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Functional skills level 1 Maths guide

(for all exam boards)

STUDENT LEARNING GUIDE

BUILD THE SKILL. EXPLAIN THE METHOD. USE IT WITH CONFIDENCE.

An original student learning guide for the shared reformed Functional Skills Level 1 mathematics content in England.

31 mapped lessons	31 coached problem journeys
93 short lesson checks	Full answers with reasoning
Foundation repair pages	Charts, measuring tools and diagrams
Methods explained step by step	Common mistakes and quick checks

Name: _____

Tutor / centre: _____

Awarding organisation: _____

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INDEPENDENT EDUCATIONAL RESOURCE

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What “for all exam boards” means

This guide covers the shared reformed Functional Skills Level 1 mathematics subject content used by Ofqual-regulated awarding organisations in England. It does not mean each board has endorsed the guide or uses identical papers. The separate qualification systems used in Scotland, Wales and Northern Ireland have different requirements and are outside this guide’s curriculum claim.

The 31 numbered lesson references follow the complete Level 1 content sequence shown in the reviewed Pearson and NCFE specifications. The DfE HTML page groups some percentage statements together, so its visible numbering differs in places. The coverage map uses short topic labels rather than reproducing specification wording. [S1-S4]

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YOUR STUDENT LEARNING GUIDE

Learn the maths, one step at a time

START HERE

You do not need to understand everything before you begin. Each lesson explains one topic, shows how the method works and helps you use it in an everyday situation.

1. Read the explanation

Start with the learning goal. Read one paragraph at a time. If a word or symbol is unfamiliar, use the foundation pages or ask someone to explain it before moving on.

2. Follow the worked examples

Look at the starting information, the operation and the answer. Cover the next line and predict what should happen. Then read the explanation and check whether your reasoning matches.

3. See the maths in a real situation

The guided example shows how to choose a method, carry out the calculation and answer the original question. The mistake box explains a tempting wrong approach and how to put it right.

4. Make the idea stick

The third page adds another explained example, a useful visual where appropriate and a short summary. Focus on understanding why the steps work rather than memorising a line of calculator buttons.

5. Try a short check

Use the three checks to find out what you understand. Work on separate paper if you need space. Answers explain the method. If you make a mistake, return to the matching example and try again later.

What a good maths answer includes

State what you need to find. Choose the relevant numbers and keep their units. Show the calculation in a sensible order. Finish with an answer to the question, such as a cost, a length or a decision supported by figures. Check whether its size makes sense.

Choose a manageable starting point

Follow the numbered lessons for a complete route, or use the diagnostic to find a gap. The foundation pages explain earlier skills that Level 1 builds on. Short regular sessions are useful: learn a method, explain it aloud and return to it another day.

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Find your lesson and support

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Locate an individual lesson

The next two pages give each content point, lesson title and page range. Within each three-page lesson, the first page teaches, the second explains a real-life problem and the third builds understanding with another example and short checks. Answer pages are shown in the coverage map and on each recap page.

Use drawings well

For measured constructions, use a ruler or protractor and print at 100% or actual size. Screen sizes and “fit to page” settings can alter lengths. Angle sizes remain unchanged only under uniform resizing. Do not measure a diagram marked not to scale.

MY FIRST GOAL

I want to improve: _____
The lesson I will begin with: ____
My first review date: ____

POINTS 1-17 • FULL NUMBERING IN REVIEWED SPECIFICATIONS

Level 1 coverage map

Short labels below map the complete 31-point Level 1 sequence to this guide. The numerical references match the reviewed Pearson content table and NCFE's numbered references; DfE's current HTML presentation groups some entries. [S1-S4]

Point	Lesson focus	Teach / example / recap	Answers
1	Whole numbers to one million	15/16/17	108
2	Positive and negative numbers	18/19/20	108
3	Multiplying and dividing by 10, 100 and 1,000	21/22/23	109
4	Multiplication and division facts	24/25/26	109
5	Simple word formulae	27/28/29	110
6	Squares of numbers	30/31/32	110
7	Order of operations	33/34/35	111
8	Common fractions and mixed numbers	36/37/38	111
9	Fractions of quantities	39/40/41	112
10	Decimals to three decimal places	42/43/44	112
11	Decimal calculations to two decimal places	45/46/47	113
12	Rounding for a stated purpose	48/49/50	113
13	Reading and comparing percentages	51/52/53	114
14	Percentages of quantities and simple changes	54/55/56	114
15	Estimation with fractions and decimals	57/58/59	115
16	Equivalent fractions, decimals and percentages	60/61/62	115
17	Simple ratio and direct proportion	63/64/65	116

Knowledge used across the lessons

Number work also includes counting in steps, numerical and spatial patterns, addition, subtraction and checking strategies. See foundations on pages 10 and 14. These support the specific points rather than form an isolated optional topic.

POINTS 18-31 • FULL NUMBERING IN REVIEWED SPECIFICATIONS

Level 1 coverage map

Short labels below map the complete 31-point Level 1 sequence to this guide. The numerical references match the reviewed Pearson content table and NCFE's numbered references; DfE's current HTML presentation groups some entries. [S1-S4]

Point	Lesson focus	Teach / example / recap	Answers
18	Simple interest	66/67/68	116
19	Discounts and sale prices	69/70/71	117
20	Converting everyday units	72/73/74	117
21	Simple map and drawing scales	75/76/77	118
22	Perimeter, area and composite rectangles	78/79/80	118
23	Volume of cubes and cuboids	81/82/83	119
24	Drawing shapes, symmetry and angle size	84/85/86	119
25	Plans, elevations and nets	87/88/89	120
26	Measuring angles and describing direction	90/91/92	120
27	Tables, bar charts, pie charts and line graphs	93/94/95	121
28	Grouping discrete data	96/97/98	121
29	Mean and range	99/100/101	122
30	The probability scale	102/103/104	122
31	Simple events and equally likely outcomes	105/106/107	123

Knowledge used across the lessons

Money, time, measuring instruments, scale divisions, shape properties and compass directions build on Entry Level knowledge. Foundations on pages 11-13 and the workshops on pages 124-129 revisit them in contexts. Straightforward problems can connect two content areas. [S1-S2]

CONTENT ALIGNMENT • 13 NOVEMBER 2026

Shared content and your exam board

The shared DfE curriculum and Ofqual requirements are the basis of this cross-board teaching guide. Pearson, NCFE and City & Guilds Level 1/2 specification documents were reviewed directly. This is not an exhaustive audit of every current awarding-body handbook. [S1-S5]

Reviewed organisation	Level 1 qualification number	Evidence
Pearson Edexcel	603/4267/5	2019 Level 1/2 specification and current qualification page
NCFE	603/5055/6	Specification v2.0, August 2025; current Level 1 page
City & Guilds	603/4648/6	4748-04 handbook v1.3, August 2025

What transfers between boards

The shared maths methods and content transfer. Paper layout, total marks, section duration, calculator functions, onscreen tools, booking arrangements and access procedures must come from your own centre and awarding organisation. Other providers of the same regulated qualification use the common curriculum, but their current handbooks should be checked before assessment.

Shared assessment design

Ofqual requires 25% of total marks without a calculator and 75% with one. A different classification allocates approximately 25% to underpinning skills and 75% to problem solving, subject to the regulatory tolerance. These are not the same split: a non-calculator question can be contextual. [S2]

No universal pass mark is stated here. Use your board’s current official guidance. Do not use a historical paper’s timing, permitted equipment or boundary as a rule for every board.

COMPLETE WITH YOUR CENTRE

Awarding organisation and QN: _____
Paper or onscreen mode: _____
Section timings and approved calculator: _____
Official sample or familiarisation completed: _____
Access arrangements confirmed, if needed: _____

TRY WITHOUT NOTES • IDENTIFY GAPS

Starting-point diagnostic

Try short calculations without a calculator. Write a method where useful. This sample does not test the whole curriculum or provide an exam pass threshold. Use extra paper if needed.

1. Write 508,030 in words.

2. Order -5, 2, -1, 0.

3. Calculate 4.6 × 100.

4. Calculate 37 × 8.

5. Use cost = £5 + days × £4 for 3 days.

6. Calculate 13^2.

7. Which is greater: 2/3 or 1/2?

8. Find 3/4 of 48.

9. Calculate 7.5 - 2.85.

10. Find 15% of £80.

11. Convert 1 h 35 min to minutes.

12. Find mean and range of 2, 4, 6.

USE MISTAKES AS INFORMATION

Diagnostic answers and next steps

1. Five hundred and eight thousand and thirty.

2. -5, -1, 0, 2.

3. 460.

4. 296.

5. £17.

6. 169.

7. 2/3: 4/6 is greater than 3/6.

8. 36.

9. 4.65.

10. £12.

11. 95 minutes.

12. Mean 4, range 4.

If you need help with...	Revisit
1-4: place value,signs and calculation	Lessons 1-4; arithmetic foundation p10
5-6: word rules and squares	Lessons 5-6
7-8: fractions and quantities	Lessons 8-9
9: decimal calculation	Lessons 10-11
10: percentage amounts	Lessons 13-16
11: money/time conversions	Lesson 20 and foundation p11
12: mean and range	Lesson 29

THREE PERSONAL TARGETS

1. _____
2. _____
3. _____

A missing basic fact can make a later problem feel harder than it is. Choose the smallest repairable gap, practise it and then return to the original question.

SUPPORT FOR LESSONS 1-7

Foundation: reliable arithmetic

Addition and subtraction

Align units under units, tens under tens and decimal points under decimal points. For addition, regroup ten units as one ten when needed. For subtraction, exchange a ten for ten units when the current units are too small. Write the exchanges so each column retains the correct place value.

WORKED COLUMN IDEA

For 402 - 187,exchange through the zero tens: 402 becomes 3 hundreds,9 tens and 12 units. Then 12-7=5,9-8=1,3-1=2,so the answer is 215. Check 215+187=402.

Multiplication and division

Split a factor into useful parts: 26×14 = 26×10 + 26×4 = 260+104 = 364. For 364÷14, recognise those same multiples to recover 26. A remainder is what is left after complete equal groups, so report it in the original item unit.

Even whole numbers end in 0, 2, 4, 6 or 8;odd whole numbers end in 1, 3, 5, 7 or 9. Zero is even. Counting in twos preserves odd or even patterns;counting in ones alternates them.

Choosing an operation

Situation	Likely operation	Check
Combine separate amounts	Add	Subtract one part to recover the other
Find a gap or what remains	Subtract	Add the result back
Repeat equal-sized groups	Multiply	Divide by the group size
Share equally or count equal groups	Divide	Multiply quotient,then add remainder

Try,then check below

1. Calculate 368+257. 2. Calculate 700-286. 3. Calculate 24×17. 4. Divide 173 by 8 and interpret it as complete packs of 8 with spare items.

Answers: 625;414;408;21 complete packs with 5 items spare. If all items must be packed, use 22 packs.

SUPPORT FOR LESSONS 11,19-20 AND REAL-LIFE TASKS

Foundation: money, clocks and timetables

There are 100p in £1. Write £3.05 for three pounds and five pence;£3.50 means three pounds and fifty pence. Use £ or p consistently: 240p = £2.40. A final money answer normally shows two decimal places, including a zero in £8.50.

An analogue clock has 12 hour positions and 60 minute divisions. Each numbered step is five minutes. The short hand moves gradually between hour numbers while the long hand shows minutes. At 3:30, the short hand lies halfway between 3 and 4, not exactly at 3.

A 24-hour clock avoids am/pm ambiguity. After midday, add 12 to the hour for afternoon/evening times: 3:45pm is 15:45. Noon is 12:00;midnight is 00:00 at the start of a date. A timetable may cross midnight, so split the interval at midnight if helpful.



Analogue example: 3:30

Half past three; 15:30 in the afternoon.

The short hand is between 3 and 4.

WORKED TIME ROUTE

From 09:35 to 12:10: 25 minutes to 10:00,2 hours to 12:00,then 10 minutes. Total 2 hours 35 minutes = 155 minutes. Do not subtract the clock figures as ordinary decimals.

Useful links: 60 seconds = 1 minute;60 minutes = 1 hour;24 hours = 1 day;7 days = 1 week. A year normally has 365 days, a leap year 366. It contains 52 complete weeks plus 1 or 2 days;use 52 weeks for a simplified year only when the task specifies it. Months vary between 28 and 31 days;read the actual calendar. An average month is not automatically four weeks.

Try,then check below

1. Convert 465p to pounds. 2. Convert 7:20pm to 24-hour time. 3. Find the time from 22:50 to 00:25 next day. 4. Three items cost £2.65 each;find change from £10.

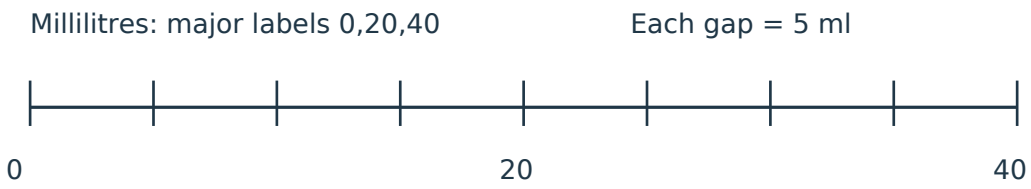
Answers: £4.65;19:20;1 hour 35 minutes;total £7.95 and change £2.05.

SUPPORT FOR LESSONS 20-23 AND 26

Foundation: measuring and reading scales

Choose a tool and unit suited to the quantity: ruler or tape for length, weighing scales for mass, measuring jug for capacity, thermometer for temperature and protractor for angles. Small objects may need millimetres or grams;journeys may use kilometres.

Find the value of an unlabelled division by subtracting two neighbouring labelled readings and dividing by the number of equal gaps. Count gaps, not tick marks. If 20 to 40 is split into four gaps, each gap represents 5. Read the unit beside the scale.



Start a ruler at its zero mark. If an object begins at a different reading, subtract the start reading from the end. An object from 2.4 cm to 8.1 cm is 5.7 cm long, not 8.1 cm. Look straight at a scale to reduce viewing error;choose the appropriate nearest division for a reading.

Read measuring jugs on a level surface. Use the stated scale and the level shown in the question. Do not assume every instrument has the same divisions. For imperial measures, stay within the given system or use only relationships supplied or learned for that task.

Try,then check below

1. A scale from 10 to 30 has five equal gaps. What is each gap? 2. An item runs from 1.8 cm to 7.3 cm. Find its length. 3. Choose suitable units for a parcel mass and a water bottle capacity.

Answers: 4 units per gap;5.5 cm;kg or g for a parcel and ml or litres for a bottle, depending on size.

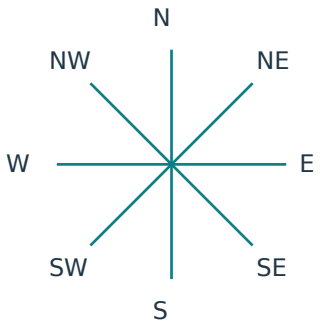
SUPPORT FOR LESSONS 21-26

Foundation: shape names and position

Shape	Useful properties
Triangle / quadrilateral	3 / 4 straight sides. A right angle is 90°.
Rectangle / square	4 right angles. Opposite sides equal;all square sides equal.
Pentagon / hexagon	5 / 6 straight sides. Regular means equal sides and equal angles.
Circle	Curved boundary;radius from centre to edge;diameter across centre.
Cube / cuboid	6 flat faces,12 edges,8 vertices. Cube faces are equal squares.
Cylinder / cone / sphere	Cylinder has two circular flat faces and a curved surface;cone has a circular base and a point;sphere has one curved surface.

An edge is where surfaces meet; a vertex is a corner. Definitions for curved edges and surfaces can vary in elementary descriptions, so use the language and diagram in the question. For cuboids, the flat-face counts are unambiguous.

Position words include above, below, beside, between, in front and behind. Compass directions give a fixed reference: north, east, south, west clockwise. Halfway between are north-east, south-east, south-west, north-west. A quarter turn moves 90°;between adjacent eight-point directions is 45°.



Clockwise: N → E → S → W

Anticlockwise reverses that order.

Sorting can use two criteria at once: for example, put shapes into groups by four sides / not four sides and right angle / no right angle. A square has four sides and right angles;an equilateral triangle has neither property.

Check: a cereal box is approximately a cuboid;a ball approximately a sphere. Facing west and turning clockwise 90° gives north.

PART OF THE LEVEL 1 NUMBER EXPECTATIONS

Foundation: numerical and spatial patterns

A numerical sequence follows an intended rule. Compare neighbouring terms to find what changes. For 7, 12, 17, 22, the difference is +5 each time, so the next terms are 27 and 32. For 80, 40, 20, 10, the rule divides by two. Test a rule on every given step before trusting it.

Patterns can cross zero: -6, -3, 0, 3 increases by three. Decimal patterns use the same idea: 1.2, 1.4, 1.6 increases by 0.2. A missing middle term should fit both its previous and following terms. Read whether the problem describes a constant step or another repeating relationship.

A spatial pattern grows by adding pieces. Count what stays fixed and what is added each time. Three rows of dots with counts 4, 7, 10 show three extra dots per stage. Draw the next stage or count forward as requested;an algebraic general formula is not necessary to explain the pattern at this level.



Stage 1: 4



Stage 2: 7



Stage 3: 10

WORKED PATTERN

A shelf holds 6 boxes after one delivery,10 after two and 14 after three. Each delivery adds 4 boxes. After four deliveries there are 18 boxes. Check the difference is 4 at each step;do not multiply every existing count by four.

Try,then check below

1. Continue 3, 9, 15 for three terms. 2. Fill the gap in 2.5, 3.0, __, 4.0. 3. A tile pattern uses 5, 9, 13 tiles in its first three stages. Find stage 4 and explain the change.

Answers: 21, 27, 33;3.5;stage 4 uses 17 tiles because four more are added each time.

LESSON 01 • UNDERSTAND • CONTENT POINT 1

Whole numbers to one million

LEARNING GOAL

Read, write, order and compare whole numbers accurately.

Place value tells you what a digit is worth. From right to left the columns are units, tens, hundreds, thousands, ten thousands, hundred thousands and millions. In 506,240 the 5 means 500,000 and the 6 means 6,000. A zero holds an empty column so later digits stay in their correct places.

To read a large number, split it into thousands and the remainder. 430,018 is four hundred and thirty thousand and eighteen. To write a number from words, build the columns rather than write separate spoken pieces beside one another. “Seven hundred and six thousand” is 706,000.

To compare numbers, first compare the number of digits when there are no unnecessary leading zeros. For equal-length numbers, compare from the left until a digit differs. Use < for less than, > for greater than and = for equal to. In an ascending list the smallest comes first.

Read labels and units with the number. A population count, a price and a distance can use the same digits but describe different things. When calculating a difference, subtract the smaller count from the larger and explain what that difference represents.

Worked examples: follow the method

1. Write “nine hundred and two thousand and forty” as 902,040. Empty hundreds and units columns still need zeros.

2. Compare 508,090 and 580,009. Both have six digits; the ten-thousands column decides. 508,090 < 580,009.

WHAT TO CHECK

Compare the largest place values first; the ending digits cannot override an earlier difference.

LESSON 01 • CHOOSE, CALCULATE, EXPLAIN

A real-life example, explained

ORIGINAL TEACHING TASK

A local survey records 245,608 visitors in one year and 254,680 the next. Identify the larger count and find the increase.

How to approach the question

1. Compare the first differing column.

2. Which subtraction gives a positive increase?

Read the planning questions, then follow the model below. Notice how each step helps answer the final question.

Model route

Step 1. 254,680 is greater: the ten-thousands digit is 5 rather than 4.

Step 2. Increase = 254,680 - 245,608 = 9,072 visitors. Check by adding 9,072 to the first count.

Misconception clinic

“The first count is larger because it ends in 608, and 608 is larger than 680.”

Compare the largest place values first; the ending digits cannot override an earlier difference.

What this example teaches you

Read, write, order and compare whole numbers accurately. The important connection is between the information given, the operation chosen and the meaning of the answer. Compare the result with the original question before finishing.

LEARNING TIP

Cover the model route and describe the method aloud. You can use a different valid method if you explain it clearly and reach a sensible answer.

LESSON 01 • EXPLAINED RECAP AND QUICK CHECK

Build your understanding

Why the method works

Place value describes groups of ten. A digit's position tells you whether it represents units, tens, hundreds or a larger group. Compare numbers from the left because a difference in the largest place outweighs every smaller place.

Another example, step by step

Compare 406,090 and 460,009. Both have 4 hundred-thousands. At the next place, the first has 0 ten-thousands and the second has 6. Therefore 406,090 is smaller. You do not need to compare the remaining digits.

REMEMBER

Zeros hold empty places. Read and compare the value of each place, not just the digits that appear.

Check your understanding

Try these without looking at the examples. Use separate paper for working or drawings.

1. Write seven hundred and four thousand and sixty in figures.
2. Order 89,090; 98,009; 89,900; 90,089 from smallest to largest.
3. A total rises from 168,450 to 173,025. Find the increase and check it.

Explained answers: page 108. If a check is difficult, reread the worked example before trying again.

LESSON 02 • UNDERSTAND • CONTENT POINT 2

Positive and negative numbers

LEARNING GOAL

Use signed values in temperatures, balances and number sequences.

Zero separates positive and negative numbers. On a number line values increase to the right. Negative values appear to the left of zero; -2 is greater than -8 because -2 is further right. A minus sign may show a temperature below zero or an account below a zero balance.

Adding a positive amount moves right; subtracting a positive amount moves left. From -5, a rise of 8 reaches 3. You can count five steps to zero and three more. The distance travelled is eight even though the start and finish use different signs.

Count in equal steps through zero as well as above it. Starting at -9 and adding 3 repeatedly gives -9, -6, -3, 0, 3. Read whether a sequence rises or falls and keep the step consistent. A negative sign belongs to the value, not to a separate label.

When a question asks for a difference in temperature, it usually wants a positive gap. When it asks for the change, include direction: a rise of 7°C or a fall of 7°C. State what the result means rather than leave an unexplained sign.

Worked examples: follow the method

1. Order -4, 2, -11, 0: -11, -4, 0, 2.

2. A freezer changes from -13°C to -6°C. It warms by 7°C; counting towards zero verifies the gap.

WHAT TO CHECK

The later changes may cross zero. Calculate the whole sequence before interpreting the final sign.

LESSON 02 • CHOOSE, CALCULATE, EXPLAIN

A real-life example, explained

ORIGINAL TEACHING TASK

An account starts at -£28. A £65 payment arrives and £19 is spent. Find the final balance and whether it is above zero.

How to approach the question

1. Use the events in their stated order.
2. Does spending move the balance left or right?

Read the planning questions, then follow the model below. Notice how each step helps answer the final question.

Model route

Step 1. -28 + 65 = £37 after the payment.

Step 2. £37 - £19 = £18. The positive result means £18 remains above zero.

Misconception clinic

“A negative start means the final balance must stay negative.”

The later changes may cross zero. Calculate the whole sequence before interpreting the final sign.

What this example teaches you

Use signed values in temperatures, balances and number sequences. The important connection is between the information given, the operation chosen and the meaning of the answer. Compare the result with the original question before finishing.

LEARNING TIP

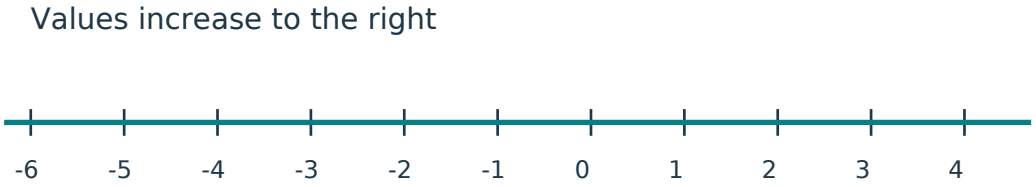
Cover the model route and describe the method aloud. You can use a different valid method if you explain it clearly and reach a sensible answer.

LESSON 02 • EXPLAINED RECAP AND QUICK CHECK

Build your understanding

Why the method works

A negative number represents a position below a chosen zero, such as a debt or a temperature below freezing. Moving right on a number line increases the value, even while the number is still negative.



Another example, step by step

The temperature rises from -6°C to 4°C. It rises 6 degrees to reach zero, then another 4 degrees. The increase is 10°C. This is a change in temperature; the final temperature is 4°C.

REMEMBER

For signed values, distinguish the starting value, the change and the final value.

Check your understanding

Try these without looking at the examples. Use separate paper for working or drawings.

1. Order -6, 3, -1, -9, 0.
2. Continue the sequence -8, -4, 0 for three more terms.
3. A reading of -7°C rises by 12°C, then falls by 4°C. Find the final reading.

Explained answers: page 108. If a check is difficult, reread the worked example before trying again.

LESSON 03 • UNDERSTAND • CONTENT POINT 3

Multiplying and dividing by 10, 100 and 1,000

LEARNING GOAL

Use place-value shifts without changing the order of the digits.

Multiplying by ten makes each digit worth ten times as much: its place moves one column to the left. Multiplying by 100 moves two columns and by 1,000 three. Digits keep their order. The decimal point stays between the units and tenths columns in a place-value chart.

Dividing by ten reverses the move: digits become worth one tenth as much and move one column right. Division by 100 or 1,000 moves two or three columns. Insert zeros where an empty place must be shown. A whole number can become a decimal when divided.

“Add a zero” is only a limited shortcut for multiplying whole numbers by ten. It does not correctly describe 3.7 × 10, which is 37, not 3.70. Use place value so the method works for decimals too.

Check direction before writing an answer. Multiplying a positive value by 100 makes it larger; dividing makes it smaller. Count the moves carefully and read the result aloud if it helps detect a misplaced zero.

Worked examples: follow the method

1. 4.26 × 100 = 426: hundredths become units, tenths become tens and units become hundreds.

2. 58 ÷ 1,000 = 0.058. The 5 is now five hundredths and the 8 eight thousandths.

WHAT TO CHECK

Trailing zeros after a decimal do not change its value. Multiplication by 100 must make this positive mass 100 times larger.

LESSON 03 • CHOOSE, CALCULATE, EXPLAIN

A real-life example, explained

ORIGINAL TEACHING TASK

A box holds 100 identical parts. Each part has mass 0.24 kg. Find the total mass. The total is then shared equally into 10 smaller boxes. Find mass in each.

How to approach the question

1. Which operation combines 100 identical masses?

2. What does dividing the combined mass by 10 represent?

Read the planning questions, then follow the model below. Notice how each step helps answer the final question.

Model route

Step 1. 100 × 0.24 = 24 kg.

Step 2. 24 ÷ 10 = 2.4 kg per smaller box. Check 10 × 2.4 = 24 kg.

Misconception clinic

“0.24 × 100 = 0.2400.”

Trailing zeros after a decimal do not change its value. Multiplication by 100 must make this positive mass 100 times larger.

What this example teaches you

Use place-value shifts without changing the order of the digits. The important connection is between the information given, the operation chosen and the meaning of the answer. Compare the result with the original question before finishing.

LEARNING TIP

Cover the model route and describe the method aloud. You can use a different valid method if you explain it clearly and reach a sensible answer.

LESSON 03 • EXPLAINED RECAP AND QUICK CHECK

Build your understanding

Why the method works

Multiplying by ten makes each digit worth ten times as much, so it occupies the next larger place. Dividing by ten reverses that change. The decimal point separates whole units from fractional units.

Another example, step by step

For 3.47×100, the 3 units become 3 hundreds, the 4 tenths become 4 tens and the 7 hundredths become 7 units: 347. Reverse the process: 347÷100 = 3.47. This inverse calculation checks the result.

REMEMBER

Use place value. A rule about adding zeros does not explain decimal calculations reliably.

Check your understanding

Try these without looking at the examples. Use separate paper for working or drawings.

1. Calculate 6.35 × 10 and 6.35 × 100.

2. Calculate 470 ÷ 100 and 2.8 ÷ 1,000.

3. One item costs £0.85. Find cost of 100 items, then the cost per person when 10 people share equally.

Explained answers: page 109. If a check is difficult, reread the worked example before trying again.

LESSON 04 • UNDERSTAND • CONTENT POINT 4

Multiplication and division facts

LEARNING GOAL

Use number facts and efficient written methods to calculate and check.

Multiplication counts equal groups. If eight groups contain six items each, there are 8 × 6 = 48 items. The same array can be read as six groups of eight, so multiplication can be reversed. Division reverses grouping: 48 ÷ 8 = 6 and 48 ÷ 6 = 8.

Learn the facts from 0 to 12 and connect them to larger calculations. Knowing 7 × 8 = 56 helps with 70 × 8 = 560. Use doubles, halves and nearby easy facts: 9 × 6 = 10 × 6 - 6. When one factor changes, explain how the product changes.

For a written product, split a number into tens and units. 34 × 16 = 34 × 10 + 34 × 6. For division, use known multiples to build the quotient and record any remainder. In context, a remainder may require one more pack or may mean spare items.

Check multiplication using division or a second decomposition. Check division using quotient × divisor plus remainder. A calculator is helpful only when the entries are correct; write intermediate values so the route can be checked.

Worked examples: follow the method

1. 27 × 14 = 270 + 108 = 378.

2. 157 ÷ 12 = 13 remainder 1. Check 13 × 12 + 1 = 157.

WHAT TO CHECK

The remainder counts badges, not packets. One additional packet can hold both remaining badges.

LESSON 04 • CHOOSE, CALCULATE, EXPLAIN

A real-life example, explained

ORIGINAL TEACHING TASK

A club has 146 badges to put into packets of 12. Find complete packets and badges left over. If every badge must be packed, find packets needed.

How to approach the question

1. Which multiple of 12 is just below 146?

2. Does the last partly filled packet still count?

Read the planning questions, then follow the model below. Notice how each step helps answer the final question.

Model route

Step 1. 12 × 12 = 144. There are 12 complete packets and 2 badges left.

Step 2. To pack all badges, use 13 packets. Check that 12 packets have space for only 144.

Misconception clinic

“A remainder of 2 means buy two extra packets.”

The remainder counts badges, not packets. One additional packet can hold both remaining badges.

What this example teaches you

Use number facts and efficient written methods to calculate and check. The important connection is between the information given, the operation chosen and the meaning of the answer. Compare the result with the original question before finishing.

LEARNING TIP

Cover the model route and describe the method aloud. You can use a different valid method if you explain it clearly and reach a sensible answer.

LESSON 04 • EXPLAINED RECAP AND QUICK CHECK

Build your understanding

Why the method works

Multiplication combines equal groups. Division either shares a total equally or finds how many equal groups fit. The same fact family links the two operations and helps you check an answer.

Another example, step by step

Calculate 28×15 by splitting 15 into 10 and 5: 28×10 = 280 and 28×5 = 140. Add 280+140 = 420. Check by dividing 420 by 15: the result is 28. Both parts of the split must be included.

REMEMBER

A remainder must be interpreted. Leftover items, complete groups and the number of containers needed can give different final answers.

Check your understanding

Try these without looking at the examples. Use separate paper for working or drawings.

1. Use 8 × 7 = 56 to state two division facts.

2. Calculate 46 × 18 without a calculator.

3. There are 215 seats needed and 30 seats per vehicle. Find vehicles required and unused seats.

Explained answers: page 109. If a check is difficult, reread the worked example before trying again.

LESSON 05 • UNDERSTAND • CONTENT POINT 5

Simple word formulae

LEARNING GOAL

Identify inputs and follow one-step or two-step word rules.

A formula describes a relationship between quantities. A word formula might say total price = number of tickets × price per ticket. Each named quantity has a meaning and often a unit. Write the rule before putting numbers into it.

For a one-step rule, identify the operation and inputs. For a two-step rule, decide which quantity must be calculated first. “Charge = booking fee + hours × hourly price” means calculate the hourly part before adding the fee. A fixed fee is paid once, not once per hour.

Replace every input with the stated value and keep units consistent. A rule using hours needs hours, not an unconverted number of minutes. Write enough working that another person can see which value belongs to which quantity.

Check by thinking about the relationship. If the number of tickets doubles while the ticket price stays the same, their total cost doubles. A fixed booking fee does not double unless a second booking is made. A formula is useful because the same rule works with different inputs.

Worked examples: follow the method

1. Total wages = hours worked × rate per hour. At 6 hours and £12 per hour: wages = 6 × 12 = £72.

2. Hire cost = £9 booking fee + days × £7. For 4 days: £9 + 4 × £7 = £37.

WHAT TO CHECK

The £6 is a single delivery charge. Multiplying it by eight would charge for eight deliveries.

LESSON 05 • CHOOSE, CALCULATE, EXPLAIN

A real-life example, explained

ORIGINAL TEACHING TASK

A delivery rule is total cost = £6 fixed charge + number of boxes × £3.50. A customer orders 8 boxes. Find the cost and change from £40.

How to approach the question

1. Calculate the charge that repeats for each box.
2. Add the fixed charge once.

Read the planning questions, then follow the model below. Notice how each step helps answer the final question.

Model route

Step 1. Box charge = 8 × £3.50 = £28.

Step 2. Total = £28 + £6 = £34. Change = £40 - £34 = £6.

Misconception clinic

“Each box costs £6 + £3.50, so multiply £9.50 by 8.”

The £6 is a single delivery charge. Multiplying it by eight would charge for eight deliveries.

What this example teaches you

Identify inputs and follow one-step or two-step word rules. The important connection is between the information given, the operation chosen and the meaning of the answer. Compare the result with the original question before finishing.

LEARNING TIP

Cover the model route and describe the method aloud. You can use a different valid method if you explain it clearly and reach a sensible answer.

LESSON 05 • EXPLAINED RECAP AND QUICK CHECK

Build your understanding

Why the method works

A word formula is a rule written using named quantities. Replace each quantity with its value, keeping the order and units. A fixed charge is added once; a charge per item is multiplied by the number of items.

Another example, step by step

A hire rule is cost = £9 + hours×£4. For 5 hours, first calculate 5×£4 = £20. Then add the fixed £9: total £29. Calculating (9+5)×4 would charge the fixed fee four times, which the rule does not say.

REMEMBER

Read the meaning of the rule before using it. A word formula usually contains one or two linked operations.

Check your understanding

Try these without looking at the examples. Use separate paper for working or drawings.

1. Use total cost = quantity × price to find 7 items at £4 each.

2. Use charge = £12 + hours × £5 for 3 hours.

3. Use total pay = ordinary pay + bonus. Ordinary pay is £84 and bonus £15. Find total and check by subtraction.

Explained answers: page 110. If a check is difficult, reread the worked example before trying again.

LESSON 06 • UNDERSTAND • CONTENT POINT 6

Squares of numbers

LEARNING GOAL

Calculate a square as a number multiplied by itself.

The square of a number is the result of multiplying it by itself. We write 6^2 for $6 \times 6 = 36$. The small raised 2 is an index telling us to use two identical factors; it does not mean multiply the number by two.

Squares can describe square arrays. A square with side length 5 units contains five rows of five unit squares, so its area is 25 square units. This explains both the name and the square-unit notation. An area is different from a boundary length.

Know the one-digit square facts, then use multiplication for two-digit numbers. For 14^2, calculate $14 \times 14 = 14 \times 10 + 14 \times 4$. Do not square the tens and units separately and add; $10^2 + 4^2$ does not include all the parts of the product.

Check a two-digit square against nearby easy squares. 19^2 is below $20^2 = 400$ and above $18^2 = 324$. This does not verify every digit, but it helps catch an answer with the wrong size. Use written multiplication or the approved calculator when allowed.

Worked examples: follow the method

1. $9^2 = 9 \times 9 = 81$, whereas $9 \times 2 = 18$.

2. $23^2 = 23 \times 20 + 23 \times 3 = 460 + 69 = 529$.

WHAT TO CHECK

That calculates double 16. A square uses two factors of 16: 16×16.

LESSON 06 • CHOOSE, CALCULATE, EXPLAIN

A real-life example, explained

ORIGINAL TEACHING TASK

A square display contains 16 rows of 16 lights. Find the number of lights. Another has 15 rows of 15. How many more lights are on the first?

How to approach the question

1. Write each count as a square.

2. Subtract the smaller product from the larger.

Read the planning questions, then follow the model below. Notice how each step helps answer the final question.

Model route

Step 1. $16^2 = 256$ and $15^2 = 225$.

Step 2. The first has 256 - 225 = 31 more lights. Check 225 + 31 = 256.

Misconception clinic

“16^2 is 32.”

That calculates double 16. A square uses two factors of 16: 16 × 16.

What this example teaches you

Calculate a square as a number multiplied by itself. The important connection is between the information given, the operation chosen and the meaning of the answer. Compare the result with the original question before finishing.

LEARNING TIP

Cover the model route and describe the method aloud. You can use a different valid method if you explain it clearly and reach a sensible answer.

LESSON 06 • EXPLAINED RECAP AND QUICK CHECK

Build your understanding

Why the method works

Squaring multiplies a number by itself. It does not multiply the number by two. The word square links the calculation to an array with the same number of rows and columns.

Another example, step by step

A square display has 14 rows with 14 tiles in each row. Its tile count is $14^2 = 14 \times 14$. Split the second 14 into 10 and 4: $140 + 56 = 196$ tiles. Doubling 14 would give 28, a different operation.

REMEMBER

Read the small raised 2 as squared. For a two-digit square, use multiplication rather than guessing from the last digit.

Check your understanding

Try these without looking at the examples. Use separate paper for working or drawings.

1. Calculate 7^2 and 8^2.
2. Calculate 12^2 using a written method.
3. A square arrangement has 25 rows of 25 seats. Find the total and explain what 25^2 means.

Explained answers: page 110. If a check is difficult, reread the worked example before trying again.

LESSON 07 • UNDERSTAND • CONTENT POINT 7

Order of operations

LEARNING GOAL

Evaluate calculations with brackets and operations in a consistent order.

An expression is a calculation written using numbers and operation symbols. Everyone needs the same rules to interpret it. Work inside brackets first. Then deal with powers such as squares, then multiplication and division, and finally addition and subtraction.

Multiplication and division have equal priority: work from left to right within that level. Addition and subtraction also have equal priority. A remembered acronym must not be used to put all multiplication before every division or all addition before every subtraction.

Write an intermediate expression after each stage. For 18 - 3 × 4, first replace 3 × 4 with 12, then calculate 18 - 12 = 6. Brackets change the grouping: (18 - 3) × 4 = 60. The same numbers can therefore give different correct results under different expressions.

In a context, a word rule or a diagram helps you decide the grouping. If three items cost £4 each and delivery is £2, the cost is 3 × 4 + 2. Write the structure before entering it into a calculator; calculator buttons do not choose the intended model for you.

Worked examples: follow the method

1. 7 + 2 × 5 = 7 + 10 = 17.

2. 24 ÷ 6 × 2 = 4 × 2 = 8, working left to right.

WHAT TO CHECK

Only operations of equal priority work left to right. A multiplication must be completed before an earlier addition unless brackets say otherwise.

LESSON 07 • CHOOSE, CALCULATE, EXPLAIN

A real-life example, explained

ORIGINAL TEACHING TASK

A centre buys 5 packs at £6 each and pays £4 delivery once. A learner writes (5 + 4) × 6. Find the correct total and explain the error.

How to approach the question

1. Which amount repeats five times?
2. Which charge is added once?

Read the planning questions, then follow the model below. Notice how each step helps answer the final question.

Model route

Step 1. Correct expression: 5 × £6 + £4 = £34.

Step 2. The proposed expression treats the £4 delivery as four extra £6 packs. It does not match the quantities.

Misconception clinic

“Always work every calculation from left to right.”

Only operations of equal priority work left to right. A multiplication must be completed before an earlier addition unless brackets say otherwise.

What this example teaches you

Evaluate calculations with brackets and operations in a consistent order. The important connection is between the information given, the operation chosen and the meaning of the answer. Compare the result with the original question before finishing.

LEARNING TIP

Cover the model route and describe the method aloud. You can use a different valid method if you explain it clearly and reach a sensible answer.

LESSON 07 • EXPLAINED RECAP AND QUICK CHECK

Build your understanding

Why the method works

Operation order gives a shared way to interpret a calculation. Brackets say which part belongs together. Multiplication and division have equal priority; addition and subtraction also have equal priority.

Another example, step by step

Compare 18-6÷3 with (18-6)÷3. In the first, divide first: 6÷3 = 2, then 18-2 = 16. In the second, the brackets give 12, then 12÷3 = 4. The same numbers give different results because the grouping differs.

REMEMBER

Within a pair of equal-priority operations, work from left to right. Brackets can change the meaning.

Check your understanding

Try these without looking at the examples. Use separate paper for working or drawings.

1. Calculate 8 + 3 × 6.
2. Calculate (20 - 8) ÷ 4 + 5.
3. A bill is 4 × £7 + £3. Find it, then explain why (4 + 3) × £7 is different.

Explained answers: page 111. If a check is difficult, reread the worked example before trying again.

LESSON 08 • UNDERSTAND • CONTENT POINT 8

Common fractions and mixed numbers

LEARNING GOAL

Read and compare fractional shares using equivalent parts.

A fraction names equal parts of a whole. The denominator, below the line, tells how many equal parts make one whole. The numerator, above, counts how many parts are used. In 3/5, the whole is split into five equal parts and three are counted.

Equivalent fractions name the same share. Multiply or divide the numerator and denominator by the same positive number: 1/2 = 2/4 = 5/10. A proper fraction is below one. An improper fraction is at least one; a mixed number combines a whole number with a fractional part.

To convert 2 1/4 to an improper fraction, count two whole groups of four quarters and one extra quarter: 9/4. To reverse it, divide 9 by 4, giving two wholes and one quarter. Use these forms to compare quantities that extend beyond one whole.

Compare common fractions using diagrams, a common denominator or benchmark halves and quarters. A larger denominator does not guarantee a larger fraction: 1/8 is less than 1/4 because each eighth is smaller. Compare shares of the same whole or match the units first.

Worked examples: follow the method

1. 3/4 = 6/8, so 3/4 > 5/8.

2. 1 2/3 = 5/3. It lies between 1 and 2.

WHAT TO CHECK

A denominator alone is not enough when numerators differ. Convert both fractions to equal-sized parts.

LESSON 08 • CHOOSE, CALCULATE, EXPLAIN

A real-life example, explained

ORIGINAL TEACHING TASK

Two equal-sized containers are 3/4 full and 5/6 full. Which holds the larger share, and how can equal-sized parts show this?

How to approach the question

1. Choose a denominator shared by 4 and 6.

2. Keep the containers the same size when comparing shares.

Read the planning questions, then follow the model below. Notice how each step helps answer the final question.

Model route

Step 1. 3/4 = 9/12 and 5/6 = 10/12.

Step 2. The 5/6 container holds the larger share, by one twelfth of a full container.

Misconception clinic

“Three quarters is greater because 4 is smaller than 6.”

A denominator alone is not enough when numerators differ. Convert both fractions to equal-sized parts.

What this example teaches you

Read and compare fractional shares using equivalent parts. The important connection is between the information given, the operation chosen and the meaning of the answer. Compare the result with the original question before finishing.

LEARNING TIP

Cover the model route and describe the method aloud. You can use a different valid method if you explain it clearly and reach a sensible answer.

LESSON 08 • EXPLAINED RECAP AND QUICK CHECK

Build your understanding

Why the method works

A fraction describes equal parts of a whole. Equivalent fractions rename the same share using smaller or larger equal parts. This lets you compare fractions without changing their values.



Another example, step by step

Compare 3/4 and 5/8 using eighths. Each quarter is two eighths, so 3/4 = 6/8. Six eighths is greater than five eighths, therefore 3/4 is greater. The comparison assumes both fractions refer to the same-sized whole.

REMEMBER

A larger denominator means smaller individual parts when the whole stays the same. Compare equal wholes and equal-sized parts.

Check your understanding

Try these without looking at the examples. Use separate paper for working or drawings.

1. Write two fractions equivalent to 1/2.
2. Convert 11/4 to a mixed number.
3. Order 1/2, 3/4 and 2/3, showing a common denominator.

Explained answers: page 111. If a check is difficult, reread the worked example before trying again.

LESSON 09 • UNDERSTAND • CONTENT POINT 9

Fractions of quantities

LEARNING GOAL

Find a fractional amount by calculating one equal part first.

To find a fraction of an amount, divide by the denominator to get one part, then multiply by the numerator. For 3/8 of 40, one eighth is 40 ÷ 8 = 5 and three eighths are 3 × 5 = 15. The denominator decides the size of a part, not the number of parts selected.

The method works with counts, money and measurements. Keep the original unit with the result. One quarter of £60 is £15; one quarter of 60 cm is 15 cm. A fraction is a multiplier describing the share; it does not change the type of quantity.

Check a proper-fraction result is no larger than its whole. If the share is more than half, its value should be more than half the whole. For quantities that cannot be split, use examples whose stated fraction gives a whole-number count, or interpret the remainder as the question requires.

To find what is left, subtract the used share from the original quantity or find the complementary fraction. If 2/5 is used, 3/5 remains. Do not take the remaining fraction from the smaller used amount; it still refers to the original whole.

Worked examples: follow the method

1. 5/6 of 72 = 72 ÷ 6 × 5 = 60.

2. A 48 m roll has 3/4 used: 36 m used and 12 m left.

WHAT TO CHECK

The denominator is the number of equal groups. Divide by eight first; the reversed calculation would exceed the whole.

LESSON 09 • CHOOSE, CALCULATE, EXPLAIN

A real-life example, explained

ORIGINAL TEACHING TASK

A course has 56 learners. Three eighths attend on Monday. Everyone else attends on Tuesday. Find both attendance numbers and check the total.

How to approach the question

1. Find one eighth of 56.

2. Which part of the class remains after Monday?

Read the planning questions, then follow the model below. Notice how each step helps answer the final question.

Model route

Step 1. 56 ÷ 8 = 7, so Monday has 3 × 7 = 21 learners.

Step 2. Tuesday has 56 - 21 = 35. Check 21 + 35 = 56; Tuesday is the remaining 5/8.

Misconception clinic

“3/8 of 56 means 56 ÷ 3 × 8.”

The denominator is the number of equal groups. Divide by eight first; the reversed calculation would exceed the whole.

What this example teaches you

Find a fractional amount by calculating one equal part first. The important connection is between the information given, the operation chosen and the meaning of the answer. Compare the result with the original question before finishing.

LEARNING TIP

Cover the model route and describe the method aloud. You can use a different valid method if you explain it clearly and reach a sensible answer.

LESSON 09 • EXPLAINED RECAP AND QUICK CHECK

Build your understanding

Why the method works

The denominator tells you how many equal groups make the whole. Dividing by it finds one group. The numerator tells you how many of those groups you need.

Another example, step by step

Find 5/6 of 72 seats. One sixth is 72÷6 = 12 seats. Five sixths is 12×5 = 60 seats. The unused sixth contains 12 seats, and 60+12 = 72 checks the whole.

REMEMBER

Divide by the denominator, then multiply by the numerator. Keep the answer in the quantity's original unit.

Check your understanding

Try these without looking at the examples. Use separate paper for working or drawings.

1. Find 2/3 of 45.
2. Find 5/8 of £96.
3. A 70 kg stock has 3/5 used. Find mass used and left.

Explained answers: page 112. If a check is difficult, reread the worked example before trying again.

LESSON 10 • UNDERSTAND • CONTENT POINT 10

Decimals to three decimal places

LEARNING GOAL

Read, write and compare tenths, hundredths and thousandths.

Decimals extend place value to the right of the units column. The first position is tenths, the second hundredths and the third thousandths. In 6.275, the digits mean six units, two tenths, seven hundredths and five thousandths.

A zero can hold an empty decimal place. 0.04 is four hundredths, whereas 0.4 is four tenths and ten times as large. Trailing zeros do not change the value: 3.5 = 3.50 = 3.500. Zeros between the decimal point and a non-zero digit do affect its place.

To compare decimals, align their decimal points and add trailing zeros so every comparison has the same columns. Compare from the largest place value towards the smallest. Do not compare the decimal portions as if they were separate whole numbers.

Measurements may be recorded to different precisions. Keep a full recorded value when comparing a close limit; only round when requested. If the unit is money in pounds, a thousandth of a pound is not a whole penny, so a final payment normally needs two decimal places.

Worked examples: follow the method

1. Order 2.06, 2.6, 2.006 as 2.006, 2.060, 2.600.

2. In 0.308 the 3 is worth 0.3 and the 8 is worth 0.008.

WHAT TO CHECK

Compare aligned place values: 1.150 is larger than 1.095. The first differing decimal column is tenths.

LESSON 10 • CHOOSE, CALCULATE, EXPLAIN

A real-life example, explained

ORIGINAL TEACHING TASK

Three parcels have masses 1.095 kg,1.15 kg and 1.009 kg. A shelf limit is 1.100 kg per parcel. Order the parcels and identify which meet the limit.

How to approach the question

1. Write every value to three decimal places.

2. “At most” includes equality with the limit.

Read the planning questions, then follow the model below. Notice how each step helps answer the final question.

Model route

Step 1. Ascending: 1.009, 1.095, 1.150 kg.

Step 2. The first two are at or below 1.100 kg. The 1.150 kg parcel exceeds it by 0.050 kg.

Misconception clinic

“1.15 is below 1.095 because 15 is below 95.”

Compare aligned place values: 1.150 is larger than 1.095. The first differing decimal column is tenths.

What this example teaches you

Read, write and compare tenths, hundredths and thousandths. The important connection is between the information given, the operation chosen and the meaning of the answer. Compare the result with the original question before finishing.

LEARNING TIP

Cover the model route and describe the method aloud. You can use a different valid method if you explain it clearly and reach a sensible answer.

LESSON 10 • EXPLAINED RECAP AND QUICK CHECK

Build your understanding

Why the method works

Decimals extend place value to parts smaller than one. Tenths, hundredths and thousandths are successive divisions by ten. Zeros at the end can make the places easier to compare without changing value.

Another example, step by step

Compare 2.305 and 2.35. Write the second as 2.350. Units and tenths match. At the hundredths place, 0 is smaller than 5, so 2.305 is smaller. Counting the number of decimal digits would give an unreliable comparison.

REMEMBER

Align decimal places and compare from the largest place. More decimal digits do not necessarily mean a larger value.

Check your understanding

Try these without looking at the examples. Use separate paper for working or drawings.

1. Give the value of 7 in 4.073.
2. Order 0.48, 0.408, 0.084.
3. Which is larger, 5.09 or 5.090? Explain.

Explained answers: page 112. If a check is difficult, reread the worked example before trying again.

LESSON 11 • UNDERSTAND • CONTENT POINT 11

Decimal calculations to two decimal places

LEARNING GOAL

Add, subtract, multiply and divide decimal inputs accurately.

For decimal addition and subtraction, align decimal points so like place values match. Add trailing zeros where helpful. In 8.4 - 2.75, write 8.40 - 2.75. The decimal point in the answer remains aligned with the inputs.

For written multiplication, calculate with whole numbers first and then restore the combined number of decimal places. 1.2 × 0.35 uses three decimal places altogether: 12 × 35 = 420 gives 0.420 = 0.42. The inputs can each have up to two decimal places even when the exact product has more.

For division by a decimal, scale both dividend and divisor by the same power of ten until the divisor is whole. 6.48 ÷ 0.12 becomes 648 ÷ 12. Scaling both equally preserves how many groups fit; scaling only one changes the answer.

Use an estimate to check size. Multiplying a positive amount by a number below one makes it smaller; dividing by a positive number below one makes it larger. A money answer should be written to two decimal places when giving a final payment.

Worked examples: follow the method

1. £14.60 + £3.85 = £18.45.

2. 4.2 ÷ 0.6 = 42 ÷ 6 = 7.

WHAT TO CHECK

The decimal placement is determined by place value, not by the number of digits displayed. £14.1 and £14.10 have the same value.

LESSON 11 • CHOOSE, CALCULATE, EXPLAIN

A real-life example, explained

ORIGINAL TEACHING TASK

A shop sells 6 notebooks at £2.35 each. A customer pays £20. Find the total and change.

How to approach the question

1. Multiply the price by the number bought.
2. Subtract the total from the payment, not the other way round.

Read the planning questions, then follow the model below. Notice how each step helps answer the final question.

Model route

Step 1. 6 × £2.35 = £14.10.

Step 2. £20.00 - £14.10 = £5.90. Check £14.10 + £5.90 = £20.00.

Misconception clinic

“6 × £2.35 = £14.1, so the answer must be £1.41.”

The decimal placement is determined by place value, not by the number of digits displayed. £14.1 and £14.10 have the same value.

What this example teaches you

Add, subtract, multiply and divide decimal inputs accurately. The important connection is between the information given, the operation chosen and the meaning of the answer. Compare the result with the original question before finishing.

LEARNING TIP

Cover the model route and describe the method aloud. You can use a different valid method if you explain it clearly and reach a sensible answer.

LESSON 11 • EXPLAINED RECAP AND QUICK CHECK

Build your understanding

Why the method works

Addition and subtraction combine the same kinds of units, so decimal points must line up. Multiplication changes the size of groups; division can use an equivalent calculation with a whole-number divisor.

Another example, step by step

Calculate £8.20-£3.75. Subtract 3 first to get 5.20, then 0.75 to get £4.45. Check by adding £3.75+£4.45 = £8.20. The two decimal places in money show pounds and hundredths of a pound.

REMEMBER

Estimate before calculating. A subtraction from about £8 by about £4 should give about £4, not £40.

Check your understanding

Try these without looking at the examples. Use separate paper for working or drawings.

1. Calculate 7.85 + 4.6.
2. Calculate 9.6 ÷ 0.4.
3. Four items cost £3.75 each. Find total and change from £20.

Explained answers: page 113. If a check is difficult, reread the worked example before trying again.

LESSON 12 • UNDERSTAND • CONTENT POINT 12

Rounding for a stated purpose

LEARNING GOAL

Round to a whole number and to one or two decimal places.

Rounding replaces a value with a nearby value at a stated accuracy. Decide which place is being kept, then inspect the digit immediately to its right. If that digit is 5 or more, increase the kept digit by one; otherwise leave it. Remove the later digits.

For rounding to a whole number, inspect tenths. For one decimal place, inspect hundredths. For two decimal places, inspect thousandths. The kept places still need to be shown when a question specifies them: 6.00 is a two-decimal-place report.

A carry can pass through several nines. Rounding 7.996 to two decimal places gives 8.00. Keeping 7.99 would move the wrong way because the thousandths digit is six. Do not round to one decimal place and then to a whole number; round directly from the original value.

Ordinary rounding is different from a purchase decision. If 4.2 packs are needed and packs are indivisible, buy five. The nearest whole number is four, but it is insufficient. State whether you are reporting a measurement or buying enough.

Worked examples: follow the method

1. Round 18.462 to 1 dp: 18.5. To 2 dp: 18.46.

2. Round 4.95 to a whole number: 5; round it to 1 dp: 5.0.

WHAT TO CHECK

Values with a following digit below five round down to the nearer lower value.

LESSON 12 • CHOOSE, CALCULATE, EXPLAIN

A real-life example, explained

ORIGINAL TEACHING TASK

A calculation gives a parcel mass of 12.786 kg. Report it to two decimal places and to the nearest kilogram. Explain which digit controls each report.

How to approach the question

1. Two decimal places keep hundredths.
2. Nearest kilogram keeps the units column.

Read the planning questions, then follow the model below. Notice how each step helps answer the final question.

Model route

Step 1. To two decimal places: 12.79 kg because thousandths is 6.

Step 2. Nearest kg: 13 kg because tenths is 7. Both use the original 12.786.

Misconception clinic

“Rounding always means making the number bigger.”

Values with a following digit below five round down to the nearer lower value.

What this example teaches you

Round to a whole number and to one or two decimal places. The important connection is between the information given, the operation chosen and the meaning of the answer. Compare the result with the original question before finishing.

LEARNING TIP

Cover the model route and describe the method aloud. You can use a different valid method if you explain it clearly and reach a sensible answer.

LESSON 12 • EXPLAINED RECAP AND QUICK CHECK

Build your understanding

Why the method works

Rounding replaces a value with a nearby value at a stated precision. The next digit decides which of the two nearest choices is closer. The rounded result is an approximation, not an exact equality.

Another example, step by step

Round 6.274 to two decimal places. The nearest hundredths are 6.27 and 6.28. The thousandths digit is 4, so 6.274 is closer to 6.27. To one decimal place, the hundredths digit is 7, so round to 6.3.

REMEMBER

Identify the last place to keep, then inspect the next digit. Use the precision requested by the question.

Check your understanding

Try these without looking at the examples. Use separate paper for working or drawings.

1. Round 6.348 to 1 dp and 2 dp.

2. Round 9.995 to 2 dp.

3. A coverage calculation needs 8.2 boxes. Give the nearest whole number and the number to buy; explain the difference.

Explained answers: page 113. If a check is difficult, reread the worked example before trying again.

LESSON 13 • UNDERSTAND • CONTENT POINT 13

Reading and comparing percentages

LEARNING GOAL

Interpret a whole-number percentage as a share per hundred.

Percent means per hundred. A rate of 35% describes 35 equal parts out of 100. The full whole is 100%, half is 50%, a quarter is 25% and none is 0%. A percentage has meaning only when the quantity treated as the whole is known.

Whole-number percentages compare directly when they refer to the same whole: 68% is greater than 62%. Put a list in numerical order while keeping each percentage sign. A percentage above 100% represents more than one whole; 120% is one whole plus another fifth.

A larger percentage does not always describe a larger number of people or items when the totals differ. Half of 100 is 50, while 80% of 20 is 16. Check whether the question compares shares or actual counts. A percentage alone gives a proportion.

Use a hundred-square or bar to picture a percentage. Every one of 100 equal cells is 1%. Shading 60 cells shows 60%, leaving 40 unshaded. This supports percentage calculations without confusing the percentage value with the amount being described.

Worked examples: follow the method

1. Ascending order: 7%, 25%, 56%, 90%.

2. A project at 100% is complete; 75% complete has 25% remaining.

WHAT TO CHECK

That is true only if the complete job contains 100 tasks. The percentage needs a base total to become a count.

LESSON 13 • CHOOSE, CALCULATE, EXPLAIN

A real-life example, explained

ORIGINAL TEACHING TASK

Two equal-sized jobs are 45% and 60% complete. Which has the larger completed share? Find the unfinished percentage for each.

How to approach the question

1. Both jobs use the same-sized whole.

2. A whole consists of 100 percentage parts.

Read the planning questions, then follow the model below. Notice how each step helps answer the final question.

Model route

Step 1. The 60% job has the larger completed share.

Step 2. Unfinished shares are 100 - 45 = 55% and 100 - 60 = 40%.

Misconception clinic

“60% complete means 60 tasks have been completed.”

That is true only if the complete job contains 100 tasks. The percentage needs a base total to become a count.

What this example teaches you

Interpret a whole-number percentage as a share per hundred. The important connection is between the information given, the operation chosen and the meaning of the answer. Compare the result with the original question before finishing.

LEARNING TIP

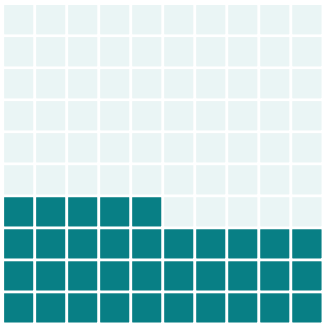
Cover the model route and describe the method aloud. You can use a different valid method if you explain it clearly and reach a sensible answer.

LESSON 13 • EXPLAINED RECAP AND QUICK CHECK

Build your understanding

Why the method works

Percent means per hundred. It is a way of comparing shares on a common scale. For whole-number percentages, order the numbers in the ordinary way, but remember what each percentage is a share of.



35 shaded squares out of 100

35% shaded; 65% unshaded

Every cell represents 1%.

Another example, step by step

A score of 68% is a greater share than 64%. If both tests have 100 marks, that is 68 marks compared with 64. If the totals differ, the percentages still compare shares, but they do not by themselves tell you the number of marks gained.

REMEMBER

A percentage is a share of a stated whole. Name that whole before interpreting the result.

Check your understanding

Try these without looking at the examples. Use separate paper for working or drawings.

1. Order 38%, 8%, 83%, 30%.
2. A task is 65% complete. What percentage remains?
3. Explain why 50% of 80 items can exceed 75% of 40 items.

Explained answers: page 114. If a check is difficult, reread the worked example before trying again.

LESSON 14 • UNDERSTAND • CONTENT POINT 14

Percentages of quantities and simple changes

LEARNING GOAL

Find percentages, then calculate increases and decreases in multiples of 5%.

To find a percentage of an amount, first identify the whole. Ten per cent means one tenth, so divide by ten. Five per cent is half of ten per cent. Build multiples such as 15% = 10% + 5% and 35% = 30% + 5%.

A calculator method multiplies by the percentage divided by 100. For 20% of 70, use 0.20 × 70 = 14. The written method and calculator method express the same share; neither changes what counts as the whole.

An increase has two stages: find the percentage amount, then add it to the original. A decrease subtracts the percentage amount. For 15% more than £80, find £12 and add it, giving £92. The £12 is the change, not the final price.

Check direction and size. A 5% increase should be small relative to the original; a 50% decrease halves it. State the final unit. When the question involves a discount, give the amount paid as well as the saving if requested.

Worked examples: follow the method

1. 25% of £240 is £60, because one quarter of 240 is 60.

2. Increase £150 by 10%: £15 extra, so £165.

WHAT TO CHECK

Dividing by 20 finds 5% of the whole. Find 20% first, then subtract it.

LESSON 14 • CHOOSE, CALCULATE, EXPLAIN

A real-life example, explained

ORIGINAL TEACHING TASK

A club fee is £80. It rises by 15%. Find the increase and new fee. A learner says the new fee is £12. Evaluate the claim.

How to approach the question

1. Find 10% and 5% of the original £80.
2. Distinguish change from final amount.

Read the planning questions, then follow the model below. Notice how each step helps answer the final question.

Model route

Step 1. 10% is £8 and 5% is £4; increase £12.

Step 2. New fee = £80 + £12 = £92. The learner calculated only the increase.

Misconception clinic

“To reduce by 20%, divide by 20.”

Dividing by 20 finds 5% of the whole. Find 20% first, then subtract it.

What this example teaches you

Find percentages, then calculate increases and decreases in multiples of 5%. The important connection is between the information given, the operation chosen and the meaning of the answer. Compare the result with the original question before finishing.

LEARNING TIP

Cover the model route and describe the method aloud. You can use a different valid method if you explain it clearly and reach a sensible answer.

LESSON 14 • EXPLAINED RECAP AND QUICK CHECK

Build your understanding

Why the method works

Useful percentage amounts can be built from 10%, 5%, 25% and 50%. An increase adds a percentage amount to the original; a decrease subtracts it. The original value remains the whole for this calculation.

Another example, step by step

Increase £120 by 15%. Ten percent is £12 and five percent is £6. The increase is £18, so the new amount is £138. Check: £138-£120 = £18, the same increase found earlier.

REMEMBER

The percentage amount and the new total are different quantities. Answer the one the question requests.

Check your understanding

Try these without looking at the examples. Use separate paper for working or drawings.

1. Find 35% of £200.
2. Increase 60 kg by 5%.
3. Reduce a £140 fee by 15%, showing saving and final fee.

Explained answers: page 114. If a check is difficult, reread the worked example before trying again.

LESSON 15 • UNDERSTAND • CONTENT POINT 15

Estimation with fractions and decimals

LEARNING GOAL

Choose convenient approximate values and use them to check answers.

An estimate is a sensible approximate calculation. It helps predict size and decide whether an exact answer is reasonable. Replace awkward values with convenient nearby values, then calculate with those. Make the approximation clear with the word about or the symbol ≈.

For decimals, rounding to nearby whole numbers or useful tenths often simplifies the work. A bill for 19 items at £4.95 is about 20 × £5 = £100. A precise answer can be lower because both approximations increased the inputs.

Fractions can be estimated using benchmarks such as 0, 1/4, 1/2, 3/4 and 1. A share of 0.49 is close to half; 0.76 is close to three quarters. Choose a benchmark that makes sense in the context, rather than always rounding a fraction to zero or one.

An estimate checks plausibility, not exact accuracy. A result near the estimate can still contain a small calculation error. An estimate must also be tight enough for a decision: if a budget is close, calculate exactly before claiming it is sufficient.

Worked examples: follow the method

1. 7.8 × 3.1 is about 8 × 3 = 24.

2. 0.51 of 198 is about half of 200 = 100.

WHAT TO CHECK

The rounded inputs changed the calculation. Use the original numbers when an exact payment is needed.

LESSON 15 • CHOOSE, CALCULATE, EXPLAIN

A real-life example, explained

ORIGINAL TEACHING TASK

A learner calculates 29 × £6.95 as £20.15. Use an estimate to assess the answer, then find the exact cost.

How to approach the question

1. Round to an easy item count and price.
2. Is the proposed total consistent with nearly 30 items costing nearly £7 each?

Read the planning questions, then follow the model below. Notice how each step helps answer the final question.

Model route

Step 1. Estimate 30 × £7 = £210, so £20.15 is far too small.

Step 2. Exact cost 29 × £6.95 = £201.55, close to the estimate.

Misconception clinic

“An estimate of £210 proves the exact answer is £210.”

The rounded inputs changed the calculation. Use the original numbers when an exact payment is needed.

What this example teaches you

Choose convenient approximate values and use them to check answers. The important connection is between the information given, the operation chosen and the meaning of the answer. Compare the result with the original question before finishing.

LEARNING TIP

Cover the model route and describe the method aloud. You can use a different valid method if you explain it clearly and reach a sensible answer.

LESSON 15 • EXPLAINED RECAP AND QUICK CHECK

Build your understanding

Why the method works

Estimation makes a calculation easier while preserving its approximate size. It is useful for checking, planning and deciding whether an exact answer is plausible. State clearly when a value is only approximate.

Another example, step by step

Estimate 19×£4.95 by using 20×£5 = £100. Both replacements are slightly larger, so expect the exact cost to be lower. The exact result is £94.05. The estimate confirms the size and explains why £940.50 would be unreasonable.

REMEMBER

Choose convenient nearby values. An estimate supports a check; it does not replace an exact answer when exactness is required.

Check your understanding

Try these without looking at the examples. Use separate paper for working or drawings.

1. Estimate 8.9 × 4.2 using whole numbers.
2. Estimate 0.48 of 302 using a fraction benchmark.
3. An answer to 41 × £2.95 is £1,209.50. Estimate, then find the exact cost and comment.

Explained answers: page 115. If a check is difficult, reread the worked example before trying again.

LESSON 16 • UNDERSTAND • CONTENT POINT 16

Equivalent fractions, decimals and percentages

LEARNING GOAL

Convert common shares and use them in everyday decisions.

Fractions, decimals and percentages are ways to record the same proportion. One half is 1/2 = 0.5 = 50%; one quarter is 1/4 = 0.25 = 25%. Learning common links gives several possible methods for a calculation.

To change a common fraction into a decimal, divide numerator by denominator. Multiply the decimal by 100 to write a percentage. To change a percentage into a fraction, write it over 100 and simplify: 40% = 40/100 = 2/5.

A decimal can become a fraction using its place value. 0.6 = 6/10 = 3/5 and 0.75 = 75/100 = 3/4. Keep the same value while changing notation; do not confuse 0.5 with 0.5%, which is a much smaller share.

Choose the most useful form. To find 25% of an amount, dividing by four is efficient. To compare a fraction and a percentage, put both into percentages or decimals. Some fractions, such as 1/3, have recurring decimals; use an approximate sign if a decimal has been cut off.

Worked examples: follow the method

1. 3/5 = 0.6 = 60%.

2. 0.125 = 1/8 = 12.5%; this common benchmark also helps with eighths.

WHAT TO CHECK

A decimal becomes a percentage by multiplying by 100; 0.75 represents 75%, not less than 1%.

LESSON 16 • CHOOSE, CALCULATE, EXPLAIN

A real-life example, explained

ORIGINAL TEACHING TASK

A learner has completed 3/4 of 80 questions. Another says this is the same as 75% and 0.75 of the questions. Verify the equivalence and find the completed count.

How to approach the question

1. Rewrite the fraction with denominator 100 or divide 3 by 4.

2. Use one of the equivalent forms to find the count.

Read the planning questions, then follow the model below. Notice how each step helps answer the final question.

Model route

Step 1. 3/4 = 75/100 = 75% = 0.75.

Step 2. 80 ÷ 4 × 3 = 60 questions, agreeing with 0.75 × 80 = 60.

Misconception clinic

“0.75 means 0.75%.”

A decimal becomes a percentage by multiplying by 100; 0.75 represents 75%, not less than 1%.

What this example teaches you

Convert common shares and use them in everyday decisions. The important connection is between the information given, the operation chosen and the meaning of the answer. Compare the result with the original question before finishing.

LEARNING TIP

Cover the model route and describe the method aloud. You can use a different valid method if you explain it clearly and reach a sensible answer.

LESSON 16 • EXPLAINED RECAP AND QUICK CHECK

Build your understanding

Why the method works

Fractions, decimals and percentages can name the same part of a whole. A decimal expresses tenths or hundredths directly; a percentage expresses hundredths as a number out of one hundred.

Another example, step by step

Convert 3/5 into a percentage by making hundredths: multiply numerator and denominator by 20 to get 60/100. Therefore 3/5 = 0.6 = 60%. Check the size: three fifths is greater than one half, so it should exceed 50%.

REMEMBER

Learn common equivalences, and connect them to their size. For example, 1/4 = 0.25 = 25%.

Check your understanding

Try these without looking at the examples. Use separate paper for working or drawings.

1. Write 1/5 as a decimal and percentage.
2. Write 0.4 as a simplest fraction and percentage.
3. Which is larger, 3/4 or 70%? Explain with equivalent forms.

Explained answers: page 115. If a check is difficult, reread the worked example before trying again.

LESSON 17 • UNDERSTAND • CONTENT POINT 17

Simple ratio and direct proportion

LEARNING GOAL

Compare labelled parts, share totals and scale amounts consistently.

A ratio compares quantities in a stated order. Apples:pears = 2:3 means two apple parts for three pear parts. It does not mean apples are two thirds of all fruit: the total has five parts, so the apple share is 2/5.

Simplify a ratio by dividing every part by the same common factor. Match units first: 200 g:1 kg becomes 200:1000 = 1:5. Keep labels attached so you do not reverse the quantities. Ratios can compare two or more groups.

To share a total, add the ratio parts, divide the total by that sum, then multiply by each part. To find one quantity when another share is given, first identify how many ratio parts the given quantity represents. Always check the shares add to the total.

Direct proportion means quantities scale together at a constant rate. Double a fixed recipe’s portions and every ingredient doubles. Find the amount for one portion, then multiply by the target. This assumes the recipe or unit rate stays unchanged.

Worked examples: follow the method

1. Share £180 in ratio 2:3: five parts, £36 per part, so £72 and £108.

2. A recipe for 4 people uses 300 g of rice. For 6 people: 300 ÷ 4 × 6 = 450 g.

WHAT TO CHECK

There are one plus four parts in total. Concentrate is 1/5 of the mixture, not 1/4.

LESSON 17 • CHOOSE, CALCULATE, EXPLAIN

A real-life example, explained

ORIGINAL TEACHING TASK

A drink uses concentrate:water = 1:4. A group needs 15 litres. Find the amount of each ingredient and check the mixture total.

How to approach the question

1. How many ratio parts make the whole mixture?
2. Find one part before finding each ingredient.

Read the planning questions, then follow the model below. Notice how each step helps answer the final question.

Model route

Step 1. There are 5 parts. One part = 15 ÷ 5 = 3 litres.

Step 2. Concentrate 3 litres and water 12 litres. Check 3 + 12 = 15 and 3:12 = 1:4.

Misconception clinic

“The concentrate is 1/4 of the full mixture.”

There are one plus four parts in total. Concentrate is 1/5 of the mixture, not 1/4.

What this example teaches you

Compare labelled parts, share totals and scale amounts consistently. The important connection is between the information given, the operation chosen and the meaning of the answer. Compare the result with the original question before finishing.

LEARNING TIP

Cover the model route and describe the method aloud. You can use a different valid method if you explain it clearly and reach a sensible answer.

LESSON 17 • EXPLAINED RECAP AND QUICK CHECK

Build your understanding

Why the method works

A ratio describes relative amounts using equal-sized parts. The sum of the parts represents a combined total. Direct proportion means the same multiplier changes both linked quantities.

Another example, step by step

Share £84 in the ratio 3:4. There are 7 parts altogether, so one part is £84÷7 = £12. The shares are 3×£12 = £36 and 4×£12 = £48. They total £84 and simplify back to the ratio 3:4.

REMEMBER

For a ratio total, add the parts first. For direct proportion, finding one unit often gives a clear route.

Check your understanding

Try these without looking at the examples. Use separate paper for working or drawings.

1. Simplify 12:18.
2. Share £360 in ratio 1:2.
3. Six portions use 420 g of flour. Find flour for 10 portions.

Explained answers: page 116. If a check is difficult, reread the worked example before trying again.

LESSON 18 • UNDERSTAND • CONTENT POINT 18

Simple interest

LEARNING GOAL

Calculate interest in multiples of 5% using the original amount each period.

Interest is an extra amount earned on savings or charged on borrowing under a stated model. The original amount is called the principal. An interest rate describes a percentage of that principal for a specified period, usually a year. Read the time period before multiplying.

Simple interest uses the same original principal every period. Find one year’s interest, then multiply it by the number of years. Total balance = principal + interest earned. In words: simple interest = principal × rate per year × number of years, with the rate written as a fraction or decimal.

For rates in multiples of 5%, mental percentage methods are efficient. Five per cent is half of ten per cent; 15% is 10% plus 5%. Keep interest earned separate from the total balance. A final balance includes the principal; interest alone does not.

This notebook uses invented rates for teaching. Unless the exercise says otherwise, assume no deposits, withdrawals, fees or changes in rate. Repeatedly taking interest from an increasing balance would describe compound interest, which is a different model from this Level 1 simple-interest calculation.

Worked examples: follow the method

1. £600 at 5% simple interest for one year earns £30; balance £630.

2. £800 at 10% simple interest for 3 years earns £80 each year, so £240 interest and £1,040 total.

WHAT TO CHECK

That changes the base to the growing balance. Simple interest uses the original £500 again.

LESSON 18 • CHOOSE, CALCULATE, EXPLAIN

A real-life example, explained

ORIGINAL TEACHING TASK

A £500 deposit earns 15% simple interest each year for 2 years. Find annual interest, total interest and final balance.

How to approach the question

1. Find 10% and 5% of the original £500.
2. Use that same annual interest twice.

Read the planning questions, then follow the model below. Notice how each step helps answer the final question.

Model route

Step 1. 10% is £50 and 5% is £25, so annual interest is £75.

Step 2. Two years earn £150. Final balance = £500 + £150 = £650.

Misconception clinic

“Year 2 interest must be 15% of £575.”

That changes the base to the growing balance. Simple interest uses the original £500 again.

What this example teaches you

Calculate interest in multiples of 5% using the original amount each period. The important connection is between the information given, the operation chosen and the meaning of the answer. Compare the result with the original question before finishing.

LEARNING TIP

Cover the model route and describe the method aloud. You can use a different valid method if you explain it clearly and reach a sensible answer.

LESSON 18 • EXPLAINED RECAP AND QUICK CHECK

Build your understanding

Why the method works

Simple interest is calculated on the original amount for every year. It adds the same interest amount each year when the rate stays fixed. The final balance includes the original money as well as the interest.

Another example, step by step

An invented account pays 10% simple interest on £450 for 3 years. Annual interest is £45. Three years earn 3×£45 = £135. Final balance = £450+£135 = £585. The second year's interest is still based on £450.

REMEMBER

Simple interest uses the original principal each year. Read whether the question asks for interest alone or the final balance.

Check your understanding

Try these without looking at the examples. Use separate paper for working or drawings.

1. Find 5% simple interest on £240 for one year.
2. Find final balance on £700 at 10% simple interest for 2 years.
3. £360 earns 15% simple interest for 3 years. Find interest and total.

Explained answers: page 116. If a check is difficult, reread the worked example before trying again.

LESSON 19 • UNDERSTAND • CONTENT POINT 19

Discounts and sale prices

LEARNING GOAL

Find savings and final prices for discounts in multiples of 5%.

A discount reduces an original price. Its percentage is normally based on that original price unless the question says otherwise. To find 20% off £90, calculate a £18 saving and subtract it, leaving £72. The saving and the price paid are different answers.

Use 10% and 5% as building blocks. For a 15% reduction, add the 10% and 5% savings before subtracting. A 25% reduction is one quarter off, so three quarters remain. Explain the method using the original amount so the base is clear.

If several identical items are discounted, either discount one item and multiply or find the original total and discount that. These agree when the same percentage applies to every item and no different money-rounding rule changes the calculation.

Read exclusions and extra charges. A delivery fee added after a discount may not be discounted. Compare final amounts for the same quantity when choosing a supplier. A low advertised price alone does not settle which deal costs less overall.

Worked examples: follow the method

1. 15% off £120: 10% is £12 and 5% is £6; save £18 and pay £102.

2. 25% off £48 saves £12, leaving £36.

WHAT TO CHECK

Twenty per cent is the saving. Eighty per cent remains to be paid.

LESSON 19 • CHOOSE, CALCULATE, EXPLAIN

A real-life example, explained

ORIGINAL TEACHING TASK

A desk costs £160 with 20% off. Delivery costs £12 and is not discounted. A second seller charges £145 delivered. Which deal is cheaper?

How to approach the question

1. Find the discounted desk price before adding delivery.
2. Compare the two delivered totals.

Read the planning questions, then follow the model below. Notice how each step helps answer the final question.

Model route

Step 1. 20% of £160 = £32, so desk price = £128.

Step 2. Delivered total = £128 + £12 = £140. It is £5 cheaper than £145.

Misconception clinic

“20% off means the customer pays 20% of the price.”

Twenty per cent is the saving. Eighty per cent remains to be paid.

What this example teaches you

Find savings and final prices for discounts in multiples of 5%. The important connection is between the information given, the operation chosen and the meaning of the answer. Compare the result with the original question before finishing.

LEARNING TIP

Cover the model route and describe the method aloud. You can use a different valid method if you explain it clearly and reach a sensible answer.

LESSON 19 • EXPLAINED RECAP AND QUICK CHECK

Build your understanding

Why the method works

A discount is a reduction based on the original price. The saving is the percentage amount; the sale price is what remains after subtracting it. Extra fees can change which offer is cheapest.

Another example, step by step

A £90 item has 20% off. Ten percent is £9, so 20% is £18. Sale price = £90-£18 = £72. If delivery is £6, the delivered total is £78. Compare £78 with another delivered total, not with an incomplete price.

REMEMBER

Find the reduction, subtract it once, then include any separately stated costs.

Check your understanding

Try these without looking at the examples. Use separate paper for working or drawings.

1. Find the saving and price after 10% off £85.
2. Find the price after 35% off £200.
3. Two £60 items have 15% off, then £8 delivery is added once. Find the delivered total.

Explained answers: page 117. If a check is difficult, reread the worked example before trying again.

LESSON 20 • UNDERSTAND • CONTENT POINT 20

Converting everyday units

LEARNING GOAL

Convert length, mass, capacity, money and time within the same system.

A conversion changes the unit without changing the underlying quantity. Start with a relationship such as 1 m = 100 cm. Converting to a smaller unit gives a larger numerical count; converting to a larger unit gives a smaller count. Write the unit at every stage.

Metric links include 1 km = 1,000 m; 1 m = 100 cm = 1,000 mm; 1 kg = 1,000 g; 1 litre = 1,000 ml. Imperial relationships stay within their own system: 12 inches = 1 foot, 3 feet = 1 yard, 16 ounces = 1 pound, 14 pounds = 1 stone, and 8 pints = 1 gallon.

Money uses 100 pence = £1. Time uses 60 seconds = 1 minute, 60 minutes = 1 hour and 24 hours = 1 day. Minutes are not hundredths of an hour. For 1.5 hours, convert the half hour to 30 minutes. Use the stated month or calendar rather than assume every month has the same number of days.

Before adding quantities in different units, convert to one common unit. For a mixed measure such as 2 kg 350 g, write 2,350 g or 2.35 kg. Use a sensible unit for the answer and check by reversing the conversion.

Worked examples: follow the method

1. 3.75 litres = 3,750 ml.

2. 2 h 15 min = 135 min. Five feet = 60 inches.

WHAT TO CHECK

A litre contains 1,000 ml, so 2.5 litres is ten times that claimed value.

LESSON 20 • CHOOSE, CALCULATE, EXPLAIN

A real-life example, explained

ORIGINAL TEACHING TASK

A container holds 2.5 litres. A worker pours in 650 ml, then 900 ml. Find the remaining capacity in ml.

How to approach the question

1. Convert the capacity into the same unit as the pours.
2. Add the poured volumes, then subtract.

Read the planning questions, then follow the model below. Notice how each step helps answer the final question.

Model route

Step 1. 2.5 litres = 2,500 ml. Poured total = 1,550 ml.

Step 2. Remaining capacity = 2,500 - 1,550 = 950 ml.

Misconception clinic

“2.5 litres is 250 ml.”

A litre contains 1,000 ml, so 2.5 litres is ten times that claimed value.

What this example teaches you

Convert length, mass, capacity, money and time within the same system. The important connection is between the information given, the operation chosen and the meaning of the answer. Compare the result with the original question before finishing.

LEARNING TIP

Cover the model route and describe the method aloud. You can use a different valid method if you explain it clearly and reach a sensible answer.

LESSON 20 • EXPLAINED RECAP AND QUICK CHECK

Build your understanding

Why the method works

Converting units changes how an amount is described, not the amount itself. Smaller units require a larger number to describe the same quantity. Time uses groups of 60 rather than the base-ten structure of metric measures.

Another example, step by step

Convert 3.4 kg to grams: each kilogram is 1,000 g, so 3.4×1,000 = 3,400 g. Convert 2 hours 25 minutes to minutes: 2×60+25 = 145 minutes. The conversion factor depends on the units, not on a universal rule.

REMEMBER

Write the relationship first. Check that conversion to a smaller unit increases the numerical value.

Check your understanding

Try these without looking at the examples. Use separate paper for working or drawings.

1. Convert 4.2 km to m and 680 g to kg.

2. Convert 2 h 35 min to minutes and £7.40 to pence.

3. A 3-foot strip is cut into 8-inch pieces. Use 12 inches = 1 foot. Find complete pieces and length left.

Explained answers: page 117. If a check is difficult, reread the worked example before trying again.

LESSON 21 • UNDERSTAND • CONTENT POINT 21

Simple map and drawing scales

LEARNING GOAL

Use a stated scale to find actual distances and drawing lengths.

A scale links a drawing length with the real length it represents. “1 cm represents 2 km” means every centimetre on the map stands for two kilometres on the ground. Multiply the measured map length by two to obtain kilometres under that scale.

A ratio scale compares lengths using the same unit. At 1:100, one centimetre represents 100 cm, which is 1 m. To find an actual length, multiply by the factor and then convert units. To find a drawing length, put the real measurement into the drawing unit and divide by the factor.

Use a ruler carefully when the task asks you to measure. Start at zero, not the physical ruler edge. A scale bar can be used to compare distances even if a printed map is resized along with its bar. A written ratio alone assumes the intended print size.

Distinguish a straight-line distance from a route following roads or paths. Add the appropriate route segments when instructed. A sketch marked not to scale must be interpreted using its stated lengths, not measured. Check that the result is sensible for the scale and location.

Worked examples: follow the method

1. A 3.5 cm map line at 1 cm to 2 km represents 7 km.

2. A 1:50 plan line of 6 cm represents 300 cm = 3 m.

WHAT TO CHECK

A reduction drawing makes a real length smaller. Convert units, then divide for drawing length.

LESSON 21 • CHOOSE, CALCULATE, EXPLAIN

A real-life example, explained

ORIGINAL TEACHING TASK

A walking route has two map segments of 4 cm and 2.5 cm. The scale is 1 cm represents 200 m. Find total actual distance and compare it with a 1.5 km target.

How to approach the question

1. Add the route lengths before converting.
2. Match metres and kilometres for the comparison.

Read the planning questions, then follow the model below. Notice how each step helps answer the final question.

Model route

Step 1. Total map length = 6.5 cm. Actual length = 6.5 × 200 = 1,300 m.

Step 2. This is 1.3 km, which is 0.2 km shorter than the target.

Misconception clinic

“A 1:100 scale means multiply real metres by 100 to draw them.”

A reduction drawing makes a real length smaller. Convert units, then divide for drawing length.

What this example teaches you

Use a stated scale to find actual distances and drawing lengths. The important connection is between the information given, the operation chosen and the meaning of the answer. Compare the result with the original question before finishing.

LEARNING TIP

Cover the model route and describe the method aloud. You can use a different valid method if you explain it clearly and reach a sensible answer.

LESSON 21 • EXPLAINED RECAP AND QUICK CHECK

Build your understanding

Why the method works

A scale connects a drawing measurement to a real measurement. Each equal drawing length represents the same real length. The units on both sides of the scale must be read carefully.

Scale bar: each 2 cm segment represents 200 m



The ruler length is meaningful only at the intended print size.

Another example, step by step

A map uses 1 cm for 250 m. A route measures 6 cm, so the real distance is 6×250 = 1,500 m = 1.5 km. For a real distance of 1,000 m, divide by 250 to find a drawing length of 4 cm.

REMEMBER

Drawing to real usually multiplies by the stated scale amount; real to drawing reverses that calculation. Check the direction.

Check your understanding

Try these without looking at the examples. Use separate paper for working or drawings.

1. At 1 cm to 5 km, find distance for 2.8 cm.
2. At 1:100, find actual metres for a 7 cm wall.
3. A real 4 m wall is drawn at 1:50. Find the drawing length in cm.

Explained answers: page 118. If a check is difficult, reread the worked example before trying again.

LESSON 22 • UNDERSTAND • CONTENT POINT 22

Perimeter, area and composite rectangles

LEARNING GOAL

Choose the right measure for boundaries and coverage.

Perimeter is the distance all the way around the outside boundary. It uses length units such as metres. Area is the amount of flat surface covered; it uses square units such as m^2. Fencing needs a boundary calculation, while flooring usually needs coverage.

For a rectangle, area = length × width. Perimeter = 2 × length + 2 × width. A square is a rectangle with four equal sides. Check all lengths use the same unit before calculating. Multiplying two lengths creates square units, not metres alone.

A composite rectangular shape can be divided into non-overlapping rectangles. Calculate each area and add, or subtract a cut-out rectangle from a larger enclosing rectangle. Use total lengths to infer missing dimensions. Draw the divisions lightly so they do not become extra outside edges.

For perimeter, trace the actual exposed boundary once. Internal dividing lines do not count. If a gate or opening is excluded from fencing, subtract its length only after finding the whole perimeter. Round material purchases up when whole packs are required.

Worked examples: follow the method

1. A 7 m by 4 m rectangle has area 28 m^2 and perimeter 22 m.

2. An 8 m by 6 m floor with a 3 m by 2 m corner removed has area 48 - 6 = 42 m^2.

WHAT TO CHECK

They measure different things and use different units. A product gives coverage; adding boundary lengths gives perimeter.

LESSON 22 • CHOOSE, CALCULATE, EXPLAIN

A real-life example, explained

ORIGINAL TEACHING TASK

A rectangular garden is 9 m by 5 m. A 1 m gate is left unfenced. Find fencing length and cost at £8 per metre.

How to approach the question

1. Find the full outside boundary first.
2. Subtract only the gate length, then apply the rate.

Read the planning questions, then follow the model below. Notice how each step helps answer the final question.

Model route

Step 1. Perimeter = 2 × 9 + 2 × 5 = 28 m. Fence length = 27 m.

Step 2. Cost = 27 × £8 = £216. Area 45 m² would not answer the fence question.

Misconception clinic

“Area and perimeter are the same because they use the same two dimensions.”

They measure different things and use different units. A product gives coverage; adding boundary lengths gives perimeter.

What this example teaches you

Choose the right measure for boundaries and coverage. The important connection is between the information given, the operation chosen and the meaning of the answer. Compare the result with the original question before finishing.

LEARNING TIP

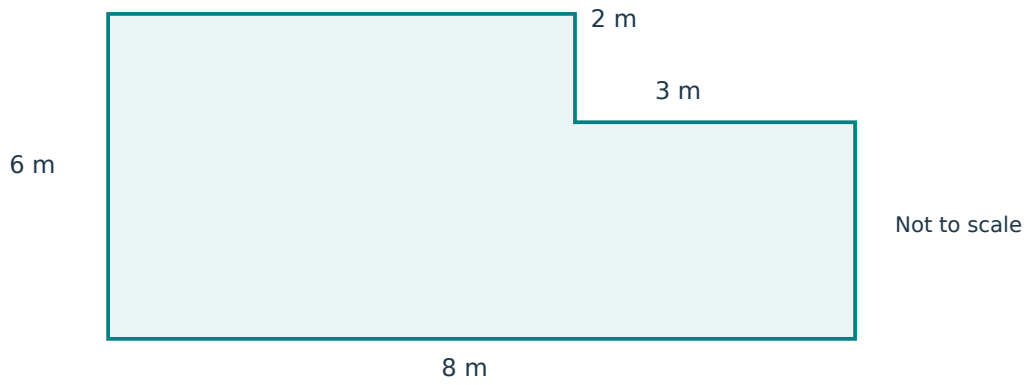
Cover the model route and describe the method aloud. You can use a different valid method if you explain it clearly and reach a sensible answer.

LESSON 22 • EXPLAINED RECAP AND QUICK CHECK

Build your understanding

Why the method works

Perimeter measures distance around a boundary. Area counts the square units covering a surface. Composite rectangular shapes can be split into non-overlapping rectangles or found by subtracting a missing rectangle.



Another example, step by step

A 9 m by 6 m rectangle has a 3 m by 2 m corner removed. Area = 9×6-3×2 = 54-6 = 48 m². To find perimeter, trace every exposed edge of the new boundary rather than subtracting the missing area's value from a length.

REMEMBER

Perimeter uses length units such as m. Area uses square units such as m². They answer different questions.

Check your understanding

Try these without looking at the examples. Use separate paper for working or drawings.

1. Find area and perimeter of a 6 m by 3.5 m rectangle.
2. Use the printed L-shape to find area and perimeter.
3. A 24 m² floor needs packs covering 2 m² at £15 each. Find packs and cost.

Explained answers: page 118. If a check is difficult, reread the worked example before trying again.

LESSON 23 • UNDERSTAND • CONTENT POINT 23

Volume of cubes and cuboids

LEARNING GOAL

Calculate three-dimensional capacity using cubic units.

Volume measures the space occupied by a solid or the internal space available inside a container. A unit cube has length, width and height each one unit, so it occupies one cubic unit. We write cm^3 for cubic centimetres and m^3 for cubic metres.

A cuboid has a rectangular cross-section repeated through its height. Volume = length × width × height. A cube has equal edge lengths, so volume = side × side × side. Do not confuse a squared side, which gives one face’s area, with the three-factor volume.

Convert all dimensions into one length unit before multiplying. A box 20 cm long, 10 cm wide and 0.3 m high has height 30 cm, so volume = 20 × 10 × 30 = 6,000 cm^3. Internal measurements are needed when calculating usable capacity.

For capacity links, 1 cm^3 = 1 ml, so 1,000 cm^3 = 1 litre. A calculation may ask how much is held at half full or how many smaller containers can be filled. Calculate the volume first, then take the share or divide by the smaller volume.

Worked examples: follow the method

1. A 12 cm by 5 cm by 4 cm cuboid has volume 240 cm^3.

2. A cube of side 6 cm has volume 6 × 6 × 6 = 216 cm^3.

WHAT TO CHECK

Adding edges does not count the cubes inside. Volume requires three lengths multiplied and a cubic unit.

LESSON 23 • CHOOSE, CALCULATE, EXPLAIN

A real-life example, explained

ORIGINAL TEACHING TASK

A tank is 40 cm long,25 cm wide and 20 cm high internally. Find its capacity in litres and the water held when half full.

How to approach the question

1. Keep every dimension in centimetres.
2. Use 1,000 cm^3 per litre after multiplying.

Read the planning questions, then follow the model below. Notice how each step helps answer the final question.

Model route

Step 1. Volume = 40 × 25 × 20 = 20,000 cm^3 = 20 litres.

Step 2. Half full holds 10 litres. Check two half volumes restore the full capacity.

Misconception clinic

“The volume is 40 + 25 + 20 = 85 cm.”

Adding edges does not count the cubes inside. Volume requires three lengths multiplied and a cubic unit.

What this example teaches you

Calculate three-dimensional capacity using cubic units. The important connection is between the information given, the operation chosen and the meaning of the answer. Compare the result with the original question before finishing.

LEARNING TIP

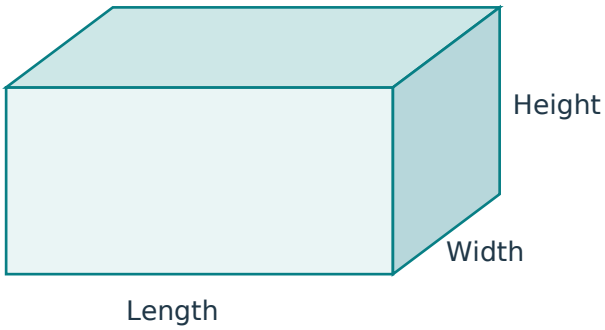
Cover the model route and describe the method aloud. You can use a different valid method if you explain it clearly and reach a sensible answer.

LESSON 23 • EXPLAINED RECAP AND QUICK CHECK

Build your understanding

Why the method works

Volume counts the cubic units filling a solid. A cuboid has equal rectangular layers: length×width gives cubes in one layer, then height gives the number of layers. All three dimensions must use compatible units.



$V = l \times w \times h$

Cubic units

Not to scale

Another example, step by step

A box measures 30 cm by 20 cm by 15 cm internally. One layer is 30×20 = 600 cm². Volume is 600×15 = 9,000 cm³. Since 1,000 cm³ = 1 litre, this is 9 litres. Use internal measurements when finding capacity.

REMEMBER

For a cube, multiply its side length three times. Label volume with cubic units or an appropriate capacity unit.

Check your understanding

Try these without looking at the examples. Use separate paper for working or drawings.

1. Find volume of a cube with side 4 cm.
2. Find volume of a 9 cm by 7 cm by 5 cm cuboid.
3. A container is 30 cm by 20 cm by 10 cm internally. Find litres at full and one-third full.

Explained answers: page 119. If a check is difficult, reread the worked example before trying again.

LESSON 24 • UNDERSTAND • CONTENT POINT 24

Drawing shapes, symmetry and angle size

LEARNING GOAL

Construct common 2-D shapes and identify reflective symmetry.

A two-dimensional shape is flat. Describe it by its straight or curved boundary, equal sides, parallel sides and angles. A rectangle has four right angles and opposite sides equal; a square also has all four sides equal. A triangle has three straight sides and a quadrilateral four.

Use a sharp pencil and ruler for straight sides. To draw a measured rectangle, draw one side, construct a right angle at each end, measure the two equal heights and join their endpoints. Check the opposite sides and angles, rather than judge the shape by appearance alone.

A line of symmetry divides a shape into halves that match exactly when reflected or folded. A non-square rectangle has two symmetry lines; a square has four. A diagonal of a non-square rectangle is not a symmetry line because its halves do not reflect onto one another.

Angle size measures a turn, not arm length. A right angle is 90°. Acute angles are smaller; obtuse angles are bigger than 90° but smaller than 180°. A straight angle is 180° and a reflex angle lies between 180° and 360°. Use these benchmarks to compare or check a measurement.

Worked examples: follow the method

1. A square has two midline and two diagonal symmetry lines.

2. A 35° angle is acute; a 120° angle is obtuse, regardless of how long their drawn arms are.

WHAT TO CHECK

The opening or turn determines the angle. Extending an arm along the same direction does not change it.

LESSON 24 • CHOOSE, CALCULATE, EXPLAIN

A real-life example, explained

ORIGINAL TEACHING TASK

A learner draws a 6 cm by 4 cm rectangle and marks both diagonals as symmetry lines. Explain how to correct the symmetry marking.

How to approach the question

1. Imagine folding across a vertical or horizontal middle line.
2. Would the unequal side lengths match across a diagonal reflection?

Read the planning questions, then follow the model below. Notice how each step helps answer the final question.

Model route

Step 1. The valid symmetry lines pass through the midpoints vertically and horizontally.

Step 2. The diagonals are not symmetry lines for a non-square rectangle. Keep the two midlines and remove the diagonal claims.

Misconception clinic

“Longer arms always make a bigger angle.”

The opening or turn determines the angle. Extending an arm along the same direction does not change it.

What this example teaches you

Construct common 2-D shapes and identify reflective symmetry. The important connection is between the information given, the operation chosen and the meaning of the answer. Compare the result with the original question before finishing.

LEARNING TIP

Cover the model route and describe the method aloud. You can use a different valid method if you explain it clearly and reach a sensible answer.

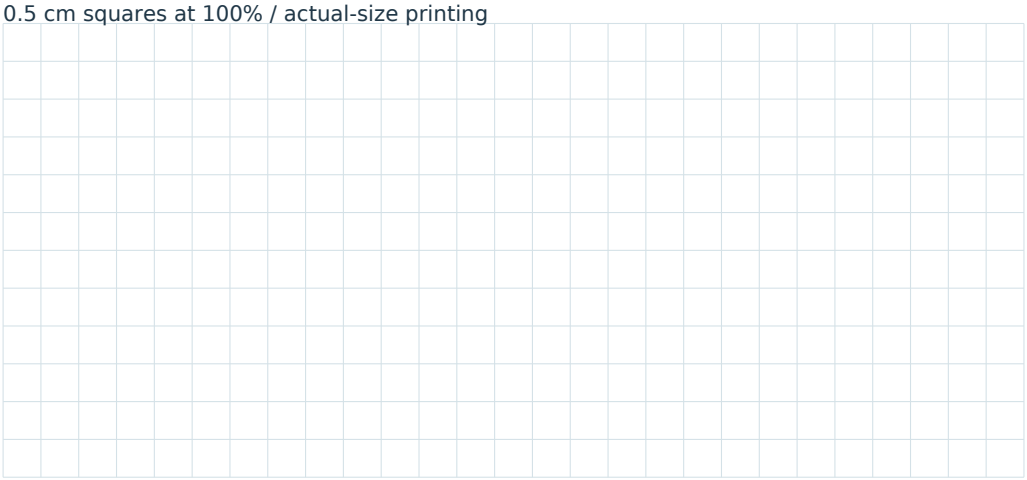
LESSON 24 • EXPLAINED RECAP AND QUICK CHECK

Build your understanding

Why the method works

A construction needs accurate measurements and a suitable tool. Symmetry is a matching relationship: reflecting a shape across a symmetry line makes the two halves coincide. A crease that merely splits area in half may not be a symmetry line.

0.5 cm squares at 100% / actual-size printing



Another example, step by step

Draw a rectangle 7 cm long and 4 cm wide. Use a ruler for lengths and right angles for corners. Its two symmetry lines pass through the centre, parallel to the pairs of sides. Its diagonals are not symmetry lines because the rectangle is not a square.

REMEMBER

Read which lengths and angles are required. A sketch shows an idea; an accurate drawing must satisfy the stated measurements.

Check your understanding

Try these without looking at the examples. Use separate paper for working or drawings.

1. Draw a 5 cm by 3 cm rectangle and mark its symmetry lines.
2. How many symmetry lines does a square have? Sketch them.
3. Classify 40°, 90°,135°,180° as acute, right, obtuse or straight.

Explained answers: page 119. If a check is difficult, reread the worked example before trying again.

LESSON 25 • UNDERSTAND • CONTENT POINT 25

Plans, elevations and nets

LEARNING GOAL

Interpret flat representations of simple three-dimensional shapes.

A three-dimensional shape has length, width and height. A plan is its view from above. A front elevation is the view looking straight at its front, and a side elevation looks from a named side. An elevation does not show perspective depth: it records the projected outline.

For a cuboid, the plan uses length and width, the front elevation length and height, and a side elevation width and height. Mark the viewing direction because “front” is a chosen orientation. A single view may not reveal every dimension or identify a unique solid.

A net is an arrangement of faces laid flat so it can fold into a solid. A cube net needs six equal squares placed to avoid overlap when folded. A cuboid net has three pairs of matching rectangular faces. Check matching edges as well as the face count.

For a model made of cube stacks, a plan shows occupied floor cells. A front elevation shows the greatest height along each front-to-back line; do not add hidden stacks. The same plan can correspond to several different stack heights, so use all supplied information.

Worked examples: follow the method

1. A 7 cm by 4 cm by 3 cm cuboid has a 7 by 4 plan, 7 by 3 front and 4 by 3 side when the 7 cm edge faces front.

2. A cylinder standing upright has a circular plan and a rectangular front elevation.

WHAT TO CHECK

Separate stacks behind one another are not placed on top of one another. An elevation shows the highest outline along each viewing line.

LESSON 25 • CHOOSE, CALCULATE, EXPLAIN

A real-life example, explained

ORIGINAL TEACHING TASK

A block model has front stack heights 1,3 and back heights 2,1. Find its cube count, plan footprint and front elevation heights.

How to approach the question

1. Add stack heights for the total cubes.

2. Use maxima, not sums, for elevation heights.

Read the planning questions, then follow the model below. Notice how each step helps answer the final question.

Model route

Step 1. Cube count = 1+3+2+1 = 7. All four floor positions are occupied.

Step 2. Front heights are max(1, 2)=2 and max(3, 1)=3.

Misconception clinic

“The front heights must be 3 and 4 because front and back stacks add.”

Separate stacks behind one another are not placed on top of one another. An elevation shows the highest outline along each viewing line.

What this example teaches you

Interpret flat representations of simple three-dimensional shapes. The important connection is between the information given, the operation chosen and the meaning of the answer. Compare the result with the original question before finishing.

LEARNING TIP

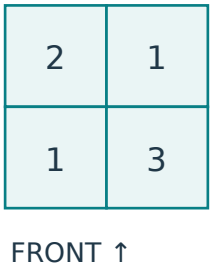
Cover the model route and describe the method aloud. You can use a different valid method if you explain it clearly and reach a sensible answer.

LESSON 25 • EXPLAINED RECAP AND QUICK CHECK

Build your understanding

Why the method works

A plan looks down from above; an elevation looks horizontally from one direction. A view shows the visible outline, while a labelled plan can also record hidden stack heights. A net unfolds the faces into a flat arrangement.



Stack heights from above

Back row: 2, 1

Front row: 1, 3

Another example, step by step

Two stacks of cubes stand one behind the other, with heights 2 at the front and 4 at the back. From the front, the outline reaches 4 cubes high because the taller stack rises behind the shorter one. The total count is 2+4 = 6 cubes, not 4.

REMEMBER

For an outline, use the greatest height on each line of sight. For a cube count, add every stack.

Check your understanding

Try these without looking at the examples. Use separate paper for working or drawings.

1. Describe plan and front view of an upright cylinder diameter 4 cm, height 8 cm.
2. A cuboid has length 8, width 5, height 2 cm. Give the three view dimensions.
3. Explain one valid cube net using six equal squares.

Explained answers: page 120. If a check is difficult, reread the worked example before trying again.

LESSON 26 • UNDERSTAND • CONTENT POINT 26

Measuring angles and describing direction

LEARNING GOAL

Use a protractor and angle turns for position and direction.

An angle measures a turn in degrees. A full turn is 360°, half a turn 180° and a quarter turn 90°. Clockwise follows a clock's hands; anticlockwise turns the other way. State both direction and angle when describing a movement.

To measure a drawn angle, put the protractor centre on the vertex. Align its zero baseline with one arm. Read the scale starting at zero on that arm, then follow to the other arm. A semicircular protractor has two number scales, so choosing the wrong zero gives the supplementary reading.

First estimate whether the angle is acute, obtuse or near a right angle. This checks the scale choice. Extend a short arm with a ruler if needed rather than move the protractor centre away from the vertex. A measurement requires correct placement, not just reading a nearby number.

Compass directions connect turns to position. North, east, south, west occur in clockwise quarter turns. The eight compass points include north-east, south-east, south-west and north-west, with 45° between adjacent points. Use these directions to interpret a map or route description.

Worked examples: follow the method

1. Facing north, a clockwise quarter turn faces east. A half turn from east faces west.

2. If an angle looks obtuse and a scale reading is 40° on one scale and 140° on the other,140° is the plausible one.

WHAT TO CHECK

A turn is relative to the current facing. Track direction on a compass diagram rather than treat every page movement as the same turn.

LESSON 26 • CHOOSE, CALCULATE, EXPLAIN

A real-life example, explained

ORIGINAL TEACHING TASK

A robot faces east. It turns 90° anticlockwise,then 180° clockwise. State each facing direction and the final direction.

How to approach the question

1. Use a compass sketch to track the first turn.

2. Apply the second turn from the new direction.

Read the planning questions, then follow the model below. Notice how each step helps answer the final question.

Model route

Step 1. East turned 90° anticlockwise becomes north.

Step 2. North turned 180° clockwise becomes south. Final facing is south.

Misconception clinic

“Anticlockwise means always turn left on the page.”

A turn is relative to the current facing. Track direction on a compass diagram rather than treat every page movement as the same turn.

What this example teaches you

Use a protractor and angle turns for position and direction. The important connection is between the information given, the operation chosen and the meaning of the answer. Compare the result with the original question before finishing.

LEARNING TIP

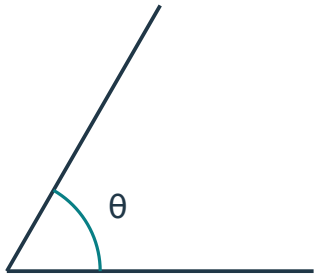
Cover the model route and describe the method aloud. You can use a different valid method if you explain it clearly and reach a sensible answer.

LESSON 26 • EXPLAINED RECAP AND QUICK CHECK

Build your understanding

Why the method works

An angle measures the amount of turn between directions. Arm length does not determine angle size. Clockwise and anticlockwise turns must be combined with a stated starting direction.



Measure the opening θ.

Use the vertex and baseline.

Extend arms if needed.

Another example, step by step

Start facing west. Turn 90° clockwise: west moves to north. Turn another 45° clockwise: north moves to north-east. The combined turn is 135°. A compass sketch helps keep the direction and size of turn separate.

REMEMBER

Estimate acute, right, obtuse or reflex before measuring. A protractor answer should agree with that estimate.

Check your understanding

Try these without looking at the examples. Use separate paper for working or drawings.

1. Facing south, turn 90° clockwise. Which direction now?
2. Measure the labelled angle on this page with a protractor.
3. Facing north-east, turn 45° clockwise then 90° anticlockwise. Find final direction.

Explained answers: page 120. If a check is difficult, reread the worked example before trying again.

LESSON 27 • UNDERSTAND • CONTENT POINT 27

Tables, bar charts, pie charts and line graphs

LEARNING GOAL

Select,construct and interpret common statistical displays.

Discrete data are separate counts or categories, such as journeys by bus or the number of pets. A table lists categories and frequencies clearly. A tally groups counts in fives to make them easier to total. Every observation should be included once in the intended categories.

A bar chart compares category frequencies. Give a title, label the category and frequency axes, use an equal scale and draw equal-width bars with gaps between categories. The bar height, not its width or colour, shows the frequency. Start a frequency axis at zero for a straightforward fair comparison.

A pie chart shows parts of one whole. Sector size follows the category proportion. A half of the people needs half the circle,180°; a quarter needs 90°. To construct a full pie chart, calculate each sector as frequency ÷ total × 360°, then use a protractor. Check all angles total 360°.

A line graph usually shows change over an ordered variable such as time. Plot the pairs on labelled axes and join successive points when appropriate. Equal time intervals need equal spacing. Read values, changes and trends, then explain them in context. The three chart workshops at the back give extra construction practice.

Worked examples: follow the method

1. In a 20-person survey, 5 choose cycling. The share is 5/20 = 1/4, so its pie sector is 90°.

2. A line rises from 12 to 18 between two readings: increase 6 units. A horizontal part shows no recorded change.

WHAT TO CHECK

The categories cover the whole survey. Their sectors must fill one complete circle,including small categories.

LESSON 27 • CHOOSE, CALCULATE, EXPLAIN

A real-life example, explained

ORIGINAL TEACHING TASK

A travel survey records walk 8,bus 6,car 4,cycle 2. Find the total and choose a suitable chart to compare counts. Find the pie-chart angle for walking.

How to approach the question

1. Add all frequencies.
2. Walking is what fraction of the total?

Read the planning questions, then follow the model below. Notice how each step helps answer the final question.

Model route

Step 1. Total = 20. A labelled bar chart can compare the four category counts.

Step 2. Walking is 8/20 = 2/5, so sector = 2/5 × 360 = 144°.

Misconception clinic

“A pie chart may leave unused space because not every category is large.”

The categories cover the whole survey. Their sectors must fill one complete circle, including small categories.

What this example teaches you

Select, construct and interpret common statistical displays. The important connection is between the information given, the operation chosen and the meaning of the answer. Compare the result with the original question before finishing.

LEARNING TIP

Cover the model route and describe the method aloud. You can use a different valid method if you explain it clearly and reach a sensible answer.

LESSON 27 • EXPLAINED RECAP AND QUICK CHECK

Build your understanding

Why the method works

Tables preserve exact recorded values. Bar charts compare categories, pie charts compare shares of a whole, and line graphs show changes across an ordered scale such as time. Choose a representation that matches the information.



Another example, step by step

A table records bus 9, walk 6 and cycle 3. Total = 18 people. A bar chart uses heights 9, 6 and 3. For a pie chart, bus is 9/18 = 1/2 of the whole, so its sector is 180°. The same data can support different comparisons.

REMEMBER

Read the title, labels, units, scale and key before calculating from a chart. A visual impression alone can mislead.

Check your understanding

Try these without looking at the examples. Use separate paper for working or drawings.

1. Use the supplied grid to draw a bar chart of walk 8, bus 6, car 4, cycle 2.

2. For a survey of 40 with frequencies 20, 10, 10, give the pie angles.

3. A line graph shows readings 10, 15, 15 at times 09:00, 10:00, 11:00. Describe the two changes.

Explained answers: page 121. If a check is difficult, reread the worked example before trying again.

LESSON 28 • UNDERSTAND • CONTENT POINT 28

Grouping discrete data

LEARNING GOAL

Create non-overlapping classes and represent their frequencies.

A frequency says how often a value occurs. When many different count values are recorded, grouping can summarise the data. For counts of 0 to 14, suitable groups might be 0-4, 5-9, 10-14. Each count fits exactly one group.

For discrete whole-number data, 0-4 includes 0, 1, 2, 3, 4 and 5-9 includes 5, 6, 7, 8, 9. Avoid groups such as 0-5 and 5-10 unless the boundary convention is made explicit, because the value five would otherwise belong twice. Include all possible observations without unintended gaps.

Use tally marks to sort each observation into its group, then count each frequency. Check the frequencies add to the number of original observations. A zero is a valid count and belongs in its stated class;it is not automatically missing data.

Represent the grouped frequencies with a clear chart whose horizontal labels are the group intervals and whose vertical scale counts observations. For these discrete-data bar charts, use consistent intervals and widths. The grouped summary loses the exact within-group observations, so do not pretend it reveals every individual value.

Worked examples: follow the method

1. Values 1, 2, 5, 5, 6, 9, 10, 12, 14 form frequencies 2, 4, 3 in classes 0-4, 5-9, 10-14.

2. The total frequency is 9, matching the nine observations.

WHAT TO CHECK

Zero records a genuine observation with no books borrowed. Removing it changes the sample.

LESSON 28 • CHOOSE, CALCULATE, EXPLAIN

A real-life example, explained

ORIGINAL TEACHING TASK

A library records books borrowed:0,2,4,5,7,8,10,11,13,14. Group into 0-4,5-9 and 10-14. Identify the most frequent group.

How to approach the question

1. Place each observation in exactly one class.

2. Check the total count after grouping.

Read the planning questions, then follow the model below. Notice how each step helps answer the final question.

Model route

Step 1. 0-4 has 0, 2, 4:frequency 3. 5-9 has 5, 7, 8:frequency 3.

Step 2. 10-14 has 10, 11, 13, 14:frequency 4. Total 10;most frequent group is 10-14.

Misconception clinic

“Zero is nothing, so it should be left out.”

Zero records a genuine observation with no books borrowed. Removing it changes the sample.

What this example teaches you

Create non-overlapping classes and represent their frequencies. The important connection is between the information given, the operation chosen and the meaning of the answer. Compare the result with the original question before finishing.

LEARNING TIP

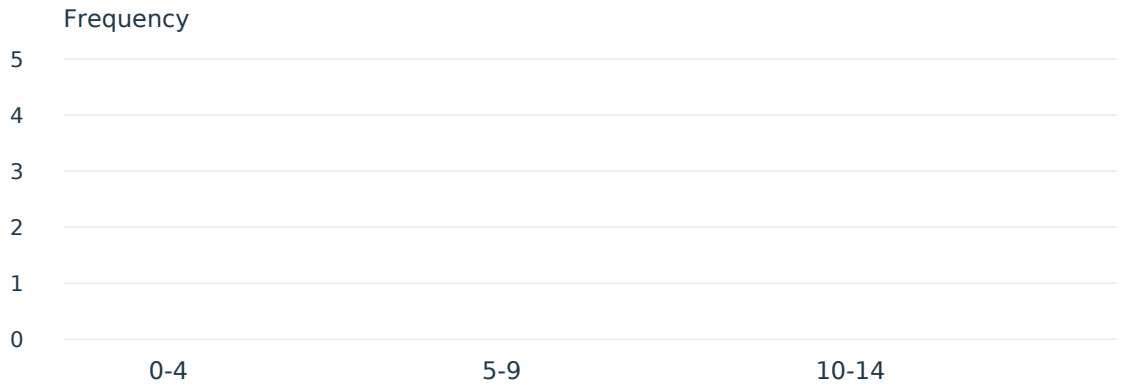
Cover the model route and describe the method aloud. You can use a different valid method if you explain it clearly and reach a sensible answer.

LESSON 28 • EXPLAINED RECAP AND QUICK CHECK

Build your understanding

Why the method works

Grouping gathers individual values into classes so a pattern is easier to see. Each value must belong to exactly one class. Non-overlapping classes prevent double counting; the final frequency total must match the data count.



Another example, step by step

Group 1, 2, 4, 4, 7, 9 into 0-2, 3-5 and 6-9. The first class contains 1 and 2: frequency 2. The second contains the two 4s: frequency 2. The third contains 7 and 9: frequency 2. Total frequency 6 matches six observations.

REMEMBER

Count repeated observations separately. Class labels describe which values belong; bar height shows how many were counted.

Check your understanding

Try these without looking at the examples. Use separate paper for working or drawings.

1. Group 0, 1, 3, 4, 4, 7, 8, 9 into 0-2, 3-5, 6-8, 9-11.
2. Explain why groups 0-5 and 5-10 can be ambiguous.
3. Draw the grouped frequencies from the coached example on the grid.

Explained answers: page 121. If a check is difficult, reread the worked example before trying again.

LESSON 29 • UNDERSTAND • CONTENT POINT 29

Mean and range

LEARNING GOAL

Calculate a typical value and spread,then interpret both.

The mean is one type of average. Add every observation, then divide by the number of observations. The denominator is the count of values, not the largest value or the number of different values. Include zeros when they are valid recorded observations.

The range measures spread: largest value minus smallest value. It is not a typical value. Order the data if that helps locate the endpoints, but ordering is not necessary for the mean because the total stays the same. Write the same unit as the original measurements.

A mean may be fractional even when each observation is a whole-number count. For example, a mean of 2.5 customers does not mean one actual customer was cut in half;it summarises total customers over several equal periods. A very high or low value can influence the mean.

For a comparison, quote the two means and explain the typical outcome, then quote the ranges and explain consistency. Whether a higher mean is better depends on what was measured. Lower times may be desirable;higher production may be desirable. A smaller range suggests a more consistent observed set.

Worked examples: follow the method

1. Values 2, 4, 4, 6 have total 16, count 4, mean 4 and range 6-2=4.

2. Times 8, 9, 10 have mean 9 and range 2;times 5, 9, 13 also have mean 9 but range 8, so the first set is more consistent.

WHAT TO CHECK

That gives the midpoint of the extremes,not generally the mean. Use the total of every observation divided by its count.

LESSON 29 • CHOOSE, CALCULATE, EXPLAIN

A real-life example, explained

ORIGINAL TEACHING TASK

A team completes 6,8,10,8 jobs in four days. Find the mean jobs per day and range. Explain what each describes.

How to approach the question

1. Include all four days in the count.

2. Separate typical level from spread.

Read the planning questions, then follow the model below. Notice how each step helps answer the final question.

Model route

Step 1. Total jobs = 32. Mean = 32 ÷ 4 = 8 jobs/day.

Step 2. Range = 10 - 6 = 4 jobs. The mean summarises daily output;range describes variation between highest and lowest.

Misconception clinic

“Find the mean by adding the largest and smallest values and dividing by two.”

That gives the midpoint of the extremes, not generally the mean. Use the total of every observation divided by its count.

What this example teaches you

Calculate a typical value and spread, then interpret both. The important connection is between the information given, the operation chosen and the meaning of the answer. Compare the result with the original question before finishing.

LEARNING TIP

Cover the model route and describe the method aloud. You can use a different valid method if you explain it clearly and reach a sensible answer.

LESSON 29 • EXPLAINED RECAP AND QUICK CHECK

Build your understanding

Why the method works

The mean shares the total equally across all observations. The range describes the distance between the smallest and largest values. A data set can have the same mean as another set but a different spread.

Another example, step by step

Compare A: 4, 4, 4 and B: 1, 4, 7. Both totals are 12, so both means are 12÷3 = 4. A has range 0; B has range 7-1 = 6. Their averages match, but B's values vary more.

REMEMBER

Include zeros in the count when they are observations. Find the maximum and minimum rather than subtracting the first and last unsorted values.

Check your understanding

Try these without looking at the examples. Use separate paper for working or drawings.

1. Find mean and range of 3, 5, 7, 9.
2. Find mean and range of 0, 4, 4, 8.
3. Compare A:5, 6, 7 with B:3, 6, 9 using mean and range.

Explained answers: page 122. If a check is difficult, reread the worked example before trying again.

LESSON 30 • UNDERSTAND • CONTENT POINT 30

The probability scale

LEARNING GOAL

Use zero to one to describe and compare likelihood.

Probability measures how likely an event is. Zero means impossible and one means certain. A probability halfway between them, 1/2 or 0.5, means an even chance. Values below one half are less likely than not;values above one half are more likely than not.

Use the whole scale, not only the endpoints. A probability of 0.1 is small but not impossible. A probability of 0.9 is high but not certain. A single result cannot prove a model impossible merely because an unlikely event happened.

Compare numerical probabilities by placing them in order on the same scale. Common fractions and decimals help: 1/4 = 0.25, 1/2 = 0.5, 3/4 = 0.75. A probability cannot be negative or greater than one. If such a value appears, recheck the counts or calculation.

Distinguish a possible outcome from a prediction. A forecast or probability model describes uncertainty, not a promise about one occasion. For a simple event and its opposite, the probabilities sum to one, because one of those two possibilities must occur.

Worked examples: follow the method

1. 0.2 is less likely than 0.7, though both events remain possible.

2. If the chance of rain is 0.3 under a stated model, the chance of no rain is 0.7.

WHAT TO CHECK

It is very likely under the model,but there is still a chance of not winning.

LESSON 30 • CHOOSE, CALCULATE, EXPLAIN

A real-life example, explained

ORIGINAL TEACHING TASK

Two games have win probabilities 1/4 and 3/5. Compare the chance of winning and identify whether either guarantees a win.

How to approach the question

1. Convert to comparable decimals or fractions.
2. A guarantee would need probability one.

Read the planning questions, then follow the model below. Notice how each step helps answer the final question.

Model route

Step 1. 1/4 = 0.25 and 3/5 = 0.6. The second game has the greater win probability.

Step 2. Neither is certain;both probabilities are below one.

Misconception clinic

“A probability of 0.9 means winning is certain.”

It is very likely under the model, but there is still a chance of not winning.

What this example teaches you

Use zero to one to describe and compare likelihood. The important connection is between the information given, the operation chosen and the meaning of the answer. Compare the result with the original question before finishing.

LEARNING TIP

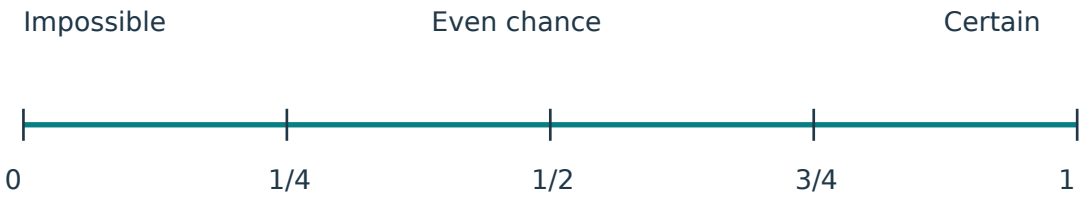
Cover the model route and describe the method aloud. You can use a different valid method if you explain it clearly and reach a sensible answer.

LESSON 30 • EXPLAINED RECAP AND QUICK CHECK

Build your understanding

Why the method works

The probability scale runs from 0 to 1. Zero represents impossible and one represents certain. Probabilities between them describe increasing likelihood. A probability is not a promise about the next single attempt.



Another example, step by step

An event with probability 3/4 is more likely than one with probability 1/4. Since 3/4 = 0.75 and 1/4 = 0.25, both lie within the scale. Neither event is certain. Even a likely event can fail to happen on a particular attempt.

REMEMBER

Use likelihood words consistently: impossible, unlikely, even chance, likely and certain. Keep numerical probabilities between 0 and 1.

Check your understanding

Try these without looking at the examples. Use separate paper for working or drawings.

1. Place 0, 1/4, 1/2, 3/4, 1 in order on the scale.
2. Which is more likely, 0.35 or 0.6? Is either certain?
3. Explain why probabilities -0.2 and 1.4 are invalid.

Explained answers: page 122. If a check is difficult, reread the worked example before trying again.

LESSON 31 • UNDERSTAND • CONTENT POINT 31

Simple events and equally likely outcomes

LEARNING GOAL

Count favourable outcomes and express simple probabilities as fractions.

When all possible outcomes are equally likely, probability = number of favourable outcomes ÷ total outcomes. A fair six-sided die has six equally likely scores. The chance of an even score is 3/6 because 2, 4, 6 are favourable. Simplify the fraction where possible.

List the full outcome set before selecting the favourable outcomes. For a fair spinner with equal sectors, count sectors rather than only distinct colour names. Three red sectors and one blue sector do not give each colour an equal chance;each sector is equally likely.

An event may include several outcomes, such as “score greater than four”. The word or can collect alternatives in a single simple trial: rolling 1 or 2 on a die gives two favourable scores. Do not count the same score twice if two descriptions overlap.

The equal-likelihood assumption matters. A biased die or unequal-area spinner needs more information than a simple count of labels. This lesson uses single-stage selections and fair/equally likely models. Combined-event methods are part of later study rather than required teaching here.

Worked examples: follow the method

1. A fair die has P(score greater than 4)=2/6=1/3.

2. A bag has 3 red and 5 blue equal-sized counters mixed thoroughly. P(red)=3/8 and P(blue)=5/8.

WHAT TO CHECK

The equally likely outcomes are the sectors,not the different labels. B occupies two of eight sectors.

LESSON 31 • CHOOSE, CALCULATE, EXPLAIN

A real-life example, explained

ORIGINAL TEACHING TASK

A spinner has eight equal sectors:three marked A,two B and three C. Find P(B),P(A or C),and explain why letters are not equally likely.

How to approach the question

1. Count sectors in each favourable group.

2. Use all eight sectors as the denominator.

Read the planning questions, then follow the model below. Notice how each step helps answer the final question.

Model route

Step 1. P(B)=2/8=1/4. P(A or C)=6/8=3/4.

Step 2. Letters occur on different numbers of equal sectors. There are three labels, but eight equally likely sector outcomes.

Misconception clinic

“There are three letter names, so P(B)=1/3.”

The equally likely outcomes are the sectors, not the different labels. B occupies two of eight sectors.

What this example teaches you

Count favourable outcomes and express simple probabilities as fractions. The important connection is between the information given, the operation chosen and the meaning of the answer. Compare the result with the original question before finishing.

LEARNING TIP

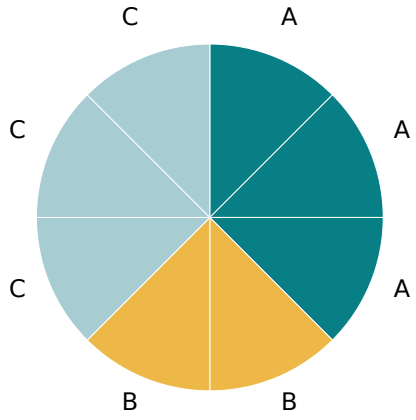
Cover the model route and describe the method aloud. You can use a different valid method if you explain it clearly and reach a sensible answer.

LESSON 31 • EXPLAINED RECAP AND QUICK CHECK

Build your understanding

Why the method works

For equally likely simple outcomes, probability compares the number of favourable outcomes with the number of possible outcomes. Count outcomes rather than just the names of outcome categories.



Eight equal sectors

A: three sectors

B: two sectors

C: three sectors

Another example, step by step

A bag contains 4 green and 6 white counters, all equally likely to be selected. There are 10 counters, so P(green) = 4/10 = 2/5. P(white) = 6/10 = 3/5. Their probabilities total 1 because these are the only possible colours.

REMEMBER

The equally likely condition matters. A spinner needs equal sectors for a simple sector count; unequal sectors require attention to their sizes.

Check your understanding

Try these without looking at the examples. Use separate paper for working or drawings.

1. For a fair die, find P(an odd number).
2. A bag has 4 green and 6 yellow counters. Find P(green) in simplest form.
3. A fair spinner has 10 equal sectors:number1 on four, 2 on three, 3 on three. Find P(2 or 3).

Explained answers: page 123. If a check is difficult, reread the worked example before trying again.

LESSONS 01 AND 02

Lesson-check answers

These are model methods for review, not an official mark scheme. Equivalent correct approaches are valid. Drawing checks use the dimensions, labels and features described;careful print measurements may differ by about 1-2 mm or 2° where appropriate.

01 • Whole numbers to one million

1. 704,060. The zero columns preserve the places.

2. 89,090; 89,900; 90,089; 98,009.

3. 173,025 - 168,450 = 4,575. Check 168,450 + 4,575 = 173,025.

02 • Positive and negative numbers

1. -9, -6, -1, 0, 3.

2. 4, 8, 12; add 4 each time.

3. -7 + 12 = 5°C; 5 - 4 = 1°C.

How to learn from these answers

Identify an error cause: reading, method, calculation, units, rounding or explanation. Correct the cause, then show the complete method once more without looking at the answer.

READY TO MOVE ON?

I can identify the whole or units,choose a suitable operation,explain the calculation and check that the result answers the question. If not,revisit the coached example.

LESSONS 03 AND 04

Lesson-check answers

These are model methods for review, not an official mark scheme. Equivalent correct approaches are valid. Drawing checks use the dimensions, labels and features described;careful print measurements may differ by about 1-2 mm or 2° where appropriate.

03 • Multiplying and dividing by 10, 100 and 1,000

1. 63.5 and 635.

2. 4.7 and 0.0028.

3. £85 in total; £8.50 each. Check 10 shares total £85.

04 • Multiplication and division facts

1. 56 ÷ 8 = 7 and 56 ÷ 7 = 8.

2. 46 × (20 - 2) = 920 - 92 = 828.

3. 215 ÷ 30 = 7 remainder 5; need 8 vehicles. Unused seats 240 - 215 = 25.

How to learn from these answers

Identify an error cause: reading, method, calculation, units, rounding or explanation. Correct the cause, then show the complete method once more without looking at the answer.

READY TO MOVE ON?

I can identify the whole or units,choose a suitable operation,explain the calculation and check that the result answers the question. If not,revisit the coached example.

LESSONS 05 AND 06

Lesson-check answers

These are model methods for review, not an official mark scheme. Equivalent correct approaches are valid. Drawing checks use the dimensions, labels and features described;careful print measurements may differ by about 1-2 mm or 2° where appropriate.

05 • Simple word formulae

1. 7 × £4 = £28.

2. £12 + 3 × £5 = £27.

3. £99. Check £99 - £15 = £84.

06 • Squares of numbers

1. 49 and 64.

2. 12 × 12 = 144.

3. 625 seats. 25^2 means 25 multiplied by 25.

How to learn from these answers

Identify an error cause: reading, method, calculation, units, rounding or explanation. Correct the cause, then show the complete method once more without looking at the answer.

READY TO MOVE ON?

I can identify the whole or units,choose a suitable operation,explain the calculation and check that the result answers the question. If not,revisit the coached example.

LESSONS 07 AND 08

Lesson-check answers

These are model methods for review, not an official mark scheme. Equivalent correct approaches are valid. Drawing checks use the dimensions, labels and features described;careful print measurements may differ by about 1-2 mm or 2° where appropriate.

07 • Order of operations

1. 26.

2. 12 ÷ 4 + 5 = 8.

3. £31; the alternative is £49 and groups the quantities differently.

08 • Common fractions and mixed numbers

1. Examples 2/4 and 3/6.

2. 2 3/4.

3. 6/12, 9/12, 8/12, so 1/2, 2/3, 3/4.

How to learn from these answers

Identify an error cause: reading, method, calculation, units, rounding or explanation. Correct the cause, then show the complete method once more without looking at the answer.

READY TO MOVE ON?

I can identify the whole or units,choose a suitable operation,explain the calculation and check that the result answers the question. If not,revisit the coached example.

LESSONS 09 AND 10

Lesson-check answers

These are model methods for review, not an official mark scheme. Equivalent correct approaches are valid. Drawing checks use the dimensions, labels and features described;careful print measurements may differ by about 1-2 mm or 2° where appropriate.

09 • Fractions of quantities

1. 45 ÷ 3 × 2 = 30.

2. 96 ÷ 8 × 5 = £60.

3. 42 kg used and 28 kg left.

10 • Decimals to three decimal places

1. 0.07, or seven hundredths.

2. 0.084, 0.408, 0.480.

3. They are equal; a trailing zero does not change the amount.

How to learn from these answers

Identify an error cause: reading, method, calculation, units, rounding or explanation. Correct the cause, then show the complete method once more without looking at the answer.

READY TO MOVE ON?

I can identify the whole or units,choose a suitable operation,explain the calculation and check that the result answers the question. If not,revisit the coached example.

LESSONS 11 AND 12

Lesson-check answers

These are model methods for review, not an official mark scheme. Equivalent correct approaches are valid. Drawing checks use the dimensions, labels and features described;careful print measurements may differ by about 1-2 mm or 2° where appropriate.

11 • Decimal calculations to two decimal places

1. 12.45.

2. 96 ÷ 4 = 24.

3. £15.00 total; £5.00 change.

12 • Rounding for a stated purpose

1. 6.3 and 6.35.

2. 10.00.

3. Nearest whole is 8; buy 9 to provide enough coverage.

How to learn from these answers

Identify an error cause: reading, method, calculation, units, rounding or explanation. Correct the cause, then show the complete method once more without looking at the answer.

READY TO MOVE ON?

I can identify the whole or units,choose a suitable operation,explain the calculation and check that the result answers the question. If not,revisit the coached example.

LESSONS 13 AND 14

Lesson-check answers

These are model methods for review, not an official mark scheme. Equivalent correct approaches are valid. Drawing checks use the dimensions, labels and features described;careful print measurements may differ by about 1-2 mm or 2° where appropriate.

13 • Reading and comparing percentages

1. 8%, 30%, 38%, 83%.

2. 35%.

3. The counts are 40 and 30; the totals differ.

14 • Percentages of quantities and simple changes

1. £70.

2. 5% is 3 kg, so 63 kg.

3. Saving £21; final £119.

How to learn from these answers

Identify an error cause: reading, method, calculation, units, rounding or explanation. Correct the cause, then show the complete method once more without looking at the answer.

READY TO MOVE ON?

I can identify the whole or units,choose a suitable operation,explain the calculation and check that the result answers the question. If not,revisit the coached example.

LESSONS 15 AND 16

Lesson-check answers

These are model methods for review, not an official mark scheme. Equivalent correct approaches are valid. Drawing checks use the dimensions, labels and features described;careful print measurements may differ by about 1-2 mm or 2° where appropriate.

15 • Estimation with fractions and decimals

1. About 9 × 4 = 36.

2. About half of 300 = 150.

3. Estimate 40 × £3 = £120. Exact £120.95; the proposed answer is about ten times too large.

16 • Equivalent fractions, decimals and percentages

1. 0.2 and 20%.

2. 2/5 and 40%.

3. 3/4 = 75%, so it is larger than 70%.

How to learn from these answers

Identify an error cause: reading, method, calculation, units, rounding or explanation. Correct the cause, then show the complete method once more without looking at the answer.

READY TO MOVE ON?

I can identify the whole or units,choose a suitable operation,explain the calculation and check that the result answers the question. If not,revisit the coached example.

LESSONS 17 AND 18

Lesson-check answers

These are model methods for review, not an official mark scheme. Equivalent correct approaches are valid. Drawing checks use the dimensions, labels and features described;careful print measurements may differ by about 1-2 mm or 2° where appropriate.

17 • Simple ratio and direct proportion

1. 2:3.

2. £120 and £240.

3. 420 ÷ 6 × 10 = 700 g.

18 • Simple interest

1. £12.

2. £70 per year; £140 interest; £840 total.

3. £54 per year, £162 interest and £522 total.

How to learn from these answers

Identify an error cause: reading, method, calculation, units, rounding or explanation. Correct the cause, then show the complete method once more without looking at the answer.

READY TO MOVE ON?

I can identify the whole or units,choose a suitable operation,explain the calculation and check that the result answers the question. If not,revisit the coached example.

LESSONS 19 AND 20

Lesson-check answers

These are model methods for review, not an official mark scheme. Equivalent correct approaches are valid. Drawing checks use the dimensions, labels and features described;careful print measurements may differ by about 1-2 mm or 2° where appropriate.

19 • Discounts and sale prices

1. £8.50 saving; £76.50 paid.

2. Save £70 and pay £130.

3. Original £120; saving £18; discounted £102; delivered £110.

20 • Converting everyday units

1. 4,200 m and 0.68 kg.

2. 155 minutes and 740p.

3. 3 feet = 36 inches; four pieces use 32 inches, leaving 4 inches.

How to learn from these answers

Identify an error cause: reading, method, calculation, units, rounding or explanation. Correct the cause, then show the complete method once more without looking at the answer.

READY TO MOVE ON?

I can identify the whole or units,choose a suitable operation,explain the calculation and check that the result answers the question. If not,revisit the coached example.

LESSONS 21 AND 22

Lesson-check answers

These are model methods for review, not an official mark scheme. Equivalent correct approaches are valid. Drawing checks use the dimensions, labels and features described;careful print measurements may differ by about 1-2 mm or 2° where appropriate.

21 • Simple map and drawing scales

1. 14 km.

2. 700 cm = 7 m.

3. 400 cm ÷ 50 = 8 cm.

22 • Perimeter, area and composite rectangles

1. Area 21 m^2; perimeter 19 m.

2. 8 × 6 - 3 × 2 = 42 m^2. Boundary 8+4+3+2+5+6 = 28 m.

3. 12 packs; £180.

How to learn from these answers

Identify an error cause: reading, method, calculation, units, rounding or explanation. Correct the cause, then show the complete method once more without looking at the answer.

READY TO MOVE ON?

I can identify the whole or units,choose a suitable operation,explain the calculation and check that the result answers the question. If not,revisit the coached example.

LESSONS 23 AND 24

Lesson-check answers

These are model methods for review, not an official mark scheme. Equivalent correct approaches are valid. Drawing checks use the dimensions, labels and features described;careful print measurements may differ by about 1-2 mm or 2° where appropriate.

23 • Volume of cubes and cuboids

1. 64 cm^3.

2. 315 cm^3.

3. 6,000 cm^3 = 6 litres; one third full is 2 litres.

24 • Drawing shapes, symmetry and angle size

1. Accurate 5 by 3 cm rectangle; two centre lines, one along each direction.

2. Four: two midlines and two diagonals.

3. Acute, right, obtuse, straight.

How to learn from these answers

Identify an error cause: reading, method, calculation, units, rounding or explanation. Correct the cause, then show the complete method once more without looking at the answer.

READY TO MOVE ON?

I can identify the whole or units,choose a suitable operation,explain the calculation and check that the result answers the question. If not,revisit the coached example.

LESSONS 25 AND 26

Lesson-check answers

These are model methods for review, not an official mark scheme. Equivalent correct approaches are valid. Drawing checks use the dimensions, labels and features described;careful print measurements may differ by about 1-2 mm or 2° where appropriate.

25 • Plans, elevations and nets

1. Plan circle diameter 4 cm; front rectangle 4 cm wide by 8 cm high.

2. Plan 8×5; front 8×2; side 5×2 cm for the stated orientation.

3. Four squares in a row, with one above and one below the second square, form a valid net.

26 • Measuring angles and describing direction

1. West.

2. 60°; allow about ±2° for careful measurement on an unchanged print.

3. North-east → east → north.

How to learn from these answers

Identify an error cause: reading, method, calculation, units, rounding or explanation. Correct the cause, then show the complete method once more without looking at the answer.

READY TO MOVE ON?

I can identify the whole or units,choose a suitable operation,explain the calculation and check that the result answers the question. If not,revisit the coached example.

LESSONS 27 AND 28

Lesson-check answers

These are model methods for review, not an official mark scheme. Equivalent correct approaches are valid. Drawing checks use the dimensions, labels and features described;careful print measurements may differ by about 1-2 mm or 2° where appropriate.

27 • Tables, bar charts, pie charts and line graphs

1. Four bars with heights 8, 6, 4, 2;title and labelled axes, equal intervals and equal bar widths.

2. 180°, 90°, 90°;sum 360°.

3. Increase 5 from 09:00 to 10:00, then no change from 10:00 to 11:00.

28 • Grouping discrete data

1. Frequencies 2, 3, 2, 1;total 8.

2. The value 5 fits both unless a boundary rule says otherwise.

3. Bars 3, 3, 4 for classes 0-4, 5-9, 10-14;appropriate title, axes and scale.

How to learn from these answers

Identify an error cause: reading, method, calculation, units, rounding or explanation. Correct the cause, then show the complete method once more without looking at the answer.

READY TO MOVE ON?

I can identify the whole or units,choose a suitable operation,explain the calculation and check that the result answers the question. If not,revisit the coached example.

LESSONS 29 AND 30

Lesson-check answers

These are model methods for review, not an official mark scheme. Equivalent correct approaches are valid. Drawing checks use the dimensions, labels and features described;careful print measurements may differ by about 1-2 mm or 2° where appropriate.

29 • Mean and range

1. Mean 24÷4=6;range 6.

2. Mean 16÷4=4;range 8.

3. Both means 6. A range 2 and B range 6, so A is more consistent.

30 • The probability scale

1. 0, 0.25, 0.5, 0.75, 1 from impossible to certain.

2. 0.6 is more likely;neither equals 1.

3. Probabilities must lie from zero to one inclusive.

How to learn from these answers

Identify an error cause: reading, method, calculation, units, rounding or explanation. Correct the cause, then show the complete method once more without looking at the answer.

READY TO MOVE ON?

I can identify the whole or units,choose a suitable operation,explain the calculation and check that the result answers the question. If not,revisit the coached example.

LESSONS 31

Lesson-check answers

These are model methods for review, not an official mark scheme. Equivalent correct approaches are valid. Drawing checks use the dimensions, labels and features described;careful print measurements may differ by about 1-2 mm or 2° where appropriate.

31 • Simple events and equally likely outcomes

1. 3/6=1/2.

2. 4/10=2/5.

3. 6/10=3/5.

How to learn from these answers

Identify an error cause: reading, method, calculation, units, rounding or explanation. Correct the cause, then show the complete method once more without looking at the answer.

READY TO MOVE ON?

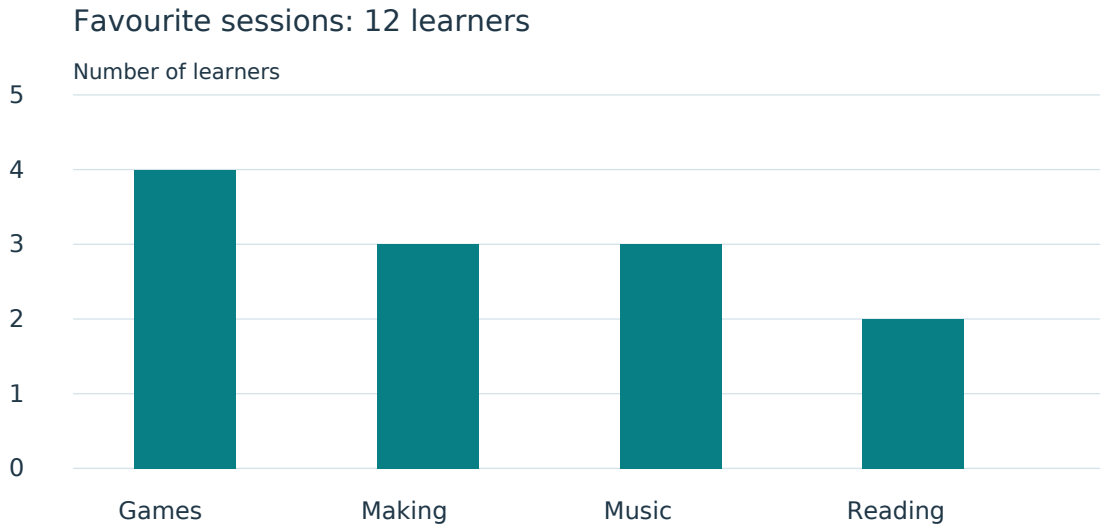
I can identify the whole or units,choose a suitable operation,explain the calculation and check that the result answers the question. If not,revisit the coached example.

EXTRA TEACHING FOR LESSON 27

Chart workshop: bar charts

A survey of 12 learners records favourite session types:games 4, making 3, music 3, reading 2. A bar chart compares these separate categories. Add a title, put the category names along the horizontal axis, and label the vertical axis with frequency or number of learners.

Choose equal vertical intervals that include the largest frequency. Keep all bars the same width and leave gaps between categories. Draw each height from the zero baseline. A category with frequency zero would still be named if it belongs to the intended comparison.



Read and compare

Games is the most common choice, with 4 learners. Making and music have equal counts of 3. Games exceeds reading by 2. The total 4+3+3+2 = 12 checks against the survey size. “Most common” is a count comparison, not a statement about quality.

A pictogram uses a key: if each full symbol represents 2 people, three full symbols represent 6 and a half symbol represents 1. Count the represented values, not only the visible symbols. Tally marks collect counts in groups of five;seven is one group of five plus two more.

Try,then check

A second survey records tea 6, water 4, juice 2. Draw a bar chart on separate squared paper. Check the total and give one comparison sentence.

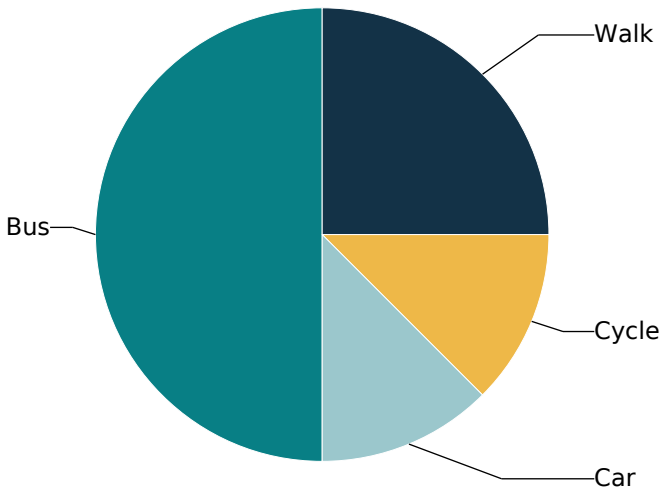
Checking criteria: bars 6, 4, 2;title and named categories;vertical count scale from zero with equal intervals. Total 12. Example comparison: tea has 4 more choices than juice.

EXTRA TEACHING FOR LESSON 27

Chart workshop: pie charts

A pie chart represents one whole divided into category sectors. A whole turn is 360°. Convert each category into its share of the whole, then use that same share of 360°. A half is 180°, a quarter 90° and an eighth 45°.

Choice	Frequency	Share	Sector angle
Bus	20	20/40 = 1/2	180°
Walk	10	10/40 = 1/4	90°
Cycle	5	5/40 = 1/8	45°
Car	5	5/40 = 1/8	45°
Total	40	1 whole	360°



Travel choices: 40 people

Check total frequency = 40

Check total angle = 360°

Construct with compasses and a protractor. Draw a starting radius, measure the first sector, then measure the next from that new boundary. Label the sectors or provide a key. A title states what the whole represents. Do not leave gaps or let sector angles overlap.

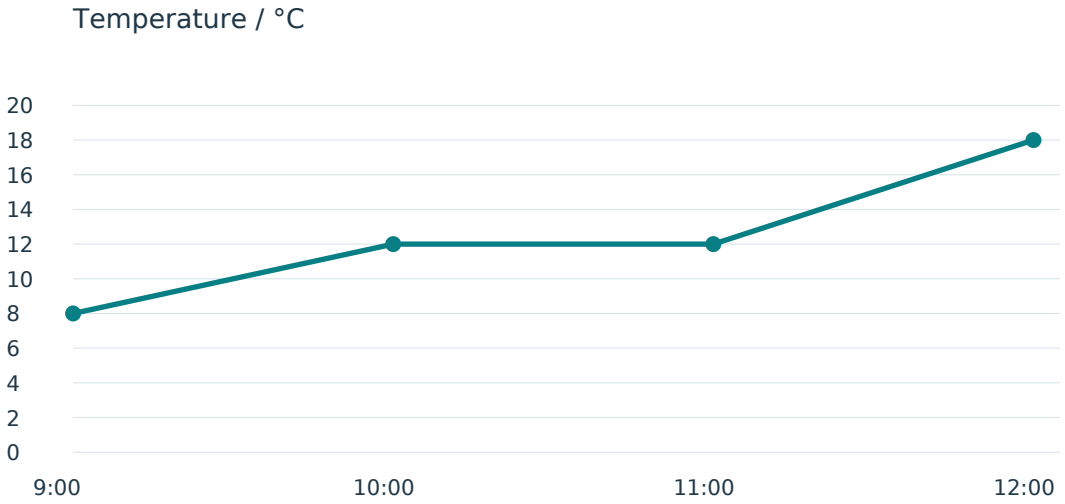
Try: 24 people choose A 12, B 6, C 6. Find angles and construct the chart. Check: 180°, 90°, 90°. Equal printed sector sizes compare proportions;two surveys of different total sizes need not contain equal counts in equal-sized sectors.

EXTRA TEACHING FOR LESSON 27

Chart workshop: line graphs

A line graph can show a quantity measured over time. Put time on the horizontal axis with equal spacing for equal durations. Put the measured quantity on the vertical axis with its unit. Plot each pair and join consecutive observations with straight segments when that representation suits the question.

Time	09:00	10:00	11:00	12:00
Temperature / °C	8	12	12	18



Interpret in context

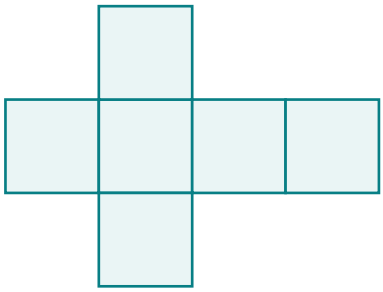
From 09:00 to 10:00, the temperature rises by 4°C. It then stays at 12°C until 11:00, before rising by 6°C to 18°C at noon. The steeper last segment shows a bigger rise over the same one-hour duration. A horizontal segment shows equal recorded values, not missing readings.

Try: describe the overall change from 09:00 to noon and estimate the temperature halfway between 11:00 and noon under the drawn straight-segment model. Check: overall rise 10°C;halfway estimate 15°C. It is an estimate between readings, not a directly recorded measurement.

EXTRA TEACHING FOR LESSON 25

Visual workshop: nets and views

One valid cube net



One valid cube net

Six equal square faces

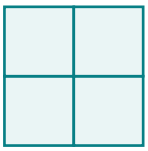
Fold along shared edges

The four squares in a row fold into the sides. The two attached squares close the top and base. Other valid nets exist. All six faces must have matching edge lengths and must avoid overlap after folding.

Plan and elevations of the coached block model

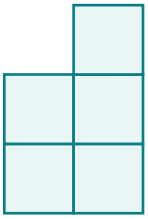
Front row heights are 1, 3;back row heights are 2, 1. The plan has four occupied cells. The front elevation has heights 2, 3 and the right elevation, front to back, has heights 3, 2. These drawings show unit-square outlines.

Plan

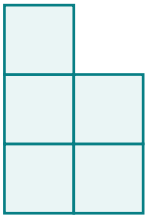


FRONT ↑

Front elevation



Right elevation



Front → back

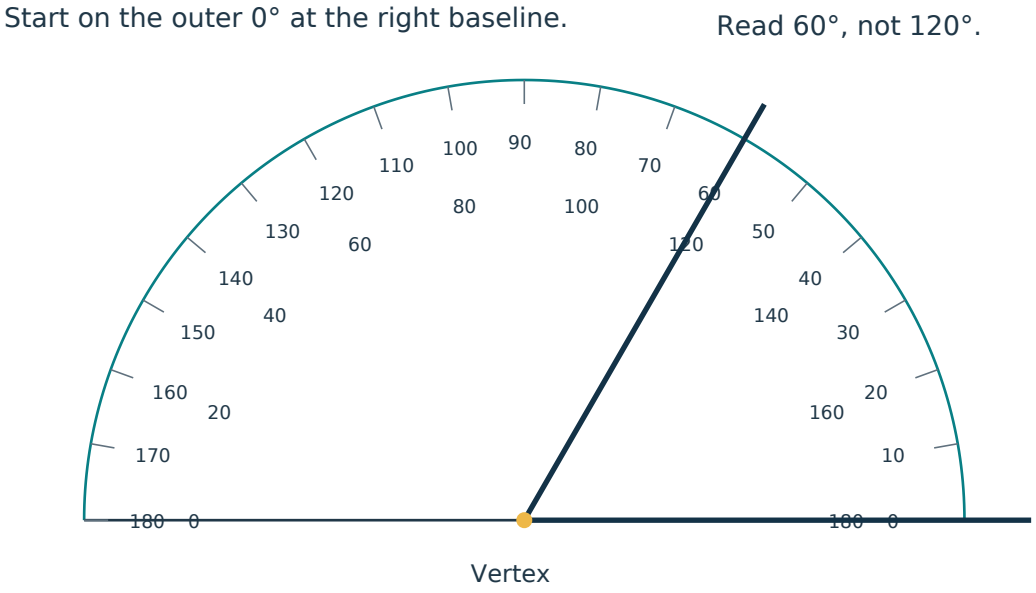
CHECK THE REPRESENTATION

For cube count,add every stack height. For a view’s height,use the largest stack on each line of sight. For a plan,check which floor cells are occupied. These are three different questions.

EXTRA TEACHING FOR LESSON 26

Visual workshop: using a protractor

The diagram models a semicircular protractor. Its centre must sit on the vertex, and the zero baseline must lie on the starting arm. The arm on the right starts at the outer 0°. Follow that scale up to the second arm. The second scale runs the other way for an arm starting on the left.



Why the correct reading is 60°

The opening is visibly smaller than a right angle, so it must be acute. The scale that begins at the right-hand zero reaches 60° on the sloping arm. Reading 120° would use the other starting direction and contradict the acute-angle estimate.

A practical routine

1. Estimate the angle type: acute, right, obtuse or reflex.
2. Place the centre exactly on the vertex.
3. Align the baseline zero with the first arm.
4. Read from that zero to the other arm and include the degree sign.
5. Check the number agrees with the estimated angle type.

LEVEL 1 PROBLEM-SOLVING WORKSHOP

Connecting skills in a real decision

A straightforward problem may use more than one connected step and connect two content areas. The important decision is which calculation helps answer the final question. Identify the output first, then work through the relevant information. [S1-S4]

CASE 1 • COVERAGE AND COST

A rectangular room is 6 m by 4 m. Each flooring pack covers 3 m² and costs £18. Find the minimum pack count and cost,with no waste allowance.

Area = 6×4 = 24 m². Packs = 24÷3 = 8. Cost = 8×£18 = £144. Check 8 packs cover exactly 24 m². The area is an intermediate result;the final question needs a count and cost.

CASE 2 • TIME AND MONEY

A session runs 10:20-13:05 with a 15-minute unpaid break. A worker receives an invented £12 per hour. Find paid time and pay.

Elapsed time is 2 h 45 min. Paid time is 2 h 30 min = 2.5 hours. Pay = 2.5×£12 = £30. Check 30 minutes is half an hour, so it earns £6 in addition to the first two hours' £24.

CASE 3 • DATA AND A COMPARISON

Daily sales are 8,12,10,14. A manager says the average is at least 12. Decide whether the claim is supported.

Mean = (8+12+10+14)÷4 = 44÷4 = 11 sales/day. The claim is not supported by this data because 11 is below 12. "At least" would include exactly 12, but the calculated mean is smaller.

Your explanation frame

"I first calculated ___ because ___. This gave ___ [unit]. I then ___. Therefore ___, because ___ [comparison using figures]. I checked by ___."

REVISION SUPPORT • NOT AN EXAM INSERT

A compact reference bank

Skill	Method or relationship
Place value	Compare largest places first;align decimal points.
Operation order	Brackets,powers,multiply/divide left to right,add/subtract left to right.
Square	$n^2 = n \times n$.
Fraction of quantity	Divide by denominator,then multiply by numerator.
Percentage	10%=one tenth;5%=half of10%;25%=one quarter;50%=one half.
Increase / decrease	Find percentage amount,then add / subtract from original.
Simple interest	Annual interest uses original principal;total interest multiplies by years.
Ratio total	One part = total ÷ sum of ratio parts.
Direct proportion	Find one unit or one portion,then scale to the required number.
Rectangle	Area=l×w;perimeter=2l+2w.
Cuboid / cube	Volume=l×w×h;cube volume=side×side×side.
Mean / range	Mean=sum÷count;range=maximum-minimum.
Simple probability	Favourable outcomes ÷ total equally likely outcomes.
Pie sector	Category fraction × 360°.
Metric	1km=1000m;1m=100cm=1000mm;1kg=1000g;1litre=1000ml.
Time / money	60s=1min;60min=1h;24h=1day;100p=£1.
Imperial within-system	12in=1ft;3ft=1yd;16oz=1lb;14lb=1stone;8pints=1gallon.
Turns	Quarter=90°;half=180°;full=360°;adjacent eight-point compass directions=45°.

Follow the equipment and formula instructions for your own assessment. This page is for learning and cannot automatically be taken into an exam. Use the stated units and supplied relationships in a task.

LEARNING SUPPORT • READ THE SITUATION

Choose the method with confidence

A question may not name the topic. Start by asking what the answer must represent. The clues below help you connect a situation to a method; always read the whole question before deciding.

What you need to find	Think about	Where to learn
A total or a remaining amount	Addition or subtraction; match units.	Lessons 1-4, 10-11
A share of a whole	Fractions, percentages or ratio.	Lessons 8-9, 13-17
A changed price or savings total	Discount or simple interest.	Lessons 18-19
A real distance from a drawing	Scale and unit conversion.	Lessons 20-21
A boundary, covering or capacity	Perimeter, area or volume.	Lessons 22-23
A view, turn or construction	Shape, direction and angle.	Lessons 24-26
A comparison between data sets	Charts, mean and range.	Lessons 27-29
How likely an outcome is	Probability and equal outcomes.	Lessons 30-31

Example: buying enough

A task asks for the number of 6-seat tables needed for 43 people. Division gives 43÷6 = 7 remainder 1. Seven tables seat only 42 people, so you need 8. The question is about a whole number of tables, so an ordinary rounded answer of 7 would not meet the need.

Example: deciding whether money is enough

You have £25. Three tickets cost £7.80 each and booking costs £1.20 in total. Tickets cost 3×£7.80 = £23.40. Add the booking fee once: £24.60. Compare this with £25: there is enough money, with 40p left. The comparison completes the answer.

A USEFUL ROUTE

Find the required output → choose useful information → calculate in stages → interpret the result → check it.

LEARNING SUPPORT • CHECK THE REASON

Understand and repair common mistakes

A wrong answer can reveal a small, fixable misunderstanding. Match the mistake to its cause, then repeat the method correctly. Understanding the repair is more useful than copying a corrected number.

Mixing units

You cannot add 2 m and 35 cm as 37 m. Convert first: 2 m = 200 cm, so the total is 235 cm = 2.35 m. Keep the unit with every intermediate result.

Choosing the wrong whole

A 20% discount on £60 means 20% of the original £60: £12. The sale price is £48. The discount amount and the final price answer different questions.

Rounding at the wrong time

Keep useful precision while calculating and round the final answer as requested. Buying enough packs may require rounding up even when ordinary rounding would go down.

Reading a decimal as a whole number

0.45 is forty-five hundredths, not forty-five. A useful comparison is money: £0.45 is less than £1. Adding a zero at the end gives 0.450, the same value.

Ignoring what an average means

For 2, 3 and 10, the mean is 15÷3 = 5. It is not the middle value, 3. The range is 10-2 = 8; it measures spread, not the average.

Stopping before the decision

If a calculation gives a cost of £36 and the budget is £40, write the comparison: the purchase is affordable because £36 is £4 below the budget. Include figures that support your conclusion.

WHEN YOU GET STUCK

Return to a simpler example. Say what each number means. Identify the first step you understand, then work forward one step at a time. Ask for help with the exact step that is unclear.

1 OF 3 • CHECKED 13 NOVEMBER 2026

Official curriculum and source record

Links identify the curriculum and qualification basis, not endorsement. Check current document versions and centre instructions before using the book with a registered group. The source documents retain their own copyright and licensing terms.

S1 • DfE: Maths Functional Skills subject content

Current HTML presentation, updated 8 November 2024. Shared curriculum and Level 1 problem-solving expectations.

Open official source

S2 • Ofqual: mathematics conditions and requirements

Updated 1 May 2024. Regulatory common-content and assessment-design requirements.

Open official source

S3 • Pearson Edexcel: Level 1/2 Mathematics specification

2019 reformed specification. Level 1 content points 1-31 and qualification number 603/4267/5 reviewed.

Open official source

Numbering note

The complete sequence of 31 content points is used so that percentage reading, percentage amounts, estimation and equivalence each receive explicit lessons. The current DfE HTML groups some of these under a single visible list item. This is a presentation difference, not omitted curriculum content.

2 OF 3 • CHECKED 13 NOVEMBER 2026

Official curriculum and source record

Links identify the curriculum and qualification basis, not endorsement. Check current document versions and centre instructions before using the book with a registered group. The source documents retain their own copyright and licensing terms.

S4 • NCFE: Level 1/2 Mathematics qualification specification

Version 2.0, August 2025. Level 1 mathematical content and reference sequence reviewed.

Open official source

S5 • City & Guilds: 4748-04 Mathematics handbook

Version 1.3, August 2025. Level 1/2 handbook and common-content approach reviewed.

Open official source

S6 • Pearson: Functional Skills Mathematics qualification page

Current qualification information including Level 1 QN 603/4267/5.

Open official source

S7 • NCFE: Level 1 Mathematics qualification page

Current Level 1 QN 603/5055/6 and support-material access. Some assessment resources require centre access.

Open official source

Verification scope

The shared curriculum and the listed specifications were reviewed. This does not certify every current awarding-body handbook or exam delivery rule. If a centre uses another organisation, check its current specification and sample assessment against the shared content map.

SOURCE RECORD 3 OF 3 • FINAL PREPARATION

From this guide to assessment

What the book covers

All 31 specific Level 1 content points have teaching, worked examples, a coached task, extra explained examples and short-check answers. Foundation pages and workshops also develop the broader number-pattern, money, time, measurement, position, shape and chart skills needed to apply them. Straightforward decisions connect quantities and require a contextual explanation.

What to confirm with your centre

- Awarding organisation, qualification number and current specification.
- Non-calculator and calculator section timings, marks and handover rules.
- Approved calculator and equipment, including onscreen drawing tools.
- Current official sample or familiarisation materials for the intended delivery mode.
- Any approved access arrangements before the exam date.

A sensible readiness check

Can you recognise a method without being told it? Can you explain why it fits? Can you write a complete answer with units and a contextual decision? Can you check it another way? If not, return to the relevant lesson and repair the gap before concentrating on timed practice.

Use current official materials after learning. Historical examples and reports can support understanding, but are not a universal source of current pass marks or exam rules. No current live assessment question or restricted paper was used to write this guide.

MY HANDOVER TO INDEPENDENT PRACTICE

Secure topics: _____
Topics needing support: _____
Most common error and repair: _____
Official practice completed: _____
Tutor review and date: _____

Editorial release check:confirm the legal publisher and rights notice, arrange independent mathematical and accessibility proofreading, and keep a dated amendment record. This resource supports preparation and cannot guarantee a pass.