

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 partition numbers into thousands, hundreds, tens and ones. ● To add/subtract 1, 10, 100 or 1000 to/from any integer, and count on or back in tens, hundreds or thousands from any whole number up to 10 000.

Vocabulary number; zero, one, two ... ten, thousand; units; ones; tens; hundreds; thousands; column; digit; figure; 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; four sets of 0–9 digit cards; selection of one-, two-, three- and four-digit place value cards; Blu-tack

➡ Draw the place value chart on the board for all to see.

H	T	U
3	5	

➡ Place digit cards on the place value chart to make 35. Ask: **How many tens/units does this number have?** (3 tens, 5 units)

i If necessary, display lists of number words next to the board as spelling references: “one” to “nine”; “ten” to “nineteen”; “twenty” to “twenty-nine” and “thirty” etc up to “one hundred”. (Use a hyphen to write two-digit numbers in words, e.g. “forty-five”.)

➡ Ask: **How do you say this number? Who can write it on the board?**

➡ Ask: **If we add one unit, what does the number become?** (36) Make 36 with digit cards on the place value chart. Ask: **If we add one ten, what does the number become?** (46) Make 46 with digit cards. Say: **Let’s count on in tens.** Count in tens from 46 to 96. Then, count in ones to 99.

➡ Ask: **What comes after 99?** (100) **Who can make 100 with the digit cards? If we add four units, what does the number become?** (104) **Who can make this number? How many tens has this number?** (none) **Who can write this number on the board? If we add three tens, what does the number become?** (134) **If we add one hundred, what does the number become?** (234) Count in hundreds up to 934. Then, count in tens to 994. Then, count in ones to 999.

↓ Ask: **Who can show/write 3254 in words?**

↑ Ask: **Who can show/write 3054/3004/3204/3200 in words? Which number comes after 9999?**

↑ Say: **Count on five tens from 2974.**

➡ Ask: **What comes after 999?** (1000) Remove the digit cards, point to the thousands column and say: **We need a thousands column. Who can write “thousands”? Who can make 1000 with the digit cards?** Gradually build the number to 9999. Children write some of the numbers in words.

➡ Work backwards to 0. Ask: **Now subtract a thousand?**

➡ Make 674 using digit cards. Say: **Let’s count on five tens. Cheryl, change the digits as we count. Use your fingers to keep count of the tens.** Repeat, counting on six hundreds from 724 to 1324. Repeat, counting back from four-digit numbers in tens then hundreds.

➡ Clear the columns. Ask: **Who can make the number 2637 using the digit cards? Who can make a number with three hundreds and five units?**

➡ Make a four-digit number, e.g. 5804. Ask: **How many units/tens/hundreds/thousands does this number have? What is one/ten/hundred/thousand more/less than this number?**

➡ Make another four-digit number, e.g. 9471. Ask: **What does the 9/4/7/1 represent?** (9000, 400, 70, 1) Record this on the board: $9471 = 9000 + 400 + 70 + 1$. Repeat with other four-digit numbers.

Pupil Book 1:
Footprint figures

5

Pupil consolidation**Refresher**

- 1 Children write a partitioned number in figures, e.g. 3 hundreds, 2 tens and 6 units gives 326.
- 2 They write the value of a digit in a number.

Practice

- 1 Children construct a number from its parts, e.g. 300, 1, 5000, 20 gives 5321.
- 2 They add/subtract 10, 100 or 1000 from numbers.
- 3 They write four-digit numbers in words.

Support CM:
Making numbers

1

Support

- 1 Children write numbers up to 999 and multiples of 1000 using words and figures.
- 2 Children construct a number from its parts.
- 3–5 Children add 1, 100, 1000 to numbers.

Extension

- 1 Challenge children to make the largest and smallest numbers from four given digits, e.g. 2, 9, 3, 2.
- 2 Write a range of calculations involving adding/subtracting multiples of 10, 100 and 1000 to numbers, e.g. $4367 + 200$, $5836 - 70$, $8024 - 3000$.



Game 31

Games Pack 2**Snake race****Plenary** (about 10 to 15 min)

- Arrange the children so they can see the board. Write a range of three- and four-digit numbers on the board, e.g. 289, 700, 806, 1724, 4000, 2013, 9991, 6008, 7748, 5407.
- Point to a number, e.g. 1724 and ask: **How do you say this number? How many thousands/hundreds/tens/units does it have? Jason, come and write the number in words. What does the digit 8 represent/stand for? What is the figure 5 worth? What is one/ten/hundred/thousand more/less than the number? Who can count on past 1800 in tens/2000 in hundreds/5000 in thousands? Which numbers have no units/tens/hundreds/thousands?**

Homework CM:
Writing whole numbers

1

Homework (about 20 min)**Refresher**

- 1 Children write a partitioned number in figures.
- 2 They write the value of a digit in a number.
- 3 They partition a four-digit number.

Practice

- 1 Children construct a number from its parts.
- 2 They add/subtract 100 or 1000 from numbers.
- 3 They write four-digit numbers in words.
- 4 They count on or back in tens, hundreds or thousands.

Place value, ordering and rounding (whole numbers)

Objectives ● To round any positive integer less than 1000 to the nearest 10 or 100. ● To read and write the vocabulary of estimation and approximation.

Vocabulary number; zero, one, two ... to thousand; units; tens; hundreds; digit; figure; two-digit number; three-digit number; closer; closest; nearer; nearest; round; exactly; halfway between; approximate; approximation

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 number line with only multiples of ten marked; 0–1000 wall number line; 0–1000 wall number line (with only the multiples of 100 marked); Blu-tack

20 21 22 23 24 25 26 27 28 29 30

➡ Blu-tack the 0–100 number line to the board. Count with the class in tens, from 0 to 100 and back. Number the line from **20** to **30**. Point to 28 and ask: **Which ten is 28 closer to: 20 or 30? The nearest ten to 28 is 30. 28 rounded to the nearest ten is 30.** Rub out the 28 and write **28** above 30.

➡ Repeat for 21 to 24, 26, 27 and 29, in random order.

➡ Point to 25 and ask: **Which ten is 25 closer to? 25 is exactly half way between 20 and 30. We always round up when a number is half way between two tens.** Write **25** above 30.

➡ Draw attention to the 0–1000 number line. Highlight the range 420–430. Point to 428 and ask: **Is 428 nearer 420 or 430? 428 is nearer to 430 because 28 is nearer to 30. If you round 428 to the nearest ten, you get 430.** Round the other numbers between 420 and 430.

➡ Blu-tack the multiples of 100 number line to the board.

200 210 220 230 240 250 260 270 280 290 300

➡ Number the multiples of 10 on the number line from **200** to **300**. Point to 280 and ask: **Which hundred is 280 closer to? The nearest hundred to 280 is 300. 280 rounded to the nearest hundred is 300.** Rub out the 280 and write **280** above 300.

➡ Round the remaining numbers between 210 and 290.

➡ Draw attention to the 0–1000 wall number line. Highlight the range 200–300. Point to 283 and ask: **Is 283 nearer 200 or 300? If you round 283 to the nearest hundred, you get 300. What about 284, 285, 286 etc? They all round to 300 because 280 rounds to 300.**

➡ Highlight the range 280–290. Point to 283 and ask: **Is 283 nearer 280 or 290? (280) 283 is 280 rounded to the nearest 10.**

➡ Reveal the whole number line. Point to a number and ask: **What is the nearest multiple of ten/hundred? Round this number to the nearest ten/hundred.**

➡ Write ten two- and three-digit quantities on the board, e.g. 873 g, 325 cm, 251 p, 93 litres, 121 minutes. Ask individuals to round each quantity to the nearest 10/100 units using the 0–1000 wall number line, if necessary.

➡ Write **£2.34**, **£5.61**, **£2.99** on the board. Point to an amount and ask: **What is £2.34 rounded to the nearest 10p/£? (£2.30/£2)**

i At first, children may not see 0 as the nearest hundred. Use the number line to explain that 300 is three hundreds, 200 is two hundreds, 100 is one hundred and 0 is zero hundreds.

↑ Say: **Mohka, round 497 to the nearest ten. Now round it to the nearest hundred. Why do you get the same answer?** (because 500 is a multiple of 10 and 100) Round 45 to the nearest ten/hundred.

↑ Say: **Tell me another weight that rounds to 870g.**

i You may need to explain that rounding to the nearest £ is the same as rounding to the nearest 100p.

Pupil Book 1:
Rounding money

6

Pupil consolidation**Refresher**

Children round two- and three-digit numbers on a number line to the nearest 10/100.

Practice

- 1 Children round savings in pence to the nearest 10p/100p.
- 2 They round prices to the nearest 10p/£.

Extension CM:
Roundabouts

1

Extension

- 1 Children round weights to the nearest 10g.
- 2 Children round lengths to the nearest 10m, e.g. 234m to 230m.
- 3 Children then round their answers to the nearest 100m. Clarify with the children that, if they want to round to the nearest 100 directly, they shouldn't round to the nearest 10 first. Example: 249 becomes 250 to the nearest 10; then 250 becomes 300 to the nearest 100. Whereas 249 becomes 200 to the nearest 100.
- 4 Children find possible volumes given the capacities of paint cans to the nearest 10/100 millilitres.



Game 33

Games Pack 2

Tricky trail

Plenary (about 10 to 15 min)

Resources about 30 three-digit number cards (do not include multiples of 100); set of multiples of 100 cards; 0–1000 wall number line; Blu-tack

- Arrange the children so they can see the board and a 0–1000 wall number line. Distribute the three-digit number cards amongst the children. Blu-tack the multiples of hundred in a row on the board.
- Say: **Look at your number.** Point to a multiple of 100, e.g. 600. Ask: **Hold up your card if it is 600 rounded to the nearest hundred.** Repeat several times, pointing to different multiples of 100, gradually quickening the pace.

Measures: (length)

Objective ● To record estimates and readings from scales to a suitable degree of accuracy.

Vocabulary number; zero, one, two ... to thousand; estimate; about; approximately; exact; nearest; millimetre; centimetre; metre; measure; measurement

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

Choose an activity from Strand 5, Topic 5.1, Strand 1 or Strand 2.

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

Resources vertical wall ruler marked in metres and centimetres; tape measure; 30 cm rulers; strips of card and other objects that can easily be measured using a 30 cm ruler, e.g. playing card, pencil, calculator

Heights	Nearest cm	Nearest 10cm	Nearest metre
Jessie	137cm	140 cm	

➡ Gather the children around the vertical wall ruler. Say: **Let's measure some of your heights.** Invite a child to stand next to the ruler. Ask another child: **Gary, read Jessie's height to the nearest centimetre.** Write the height next to Jessie's name in a table on the board.

➡ Ask another child: **Kim, what is Jessie's height to the nearest 10cm.** Write the estimate on the board.

i Remind the children that there are 100 cm in a metre. So, rounding to the nearest metre is the same as rounding to the nearest 100 cm.

➡ Ask another child: **Barry, read Jessie's height to the nearest metre.** Write the answer on the board.

➡ Repeat for other children. Then, measure just to the nearest centimetre, record the height and ask, for example: **What is 135cm to the nearest 10cm?** (140cm) **What is 135cm to the nearest metre?** (1 m)

➡ Make a new table for measuring the heights of children with hands stretched upwards. Children will need to stand on a chair to read the heights.

➡ Invite pairs of children to take measurements using a tape measure, e.g. desk width, waist, to the nearest 10 cm. And using a trundle wheel or tape measure to measure, e.g. the width of the room, distance between two children, to the nearest 10 cm and nearest metre. Record the measurements on the board.

i In this lesson, children are measuring to the nearest centimetre. In week 4, they will begin to measure in millimetres.

➡ Return the children to their desks. Give each child a 30 cm ruler and a strip of card (or other object) to measure. Hold up a ruler and say: **Measure the length of your card exactly. Write down your measurement. Now swap cards and measure each other's card. Check you get the same measurements.** Walk around the class, checking accurate alignment of the ruler and random measurements.

➡ Rub out some of the heights recorded on the board, so that only one measurement (exact or rounded) remains for each child, ready for the Plenary.

Pupil Book 1:
Estimating all**Pupil consolidation****Refresher**

Children round numbers on a scale to the nearest 10 and 100.

Practice

- 1 Children estimate the heights of people to the nearest cm and 10 cm.
- 2 Children round some distances to the nearest 10 km.
They then round the distances to the nearest 100 km.
- 3 They measure lines to the nearest nearest centimetre.

Extension**Resources** tape measure; trundle wheel

Give each pair a list of measurements to make. State the degree of accuracy, e.g. to the nearest 10 cm.

Plenary (about 10 to 15 min)

- ➞ Point to a child's height on the board, recorded to the nearest cm. Ask: **What is this measurement to the nearest 10 cm/metre.**
- ➞ Point to a height recorded to the nearest 10 cm on the board. Ask: **How tall could Jessica be? Who can point to a possible height on the wall ruler?**
- ➞ Point to a height recorded to the nearest metre on the board. Ask: **How tall could Paul be? Who can point to a possible height on the wall ruler?**

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

Objectives ● To consolidate understanding of the relationship between + and -. ● To understand the principle (not the name) of commutative law as it applies or not to addition and subtraction. ● To use known number facts and place value to add or subtract mentally, including any pair of two-digit whole numbers (not crossing the 10 or 100 boundary).

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

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)

i It is important that children see that 50 and 40 are being added together, not just think of it as 5 add 4.

⇒ Write $51 + 46 =$ on the board. Ask the class to work it out in their head.

⇒ Say: ***This is how I worked it out. I added the tens together and then the units. 50 add 40 is 90, I add 6 is 96, so the answer is 96.*** Write $50 + 40 = 90$, $1 + 6 = 7$, $90 + 7 = 97$ on the board as you speak.

⇒ Ask: ***Did anyone work it out in a different way?*** Invite anyone who worked it out differently to explain their method and record it as a calculation on the board. Discuss the different methods.

⇒ Now write $46 + 51 =$ on the board. Ask: ***I have written the calculation out in a different order. What is the answer?*** Establish that as the numbers have not changed the answer will not change. Addition calculations can be worked out in any order.

⇒ Write $74 - 51 =$ on the board. Ask the class to work it out in their head.

⇒ Invite a child to explain how they worked it out. Record their method as calculations on the board.

↓ If children are not confident adding and subtracting two-digit numbers spend more time discussing methods.

⇒ Ask: ***Did anyone work it out in a different way?*** Invite anyone who worked it out differently to explain their method and record it on the board. Discuss the different methods.

⇒ Ask: ***Can I change the order of this calculation?*** Establish that, unlike addition, the order of subtraction calculations cannot be changed.

⇒ Write $-- + -- = 65$ on the board. Say: ***I want to find two two-digit numbers that can be added together to make 65. I know that 1 and 4 make 5, so the units in my numbers will be 1 and 4.*** Write 1 and 4 in to the unit spaces. Say: ***40 and 20 equals 60, so the tens in my numbers will be 40 and 20. I have used my addition facts to ten to help me.***

i Some children may suggest methods that use number facts to 20 e.g. for the target number 65, if they know that 7 plus 8 equals 15, they can use this to work out the two two-digit numbers. Accept these methods although they are not the objective being taught in the lesson as they involve crossing the tens boundary.

⇒ Ask: ***Who can tell me two other two-digit numbers that can be added together to equal 65?*** Record any other suggestions on the board. Ask children to explain how they worked out the two numbers.

⇒ Repeat to find two two-digit numbers that can be subtracted from one another to equal 65. Encourage the children to use subtraction facts to ten to help them.

Pupil Book 1:
Diamond numbers

8

Pupil consolidation**Refresher**

Children, who are experiencing difficulty, can first work through this section that involves lower numbers. Children write out the target number and record the four calculations.

Practice

Children write out the target number and record the four calculations.

Extension CM:
Target 100

2

Extension**Resources** set of 0–9 cards

Children play the game, Target 100. They make addition calculations with the cards with the answers as close to 100 as they can.



Game 39

Games Pack 2

Dotty dragon

Plenary (about 10 to 15 min)**Resources** set of 0–9 number cards, Blu-tack

- Write **78** on the board. Shuffle the cards, take the top five cards and Blu-tack them to the board.
- Ask: **78 is your target number. Using these numbers only, can you make an addition calculation with the answer as close to 78 as possible? Use your addition facts to ten to help you.**
- Invite children to say their calculations and record them on the board.
- Ask: **Using the same numbers, can you make a subtraction calculation with the answer as close to 78 as possible? Use your subtraction facts to ten to help you.**
- Invite children to say their calculations and record them on the board.
- Repeat for other target numbers.

**Software: Rapid Maths 4**

Crushers!

Mental calculation strategies (+)

Objective ● To identify near doubles, using known doubles.

Vocabulary double; near double; twice; more; less

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)

- ⇒ Say: ***I am going to call out some numbers. I want you to double them and call out the answer.*** Start with single-digit numbers and move onto two- and then three-digit numbers. Say: ***Double 5, 8, 20, 45, 150.***
- ⇒ Remind the class that the doubles they know can be used to work out addition calculations that involve near doubles.
- ⇒ Say: ***The double you choose to help you work out a calculation will depend on the doubles that you know.***
- ⇒ Write $24 + 23$ on the board. Say: ***I can use the double 20 add 20 to help me work this out in my head. I know 20 plus 20 is 40, 4 add 3 is 7, so the answer is 47.***
- ⇒ Say: ***Another near double that I could have used to help me work it out is 25 plus 25. 25 add 25 is 50. As 25 is a larger number than 23 and 24, I need to subtract 1 then 2 from 50. So the answer is 47.***
- ⇒ Say: ***Or, I could say double 24, which is 48, then take away 1 equals 47. Or I could say double 23, which is 46, add 1 equals 47.***
- ⇒ Write $46 + 43$ on the board. Say: ***Work this out in your head, using a double you know to help you.***
- ⇒ Invite a child to say which double they used and explain how they worked out the answer. Record their working out on the board.
- ⇒ Ask: ***Did anyone use a different double?*** If no suggestions are made suggest one yourself. The doubles most likely to be used are $40 + 40$, $45 + 45$ and possibly $50 + 50$.
- ◀ ⇒ Repeat for $160 + 170$. Possible doubles to use are $150 + 150$, $160 + 160$ or $170 + 170$.
- ⇒ Now invite a child to write a known double on the board. Say: ***Think of a near double calculation that this double could help you work out.***
- ⇒ Invite a child to write their near double on the board. Ask: ***Did anyone think of a different near double?*** Ask several children to record their near doubles on the board.
- ⇒ Repeat until children are confident at using near doubles.



If children are not confident with two-digit near doubles, then work through some more examples before moving onto three-digit doubles.

Pupil Book 1:
Double trouble

9


Pupil consolidation**Refresher**

Children, who are unsure, work through this section that involves single-digit, then two-digit near doubles. Children work out the near doubles using a known double to help them.

Practice

Children work out the near doubles using a known double to help them.

Extension

-  Children go through the calculations in the Practice section of the Pupil Book and think of a second double that could be used to work out each of them.

Plenary (about 10 to 15 min)

- ➞ Invite a child to the front of the class. Ask them to tell the rest of the class a double that they are confident they know. Write this double on the board.
- ➞ Say: **Think of a near double calculation to ask Max to work out.** Invite children to ask their questions. The child at the front works them out. Provide support as appropriate.
- ➞ Say: **Doubles are not the only way to work out calculations in your heads, but remember to use them when the numbers are near doubles.**
- ➞ Repeat with different children in front of the class.

**Software: Rapid Maths 4**

Goo Station

Homework CM:
Known doubles

2

Homework (about 20 min)

This provides practice in revising known doubles and using them to work out calculations.

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

Objectives ● To use informal pencil and paper methods to support, record or explain additions: empty number line. ● To count on or back in repeated steps of 1, 10 or 100.

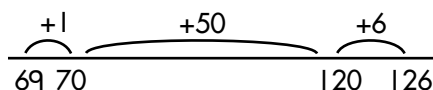
Vocabulary add; addition; more; plus; sum; total; and; altogether; equals; makes; is the same as; sign

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

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

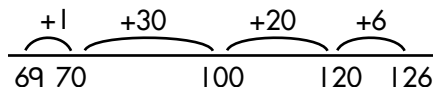
Main teaching and pupil activities (about 30 to 40 min)

- ⇒ Write **52** on the board. Say: **Start counting in ones from 52.** Let the class count together for a minute. Say: **Now, start counting in tens from 52.** Let the class count together for another minute. Say: **Now, start counting in hundreds from 52.** Say: **Counting in ones, tens and hundreds is important when working out addition calculations.**
- ⇒ Write **57 + 69** on the board. Say: **It is sometimes useful to make jottings when working out addition calculations.**
- ⇒ Draw a line on the board. Say: **This is an empty number line. This is a useful tool to help work out addition calculations.** Write **69** at the beginning of the line. Say: **I am starting with the largest number, so there is less to add on. First I will jump to 70. That means I have added 1. Now I am at 70, it is easy to add the 50 from 57. 70 add 50 is 120. Now, I need to add 6 more so that I have added 57 in total. 120 add 6 is 126. The answer is 126.** As you talk, draw the jumps on the number line.

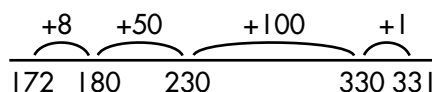


Demonstrate jumping to the hundred boundary for some other calculations.

- ⇒ Point out to children that all the jumps you have made add up to 57 which is the number you are adding on. Drawing another empty number line say: **I jumped from 70 to 120 by adding 50, but I could have done that in two jumps and jumped to 100 first, then 120, if I had found that easier.** Draw the jumps on the empty number line as you speak.



- ⇒ Write **159 + 172** on the board. Draw another empty number line and write **172** at the beginning of the line. Say: **First I will add 8 to get to 180. Then, I will add the 50. 180 plus 50 is 230. Now, I add the 100, 230 add 100 is 330. I need to add one more so that I have added 159 in total. The answer is 331.** As you talk draw the jumps on the number line.



- ⇒ Write **241 + 178** on the board. Ask a child to come and work it out using the empty number line method. Encourage them to explain what they are doing.
- ⇒ Repeat using other calculations involving HTU + HTU.

Pupil Book 1:
Leaping along

10

Pupil consolidation**Refresher**

Children who are experiencing difficulty can first work through this section where the empty number line has already been drawn. Children need to label the jumps.

Practice

Children copy out the calculations and then work them out using an empty number line to record their method.

Support CM:
Setting the boundaries

2

Support

Children work out the jump from one box to the next.

Extension CM:
Motorbike race

3

Extension

Resources 0–9 die; die labelled in multiples of 10



Children play the game in pairs. This involves adding numbers on an empty number line.

Plenary (about 10 to 15 min)

- ☞ Say: ***If you cannot work out a calculation in your head, then it is useful to make jottings to help you remember all the numbers involved.***
- ☞ Choose a few questions from the Pupil Book and ask children to demonstrate how they used the empty number line to help them.
- ☞ Say: ***The tens and hundreds boundaries are good to jump to as they are easy to add on to.***
- ☞ Say: ***I am going to say a number and I want you to say the next ten boundary and then the next hundred boundary. So, if I say 136, you say 140, 200.*** Call out various numbers getting progressively higher.

**Software: Rapid Maths 4**

Souperbowl

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 most significant digits first. ● To consolidate knowing by heart: addition and subtraction facts for all numbers to 20.

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

⇒ Begin by asking quickfire addition and subtraction facts to 20. Ask:

What is 5 plus 9, 8 add 7, 19 subtract 5, 15 minus 7?

⇒ 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.**

↓ Change the calculation to **236 + 43**. This does not cross the tens or the hundreds boundary.

⇒ Write **267 + 75** on the board. Say: **A popular way to add in your head is to think of the number as hundreds, tens and ones. So, thinking of 75 as 70 and 5 makes it easier to add on.**

i The standard written method of addition is not being taught here. This is an introduction to the layout and the importance of writing it out correctly. The children will continue to work out the calculation mentally adding the units, the tens and then the hundreds. They will record the stages in this vertical layout.

⇒ Say: **The calculation can be written like this.** Write **267 + 75** vertically. Say: **This will make the calculation easier to do mentally, as we will break it down into steps. The numbers are added in hundreds, tens and units.**

⇒ Point and say: **When the calculation is written like this, the units are underneath each other and the tens are underneath each other. There is nothing underneath the 200, as there are no hundreds in 75.**

⇒ Say: **It is very important that the hundreds, tens and units are written underneath each other, in order to be clear what each digit represents.**

⇒ Say: **First, we look at the hundreds. 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** under the line.

i The hundreds and tens digit must always be referred to as the number they represent not just as a single digit e.g. in 75, 70 must always be said, not 7.

$$\begin{array}{r} 267 \\ 75+ \\ \hline \end{array}$$

⇒ Say: **Now we can add the tens: 60 and 70. The answer, 130, is written underneath 200. Again, each digit must be written in the right column.**

⇒ Say: **Now we add the units: 7 and 5. The answer is 12. Write 12 under 130.**

⇒ Say: **To get the final answer we need to add 200, 130 and 12 together. Now the numbers have been partitioned into hundreds, tens and units, it is easy to add them in your head. 200 add 130 is 330, add 12 is 342.**

$$\begin{array}{r} 267 \\ 75+ \\ \hline 200 \\ 130 \\ 12 \\ \hline 342 \end{array}$$

⇒ Write **342 + 87** horizontally on the board. Invite a child to come and write the calculation out vertically.

⇒ Say: **First we will add the hundreds.** Invite a child to come and write the hundreds in the correct place. Repeat for the tens and then the units. Finally ask a child to work out the answer to the calculation.

⇒ Repeat for **428 + 95**.

⇒ Move onto calculations involving HTU + HTU, if appropriate.

Pupil Book 1:
Baking additions**Pupil consolidation****Resources** squared paper**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 calculations both ways then work them 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.

Extension CM:
Roll the dice**Extension****Resources** three 0-9 dice

Working in pairs, each child rolls three dice. They use the three digits from each roll of dice to make two three-digit numbers to add together vertically.



As a separate activity, both children say a three-digit number. They write the two three-digit numbers in a vertical format. They each add the two numbers together and then check that they have the same answer.



Game 29

Games Pack 2

Patchwork quilt

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.**
- ☞ Ask questions involving the adding of multiples of hundreds together, multiples of tens and units. Ask: **What is 300 add 600; 800 plus 500; 90 and 40; 7 and 4?**
- ☞ Say: **When adding multiples of hundreds and tens together, knowing the number facts to 20 makes it easier. If I know 5 plus 7 is 12, then I know 50 plus 70 is 120, and 500 add 700 is 1200.**

**Software: Rapid Maths 4**

Crushers!

Homework CM:
Addition calculations**Homework** (about 20 min)

This provides further practice in working out addition calculations vertically.

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: compensation (add too much, take off). ● To consolidate knowing by heart: addition and subtraction facts for all numbers to 20.

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

- ⇒ Say: **Tell me two numbers that add together to equal 15.** Ask various children for their answers. Repeat for 18. Encourage instant responses.
- ⇒ Say: **If you know all your addition facts to 20, it will make more difficult calculations much easier to work out.**
- ⇒ Write $172 + 89$ on the board. Say: **One method, that can sometimes be useful for adding up in your head, is to round a number up to the next multiple of ten or a hundred as these are easier to add on, and then to subtract the extra.**
- ⇒ Say: **So, to add 89 to 172, I can round 89 to 100 as 100 is very easy to add on. 172 plus 100 is 272. Now, I need to subtract the extra. 100 is 11 more than 89, so I take away 11. 272 minus 11 is 261.**
- ⇒ Say: **The calculation can be written like this.** Write $172 + 89$ vertically. Say: **This will make the calculation easier to do mentally, as we will record the steps as we do them.**
- ⇒ Point and say: **When the calculation is written like this, the units are underneath each other and the tens are underneath each other. There is nothing underneath the 100, as there are no hundreds in 89.**
- ⇒ Say: **First, we added 100 instead of 89. 172 plus 100 is 272, so I will write 272 here.** Write 272 under the answer line. Say: **Then I subtracted 11, as I had added 11 too many, so I will write subtract 11 here.** Write -11 underneath 272. Say: **I can now work out the answer to the calculation, as I have worked out the stages. 272 minus 11 is 261.**
- ⇒ Write $181 + 85$ horizontally on the board. Invite a child to come and write the calculation out vertically.
- ⇒ Ask: **Which number shall we round 85 to so we make it easier to add?** Children may suggest 100 or 90. Accept both, saying that it is up to the preference of the person doing the adding.
- ⇒ Invite a child to explain how they would work out the calculation, and to record the steps on the board in the vertical format.
- ⇒ Repeat for $235 + 78$.
- ⇒ Move onto calculations involving HTU + HTU. Choose numbers that can be rounded up to the next multiple of 100, so the children have the choice of rounding to a multiple of ten or a hundred e.g. $247 + 193$; $352 + 280$.

i The standard written method of addition is not being taught here. This is an introduction to the layout and the importance of writing it out correctly. The children will continue to work out the calculation mentally. They will record the stages in this vertical layout.

i The hundreds and tens digit must always be referred to as the number they represent not just as a single digit e.g. in 89, 80 must always be said, not 8.

$$\begin{array}{r} 172 \\ 89+ \\ \hline 272 \\ -11 \\ \hline 261 \end{array}$$

Pupil Book 1:
Fruit tree addition

12

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

Children who are experiencing difficulty can first work through this section that involves the adding of two-digit numbers only and the second numbers can all be rounded to 100. They work out the calculations 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.

Support CM:
Target 100

3

Support

This provides children with practice in rounding numbers up to 100.

Extension

Write these numbers on the board: 498, 487, 593, 588, 675, 686, 780, 795, 886, 899. Children make up ten more addition calculations using these numbers.



Game 29

Games Pack 2

Patchwork quilt

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.**
- ➡ Ask questions involving the adding of multiples of hundreds together, multiples of ten and units. Ask: **What is 300 add 600; 800 plus 500; 90 and 40; 7 and 4?**
- ➡ Say: **When adding multiples of hundreds and tens together, knowing the number facts to 20 makes it easier. If I know 5 plus 7 is 12, then I know 50 plus 70 is 120, and 500 add 700 is 1200.**

**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 subtractions: complementary addition (counting up). ● To consolidate knowing by heart: addition and subtraction facts for all numbers to 20.

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

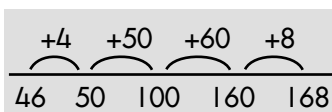
Oral work and mental calculation (about 5 to 10 min)

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

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

⇒ Begin by asking quick fire addition and subtraction facts to 20. Ask: **What is 7 plus 9, 6 add 7, 14 subtract 5, 18 minus 3.**

⇒ Say: **If you know all your addition and subtraction facts to 20, it will make more difficult calculations much easier to work out.**



i When talking about the hundred and tens digits, always refer to them as the number they represent e.g. in 46 say 40, not 4.

⇒ Write **168-46** on the board. Draw a line on the board. Say: **This is an empty number line and I am going to use it to work out this calculation.** Write **46** at the beginning of the line and **168** at the end. Say: **I will work out what I need to add to 46 to get to 168. First I will jump to 50. That means I have added 4. Now I am at 50, it is easy to jump to 100. That means I have added 50. Now I need to jump to 160. That means I have added 60 more. Last of all, I jump 8 to get to 168. If I look at all my jumps, I can see that, altogether, I have added 122. The answer is 122.** As you talk, draw the jumps on the number line.

$$\begin{array}{r} 168 \\ 46- \\ \hline 4 \\ 50 \\ 60 \\ 8 \\ \hline 122 \end{array}$$

⇒ Say: **This method of working out subtractions is called complementary addition, as we are using addition to answer a subtraction calculation. There is another way we can record this method.**

⇒ Write **168 - 46** vertically on the board.

⇒ Say: **When you write a calculation out like this, it is important to make sure that the right digits are underneath each other. 8 and 6 are underneath each other as they are both units. 60 and 40 are underneath each other as they are both tens. 100 does not have anything underneath it as there are no hundreds in 46.**

i The standard written method of subtraction is not being taught here. This is an introduction to the layout and the importance of writing it out correctly. The children will continue to work out the calculation mentally but will record the stages in this vertical layout. This is not the only method for subtraction that can be recorded in this way. You may prefer to use the other method laid out on page 50 of the Y4,5,6 examples in the **NNS: Framework for teaching mathematics R to Y6.**

⇒ Say: **Now I will use complementary addition to work this out. I start at 46 and I add 4 to get to 50.** Write **4** in the units column. Say: **Now, I add 50 to get to 100.** Write **50** in the tens and units columns. Say: **Then, I add 60 to get to 160.** Write **60** underneath 50. Say: **Lastly, I add 8 to get to 168.** Write **8** in the units column.

⇒ Say: **I have written each number that I added on in the right column, so I know what each digit is worth. I add all these numbers together and then I have the answer.** Write **122** underneath.

⇒ Write **195 - 62** on the board. Invite a child to work it out on the empty number line. Encourage them to explain what they are doing.

⇒ Invite another child to record the method vertically on the board and to work it out using the vertical form of complementary addition.

⇒ Repeat using different calculations. Use HTU - HTU if appropriate.

Pupil Book 1:
Subtraction highlights

13

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

Children who are experiencing difficulty can first work through this section that involves the subtraction of two-digit numbers only. Children copy out the calculations both ways then work them out using the empty number line or 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 empty number line or the vertical method. Children will need squared paper to lay out their work correctly.

Support CM:
Empty number lines

4

Support

This involves practice in using the empty number line to work out subtraction calculations.

Extension**Resources** three 0–9 dice

Working in pairs, both children throw the dice and make a three-digit number. They both write down the two numbers in a vertical format. They subtract one number from the other using complementary addition and then check that they have the same answer.



Game 29

Games Pack 2

Patchwork quilt

Plenary (about 10 to 15 min)

- ☞ Say: **We have been using a way to record the subtracting 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.**
- ☞ Choose some of the calculations from the Practice section of the Pupil Book. Write them out on the board and invite children to come and explain how they worked them out.
- ☞ Say: **I am going to call out a number. I want you to answer with the number I would need to add to it to get to the next multiple of ten. So, if I say 63, you say 7.**
- ☞ Repeat for several numbers.

**Software: Rapid Maths 4**

Crushers!

Pencil and paper procedures (-)/Checking results of calculations

Objectives ● To use informal pencil and paper methods to support, record or explain subtractions: compensation (take too much, add back). ● To check with an equivalent calculation.

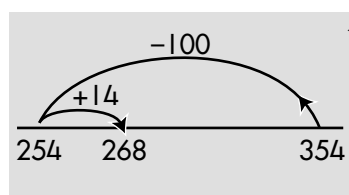
Vocabulary subtract; subtraction; minus; take away; difference; equals; makes; is the same as; sign; column

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 $354 - 86$ on the board. Say: **One method that can sometimes be useful for subtracting in your head is to round a number up to the next multiple of ten or a hundred, as these are easier to subtract, and then to add the extra.**



⇒ Draw an empty number line. Say: **So, to subtract 86 from 354, I can round 86 to 100 as 100 is very easy to subtract. 354 minus 100 is 254. Now, I need to add back the extra that I subtracted. 100 is 14 more than 86, so I add on 14. 254 add 14 is 268.** As you talk, draw the jumps on the number line.

i The standard written method of subtraction is not being taught here. This is an introduction to the layout and the importance of writing it out correctly. The children will continue to work out the calculation mentally. They will record the stages in this vertical layout.

⇒ Say: **The calculation can be written like this.** Write $354 - 86$ vertically. Say: **This will make the calculation easier to do mentally, as we will record the steps as we do them.**

⇒ Point and say: **When the calculation is written like this, the units are underneath each other and the tens are underneath each other. There is nothing underneath the 300, as there are no hundreds in 86.**

⇒ Say: **It is very important that the hundreds, tens and units are written underneath each other in order to be clear what each digit represents.**

⇒ Say: **First, we subtracted 100 instead of 86. 354 minus 100 is 254, so I will write 254 here.** Write 254 under the answer line. Say: **Then I added 14, as I had subtracted 14 too many, so I will write plus 14 here.** Write +14 underneath 254. Say: **I can now work out the answer to the calculation, as I have worked out the stages. 254 add 14 is 268.**

i The hundreds and tens digit must always be referred to as the number they represent, not just as a single digit e.g. in 86, 80 must always be said, not 8.

⇒ Ask: **What addition calculation could I do to check my answer?** Invite a child to write $268 + 86$ on the board and to work it out explaining their method.

$$\begin{array}{r} 354 \\ 86- \\ \hline 254 \\ +14 \\ \hline 268 \end{array}$$

⇒ Write $428 - 89$ horizontally on the board. Invite a child to come and write the calculation out vertically.

⇒ Ask: **What number shall we round 89 to to make it easier to subtract?** Children may suggest 100 or 90. Accept both, saying that it is up to the preference of the person doing the calculation.

⇒ Invite a child to explain how they would work out the calculation, and to record the steps on the board in the vertical format.

⇒ Invite another child to check the answer using an addition calculation.

Pupil Book 1:
Subtraction round-up

14

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

Children who are experiencing difficulty can first work through this section that involves the subtraction of two-digit numbers only and these can all be rounded to 100. Children work out the calculations using the vertical method or the number line. Children will need squared paper to lay out their work correctly.

Practice

Children work out the calculations either vertically or using the empty number line.

Support CM:
Jumping back

5

Support

This provides practice using the empty number line for children who are not confident.

Extension CM:
What was subtracted?

5

Extension

This involves working out the missing number in subtraction calculations. The children write down the two numbers using either a vertical format or the empty number line. They subtract one number from the other using complementary addition and then check that they have the same answer.

Plenary (about 10 to 15 min)

- ➡ Say: **We have been using a way to record the subtracting 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.**
- ➡ Choose some of the calculations from the Practice section of the Pupil Book. Write them out on the board and invite children to say the answers. Ask: **What addition calculations can I do to check the answers?**
- ➡ Invite children to say the appropriate addition calculation and record it on the board.

**Software: Rapid Maths 4**

Souperbowl

Homework CM:
Subtraction calculations

4

Homework (about 20 min)

This provides further practice in working out subtraction calculations using either the vertical method or the empty number line.

Problems involving money

Objective ● To use all four operations to solve word problems involving numbers in money using one or more steps, including converting pounds to pence and vice versa.

Vocabulary money; coin; note; pound; pence; pee; sign; worth; value; amount; how many?; how much; decimal point

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

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

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

Resources £20, £10 and £5 notes; £2, £1, 50p, 20p, 10p, 5p, 2p, 1p coins.

- ⇒ Begin by holding up each coin and note in turn and ask children to identify them.
- ⇒ Hold up a £1 coin. Ask: **How many pence in one pound?** Establish that one pound is equivalent to 100 pence.
- ⇒ Hold up a £1 coin and a 20p coin. Ask: **What is the value of these two coins together?** Invite a child to explain how they got their answer.
- ⇒ Draw a table on the board with a column for £ and p and a column for pence.
- ⇒ Record **£1.20** in the first column on the table. Point to the decimal point and say: **The decimal point separates the pounds and the pence. When you use the pound sign and the decimal point, you do not write the p sign.**
- ⇒ Say: **£1.20 is 120 pence. £1 is 100 pence, 100 add 20 is 120.** Write **120p** in the second column on the table.
- ⇒ Hold up a £2 coin and a 50p. Ask: **What is the value of these two coins?** Invite a child to record the amount in the first column on the table.

£ + p	p

i Children need to understand that £2 is worth 200 pence and so £2.50 is 250 pence, and not to work it out by just removing the decimal point.

- ⇒ Ask: **What is the value of these two coins in pence?** (250p) Invite a child to record the amount in second column on the table and to explain how they worked it out.
- ⇒ Repeat for four other combinations of coins and notes.
- ⇒ Draw a second table on the board. This time put the pence column first. In the first row write **462p**.

p	£ + p
462p	

- ⇒ Say: **I want to change 462p into pounds and pence. First I look at the hundreds digit. I know that 100 pence is £1, so 400 pence is £4.** Write £4 in to the second column.
- ⇒ Say: **The tens and units digits tell me how many pence there are, so there are 62. First, I need to write the decimal point to separate the pounds and pence. Then, I can write in 62.** Write **.62** into the second column as you speak.

↓ Do not use the amounts over £10 unless the children are confident with the converting process.

- ⇒ One at a time, fill in the following amounts into the table and invite children to convert them into pounds and pence: **698p, 804p, 1037p, 1284p, 2058p**. Encourage children to explain how they did the converting.

Y4 Solving problems

Suggested order: Autumn Term, Week 3, Lesson 3

Pupil Book 1:
Count your money

15

Pupil consolidation**Refresher**

Children who are having difficulties should first work through this section where there are pictures of coins to help them. They work out the total value of the coins in each row and then record the amount in pounds and pence.

Practice**Resources** 20 counters, 10 each of two colours

Children play the game Convert it! The player who has the most counters on the grid at the end is the winner.

Extension CM:
Handfuls of money

6

Extension**Resources** box of plastic (or real) money

Put a box full of plastic money in the middle of the table. Children close their eyes and take out 2/3/4/5 coins. They then record the amount of money they have in their hand in pounds and in pence.



Game 42

Games Pack 2

Bank your money

Plenary (about 10 to 15 min)

⇒ Ask: **How many pence in £4, £9, £13, £17, £23?**

⇒ Say: **As I know that there are 100 pence in one pound, I can work out how many pence in other amounts.**

⇒ Write various amounts in £ and p randomly on the board e.g. **£3.98, £7.18, £25.67.**

⇒ Invite two children to the front. Say one of the amounts in just pence e.g. **398 pence.** The first child to point to the corresponding amount stays in the game. The other child sits down and a different child comes up.



Problems involving money/Making decisions

Objectives

- To use addition and subtraction to solve word problems involving numbers in 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 how the problem was solved.

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

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

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

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

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

i Some children may find it easier if the questions are written on the board. This could be done before the lesson. Underline the most important information with the class.

↓ Spend more time working out one-step problems.

- ➞ Before the lesson, write on the board **Roller coaster £2.70, Ghost Train £2.95, Water Splash Ride £3.45.**
- ➞ Say: **These are some of the rides at a fairground.**
- ➞ Ask: **If I have a ride on the roller coaster and the ghost train, how much will that cost?** (£5.65)
- ➞ Invite a child to write the calculation on the board and work out the answer. Ask: **How did you work it out? Did anyone else work it out in a different way?**
- ➞ Say: **When working out money problems, we must always write the answer as money. So £5.65 is the answer to this question.**
- ➞ Ask: **If I pay for my ride on the roller coaster with a £5 note, what change will I get?** Invite a child to come out and write the calculation they used to work out the answer. ($£5.00 - £2.70 = £2.30$ or $£2.70 + \square = £5.00$). Encourage a full explanation. Ask: **Did anyone use a different calculation?** Establish that addition and subtraction can be used to work out change.
- ➞ Say: **To work out the answers to these questions we only had to do one calculation. For the next question we will need to work out two calculations.**
- ➞ Ask: **If I have two rides on the ghost train and I pay with a £10 note, what change will I get?** (£4.10)
- ➞ Ask: **What is the first thing that we need to work out?** Establish that we first need to work out how much money the two rides will cost. Invite a child to work out the calculation on the board. Ask: **How did you work out the answer?**
- ➞ Ask: **Did anyone work it out in a different way?** Discuss the different strategies used.
- ➞ Say: **Now we know the cost of the two rides, we can work out the change.** Invite a child to work out the calculation on the board. Ask: **How did you work out the answer?**
- ➞ Continue asking questions involving two-step problems. Invite children to ask questions to the rest of the class.

Y4 Solving problems

Suggested order: Autumn Term, Week 3, Lesson 4

Pupil Book 1:
Fairground problems

16

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

Some of these problems require two steps to work out the answer. Children should record first the calculation(s) they used and then record the answer to the question.

Extension

Write this information on the board: "Hamburger and chips £3.92, Fish, chips and peas £4.38, Double chicken nuggets and chips £9.66". Children who finish the Practice calculations should work in pairs and make up problems for one another using this information. Encourage them to try and think of two-step problems.

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 first decide which operations you need to use. You may need to use two different ones to solve some questions.**
- Focus the children's attention on the Extension information on the board. Ask one of the children who worked on it to read a question for the class to work out.
- Invite the other children to make up questions for the class.

Homework CM:
At the supermarket

5

Homework (about 20 min)

This provides further practice in solving word problems involving money.

Problems involving “real life”/Making decisions

Objectives

- To use addition and subtraction to solve word problems involving numbers in “real life” 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 how the problem was solved.

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, Strand 1 or Strand 2.

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

➡ Before the lesson, draw the table about books on Monday on the board.

Monday	Books taken out	Books returned	Books put back on shelf
morning	79	138	96
afternoon	89	42	114
evening	117	158	128
total			

↓ Ask: **How many books were taken out in the morning and how many in the afternoon?**

➡ Focus the children’s attention on the table. Discuss the information in it.

➡ Ask: **How many books were taken out on Monday?** Invite a child to record the calculation needed to answer the question on the board.

➡ Ask: **How shall we work out the calculation?** Invite a child to explain their method and record their working on the board. Ask: **Did anyone work it out in a different way?**

➡ Discuss the different methods used. Encourage the use of adding the most significant digits and rounding 89 to 100. Write the total in the table.

➡ Ask: **How many books were returned on Monday?** Repeat the process.

➡ Ask: **Did all the books that were returned on Monday get put back on the shelves? What do we need to do to work out the answer?** Establish that first we need to know how many books were put back on the shelf on Monday.

➡ Invite a child to work out the calculation and explain their method and record their working on the board.

➡ Ask: **So, what is the answer to the question? Were all the books put back on the shelves?** (yes)

↓ This problem is a two-step one. Spend more time on one-step problems if the class are unsure.

➡ Ask: **The total number of books taken out on Monday and Tuesday was 440. On Tuesday, 23 more books were returned than taken out. How many books were taken out?**

➡ Ask: **How can we find out how many books were returned on Tuesday?** Establish that first we need to know how many books were taken out on Tuesday. Ask: **How can we work this out?**

➡ Invite a child to record the calculation needed to work out the answer (440–285) Ask: **How can we work this out?** Tell children to make jottings on the board if necessary.

➡ Repeat with other two-step questions.

Y4 Solving problems

Suggested order: Autumn Term, Week 3, Lesson 5

Pupil Book 1:
Library problems

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

Some of these problems require two steps to work out the answer. Children should record first the calculation they used and then the answer to the question.

Support CM:
Library problems

6

Support

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

Extension

Children who finish the Practice calculations can make up some problems for each other in pairs around the theme of the library.

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 $194 + 215 - 89$ on the board. Ask children to make up some word problems using these numbers.

Measures: (length)

Objectives ● To use, read and write standard metric units (km, m, cm, mm), including their abbreviations. ● To suggest suitable units and measuring equipment to estimate or measure length. ● To know and use the relationships between familiar units of length.

Vocabulary kilometre; metre; centimetre; millimetre; unit; standard unit; metric unit; distance apart, between, to, from; roughly; nearly; about; approximately

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

Choose an activity from Strand 5, Topic 5.1, Strand 1 or Strand 2.

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



Resources rulers; metre sticks; measuring tapes; small items between 1 cm and 10 cm in length, e.g. paper clips, pasta, short pencils, crayons, straws per group.

- ➞ Indicate the display of measuring equipment and ask: **Who might use these? Why? What numbers do they show? Which might you use to measure your height?**
- ➞ Revise notation and ways of reading a child's height, e.g. 142 cm and 1 m 42 cm. Repeat with several examples.
- ➞ Provide each child with a piece of paper, a ruler and a pencil.
- ➞ Ask the children to rule a straight line that is more than 5 cm and less than 6 cm long.
- ➞ Remind the children to measure from the zero mark and to use a sharp pencil.
- ➞ Discuss the division of the centimetre into ten smaller units called millimetres.
- ➞ In pairs, the children measure and compare lengths of lines drawn. Remind them to keep their eye directly in front of the calibration being read.
- ➞ Ask: **Can you describe the length of your line in words? How can you write it?**
- ➞ Introduce the millimetre notation and record the written forms in various ways: $5\frac{7}{10}$ cm or 5 cm 7 mm or 57 mm.
- ➞ Repeat with other examples for further practice.
- ➞ Discuss the prefixes milli- and centi- and the relationships between millimetres and centimetres then metres. Elicit and write:
1 metre = 100 cm or 1000 mm, and 1 centimetre = 10 mm.
- ➞ Provide each group with a collection of small items between 1 cm and 10 cm in length. The children estimate, measure and record in centimetres and millimetres the lengths of the items. They compare results with a partner.
- ➞ Briefly discuss the length of certain objects with the class.



Tell the children that at this stage it is reasonable to allow a difference of one or two millimetres in their results because the millimetre is such a small unit of length.



Items such as straws which have well-defined "ends" may be more suited to the less able child.

Pupil Book 1:
Measuring straws

18

Pupil consolidation**Refresher**

Children draw lines up to 10 cm in length to the nearest 5 mm. Remind children to measure from the zero mark on their ruler and to use a very sharp pencil.

Practice

- 1 Children measure the straws in millimetres and draw lines of the same length. They record each length in millimetres, in mixed units and in fractions of a centimetre.
- 2 Children interpret the statements and draw lines to the appropriate lengths.

Extension CM:
Constructing spirals in
millimetres

7

Extension

The children construct spirals on 5 mm squared and 5 mm triangular lattice grids where each successive side increases by 5 mm, e.g. 5 mm, 10 mm, 15 mm, 20 mm and so on. They calculate the total length of each spiral.

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

- Ask several children to explain or to demonstrate how they measured some of the small items. Establish that items which have well-defined end points are easier to measure.
- Discuss the finished lengths for question 2 of the Practice section. Ask: **Did anyone find a quick way of working out how long the line must be? Can you explain it to us?**
- Discuss and compare lengths of spirals which children constructed in the Extension task. Ask: **Who made the longest spiral?**
- Show the children a micrometer and ask for suggestions for its use. Ask: **If you did not have a micrometer, how could you measure the distance across a button or a coin?**
- Recall the relationships between the metre, the centimetre and the millimetre and the ways of writing them. Ask: **Is a millimetre the smallest measure of length? How do you know? Can you think of something with a length/width/height of 1 mm?** (thickness of a sheet of paper, lead in a propelling pencil, grain of salt etc)

Measures: (length)

Objectives ● To record estimates and readings from scales to a suitable degree of accuracy. ● To suggest suitable units and measuring equipment to estimate or measure length: record metres and centimetres using decimals, and other measurements using mixed units. ● To convert up to 1000 centimetres to metres, and vice versa.

Vocabulary kilometre; metre; centimetre; millimetre; unit; standard unit; metric unit; distance apart, between, to, from; roughly; nearly; about; approximately

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

Choose an activity from Strand 5, Topic 5.1, Strand 1 or Strand 2.

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



Resources metre stick; measuring tapes; rulers calibrated in millimetres; six strips of paper cut into lengths up to 100 cm; plastic drinking straws and scissors

- ➡ Give six children a paper strip each. As the first child holds up the strip, ask the class to estimate its length in centimetres. Write several estimates on the board. The child now measures the strip using equipment of their choice.
- ➡ Ask: **Whose estimate was the most/least accurate? What is the difference between these two estimates?**
- ➡ Repeat, as above, for the other five strips.
- ➡ Say: **Take a straw. Snip off a small amount. Measure the remaining length.**
Ask: **How might you describe its length?** (9 cm 4 mm, 94 mm or $9\frac{4}{10}$ cm)
- ➡ Explain that tenths of a centimetre can also be written in decimal form and that the place to the right of the decimal point shows the number of tenths of a centimetre, namely millimetres, e.g. 9.4 cm.
- ➡ Draw a table on the board. Ask some children to write the length of their strip in cm and mm. Discuss the relationships between columns.
- ➡ Make lengths that are formed by joining each paper strip, in turn, to a metre length. Draw a table on the board. Ask the children to describe these lengths in different forms. Write the fractional notation for each length, e.g. $162\text{ cm} = 1\text{ m}$, $62\text{ cm} = 1\frac{62}{100}\text{ m}$, establishing the place value of the 6 in six tenths and the 2 in two hundredths and in sixty-two hundredths.
- ➡ Choose four children to demonstrate this task: Pupil 1 holds the measuring tape and calls out a length in centimetres between 1 m and 10 m, e.g. 435 cm. Pupil 2 pulls out the tape, keeping it in a straight line. Pupil 3 estimates when the tape has reached a length of 435 cm and says, "Stop". Pupil 4 reads off the measurement and mentally works out the difference between the estimated and measured lengths. Pupil 4 then shows the class the actual length, i.e. 435 cm. Pupil 1 rolls up the tape and passes it to pupil 2.
- ➡ Working in groups of four, the children complete the above practical activity. Remind the children to measure to the nearest whole centimetre.
- ➡ Repeat the task with each pupil moving on one place until each has had a turn.

length of strips		
in cm and mm	in cm fractions	in cm decimals
9 cm 4 mm	$9\frac{4}{10}$	9.4 cm
9 cm 7 mm	$9\frac{7}{10}$	9.7 cm

cm	in m and cm	in m fractions
162 cm	1 m 62 cm	$1\frac{62}{100}\text{ m}$
183 cm	1 m 83 cm	$1\frac{83}{100}\text{ m}$
107 cm	1 m 07 cm	$1\frac{7}{100}\text{ m}$



For some groups the challenge of finding the "best estimator" may act as a stimulus.



Because of demands on space and resources, you may wish to set half of the class to the above practical activity and half to the following Pupil Book task.

Pupil Book 1:
Centimetre carpets

19

Pupil consolidation**Refresher**

Children read measurements from tapes and record in decimal form.

Practice

- 1 Children copy and complete the arrow diagrams.
- 2 They investigate the problem by working out the different length combinations that the carpet fitter can make by fitting any two from four lengths.

Support CM:
How many metres?

7

Support

The page shows six different measuring tapes. Children read the marked lengths and convert centimetres to metres and centimetres.

Extension

- Extend the Pupil Book problem by asking the children to investigate the possible length combinations if the fitter had a fifth carpet of 123 cm.

Plenary (about 10 to 15 min)

- Write pairs of numbers such as **298 cm**, **304 cm** and **3 m 96 cm**, **4 m 5 cm**. Discuss mental calculation strategies for finding the difference between pairs of numbers lying either side of a multiple of 100.
- Ask: **Which is longer, $2\frac{1}{2}m$ or 254 cm? By how much?** (4 cm) Repeat with further examples, including some where there is a zero, e.g. **305 cm** or **3 m 9 cm**.
- Discuss the carpet fitter problem. Ask: **Who found six different lengths? How can you be sure that there are no more?**
- Say: **Let's label the carpets A, B, C and D.** Build up a table on the board showing the six combinations.

The fitter can join:	then:	then:
A with B	B with C	C with D
A with C	B with D	—
A with D	—	—

- Similarly show that there are 10 combinations for five carpets A, B, C, D and E.

Measures: (length)

Objectives ● To know and use the relationships between familiar units of length. ● To know the equivalent of one half, one quarter, three quarters and one tenth of 1 kilometre in m, 1 metre in cm or mm.

Vocabulary kilometre; metre; centimetre; millimetre; unit; standard unit; metric unit; distance apart, between, to, from; breadth; roughly; nearly; about; approximately

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

Choose an activity from Strand 5, Topic 5.1, Strand 1 or Strand 2.

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

Resources metre stick calibrated in cm with coloured decimetre units; measuring tapes; strips of paper cut into 50 cm, 25 cm and 10 cm lengths and labelled 500 mm, 250 mm and 100 mm respectively

- ➞ Show the metre stick and ask: **What measurement is half way between zero and 100 cm?** (50 cm) Hold up the 50 cm strip and ask: **How many times will this 50 cm strip fit into the metre length?** (twice)
- ➞ Revise the meaning of the prefix “milli-”. (to do with a thousand) Ask: **How many millimetres are the same as 1 cm?** (10 mm) **How many millimetres are the same as 10 cm?** (100 mm) **How many are the same as 100 cm?** (1000 mm) **How many are the same as 50 cm?** (500 mm)
- ➞ Ask: **What measurement is halfway between zero and 50 cm?** (25 cm) **How many times will the 25 cm strip fit into 50 cm/100 cm?** (twice/four times) **What is a quarter of a metre in millimetres?** (250 mm) **How did you work it out? What if I join the half and quarter metre strips? What fraction of a metre will I make?** ($\frac{3}{4}$ m) **How many centimetres are the same as $\frac{3}{4}$ m?** (75 cm) **How many millimetres is that?** (750 mm)
- ➞ Hold up the metre stick and invite suggestions about the coloured sections and their relationship with a metre.
- ➞ Discuss the written notation for $\frac{1}{2}$, $\frac{1}{4}$, $\frac{3}{4}$ and $\frac{1}{10}$ of a metre in millimetres. Write the three-way relationships in fractional and abbreviated form.
- ➞ Revise understanding of place value and the practice of writing, for example, 1500 m as 1.5 m rather than 1.500 m.
- ➞ Recall the meaning of the prefix “kilo-” (1 thousand) and that “1 kilometre” means “one thousand metres”.
- ➞ Say: **Imagine a long line of metre rods fitted end to end. How many would be the same length as one kilometre?** (1000)
- ➞ Pose questions to establish the number of metres in $\frac{1}{2}$, $\frac{1}{4}$, $\frac{3}{4}$ and $\frac{1}{10}$ of a kilometre. Write the relationships in fractional and abbreviated form.
- ➞ Discuss what might be measured in kilometres, in multiples of 100 m.
- ➞ Say: **At a brisk pace you can walk one kilometre in just over 10 minutes. About how long will it take you walk 100 metres?** (roughly 1 minute) **Can you predict how long it will take to walk half a kilometre?**
- ➞ Ask: **Who lives about a 10 minute walk from school? What landmarks are about 1 km from the school?**

1 m = 100 cm = 1000 mm
 $\frac{1}{2}$ m = 50 cm = 500 mm
 $\frac{1}{4}$ m = 25 cm = 250 mm
 $\frac{3}{4}$ m = 75 cm = 750 mm
 $\frac{1}{10}$ m = 10 cm = 100 mm

1 km = 1000 m
 $\frac{1}{2}$ km = 500 m
 $\frac{1}{4}$ km = 250 m
 $\frac{3}{4}$ km = 750 m
 $\frac{1}{10}$ km = 100 m

Pupil Book 1:
Jogging in metres

20

Pupil consolidation**Refresher**

- 1 Children express fractional parts of a metre in millimetres and vice versa.
- 2 They copy and complete the table.

Practice

- 1 Children complete three-way relationships for metres, centimetres and millimetres.
- 2 They express fractional parts of a kilometre in metres and vice versa.
- 3 Children interpret and order fractional parts of a metre.

Extension

The children calculate the distances the walkers will cover in 20 minutes. If time permits, the children make a second list of distances between 700 m and 1500 m for a friend to order.

Plenary (about 10 to 15 min)

Resources 7 cards labelled $\frac{3}{4}$ km, 0.9 km, 906 m, 960 m, 1.0 km; 1 km 100 m, $1\frac{1}{4}$ km; Blu-tack

- Draw a triangle on the board. Write a length, e.g. **80 cm**. Invite a child to complete the three-way relationship. Repeat for other lengths.
- Draw a number line with ten divisions. Label the ends **zero** and **1 km**. Distribute the seven cards. Ask children, one at a time, to Blu-tack their card in position on the number line.
- Discuss the position of the cards relative to each other. Finally compare results with the Pupil Book task which used the same lengths.
- Remind children that the standard unit for measuring length is the metre. Ask:
Which prefix means a thousand times the standard unit? (kilo) **Which prefix means a thousandth part of the standard unit?** (milli-)
- Ask the children for examples of words which begin with the prefixes “kilo”, “centi-” and “milli-”.

Homework CM:
Distance dominoes

6

Homework (about 20 min)

The dominoes game for 2 to 4 players reinforces the relationships between kilometres and metres. The domino rules are refined to: on your turn, join a domino so that the matching lengths total 1 kilometre, e.g. 750 m + $\frac{1}{4}$ km = 1 km.

Measures: (length)

Objectives ● To suggest suitable units and measuring equipment to estimate or measure length. ● To record estimates and readings from scales to a suitable degree of accuracy.

Vocabulary kilometre; metre; centimetre; millimetre; unit; standard unit; metric unit; distance apart, between, to, from; breadth; roughly; nearly; about; approximately

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

Choose an activity from Strand 5, Topic 5.1, Strand 1 or Strand 2.

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

Resources ruler; metre stick; tape measure; expanding rules; surveyor's tape; trundle wheel; micrometer; depth gauge; 100 square; six small arrow cards; felt tip pens

- ➞ Choosing numbers from the 100 square, revise rounding numbers to the nearest 10. Ask the children to explain why numbers with units digits from 5 to 9 are rounded up and those with units digits 1 to 4 are rounded down.
- ➞ Add a length name to a two-digit number, e.g. 26 km, 83m, 42cm, 55mm and ask the children to round to the nearest ten.
- ➞ Extend the use of the rule to rounding three-digit lengths to the nearest ten, e.g. 274cm.
- ➞ Run out a measuring tape to 4 metres.
- ➞ Distribute the arrow cards. Ask each of six children to write a length between 200cm and 400cm on their card, e.g. 213cm, 242cm, 275cm, 339cm, 351cm and 387cm.
- ➞ Say: **On the other side of your card, write your length to the nearest 10 centimetres. Put your card at that mark on the measuring tape.** (210, 240, 280, 340, 350, 390cm) **Mentally round the length on your card to the nearest 100cm.** Reposition your card. (200, 200, 300, 300, 400, 400cm)
- ➞ Turn over the cards to show the starting number. Discuss the measurements which rounded to 200cm, 300cm and 400cm.
- ➞ Discuss practical applications, e.g. buying lengths of wood or curtain material to cut to size.
- ➞ Discuss length terminology, i.e. length, width, height, depth, distance round, distance across. Invite suggestions of suitable objects for each and write them on the board, e.g. width of a page, depth of a flower pot, distance around a tree.
- ➞ Display the measuring tools and discuss the best instrument and unit of measure for each task.
- ➞ Demonstrate and discuss measuring techniques and recording in two ways: actual length in cm and mm, then rounded to the nearest centimetre.

Pupil Book 1:
Measurement round up

21

Pupil consolidation**Refresher**

Children round three-digit lengths to the nearest 10 cm.

Practice

Working with a partner, the children choose the best tool to measure self-selected lengths. They record the actual measurements in metres and centimetres and in metres with decimal notation and round them to the nearest 10 cm.

Extension

Resources paper and pencil; exercise book

Working with a partner, children investigate this problem, written on the board: “Hattie’s house is 300 m along the road from her school. There is a lamp-post at her front gate, one outside the school and four lamp-posts in between. All the lamp-posts are the same distance apart. What is the distance in metres between each lamp-post?” The children may find it useful to draw a diagram.

Plenary (about 10 to 15 min)

- Discuss which tools children chose to use and any problems they may have encountered in using them.
- Ask a child: **What did you and your partner choose to find the length of?** Write the length in metres and centimetres on the board. Ask the class: **What is that length in metres? What is that length rounded to the nearest 10 cm?**
- Repeat, as above, for other measurements.
- Say: **Beth found that the width of the corridor, rounded to the nearest 10 cm was 240 cm. What might the actual measurements have been? Andrew recorded the depth of the broom cupboard as 1.86 m. What did he write when he rounded it to the nearest 10 cm?**

Homework CM:
Jewellery in millimetres

7

Homework (about 20 min)**Refresher**

Children estimate and measure the bracelets to the nearest whole centimetre and record these in the grid.

Practice

- 1–2 Children estimate and measure to the nearest whole centimetre then to the nearest millimetre. They round answers to the nearest 10 mm and write the rounded length in cm.
- 3 Children find a necklace or pendant and measure the length of the chain to the nearest cm.

Measures: (length)/Problems involving length/Making decisions

Objectives ● To use, read and write standard metric units (km, m, cm, mm), including their abbreviations. ● To use all four operations to solve word problems involving numbers in measures (length), using one or more steps, including converting metres and centimetres and vice versa. ● To choose and use appropriate number operations and appropriate ways of calculating (mental, mental with jottings, pencil and paper) to solve problems.

Vocabulary kilometre; metre; centimetre; millimetre; unit; standard unit; metric unit; distance apart, between, to, from; breadth; roughly; nearly; about; approximately

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

Choose an activity from Strand 5, Topic 5.1, Strand 1 or Strand 2.

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

Resources OHT or large scale map of the school catchment area; OHP pen

- ➞ On the OHT draw a circle, with the school as the centre and the radius length representing 1 kilometre.
- ➞ Ask: **Who lives about 1 kilometre from school? Can you think of a place or landmark that is about 1 kilometre from our school?** Mark the approximate position on the OHT.
- ➞ Choose a location which is about 1 kilometre from the school. Establish the distance as 1 km “as the crow flies”. Discuss the meaning of the phrase. Ask: **If you walked from the school to here, would the distance be more than, about or less than 1 km? Can you give a reason for your answer?**
- ➞ Draw a circle on the OHT set at a radius representing $\frac{1}{2}$ km and discuss places at this distance from school. Repeat for $1\frac{1}{2}$ km and 2 km.
- ➞ Say: **There is a unit of distance which is more than 1 km but less than 2 km. You see it on signposts to villages, towns and cities. Does anyone know what it is called?** (mile)
- ➞ Discuss the mile as an imperial measure of length or distance and the kilometre as a metric measure of length or distance. Ask: **Have you been to a country which measures the distances by road in kilometres?** (continental Europe) **In miles?** (Britain, U.S.A.)
- ➞ Draw a triangle. Label the points: **school, sports centre, library** (or adapt to own location). Write these distances on the three sides **500m, 250m, 750m**.
- ➞ Ask: **What is the distance in metres/kilometres if you walk from school to the library? What is it if you walk from the library to the sports centre? What is it if you walk from the sports centre back to school? What is the total distance?** (1500 m/ $1\frac{1}{2}$ km) **Is this more or less than 1 mile?** (less)
- ➞ Draw a line as in question 1 of the Pupil Book, marking the ends $\frac{5}{10}$ km and **finish**. Use the names of three of your pupils and write them at $\frac{1}{10}$, $\frac{3}{10}$ and $\frac{5}{10}$ km from the finish. Pose questions about the distances between each runner and how far each runner is from the winning post.

i At this stage, children only need to know that the one mile mark lies between 1km and 2 km, but for the sake of accuracy, locations beyond the $1\frac{1}{2}$ km circle should be identified.

Pupil Book 1:
Fun run

22

Pupil consolidation**Refresher**

Using the race map, children find the distance of each leg of the race and record it in metres and in kilometres.

Practice

1 Children work out the relative position in the race of each competitor and mark it on a scale divided into tenths of a kilometre.

2–4 Children choose appropriate operations and use the information from question 1 to solve word problems set in the context of the race.

Extension

- 2 Pose the problem: “It takes about one minute to run $\frac{2}{10}$ of a kilometre. In how many minutes’ time will each runner reach the finishing line?”

Plenary (about 10 to 15 min)

- ⇒ On the board, write the distances for each leg of the race: $\frac{1}{2}$ km, $\frac{1}{4}$ km, $\frac{3}{4}$ km, 2 km, 1 km 500 m. Discuss ways of totalling the distances, e.g. adding fractional parts to make whole kilometres. ($\frac{1}{4}$ km + $\frac{3}{4}$ km = 1 km)
- ⇒ On the board, replicate the number line in the Practice question. Mark the position of Andy. Choose children to mark the positions of the remaining runners. Ask: **How did you work it out?**
- ⇒ Review the answers to the problems in questions 2 to 4, inviting children to explain their methods and reasoning.
- ⇒ Ask: **If you ran in a one mile race, would you run further than or less than one kilometre?** (further)

Measures: (perimeter)

Objective ● To measure and calculate the perimeter and area of rectangles and other simple shapes, using counting methods and standard units (cm).





Vocabulary kilometre; metre; centimetre; millimetre; distance; edge; perimeter

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

Choose an activity from Strand 5, Topic 5.1, Strand 1 or Strand 2.

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

Resources OHT transparency; OHP pen; pinboards and elastic bands; plastic 2D shapes; large sheet of paper and marker; centicubes

-  ➞ Provide each child with a large sheet of paper and a marker.
-  ➞ Provide each group with a selection of 2D shapes.
- ➞ Sketch a rectangular and an oval closed shape on the OHT. Introduce the term, “perimeter” in the context of boundaries (e.g. a perimeter fence, a hedge around a garden or field) and distances around shapes and objects (e.g. a perimeter track for athletes).
- ➞ Demonstrate on the OHP and say: **Take a shape, a square, or a rectangle, and draw around its edge with your marker like this.** Establish that the pencil outline is the perimeter or distance around the shape and makes a closed shape by coming back to the starting point.
- ➞ Hold up a large and a small rectangle and ask: **Which rectangle has the longer perimeter? How do you know? How would you measure the distance?**
-  ➞ Distribute a pinboard and elastic band to pairs of children. It is also possible to use a pegboard, substituting the nails with four pegs.
-  ➞ Ask the children to make the smallest rectangle they can with their pinboards and elastic bands.
- ➞ In pairs, the children take turns to make different-sized rectangles with the elastic band. Their partner works out the perimeter in units of length equal to the distance between two pins.
- ➞ Say: **Make a rectangle which has a perimeter of 10 units. Who has a different rectangle?**
- ➞ Discuss ways of counting the perimeter lengths. Ask: **Can you find a short way to work out the perimeter of a rectangle?**
- ➞ The children investigate ways to work out the perimeter of different-sized squares.
- ➞ Invite about four children to come to the front to demonstrate the following. Say: **Take 12 cubes each. Make a rectangle and work out its perimeter.** Ask: **Which rectangle has the greatest/least perimeter?**
- ➞ Say: **Now take four more cubes each and make a shape. Try to find a different shape from everyone else.** Ask: **What is its perimeter?**
- ➞ Discuss the various shapes with the rest of the class.

i The smallest rectangle is a square with sides one unit, i.e. one unit is the distance between two pins. However, at this stage most children see the square as a shape distinct from the rectangle and not, by definition, a regular rectangle.

Pupil Book 1:
Pinboard perimeters

23

Pupil consolidation**Refresher****Resources** pinboards and elastic bands

Children make four rectangles on their pinboards and find the perimeters by counting units.

Practice**Resources** pinboard; elastic band; 5 centicubes (or 1 cm or 2.5 cm cubes); dot paper; RCM 1, dot paper

- 1 Children make rectangles on pinboards of specified perimeters, and record them on dot paper.
- 2 Children make shapes (polyominoes) with 5 cubes. They record each shape on dot paper, find its perimeter and colour those with the same perimeter.

Support CM:
Perimeters of rectangles

8

Support

Children complete the partially drawn rectangles and work out their perimeters,

Extension CM:
Perimeter search

8

Extension

- 1 Children draw two rectangles and one shape, each with the same perimeter as the square (16 cm).
- 2 They investigate perimeters of caterpillars drawn on a triangular grid.

Plenary (about 10 to 15 min)

- ➡ Review the Pupil Book tasks. Ask: **Did anyone find a pentomino which did not have a perimeter of 12 units? Can you describe the shape to us?** (P-shape)
- ➡ Say: **Estimate, then measure the perimeter of a book/the top of your desk. Who can suggest a quick way to measure, in paces, the perimeter of the classroom?** (walk half way [along two adjacent sides] and double your answer)
- ➡ Say: **I'm thinking of a rectangle. One side measures 3 cm and the other, 6 cm. What is its perimeter?** (18 cm) **What is the distance around a square that has a side of 5 cm?** (20 cm) **I am thinking of a rectangle. Its perimeter is 20 cm. What might its dimensions be?** (9 + 1 + 9 + 1, 8 + 2 + 8 + 2)
- ➡ Repeat for other examples.

Shape and space: (2D)/ Reasoning about shapes

Objectives ● To recognise equilateral and isosceles triangles. ● To make and investigate a general statement about familiar shapes by finding examples that satisfy it.

Vocabulary 2D, two-dimensional; equilateral triangle, isosceles triangle; right angle

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

Choose an activity from Strand 1 or Strand 2.

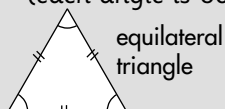
Main teaching and pupil activities (about 30 to 40 min)

Resources large equilateral triangle and isosceles triangle; card/plastic equilateral, isosceles and right-angled triangles per group; interlocking equilateral triangles; geostrips; fasteners; small squares of card; scissors

i Equilateral means “having equal sides”.

An equilateral triangle has:

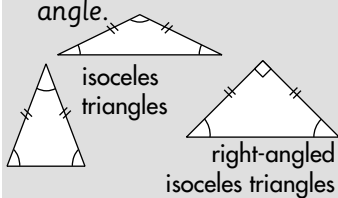
- three sides equal in length
- three angles equal in size (each angle is 60°)



Isosceles means “having equal legs”.

An isosceles triangle has:

- two sides equal in length.
- two angles equal in size.
- a third angle that can be a right angle or be less or greater than a right angle.



perimeter = 4 units



perimeter = 5 units



perimeter = 6 units



Limit the task for less able children to 2, 3 and 4 triangles.

➡ Provide each table with sufficient equilateral and isosceles triangles for each child (including some right-angled isosceles triangles), paper, rulers and scissors.

➡ Show a large equilateral triangle and ask: **What can you tell me about this shape?**

➡ Demonstrate drawing round the edge of an equilateral triangle to produce an outline of the shape. Say: **Find an equilateral triangle like this. Draw around its edge.**

➡ Ask: **How many times will the triangle fit into its outline? (3) Why is this possible?**

➡ Establish that the term “equilateral” means “having equal sides”. Ask: **What can you say about the angles?** (they are equal)

➡ Set children to investigate the different shapes that can be made by combining 2, 3, 4 and 5 equilateral triangles and to calculate the perimeter of each shape in unit lengths. Ask: **What will you count when you are working out the perimeter?** (number of edges of the shape)

➡ Compare and discuss results.

➡ Show the large isosceles triangle and say: **Find a triangle like this and draw around its outline. What can you tell me about this triangle?** (it has two equal sides)

➡ Introduce the term, “isosceles” meaning “having equal legs”.

➡ Distribute the squares of card. Recall that a square has four right angles. The children mark the four right angles with a small square, use a ruler to draw a diagonal line and by cutting the square in half along the diagonal, make two identical triangles.

➡ Say: **What can you tell me about the triangle?** Establish that the triangle is both right-angled (already marked) and isosceles (the equal legs, when folded over, fit on top of each other). Say: **Here's a challenge. Use both triangles and make one large isosceles right-angled triangle!**

➡ Distribute the geostrips and say: **You have five minutes. Work as a group and make as many different isosceles triangles as you can.**

➡ Discuss and compare results. Ask: **Who made an isosceles triangle which has one angle larger than a right angle?**

Pupil Book 1:
Try out triangles

24

Pupil consolidation**Refresher****Resources** geostrips and fasteners

The children make triangles a, b and c with geostrips. They name each triangle as equilateral, isosceles or right-angled, then find three more, one for each set.

Practice**Resources** squares of paper; scissors; glue

- 1 The children complete a table to sort the triangles as equilateral, isosceles or other.
- 2 Having folded a square of paper along the diagonals and cut out the triangles, the children use all four triangles to make a large isosceles triangle.

Extension**Resources** 6 congruent card or plastic interlocking equilateral triangles, 1 cm dotted triangular paper

Working with a partner, the children find different ways to fit together six equilateral triangles. They draw each shape on triangular dotted paper and record its perimeter in centimetres.

Plenary (about 10 to 15 min)

- Ask the children who completed the Refresher section to name the triangles that they found for each set: equilateral, isosceles and right-angled.
- Ask the children who completed the Practice section to name the right-angled isosceles triangles.
- Ask: **What different facts can you state about an equilateral triangle/an isosceles triangle? How are these two shapes alike/different?**
- Say: **Imagine a right-angled isosceles triangle. Now the two equal sides move closer together until all three sides are the same length. What is the name of the triangle?** (equilateral triangle)

Homework CM:
I spy isosceles
triangles

8

Homework (about 20 min)

Children draw the diagonals on a pentagon. They find and colour a different isosceles triangle for each pentagon.

Shape and space: (3D)/Reasoning about shapes

Objectives ● To describe and visualise 3D shapes, including the tetrahedron. ● To make and investigate a general statement about familiar shapes by finding examples that satisfy it.

Vocabulary polyhedron; tetrahedron; cube; cuboid; sphere; spherical; cone; cylinder; cylindrical; pyramid; prism; hemi-sphere; right angles; vertex; vertices; layer; diagram; 3-D; three-dimensional; polygon; surface; face; curved; straight; equal

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

Choose an activity from Strand 1 or Strand 2.

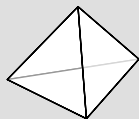
Main teaching and pupil activities (about 30 to 40 min)

Resources geometric 3D shapes: cube, cuboid, sphere, hemi-sphere, cylinder, cone, square-based pyramid, triangular prism, pentagonal prisms, hexagonal prisms, tetrahedron; interlocking triangular tiles; hoops

- ➞ Display the 3D shapes to children and ask: **What words are useful in describing three-dimensional shapes?**
- ➞ List the suggested terms, e.g. edge, face, vertex, vertices, right-angled, curved, straight, equal, spherical, prism, 3D and so on.
- ➞ Ask the children to name a shape with a particular property. For example: **Which shapes have 8 vertices?** (cube, cuboid) **Which shapes have five faces?** (triangular prism, square-based pyramid) **How are they alike/different?**
- ➞ Distribute the interlocking tiles and say: **Take four equilateral triangles and make a closed, hollow 3D shape.** (regular tetrahedron)
- ➞ Introduce the terms, “tetrahedron” meaning “having four faces” and “polyhedron” meaning a solid shape with many faces where each face has a flat surface and is a polygon.
- ➞ Pass around examples of polyhedra for children’s inspection.
- ➞ Using sorting diagrams (Venn or Carroll), classify the 3D shapes as “is/is not a polyhedron”. Select a shape with a curved face and ask: **Why is this shape not a polyhedron?**
- ➞ Extend the activity to making subsets of polyhedra according to such properties as “has right-angled vertices”, “has triangular faces” and so on.
- ➞ Remind children that a prism has two identical end faces and the same cross-section throughout its length and that the end faces are straight-sided.
- ➞ Invite some children to make a set of shapes which are prisms. Ask: **Are all prisms polyhedra?** (yes) **Are all polyhedra prisms?** (no) **Show me a polyhedron that is not a prism.** (tetrahedron, pyramid)
- ➞ Children work in twos or threes. They take it in turn to select a shape that they conceal from the others who, by posing questions, have to identify the hidden shape.

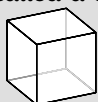
i A polyhedron (plural: polyhedra) is a solid shape with many faces. A tetrahedron is a solid shape with four sides. It is not a prism.

tetrahedron



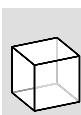
The four faces of a regular tetrahedron are congruent equilateral triangles..

A hexahedron, which has six square faces, is usually called a cube. It is a prism.

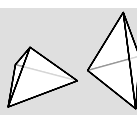


hexahedron (cube)

A prism has two identical end faces and the same cross-section throughout its length. The end faces are straight-sided. Thus a cylinder is not a prism.



has right-angled vertices



has triangular faces

Pupil Book 1:
Shape investigation

25

Pupil consolidation**Refresher**

Children complete a shapes table for the properties: is a prism, has triangular faces, has eight vertices.

Practice

Children investigate the statement: "The number of edges of an end face is 2 less than the total number of faces of a prism." They draw up a table in which they list the shapes and show how they satisfy the statement.

Extension

Resources equilateral interlocking triangles.

- Ask the children to make a tetrahedron. Then ask them to make a tetrahedron which is four times as large.

Plenary (about 10 to 15 min)

- Discuss the general statement in the Practice section. Ask: **What shapes did you find to make the statement true?**
- Revise the meaning of the new vocabulary, polyhedron and tetrahedron.
- Say: **Imagine a tetrahedron. Turn it in your mind. Describe what you see.**
- Say: **I see the rectangular face of a 3D shape. I turn it and I see a triangular face. What might my shape be?** (triangular prism or square-based pyramid)
- Ask children to describe shapes they imagine for the rest of the class to identify.

Shape and space: (2D)/Reasoning about shapes

Objectives ● To describe and visualise 2D shapes, including the heptagon. ● To classify polygons using criteria such as number of right angles, whether or not they are regular, symmetry properties. ● To make and investigate a general statement about familiar shapes by finding examples that satisfy it.

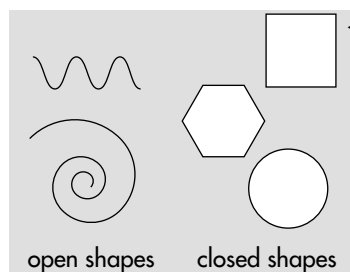
Vocabulary 2D; two-dimensional; equilateral triangle; isosceles triangle; oblong; heptagon; polygon; regular; irregular; concave; convex; open; closed

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 prepared kite and set of regular 5-, 6- and 7-sides shapes made of geostrips; set of 2D shapes; geostrips; fasteners; cards labelled “regular”, “irregular”; small blank cards



➡ Provide each group with a supply of geostrips and fasteners.

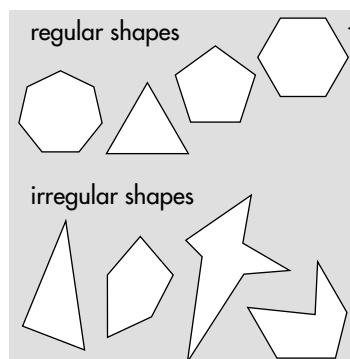
➡ Draw examples of some open and closed shapes.

➡ Say: **Make a group collection of as many different triangles as you can.**

➡ Name the triangles and discuss their properties, e.g. equal-sided, right-angled, symmetrical.

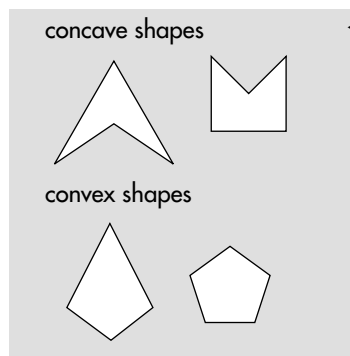
➡ Introduce the term “polygon” as a closed flat shape with three or more straight sides.

➡ Say: **What different polygons can you make with four geostrips?**



➡ Select some triangles and quadrilaterals from the group tables and gather the class together. Secretly sort the shapes as “regular”, “irregular” and ask the children to identify the criteria used. Label the sets using the small blank cards.

➡ Show the regular pentagon and hexagon and ask: **To which set do these shapes belong?** (regular) Introduce and name the heptagon. Discuss the number of sides and ask the children to name a seven-sided coin. (20p, 50p) Say: **Any shape with seven sides is a heptagon. This heptagon has seven equal sides. To which set does it belong?**



➡ Demonstrate how a regular pentagon moves to make a concave pentagon. Establish that the sides are equal but the angles are not, so the pentagon is irregular and concave. Discuss the term “concave” in an everyday sense, e.g. a cave in a hillside, the roof of a derelict house that has caved in.

➡ Invite children to make some of the shapes “concave” e.g. from kite to arrowhead.

➡ Say: **Convex is the opposite of concave. Watch as I move the geostrips to change the arrowhead from a concave to a convex shape, the kite.**

➡ Discuss other ways of classifying polygons such as the number of right angles, whether or not the shape has line symmetry.

➡ In small groups, the children make Carroll diagrams to classify polygons using the criteria shown in the Pupil Book page.

Pupil Book 1:
Proper polygons

26

Pupil consolidation**Refresher**

Working in small groups, the children classify polygons using one criterion.

Practice

- 1 Working in small groups, the children classify polygons using two criteria.
- 2 Children refer to the illustrated polygons to identify specific properties. They copy and complete a table in their exercise books.

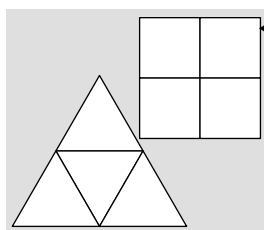
Extension

Resources a set of 2D shapes

- 1 Working in pairs, children take turns to secretly sort some shapes. The partner identifies the criteria used.
- 2 Working in pairs, each child chooses a shape. The two shapes are placed side by side on the table. Between them, the children must find two ways in which the shapes are alike, e.g. both are quadrilaterals and have line symmetry, and two ways in which they differ e.g. one shape is regular and has right angles.

Plenary (about 10 to 15 min)

- Review the Pupil Book activities and clarify any difficulties children may have had in classifying shapes. Discuss the results in the table. Ask: **Which shapes had all three properties?** (shape i)
- Sketch, one by one, the shapes shown (left) and ask: **How many regular shapes do you see?** (5)
- Revise knowledge of some of the properties by posing incomplete statements such as: **Any shape with four/seven straight sides is a ... Any closed, flat shape with three or more straight sides is a ... A polygon is regular if it has ...**

Homework CM:
Picture it

9

Homework (about 20 min)**Refresher**

Children join the dots in the order shown to reveal the shape picture, then write the name of the shape in its frame.

Practice

- 1 Children join the dots in the order shown to reveal the shape picture. They write its name in the frame.
- 2 Children draw the line(s) of symmetry where appropriate.
- 3 They colour the regular shape red and the heptagon blue.

Shape and space: (position and direction)

Objective ● To recognise positions and directions: for example, describe and find the position of a point on a grid of squares where the lines are numbered.

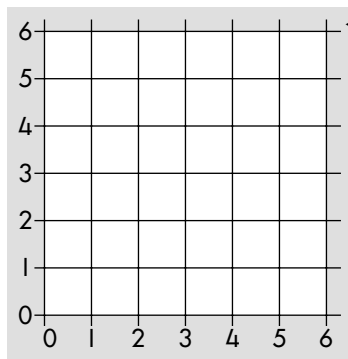
Vocabulary grid; row; column; origin; co-ordinates; horizontal; vertical; diagonal; map; plan

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 prepare a numbered grid on the board or on an OHP transparency; felt or OHP pens; counters



i Children progress from specifying location of regions in, for example, a local map or plan to describing positions with pinpoint accuracy. In the 17th century, René Descartes devised the system of co-ordinates in which an ordered pair of numbers specify a point at the intersection of two grid lines.

- ➡ Display the OHP grid and randomly place a counter in three regions. Recall the letter and number references used to identify regions on a grid such as C4, D3 and so on.
- ➡ Introduce and discuss the following steps:
 - the lines and intersections on the grid are used to locate positions
 - the lines are numbered, for both horizontal and vertical axes, from a “key” point which is called “the origin”
 - the origin is the point (0, 0)
 - the point at which two lines cross is given two numbers called co-ordinates.
 - the horizontal co-ordinate comes first, then the vertical co-ordinate.
- ➡ Place a counter on the point (4, 3) and say: **Start at the origin. Move 4 along (the corridor) then 3 up (the stairs). We write the co-ordinates like this, (4, 3).**
- ➡ Place some counters on the grid to give the children practice in reading co-ordinates.
- ➡ Use a coloured OHT pen to outline an island.
- ➡ Say: **There is hidden treasure somewhere on this map. You have to guess the co-ordinates of the point where it might be buried.**
- ➡ After each guess ask the child to plot the point with a counter. Ask the class to verify that the correct point has been located.
- ➡ Once you have about six marked points say: **I’ve just found this clue. The numbers of the co-ordinates add up to 4 .What might the co-ordinates be?**
- ➡ Write the co-ordinates on the board: (0, 4), (1, 3), (2, 2), (3, 1), (4, 0).
- ➡ Say: **Here is the last clue. The number on the horizontal axis is the same as the number on the vertical axis. Who knows where the treasure is buried?** (2, 2)

Pupil Book 1:
Co-ordinates treasure hunt

27

Pupil consolidation**Refresher**

- 1 Children write the co-ordinates of the points where the pirates are digging.
- 2 They work out from the map the possible co-ordinates of the captain's position.

Practice

- 1 By decoding the co-ordinates grid, the children work out the site of the treasure.
- 2 Children use the co-ordinates grid to write their name and devise a message.

Support CM:
Three points co-ordinates

9

Support

Resources 1–6 die

Each child has a die and records their throws until they have circled three points in a straight line on the grid.

Extension CM:
Co-ordinates connections

9

Extension

Resources 2 dice; supply of counters in two colours.

This paired game is similar to the rules of Connect. The children take turns to throw both dice and use the scores to form a co-ordinated pair. They cover points in the grid in counters of their own colour until one player has three in a row, in any direction.



Game 37

Games Pack 2

Ancient bones

Plenary (about 10 to 15 min)

Resources OHP grid; 2 × 1–6 dice

- Display the OHP grid; throw the dice and say: ***I throw the dice and score a five and a three. Which points can I cover? What are their co-ordinates?*** (5, 3) (3, 5)
- Ask a child to cover both points with counters. Ask the class: ***Is he correct?***
- Using the dice repeat for other pairs of numbers to establish that they describe different points.
- Review the tasks by asking the children to suggest possible points for Captain Black's position in the Refresher section of the Pupil Book activity and discussing whether the variation to the game in the Extension, made winning easier.
- Discuss Descartes and his rules for finding the location of any point on the first quadrant of a grid, going "along the corridor and up the stairs".

Measures: (area)

Objective ● To measure and calculate the area of rectangles and other simple shapes, using counting method.

Vocabulary area; covers; surface; edge; unit; standard unit

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

Choose an activity from Strand 5, Topic 5.1, Strand 1 or Strand 2.

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

Resources guest and bath towel; large sheet of paper; some large circles, triangles, pentagons; covering units, e.g. sheets of paper, tiles, playing cards, cubes, exercise books, postcards, greetings cards of a similar size; felt pen; Blu-tack; glue

i Children need to understand “perimeter” as the distance around a region or closed shape and “area” as the amount of surface. Because area is a difficult concept, it is important to begin such work by focusing on area as a measure of the amount of surface, flat or curved.

- ➞ Inform the class of the new topic, area. Initiate discussion by asking:
What is a surface? Can you name some surfaces in this classroom? Which people need to measure surfaces? Why?
- ➞ Say: **Show me the surface of a book. Run your hands over the surface of your desk going right to the edges.**
- ➞ Show the towels. Ask: **Which would you take with you to the swimming pool? Why?** (bath size towel to dry surface of body)
- ➞ Spread the sheet of paper on the floor. Ask a volunteer to lie on the paper and using the felt pen, outline the pupil. Say: **This closed shape is Mark's outline. How can we measure his amount of surface?**
- ➞ Elicit shapes for covering the surface area using various uniform objects (not rectangular).
- ➞ Referring to the circles and pentagons, highlight the gaps between the shapes and ask: **Who can suggest a better shape to use?**
- ➞ Show the postcard and say: **Can you estimate how many postcards we will need?**
- ➞ Choose children to cover the outlined surface with cards, avoiding gaps or overlaps.
- ➞ Say: **How might I compare the surface of my table with a table in the lunch room/dinner hall?**
- ➞ Organise group tasks where children compare two surfaces such as desktop and cupboard shelf using appropriate covering units, e.g. exercise books or postcards. Remind children that there should be no gaps or overlaps.
- ➞ Discuss and compare results. Ask: **Which shapes are best for covering surfaces? Why?**
- ➞ Elicit a definition of the term, “area”, as a measure of the amount of surface.

Pupil Book 1:
Postcard area

28

Pupil consolidation**Resources** small squares; rectangles; circles; coins; 2.5 cm cubes; 1 cm cubes**Refresher**

Children choose three different uniform units to cover the postcard.

Practice**1–2** Children count the number of 1 cm cubes needed to cover each shape and compare areas.**3** By counting the number of squares, children find the area of shapes in square units.**Extension****Resources** coloured rods of length 2 to 5 cm; 1 cm squared grid paper

The children place some small rods on the squared grid paper to design shapes, letters of the alphabet, their first name etc. They count and colour the number of squares used to form each shape and record area in square units.

Plenary (about 10 to 15 min)

- ⇒ Ask: **How can you measure the amount of surface inside a closed shape? Which shapes might you use? Why is the square the best shape for covering surfaces?** (it fits four ways)
- ⇒ Discuss examples of flat shapes fitting together to cover surfaces, e.g. ceiling, wall or floor tiles, window panes, bricks, paving stones, fencing.
- ⇒ Refer to the resources used in the main lesson. Ask the children to suggest suitable units and estimate the amount needed to cover, say, a page of a book, a postcard, the seat of a chair, the depth of a shelf.
- ⇒ Ask: **How would you find the area of skin of a banana or an orange? What if the shape was a solid, for example, a cube or a cone or a cylinder? How might you measure the surface area of these shapes?**

Measures: (area)

Objective ● To measure and calculate the area of rectangles and other simple shapes, using counting methods and standard units (cm^2).




Vocabulary area; covers; surface; edge; square centimetres (cm^2); unit; standard unit


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


Choose an activity from Strand 5, Topic 5.1, Strand 1 or Strand 2.

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

Resources pinboards; elastic bands; OHT of a 1 cm squared grid; 1 cm cubes; 1 cm squared grid paper; pencils

- ➡  Distribute the pinboards and elastic bands to pairs of children.
- ➡ Discuss why the square is the best unit for measuring the areas of squares.
- ➡ Say: **Make the smallest square you can on your pinboard. We can say “the area of the square is one square unit”. Make a shape with an area of 4 squares. How many squares will it contain? (four) Compare your shape with your neighbour’s. Now make a shape that has an area of six squares.**
- ➡  Discuss and compare results. **Who made a rectangle? Who made a different shape?**
- ➡ Distribute the 1 cm squared grid paper and ask the children to use the grid lines to draw the closed shape that they made on their pinboard.
- ➡ Introduce the term, “square centimetre” (cm^2) as a standard unit for measuring area.
- ➡ Draw a line of 6 cm on the OHT 1 cm squared grid. Place six centicubes on the line to project a 6 cm by 1 cm rectangle. Discuss that the rectangle encloses six small squares, each of which has sides of 1 cm. Draw around and reveal the outline of the rectangle. Count the squares within the rectangle.
- ➡ Write **six square centimetres** below the rectangle and ask the children to copy it.
- ➡  Ask the children to draw three closed shapes with areas up to 16 cm^2 . Children check their partner’s work by placing centicubes within the closed shapes,
- ➡ Display a pinboard shape with an area of $4\frac{1}{2}$ squares. Discuss that the diagonal halves the square.
- ➡ Say: **Show me a pinboard shape with an area of $2\frac{1}{2}$ squares, $3\frac{1}{2}$ squares and so on.**
- ➡ Say: **On your squared paper, draw three different shapes with an area of three and a half square centimetres.**

 A transparent pinboard projected onto an overhead screen is an ideal tool for demonstration and discussion.

 Encourage the more able to extend beyond 20 cm^2 .

Pupil Book 1:
Dotty shapes

29

Pupil consolidation**Refresher**

Children find the areas of shapes on pinboards.

Practice

Resources 1 cm squared grid paper

- 1 Children draw rectangles and shapes of given areas on 1 cm squared paper.
- 2 They copy and complete partially drawn rectangles and shapes of given areas. Some examples include half square centimetres.

Support CM:
Pinboard areas

10

Support

Resources pinboard; elastic band

- 1 Children copy rectangles on to their pinboards and work out the areas.
- 2 They find three different rectangles, draw them on the dot paper and work out the areas.
- 3 They explore shapes with an area of five squares and draw three of them on the dot paper

Extension CM:
Halving pinboard areas

10

Extension

Children find different ways of halving the area of a 5 by 5 pinboard. They can join pins with straight or diagonal lines such that each half has the same area (8cm^2).

Plenary (about 10 to 15 min)

- Ask: **What have you learned about area in this lesson? Why do we say “square centimetres” when we measure a shape on the squared paper?**
- Review some of the questions in the Pupil Book, especially question 2. Ask some children to explain to the class how they worked out their answers. Look for different solutions to the torn shapes.
- Ask the children to suggest areas to measure in square centimetres. **What unit might you use to measure the area of a football pitch or a carpet for a bedroom?**

Homework CM:
Areas of shapes

10

Homework (about 20 min)**Refresher**

Children attempt question 1 only. They work out the area of each shape by counting squares and recording in standard units.

Practice

Children find the area of each shape in square centimetres and record their answers in a table. They consult the table to complete the sentences in question 2.

Measures: (area and perimeter)/Reasoning about shapes

Objectives ● To measure and calculate the area of rectangles and other simple shapes, using counting methods and standard units (cm^2). ● To measure and calculate the perimeter of rectangles and other simple shapes, using counting methods and standard units (cm). ● To solve mathematical problems or puzzles, recognise and explain patterns and relationships.


Vocabulary area; covers; surface; edge; perimeter; distance; centimetres; square centimetres (cm^2); unit; standard unit

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

Choose an activity from Strand 5, Topic 5.1, Strand 1 or Strand 2.

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

Resources interlocking square tiles; squared paper

- ➞ Ask the children to take six squares each and make a shape.
- ➞ Discuss and compare the shapes.
- ➞ Say: **Draw your shape on the sheet of squared paper and below it record the perimeter.**
- ➞ Ask: **Which unit will you use?** (centimetres) **Why?**
- ➞ The children rearrange their tiles to make a different shape. They record the shape and its perimeter.
- ➞ Discuss the closed shape and the need to count the perimeter in a systematic way. Ask: **Where should you begin to count the perimeter?** **Why is a corner the best place?** (this avoids duplication/omission of units)
- ➞ Children make and record further shapes.
- ➞ Compare the perimeters. Ask: **What do you notice about the perimeters?** (they are different lengths)
- ➞ Compare the areas. Ask: **What can you say about the area of each shape you have made?** (it is 6 cm^2 each time)
- ➞ Discuss how the same area can be different shapes and perimeters.
- ➞ Pose the problem: **Tim has 24 metres of wire netting and four corner posts to build a new run for his pet rabbit. He wants to give his rabbit as much grass as he can. What size of rectangle should he build?**
- ➞  In pairs, children investigate by drawing different rectangles with a perimeter of 24 cm.
- ➞ Discuss findings. (6 cm by 6 cm gives largest area) Ask: **How can we be sure we have found all the possible answers?**
- ➞ Make an organised list, e.g. 1 cm by 11 cm, 2 cm by 10 cm, 3 cm by 9 cm ... 11 cm by 1 cm and so on. Discuss that the regular rectangle (square) gave the largest area.

Pupil Book 1:
Shape measurement

30

Pupil consolidation**Resources** 1 cm squared grid paper; interlocking square tiles**Refresher**

Children investigate the area and perimeter of some pentominoes and find three more.

Practice

In pairs, children make rectangles by joining pentominoes. They record on squared paper and work out the areas and perimeters.

Support CM:
Looking at rectangles

11

Support

Children measure the length and width of rectangle A in centimetres and then calculate the perimeter of the shape. Questions 2, 3 and 4 require drawing rectangles which are half, double and 2 cm more than the dimensions of rectangle A and working out the respective perimeters and areas.

Extension CM:
Investigating L-shapes

11

Extension

Children explore the patterns in perimeters and areas that are produced by a series of growing L-shapes. They use the patterns to work out the area and perimeter of the 10th shape.

Plenary (about 10 to 15 min)

- ⇒ Say: **I have a 12 metre length of rope. What different rectangles can I make? Which rectangle will have the smallest/greatest area?**
- ⇒ Say: **Imagine a rectangular swimming pool. How might you explain to a friend what area is? Now imagine a football pitch. How would you explain to your friend about perimeter?**
- ⇒ Discuss the pentomino jigsaws and their solutions.
- ⇒ Choose a child who completed the Support task to state the perimeter and area of each rectangle. Ask: **What patterns do you see?**
- ⇒ Ask the children who completed the Extension activity: **Did you spot any patterns? Who found a quick way to find the answer for the 10th shape?**

Properties of numbers and number sequences

Objective ● To recognise and extend number sequences formed by counting from any number in steps of constant size (2s, 4s).

Vocabulary number; number names; digits; count; multiple; pattern; sequence; count forwards/ backwards; increase; decrease; predict; continue; count on/back; next; consecutive; rule; relationship; sort; classify; property

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

Choose an activity from Strand 1, Topic 1.2.

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

Resources number line to at least 40; large hundred square

- ➡ Count in twos from 0 to 100. Say: **These are the multiples of two.**
- ➡ Perform counting activities related to multiples of two; e.g. Say: **Start at 46; stop at 68. Start at 94; count back in twos to 56,** and so on.
- ➡ Count in twos from various start numbers; leaving out one of the numbers. Ask children to identify the number missed.
- ➡ Ask: **What are the first five multiples of 2? (2, 4, 6, 8, 10)** Record these on the board, one under the other.
- ➡ Ask: **What are the next five multiples of 2? (12, 14, 16, 18, 20)** Record these beside the first set on the board, one under the other.
- ➡ Ask: **What pattern do you notice?** (all of the units digits are even)
- ➡ Ask: **Who can tell me another number up to 100 that is a multiple of 2?** Write these on the board.
- ➡ Revise counting in multiples of 4 up to 40.
- ➡ Ask: **What are the first five multiples of 4? (4, 8, 12, 16, 20)** Record these on the board, one under the other, next to the multiples of 2.
- ➡ Ask: **What are the next five multiples of 4? (24, 28, 32, 36, 40)** Record these beside the first set on the board, one under the other.
- ➡ Ask: **What pattern do you notice?** (all of the units digits are even, they are the same as the multiples of 2 except in a different order)
- ➡ Ask: **What do you think will happen with the next set of multiples of 4?** (they have the same units digits). Record these on the board.
- ➡ Ask: **Can anyone think of a way to count in fours easily in their head?** (jump two lots of 2)
- ➡ Using this strategy and the pattern discovered, count in fours up to 100. Repeat, aiming to achieve greater confidence and speed of recall.
- ➡ Repeat the above activities counting in steps of two starting from 1.
- ➡ Ask: **What pattern do you notice?** (all of the units digits are odd)
- ➡ Count in fours starting from number 1.
- ➡ Ask: **What pattern do you notice?** (all of the units digits are odd, they are the same as multiples of two except in a different order)
- ➡ Try counting in fours starting at 2 and then starting at 3. Look at the different patterns formed with the units numbers.

⬆ Ask: **Who can think of a number that includes hundreds/ thousands that is a multiple of 2?**

⬆ Use a number line to demonstrate if necessary.

⬇ Children count in multiples of 2, but they whisper every second multiple e.g. 0, 2, 4, 6, 8, 10, 12.

Start at 1 Make jumps of 4	Start at 2 Make jumps of 4	Start at 3 Make jumps of 4
1	2	3
5	6	7
9	10	11
13	14	15
17	18	19
21	22	23
25	26	27
29	30	31
33	34	35

Pupil Book 1:
Travel numbers

31

Pupil consolidation**Refresher**

- 1 Children copy and complete the number sequences in their books.
- 2 They add 2 to each of the numbers shown and write the answer.
- 3 They add 4 to each of the numbers shown and write the answer.

Practice

- 1 Children draw tables and label as shown. Starting at the number indicated they add 4 to each number a total of ten times.
- 2 Children carefully observe the numbers in the units column of each table and answer the questions.

Support CM:
Kite counting

12

Support

- 1 Children fill in the missing numbers on the number line. Counting in twos, children draw a line from each kite to its appropriate position on the number line and write the multiple of 2 in the kite.
- 2 Counting in fours, children draw a line from each kite to its appropriate position on the number line and write the multiple of 4 in the kite.
- 3 Children colour the kites from the multiples of 2 and 4 that go to the same number.
- 4 Starting from the number shown on the bracelet, children add or subtract 2 or 4 each time as indicated.

Extension CM:
All 45

12

Extension

- 1 Starting from the number shown on the bracelet, children add or subtract 2 or 4 each time as indicated.
- 2–3 Children fill in the numbers on the grids; colouring every fourth number. They answer the questions.

Plenary (about 10 to 15 min)

- ☞ Ask: **Who can remember the pattern of units numbers when we count in fours starting from an even number?** Write **4, 8, 2, 6, 0** on the board. Show that if we start counting from a number with, e.g. 2 in the units place, the pattern starts from 2 and continues.
- ☞ Practice counting in steps of four up to about 100 from different even starting numbers.
- ☞ Ask: **Who can remember the pattern of units numbers when we count in fours starting from an odd number?** Write **1, 5, 9, 3, 7** on the board. Show that if we start counting from a number with, e.g. 9 in the units place, the pattern starts from 9 and continues.
- ☞ Practice counting in steps of four up to about 100 from different odd starting numbers.

Properties of numbers and number sequences

Objective ● To recognise and extend number sequences formed by counting from any number in steps of constant size: count on in steps of 25 to 500.

Vocabulary number; number names; tens; units; digits; count; multiple; pattern; sequence; count forwards/ backwards; increase; decrease; predict; continue; count on/back; next; consecutive; rule; relationship; sort; classify; property

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

Choose an activity from Strand 1, Topic 1.2.

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

Ask: **Who can think of a number that includes thousands which would be a multiple of 100?** (e.g. 1800, 3600, 1700)

- ➡ Revise counting forwards and backwards in multiples of 100 up to 1000 with the class. Write the numbers on the board.
- ➡ Ask: **Can you see any patterns in the numbers that have been written?** (all of the numbers have zero in the tens and units places until 1000 is reached when there are zeros in the hundreds, tens and units places)
- ➡ Ask questions such as: **What is the multiple of 100 that comes before/ after 500? What is the number that is 200/400/700 more than 200?** etc
- ➡ Revise counting in multiples of 50 up to 500 with the class. Write the numbers on the board.
- ➡ Ask: **Can you see any patterns in the numbers that have been written?** (all of the numbers have 50 or 00 in the tens and units places)
- ➡ Ask: **Why do the multiples of 50 have the same tens and units digits as the multiples of 100?** (because 50 is half of 100, or 50 add 50 is 100)
- ➡ Ask: **What is half of 50?** (25)
- ➡ Say: **Let's count in steps of twenty-five and see if the same thing occurs.** Write 25 on the board. Ask: **What is the next number in the sequence?** (50)
- ➡ Continue adding 25 to each number until 200 is reached.
- ➡ Ask: **Can you see any patterns in the numbers that have been written?** (the tens and units digits are in a repeating pattern of 25, 50, 75 and 00)
- ➡ Ask: **What are the next four multiples of 25 after 200?** (225, 250, 275, 300)
- ➡ Ask: **Does the same pattern occur?** (yes)
- ➡ Ask: **Who can tell me a number between 300 and 500 that is a multiple of 25?** (325, 350, 375, 400, 425, 450, 475, 500) Write these numbers on the board.
- ➡ Ask: **Why do the multiples of 25 have the same tens and units digits as the multiples of 50 and 100?** (because two lots of 25 is 50 and 4 lots of 25 is 100)
- ➡ Ask questions such as: **What is the multiple of 25 that comes before/ after 400/350? What is the number that is 25 more/less than 200?**
- ➡ Ask: **How can we be sure these numbers are multiples of 25?** (the numbers have 25, 50, 75 or 00 in the tens and units places)

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

Pupil Book 1:
Step multiples

32

Pupil consolidation**Refresher**

Children count forwards or backwards from the number shown on each set of stairs in steps of 25, 50 or 100 as indicated. They record each sequence in their books.

Practice

- 1 Children write the multiple of 25 that comes before each number shown.
- 2 They write the multiple of 25 that comes after each number shown.
- 3 They write multiples of 25 that fulfil the criteria in their books.

Extension CM:
Adding multiples of 25

13

Extension

Children read the information at the top of the page related to adding multiples of 25 to each other. The diagram shows the cycle formed and should be used to help with answering the questions both in the table and in the number sentences given.

Plenary (about 10 to 15 min)

- ⇒ Write about 20 numbers on the board between 1 and 500, including numbers that are multiples of 25 and some that are not, e.g. 450, 200, 130, 343, 121, using two different colours or different criteria such as circle, underline or cross.
Ask: **Who can circle a number that is a multiple of 25?**
- ⇒ Invite individual children to identify numbers.
- ⇒ Ask: **How can we be sure these numbers are multiples of 25?** (the numbers have 25, 50, 75 or 00 in the tens and units places; they are also multiples of 50 and 100)
- ⇒ Point to specific numbers, e.g. 450. Ask questions such as: **What is the multiple of 25 that comes before/after 450?** Repeat with other numbers.
- ⇒ Count as a class in steps of 25 from 0 to 500.

Homework CM:
Multiple steps

11

Homework (about 20 min)**Refresher**

Children identify and colour all of the multiples of 100, 50 and 25 as indicated.

Practice

Children count forwards or backwards from the number shown on each set of stairs in steps of 25, 50 or 100 as indicated. They record the sequence on each set of stairs.

Properties of numbers and number sequences

Objective ● To recognise odd and even numbers up to 1000, and some of their properties, including the outcome of sums or differences of pairs of odd/even numbers.

Vocabulary number; number names; tens; units; digits; count; multiple; pattern; sequence; count forwards/ backwards; increase; decrease; predict; continue; count on/back; next; consecutive; rule; relationship; sort; classify; property; odd; even

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

Choose an activity from Strand 1, Topic 1.2.

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

- ➞ Ask children to explain to the class what odd and even numbers are. (even numbers are groups of objects that can be arranged in pairs or numbers that can be split equally into two groups; odd numbers are groups of objects that when arranged in pairs have one left over)
- ➞ Ask the children to recall the even numbers to twenty and the odd numbers to twenty and write them on the board: **even: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20; odd: 1, 3, 5, 7, 9, 11, 13, 15, 17, 19.**
- ➞ Draw the children's attention to the units digit in the even numbers written. Ask: **What do you notice about all of the even numbers written so far?** Say: **All even numbers end with 0, 2, 4, 6 or 8.**
- ➞ Look at the odd numbers. Draw attention to the units digit in the odd numbers written. Ask: **What do you notice about all of the odd numbers written so far?** Say: **All odd numbers end with 1, 3, 5, 7 or 9.**
- ➞ Ask: **Can anyone tell me an even number less than 100?**
- ➞ Ask: **How can we be sure it is even?** (the units digits are 0, 2, 4, 6 or 8; or it can be split evenly into two groups)
- ➞ Ask: **Can anyone tell me an odd number less than 100?**
- ➞ Ask: **How can we be sure it is odd?** (the units digits are 1, 3, 5, 7 or 9; or it cannot be split evenly into two groups)
- ➞ Repeat for other odd and even numbers to 1000. Ask: e.g. **Who can tell me an odd number greater than 340 and less than 530?**
- ➞ Write a series of consecutive numbers on the board, e.g. **340, 341, 342 343, 344, 345, 346, 347, 348, 349, 350.**
- ➞ Ask a child to identify and circle all of the even numbers in the sequence.
- ➞ Ask: **Can anyone tell me something else about odd or even numbers by looking at this sequence?** (the numbers on both sides of even numbers are odd; every second number is either odd or even depending on which number you begin with)
- ➞ Repeat with other sequences of consecutive numbers to check.

Pupil Book 1:
Odd or even?

33

Pupil consolidation


Refresher

Odd and even numbers have been placed in groups. One number in each set is incorrect. Children copy the sequence changing the incorrect number for the correct number. They write whether each sequence is odd or even.

Practice

- 1 Children write a series of ten numbers in their books that match the statements written about odd and even numbers.
- 2 Children add combinations of three numbers from those given to determine which of the statements is correct.

Extension

-  Ask the children to investigate this question: odd numbers cannot be split evenly into two groups but can they be split evenly into three groups? Write a selection of odd numbers on the board or on number cards, e.g. 11, 15, 17, 21, 25, 27, 29, 33. Children investigate whether odd numbers can be split into three equal groups.



Game 25

Games Pack 2

Reach the summit

Plenary (about 10 to 15 min)

- ➡ Write one number on the board at a time, e.g. **751**.
- ➡ Ask: **Is this number odd or even?** (odd) Ask: **How do you know?**
- ➡ Include a variety of both odd and even numbers involving hundreds up to 1000, e.g. **654, 275, 960**.
- ➡ Ensure children can give an explanation as to why the number is odd/even.
- ➡ Using the numbers on the board, ask individual children to identify and circle numbers that fulfil certain criteria, e.g. an even number greater/less than 460; an odd number between 360 and 370.
- ➡ Go through some of the statements on the Pupil Book page, asking children to give examples they made to match the statements. In particular, ask them to give examples for the statements Even + Even = Even; and Odd + Odd = Even. Remind children that they can use this information to help them check if answers to addition calculations are correct.
- ➡ Write some examples on the board, e.g. **345 + 237 =** ; **456 + 372 =**. Ask children to consider whether the answer would be odd or even. Ask: **How do you know?** (because even + even = even and odd + odd = even)

Reasoning about numbers

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

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

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

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

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

- ⇒ Write the numbers **2, 3, 4** on the board.
- ⇒ Ask: **Can anyone tell me something about these numbers?** (they come one after the other when counting)
- ⇒ Say: **Numbers that follow each other are called consecutive numbers.** Write **consecutive** on the board.
- ⇒ Ask: **Can you give me some other examples of consecutive numbers?** Accept any appropriate examples. (e.g. 45, 46, 47) Write some of these on the board.
- ⇒ Say: **We are going to investigate which numbers can be made by adding together consecutive numbers. We can add as many numbers as we want but they must be consecutive.**
- ⇒ Write the numbers **1 to 10** on the board.
- ⇒ Demonstrate how to add together consecutive numbers, writing examples on the board. Say: **If I add 1 and 2, I get a total of 3. If I add 3 and 4 together, I get a total of 7.**
- ⇒ Ask: **Can anyone find any other totals by adding two consecutive numbers together?** Invite children to write their examples on the board.
- ⇒ Say: **I am going to add three consecutive numbers together to see if I can make some different totals. If I add 2, 3, and 4, the total is 9.**
- ⇒ Ask: **Can anyone find any other totals by adding three consecutive numbers together?** Invite children to write their examples on the board.
- ⇒ Say: **Let's see how many different totals we have found.** Write down in order all of the totals you have made by adding consecutive numbers.



This does not have to be exhaustive as the children will continue the process in the Pupil consolidation.

Pupil Book 1:
Jigsaw numbers

34

Pupil consolidation**Refresher**

Children add each set of consecutive numbers and write the number sentence and answer in their books.

Practice

- 1 Children write the numbers 1 to 20 one under the other, in their books. They investigate whether it is possible to make each of these numbers by adding consecutive numbers together.
- 2 Children write numbers 1 to 20 in a row and find all of the numbers that can be made by adding two consecutive numbers. They find all of the numbers that can be made by adding three consecutive numbers. They write any patterns found.

Extension

Children further the work done in the Practice, investigating which numbers from 21 to 30 can be made by adding together consecutive numbers.

Plenary (about 10 to 15 min)

- ➡ Go through some of the examples the children worked on independently.
- ➡ Ask: **What are consecutive numbers?** (numbers that follow each other)
- ➡ Ask the children to give examples of totals that were made by adding two or more numbers from the set of numbers 1, 2, 3, 4, 5.
- ➡ Ask: **Which numbers between 5 and 20 can you make?**
- ➡ Write the numbers 5 to 20, one under the other on the board. Invite children to write their examples next to the appropriate number.
- ➡ Ask: **Are there any numbers that can be made in more than one way?** Invite children to check their work to see if they found ways of making numbers other than those shown on the board.
- ➡ Ask: **Are there any numbers that cannot be made by adding together consecutive numbers? Why?**

Homework CM:
Consecutive numbers

12

Homework (about 20 min)**Refresher**

Children write the sequence of consecutive numbers that surround the number given.

Practice

- 1 Children find consecutive numbers that add together to match the totals.
- 2 They use two or more of the numbers 1, 2, 3, 4, 5 to see what totals can be made.

Reasoning about numbers

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

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

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

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

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

Resources sets of 0–9 number cards per child; large set of 0–9 number cards; Blu-tack

- ➞ Distribute a set of 0–9 digit cards to each child. Blu-tack the large 0–9 number cards on the side of the board.
- ➞ Say: **We are going to investigate which two-digit numbers it is possible to make using these numbers.**
- ➞ Say: **Use your number cards 0 to 9 to see what two-digit numbers you can find. You may use each number only once. Don't give your answers to anyone. I will stop you in a few minutes to see what you have found.**
- ➞ Give the children about 1 minute to work on this.
- ➞ Draw the children's attention back to the board.
- ➞ Ask: **Who would like to show us the two-digit numbers they made using the numbers 0 to 9?**
- ➞ Invite a child to the board to show their numbers.
- ➞ Ask: **Who had all of the same numbers?** (probably no-one, or very few) **Why?** (because there are so many combinations of numbers that can be made using only two digits)
- ➞ Ask: **Who can arrange their numbers in order smallest to largest?**
- ➞ Invite a child to write the numbers in the correct order on the board.
- ➞ Say: **Using each of your cards only once, make five even/odd numbers.**
- ➞ Ask: **How is it possible to make five even/odd numbers?** (for even numbers, the odd number has to appear in the tens place, the even number in the units place. The opposite occurs when making odd numbers)
- ➞ Ask: **Using each of your cards only once, can you make five multiples of 5?**
- ➞ Ask: **Is it possible to make five multiples of 5?** (no, the multiples of five end in a 0 or a 5 so it is not possible to make any more than two multiples of 5)
- ➞ Say: **Using each card only once, make the five largest two-digit numbers possible.** Ask: **Which are the five largest two-digit numbers possible?** (94, 83, 72, 61, 50)
- ➞ Say: **Using each card only once, make the largest two-digit number possible** (98)
- ➞ Ask: **Using each card only once, make the smallest two-digit number possible** (10)

i For each of the following activities, allow children about 1 to 2 minutes to sort their cards.

Pupil Book 1:
Number order

35

Pupil consolidation**Resources** a set of 0–10 number cards**Refresher**

Using the numbers 0 to 9 children make sets of three-digit numbers and arrange them in order from smallest to largest. They record their work in their books.

Practice

Using a set of 1 to 10 numbers, children make different two- and three-digit numbers according to the criteria given. They record their work in their books.

Support CM:
Number card ordering

13

Support**Resources** a set of 0–9 number cards

or

Using the numbers 0 to 9, children make sets of two-digit numbers and arrange them in order from smallest to largest and according to the other criteria given.

Extension

or

Resources a set of 0–9 number cards

Write challenge questions on the board such as, “Find pairs of numbers with: a sum of 11, and a product of 24; a sum of 14, and a product of 48; a sum of 40, and a product of 400”. Children use the number cards, if necessary, and record their work in their books.

Plenary (about 10 to 15 min)

- ☞ Go through the questions the children have worked on independently. Ask children to give sets of three-digit numbers they found. Invite individuals to order them from smallest to largest/largest to smallest.
- ☞ Ask children to identify the multiples of 5, 10, 25 and 50 that could be made using the set of number cards.
- ☞ Ask: **Why was it possible to make only two multiples of 5 and 25?** (the multiples of five end in a 0 or a 5)
- ☞ Ask: **Why was it possible to make only one multiple of 10 and 50?** (the multiples of ten end in a 0 only)
- ☞ Ask: **Would it be possible to make more multiples of each number if we could use each number card more than once?** (yes)
- ☞ Ask children to suggest two-, three- or four-digit multiples of 5, 10, 25 and 50 that could be made. Write these on the board.

Understanding multiplication and division/Rapid recall of multiplication facts/Mental calculation strategies (x)/ 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 know by heart multiplication facts for the 2, 3, 4, 5 and 10 times tables.
- To use doubling or halving, starting from known facts, to multiply by 4, double, then double again.
- To check with an equivalent calculation.

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

i 1) This lesson provides an opportunity for you to evaluate and assess the children's understanding and mastery of the times tables 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) The 4 facts beginning 1 \times , 2 \times , 5 \times , 10 \times have been referred to as the "key facts". It is important that children know these as they are used to derive the remaining number facts for each multiplication table.

3) Another strategy for calculating the 4 times table is to double the 2 times table or double, then double again.

↓ Easier examples are close to the key facts.

↑ Harder examples are further from the key facts.

\times	3	5	2	8	7	9	1	4	6	10
2										
3										
4										
5										
10										

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

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

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

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

- ➡ Revise the concept of multiplication using array cards. Place an array card with 5 rows of 3 on the board.
- ➡ Ask: **What multiplication facts can we write for this picture?** ($5 \times 3 = 15$ and $3 \times 5 = 15$) Turn the array card around to demonstrate this.
- ➡ Remind children that if they know the fact, e.g. $3 \times 5 = 15$ they also know the fact $5 \times 3 = 15$. Repeat with other array cards.
- ➡ Ask: **How could we write the fact $3 \times 5 = 15$ as an addition?** ($5 + 5 + 5 = 15$) Repeat for $5 \times 3 = 15$.
- ➡ Write **30** on the board. Ask: **How many threes make 30?** (10)
- ➡ Say: **When there is a missing number we write it like this:** $\square \times 3 = 30$.
- ➡ Write other examples on the board for the children to answer.
- ➡ Shuffle the multiplication facts cards. Ask the class as a whole and individual children to give answers. Encourage children to use the key facts to work out and occasionally to explain their answers, e.g. **Who can work out what 9×2 equals?** (18) Ask: **How did you work it out?** (because double 9 is 18; or 10×2 is 20 so 9×2 is 2 less than 20, which is 18)
- ➡ Ask e.g.: **Who can work out what 6×5 equals?** (30) Ask: **How did you work it out?** (because 5×5 is 25 so 6×5 is 5 more than 25, which is 30.)
- ➡ For the 10 times table ask: **What is the pattern?** (all the numbers have a 0 in the units place)
- ➡ Ask e.g.: **Who can work out what 4×6 equals?** (24) Ask: **How did you work it out?** (2×6 is 12 so 4×6 is double 2×6 , and double 12 is 24)
- ➡ Draw a grid on the board. Ask individual children to choose one fact to answer. Fill in the answer in the correct position.
- ➡ Continue until the grid is complete.

Pupil Book 1:
Multiplication scores

36

Pupil consolidation**Refresher**

Children write two matching addition and multiplication facts for each array in their books.

Practice

- 1 Children follow the rules for darts thrown on each dartboard. They write a multiplication fact in their books for each dart thrown.
- 2 They copy and complete the multiplication facts given.

Support CM:
Know your times tables

14

Support

- 1 Children multiply the numbers in each box by the number indicated at the top.
- 2 Children match the number fact to its answer.
- 3 They fill in the missing numbers to complete the multiplication facts.

Extension

Resources 1–12 die

In pairs, children choose a times table from those covered in the lesson to practise, preferably one that children know they need to get quicker at. They take turns to throw the die. They multiply the number on the die by the times table chosen. Repeat with other times tables.



Game 35
Game 45

Games Pack 2

Athletics arena; Happy hundred

Plenary (about 10 to 15 min)

Resources two rulers

- Revise strategies for working out the 2, 3, 4, 5 and 10 times tables by writing number facts on the board one at a time. Ask children to explain their strategy for working out the answer.
- Play the game “Gladiators”:
Write various multiples of 2, 3, 4, 5 and 10 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. 4×3 . The first child to point to the correct answer remains out the front, 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:
Revising multiplication facts

13

Homework (about 20 min)**Refresher**

Children fill in the multiples for each of the numbers given.

Practice

They fill in the missing numbers in the multiplication tables.