numbers.

Give each child a number card. Say: **Joe, what is a third of your number? Pat, divide your number by two. What fraction is that?** (half)

Fractions and decimals

Objective ● To begin to relate fractions to division and find simple fractions such as $\frac{1}{5}$, $\frac{1}{10}$ of numbers or quantities.

Vocabulary one, two ... ten thousand; fifth; tenth; hundredth; whole; fraction; share; divide; division; division fact; figure; method; calculate

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

Choose an activity from Strand 1 Topic 3.

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

Resources interlocking cubes; packets of food (contents are a multiple of ten, e.g. 500 g of flour)

- ➞ Arrange the children in a U-shape on the carpet.
- ➞ Place 10 interlocking cubes on the carpet. Ask: **How many cubes are there? Wayne, divide them into fifths. A fifth of ten is two.** Write $\frac{1}{5}$ of $10 = 2$. Say: **Wayne divided ten cubes into five equal parts.** Write $10 \div 5 = 2$ as you say: **Ten cubes divided by five gives two cubes in each part.**
- ➞ Place 20 interlocking cubes on the carpet. Ask: **How many cubes are there? (20) If you want to find a fifth of 20, what number must you divide 20 by? (5) Write $20 \div 5 =$ and ask for the answer. Say: **Tim, divide the cubes in fifths. A fifth of 20 is four.** Write $\frac{1}{5}$ of $20 = 4$.**
- ➞ Place 25 cubes on the carpet. Ask: **How many cubes are there? Ask: What number do we divide 25 by to find a fifth? (5) Write $\frac{1}{5}$ of $25 = 25 \div 5 =$. What is the answer? (5) Write the answer.**
- ➞ Make two adjacent rows of 10 cubes each on the carpet. Ask: **How many cubes are there? (20) Fay, divide these cubes into tenths. A tenth of 20 is two.** Write $\frac{1}{10}$ of $20 = 2$. Say: **Fay divided 20 cubes into ten equal parts.** Write $20 \div 10 = 2$ as you say: **20 cubes divided by ten gives two cubes in each part.**
- ➞ Make four rows of cubes. Ask: **How many cubes are there? (40) Ask: What number do we divide 40 by to find a tenth? (10) Write $\frac{1}{10}$ of $40 = 40 \div 10 =$. What is the answer? (4) Write the answer.**
- ➞ Find $\frac{1}{5}$ of various numbers without using cubes, using known division facts. For example, write $\frac{1}{5}$ of $35 =$ and ask: **Mel, how can you find a fifth of 35? (divide 35 by 5) Write the division on the board: $35 \div 5 =$. Ask: What is the answer? (7)**
- ➞ Find $\frac{1}{10}$ of whole numbers without using cubes. For example, write $\frac{1}{10}$ of $250 =$ and ask: **Salim, how can you find a tenth of 250? (divide 250 by 10) Write the division on the board: $250 \div 10 =$. Ask: What is the answer? (25)**
- ➞ Repeat for $\frac{1}{100}$ of whole numbers.
- ➞ Show the class a packet of food, e.g. 300g of rice. Ask: **If ten people eat this rice, what fraction does each person get? (tenth) How much rice does each person get? (30g) Repeat using other quantities.**
- ➞ Ask: **How many pence in £1? (100) What is a tenth of £1? (10p) Write $\frac{1}{10}$ of $£1 = 10p$. Ask: How can you find a fifth of £1? (divide 100p by 5)**



Find $\frac{1}{10}$ of 50.



Find $\frac{1}{10}$ of 3070.

Pupil Book 1:
Cooking fractions

49

Pupil consolidation**Refresher**

Children practice their division facts ($\div 5$, $\div 10$), with the aid of their multiplication tables, if necessary.

Practice

- 1 Children find $\frac{1}{5}$ of quantities of food. They write down a fraction statement and the associated division fact.
- 2 Children find $\frac{1}{10}$ of quantities of food and write the associated division fact.
- 3 Children match a fraction of £1 with the correct coin, e.g. $\frac{1}{5}$ and 20p.

Extension

Resources set of cards cut from RCM 2, Fraction facts and RCM 3, Division facts



Children share out the cards. Each child places a card on the table. They calculate the answers. The player with the highest cards wins both cards. The player with the most cards at the end of the game is the winner. As a variation use only fraction facts.

Plenary (about 10 to 15 min)

- Write about fifteen numbers on the board: some multiples of 5 (up to 50) and multiples of 10, 100, 1000.
- Point to a number and ask: **What is a fifth/tenth/hundredth of this number? If you divide this number by five/ten/hundred, what fraction do you get? What is the answer?**

Homework CM:
Lengthy fractions

18

Homework (about 20 min)**Refresher**

Children practice their division facts ($\div 5$, $\div 10$).

Practice

- 1 Children find $\frac{1}{5}$ of lengths. They write down a fraction statement and the associated division fact.
- 2 Children find $\frac{1}{10}$ of lengths.
- 3 Children find $\frac{1}{5}$, $\frac{1}{10}$ or $\frac{1}{100}$ of lengths.
- 4 Children join a fraction of 1 m with the correct length, e.g. $\frac{1}{4}$ and 25 cm.

Fractions and decimals

Objectives ● To recognise simple fractions that are several parts of a whole, such as $\frac{2}{3}$ or $\frac{5}{8}$. ● To begin to relate fractions to division and find simple fractions such as $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{1}{10}$... of numbers or quantities.

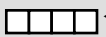
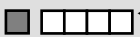
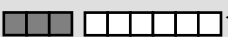

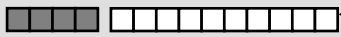

Vocabulary one, two ... ten thousand; half; halve; third; quarter; fifth; tenth; hundredth; whole; fraction; share; divide; division; division fact; figure; method; calculate

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 grid strips; markers; scissors; counters; £1 coin; 50p coins; 20p coins; 10p coins

-  ➞ Arrange the children in a U-shape on the carpet so they can see the board. Show the class a strip of four squares.
-  ➞ Colour the left square and ask: **What fraction is coloured?** (quarter) Cut off the coloured square and discard the remainder. Blu-tack it to the board. Blu-tack a new strip of four squares to the right. Say: **This coloured square is a quarter of the whole strip. One is a quarter of four.**
-  ➞ Blu-tack three coloured squares to the left of a strip of six squares. Ask: **What fraction are these three squares of the whole strip?** (half) **Three is half of six.**
- ➞ Write **4 is ... of 12.** Point to the space and ask: **What fraction is four of 12?** (third) **How do you know?** (because $12 \div 3 = 4$) **Four is a third of 12.** Repeat for other obvious fractions of numbers, e.g. **10 is ... of 50.**
-  ➞ Show the class a strip of five squares. Colour the first three squares and ask: **What fraction is coloured?** ($\frac{3}{5}$) Cut off the coloured squares and Blu-tack them to the board next to a new strip of five squares. Say: **Three squares out of five squares is the fraction $\frac{3}{5}$. Three squares is $\frac{3}{5}$ of five squares.**
-  ➞ Blu-tack four coloured squares to the left of a strip of 10 squares. Ask: **What fraction are these coloured squares of the whole strip?** ($\frac{4}{10}$) **Four squares out of 10 squares is the fraction $\frac{4}{10}$.**
- ➞ Write **3 out of 4 =** and ask: **What fraction is three out of four?** ($\frac{3}{4}$). Repeat for other simple fractions, e.g. $\frac{1}{2}$, $\frac{3}{8}$, $\frac{9}{10}$, $\frac{23}{100}$.
- ➞ Place 15 counters on the carpet and ask: **How many counters are there?** **How many lots of three counters are there in 15 counters?** (five) **Joshua, divide the counters into five equal parts. 15 divided by three is five; so three is a fifth of 15.**
- ➞ Repeat for other fractions, e.g. 2 is $\frac{1}{4}$ of 8 counters.
-  Ask: **What fraction is 5 of 40?** ($\frac{1}{8}$) ➞ Write **5 is ... of 15.** Point to the space and ask: **What fraction is 5 of 15?** (third) **15 divided by five is three, so five is a third of 15.**
- ➞ Place a 20p coin to the left of a £1 coin. Ask: **What fraction of £1 is 20p?** ($\frac{1}{5}$) **How do you know?** Demonstrate by replacing the £1 coin by five 20p coins. Repeat, using 50p and 10p coins.

Pupil Book 1:
Artistic fractions

50

Pupil consolidation**Refresher**

Children write one person's crayons as a fraction of another person's.

Practice

- 1 Children express one quantity of paint as a fraction of another, e.g. 10g is $\frac{1}{5}$ of 50g.
- 2 Children express a number of pence as a fraction of £1.
- 3 Children fill in the missing fractions, e.g. 4 is ... of 20.

Extension CM:
Billboard fractions

19

Extension

- 1 Children fill in the missing fractions, e.g. 8 is ... of 40, 5 is ... of 40, 4 is ... of 24.
- 2 Children express one quantity of paint as a fraction of another, e.g. 200cl is $\frac{1}{3}$ of 600cl, 2 litres is $\frac{1}{8}$ of 16 litres.

Plenary (about 10 to 15 min)

- Draw two large circle on the board. Write ten numbers in the left circle that divide into other numbers in the right circle, e.g. left: 2, 3, 4, 5, 8, 10, 15, 20, 100, 200 and right: 4, 8, 10, 12, 20, 30, 40, 50, 200, 400, 500.
- Point to a number on the left, e.g. 3, and a number on the right it divides into, e.g. 12, and ask: **What fraction is 3 of 12?** ($\frac{1}{4}$) **What is 3 as a fraction of 12?** **What fraction of 12 is 3?**

Mental calculation strategies (+ and -)

Objectives ● To use known number facts and place value: to add or subtract a pair of two-digit numbers crossing the tens but not the hundreds boundary. ● To find a small difference by counting up. ● To continue to use the relationship between addition and subtraction.

Vocabulary add; addition; more; plus; and; total; sum; make; altogether; subtract; subtraction; minus; take away; left; less; tens; units; ones; equals; makes; increase

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

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

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

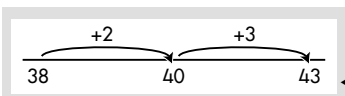
Resources cards 10 to 50 from a pack of 0–100 cards; Blu-tack



Revise the place value of the tens and units digits in a two-digit number.

Choose two cards yourself to ensure that the tens boundary is not crossed.

- ➡ Shuffle the cards and split them into two piles. Show the cards to the class. Explain that these are all two-digit numbers. Ask a child to pick one card from each pile. Blu-tack the two cards onto the board. Invite a child to write an addition calculation on the board using the two numbers.
- ➡ Say: **Work this calculation out in your head.** Allow about a minute thinking time. Invite a child to say the answer and to explain how they worked it out. Record their method as calculations on the board.
- ➡ Ask: **Did anyone work it out in a different way?** Record any other methods on the board. If there are children who are not sure, emphasise the method of adding the tens and then the units and then recombining e.g. $35 + 47$, $30 + 40 = 70$, $5 + 7 = 12$, $70 + 12 = 82$.
- ➡ Ask another child to write a subtraction calculation on the board using the same two numbers. Ask children to work out the calculation in their heads. Again, allow about a minute thinking time.
- ➡ Ask: **Who can explain how they worked this out?** Invite the child to record their method on the board. Ask: **Did anyone work it out in a different way?** Record any other methods on the board.
- ➡ If there are children who are not sure, emphasise the method of subtracting the tens and then the ones from the starting number e.g. $47 - 35$, $47 - 30 = 17$, $17 - 5 = 12$, $47 - 35 = 12$.
- ➡ Ask a child to choose two more cards and repeat making an addition and subtraction calculation from the numbers.
- ➡ Choose two cards with a small difference e.g. 43 and 38. Write a subtraction calculation using these numbers.
- ➡ Say: **If you need to work out a calculation like this, where the number that needs to be subtracted is not much smaller than the first number, it is easier to count up from the smaller number to find the difference.**
- ➡ Draw an empty number line on the board. Write **38** at the beginning. Say: **To get from 38 to 40, I need to count on 2. From 40 to 43, I need to count on another 3. So, the difference between the two numbers is 5, so the answer is 5.** Draw the jumps on the number line as you speak.
- ➡ Repeat with two other numbers that are close together.



Choose numbers beyond the range of the cards e.g. 263 and 271, 397 and 409, 4000 and 3993.

Pupil Book 1:
Find the difference

51

Pupil consolidation**Refresher**

Children who are having difficulties can work through these calculations that do not cross the tens boundary. Children write an addition and subtraction calculation for each pair of numbers.

Practice

- 1 Children write an addition and subtraction calculation for each pair of numbers.
- 2 They find the difference between the two numbers using the empty number line.

Support CM:
Count on and back

20

Support

Children first work out the calculations involving the addition and subtraction of multiples of ten. They then work out the calculations which have been broken down into two steps.

Extension**Resources** pack of 0–100 cards

In pairs, children shuffle the cards and put them in a pile in front of them. Both children take two cards from the pile and keep them secret. Each child then decides whether to make an addition or subtraction calculation using their secret numbers and then works out the answer. They then read out the calculation and the answer to their partner but miss out one of the secret numbers e.g. $56 + \square = 112$. They both then work out the secret number from their partner's calculation.



Game 39

Games Pack 2

Dotty dragon

Plenary (about 10 to 15 min)

- Say: **There are different methods that can be used for adding and subtracting two-digit numbers in your head. You need to choose the best method to suit the numbers in the calculation.**
- Choose some of the calculations from the Pupil Book and invite different children to explain the method they choose for that calculation.
- Finish by asking children to find small differences between numbers e.g. 72 and 69, 140 and 134, 403 and 386.

**Software: Rapid Maths 4**

Crushers!

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

Objectives ● To use informal pencil and paper methods to support, record or explain additions: adding the least significant digits, preparing for 'carrying'. ● To consolidate knowing by heart: addition and subtraction facts for all numbers to 20. ● To write a subtraction fact corresponding to a given addition fact and vice versa.

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

↓ Change the calculation to $625 + 43$. This does not cross the tens boundary.

i) The standard written method of addition is not being taught here. This is an introduction to the idea of adding the least significant digits first, which will lead to "carrying" next term. If schools or teachers do not intend to introduce this method to the children then they may wish to consolidate the other informal pencil and paper methods of adding the most significant digit first (see Autumn Term, Week 2, Lesson 4) or compensation (see Autumn Term, Week 2, Lesson 5). The Pupil Book pages for this lesson covers similar mathematical content and can be used for these methods also.

2) The hundreds and tens digits must always be referred to as the number they represent not just as a single digit e.g. in 48, 40 must always be said, not 4.

↓ Choose a calculation that does not involve crossing the tens and the hundreds boundaries e.g. $541 + 57$.

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

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

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

- ⇒ Begin by writing an addition fact for a number to 20 on the board e.g. $6 + 8 = 14$. Ask: **If I know this fact, what are the other facts that I also know?** Write them on the board as children say them ($8 + 6 = 14$, $14 - 6 = 8$, $14 - 8 = 6$). Write other addition facts on the board and repeat.
- ⇒ Say: **If you know all your addition and subtraction facts to 20, it will make more difficult calculations much easier to work out. If you do not know all your facts, then try to learn them. Use the ones you already know to learn the related facts.**
- ⇒ Write $625 + 48$ horizontally on the board. Say: **When we work this out by adding the hundreds, tens and units separately, we can record our working vertically.** Write the calculation out vertically.
- ⇒ Remind the class of the vertical layout. Say: **The units are written underneath each other and the tens are written underneath each other. There is nothing underneath the 600 as there are no hundreds in 48.**
- ⇒ Say: **Each of these is called a column: the units column, the tens column and the hundreds column.** Point to the appropriate column as you speak.
- ⇒ Say: **I am going to add the least significant digits, the units, first. 5 plus 8 is 13, so I write 13 in the tens and units columns.**
- ⇒ Say: **Now we can add the tens, 20 and 40. The answer 60 is written in the tens and units columns.**
- ⇒ Say: **Now we add the hundreds. As only one of the numbers has any hundreds I do not need to add. I can just write down 600.**
- ⇒ Say: **To get the final answer we need to add 13, 60 and 600 together. Now the numbers have been partitioned into units, tens and hundreds it is easy to add them in your head. 13 add 60 is 73, 73 add 600 is 673. Write 673 below 600.**

$$\begin{array}{r} 625 \\ + 48 \\ \hline 13 \\ 60 \\ 600 \\ \hline \end{array}$$

- ⇒ Write $587 + 59$ horizontally and vertically on the board. Invite a child to come and work out the calculation adding the least significant digits first.
- ⇒ Repeat for $783 + 48$.
- ⇒ Move onto calculations involving HTU + HTU if appropriate e.g. $247 + 518$. Do not cross the thousands boundary.

Pupil Book 1:
Addition facts

52

Pupil consolidation**Resources** squared paper**Refresher**

Children who are experiencing difficulty can first work through this section that starts with the adding of two-digit numbers. The HTU + TU calculations do not cross the tens or hundreds boundaries. Children copy out the calculation both ways then work it out using the vertical method. Children will need squared paper to lay out their work correctly.

Practice

Children write out the calculations both ways then work them out using the vertical method. Children will need squared paper to lay out their work correctly.

Extension CM:
Adding three numbers

20

Extension

This involves adding three numbers using the vertical method of laying them out.

Plenary (about 10 to 15 min)

- ☞ Say: **We have been using a way to record the adding you do in your head. It is important to write it out correctly with units always under units, tens always under tens and hundreds always under hundreds.**
- ☞ Say: **If we add the units then the tens then the hundreds, we make the numbers easier to add together. We write the answers down as we are adding so we do not forget them.**
- ☞ Say: **Remember that when adding multiples of hundreds and tens together knowing the number facts to 20 makes it easier. If I know 9 plus 4 is 13, then I know 90 plus 40 is 130 and 900 add 400 is 1300.**
- ☞ Invite four children to the front of the class. Ask the first child to say an addition or subtraction fact to 20 that they know. The other three children then have to say the three related facts.
- ☞ Write the facts on the board as the children say them. Repeat with four more children.

**Software: Rapid Maths 4**

Crushers!

Homework CM:
Addition calculations

19

Homework (about 20 min)

This provides further practice in laying out addition calculations vertically. Children complete the first section and then make up some of their own calculations.

Pencil and paper procedures (–)

Objective ● To use informal pencil and paper methods to support, record or explain subtractions: decomposition.

Vocabulary subtract; subtraction; minus; take away; difference; equals; makes; is the same as; sign; column; partition

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

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

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

i 1) This is an informal written method that will lead to the standard method of decomposition that will be introduced in the Spring Term. If schools or teachers do not intend to introduce this method to the children they may wish to consolidate the other informal methods of counting up (see Autumn Term, Week 3, Lesson 1) and compensation (see Autumn Term, Week 3, Lesson 2). The Pupil Book page for this lesson covers similar mathematical content and can be used for these methods also.

2) The hundreds and tens digits must always be referred to as the number they represent not just as a single digit e.g. in 72, 70 must always be said, not 7.

$$\begin{array}{r} 600 \\ 754 = 700 + 150 + 4 \\ 72 = \quad \quad 70 + 2 \\ \hline 600 \quad 80 \quad 2 = 682 \end{array}$$

↓ This calculation involves adjusting the tens in order to make the subtraction work. **784 – 72** would not require this and could be done first as an introduction to the method.

$$\begin{array}{r} 600 \\ 754 = \cancel{700} + 150 + 4 \\ 72 = \quad \quad 70 + 2 \\ \hline 600 \quad 80 \quad 2 = 682 \end{array}$$

- ⇒ Say: **I am going to write a number and I want you to say what each digit represents.** Write **837** on the board. Point to the three digits in turn. Repeat for other three digit numbers. Point to the digits in varying order.
- ⇒ Write **754 – 72** on the board horizontally and vertically. Remind the class of the vertical layout. Say: **The units are written underneath each other and the tens are written underneath each other. There is nothing underneath the 700 as there are no hundreds in 72.**
- ⇒ Say: **To make the subtraction of these numbers easier, we are going to decompose or partition the numbers into hundreds, tens and units. 754 is 700 add 50 add 4.** Write **700 + 50 + 4** on the board. Say: **72 is 70 add 2.** Write **70 + 2** underneath **50 + 4**. Draw an answer line underneath.
- ⇒ Say: **Now I have partitioned the numbers into hundreds, tens and units, I can carry out the subtraction. 4 minus 2 is 2.** Write **2** underneath the answer line.
- ⇒ Say: **Now I subtract the tens. I cannot subtract 50 from 70, so I have to change 50 to make it larger than 70. I can take 100 from 700 and change 50 into 150. 700 will now be 600.** Cross out 700 and write **600**. Change 50 to **150**.
- ⇒ Say: **600 add 150 add 4 still makes 754. So I have not changed the number but I have adjusted the way it is written.**
- ⇒ Say: **Now I can carry out the subtraction. 150 minus 70 is 80.** Write **80** below the answer line. Say: **600 subtract nothing is 600.** Write **600** below the answer line.
- ⇒ Say: **The answer to the calculation is 600 plus 80 plus 2, which is 682.**
- ⇒ Write **437 – 94** on the board. Invite a child to partition the numbers. Then invite another child to explain how they would work out the calculation, and to record the steps on the board.
- ⇒ Repeat for **871 – 69**. In this calculation the units need adjusting.
- ⇒ Move onto calculations involving HTU – HTU and calculations where the units and the tens need adjusting.

Pupil Book 1:
Take it away

53

Pupil consolidation**Refresher****Resources** squared paper

Children who are experiencing difficulty can first work through this section that starts with the subtraction of two-digit numbers. The HTU-TU calculations do not involve any adjusting. Children copy out the calculations vertically. Children will need squared paper to lay out their work correctly.

Practice

Children work out the calculations vertically. They partition the numbers and adjust as appropriate.

Support CM:
Partitioning numbers

21

Support

Children partition numbers into hundreds, tens and units. Then they give the three-digit numbers for numbers partitioned into hundreds, tens and units.

Extension**Resources** three 0–9 dice

The child rolls the three dice and uses the three numbers to make two three-digit numbers. They then subtract the smaller number from the larger number using the partitioning and adjusting method.

Plenary (about 10 to 15 min)

- Say: **Partitioning the numbers makes subtracting easier as it can be done in three steps of first the units, then the tens and then the hundreds. But sometimes some adjusting needs to be done to make the subtraction work.**
- Choose some of the calculations from the Practice section of the Pupil Book. Ask: **What numbers had to be adjusted to make the calculation work?**
- Say: **I am going to tell you how many hundreds, tens and units in a number and I want you to say what the number is. So if I say 6 tens, 300 and 2 units the number is 362.** Vary the order you say the hundreds, tens and units. Sometimes say 3 hundreds and sometimes say 300, 6 tens or 60.

**Software: Rapid Maths 4**

Souperbowl

Measures: (time)/Problems involving measures (time)

Objectives ● To read the time from an analogue clock to the nearest minute, and from a 12-hour digital clock. ● To use am and pm and the notation 9:53. ● To use all four operations to solve word problems involving numbers in measures (time), using one or more steps.

Vocabulary a.m.; p.m.; noon; midnight; hour; minute; second; how long ago?; how long will it be to . . . ?; faster; fastest; slower; slowest; takes longer; takes less time; earliest; latest


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

Choose an activity from Strand 1 or Strand 2.

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

Resources geared analogue clock face; digital clocks or cards and baseboard for same; analogue clock faces

- ➞ Show a time to the 10 minutes on the analogue and digital clock faces and ask: **What time will the clock show in 10/20/30 minutes? What time did it show 10/20/30 minutes ago?** Repeat for a time to the 5 minutes.
- ➞ Set the analogue clock to 9:10 and ask: **What time will the clock show after 1, 2, 6 minutes?** (11, 12, 16 minutes past 9) Repeat for different times.
- ➞ Show times to the minute between 1 and 30 minutes past the hour, e.g. 6:22, 11:14, 7:03 to give children practice in saying the times.
- ➞ Show a time that is minutes short of the next hour, e.g. 2:57 and ask: **In how many minutes time will it be 3 o'clock?** (3) With the children, count back from the hour: **Sixty, fifty-nine ...** The children say the time in two ways. (e.g. fifty-seven minutes past two; and three minutes to three) Ask a child to come out and write, on the board, the time in digital form.
- ➞ Repeat for other times, e.g. 10:54 and practise the three-way relationship. (e.g. ten fifty-four, fifty-four minutes past ten, six minutes to 11)
- ➞ Provide each pair with a digital clock and an analogue clock. If digital clocks are not available, use paper and pencil.
- ➞ In pairs, children practise reading times to the minute. One child shows times on the analogue clock face for their partner to read and then show on the digital clock. After several turns, they reverse roles.
- ➞ Write 2:36 a.m. on the board and ask: **What will be shining in the sky at this time, the sun or the stars?** (stars) **How do you know? Who can remember what the letters a.m. stand for?** (ante meridiem) **Who can write the time if the sun was shining?** (2:36 p.m.) Ask: **At what time of day does a.m. change to p.m.?** (noon/midday) **How would you write six minutes after midday/midnight?** (12:06 p.m./a.m.)
- ➞ Set the digital clock to 7:27 and ask the children to find times which are 1, 2, 4 hours earlier/later. Extend to half and quarter hours.
- ➞ Finally pose word problems which are set in a context appropriate to your school.

 The 5-a-side football/netball match against ... school began at 3:00 p.m. They played 20 minutes each way. The half time break was for 5 minutes. At what time did they finish?

Pupil Book 1:
Up to the minute

54

Pupil consolidation

Refresher

Children write analogue and digital times, shown on clock faces, in words.

Practice

- 1 Children write times in three ways.
- 2 They copy and complete time sequences in which they add on 1, then 2 minutes each time.
- 3–4 Children add or subtract amounts of time to the times shown on an analogue and a digital clock face.

Extension



Challenge the children to make up puzzles for their friends to solve e.g. show a time which is in the morning and is 6 minutes after twenty-five past nine; show a time which is not in the morning and is eleven minutes before six.



Game 44

Games Pack 2

Travel on time

Plenary (about 10 to 15 min)

- Use the clock faces to give the children further practice in reading analogue and digital times to the minute.
- Next say: **Join in as soon as you can. 10:45, 10:46, 10:47 ...**
- Repeat with other sequences which require adding or subtracting intervals of one minute, then of two minutes.
- Set the clocks to the times shown in questions 3 and 4 of the Practice section of the Pupil Book activity and ask children to demonstrate and explain how they worked out their answers.

Homework CM:
Measuring time

20

Homework (about 20 min)

Refresher

Children draw the hands in analogue clocks to match the digital times shown.

Practice

- 1 Children order a.m. to p.m. times.
- 2 They investigate a problem about an old koala climbing a eucalyptus tree.

Measures: (time)/Problems involving measures (time)

Objectives ● To use, read and write the vocabulary related to time. ● To estimate/check times using seconds, minutes, hours.
● 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 a.m.; p.m.; noon; midnight; hour; minute; second; century; millennium; how long ago?; how long will it be to . . . ?; faster; fastest; slower; slowest; takes longer; takes less time; earliest; latest

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

Choose an activity from Strand 1 or Strand 2.

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

Resources stop watch; sand and water timers; tockers

60 seconds = 1 minute

60 minutes = 1 hour

24 hours = 1 day

7 days = 1 week

52 weeks = 1 year

12 months = 1 year

100 years = 1 century

1000 years = 1 millennium



At midnight on 1 January 2000, the digits rolled over from 1999 to 2000 and this date was hailed as the first day of the next millennium. This is not strictly correct. There was no year '0' for, in the Julian calendar, 1BC was followed by AD1 and the thousandth year was completed on 31 December 1000. Thus the second millennium began on 1 January 1001 and the first day of the third millennium was 1 January 2001.

➞ Revise the units of time and establish the relationship between them. With appropriate questioning, build up the table of time.

➞ Discuss the new term, "millennium" and the prefix "milli-". Ask: **What words do you know that begin with "milli-"?** (millipede, millimetre, millilitre...) **How many years are in 2/3 millennia?** (2000/3000) **How long is a century?** (100 years) **How many centuries are the same as 1 millennium?** (10)

➞ Ask the children to suggest things they would estimate or measure in seconds, minutes, hours, days, weeks, months, years or centuries.

➞ Pose questions such as: **Which unit of time would you use to measure: the time it takes to log on to the internet/print a sheet of paper on your computer; the time you spend watching TV/sleeping in a week? How long it is to the end of the term/year?**

➞ Invite estimates for how long it takes to: walk to the school office from the classroom; run 100 metres; fly to Spain for a holiday.

➞ Elicit some measuring instruments in a kitchen, e.g. timers on cooker, washing machine. Discuss and compare how they are used, e.g. how a microwave and an egg timer are alike and different?

➞ Ask: **Who might use a stopwatch? Which units of time does it measure? Who can explain how to use it?**

➞ Through discussion and demonstration, ensure that the children know how to use the timers which you have set at the three stations for use during the consolidation activities.

Pupil Book 1:
Measuring time

55



To meet the demands on space and resources, you may wish to set some children to the Refresher and Extension tasks and the rest of the class to the practical activities, changing over as time and space allows.

Extension CM:
Puzzle time

21



Game 40

Pupil consolidation**Resources**

stop watches; sand and water timers; tockers; ice cubes; 100 ml jug; interlocking tiles; wooden beads; laces

Refresher

- 1 Children write the unit best suited to measure durations of time.
- 2 They select from three measures the best estimate for four lengths of time.

Practice

Children work in small groups and should spend about five minutes at each of the three stations.

Extension

Working independently or with a partner, the children try to solve the five puzzles in their own way.

Games Pack 2

At the shops

Plenary (about 10 to 15 min)

- Discuss the tasks at the stations, checking that the results were within reasonable limits, e.g. about 20 seconds to say the 4 times table. Ask: **Who could say the table/thread the beads in the least time?**
- Establish the relationships: the larger the ice cube, the longer to melt and the slower the drip, the longer to fill the jug. Ask: **If the water level from the dripping tap reaches the 50 ml level in 30 seconds, how long will it take to reach the 100 ml mark?** (1 minute) **The tap keeps on dripping. How much water is there in the jug in 5 minutes?** (0.5l) **How much water in 10 minutes?** (1l) **How long will it take to fill a 10 litre container?** (1 hr 40 min)
- Discuss question 2a of the Refresher section and the estimate which best suits your geographical location.
- Choose some of the Extension puzzles and ask the children to explain their methods.

Organising and interpreting data

Objective ● 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: tally charts and frequency tables.

Vocabulary number; zero, one, two ... to sixty; tally; tally chart; frequency; total; frequency table; row; label; heading; title; record; data; information; most; least; common; popular; highest; lowest; compare

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

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

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

Resources large six-sided blank die with coloured faces: 1 yellow, 2 red, 3 blue

- ➞ Roll the die a few times to show the class the colours. Say: **Let's try and count how many times each colour turns up.** Roll the die about ten times, trying to keep count of the colours, e.g. one red, one yellow, two red, one blue, two yellow. It will soon become clear that this is difficult.
- ➞ Say: **This is too difficult. How can we record the colours that turn up?** (make a table) Write row headings for a tally chart on the board: **Red, Yellow, Blue.** Roll the die again and ask: **How can we record red?** (make a tally mark) Make a tally mark next to "Red".
- ➞ Continue rolling the die, with children making more tally marks (not grouped in fives). Stop when "Blue" has about 15 tally marks. Say: **This is called a tally chart.** Ask: **How many times did red appear?** Write the total and say: **This number is called a frequency. It tells you how many times something happened. Red has a frequency of** e.g. **eight.** Repeat for yellow and blue.
- ➞ Ask: **Which colour appeared the most/least? Which colour has the highest/lowest frequency?**
- ➞ Say: **Let's make a better tally chart.** Write the row and column headings for a new tally chart. Ask individual children to roll the die and make a tally mark, in quick succession. Stop them when one of the colours has occurred five times. Group the five tally marks **||||** saying: **Group five tally marks together like this. One, two, three, four, five. This makes them easier to count later on.** We can think of it as "closing the farm gate".
- ➞ As the children continue to roll the die, check they group the tally marks correctly. Continue until there are about 20 tally marks next to "Blue".
- ➞ Count with the class the tally marks for "Red", "Yellow" and "Blue" in fives as far as possible, for example: **Five, ten, eleven, twelve.** Write the frequencies. Complete the tally chart.
- ➞ Say: **We don't need the tally marks any more.** Make a quick frequency table. Point to the frequencies and ask: **What are these numbers called?** (frequencies) **What do they tell you?** (how often each colour appeared) **So this is called a frequency table.**
- ➞ Rub out the frequency table, all other frequencies and the column headings "Tally" and "Frequency", ready for the Plenary.

Die rolls		
Colour	Tally	Frequency
Red		12
Yellow		9
Blue		19

Colour	Frequency
Red	12
Yellow	9
Blue	19

Pupil book 1:
Shopping tallies**Pupil consolidation****Resources** 1–6 die; RCM 4, Tally charts**Refresher**

- 1 Children copy a tally chart, using RCM 4, Tally charts. They fill in the frequencies and answer questions about the chart.
- 2 They answer questions about the tally chart.
- 3 They copy a tally chart, fill it in and answer questions.

Practice

- 1 Children place a counter on a shop. They throw the die and move clockwise around the street. They record each shop using a tally mark, grouping in fives. They continue until one shop has 15 tally marks.
- 2 The children complete the tally chart and answer questions about it.

Extension

- Write, on the board, a series of calculations using tally marks, e.g.

$$\text{||||} + \text{||||} \text{||||} =$$

$$\text{||||} \times \text{||||} =$$

$$\text{||||} \text{||||} \text{||||} - \text{||||} \text{||||} =$$

$$\text{||||} \text{||||} \div \text{||||} =$$

Children convert the tally marks to numbers, do the calculation and write the answer using tally marks, e.g.

$$\text{||||} + \text{||||} \text{||||} = 8 + 13 = 21 = \text{||||} \text{||||} \text{||||} \text{||||}$$



Game 41

Games Pack 2

On the farm

Plenary (about 10 to 15 min)

- Draw attention to the first tally chart on the board. Ask: **What is this called?** (tally chart) **What are these called?** (tally marks) Write the column heading **Tally**. Ask: **How did we make the tally chart? How many times did the colour red/yellow/blue appear?** Write the totals and ask: **What are these totals called?** (frequencies) Write the column heading **Frequency**. Ask: **Which colour has the highest/lowest frequency?**
- Draw attention to the second tally chart on the board. Ask: **Why is this tally chart better than the first one?** (the tally marks are grouped in fives, making them easier to count) **How many times did the colour red/yellow/blue appear?** Count out loud. Write the totals and column headings. Ask: **What is the highest/lowest frequency? What does this tell you?** (the colour that appeared the most/least) **How many times did we roll the die altogether?** Count up all the fives, then the remaining tally marks.
- Finally, pass the die around the class and ask: **Which colour appeared the most?** (blue) **Why?** (because there are more blue sides to turn up)

Organising and interpreting data

Objective ● 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: tally charts and frequency tables; pictograms – symbol representing 2 units.

Vocabulary number; zero, one, two ... to thirty; count in twos; frequency; frequency table; pictogram; key; stand for; represent; row; label; heading; title; record; diagram; data; information; survey; vote; most; least; common; popular; compare; choice

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

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

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

Resources two pictogram axes drawn on large squared paper; Blu-tack

Job	Frequency
Doctor	
Secretary	
Gardener	
Policeman	

➡ Arrange the children in front of the board.

➡ Ask: **What work would you like to do when you grow up?** Choose the four most popular professions and make a quick table. Say: **How can we find out which job children like best?** (ask the class) **This is called a survey. Everyone in the class has to vote which job they like best. Who would like best to be a doctor?** Count the hands and write the frequency in the table. Repeat for the other professions. Make sure there is at least one odd frequency (add your own vote, if necessary).

➡ Point to the column of frequencies and ask: **What are these numbers called?** (frequencies) **What is the table called?** (frequency table)

Favourite job	
Doctor	😊😊😊😊😊😊😊😊
Secretary	
Gardener	
Policeman	

Key 😊 represents 1 vote

➡ Ask: **How can we show this data/information in a diagram?** (bar chart, pictogram, graph) Say: **Let's draw a pictogram.** Blu-tack the pictogram axes to the board. Write the row headings.

➡ Ask: **What shall we do next?** (draw pictures) **What picture shall we use?** (picture of a face) Ask a child to draw faces for the frequency table. Ask: **What does one picture stand for/represent?** (one child's vote) Say: **This is called the key. It tells you how to read the pictogram. What else does our pictogram need?** Write a title. Label the horizontal axis

➡ Blu-tack a new pictogram axis next to the first. Label the rows as before and ask: **How can we make a pictogram for the same data/information but drawing fewer pictures?** (use one picture to represent two votes)

Favourite job	
Doctor	😊😊😊😊😊😊😊😊
Secretary	
Gardener	
Policeman	

Key 😊 represents 2 votes

➡ Choose a profession with an odd number of votes, e.g. seven. Count in twos as you draw faces. Say: **There is one more vote. How can we draw this?** (half a face) Draw half a face. Count again in twos to seven. Invite other children to draw the remaining faces.

➡ Draw a box for the key and ask: **What is the key?** Write the key and title and label the horizontal axis.

➡ Rub out the frequency table and ask: **How many children voted for doctor? How many voted for doctor or gardener?** (count the faces in twos, then any half faces in ones) **How many children did not vote for doctor? What is the highest/lowest frequency? How do you know? What does this mean?**

Pupil Book 1:
Musical
pictograms

58 59

Pupil consolidation

Resources RCM 5, Pictograms

Refresher

- 1 Children count the instruments and complete a tally chart.
- 2–4 They copy and complete the pictogram using RCM 5, draw a picture for every two instruments and complete the key. Children use the pictogram/frequency table to answer questions.

Practice

- 1 Children count the concert tickets and complete a frequency table (odd and even frequencies).
- 2–4 They copy and complete the pictogram using RCM 5, draw a picture for every two instruments and complete the key. They then answer questions.

Support

Support CM:
Pop group pictograms

22

- 1 Children count the instruments and complete a frequency table.
- 2–5 They copy and complete the pictogram using RCM 5, draw one picture for each instrument and complete the key. They then answer questions.

Extension

Resources 40 randomly chosen playing cards (one pack per pair); RCM 5, Pictograms



Describe the four suits: hearts, diamonds, spades and clubs. Children take turns to turn over a card and record its suit in a tally chart, grouping in fives (prepare tally charts if necessary). They each draw a pictogram using RCM 5, Pictograms and use their own picture to represent two cards. Quiz children about their pictograms.



Ask: **When is it a good idea to use a picture to stand for/represent two votes?** (when there are a lot of votes) **If three more children voted for gardener, how many more faces would you need to draw? How many would there be altogether?**

Plenary (about 10 to 15 min)

- Draw attention to the first pictogram on the board. Ask: **What is this diagram called?** (pictogram) **What does it show? What does the key tell us? How many children voted for secretary? Which was the most popular job?**
- Point to the second pictogram. Ask: **How is this pictogram different from the first one?** (fewer pictures, different key, half pictures) **Which job has the lowest frequency? How do you know? What does this tell you?** (it's the least popular job)
- Ask: **If this class did the same survey next year, would the pictogram be the same? Why not?** (different number of children, different children, people change their minds) **What other picture could we use to stand for two votes?**

Homework CM:
Musical instrument survey

21

Homework (about 20 min)

Refresher and Practice

- 1–2 Children ask family and friends to choose the two musical instruments they like best from a list of four. They record each vote on a tally chart.
- 3 They calculate the frequencies.

Practice

- 1 Children complete a pictogram, using one picture to represent two votes.
- 2 They answer questions about their data.

Organising and interpreting data

Objective ● 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: tally charts and frequency tables; pictograms – symbol representing 5 units.

Vocabulary number; zero, one, two ... to thirty; count in twos; frequency; frequent; frequency table; pictogram; key; stand for; represent; row; label; heading; title; record; diagram; data; information; most; least; common; popular; compare; estimate; fraction (of a picture)

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

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

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

Resources pictogram axes drawn on large squared paper; children's dictionaries

Vowel	Tally
a	
e	
i	
o	
u	

- ➞ Arrange the children in front of the board.
- ➞ Write a few words on the board and ask: **What are vowels?** Point to a word and ask: **Which vowel(s) is(are) in this word?**
- ➞ Write the vowels as row headings in a tally chart. Ask: **Which vowel do you think we use most in the English language? How can we find out?**
- ➞ Give out some children's dictionaries. Say: **Choose a short word. Count how many of each vowel it has.** Ask each child to offer their word and vowel count as you fill in the tally chart. Remind the children of grouping the tally marks in fives. Stop when the vowel E has about 22 tally marks.
- ➞ Ask: **How many As are there? What is this number called?** (frequency of A) Write the **Frequency** heading and first frequency. Invite children to count the tally marks aloud in fives and write the frequencies.
- ➞ Ask: **Which vowel has the highest frequency? What does this mean?** ("e" happens the most) Ask: e.g. **Which vowel has a frequency of 7? Which is the least common vowel?**
- ➞ Blu-tack a pictogram axis next to the tally chart. Say: **Let's draw a pictogram to show the data. What do we need to do first?** (write the row headings) **What do we do next?** (draw pictures) Start writing the key. Agree on using a circle as the representative symbol. Say, for example: **21 of the vowels were "e". How many vowels shall we make the circle represent/stand for? If we use a circle to represent one vowel, how many will we have to draw for "e"? (21) That would take ages.** Repeat for two vowels.
- ➞ Say: **Let's make the circle represent five vowels.** Draw a circle for each group of five tally marks next to "e". Say: **There are two more tally marks. How can we show these?** (draw part of a circle) Draw just under half a circle.
- ➞ Invite children to draw the remaining circles. Rub out the tally chart while they are doing this. Give the pictogram a title.
- ➞ Ask: **How does the pictogram show the most common letter? How many times does this letter happen? What is this number called?** (frequency) **The letter that has the highest frequency is "e". It is the most frequent letter. It occurs most in the English language.**

Pupil Book 1:
Word sorting

60 61

Pupil consolidation**Resources** RCM 4, Tally charts; RCM 5, Pictograms**Refresher**

- 1 Children are shown names of fruit, animals, flowers and countries. They copy the tally chart using RCM 4, make a tally mark next to each type of word. They count the tally marks and write the frequencies in the chart (multiples of five). They copy and complete the pictogram using a copy of RCM 5 and use a pencil symbol for every five words. They complete the key.
- 2 They use the pictogram/tally chart to answer questions.

Practice

- 1 Children are shown some words that begin with vowels. They copy a tally chart. Children search a reading book for words beginning with vowels. They record each word and make a tally mark next to the vowel pair. They complete a pictogram, choosing their own picture to represent five words.
- 2 They answer questions about their data.

Extension CM:
Vowel pair pictogram

22

**Extension****Resources** children's reading books

- 1–3 Children are given words which contain pairs of vowels. Individually or in pairs, they search a reading book for words with these vowel pairs, record each word and make a tally mark next to the vowel pair. They complete the tally chart.
- 4 Children complete a pictogram, choosing their own picture to represent five vowel pairs.
- 5 They answer questions about their tally chart and pictogram.

Plenary (about 10 to 15 min)

- ☞ Draw attention to the pictogram on the board. Ask: **How did we make this pictogram? What does it show? What does the key tell us? How many "i" vowels were there?**
- ☞ Point to a fraction of a circle and say: **Estimate how many vowels this fraction of a circle stands for.**
- ☞ Ask: **What can you say about the accuracy of our pictogram? Why does using one circle to represent five vowels make our pictogram less accurate?** (difficult to tell exactly how many a fraction of a circle represents)
- ☞ Ask: **Which vowel has the lowest frequency? What does this mean? Count how many vowels were "a" or "o"? If we started all over again and made another pictogram, would it be the same?** (frequencies would be different but "e" would still be the highest)

↓ Ask: **How many vowels do two circles stand for?** (10)

↑ Say: **If we looked for the letters "t", "x", "y" and "z", which do you think would have the highest frequency? ("t") Why? How would the pictogram be different?**

Organising and interpreting data

Objective ● 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: frequency tables; pictograms – symbol representing 10 units.

Vocabulary number; zero, one, two ... to hundred; count in tens; frequency; frequent; frequency table; pictogram; key; stand for; represent; row; label; heading; title; record; diagram; data; information; most; least; common; compare; estimate; fraction (of a picture); type

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

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

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

Resources pictogram axes drawn on large squared paper; Blu-tack; coins: 25 x 1p coins, 32 x 2p coins, 19 x 5p coins, 48 x 10p coins

- ➞ Arrange the children so they can see the board. Spread out the coins on a table near the board.
- ➞ Invite four children to the front to count the coins. Ask them: **Which kind of coins are on the table?** (1p, 2p, 5p, 10p) Say: **Count one type of coin each. Make piles of ten.**

Coin	Frequency
1p	
2p	
5p	
10p	

- ➞ While they are counting, ask the class: **How can we record the coins when they have counted them?** (in a frequency table) **Who can draw a frequency table?** Invite a child to draw the table. Ask: **What does "frequency" mean?** (how many of something; how many times something happens)
- ➞ When the counting has finished, invite four more children to the front to count each type of coin in tens and ones, e.g. 10, 20, 21, 22, 23, 24, 25. They write the frequencies in the table.

Coins									
1p									
2p									
5p									
10p									

Key ○ represents 10 coins

- ➞ Blu-tack the pictogram axes on the board. Ask: **How can we draw a pictogram for the data? Who can write the types of coins?** Invite a child to label the rows of the pictogram.
- ➞ Ask: **What picture shall we use to represent the coins?** (agree on a circle) **How many coins shall we make the circle represent?** (agree on 10) **Who can write the key? How many circles do we need to draw to show twenty-five 1p coins?** ($2\frac{1}{2}$) **Karen, come and draw them.**
- ➞ Ask: **How many whole circles do we need to draw for the 2p coins?** (3 circles to show 30 coins) **Mark, come and draw them. How many coins are there left to show?** (2) **How can we draw them?** (part of a circle) **Who can draw it?** Discuss the fraction drawn (less than a half). Invite more children to draw the remaining circles. Complete the pictogram by giving it a title.
- ➞ Rub out the table. Ask: **How many 1p coins were there?** (25) **Which coin has the highest/lowest frequency?** (10p/5p) **How can you tell?** (most/least circles)

➞ If someone came and looked at this pictogram, how many 2p coins would they say there were?

Pupil Book 1:
Counter counting

62 63

Pupil consolidation**Refresher****Resources** RCM 5, Pictograms: large supply of counters (4 different colours)

- 1 Children cover a page of their Pupil Books with counters. They make piles of ten counters. They then copy and complete a frequency table. They copy the pictogram using RCM 5 and use a circle to represent ten counters. They complete the key.
- 2 They use the pictogram/frequency table to answer questions.

Practice

- 1 Children count coins and notes. They copy and complete a frequency table. They copy the pictogram using RCM 5 and use their own picture to represent ten coins/notes. They complete the key.
- 2 They use the pictogram frequency table to answer questions.

Extension**Resources** dice numbered 1, 2, 2, 2, 3, 4; RCM 4, Tally charts

Children each throw their dice 20 times and record the digits in a tally chart. They complete a pictogram, choosing their own picture and key to represent the die rolls. Question them about their results, e.g. "Why did you get more twos than ones?"

↓ Ask: *If we added another ten 1p coins, how would the pictogram change?*

↑ Ask: *If we added another five 2p coins, how would the pictogram change? If we subtracted five 2p coins, how would the pictogram change?*

Plenary (about 10 to 15 min)

- ➡ Draw attention to the pictogram on the board. Ask: *How did we make this pictogram? What does it show? What does the key tell us?*
- ➡ Point to the fraction of a circle for 1p coins and say: *Estimate how many coins does this fraction of a circle stands for.* (5) Ask: *How many 1p coins are there?* Repeat for the other denominations.
- ➡ Ask: *Why is it difficult to know exactly how many coins there are by just referring to our pictogram?* Discuss the margin of error that occurs when interpreting a fraction of the key symbol.
- ➡ Ask: *What is the frequency of 2p coins?* (32) *What is the lowest frequency?* (1p) *What does this mean?* (5p coins were least common) *If we mixed up the coins and made a new pictogram, would it be the same?* (yes)

Homework CM:
Stamps pictograms

22

Homework (about 20 min)**Refresher**

- 1 Children count stamps of each denomination (crossing them off as they count).
- 2 They complete a frequency table.

Practice

- 1 Children complete a pictogram, using their own picture to represent 10 stamps.
- 2 They answer questions about the frequency table and pictogram.

Organising and interpreting data

Objective ● 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: frequency tables; pictograms – symbol representing 2, 5 or 10 units.

Vocabulary number; zero, one, two ... to hundred; count in twos, fives, tens; frequency; frequent; frequency table; pictogram; key; stand for; represent; row; label; heading; title; record; diagram; data; information; most; least; common; popular; estimate; fraction (of a picture)

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

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

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

Resources 2 pictogram axes drawn on large squared paper; Blu-tack

⇒ Ask: **Which fairground rides have you been on?** Discuss the various rides. Write the most common four rides on the board. Ask: **How can we find out which of these four rides is your favourite?**

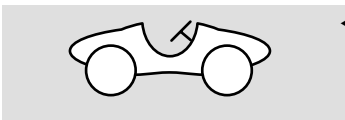
⇒ Make a quick table. Say: **You can vote for one of these rides. Who votes for the Big Wheel?** Write the frequencies in the table (add your own vote if there are no odd frequencies).

Ride	Frequency
Big Wheel	
Bumper Cars	
House of Horrors	
Roller Coaster	

⇒ Ask: **What is your favourite/least favourite ride? What is the frequency of the House of Horrors?**

⇒ Blu-tack a pictogram axis to the board. Ask: **How can we draw a pictogram for the data? Who can label the rides?**

⇒ Ask: **What picture shall we use to represent the rides?** Choose a fairground car shape. Ask: **How many rides shall we make each car represent?** Consider one ride each (probably be too many pictures). Consider five rides each (probably be too few pictures). Agree on two rides each. Ask: **Who can write the key? How many cars do we need to draw to show the big wheel rides?** Count with the class in twos as you draw the cars. Invite children to draw the remaining cars.



⇒ Remove the pictogram and rub the frequencies off the table. Say: **Let's find out which of these rides you have been on. How many people have been on the Bumper Cars?** Write the new frequencies.

⇒ Blu-tack a new pictogram axis to the board and repeat above. Agree on each car representing 5 rides.

⇒ Ask: **How many whole cars do we need to draw for the Bumper Car rides? How many rides are there left to show? How can we draw them?** (as part of a car) **Who can draw it?** Discuss the fraction drawn. Complete the pictogram as above.

↑ Ask: **If we made another pictogram next year, how would it be different?** (there would be different rides; different frequencies; higher frequencies, because more children will have been on each ride)

⇒ Discuss the completed pictogram then display both pictograms and discuss the different keys and scales used for them. Explain that when making a pictogram you decide which scale to use depending upon the frequency of each type of data being collected. Discuss the strengths and limitations of the different scales of 1, 2, 5 and 10.

⇒ Blu-tack the pictograms next to each other, ready for the Plenary.

Pupil Book 1:
Fairground pictograms

64


Pupil consolidation**Resources** RCM 5, Pictograms**Refresher**

- 1 Children copy and complete the pictogram using RCM 5. They use the smiley face symbol to represent two rides.
- 2 They use the pictogram/frequency table to answer questions.

Practice

- 1 Children copy and complete the pictogram using RCM 5. They use the smiley face to represent five rides.
- 2 They use the pictogram/frequency table to answer questions.

Extension**Resources** RCM 5, Pictograms

-  Children combine the tables for Refresher and Practice. Using a copy of RCM 5, they draw a new pictogram, using their own picture to represent ten rides.

Plenary (about 10 to 15 min)

- ➡ Draw attention to the first pictogram on the board. Ask: **How did we make this pictogram? What does it show? What does the key tell us?**
- ➡ Make a quick table. Ask: **How many children voted for the Bumper Cars?** Write in the frequencies. Ask: **What is your least/most favourite ride?**
- ➡ Draw attention to the second pictogram on the board. Ask: **What does this pictogram show? What does the key tell us?**
- ➡ Make a quick table. Point to a fraction of a car and say: **Estimate how many rides this picture represents. How many children have been on this ride altogether?** Repeat for the other rides.



Ask: **How many more/less children have been on the Bumper Cars than the Big Wheel?**

- ➡ Ask: **What is the most/least popular ride?**

Place value, ordering and rounding (whole numbers)

Objectives

- To read and write whole numbers to at least 10 000 in figures and words, and know what each digit represents.
- To multiply or divide any integer up to 10 000 by 10 (whole-number answers), and understand the effect.

Vocabulary number; zero, one, two . . . to ten thousand; units; ones; tens; hundreds; thousands; column; digit; figure; numeral; one- two- three- four-digit number; place; place value; worth; stands for; represents; count on/back;

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

Choose an activity from Strand 1 Topic 1.1.

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

Resources large place value chart; two sets of 0–9 digit cards; Blu-tack

Ten thousands	Thousands	Hundreds	Tens	Units
			1	0

$10 \times 1 = 10$

- ➞ Blu-tack the place value chart to the board. Put the digit card 1 in the units column. Move 1 into the tens column as you say: **Ten times one is ten. When you multiply by ten, the digits move one place to the left. A zero is added to hold the place value.** Place a 0 in the units column. Write on the board and say: **$10 \times 1 = 10$.**
- ➞ Repeat the above for $10 \times 2 = 20$ and $10 \times 3 = 30$.
- ➞ Put 1 in the tens column and 0 in the units column. Ask: **What does this 1 stand for?** (ten) **What is ten times ten?** (100) Move the 1 into the hundreds column and the 0 into the tens column. Say: **When you multiply by ten, the digits move one place to the left. A zero is added to hold the place value.** Place another 0 in the units column. Write **$10 \times 10 = 100$.**
- ➞ Put 2 in the tens column and 0 in the units column. Ask: **What does this 2 stand for?** (20) **If we multiply it by ten, what happens?** Move the 2 to the hundreds column and 0 into the tens column. Ask: **What does the 2 stand for now?** (200) **Ten times 20 is 200.** Write **$10 \times 20 = 200$.**
- ➞ Ask: **What is 25 multiplied by 10?** Write **$10 \times 25 = 250$.** Demonstrate by moving digit cards 2 then 5 one place to the left. Add a zero to hold the place value.
- ➞ Repeat for $10 \times 250 = 2500$ then 10×637 , 10×504 , 10×5200 .
- ➞ Occasionally ask: **Who can come and write this number in words?**
- ➞ Make 20 with the digit cards and position them on the place value chart. Ask: **How many tens in 20?** (2) **20 divided by ten is 2. When you divide by ten, the digits move one place to the right.** Move the 2 into the units column and the 0 to the right of the units column.
- ➞ Say: **If you divide 20 by ten, you move the digits one place to the right, so you get 2.** Write **$20 \div 10 = 2$.**
- ➞ Divide a range of numbers by ten, demonstrating the shift of digits one place to the right, e.g. $50 \div 10 = 5$, $430 \div 10 = 43$, $600 \div 10 = 60$, $7000 \div 10 = 700$, $4800 \div 10 = 480$, $9540 \div 10 = 954$.
- ➞ Write three-digit multiples of 10 on the board, e.g. **730** and ask: **Kulbir, say this number. Helga, multiply it by ten. David, divide it by ten.**
- ➞ Occasionally ask: **Who can write this number in words?**



Ask the children to work out calculations such as $90 \div 10$ and 56×10 .



Ask the children to work out calculations such as $8040 \div 10$ and 6400×10 .

Pupil Book 2:
Blast off tens

5

Pupil consolidation**Refresher**

- 1 Children multiply numbers by 10.
- 2 Children divide numbers by 10.

Practice

- 1 Children multiply numbers by 10.
- 2 Children divide numbers by 10.
- 3 Children write the red numbers in question 2 using words.
- 4 Children calculate the number of bags of sweets that can be filled from a large supply by dividing a number by ten.

Extension

- 1 Write a set of calculations on the board involving larger numbers: $6000 \times 10 = \square$; $80,000 \div 10 = \square$; $10000 \times 10 = \square$; $54,000 \div 10 = \square$; $100,000 \times 10 = \square$; $452,000 \div 10 = \square$; $364,123 \times 10 = \square$; $56,342 \times 10 = \square$ etc.
- 2 Write questions such as the following on the board:
A pencil weighs 10 g. How much do 350 pencils weigh?
A ball of string is 240 m long. It is cut into 10 equal pieces. How long is each piece?
How many 10p pieces are there in £2,500?
If you saved 420 £10 notes, how much money would you have altogether?
What is $\frac{1}{10}$ of 5600?
Ten people share a prize of £7,000. How much does each person get?

Plenary (about 10 to 15 min)**Resources** pack of 10 items, e.g. cakes; large place value chart; 0–9 digit cards

- Write questions like these on the board: $8 \times 10 = \square$; $70 \div 10 = \square$; $43 \times 10 = \square$; $500 \div 10 = \square$; $200 \times 10 = \square$; $640 \div 10 = \square$; $28 \times \square = 280$; $4000 \div \square = 400$; $506 \times 10 = \square$; $40,000 \div 10 = \square$.
- Show the class a packet of ten items, e.g. cakes. Say: **There are 10 cakes in this packet. How many in 4 packets?** (40) **How many in 24 packets?** (240) **How many in 60 packets?** (600) etc.
- Write 10p on the board and ask: **How many 10p coins are in £1?** (10) **How many are in £10?** (100) **How many are in £100?** (1000) Repeat for £2, £25, £250.
- Finish off by making 36 using digit cards in the place value chart. Ask: **What happens when we multiply 36 by ten?** (digits move one place to the left) Continue multiplying by ten up to 36,000. Ask: **What happens when we divide 36,000 by ten?** (digits move one place to the right) Work back to 36. Repeat, using other two- and three-digit numbers.

Place value, ordering and rounding (whole numbers)

Objectives ● To read and write the vocabulary of comparing and ordering numbers. ● To use symbols correctly, including less than (<), greater than (>), equals (=). ● To give one or more numbers lying between two given numbers.

Vocabulary number; zero, one, two ... to ten thousand; units; ones; tens; hundreds; thousands; digit; figure; numeral; one- two- three- four-digit number; worth; stands for; represents; count on/back; bigger; biggest; larger; largest; smaller; smallest; in between; less than; < ; greater than; > ; equals; equal to; = ; inequality sign; unequal; compare

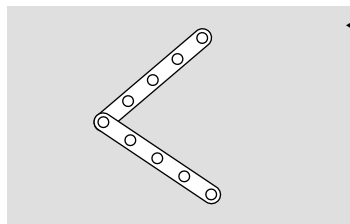
Oral work and mental calculation (about 5 to 10 min)

Choose an activity from Strand 1 Topic 1.1.

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

Resources two geostrips joined at one end; 0–9 digit cards; < and > cards

5 is less than 8



5 < 8

9 is greater than 4
9 > 4

➡ Blu-tack digit cards 5 and 8 to the board. Ask: **Which number is smallest?** (5) **Five is less than eight.** Place 5 to the left of 8 and write **is less than**.

➡ Show the class the geostrip arms (<). Say: **This looks like a crocodile's mouth. Here is the small part (its throat), here is the large part (its open mouth).** Place the arms on top of the words “is less than”. Say: **Five is the smaller number, so it is next to the small part of the crocodile's mouth. Eight is the larger number, so it is next to the large part of the crocodile's mouth.**

➡ Say: **The crocodile's mouth says that one number “is less than” another. So we can rub out these words and draw a crocodile's mouth instead.**

➡ Place other pairs of digits for children to arrange and write the < sign. End with 8 and 8. Ask: **Which sign goes here?** (=)

➡ Repeat the first three steps to introduce the > sign.

➡ Draw < and > and say: **These are called inequality signs. They show when two numbers are unequal, or not equal.**

➡ Put a pair of digits in a row. Invite children to draw an inequality sign after manipulating the geostrips. Repeat. End with 5 and 5. Ask: **Which sign goes here?** (=)

➡ Write 20 to the left of 50. Ask: **Which number is smallest?** (20) **Why?** (it has less tens) **Karen, stick the inequality sign on the board.** Repeat for numbers of increasing complexity: **45 < 75; 39 < 81; 98 > 66; 300 < 800; 587 < 910; 357 < 385; 734 > 492; 673 < 678; 2000 < 9000.**

➡ On the board, write 8234 and 4876. Say: **When you compare two numbers, compare the thousands first, then the hundreds, then the tens, then the units. Which number is larger?** (8234) **Why?** (it has more thousands) Write **8234 > 4876.** Repeat for 6452 and 6731; 2765 and 2713; and 7482 and 7486.

↓ Say: **Tell me a number between 65 and 67.**

↑ Say: **Tell me a number between 2099 and 2130.**

➡ Write 237 and 679 on the board. Say: **Tell me a number between 237 and 679?** (e.g. 456) **How do you know it is between these numbers?** (it has more hundreds than 237, but less hundreds than 679). Repeat for other three- and four-digit numbers.

Pupil Book 2:
Crocodile comparisons

6

Pupil consolidation**Refresher**

Children write the correct sign ($<$, $>$ or $=$) between two two-digit numbers.

Practice

- 1 Children write the correct sign ($<$, $>$ or $=$) between two three- or four-digit numbers. They should copy the inequalities/equations into their exercise books.
- 2 Children complete a sequence of consecutive four-digit numbers by counting on and back.
- 3 They write some weights in order.

Support CM:
Cobra comparisons

23

Support

- 1 Children write the correct sign ($<$, $>$ or $=$) between two digits.
- 2 Children write one or two possible weights that lie between two given weights (two-digit numbers; multiples of 100; multiples of 1000).

Extension CM:
In the middle

23

Extension

Children are introduced to combined inequalities, e.g. $3 < 7 < 9$.

- 1 Children write a number between two given numbers, e.g. $324 < ? < 765$.
- 2 Children order three numbers from smallest to largest and express this using a combined inequality.
- 3–4 As for questions 1 and 2, using $>$.



Game 32

Games Pack 2

That's a fact!

Plenary (about 10 to 15 min)

Resources various objects with different weights; pack of selected two- three- and four-digit number cards with some adjacent repetitions; $<$, $>$, $=$ cards; Blu-tack

- Arrange the class so they can all see the board. Invite a child to take two cards and Blu-tack them next to each other. Ask: **Which number is smaller/larger? Why? Which of these signs goes between them? What is the name of this sign? Chantelle, read what this says. Who can say a number that is in between these numbers? Why is it between them?** Repeat, using other number cards.
- Show the class various objects with different weights. Say, for example: **This can weighs between 420g and 510g. How much could it weigh?**

Homework CM:
Alligator egg sizes

23

Homework (about 20 min)**Refresher**

Children write the correct sign ($<$, $>$ or $=$) between two two-digit numbers.

Practice

Children write the correct sign ($<$, $>$ or $=$) between two three- or four-digit numbers. They write some weights in order and fill in numbers on a number line.

Place value, ordering and rounding (whole numbers)

Objectives ● To read and write the vocabulary of approximation. ● To round any positive integer less than 1000 to the nearest 10. ● To record estimates and readings from scales to a suitable degree of accuracy. ● To recognise negative numbers in context (e.g. on a number line, on a temperature scale).

Vocabulary number; zero, one, two ... to ten thousand; units; ones; tens; hundreds; thousands; multiple; estimate; approximate; round to the nearest; temperature; degrees Celsius; °C; thermometer; scale; division; negative; minus

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

Choose an activity from Strand 1 Topic 1.1.

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

Resources 0–100 and 0–1000 wall number lines; selection of numbered dials made from RCM 6, Scales and dials; thermometer scale made from RCM 7, Thermometer scale

↑ Say: **Round 4 to the nearest ten** (0) Say: **0 is also a multiple of ten: three tens are 30, two tens are 20, one ten is ten, zero tens are zero.** Say: **Round 297 to the nearest ten** (300) Explain that 300 is also a multiple of ten, because it has a zero in the units place.

↓ Write **3469** on the board for the children to round.

↑ Write **2355, 8697, 3204, 2997** on the board for the children to round (explain that 3000 is also a multiple of ten, because it has a zero in the units place) and **4001**.

- ⇒ Point to various numbers on the number lines and ask children to round numbers to the nearest 10.
- ⇒ Write 3847 on the board. Cover 38 and ask: **What is 47 rounded to the nearest ten?** (50) Uncover 38. **So what is 3847 rounded to the nearest ten?** (3850) Write other numbers on the board for children to round.
- ⇒ Hold up a weighing scale dial, e.g. numbered 0, 10, 20 g etc., on every other division. Say: **This is a weighing scale.** Point the pointer to 30. Ask: **What is the weight?** (30g) Repeat.
- ⇒ Repeat above, pointing the pointer near to a labelled division, then to an unlabelled division, then near to an unlabelled division.
- ⇒ Repeat using scales with other divisions, e.g. 0, 20, 40 etc; 0, 100, 200, 300 etc. (to the nearest 100 g); 0, 200, 400, 600 etc.
- ⇒ Show the class the thermometer scale (reading 5°C). Say: **This is a thermometer scale. It measures the temperature in degrees Celsius.** Write **Celsius** on the board. **What is the temperature?** Write 5°C on the board as you say: **Five degrees Celsius. Is that warm or cold?** (cold)
- ⇒ Reduce the temperature one degree Celsius at a time to 0°C. Ask: **What happens when the temperature is 0°C?** (water freezes) Reduce the temperature to -1°C. Say: **The temperature is now one degree below zero.**
- ⇒ Say: **We call a number that is below zero a negative number. The temperature is -1°C. How do we write minus one?** Write -1 on the scale. Say: **Minus one is a negative number. It is below zero.**
- ⇒ Reduce the temperature further and label the scale. Show different temperatures. Ask: **What is this temperature? Who can write it on the board?** **Which temperature is lower/higher: -2°C or 4°C?**
- ⇒ Turn the thermometer sideways. Say: **Now we have a number line.** Number the opposite scale from 5 to -5. Ask: **What is the largest number on our thermometer?** (5) **What is the smallest number?** (-5) Demonstrate the latter by making the thermometer vertical. Ask: **Tell me a number between -2 and -5. Which numbers are less than 3? Which numbers are below 0? What are they called?** (negative numbers)



Pupil Book 2:
Outdoors measuring

7

Pupil consolidation**Refresher**

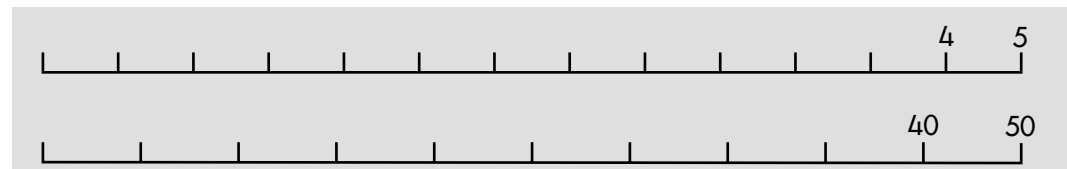
- 1 Children round two-digit weights to the nearest 10 g.
- 2 They read scales to the nearest labelled division.

Practice

- 1 Children round three- and four-digit weights to the nearest 10 g.
- 2 They read scales to the nearest unlabelled division.
- 3 Children write down temperatures they read from thermometer scales.
- 4 They copy and complete a negative and positive number scale.

Extension

- 1 Start scales on the board for children to complete.



- 2 Write sets of numbers on the board for children to order from smallest to largest, with the aid of their scales, e.g. 8, -5, 0, -2, 5; -30, 40, 0, -10.



Game 33

Games Pack 2**Tricky trail****Plenary** (about 10 to 15 min)

Resources selection of numbered dials made from RCM 6, Scales and dials

- Arrange the children so they can see the board. Move the pointers of various weighing scales for the class to read/estimate. Start with labelled divisions, then near to labelled divisions, then unlabelled divisions. Say: **Melanie, move the pointer to 325 g.**
- Write weights on the board for children to round to the nearest 10 g, e.g. **86 g, 234 g, 75 g, 108 g, 698 g, 3 g, 2943 g, 3072 g, 5999 g.**
- Draw a number line with 11 division marks. Label the first and last division marks **-5** and **5**. Point to a division and ask: **What is this number?** Count on from -5 or back from 5. Eventually, label the scale. Ask: **Tell me a number larger/smaller than -2, 0.** Point to the negative numbers and ask: **What are these numbers called?** (negative numbers)

Mental calculation strategies (+ and -)

Objective ● To add 3 or 4 small numbers, finding pairs totalling 9, 10, or 11.

Vocabulary add; addition; more; plus; sum; total; and; altogether; equals; makes; is the same as; sign; pairs of numbers

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

Choose an activity from Strand 2 Topic 2.1.

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

⇒ Begin by asking simple questions involving adding three single-digit numbers. Ask: **What is $6 + 4 + 3$? $5 + 7 + 4$?**

⇒ Say: **Sometimes you can make adding the numbers together easier by changing the order. Remember addition can be done in any order and the answer will be the same.**



Spend more time on adding three single-digit numbers.

⇒ Write $4 + 15 + 6$ on the board. Say: **I can make this calculation easier if I first add 4 and 6 together as I already know that they make 10 and 10 is an easy number to add on. 10 plus 15 is 25 so the answer is 25.**

⇒ Write $12 + 7 + 5 + 3$ on the board. Ask the class to work out the answer. Invite a child to say the answer to the class (27). Ask: **Can you explain how you worked it out?** Record the order the numbers are added on the board e.g. $7 + 3 + 12 + 5$.

⇒ Say: **Looking for pairs of numbers that equal ten can make calculations easier to do mentally.**



Children may suggest other efficient ways to work out the calculations. Accept these and say that looking for pairs of numbers that total 10 is just one efficient way to add mentally.

⇒ Write $8 + 6 + 2 + 15$ on the board. Say: **Work this out thinking of ways to make it easier.** Ask a child to explain how they worked it out. Encourage the method of pairing 8 and 2 to make 10, then adding 10 to 15 and then adding on the 6.

⇒ Repeat with other four number calculations involving pairs of numbers that total ten e.g. $4 + 3 + 19 + 7$, $9 + 16 + 5 + 1$.



Spend more time looking for pairs of numbers that equal 10.

⇒ Write $5 + 13 + 4 + 3$ on the board. Say: **This calculation does not have a pair of numbers that make 10 but 5 and 4 equal 9. 9 is also an easy number to add on as we can add on 10 then adjust the answer by subtracting one as 9 is one less than 10. 13 add 10 would be 23, so 13 add 9 is 22, 22 add 3 is 25.** Underline each number as you add it on to indicate the order more clearly to the class.

⇒ Cross out the 4 and replace it with a 6 e.g. $5 + 13 + 6 + 3$. Say: **Now this calculation has a pair of numbers that equal 11, 6 and 5 make 11. 11 is also an easy number to add on as we can add on 10 and then add on one more as 11 is one more than 10. 13 add 10 would be 23 so 13 add 11 is 24 then add on the 3 to make 27.**

⇒ Repeat with other 4-number calculations involving pairs of numbers that equal 9, 10 or 11.

Pupil Book 2:
Finding pairs

8

Pupil consolidation**Refresher**

Children who are experiencing difficulty can first use these numbers to build their calculations. There are only three numbers to add together. Children record the calculations in the order they work them out.

Practice

Children add the numbers together choosing the order. Children record the calculations in the order they work them out.

Support CM:
Spot the pairs

24

Support

This involves looking for pairs of numbers that equal 10.

Extension

Using the calculations from their Pupil Books each child copies them out on a piece of paper but leaves out one of the numbers and puts a box in its place e.g. $10 + \square + 6 = 29$. They then give the calculations to their partner who works out the missing numbers. Children then swap the calculations again to check their partner's answers.

Plenary (about 10 to 15 min)

- Select some calculations from the Pupil Book page and invite children to explain their methods.
- Say: **When adding together more than two numbers look for pairs of numbers that make 9, 10 or 11 to make the calculation easier to do mentally.**
- Say: **I am going to call out a number I want you all to reply with the number that goes with it to equal 9. So if I say 6 you say 3.** Repeat for 11.

Mental calculation strategies (+)

Objective ● To add three two-digit multiples of ten.

Vocabulary add; addition; more; plus; sum; total; and; altogether; equals; makes; is the same as; sign; multiple of ten

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

Choose an activity from Strand 2 Topic 2.1.

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

- ⇒ Begin by asking quickfire questions involving adding two two-digit multiples of ten. Ask: **50 plus 80? 90 add 70? The total of 30 and 50?**
- ⇒ Write **20 + 30** on the board. Say: **Work out the answer in your head.** Invite a child to say the answer to the class. Do not write it on the board.
- ⇒ Now write **+ 40** at the end of the calculation, e.g. **20 + 30 + 40**. Say: **I have the answer to 20 add 30 in my head (50) now I am going to add on the 40. 50 plus 40 equals 90.** Write **= 90** on the board e.g. **20 + 30 + 40 = 90.**
- ⇒ Say: **Three multiples of ten can be added together. Add the first two numbers together and keep the answer in your head. Then add the third number to that answer.**
- ⇒ Write **40 + 20 + 30 =** on the board. Say: **We can check the calculation by adding the numbers in a different order. 40 + 20 is 60, 60 plus 30 equals 90. As both calculations gave me the same answer I know the answer is right.**
- ⇒ Write **10 + 50 + 20 =** on the board. Say: **Add 10 and 50, keep the answer in your head.** Wait about 5 seconds then say: **Now add on the 20.**
- ⇒ Invite a child to say the answer. (80) Say: **How did you work it out?**
- ⇒ Invite another child to work the calculation out in a different order to check the answer.
- ⇒ Repeat for other calculations involving three multiples of ten that do not cross the hundred boundary until the class are confident about adding three multiples of ten together. e.g. **30 + 50 + 10, 40 + 40 + 10.**
- ⇒ Write **90 + 50 + 20** on the board. Say: **This calculation is harder as it crosses the hundred boundary. Remember you can use your addition facts to 20 to add multiples of 10. I know 9 plus 5 is 14, so 9 tens or 90 plus 5 tens or 50 is 14 tens or 140. I keep the answer in my head now I add on the 20. 140 add 20 is 160.**
- ⇒ Write **50 + 80 + 40 =** on the board. Say: **Add 50 and 80 together, keep the answer in your head.** Wait about 5 seconds. Say: **Now add on the 40. Invite a child to say the answer to the class (170).**
- ⇒ Repeat with other calculations involving three two-digit multiples of ten that cross the hundreds boundary. e.g. **90 + 20 + 60, 60 + 40 + 80, 90 + 70 + 50.** First lead children through the calculation, as above then allow them to work it out alone. Ask: **How did you work it out?**
- ⇒ Remind children of other known strategies if necessary, e.g. put the larger number first and count on or identify pairs of numbers that total 100.



Do not move onto calculations that cross the hundred boundary if children are not confident adding three multiples of ten that do not cross the hundred boundary.

Pupil Book 2:
Cake addition

9

Pupil consolidation*Refresher*

Children who are experiencing difficulty can begin with these calculations involving the addition of two then three multiples of ten that do not cross the hundred boundary. Children make up the calculations and record them in their books.

Practice

Children make up the calculations involving adding three multiples of ten and record them in their books.


Resources 3 blank dice labelled 10, 20, 30, 40, 50, 60

One child throws all the dice. Both children write an addition calculation and work out the answer. They then check to see that they have the same answer, if not they both work out the calculation again. The second child then throws the dice. Repeat.

Extension CM:
Roll the number

24

Extension

This involves calculations using the algebraic form.

Plenary (about 10 to 15 min)

- Say: ***I am going to call out some calculations. Hold the answers in your head.*** As you call out the calculations wait about 5 seconds between each new number. Begin with three numbers that do not cross the hundred boundary then ones that do. Speed up the delivery as appropriate for the class.
- Say: ***When adding more than two numbers together you need to hold the answers in your head.***
- Invite three children to stand in a line in front of the class. Say: ***Each child is going to say a multiple of ten. As they say them add them together.*** Allow a pause between each number being said. When all three numbers have been said ask the class for the answer.
- Repeat, occasionally asking a child to explain how they worked it out.

Homework CM:
Adding multiples
of ten

24

Homework (about 20 min)

Children work out the calculations adding two or three two-digit multiples of ten.

Refresher

Children add two then three multiples of ten that do not cross the hundreds boundary.

Practice

Children add three multiples of ten crossing the hundreds boundary.

Mental calculation strategies (+ and -)/Understanding addition and subtraction


Objectives ● To add/subtract a pair of two-digit numbers (crossing the 10 but not 100 boundary). ● To partition into tens and units, adding the tens first. ● To understand the principle (not the name) of the commutative law as it applies or not to addition and subtraction.


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


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


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

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

 This calculation involves crossing the tens boundary. If children are not confident with adding two two-digit numbers that do not cross the tens boundary start with calculations of this type, e.g. $53 + 41$.

 It is important that children see that 50 and 30 are being added together not just think of it as 5 add 3. Partitioning the numbers helps to make this clear.

 This calculation involves crossing the tens boundary. If children are not confident with subtracting two two-digit numbers that cross the tens boundary start with calculations of this type, e.g. $86 - 43$.

 There are other effective and efficient methods to add/subtract two two-digit numbers and some children may prefer to use these. Encourage children to discuss the strategy they used.

- ➡ Write $39 + 52 =$ on the board.
- ➡ Point to 39 and say: **If 39 is partitioned into tens and units what will the two numbers be?** ($30 + 9$) Write $30 + 9$ on the board. Repeat for 52.
- ➡ Say: **Partitioning numbers into tens and units is a good way to help add them as it is easier to add the multiples of ten together and then to add the units together.**
- ➡ Point to the new calculation ($30 + 9 + 50 + 2$). Say: **First I am going to add the tens together 30 and 50.**
- ➡ Ask: **Which is easier to add: 30 plus 50 or 50 plus 30?** Establish that addition calculations can be made easier if the larger number is added first. Say: **Remember, addition can be done in any order and the answer will be the same.**
- ➡ Say: **50 add 30 is 80.** Write $50 + 30 = 80$ on the board. Say: **Now I have added the tens I am going to add the units, 9 add 2 is 11.** Write $9 + 2 = 11$ on the board.
- ➡ Say: **I have added the tens and units separately to find the answer to $39 + 52$. I need to put them back together: 80 plus 11 equals 91 so 39 add 52 is 91.**
- ➡ Repeat with other addition calculations but do not cross the hundred boundary, e.g. $39 + 57$, $68 + 35$.
- ➡ Write $82 - 38 =$ on the board.
- ➡ Say: **In this subtraction calculation partitioning both numbers into tens and units does not make it easier as the units calculation would be 2 minus 8 which we cannot do. A better method would be to partition only the second number and subtract the tens and then the units from the first number.**
- ➡ Write $82 - 30 - 8 =$ on the board. Say: **82 subtract 30 is 52, 52 minus 8 is 44. So 82 minus 38 is 44.**
- ➡ Ask: **Could I have changed the order of this calculation?** Establish that, unlike addition, the order of subtraction calculations cannot be changed.
- ➡ Repeat with other calculations but do not cross the hundred boundary, e.g. $94 - 57$, $88 - 29$.

Pupil Book 2:
Turn of the cards

10

Pupil consolidation**Refresher**

Children who are experiencing difficulty can first work through this section that starts with calculations that do not cross the tens boundary. Children use the two numbers to make an addition and then a subtraction calculation. Some children may find it easier to do all the addition calculations and then all the subtraction calculations. This will allow them to focus on the method they are using.

Practice

Children use the two numbers to make an addition and then a subtraction calculation. Some children may find it easier to do all the addition calculations and then all the subtraction calculations. This will allow them to focus on the method they are using.

Support CM:
Splitting numbers

25

Support

This involves partitioning and recombining two-digit numbers.

Extension

Resources set of 0–50 cards; 20 counters

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

Plenary (about 10 to 15 min)

Resources set of 0–50 cards; Blu-tack

- ➡ Turn over the top two cards and Blu-tack them to the board. Ask the class to add them together.
- ➡ Say: **Remember, partitioning the numbers into tens and units can help you add them in your head.**
- ➡ Turn over two more cards and Blu-tack them to the board. Ask the class to subtract one from the other.
- ➡ Repeat for other cards, deciding whether to ask the children to add or subtract the two numbers.
- ➡ Say: **I am going to call out some two-digit numbers and I want you to partition them in your head into tens and units. So if I say 38 you say 30 and 8.**
- ➡ After you have called out some numbers say: **Now I want you to tell me the units first. So if I say 73 you say 3 and 70.**

Pencil and paper procedures (+)

Objectives ● To develop and refine written methods for column addition of two whole numbers less than 1000: adding the least significant digits first.

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

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

Choose an activity from Strand 2 Topic 2.1 or 2.3.

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

⇒ Write $247 + 51$ horizontally on the board. Ask the class to work out the answer in their heads. Invite a child to explain their method to the class.

⇒ Say: **A good way to add mentally is to think of the numbers as hundreds tens and units. So thinking of 51 as 50 and 1 makes it easier to add on.**

◀ ⇒ Write $247 + 51$ vertically on the board. Point and say: **Remember, when the calculation is written like this the hundreds, tens and units are underneath each other in columns.**

⇒ Say: **First we add the units 7 and 1 together. The answer 8 is written underneath in the units column.**

⇒ Say: **Now we can add the tens, 40 and 50. The answer 90 is written underneath 6 but the 9 goes under the tens and the zero under the units.**

⇒ Say: **As there are only hundreds in one of the numbers there is no need to do any adding, but we need to write 200 down here so we do not forget to add it on when we do our final total.** Write 200 in the appropriate place.

⇒ Say: **To get the final answer we need to add 200, 90 and 8, which is 298.** Write 298 under the line. Say: **When we write the answer, the digits must also be in the right columns.**

◀ ⇒ Write $247 + 51$ vertically on the board. Say: **We can work this calculation out in the same way but record it differently.**

◀ ⇒ Say: **Again we add the units first and write the answer in the same place.** Write 8 in the units column.

⇒ Say: **Now we add the tens as before, 40 plus 50 is 90. This time, instead of writing 90 as we did before, I am going to write just the 9 from 90 next to the 8.** Write 9 in the appropriate place.

⇒ Say: **Although I have only written 9 I know it means 90 as it is in the tens column. This is why it is important to keep the digits in the right columns so we know what each digit is representing.**

⇒ Say: **Now we look at the hundreds. There are only hundreds in one number so we do not need to add anything. Instead of writing 200 as before I am going to write just the 2 from 200 in the hundreds column.** Write 2 in the appropriate place.

⇒ Say: **Although I have only written 2 I know it means 200 as it is in the hundreds column. The final answer is now written here, 298.**

⇒ Repeat this method of recording with other HTU + TU calculations. Choose numbers that will not involve carrying, e.g. $346 + 43$, $524 + 63$.

↓ If children are not confident adding the units, tens and hundreds carry on recording in this way rather than introducing the standard method.

i When the standard method for recording is introduced it is important that the children are clear that they are adding tens and hundreds and not single digits, e.g. 40 and 50 are being added together not 4 and 5.

$$\begin{array}{r} 247 \\ 51+ \\ \hline 298 \end{array}$$

Pupil Book 2:
Column addition**Pupil consolidation****Refresher**

Children who are experiencing difficulty can first work through this section that involves the adding of two-digit numbers only. Children copy out the calculation then work it out using the standard vertical method.

Practice

Children write out the calculations then work them out using the standard vertical method.

Extension CM:
Adding vertically**Extension**

Children write out the calculations vertically and then work them out using the standard vertical method.

Plenary (about 10 to 15 min)

- ⇒ Say: **We have been using a way to work out additions. This is a method that will be useful for calculations that you cannot work out in your head. It is important to write them out correctly with units always under units and tens always under tens and hundreds always under hundreds.**
- ⇒ Ask questions about the place value of three-digit numbers e.g. **How many hundreds in 729? How many tens in 715? What does the 4 in 249 stand for? I am thinking of a number with 7 tens, 3 units and 8 hundreds what is it?**
- ⇒ Invite children to ask questions to the rest of the class about three-digit numbers.

Pencil and paper procedures (+)

Objectives ● To develop and refine written methods for column addition of two whole numbers less than 1000: adding the least significant digits first.

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

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

Choose an activity from Strand 2 Topic 2.1 or 2.3.

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



This calculation involves the units crossing the tens boundary. Start with calculations that do not cross the tens boundary if children are not confident at adding using the standard method.

$$\begin{array}{r} 348 \\ 35+ \\ \hline 383 \\ \hline \end{array}$$



When the standard method for recording is introduced it is important that the children are clear that they are adding tens and hundreds and not single digits, e.g. 40 and 30 are being added together not 4 and 3.



Say: *When the units add up to more than 10 as they did here and the ten has to be added in the tens column it is called carrying. We have "carried" the ten from the units column to the tens column.*

$$\begin{array}{r} 472 \\ 64+ \\ \hline 536 \\ \hline \end{array}$$

- ➞ Write $348 + 35$ horizontally and vertically on the board.
- ➞ Say: *When the calculation is written vertically the hundreds, tens and units are underneath each other in columns.*
- ➞ Say: *We add the units first. 8 plus 5 is 13. In this calculation the units come to more than 9. When this happens the answer cannot just be written in the units column as it has tens in it too. The 3 goes in the units column as there are 3 units in 13. Say: I cannot just write the 1 or the ten from 13 into the tens column as there are still tens to add Say: I am going to write the 1 in the tens column, not in the answer line but underneath it. Then I can add it to the other tens.* Write 1 underneath the answer line ready for carrying.
- ➞ Say: *Now we add the tens. 40 plus 30 is 70. I also need to add the 10 from the 13 which is under the line. 70 plus 10 is 80. I can now write 8 in the tens column on the answer line. Although I have just written 8 I know it stands for 80.*
- ➞ Say: *Now we look at the hundreds. There are only hundreds in one number so we do not need to add anything. Instead of writing 300, I am going to write just the 3 from 300 in the hundreds column.*
- ➞ Point and say: *The final answer is now written here, 383.*
- ➞ Repeat this method of recording with other HTU + TU calculations. Choose numbers that will involve carrying the units only, e.g. $527 + 67$.
- ➞ Write $472 + 64$ vertically on the board. Say: *In this calculation it is the tens that need carrying. 2 plus 4 equals 6 so that answer can be written in the units column.*
- ➞ Say: *Now I add 70 and 60. 70 plus 60 is 130. 130 is 13 tens, as it is more than 9 tens I cannot just write the answer in the tens column as it has hundreds in it. The hundred has to be carried to the hundreds column.*
- ➞ Say: *130 is one hundred and three tens. I can write the 3 tens in the tens column.* Write 3 in the appropriate place.
- ➞ Say: *The one hundred I will carry to the hundreds column. I am going to put the 1 in the hundreds column, not in the answer line but underneath it. Then I can add it to the other hundreds.* Write 1 underneath the answer line ready for carrying.
- ➞ Say: *Now I add the hundreds. 400 plus the 100 I carried is 500. I write the 5 from 500 in the hundreds column. The answer to the calculation is 536.*
- ➞ Repeat this method of recording with other HTU+TU calculations. Choose numbers that will involve carrying the tens only, e.g. $781 + 56$.

Pupil Book 2:
Carrying numbers

12


Pupil consolidation**Refresher**

Children who are experiencing difficulty can first work through this section that involves adding only carrying the units. Children copy out the calculation then work it out using the standard vertical method.

Practice

Children write out the calculations then work them out using the standard vertical method.

Extension

-  Children write out the calculations from the Practice section of the Pupil Book page again. They should add two hundred to the two-digit number, e.g. $254 + 39$ becomes $254 + 239$, then work out the answers.

Plenary (about 10 to 15 min)

- ➞ Say: **We have been using a way to record addition. This is a method that will be useful for calculations that you cannot work out in your head.**
- ➞ Say: **When the units cross the tens boundary or the tens cross the hundred boundary then you have to carry into the next column. It is very important to write down the ten or hundred that you carry otherwise you will forget to add it.**
- ➞ Choose one of the calculations from the Practice section of the Pupil Book and work it out on the board emphasising how to carry and the importance of writing the 1 in the tens or hundreds column.
- ➞ Finish by discussing any problems that have arisen in the Consolidation part of the lesson.

Homework CM:
What can it be?

25

Homework (about 20 min)

Children write out addition calculations vertically and work out the answers.

Pencil and paper procedures (–)

Objectives ● To develop and refine written methods for column subtraction of two whole numbers less than 1000: decomposition.

Vocabulary subtract; subtraction; minus; take away; difference; equals; makes; is the same as; sign; column

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

Choose an activity from Strand 2 Topic 2.2 or 2.3

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

⇒ Write **585 – 63** on the board horizontally and vertically. Remind the class of the vertical layout. Say: **The units are written underneath each other and the tens are written underneath each other. There is nothing underneath the 500 as there are no hundreds in 63.**

⇒ Say: **When subtraction calculations are written out vertically the larger number always goes at the top.**

⇒ Say: **A useful way to subtract in your head is to think of the numbers as hundreds, tens and units. So thinking of 63 as 60 and 3 makes it easier to subtract. This is how the written method of subtraction works. The numbers are thought of as hundreds, tens and units.**

$$\begin{array}{r} 500 \quad 80 \quad 5 \\ \quad 60 \quad 3- \\ \hline 500 \quad 20 \quad 2 \end{array}$$

⇒ Say: **To make the subtraction of these numbers easier we are going to decompose or partition the numbers into hundreds, tens and units. 585 is 500 and 80 and 5. Write 500 + 80 + 5 on the board. Say: 63 is 60 and 3. Write 60 + 3 underneath 80 + 5. Draw an answer line underneath.**

⇒ Say: **Now I have partitioned the numbers into hundreds, tens and units, I can carry out the subtraction. 5 minus 3 is 2.** Write 2 underneath the answer line.

⇒ Say: **Now I subtract the tens. 80 minus 60 is 20.** Write 20 below the answer line. Say: **500 subtract nothing is 500.** Write 500 below the answer line.

⇒ Say: **The answer to the calculation is 500 plus 20 plus 2, 522.**

$$\begin{array}{r} 585 \\ 63- \\ \hline 522 \end{array}$$

⇒ Write **585 – 63** on the board vertically again. Say: **We are going to work this calculation again but record the answer in a quicker way.**

⇒ Say: **First we subtract the units.** Write **5 – 3** on the board next to the vertical layout. Say: **5 minus 3 is 2. I can write the answer 2 in the units column of the calculation.** Write 2 in the units column.

⇒ Say: **Now we can subtract the tens. 80 minus 60 is 20. I write 2 in the tens column.** Write the 2 in the tens column. Say: **I know that it represents 20 as it is in the tens column.**

⇒ Point to the hundreds column and say: **500 minus nothing is 500. I write the 5 from 500 in the hundreds column.**

⇒ Say: **So the answer to 585 minus 63 is 522.**

⇒ Repeat this method of recording with other HTU – TU calculations. Choose numbers that will not involve decomposing, e.g. **876 – 52, 795 – 41.** Invite children to work out the calculation explaining what they are doing.

Pupil Book 2:
Column subtraction

13


Pupil consolidation**Refresher**

Children who are experiencing difficulty can first work through this section that involves the subtraction of two-digit numbers. Children copy out each calculation and work it out vertically.

Practice

Children copy out each calculation and work it out vertically.

Extension

-  Children write out the calculations from the Practice section of the Pupil Book page again. They should add three hundred to the two-digit number, e.g. $576 - 53$ becomes $576 - 553$, then work out the answers.

Plenary (about 10 to 15 min)

- ⇒ Say: **We have been using a way to record subtraction. This is a method that will be useful for calculations that you cannot work out in your head. It is important to write them out correctly with the units, tens and hundreds in the right columns.**
- ⇒ Say: **Subtracting the units then the tens and then the hundreds makes subtraction easier.**
- ⇒ Choose some of the calculations from the Practice section of the Pupil Book and ask children to work them out on the board and explain what they are doing.

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

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

Vocabulary subtract; subtraction; minus; take away; difference; equals; makes; is the same as; sign; column

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

Choose an activity from Strand 2 Topic 2.2 or 2.3.

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

i When working out these calculations vertically always refer to the digits by what they represent so that the children do not lose sight of what they are subtracting, e.g. say 60 not 6 in 867.

↓ This calculation will involve decomposing. Continue with calculations that will not involve this if the children are not confident with the method.

$$\begin{array}{r} 672 \\ - 57 \\ \hline 615 \end{array}$$

i Repeat for other HTU – TU calculations that will involve decomposing the units, e.g. **861 – 35**, **483 – 59**. Invite children to work out the calculation explaining what they are doing.

i Repeat for other HTU – TU calculations that will involve decomposing the tens, e.g. **628 – 54**, inviting children to work out the calculation explaining what they are doing.

- ⇒ Ask quickfire addition and subtraction facts to 20.
- ⇒ Write **867 – 42** on the board horizontally and vertically. Remind the class of the vertical layout. Ask a child to work it out explaining their method.
- ⇒ Write **672 – 57** on the board vertically.
- ⇒ Say: **First we subtract the units. We cannot subtract 5 from 2 so we need to change the 2 and make it larger.**
- ⇒ Say: **I am going to change 672 so that I can make the units larger.** Write **600 70 2** on the board. Point and say: **672 is 600 and 70 and 2.**
- ⇒ Cross out the 70 and change it to **60**. Say: **I have made 70 smaller by 10. I will put this 10 with the units.** Write a small **1** next to the 2. Say: **I have now made 2 into 12 by adding 10.**
- ⇒ Point to the vertical calculation. Say: **I am going to do exactly the same in this calculation. I will make the 70 into 60 so that I can make the units larger.** Cross out the 7 in 672 and write **6** above it.
- ⇒ Say: **The ten I have taken from the 70 I will now put into the units column.** Write a small **1** next to the 2 in 672. Say: **Now I have 12 in the units column I can work out the subtraction. 12 minus 7 is 5. I will write the answer in the units column.**
- ⇒ Say: **Now we can subtract the tens. The number in the tens column has changed in 672 it is now 60. 60 minus 50 is 10. I write 1 in the tens column. I know that it represents 10 as it is in the tens column.**
- ⇒ Point to the hundreds column and say: **600 minus nothing is 600. I write the 6 from 600 in the hundreds column. So the answer is 615.**
- ⇒ Write **847 – 75** vertically on the board. Say: **In this calculation it is the tens that will need to be changed. First we subtract the units 7 minus 5 is 2.**
- ⇒ Say: **Now for the tens. 40 minus 70 cannot be done so I need to make 40 larger.** Write **800 40 7** on the board. Say: **I am going to take 100 from 800.** Cross out 800 and write **700** above it.
- ⇒ Say: **I will now put that hundred in the tens column.** Write a small **1** next to 40. Say: **I have made 40 into 140. Now I am going to do the same in the vertical calculation.**
- ⇒ Cross out the 8 in 847, write **7** above it then write a small **1** next to the 4. Say: **I've taken 100 from 800 and I have put it in the tens column. Now I can do the subtraction 140 minus 70 is 70. I will write 7 in the tens column of the answer.**
- ⇒ Say: **800 has become 700, 700 minus nothing is 700.** Write **7** in the appropriate place. Say: **The answer to 847 minus 75 is 772.**

Pupil Book 2:
Column calculations

14

Pupil consolidation*Refresher*

Children who are experiencing difficulty can first work through this section that begins with calculations that do not involve decomposing, and then calculations that only the digits need decomposing. Children copy out each calculation and work it out vertically.

Practice

Children copy out each calculation and work it out vertically.

Extension CM:
The answer is ...

26

Extension

This involves HTU – HTU calculations. Some of them involve decomposing the units and the tens.

Plenary (about 10 to 15 min)

- ⇒ Say: **Today we have been using a written method to work out subtraction calculations. This is a method that will be useful for calculations that you cannot work out in your head.**
- ⇒ Say: **If either the units or the tens subtraction cannot be done because the first number is too small then the numbers have to be changed.**
- ⇒ Choose one of the calculations from the Practice section of the Pupil Book and work it out on the board emphasising how to decompose the numbers.
- ⇒ Finish by discussing any problems that have arisen in the consolidation part of the lesson.

Homework CM:
Work it out!

26

Homework (about 20 min)*Refresher*

Children work out the subtraction calculations using the vertical method, sometimes needing to change the units digit.

Practice

Children work out the subtraction calculations using the vertical method, changing the units or the tens digit.

Pencil and paper procedures (+ and -)

Objectives ● To develop and refine written methods for money calculations.

Vocabulary add; addition; more; plus; sum; total; and; altogether; equals; makes; is the same as; hundreds; tens; units; ones; subtract; subtraction; minus; take away; difference; sign; column; pounds; pence

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

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

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



This calculation involves the units crossing the tens boundary. Start with calculations that do not cross the tens boundary if children are not confident at addition using the standard method.

$$\begin{array}{r} \pounds 4.37 \\ \pounds 1.58+ \\ \hline \pounds 5.95 \end{array}$$



When using the standard method for recording it is important that the children are clear that they are adding tens and hundreds and not single digits. Always refer to the digits by what they represent, e.g. always say 30 for the 3 in £4.37.

$$\begin{array}{r} \pounds 6.65 \\ \pounds 2.28- \\ \hline \pounds 4.37 \end{array}$$

- ➞ Write $\pounds 4.37 + \pounds 1.58$ horizontally on the board. Say: **We can use the written methods we have learnt for addition and subtraction for money calculations.** Write $\pounds 4.37 + \pounds 1.58$ vertically on the board.
- ➞ Say: **Make sure that you write the calculation out correctly. The decimal points that divide the pounds and pence must be underneath each other.**
- ➞ Say: **We add the units in the pence first. 7 plus 8 is 15. As the units come to more than 9 we need to carry the ten into the tens column. The 5 goes in the units column as there are 5 units in 15.**
- ➞ Say: **I am going to write the 1 in the tens column not in the answer line but underneath it. Then I can add it to the other tens.** Say: **Now we add the tens. 30 plus 50 is 80. I then add the 10 from the 15 which is under the line. 80 plus 10 is 90 so the total of the tens is 90. I can now write 9 in the tens column on the answer line. I know it stands for 90 as it is written in the tens column.**
- ➞ Say: **Now I am going to put the point that divides the pounds from the pence in the answer line so that my answer will be in pounds and pence.**
- ➞ Say: **Now we look at the pounds. This is still the hundreds column because a pound is a hundred pence. £4 add £1 is £5.** Write 5 in the appropriate place. Say: **The answer is £5.95.**
- ➞ Repeat for other HTU + HU money calculations. Choose numbers that will involve carrying the units or the tens, e.g. $\pounds 6.82 + \pounds 2.44$.
- ➞ Write $\pounds 6.65 - \pounds 2.28$ vertically on the board.
- ➞ Say: **First we subtract the units. We cannot subtract 8 from 5 so we need to change the 5 and make it larger.**
- ➞ Say: **I am going to take or borrow ten from the 60.** Cross out the 6 and write 5 above it. Say: **The 60 has now become 50 and I am going to put the ten with the 5 to make 15.** Write a small 1 next to the 5.
- ➞ Say: **Now I have 15 in the units column, I can work out the subtraction. 15 minus 8 is 7. I will write 7 in the units column.**
- ➞ Say: **Now we can subtract the tens. The number in the tens column has changed. It is now 50. 50 minus 20 is 30. I write 3 in the tens column. I know that it represents 30 as it is in the tens column.**
- ➞ Say: **Now I am going to put the point that divides the pounds from the pence in the answer line so that my answer will be in pounds and pence.**
- ➞ Say: **Now we subtract the pounds. £6 minus £2 is £4.** Write 4 in the appropriate place. Say: **So the answer is £4.37.**
- ➞ Repeat for other HTU – HTU calculations.

Y4 CalculationsSuggested order: **Spring Term, Week 3, Lesson 3**Pupil Book 2:
Bookseller calculations

15

Pupil consolidation**Refresher**

Children who are experiencing difficulty can first work through this section that involves adding and subtracting without carrying or decomposing. Children copy out the calculation then work it out using the standard vertical method.

Practice

Children write out the calculations then work them out using the standard vertical method.

Extension CM:
How much?

27

Extension

This involves calculations where the tens and units need carrying or decomposing.

Plenary (about 10 to 15 min)

- ⇒ Say: **We can use the methods we have learnt for addition and subtraction to work out the answers for money calculations. The decimal point that divides the pounds and pence must be written in the answer line.**
- ⇒ Choose some of the calculations from the Practice section of the Pupil Book and invite children to work them out on the board.
- ⇒ Finish by discussing any problems that have arisen in the consolidation part of the lesson.

Rapid recall of addition and subtraction facts

Objectives ● To know by heart all number pairs that total 100. ● To derive quickly all pairs of multiples of 50 with a total of 1000.

Vocabulary multiple; hundreds; thousand; multiples of 50 to 1000; add; plus; equals; makes; total

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

Choose an activity from Strand 2 Topic 2.1 or 2.3

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

Resources pack of 0–100 cards, Blu-tack

- ⇒ Call out multiples of 10 and ask the children to reply with the multiple of ten that goes with it to make 100.
- ⇒ Say: ***If you know the multiples of ten that add together to equal 100, you can use this knowledge to work out any pair of numbers that equal 100.***
- ⇒ Shuffle the 0 to 100 cards and put them in a pile on the table. Turn over the top card and Blu-tack it to the board. Next to the card write $+ \square = 100$.
- ⇒ Say: ***To work out what needs to be added to the number to equal 100, first I will jump to the next multiple of 10. Then I use my knowledge of pairs of multiples of 10 that equal 100 to work out which multiple of ten will equal 100.***
- ⇒ Work out the missing number in this way, e.g. $43 + \square = 100$. Say: ***43 add 7 is 50, 50 add 50 is 100 so the missing number is 57.*** Write the number in the box.
- ⇒ Turn over the next card and ask the class to work out the missing number. Invite a child to explain how they worked it out.
- ⇒ Repeat using other cards.
- ⇒ Ask the class to count in 5s to 100.
- ⇒ Call out a multiple of 5 and ask the class to reply with the multiple of five that goes with it to make 100.
- ⇒ Say: ***If you know the multiples of five that add together to equal 100 you can use this knowledge to work out the pairs of multiples of 50 that equal 1000.***
- ⇒ Write $25 + 75 = 100$ on the board. Underneath, write $250 + \square = 1000$. Say: ***As I know that 25 plus 75 equals 100, I can work out that 250 add 750 equals 1000.***
- ⇒ Write $35 + 65 = 100$ on the board. Underneath, write $350 + \square = 1000$. Ask the class to work out the missing multiple of 50.
- ⇒ Repeat for other facts. When children are confident, stop writing the multiples of five on the board.
- ⇒ Finish by asking the class questions that involve finding the pairs of multiples of 50 that equal 1000 and pairs of numbers that equal 100.
Ask: ***67 add what equals 100? 550 plus what equals 1000?***

Pupil Book 2:
Find the pair

16

Pupil consolidation**Refresher**

Children who are experiencing problems can first work through this section that involves only working out pairs of two-digit numbers that equal 100. They can use the 100 square to help them. Children write out the pairs of numbers as an addition calculation.

Practice

Children choose 10 numbers from each set and work out the partner number to equal 100 or 1000 as appropriate. Children write out the pairs of numbers as an addition calculation.

Support CM:
Ten again

26

Support

This provides revision of addition facts for 10, multiples of 10 that equal 100 and multiples of 100 that equal 1000.

Extension**Resources** 0–100 cards; 20 counters

In pairs, children shuffle the cards and put them in a pile on the table. They turn over the top card and look at the number. They both work out the number that goes with it to make 100. The child who works it out first takes a counter. The first child to have ten counters is the winner.



Game 30

Games Pack 2

Run the race

Plenary (about 10 to 15 min)

- Say: **The pairs of multiples of 5 that equal 100 can be used to work out the pairs of multiples of 50 that total 1000. The pairs of multiples of 10 that equal 100 can be used to help work out the pairs of two-digit numbers that equal 100.**
- Invite two children to the front of the class. Ask one of them to say a two-digit number. The other child then answers with the number that goes with it to make 100. They then change roles. Encourage the rest of the class to work out the answer at the same time.
- Invite two different children to the front and repeat for multiples of 50 that equal 1000.

**Software: Rapid Maths 4**

Crushers!

Homework CM:
Pairs

27

Homework (about 20 min)

This provides children with multiple of 50 cards up to 1000. Children use these cards to play pelmanism.

Problems involving “real life” and money/ Making decisions

Objectives ● To use addition and subtraction to solve word problems involving numbers in “real life” or money, using one or more steps. ● To explain and record methods. ● To choose and use appropriate number operations and appropriate ways of calculating (mental, mental with jottings, pencil and paper) to solve problems.

Vocabulary operation; calculation; answer; how did you work it out?; problem; explain

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

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

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



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.

Write on the board, *Mr Franks collects stamps. He has 384 stamps in his collection. 57 of them were ruined when he spilt his cup of coffee. How many stamps does he have left?*

Ask: *What is the calculation that we need to do to find the answer to this question?* Invite a child to write the calculation on the board. ($384 - 57$)

Say: *Decide how you are going to work out the answer. You might work it out in your head or you might want to make some jottings or you might want to use paper and pencil.*

Ask: *Who would work out the answer in their head?* Repeat the question for the other two possible methods.

Invite a child who said they would work it out in their head to explain their mental method. Then ask a child who said they would work it out making jottings to come out and work it out on the board. Then do the same with the paper and pencil method.

Establish that the answer to the calculation is 327. Say: *So the answer to the problem is 327 stamps.*



Spend more time on one-step problems.

Write on the board *Jasmine spent 73p on Monday, £1.59 on Tuesday. How much of her £5 does she have left?*

Say: *For this problem we need to work out two calculations. What are they?* Invite a child to write the calculations on the board ($73p + £1.59$, $£5.00 - £2.32$).

Say: *Decide how you are going to work out the answer. You might work it out in your head or you might want to make some jottings or you might want to use paper and pencil.*

Choose one of the methods and invite a child who would work it out in this way to work it out on the board and explain to the class what they are doing.

Establish that the answer to the calculation is £2.68. Say: *So the answer to the problem is £2.68 left.*

Repeat with other two-step problems. Each time, choose a different way of working it out.

Y4 Solving problems

Suggested order: **Spring Term, Week 3, Lesson 5**Pupil Book 2:
Which method?

17

Pupil consolidation**Refresher**

Children who are unsure should start with these one-step problems. Children should record first the calculation they used and then the answer to the question.

Practice

These problems require two steps to work out the answer. Children should record first the calculations they used and then the answer to the question.

Support CM:
How many?

27

Support

The problems on this sheet use lower numbers and one-step problems.

Extension

Children who finish can make up some word problems for each other in pairs. They swap their problems, work out the answers and then swap back to check each other's answers.

Plenary (about 10 to 15 min)

- Discuss some of the word problems from the Pupil Book.
- Invite children to explain their working. Ask: **Did anyone work it out in a different way?**
- Say: **When you are working out word problems you need to decide if you can work out the answer in your head or if you need to make jottings on paper.**
- Write $£6.55 + £3.47 - 90p$ on the board. Ask children to make up some word problems using these numbers.

Measures: (mass)

Objectives ● To use, read and write standard metric units (kg, g), including their abbreviations. ● To know and use the relationships between familiar units of mass. ● To know the equivalent of one half, one quarter, three quarters and one tenth of 1 kg in grams.

Vocabulary unit; standard unit; metric unit; kilogram; gram; balances; scales; measuring scales; division; light; heavy; weighs; weight; estimate; roughly; nearly; about; approximately

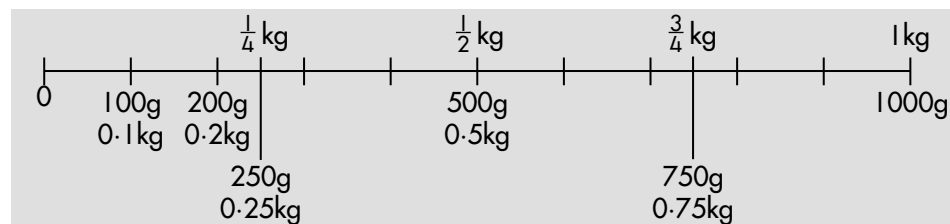
Oral work and mental calculation (about 5 to 10 min)

Choose an activity from Strand 1 or Strand 2.

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

Resources 0–1 kg number line calibrated in ten intervals; cards for equivalences – $\frac{1}{2}$ kg, 0.5 kg, 500 g; $\frac{1}{4}$ kg, 0.25 kg, 250 g; $\frac{3}{4}$ kg, 0.75 kg, 750 g; $\frac{1}{10}$ kg, 0.1 kg, 100 g; 200 g; 1000 g; Blu-tack; two-pan balance; scale balance; 3–5 objects for weighing; standard weights: 1 kg, 500 g, 200 g, 100 g

- ⇒ Recall the standard weights met in Year 3: 1 kg, $\frac{1}{2}$ kg, 200 g and 100 g.
- ⇒ Mark the ends of the number line 0 kg and 1 kg. Invite children to place cards for the weights 100 g, 200 g, $\frac{1}{4}$ kg, $\frac{1}{2}$ kg, $\frac{3}{4}$ kg at the correct intervals on the number line. Draw children's attention to the positioning of the $\frac{1}{4}$ kg and $\frac{3}{4}$ kg cards.
- ⇒ Recall the equivalences in grams for 1 kg, $\frac{1}{10}$ kg, $\frac{1}{2}$ kg, $\frac{1}{4}$ kg and $\frac{3}{4}$ kg and ask children to add these cards to the line: 1000 g, 100 g, 500 g, 250 g, 750 g.
- ⇒ Ask children to find and position the equivalent decimal cards, to complete the number line as shown.



- ⇒ Discuss and establish the three-fold relationships at each interval, e.g. 500 g is one half of 1 kg and is written as: $500\text{ g} = \frac{1}{2}\text{ kg} = 0.5\text{ kg}$.
- ⇒ Write unitary kilogram weights on the board and ask children to complete the equations in grams and vice versa, e.g. $4\text{ kg} = 4000\text{ g}$ and $9000\text{ g} = 9\text{ kg}$.
- ⇒ Place an object on the pan balance and demonstrate weighing to the nearest 100 g. For example, show that a relatively large book weighs between 600 g and 700 g. Now weigh the object on the scale balance and read the weight to the nearest 100 g.
- ⇒ Choose children to weigh two objects in the same way. Encourage observations such as: **The box is heavier than 400 grams but lighter than 500 grams. The scales show that it weighs about 400 g.**
- ⇒ Recall the rules for rounding any three-digit number to the nearest 100. Write **425 g, 680 g, 949 g** and say: **Show me on the number line, the position of 425 g. Will it round up or down? (down) What is 425 g rounded to the nearest 100 g? (400 g).**
- ⇒ Repeat for other weights.



You need objects, less than 1 kg, which will trigger rounding to the nearest 100 units and a supply of standard weights.

Pupil Book 2:
Weighing – up or down

18

Pupil consolidation**Refresher**

Resources balance scales; 100g weights; sets of objects e.g. rulers, marbles, cubes etc.

- 1 Children record equivalents of kilograms in grams.
- 2 In pairs, children find how many rulers/marbles/cubes etc. weigh about 100g.

Practice

- 1–2 Children write kilograms as grams and vice versa.
- 3 Children work out the least number of standard weights to balance the weight of packets.
- 4 Children round weights of parcels to the nearest 100g.

Extension

Resources balance scales; 100g weight; box of teabags; packet of biscuits



Provide each small group with a balance scale and a 100g weight. Challenge the children to find the weight of one teabag/biscuit.



Game 48

Games Pack 2

Milk the cow

Plenary (about 10 to 15 min)

- Discuss and compare lists of things which weigh about 100g from the Refresher section of the Pupil Book.
- Review the answers to questions 3 and 4 from the Practice section of the Pupil Book. On the board, build up this table:

weight	balancing weights		
	100 g	200 g	500 g
100g	1	–	–
200g		1	–
300g	1	1	–

and so on to 1000g.

- Ask: **How many different ways can you make 1 kg with these weights?**
- Pose further examples of 3-digit weights which children round to the nearest 100g.
- Extend to 4-digit numbers to challenge the more able.

Homework CM:
Fruit tray weights

28

Homework (about 20 min)**Refresher**

Using the clues, the children work out the weight of fruit on each tray.

Practice

Children complete the Refresher section before continuing with questions 1–4.

Measures: (mass)/Making decisions

Objectives ● To use, read and write standard metric units (kg, g), including their abbreviations. ● To measure and compare using kilograms and grams. ● To know and use the relationships between familiar units of mass. ● To choose and use appropriate number operations and appropriate ways of calculating (mental, mental with jottings, pencil and paper) to solve problems.

Vocabulary unit; standard unit; metric unit; kilogram; gram; balances; scales; measuring scales; division; light; heavy; weighs; weight; estimate; roughly; nearly; about; approximately

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

Choose an activity from Strand 1 or Strand 2.

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

Resources balance scale; 50g; 100g; 200g weights; 6 clear plastic bags; spoon; container of rice/sand; Post-it notes

- ⇒ Ask children to state, in descending order, the weights they have met so far. Write: **1000g, 500g, 200g, 100g.**
- ⇒ Ask: **Which weight, less than 100g, might come next?** (50g)
- ⇒ Invite suggestions of ways to make the 50g weight using rice, plastic bags and one 100g weight. Ask two children to carry out the task. Demonstrate that the 50g bags balance and together weigh 100g.
- ⇒ Say: **You have the following equipment: balance scales, a 200g weight; a 50g weight, rice and plastic bags. Who could measure a bag of rice which weighs 250g?** (200g + 50g) Label bag with a Post-it note for 250g.
- ⇒ Ask: **Who can suggest a way to measure out a 150g bag of rice?**
- ⇒ Place a weight in each pan and ask a child to complete the task. Label the bag with a Post-it note.
- ⇒ Extend the problem by asking: **Can you find a way to make a 100g bag? A 25g bag?**
- ⇒ Choose children to complete the task.
- ⇒ Ask a child to display the labelled bags in ascending order. (25g, 50g, 100g, 150g, 200g, 250g)
- ⇒ Say: **We have one of each of these bags. If we take any two, what other weights might we make?**
- ⇒ Ask: **If we place all six bags on kitchen scales what will the dial show?** (775g) Discuss the range of mental strategies which the children used.
- ⇒ Ask: **What is 775g rounded to the nearest 100g?** (800g) **To the nearest 10g?** (780g)
- ⇒ Say: **We began with 1kg of rice in our container. We made up these bags. How much rice will the container still hold?** (225g)

Pupil Book 2:
Balancing to 50g

19



If you have sufficient resources, you may wish to provide each table with standard weights and a balance scale to assist children with this work.

Pupil consolidation**Refresher**

- 1 Children work out which weights to use to measure out quantities for a pudding.

Practice

- 1 Children investigate different ways to balance a weight using up to four standard weights.
- 2 Using the given standard weights, children investigate ways of making specified weights.

Extension

Pose the problem: You have one 500g and one 200g weight. How might you measure out 900g of rice?



Game 48

Games Pack 2

Milk the cow

Plenary (about 10 to 15 min)

- Ask the children who completed the Refresher activity to say which weights they used to measure out each ingredient. **Did anyone use a different set of weights for the flour?**
- Say: **Imagine a mixing bowl. Put in 100g of butter and 150g of sugar. Cream them together and hold the weight in your head. Now add 250g of flour and mix well. Finally add 450g of raspberries. What weight do you have in your mixing bowl?** (950g)
- Repeat, as above, for a different recipe or ask children to invent one of their own, e.g. **The wizard's bread. Take 350g of frog spawn, 150g of best black slugs and squish them all together in a copper cauldron. Then slowly add ... !**
- Discuss and answers for question 2 of the Practice section of the Pupil Book.

Measures: (mass)/Making decisions

Objectives ● To record measurements using mixed units, or the nearest whole/half/quarter unit (e.g. 3.25 kg). ● To know and use the relationships between familiar units of mass. ● 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 unit; standard unit; metric unit; kilogram; gram; balances; scales; measuring scales; division; light; heavy; weight; weighs; estimate; roughly; nearly; about; approximately

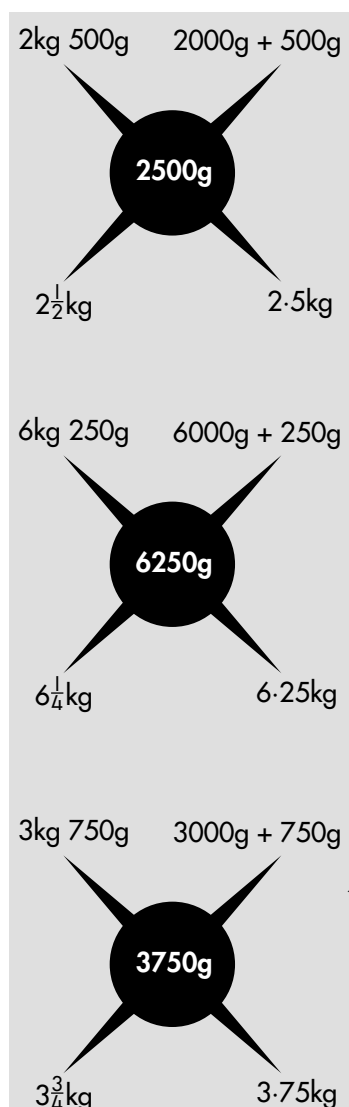
Oral work and mental calculation (about 5 to 10 min)

Choose an activity from Strand 1 or Strand 2.

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

Resources balance scales; kitchen scales; bathroom scales; spring balance; electronic scales; 100 g and 1 kg weight

- ⇒ Display a range of weighing scales and ask: **Which weighing scales are the most/least accurate?** (electronic/balance scales) **How do you know?**
- ⇒ Discuss the type of weighing scales used at a post office, health centre, airport check-in desk, supermarket. Ask for suggestions of suitable things to weigh at each location.
- ⇒ Write: **24 kg, 17 kg, 14 kg, 23 kg** and say: **A family of 4 are checking in their bags at the airport. The baggage allowance is 20 kg per person. Which bags are overweight?** (24 kg and 23 kg) **By how much?** (4 kg and 3 kg) **The airline charges £2 per kg of excess baggage. How much will they have to pay?** (£14) **One of the children says, 'I know how we can save £14'. What was the idea?** (repack bags) **How could they do it?**
- ⇒ Say: **Of the scales we have in our classroom, which is more suitable for heavy/light weights? Which would you use to measure the weight of a bag of apples ... a large book ... a cabbage ... a tennis ball ... a cup of flour ...?**
- ⇒ Discuss weight estimates, suitable units and measuring scales for items for an adventure camp, for example, rucksack – 16 kg – bathroom scales; tent peg – 100 g – balance scales/spring balance/kitchen scales; torch; T-shirt etc.
- ⇒ Write: **weight of torch = 240 g**. Pose questions which require finding the weight of 2, 4, 10 such torches in grams/mixed units.
- ⇒ Recall that $500\text{ g} = \frac{1}{2}\text{ kg} = 0.5\text{ kg}$. Elicit the fractional and decimal equivalents for $250\text{ g} = \frac{1}{4}\text{ kg} = 0.25\text{ kg}$ and $750\text{ g} = \frac{3}{4}\text{ kg} = 0.75\text{ kg}$
- ⇒ Ask: **What is the weight of 1/2/3/10 torches to the nearest quarter/half/whole kilogram?** (0.25 kg/0.5 kg/0.75 kg/2 kg)
- ⇒ Consolidate children's understanding of the relationship between units of mass by asking: **How many different ways can we record 2500 g/3750 g/6250 g?** (see diagrams)
- ⇒ Select other items from the camp list to give children practice in doubling, finding multiples of 10 and recording to the nearest whole/half/quarter kilogram.



Pupil Book 2:
Cookhouse problems

20

Pupil consolidation**Refresher**

1–2 Children use the table to work out the weight of each lunch. They relate each weight to the nearest half/quarter kilogram.

Practice

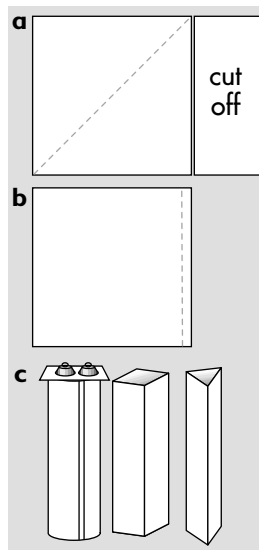
- 1 Children calculate the weights of 2, 4 and 10 portions which they express in mixed units and in decimal fractions of a kilogram.
- 2–4 Children solve word problems relating to multiples of weights.

Extension

Resources sheets of A4 paper; scissors; sticky tape/glue; ruler; 10 cm square of card; 50 g weights (per group)



In small groups, children investigate the strength of paper shapes as follows:



- 1 Fold A4 paper to make a square. Cut off excess paper.
- 2 Measure and mark a 1 cm strip to form a flap.
- 3 Roll the paper to form a cylinder and stick down the flap.
- 4 Place the card on top of the cylinder.
- 5 Put 50g weights on top of the card, one by one until the cylinder collapses.
- 6 Write down the number of grams the cylinder supported prior to collapse.
- 7 Repeat, as above, for a square-based and a triangular-based shape.
- 8 Compare results with groups.

Plenary (about 10 to 15 min)

- Refer children to the list of food weights in the Pupil Book. Say: **Make up a lunch pack which will weigh about $\frac{1}{2}$ kg?** Children read out and check each other's lists. Pose problems, based on the food weights which involve doubling and halving, e.g. **What is the weight of two packs of sandwiches?** (300g) **Half an apple?** (75g) **How many oranges weigh 0.5 kg?** 1/2/4 kg? (2/4/8/16 oranges)
- Choose children to demonstrate how they solved the problems in questions 2–4. Ask: **Who had a different/quicker way?**
- Ask children who attempted the Extension task to report on their findings.

Homework CM:
Cross over weights

29

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

Suggest that children “act out” the crossings, using coins (two 5p and two 1p) to represent the boys. They should record who is on which bank of the river at the end of each crossing as in step 1. They should write above the canoe who is going over/coming back.

Practice only

A dog, weighing 12 kg has to cross on one of the trips. There are several possible answers.

Measures: (mass)/ Problems involving measures (mass)

Objectives ● To suggest suitable units and measuring equipment to estimate or measure mass. ● To record estimates and readings from scales to a suitable degree of accuracy. ● To record measurements using mixed units, or the nearest whole/half/quarter unit (e.g. 3.25 kg). ● To use all four operations to solve word problems involving numbers in measures (mass), using one or more steps.

Vocabulary unit; standard unit; metric unit; kilogram; gram; balances; scales; measuring scales; division; light; heavy; weighs; weight; estimate; roughly; nearly; about; approximately

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

Choose an activity from Strand 5 Topic 5.2, Strand 1 or Strand 2.

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

Resources three confectionery boxes (empty): labels for 85g, 105 and 123g; packets of cereal, rice and biscuits: small cards; Blu-tack

- ➡ Write these weights; **85g, 105g and 123g**. Ask children to round each weight to the nearest 10g then to the nearest 100g. Record as follows:

actual weight	85g	105g	123g
rounded to nearest 10g	90g	110g	120g
rounded to the nearest 100g	100g	100g	100g
- ➡ Display the boxes and say: **You have £2 to spend on sweets for your mum. These boxes all cost £1.99. Each box weighs 100g rounded to the nearest 100g. Which one would you buy?**
- ➡ Say: **The boxes appear to be of equal value in terms of cost and weight, but are they? We need to know the actual weights before we decide which to buy.**
- ➡ Label the boxes 85g, 105g, 123g and ask: **Which box of sweets is the 'best buy'? (123g) The most expensive per 100g? (85g) How do you know? Can you explain your reasoning?**
- ➡ Ask questions to compare differences in the weights of the boxes.
- ➡ Inform children that to help customers many supermarkets now label food items with the price per 100g.
- ➡ Ask three children to write the weight of a package on a card, e.g. cereal: 350g, rice: 1 kg, biscuits: 170g.
- ➡ Ask questions similar to the following and ask children to show with jottings on the board, how they worked out the answers.
 - ➡ **There are 10 servings of cereal. How many grams in one serving? (35g) What if you took large helpings of cereal, say, 50g at a time. How many servings could you have? (7) There are 10 biscuits in the packet. What is the weight of one biscuit? (17g) Ten packets? (1700g/1 kg 700g/1.7kg) 125g is enough rice for two people. How many people will 1 kg rice feed? (16) 2kg? (32) How much rice is needed for 20 people? (1250g/1 kg 250g/1 1/4kg/1.25kg)**



Choose less able children to answer the first part of each set of questions.

Pupil Book 2:
Weights work-out

21

Pupil consolidation*Refresher*

1–2 Children interpret data to work out the best buy of Easter Egg and to calculate the difference in grams between the lightest and heaviest £1.99 item.

Practice

1 Children work out the approximate weight in grams of single items.

2–5 Children solve word problems using all four operations.

Extension

Pose this problem: You have a bag of rice and a packet of pasta. Together they weigh 3 kg. The rice weighs 2 kg more than the pasta. What does the pasta weigh? (500 g/0.5 kg) Challenge the children to write an extension to the problem for a friend to solve, e.g. What if the total weight was 5 kg?.

Plenary (about 10 to 15 min)

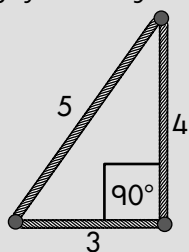
- Ask children to identify the 'best buys' from the Refresher section of the Pupil Book.
- Choose children to write on the board their methods of solving questions 1–4 of the Practice section. Discuss and compare. Ask: **Who found a different way?**
- Refer children to the illustration in the Pupil Book page and ask them to work out the total weight of all seven items. Encourage children to look for items which complement to a kilogram.
- Ask some pupils to explain their reasoning for the Extension problem and to present their own extension for others to solve.

Shape and space: (position and direction)

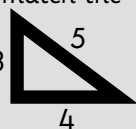
Objectives ● To recognise simple examples of horizontal and vertical lines.

Vocabulary grid; row; column; horizontal; vertical; diagonal; level; upright; horizon; ruler; set square; plumb-line; spirit-level

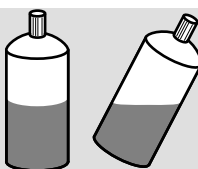
i The Ancient Egyptians needed to find a way of ensuring that the corners of the pyramids were square. They invented a method of “rope-stretching” which would always form a right angle.



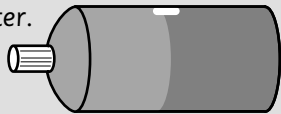
Then they made a wooden template cut to match the dimensions of the triangle.



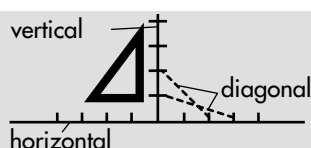
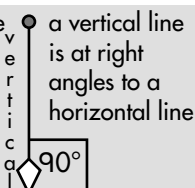
This fixed measuring tool, the set square, was used to check that floors and surfaces were level or horizontal.



i Make a spirit-level by almost filling a plastic bottle with coloured water.



a plumb-line checks that something is exactly upright



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

Choose an activity from Strand 1 or Strand 2

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

Resources holiday postcards and brochures showing “horizons”; 2 clear plastic bottles; coloured water; marbles; string; Plasticene; set square; commercial plumb-line and spirit level (if available); ruled exercise book; square grid paper

- ⇒ Discuss the need for level surfaces. Ask: **What would happen if the table was not level? What would happen if the legs were not upright?**
- ⇒ Inform children that all mathematical ideas have practical origins.
- ⇒ Display the holiday postcards/brochures to introduce and discuss the term, “horizon” as the line in which sea or land and sky appear to meet.
- ⇒ Half fill two clear plastic bottles with coloured water. Demonstrate that as you tilt one bottle, the surface of the water stays level. Introduce the term, “horizontal” meaning level, in line with the horizon.
- ⇒ Move the set square over the table top to show its flatness and say: **A table top has a horizontal surface. It should be flat and level.**
- ⇒ Ask: **Can you suggest other ways of checking that surfaces are level?** (use marbles, or a spirit-level) **How is a spirit-level used? By whom?** (bricklayers, joiners etc.)
- ⇒ Ask individual children to identify and check horizontal surfaces using set squares, marbles and spirit-levels.
- ⇒ Introduce the term, “vertical” meaning exactly upright. Say: **The Ancient Egyptians invented the plumb-line to check that walls were vertical, that is, at right angles to a horizontal line.**
- ⇒ Show how the plumb-line is used in checking if surfaces or edges are vertical.
- ⇒ Ask: **Why is it important to know that something is exactly upright?** (doors and windows need to close within their frame, wallpaper patterns need to be level)
- ⇒ Establish through discussion that the lines on a ruled page of an exercise book are horizontal. Show the square grid paper. Establish that the rows are horizontal and the columns, vertical.
- ⇒ Draw a square and recall that the diagonals are lines joining opposite corners. Say: **Diagonal means sloping or slanting.**
- ⇒ Demonstrate the use of a set square to draw a right angle on the board. Choose children to rule straight lines to join together a horizontal and a vertical point with the same number. Say: **We can use a set square to draw a right angle.**

Pupil Book 2:
Horizontal and
vertical lines

22 23

Pupil consolidation

Resources dot lattice squares see RCM 1, and squared paper; colouring materials in blue, green and orange; rulers; set squares

Refresher

- 1 Children identify lines in objects as horizontal or vertical lines and record answers as “h” or “v”.
- 2 Children copy three simple shapes on dot lattice square paper. They colour horizontal lines blue, vertical lines green and diagonal lines orange.

Practice

- 1–2 Children copy and complete spirals on squared paper colouring horizontal lines blue and vertical lines green.
- 3 Children use a set square to draw the diagram in their exercise book. They mark and number 8 points at 1 cm intervals and rule straight lines to join together a horizontal and a vertical point with the same number.

Extension

Resources rulers; set squares

- 1 The children use a set square to construct a square with sides of 10 cm. They mark and number the points. Using straight lines and adjacent sides, they join together a horizontal and a vertical point with the same number.



Game 34

Games Pack 2

Cops and robbers

Plenary (about 10 to 15 min)

Resources large capital letters; 2 hoops; card for labels

- ➡ Say: **Show me an example of a horizontal/vertical line in the classroom.**
- ➡ Discuss the importance of the terms “level” and “exactly upright” in the context of erecting scaffolding and the use of diagonal poles for rigidity.
- ➡ Display the capital letters A–F. Ask the children to suggest ways of sorting the letters.
- ➡ Elicit the criteria “has horizontal lines” and “has vertical lines” and use a labelled Venn diagram to sort the letters. Ask: **Why are the letters E and F placed in the intersection?** (they have both horizontal and vertical lines)
- ➡ Continue the sorting activity. Ask: **Can you make a word in which all the capital letters have horizontal and vertical lines?** (FEET, LEFT, THE etc)

Shape and space: (2D)

Objectives ● To make shapes: for example construct polygons. ● To visualise 3D shapes from 2D drawings and identify simple nets of solid shapes.

Vocabulary circle; semi-circle; circumference; centre; radius; diameter; curved; straight; circular; construct; compasses

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

Choose an activity from Strand 1 or Strand 2.

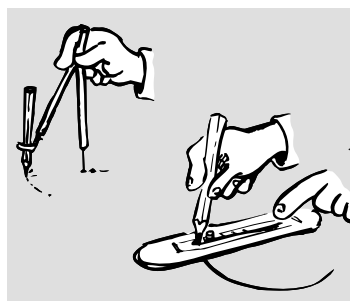
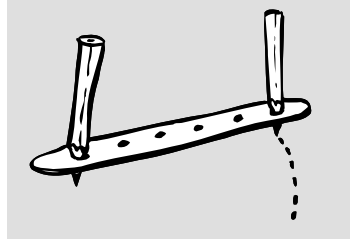
Main teaching and pupil activities (about 30 to 40 min)

Resources some circular objects for drawing around; poster paper; about 30 paper circles; rulers; sheets of scrap paper; geostrips; compasses or safety compasses

i The Ancient Greeks regarded circles as perfect shapes.

- ➞ Choose children to draw, freehand, circles of different sizes on the board.
- ➞ Discuss difficulties in freehand drawing and the need to draw accurate circles.
- ➞ Ask the children to suggest suitable circular objects for drawing around. Place objects on the poster paper and invite some children to draw around them.
- ➞ Introduce the term, 'circumference' to describe the perimeter or distance round the circle.
- ➞ Distribute the paper circles to the children and ask: **Where can you draw the longest straight line across a circle? Is there a quick way of finding where to draw the line?**
- ➞ Children fold their circle in half, open out the paper and rule a straight line along the fold.
- ➞ Ask: **How might you find the centre of the circle?** (fold circle into quarters, fold circle in half from different positions on the circumference)
- ➞ Introduce the term, "diameter" to describe a straight line that passes through the centre and divides the circle into two halves or semi-circles.
- ➞ Establish that the centre point divides the diameter in two. Introduce the term, "radius" to describe the distance from the centre of the circle to the circumference. Explain that the plural is "radii".
- ➞ Say: **Imagine the wheel of a bicycle. In your mind, spin it slowly, clockwise and anticlockwise. Now run your wheel along a muddy path for one complete turn. Describe the track left in the mud. Which part of the wheel left this track? How long is the track? What is the mathematical name for the tyre or rim of a wheel? (circumference) What is the mathematical name for the hub? (centre) What is the mathematical name for the spokes? (radii)**
- ➞ Distribute geostrips and scrap paper. Working in pairs, the children investigate ways of drawing circles of different sizes.
- ➞ Distribute compasses/safety compasses. Demonstrate the positioning of a short, sharp pencil in a pair of compasses/safety compass and how to hold the compasses to draw a circle. Encourage the children to experiment for circles of different sizes and for concentric circles.

i If there are insufficient compasses/ safety compasses for the whole class, set up two activities, changing over after about five minutes.



Pupil Book 2:
Circles

24 25

Pupil consolidation**Refresher**

Children follow instructions for folding a paper circle and identifying the circumference, diameter and radius.

Practice

Children measure diameters and radii and recognise their relationship.

Extension

Resources compasses/safety compasses; scissors; paper clips



In each small group, the children construct and cut out circles of the same radius, say, 4–5 cm. For each circle they cut out a “slice” (sector) no greater than a semi-circle. By joining the radii with a paper clip they make cones of different heights.

Plenary (about 10 to 15 min)

- ➡ Discuss and compare different techniques for drawing a circle.
- ➡ Say: **You are a pupil at school in Ancient Greece. Your teacher gives you a length of rope and two wooden sticks and asks you to draw a circle. How might you do it?**
- ➡ Draw a large circle on the board. Revise the key vocabulary: “centre”, “circumference”, “diameter” and “radius” (“radii”) by asking children to describe, draw and label each part.
- ➡ Review the answers to the Pupil Book activity and discuss the relationship between the radius and the diameter, i.e. the diameter is twice the length of the radius. Pose questions which require doubling and halving circle lengths.

Homework CM:
Circles

30

Homework (about 20 min)

Resources scissors, glue, colouring materials

Children make cone clowns. They cut out a sector from a paper circle and fold up the net to form a cone.

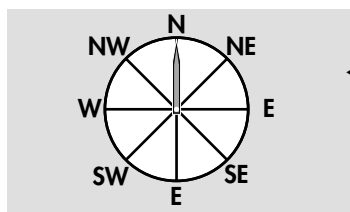
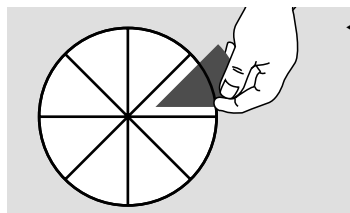
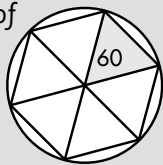
Shape and space: (position and direction/angle and rotation)

Objectives ● To use the eight compass directions N, S, E, W, NE, NW, SE, SW. ● To make and measure clockwise and anti-clockwise turns: for example from SW to N, or from 4 to 10 on a clock face. ● To begin to know that angles are measured in degrees.

Vocabulary compass point; north; south; east; west; N; S; E; W; north-east; north-west; south-east; south-west; NE; NW; SE; SW; degree; ruler; set square; angle; angle measurer; straight line

i Over 6,000 years ago, the Babylonians discovered that if you divided the circle into six, you would have six equal-sided, equal-angled triangles. Since Babylonian numbers were written in base 60, the size of the angle in the equilateral triangles was 60° which gave a total of 360° for the six angles at the centre of the circle.

The Babylonian astronomers calculated the cycle of the year as 360 days. Thus each degree of the cycle (or circle) represented one day and the symbol for the degree, $^\circ$, was a small circle.



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

Choose an activity from Strand 1 or Strand 2.

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

Resources chart showing the eight points of the compass. see RCM 16; 8 direction cards: N, S, E, W, NE, NW, SE, SW; floor compass; arrow card; paper fastener; about thirty paper circles; Blu-tack

- Distribute paper circles to the children. Ask the children to make a right angle measurer.
- Demonstrate and discuss that:
 - two right angles together make a straight line or straight angle
 - four right angles together make a complete circle.
- Children open one fold of their angle measurer to show the straight angle and check the straight line with a ruler. They open the circle fully to show the four right angles.
- Ask the children to identify classroom examples of two right angles coming together, horizontally/vertically to make a straight line or half turn.
- Say: **Sometimes we need to know the exact amount of turn. We begin with the circle and the Babylonians.**
- Introduce and define “degree” as a measure of an amount of turn.
- Write on the board: $\frac{1}{4}$ circle = $\frac{1}{4}$ turn = 1 right angle = 90°
- Label the compass chart N, S, E, W. Establish that the amount of turn, clockwise or anti-clockwise, between each of the four cardinal points is 90° .
- Say: **Fold your quarter circle to make a half right angle. How many degrees is that?** (90°)
- Show that the 45° angle measurer will fit around a compass eight times.
- Ask: **What point is half way between north and east?** (NE) **Why do we say north-east and not east-north?** (north is the more important axis) Repeat for the remaining points and label the compass chart.
- Children use their paper circles to make their own paper compass.
- Place the compass chart on the floor. Choose children to respond to instructions, e.g. **Face south-east. Turn clockwise through 45° then 90° . In which direction do you now face?** (W) **Describe the anti-clockwise turn from north to south-west.** ($90^\circ + 45^\circ$ or one right angle plus half a right angle)

Pupil Book 2:
Compass points

26 27

Pupil consolidation**Refresher**

Children use the eight compass directions to identify buildings in a child's map of Austin, Texas.

Practice

1 Children use the eight compass points to state the direction in which transport is travelling.

2–5 Children make and measure clockwise and anti-clockwise turns to solve word problems based on the map of Austin.

Extension

Using the map of Austin, the children practise responding to instructions from their partner which require making and measuring clockwise and anti-clockwise turns.

Plenary (about 10 to 15 min)

Resources: analogue clock face

- Review the answers to the Refresher task and to questions 2–5 of the Practice section in the Pupil Book.
- Refer to the map of Austin and pose questions such as: **Which building(s) lie to the south-east of the Governor's Mansion? ... north-west of the airport? ... to the south of Bark 'n' Purr?**
- Show 3:00 on the analogue clock face. Ask: **What angle is made by the hands at 3 o'clock?** (90°) **Who can work out the number of degrees the hour hand will turn through in one hour, say, from 12 to 1 o'clock?** ($\frac{1}{3}$ of $90^\circ = 30^\circ$) **How many degrees will the hour hand turn through in two hours?** (double $30^\circ = 60^\circ$) **...from 9 o'clock to 11 o'clock?** (60°) **...from 2 to 5?** (90°) **...from 6 to 10?** ($90^\circ + 30^\circ$)

Shape and space: (position and direction)/Reasoning about numbers and shapes

Objectives ● To use the eight compass directions N, S, E, W, NE, NW, SE, SW. ● To solve mathematical problems or puzzles, recognise and explain patterns and relationships, generalise and predict. Suggest extensions by asking “What if ...?”
● To explain methods and reasoning orally and in writing.

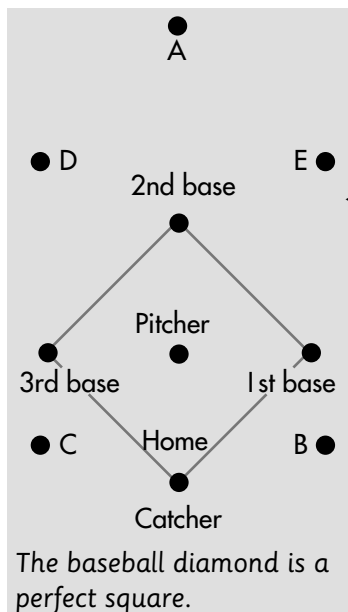
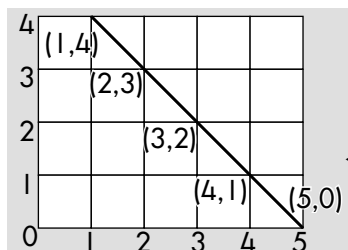
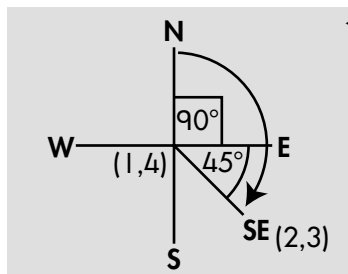
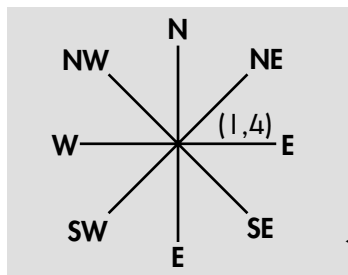
Vocabulary compass point; north; south; east; west; N; S; E; W; north-east; north-west; south-east; south-west; NE; NW; SE; SW; horizontal; vertical; diagonal; row; column; origin; coordinates; ascend; descend; route

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

Choose an activity from Strand 1 or Strand 2.

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

Resources OHP transparency of a squared grid and of an eight point compass see RCM I 6, Eight point compass



- ⇒ Revise children's knowledge of coordinates by plotting the points (1, 4) and (4, 1) on the OHT square grid.
- ⇒ Using the OHT compass, recall knowledge of the eight compass points and the amount of turn between points, e.g. from N to E. (90°)
- ⇒ Place the compass OHT over the point (1, 4) and say: **Unless there is a compass on a map, plan or grid, we assume that when we travel up a column we are going north. In which direction do we travel when we move down a column?** (S) Establish the E/W directions for the rows.
- ⇒ Remove the compass OHT. Join the points (1, 4) and (2, 3). Ask: **Can you name the line which joins opposite corners?** (diagonal)
- ⇒ Ask: **In which direction do you travel along the diagonal from the point (1, 4)?** (SE) Check with the compass OHT.
- ⇒ Ask: **What is the amount of turn from north to south-east?** ($90^\circ + 45^\circ = 135^\circ$)
- ⇒ Say: **If we continue in a SE direction, which points will the route go through?** Write the points (1, 4), (2, 3), (3, 2), (4, 1), (5, 0).
- ⇒ Say: **Beginning at the origin, I travel along the grid lines for a total of 5 units. This takes me to the point (5, 0) or (4, 1). Name other points at a distance of 5 units from the origin.** (3, 2), (2, 3), (4, 1), (5, 0)
- ⇒ Repeat as above, for a total distance of 4 units.
- ⇒ Draw the baseball diamond on the blank OHT. Mark the position of the pitcher and establish those of the catcher, 1st base, 2nd base (called “short stop”) and 3rd base as S, E, N, and W of the pitcher.
- ⇒ Say: **You have gone in to bat in the basesball game. In which direction do you run from home to 1st base? ...from 1st base to 2nd base? ... to 3rd base? ... back to home?** Overlay the compass to check.
- ⇒ Mark the positions of the outfield players A, B, C, D and E. Say: **The ball is fielded by the player at C. In which direction did you hit the ball?** (W)
- ⇒ Repeat, as above, for other directions in which the ball is hit.

Pupil Book 2:
Routes and directions

28

Pupil consolidation**Refresher**

Children identify the points in NE and NW routes.

Practice

- 1 Children identify coordinates a total distance of 6 units from the origin.
- 2 Children work out the directions in which a ball is thrown in a game of baseball.

Support CM:
Directions

28

Support

- 1 Children write directions to describe a route from A to B.
- 2 Children follow directions on a grid and colour the route taken.

Extension CM:
Routes to the game

28

Extension

Children investigate how many different routes Simon can take from his hotel to the baseball park, travelling only south-east or south-west.



Game 34

Games Pack 2

Cops and robbers

Plenary (about 10 to 15 min)

- Ask the children to talk about the patterns in their answers to question 1 of the Refresher and Practice sections of the Pupil Book page.
- Refer to the plan of the baseball game in the Pupil Book. Ask some children to explain how they worked out the direction of throw in questions 2b and 2c. Say: **The ball is on a NW route. Which player might have thrown it?** (B, C, 1st base, catcher) **Which player might receive it?** (A, pitcher, 2nd base, 3rd base)
- Draw the grid in the Extension task. Discuss why the answer must be 6 ways.

Homework CM:
Moving points

31

Homework (about 20 min)**Refresher**

- 1 Children write the directions for a route from ● to △.
- 2 They draw and record two different routes from △ back to ●.

Practice

- 1 Children follow five compass directions on a grid and colour the route taken.
- 2 They find a route back to the start that will use the three remaining compass points.

Shape and space: (angle and rotation)

Objectives ● To begin to know that angles are measured in degrees. ● To start to draw, measure and order a set of angles less than 180° .

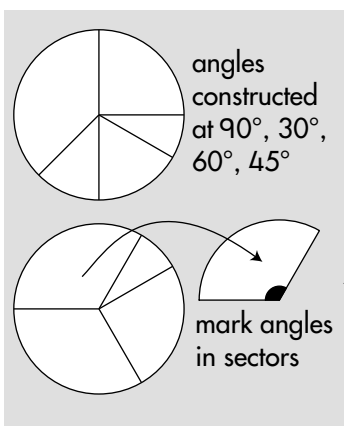
Vocabulary degree; ruler; set square; angle measurer; angle; right angle; straight angle; straight line

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

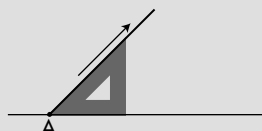
Choose an activity from Strand 1 or Strand 2.

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

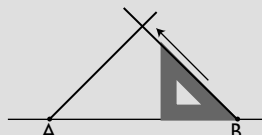
Resources 45° and 60° set squares; rulers; scissors; two large circles drawn on card; cut-out sectors of angles less than 180° such that you have a 30° , a 45° a 60° and a 90° angle as well as other acute and obtuse angles each marked with a black felt tip pen; one diagonal drawn on a large square card; one diagonal drawn on a large equilateral triangle card



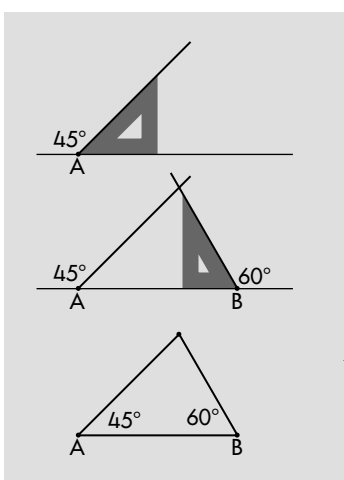
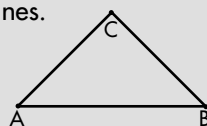
1 Place 45° angle at A.
Rule and extend line



2 Place 45° angle at B.
Rule and extend line



3 Erase construction lines.



- ➡ Recall and demonstrate the technique of directly comparing two angles.
- ➡ Choose children to place the angle sectors in order, beginning with the smallest angle.
- ➡ Ask the children to name the sizes of angles that they have met in previous work, e.g. the right angle is 90° , the half right angle is 45° , the amount of turn on an eight-point compass is 45° , the amount of turn of an hour hand in one hour is 30° , in two hours is 60° .
- ➡ Ask: **Who can remember the name of the fixed angle measurer invented by the Ancient Egyptians?** (set square)
- ➡ Say: **We are going to make two different set squares. Let's begin with the Egyptians for whom the square was very important.**
- ➡ Hold up a prepared large square with the diagonal drawn on it. Through questioning, establish that the diagonal line halves the right angle. Cut along the diagonal to produce two identical right-angled isosceles triangles with base angles of 45° and a third angle of 90° .
- ➡ Recall that the Babylonians counted in base 60 and thus the size of all the angles in an equilateral triangle is 60° .
- ➡ Hold up the prepared large equilateral triangle with the diagonal drawn on it. Establish that the diagonal halves the 60° angle. Cut along the diagonal to produce two congruent triangles. Ask: **Who can name the size of each angle in this set square?** (30° , 60° , 90°)
- ➡ Distribute commercial (or newly constructed) set squares and ask the children to use them to identify by measuring sectors which have angles of 30° , 45° , 60° and 90° .
- ➡ Rule a straight line on the board. Mark the point A and demonstrate how a set square is used to draw an angle of 45° .
- ➡ Repeat for angles of 30° and 60° , inviting children to assist.
- ➡ Demonstrate the construction of a triangle with base angles of 45° and 60° .

Pupil Book 2:
Measuring angles

29

Pupil consolidation**Refresher**

- 1 Children use 45° and 60° set squares to measure the size of the angles of the Zuni rain bird.
- 2 Using set squares, they design their own rain bird and draw it in their exercise book.

Practice

- 1 Children use the symbols $>$ and $<$ to compare angles.
- 2–3 Using rulers and set squares, children construct triangles with base angles of 30° , 45° or 60° and measure the size of the remaining angle.

Support CM:
Ordering angles

29

Support

- 1–2 Children cut out and order by size of angle, eight pizza slices.
- 3 Children use set squares to identify and measure angles of 30° , 45° , 60° and 90° .

Extension CM:
Investigating set
square angles

29

Extension

Children investigate the number of different ways to fit two, then three, set square angles together to make specified angles.

Plenary (about 10 to 15 min)

- ➞ Invite some children to explain how they constructed their Zuni rain bird in the Refresher section and in the Practice section of the Pupil Book page.
- ➞ Construct the triangles for question 2 c–e on the board. Ask children to demonstrate how they measured and calculated the size of the third angle.
- ➞ Display the pizza slices from Support activity. Show slice b and ask: **Which two slices of pizza together make the angle in slice b?** ($c + e: 45^\circ + 60^\circ = 105^\circ$)
- ➞ Repeat for slice d ($e + g: 60^\circ + 90^\circ = 150^\circ$) and slice f ($a + g: 30^\circ + 90^\circ = 120^\circ$)

Measures: (time)

Objectives ● To estimate/check times using seconds, minutes, hours.

Vocabulary a.m.; p.m.; noon; midnight; hour; minute; second; how long ago; how long will it be to; faster; fastest; slower; slowest; takes longer; takes less time; earliest; latest

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

Choose an activity from Strand 1 or Strand 2.

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

Resources stop watch or other timers; analogue and digital clock faces

- ⇒ Ask: **Can you think of a situation where it is important to measure time to the second?** (in a race, transmitting TV and radio programmes, microwave cooking) Inform children that a trained diver can hold his breath underwater for several minutes.
- ⇒ Say: **Estimate in seconds how long you could hold your breath. Write down the number of seconds. When I say 'Go', take a deep breath, and as you hold it, start to count from 21. Go!**
- ⇒ Compare and discuss results. Ask: **What do you need to score to hold your breath for longer than one minute?** (over 81) **Why should the count start from 21 and not from 1?** (it takes longer to say two-digit numbers)
- ⇒ Say: **How might we measure more accurately how long we can hold our breath?** (stopwatch)
- ⇒ Use a few children to demonstrate using a stopwatch. Ask the children to compare their own results with their estimate.
- ⇒ Write the times in seconds then in minutes and seconds.
- ⇒ Write: **53, 61, 55, 49, 59, 70.** Say: **Here are the times in seconds of six competitors in a swimming race. To qualify for the district finals you have to complete the race in less than one minute. How many people qualified?** (4) **What was the fastest time?** (49 seconds) **What times, in minutes and seconds, did the non-qualifiers score?** (1 min 1 sec, 1 min 10 sec) **How many seconds separated the first and the last in the race?** (21 seconds)
- ⇒ Say: **These six numbers are now the minutes taken to complete a cross-country race. The qualifying time is under one hour.**
- ⇒ Repeat the questions posed for the swimming race.
- ⇒ Compare results. Discuss similarities (same numbers) and differences (different units of time) and reasons for this (multiples of 60, i.e. 60 secs = 1 min, 60 min = 1 hr)
- ⇒ Set analogue and digital clocks to a range of starting/finishing times for the cross-country race, e.g. 10:30, 12 noon, 3:45. Children mentally calculate the finish/start times for each competitor.

Pupil Book 2:
Race times

30

Pupil consolidation**Refresher**

- 1 Children interpret a results board for a race and record the times taken in minutes and seconds for the swimmers.

Practice

- 1–2 Children interpret a results boards, identifying the first and second finishers and recording times in minutes and seconds and in hours and minutes.
- 3 With a starting time of 10:30, children record the finishing times in digital form.

Extension**Resources** stopwatches or seconds timers

Provide small groups of children with a stopwatch. The children set up their own time trials, for example, tying/untying shoelaces 10 times, looking up a word in a dictionary etc.

Plenary (about 10 to 15 min)

- Ask the children to order the six swimmers, beginning with the winner.
- Refer to the cross-country results and ask supplementary questions, for example.

Which runners finished ahead of/behind Darren?**Which runner was six minutes faster/slower than Greg?**

- Write: **Name** and **Finishing time**.
- Ask children to draw up a results board beginning with the winner and showing the finishing time for each runner. Children use the completed list to check their answers to question 3.

Shape and space: (3D)

Objectives ● To visualise 3D shapes from 2D drawings and identify simple nets of solid shapes.

Vocabulary length; width; height; 3D; three-dimensional; cube; cuboid; tetrahedron; line; side; edge; face; vertex; vertices; net; construct; interlocking plastic squares

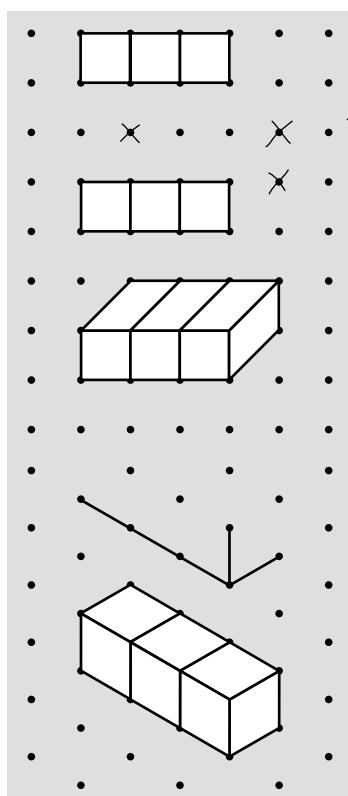
Oral work and mental calculation (about 5 to 10 min)

Choose an activity from Strand 1 or Strand 2.

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

Resources large wooden cube and cuboid; commercial packets which are cubes and cuboids; OHT of dot lattice squares and triangles (optional); interlocking plastic shapes

- ➞ Hold up a large cube. As you ask children to identify and count faces, vertices and edges, write on the board: $f = 6$, $v = 8$, $e = 12$. Repeat for the cuboid.
- ➞ Say: **These are examples of three-dimensional shapes.** Pointing to the appropriate edges of the cube, name the dimensions as length, width and height. Repeat for the cuboid, showing the horizontal then vertical elevation.
- ➞ Say: **Imagine two cubes. Fit them together to make a cuboid. Describe the shape you see.** Ask: **How many faces?** (3) **... vertices?** (7) **... edges?** (9) **How many units high, ... long, ... wide? Who can draw their shape on the board?**
- ➞ Compare drawings. Count the number of faces, vertices and edges in each drawing, compare to original totals and ask: **Why is it not possible to draw all six faces?**
- ➞ Demonstrate with solid shapes that you can only see three faces at any one time.
- ➞ Say: **It is difficult to draw a 3D shape on a 2D surface which only has length and width. Dotty squared or triangular paper can help.**
- ➞ Demonstrate how to construct the 2D drawings of 3D shapes.
- ➞ Draw children's attention to the commercial packets and the practical need for suitable templates. Say: **Let's begin with the finished product. If we unfold a cube or a cuboid along the edges, we can see the flat or 2D shape and how it was put together.**
- ➞ Choose several children to unfold packets. Discuss and compare the shapes. Introduce the term "net" for a pattern or template which, when folded up, makes a 3D shape.
- ➞ Ask some children to use interlocking plastic shapes to make a cube then to reveal a net.
- ➞ Compare the plastic nets of the cube and establish that all have a rectangular line of four cubes with one cube above and one cube below this line. Elicit the need for tabs/flaps in sticking card or paper nets.



Pupil Book 2:
Working with 3D shapes

31

Pupil consolidation**Resources** interlocking plastic cubes and squares; dot lattice square and triangle paper*Refresher*

- 1 Children build each solid shape with cubes.
- 2 Children use four cubes to build a different shape which they record on dot paper.

Practice

- 1 Children work out the least number of cubes needed to build each shape. They check by building the shape and recording on dot paper.
- 2 Children predict which net will not fold up to form a cube. They remake the net and record on dot paper.

Support CM:
Net for a cube

30

Support**Resources** scissors; ruler; glue or sticky tape (Hint: "used" ball point pens make suitable instruments for scoring lines without leaving marks)

Children cut out the net, score the dotted lines and fold up the faces to make a cube. You may wish to photocopy this sheet onto thin card.

Extension CM:
Nets for a mouse

30

Extension**Resources** scissors; ruler; glue

Children cut out the rectangle and the nets for the large and small tetrahedra. The folded rectangle acts as a "hinge" for connecting the tetrahedra as well as supplying the ears for the mouse. You may wish to print the copymaster on thin card so that children can produce more satisfactory models.

Plenary (about 10 to 15 min)

- Identify and discuss shapes which were tricky to build, count or draw and the reasons for this, e.g. concealed cube(s).
- Ask children to build the identical shapes in the Practice section of the Pupil Book page. Ask: **How do you know that these are different drawings of the same shape?**
- Invite some children to display their completed nets. Comment on the need for sharp, straight lines and careful glueing together.

Shape and space: (2D)/Reasoning about shapes

Objectives ● To make shapes: for example, construct polygons by paper folding or using pinboard, and discuss properties such as lines of symmetry. ● To solve mathematical problems or puzzles, recognise and explain patterns and relationships, generalise and predict.

Vocabulary 2D; two-dimensional; equilateral triangle; isosceles triangle; quadrilateral; oblong; heptagon; quadrilateral; polygon; diagonal; regular; mirror line; line of symmetry; line symmetry; reflect; construct; pinboard

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

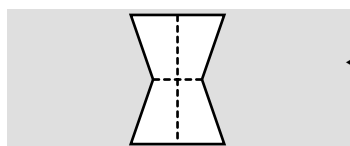
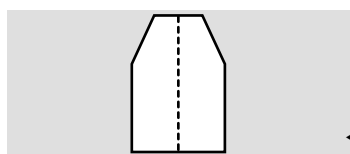
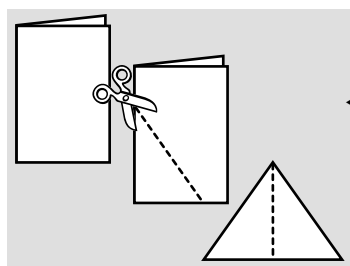
Choose an activity from Strand 1 or Strand 2.

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

Resources rulers; set squares; sheets of A6 paper ($4 \times A6 = A4$); scissors; sheets of A4 paper; a pentagonal and a hexagonal shape (as shown below) pinboards; elastic bands; mirrors; 1 cm dot lattice square paper see RCM 1

- ➞ Distribute pinboards, elastic bands, mirrors and 1 cm dot lattice square paper to each pair of children.
- ➞ Recall the meaning of the term, “quadrilateral”, a closed shape with four straight sides.
- ➞ In pairs, children take turns to make a quadrilateral on their pinboard and record the shape on dotty paper. Encourage the children to find as many different shapes as they can.
- ➞ Compare and discuss results, drawing attention to the number of right angles and equal sides in the constructed shapes.
- ➞ Say: **Use your ruler to draw a 4 cm by 4 cm square on your dot paper. Now draw both diagonals.**
- ➞ Ask: **Using your ruler, set square and mirror what can you tell me about the diagonals of a square?** (they are equal in length, intersect at right angles, each is a line of symmetry)
- ➞ In pairs, the children draw the diagonals in the quadrilaterals already constructed.
- ➞ Ask: **Who has found a shape where the diagonal is also a line of symmetry? Can you describe your shape?**

i The quadrilaterals in which the diagonal is also a line of symmetry are: square, rhombus, kite and arrowhead (concave kite). However, most children will only be able to name the square. In Year 6 they work with the rhombus and kite.



- ➞ Distribute A6 paper to each group of children and scissors to each child.
- ➞ Say: **Fold your paper once in half like this** (see opposite) **and make a straight cut. What shape have you made?** (triangle)
- ➞ Ask: **What if you fold the paper at a different angle or change the angle of cut? Will you still make a triangle?** (yes)
- ➞ Ask the children to make a second triangle. Say: **Can you make an isosceles triangle?** (fold paper edge to edge) **What can you say about the fold line?** (it is a mirror line, line of symmetry)
- ➞ Show the pentagonal shape. Ask the children to try and make this shape using only one fold of the paper and one straight cut.
- ➞ Hold up the hexagonal shape. Discuss possible ways to replicate the shape by making only one straight cut. Elicit that the shape has two lines of symmetry and thus two folds are needed.

Pupil Book 2:
Folding and cutting

32 33

Pupil consolidation**Resources** scissors; scrap paper and glue or glue stick, A6 paper*Refresher*

- 1 Children try to make shapes using only one fold of the paper and one straight cut.
- 2 Using two cuts only, children make symmetrical shapes which they stick into their exercise book.

Practice

- 1 Children find ways to make symmetrical shapes using two folds and one straight cut.
- 2 Children explore shapes that can be made with one straight cut of paper folded into three. Encourage the children to keep the same starting position but to change the angle of the cut.

Support CM:
Folding an equilateral
triangle

31

Support**Resources** sheet of A4 paper

Children follow step-by-step instructions and produce an equilateral triangle from a single sheet of A4 paper. If time permits, they can make another triangle to assemble a star.

Extension CM:
Folding a regular
pentagon

31

Extension**Resources** sheet of A4 paper, coloured A4 paper

By following the detailed instructions, the children make a regular pentagon from a single sheet of paper.



You may wish to extend the activity by challenging paired children to investigate stacking and nesting of pentagons made with (coloured) sheets of A5, A6 or A7 paper.

Plenary (about 10 to 15 min)**Resources** sheet of A4 paper

- Select two folding tasks from the Refresher and Practice sections of the Pupil Book page and ask some children to explain the steps taken to make the required shape. Ask: **Did anyone have a different way? Is it allowed?**
- Display some equilateral triangles and pentagons and discuss the criteria of a well-made shape, e.g. accuracy in folding, well-pressed lines.
- Fold a sheet of A4 paper in half and ask the children to suggest where the straight cut should be made to produce an equilateral triangle. Say: **Think angle measurers!** (30°, 60°, 90° set square)

Homework CM:
Investigating regular
polygons

32

Homework (about 20 min)*Refresher*

Children draw all the lines of symmetry for four regular shapes outlined on pinboards.

Practice

To investigate the statement, “The number of lines of reflective symmetry in a regular polygon is equal to the number of sides of the polygon”, the children cut out six regular polygons and find, by folding, all the axes of symmetry. They record their answers in a table.

Shape and space: (3D)/Reasoning about shapes

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

Vocabulary 3D; three-dimensional; cube; cuboid; pyramid; prism; skeleton; solid; triangular; square-based; pentagonal; hexagonal; edge; face; base; point; right angle; angle; vertex; vertices; layer; construct

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

Choose an activity from Strand 1 or Strand 2.

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

Resources straws; pipe cleaners or Blu-tack/Plasticine; interlocking cubes

i In Lesson 1 for Week 6, we focused on the faces and nets of 3D shapes. In this lesson, we ask children to imagine the faces as they investigate the edges and vertices of skeleton cuboids and build different cuboids with a fixed number of cubes.

i Investigation: number of straws

cuboid	4 cm	8 cm	12 cm
1	12	–	–
2	–	12	–
3	–	–	12
4	8	4	–
5	8	–	4
6	4	8	–
7	4	–	8
8	–	4	8
9	–	8	4
10	4	4	4

i dimensions in cube units

length	width	height
12	1	1
6	2	1
4	3	1

↑ Ask the children to suggest extensions, e.g. **What if ... you had 18 cubes ... 24 cubes ... 72 cubes? How many different cuboids can you make?**

⇒ Say: **Imagine a cuboid. Remove the six faces. Can you describe what is left?** (a skeleton of vertices and edges, like scaffolding, etc)

⇒ Ask: **How might we construct a skeletal cuboid? What materials could we use?**

⇒ Provide each table with a supply of straws cut to three different lengths, e.g. at 4, 8, and 12 cm and materials for joining vertices, e.g. Blu-tack, Plasticine or pipe cleaners.

⇒ Demonstrate, if necessary, how to join a vertex of two or three straws.

⇒ Ask: **In a cuboid, how many vertices are there?** (8) **How many straws will you need for the edges?** (12)

⇒ Say: **You have five minutes. Make a group collection of as many different skeleton cuboids as you can.**

⇒ Discuss and compare models eliminating repetitions where cuboids are identical but are displayed in different orientations.

⇒ Ask: **What can we say about all the cuboids we have made so far?** (all have 8 vertices, four, eight or 12 equal edges) **How many different cuboids are there at your table? How can we be sure that, as a class, we have found all the possible combinations of edges?** (make a table)

⇒ Working in twos or threes, the children draw up a table to record the group results. Encourage the children to look for patterns in their tables and thereby find all ten different cuboids.

⇒ Show that systematic recording to highlight a pattern is a useful strategy.

⇒ Replace each group's skeletal materials with interlocking cubes.

⇒ Say: **Take 12 cubes each. Make a group collection of as many different cuboids as you can.**

⇒ Compare and discuss results. Write a table on the board: (see opposite)

⇒ Ask a child at each table to find and hold up a cuboid that has two layers. (6 x 2 x 1) Establish that the base or first layer has 6 cubes.

⇒ Ask: **If you turn your cuboid from the horizontal to the vertical how many layers will there be?** (6) **How many cubes are there in the base layer?** (2)

⇒ Display and discuss that these cuboids are identical but are in different orientations (a cuboid 6 x 2 x 1 rotated through 90° makes the cuboid 6 x 1 x 2)

Pupil Book 2:
Investigating 3D shapes

34

Pupil consolidation

Resources interlocking cubes; scrap paper

Refresher



Unseen by their partner, each child builds a cuboid with 24 cubes and writes on scrap paper a description, for example, “base of 6 cubes in a row and 4 layers high”. They swap papers and build each other’s cuboids from the descriptions.

Practice

Children investigate how many different cuboids they can make with 36, then 72, cubes. Encourage children to record their results in an organised and systematic table.

Extension



Children investigate the number of different skeleton cuboids which can be made using straws in four different lengths. (20)

Plenary (about 10 to 15 min)

- ➞ Invite some children to read their descriptions for the Refresher task on the Pupil Book page. Ask: **What makes a good description?** (all facts/three dimensions given)
- ➞ Ask some children to explain their reasoning in their approach to the Practice activities on the Pupil Book page.
- ➞ Say: **Imagine a cuboid. Focus on a vertex. How many right angles come together?** (3) **How many right-angled vertices does your cuboid have?** (24) **Use this information and make a general statement about the corners of any cuboid.** (All cuboids have 24 right-angled vertices.)