GCSE MATHEMATICS

FOUNDATION TIER COMPREHENSIVE LESSON NOTEBOOK

UNIT 4 | GRAPHS

TEACH-FROM-SCRATCH • PUBLICATION EDITION

10 detailed chapters • original diagrams • worked examples • guided practice • answers

INDEPENDENT PUBLICATION NOTICE

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COMPREHENSIVE LESSON NOTEBOOK

How to learn from this notebook

Meaning first. Method second. Practice third.

FIVE-PASS ROUTINE

1 Read the key idea without a calculator. 2 Cover each worked solution and reproduce it. 3 Complete practice independently. 4 Mark in a different colour and repair errors. 5 Retest after 2–7 days.

What a complete mathematics answer contains

- A clear model or calculation, not only a calculator display.
- Enough working for another person to follow the reasoning.
- Exact values until approximation is requested.
- Units and sensible rounding in context.
- A final statement when interpretation is required.

Error loop

REPAIR, DO NOT MERELY CORRECT

Label each error: concept, operation, arithmetic, calculator entry, accuracy, unit or interpretation. Write the corrected step and one sentence explaining the change.

Foundation does not mean superficial

OCR Foundation questions can combine familiar skills in unfamiliar contexts. Grade 4–5 success depends on selecting a method, connecting several steps and deciding whether the answer is reasonable.

COMPREHENSIVE LESSON NOTEBOOK

Unit 4 coverage map

OCR J560 Graphs of Equations and Functions content organised into a teachable sequence.

CH 01	OCR 7.01a	Coordinates, scales and plotting points
CH 02	OCR 7.01b	Tables of values and linear graphs
CH 03	OCR 7.01c	Quadratic, cubic and reciprocal graphs
CH 04	OCR 7.02a	Gradient, intercept and y = mx + c
CH 05	OCR 6.03d; 7.01b	Solving equations using graphs
CH 06	OCR 7.04a	Conversion and comparison graphs
CH 07	OCR 7.04a	Distance-time graphs
CH 08	OCR 7.04a	Cost, filling and temperature graphs
CH 09	OCR 7.04b	Gradients and rates of change
CH 10	OCR 7.01-7.04 synthesis	Mixed graphical reasoning

IMPORTANT TIER NOTE

This notebook covers OCR J560 section 7 and linked 6.03d at Foundation Tier: coordinates, graph families, straight lines, graphical solutions and real-world graphs. Specification references are identifiers, not copied specification wording.

COMPREHENSIVE LESSON NOTEBOOK

Fast-reference method bank

Understand each relationship before memorising it.

Coordinates	(x,y): horizontal first, vertical second
Midpoint	average the two x-values and two y-values
Linear table	substitute x to calculate y
Gradient	change in y ÷ change in x
Straight line	y=mx+c
x-intercept	set y=0
y-intercept	set x=0
Graphical solution	read root or intersection
Distance-time	gradient=speed
Contextual gradient	vertical-axis units per horizontal-axis unit

CURRENT ASSESSMENT NOTE

OCR has announced Foundation and Higher formula sheets for GCSE Mathematics examinations in 2025, 2026 and 2027. Use the current official OCR sheet alongside this learning bank and check OCR for later exam-series arrangements.

COMPREHENSIVE LESSON NOTEBOOK

Coordinates, scales and plotting points

Read and plot ordered pairs accurately in four quadrants.

SPECIFICATION FOCUS

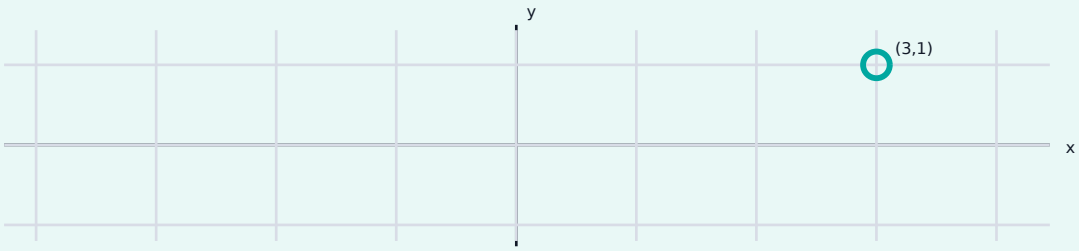
OCR reference OCR 7.01a. This lesson develops representation, accurate calculation, reasoning and interpretation within Foundation Tier.

Understand the idea

Coordinates are ordered pairs (x,y). The x-coordinate gives horizontal position and the y-coordinate gives vertical position. Scales must be read before plotting, particularly when axes do not increase by one.

KEY VOCABULARY

coordinate • origin • axis • quadrant • scale • midpoint



Why the method works

- Ordered pairs encode two independent directions.
- Axis signs identify the quadrant.
- A midpoint averages corresponding coordinates.

CHECK BEFORE MOVING ON

Answer mentally: State the coordinates of a point 3 right and 2 up from the origin. Then define one key word from this page in your own words.

COMPREHENSIVE LESSON NOTEBOOK

Coordinates, scales and plotting points — method and examples

Follow the reasoning; do not copy steps mechanically.

Reliable method

- Read the horizontal x-coordinate first.
- Move vertically to the y-coordinate second.
- Check the scale and quadrant before marking the point.

WORKED EXAMPLE 1

State the coordinates of a point 3 right and 2 up from the origin.

SOLUTION

1. Horizontal movement gives x=3.
2. Vertical movement gives y=2.

ANSWER: (3, 2)

WORKED EXAMPLE 2

Plot A(-4,3). Which quadrant contains A?

SOLUTION

1. x is negative and y is positive.
2. Move 4 left and 3 up.

ANSWER: Quadrant II

SELF-CHECK QUESTION

Which step carries the mathematical reason, and which step carries only arithmetic? Being able to distinguish them makes a solution easier to repair.

COMPREHENSIVE LESSON NOTEBOOK

Coordinates, scales and plotting points — apply and reason

Connect the method to decisions and common errors.

Where this mathematics appears

Maps, screens, designs and tracking systems locate objects with coordinate grids.

Common misconceptions

- Reading y before x.
- Ignoring a non-unit scale.
- Changing both coordinates during a reflection in one axis.

GUIDED TRY

Find the midpoint of (2,4) and (8,10). First predict the form or approximate size of the answer. Then show the complete method.

REASONING PROMPT

Explain why (2,-3) and (-3,2) are different points. Explain why each condition or operation you use is valid.

EXAM COMMUNICATION

Use one mathematical statement per line. Label units and restrictions. If the result is approximate, show the unrounded value before the final rounded answer.

COMPREHENSIVE LESSON NOTEBOOK

Independent practice

Coordinates, scales and plotting points

Complete without notes. Show all working, then use the answer section to diagnose and repair errors.

1. **State the coordinates of a point 3 right and 2 up from the origin.** [1]

2. **Plot A(-4,3). Which quadrant contains A?** [2]

3. **Find the midpoint of (2,4) and (8,10).** [3]

4. **Reflect (5,-2) in the x-axis.** [2]

5. **A point lies on the y-axis and has y=-6. State it.** [1]

6. **Point B is (-2,-5). Translate it 4 right and 7 up.** [2]

7. **Three vertices are (1,1),(5,1),(5,4). Give the fourth vertex of the rectangle.** [2]

8. **Explain why (2,-3) and (-3,2) are different points.** [2]

REFLECTION

Circle one: secure / almost / reteach. Record the question number of your most useful error and the rule that repairs it.

COMPREHENSIVE LESSON NOTEBOOK

Tables of values and linear graphs

Generate coordinates and draw a continuous straight-line graph.

SPECIFICATION FOCUS

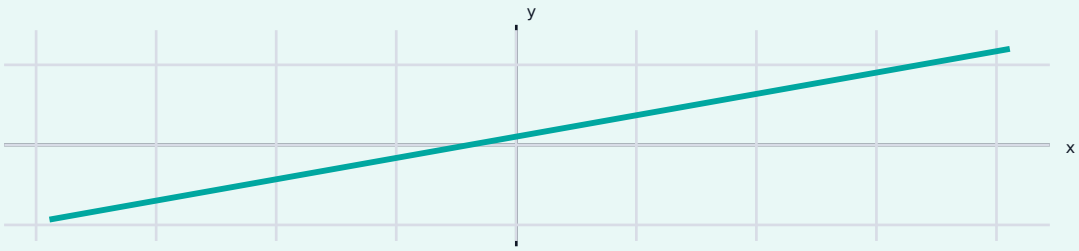
OCR reference OCR 7.01b. This lesson develops representation, accurate calculation, reasoning and interpretation within Foundation Tier.

Understand the idea

A table turns an equation into coordinate pairs. For a linear rule, equal changes in x create equal changes in y, so correctly plotted points lie on one straight continuous line.

KEY VOCABULARY

table • substitute • coordinate • continuous • linear



Why the method works

- Substitution generates points satisfying the equation.
- A constant rate produces constant gradient.
- Joining points represents all intermediate inputs.

CHECK BEFORE MOVING ON

Answer mentally: Complete y=2x+1 when x=3. Then define one key word from this page in your own words.

COMPREHENSIVE LESSON NOTEBOOK

Tables of values and linear graphs — method and examples

Follow the reasoning; do not copy steps mechanically.

Reliable method

- Choose or use the stated x-values.
- Substitute each x into the equation to calculate y.
- Plot accurately and join with one straight line.

WORKED EXAMPLE 1

Complete y=2x+1 when x=3.

SOLUTION

1. y=2(3)+1.
2. y=7.

ANSWER: y = 7

WORKED EXAMPLE 2

For y=3x-2, find y when x=-2.

SOLUTION

1. y=3(-2)-2.
2. y=-6-2=-8.

ANSWER: y = -8

SELF-CHECK QUESTION

Which step carries the mathematical reason, and which step carries only arithmetic? Being able to distinguish them makes a solution easier to repair.

COMPREHENSIVE LESSON NOTEBOOK

Tables of values and linear graphs — apply and reason

Connect the method to decisions and common errors.

Where this mathematics appears

Linear graphs model constant prices, speeds, conversions and regular changes.

Common misconceptions

- Arithmetic errors for negative x.
- Joining with a jagged freehand line.
- Using an unsuitable scale.

GUIDED TRY

Give three points on y=x+4. First predict the form or approximate size of the answer. Then show the complete method.

REASONING PROMPT

Why should points for a linear equation be joined by a line? Explain why each condition or operation you use is valid.

EXAM COMMUNICATION

Use one mathematical statement per line. Label units and restrictions. If the result is approximate, show the unrounded value before the final rounded answer.

COMPREHENSIVE LESSON NOTEBOOK

Independent practice

Tables of values and linear graphs

Complete without notes. Show all working, then use the answer section to diagnose and repair errors.

1. **Complete y=2x+1 when x=3.** **[2]**

2. **For y=3x-2, find y when x=-2.** **[2]**

3. **Give three points on y=x+4.** **[3]**

4. **Does (3,8) lie on y=2x+2?** **[2]**

5. **Find where y=4x-8 crosses the x-axis.** **[3]**

6. **Find where y=-2x+6 crosses the y-axis.** **[2]**

7. **A table for y=5-x has x=-1,0,2. Find the y-values.** **[3]**

8. **Why should points for a linear equation be joined by a line?** **[2]**

REFLECTION

Circle one: secure / almost / reteach. Record the question number of your most useful error and the rule that repairs it.

COMPREHENSIVE LESSON NOTEBOOK

Quadratic, cubic and reciprocal graphs

Connect equations with their characteristic shapes.

SPECIFICATION FOCUS

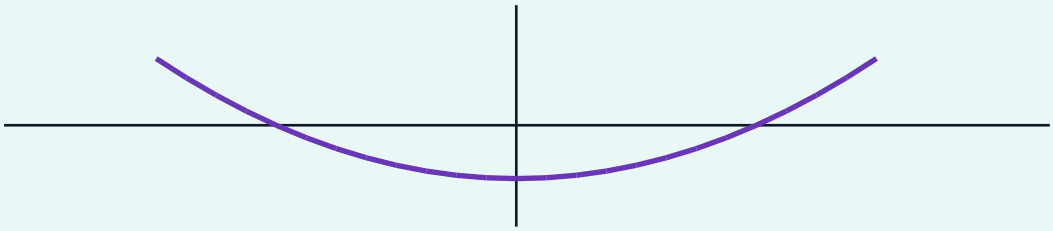
OCR reference OCR 7.01c. This lesson develops representation, accurate calculation, reasoning and interpretation within Foundation Tier.

Understand the idea

Graph families have recognisable structures. Quadratics curve with one turning point, cubics can change curvature, and reciprocal graphs split around excluded axis values. Equations and shapes should be connected through substitution and symmetry.

KEY VOCABULARY

quadratic • cubic • reciprocal • symmetry • intercept • asymptote



quadratic curves; straight lines keep a constant gradient

Why the method works

- Powers determine how signs and magnitudes behave.
- Intercepts come from setting x or y to zero.
- Excluded inputs create gaps or asymptotic behaviour.

CHECK BEFORE MOVING ON

Answer mentally: Name the graph type of $y=x^2$. Then define one key word from this page in your own words.

COMPREHENSIVE LESSON NOTEBOOK

Quadratic, cubic and reciprocal graphs — method and examples

Follow the reasoning; do not copy steps mechanically.

Reliable method

- Use symmetry, intercepts and turning behaviour.
- A quadratic has a U-shape; a cubic changes direction through an S-like shape.
- A reciprocal graph has separate branches and does not meet its axes.

WORKED EXAMPLE 1

Name the graph type of $y=x^2$.

SOLUTION

1. The highest power of x is 2.

ANSWER: Quadratic

WORKED EXAMPLE 2

Find $y=x^2-1$ when $x=3$.

SOLUTION

1. $3^2-1=9-1=8$.

ANSWER: 8

SELF-CHECK QUESTION

Which step carries the mathematical reason, and which step carries only arithmetic? Being able to distinguish them makes a solution easier to repair.

COMPREHENSIVE LESSON NOTEBOOK

Quadratic, cubic and reciprocal graphs — apply and reason

Connect the method to decisions and common errors.

Where this mathematics appears

Curved graphs model area, volume, sharing rates and non-linear change.

Common misconceptions

- Calling every curve quadratic.
- Joining reciprocal branches across x=0.
- Forgetting that negative values square positively.

GUIDED TRY

State the y-intercept of $y=x^2+2$. First predict the form or approximate size of the answer. Then show the complete method.

REASONING PROMPT

Describe one feature that distinguishes a quadratic from a straight line. Explain why each condition or operation you use is valid.

EXAM COMMUNICATION

Use one mathematical statement per line. Label units and restrictions. If the result is approximate, show the unrounded value before the final rounded answer.

COMPREHENSIVE LESSON NOTEBOOK

Independent practice

Quadratic, cubic and reciprocal graphs

Complete without notes. Show all working, then use the answer section to diagnose and repair errors.

1. **Name the graph type of $y=x^2$.** **[1]**

2. **Find $y=x^2-1$ when $x=3$.** **[2]**

3. **State the y-intercept of $y=x^2+2$.** **[2]**

4. **Find $y=x^3$ when $x=-2$.** **[2]**

5. **For $y=6/x$, find y when $x=3$.** **[2]**

6. **Why is $x=0$ not allowed in $y=6/x$?** **[2]**

7. **Which graph is symmetric about the y-axis: $y=x^2$ or $y=x^3$?** **[2]**

8. **Describe one feature that distinguishes a quadratic from a straight line.** **[2]**

REFLECTION

Circle one: secure / almost / reteach. Record the question number of your most useful error and the rule that repairs it.

COMPREHENSIVE LESSON NOTEBOOK

Gradient, intercept and y = mx + c

Interpret the equation of a straight line.

SPECIFICATION FOCUS

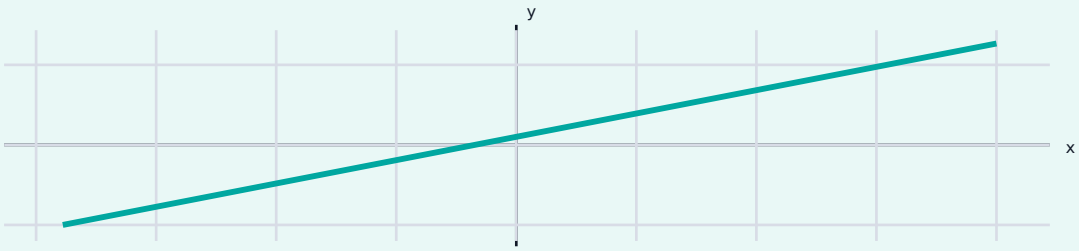
OCR reference OCR 7.02a. This lesson develops representation, accurate calculation, reasoning and interpretation within Foundation Tier.

Understand the idea

A straight-line equation summarises two visual features. The gradient m is vertical change per horizontal unit; c is the value of y when x=0. Together they fix the whole line.

KEY VOCABULARY

gradient • intercept • rise • run • y=mx+c



Why the method works

- Gradient is a ratio of corresponding changes.
- The intercept anchors the line at x=0.
- A constant gradient produces a straight line.

CHECK BEFORE MOVING ON

Answer mentally: State the gradient and y-intercept of y=3x-4. Then define one key word from this page in your own words.

COMPREHENSIVE LESSON NOTEBOOK

Gradient, intercept and y = mx + c — method and examples

Follow the reasoning; do not copy steps mechanically.

Reliable method

- In y=mx+c, m is gradient and c is y-intercept.
- Calculate gradient as change in y divided by change in x.
- Use two clear points and keep the direction consistent.

WORKED EXAMPLE 1

State the gradient and y-intercept of y=3x-4.

SOLUTION

1. Compare with y=mx+c.

ANSWER: Gradient 3; y-intercept -4

WORKED EXAMPLE 2

Find the gradient through (1,2) and (5,10).

SOLUTION

1. Change in y=10-2=8.
2. Change in x=5-1=4.
3. Gradient=8/4=2.

ANSWER: 2

SELF-CHECK QUESTION

Which step carries the mathematical reason, and which step carries only arithmetic? Being able to distinguish them makes a solution easier to repair.

COMPREHENSIVE LESSON NOTEBOOK

Gradient, intercept and y = mx + c — apply and reason

Connect the method to decisions and common errors.

Where this mathematics appears

Rates and fixed charges are naturally represented by gradient and intercept.

Common misconceptions

- Reversing rise and run.
- Using points not exactly on the line.
- Confusing x- and y-intercepts.

GUIDED TRY

Write the equation of gradient 4 and y-intercept 7. First predict the form or approximate size of the answer. Then show the complete method.

REASONING PROMPT

Explain the meaning of a negative gradient. Explain why each condition or operation you use is valid.

EXAM COMMUNICATION

Use one mathematical statement per line. Label units and restrictions. If the result is approximate, show the unrounded value before the final rounded answer.

COMPREHENSIVE LESSON NOTEBOOK

Independent practice

Gradient, intercept and y = mx + c

Complete without notes. Show all working, then use the answer section to diagnose and repair errors.

1. **State the gradient and y-intercept of y=3x-4.** **[2]**

2. **Find the gradient through (1,2) and (5,10).** **[3]**

3. **Write the equation of gradient 4 and y-intercept 7.** **[2]**

4. **Find the gradient of y=-5x+2.** **[1]**

5. **A line crosses the y-axis at 3 and passes through (2,9). Find its equation.** **[4]**

6. **Find the x-intercept of y=2x-6.** **[3]**

7. **A horizontal line passes through y=-2. Write its equation.** **[2]**

8. **Explain the meaning of a negative gradient.** **[2]**

REFLECTION

Circle one: secure / almost / reteach. Record the question number of your most useful error and the rule that repairs it.

COMPREHENSIVE LESSON NOTEBOOK

Solving equations using graphs

Use intersections and axis crossings as approximate solutions.

SPECIFICATION FOCUS

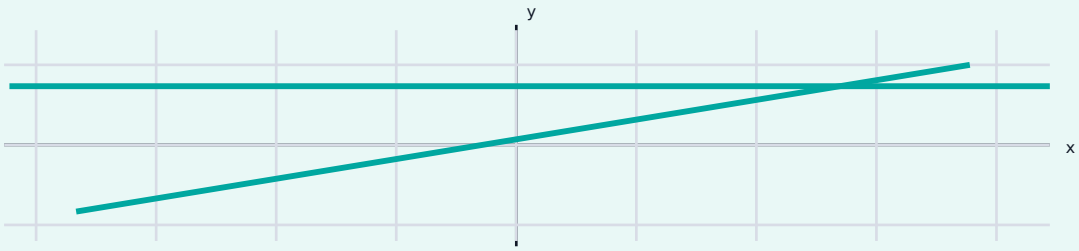
OCR reference OCR 6.03d; 7.01b. This lesson develops representation, accurate calculation, reasoning and interpretation within Foundation Tier.

Understand the idea

Graphs solve equations visually. A root is an x-axis crossing, while an intersection solves equality between two functions. Accuracy is limited by plotting and scale.

KEY VOCABULARY

root • intersection • approximate • axis crossing • accuracy



Why the method works

- At an x-intercept, y=0.
- At an intersection, both graphs have the same coordinates.
- Substitution tests the read value.

CHECK BEFORE MOVING ON

Answer mentally: The graph y=2x-6 crosses the x-axis at x=3. Solve 2x-6=0. Then define one key word from this page in your own words.

COMPREHENSIVE LESSON NOTEBOOK

Solving equations using graphs — method and examples

Follow the reasoning; do not copy steps mechanically.

Reliable method

- A root is an x-value where the graph has y=0.
- Two graphs are equal where they intersect.
- Read approximate values using the graph scale and stated accuracy.

WORKED EXAMPLE 1

The graph y=2x-6 crosses the x-axis at x=3. Solve 2x-6=0.

SOLUTION

1. A root occurs where y=0.

ANSWER: x = 3

WORKED EXAMPLE 2

Graphs y=x+1 and y=7-x intersect at (3,4). Solve x+1=7-x.

SOLUTION

1. At the intersection both expressions have equal y-values.

ANSWER: x = 3

SELF-CHECK QUESTION

Which step carries the mathematical reason, and which step carries only arithmetic? Being able to distinguish them makes a solution easier to repair.

COMPREHENSIVE LESSON NOTEBOOK

Solving equations using graphs — apply and reason

Connect the method to decisions and common errors.

Where this mathematics appears

Graphical solutions are useful when exact algebra is difficult or a visual estimate is sufficient.

Common misconceptions

- Reporting the y-coordinate instead of x.
- Giving excessive precision.
- Missing a second intersection.

GUIDED TRY

A quadratic crosses the x-axis at -2 and 5. State its roots. First predict the form or approximate size of the answer. Then show the complete method.

REASONING PROMPT

State one check for a graphical solution. Explain why each condition or operation you use is valid.

EXAM COMMUNICATION

Use one mathematical statement per line. Label units and restrictions. If the result is approximate, show the unrounded value before the final rounded answer.

COMPREHENSIVE LESSON NOTEBOOK

Independent practice

Solving equations using graphs

Complete without notes. Show all working, then use the answer section to diagnose and repair errors.

1. **The graph y=2x-6 crosses the x-axis at x=3. Solve 2x-6=0.** **[1]**

2. **Graphs y=x+1 and y=7-x intersect at (3,4). Solve x+1=7-x.** **[2]**

3. **A quadratic crosses the x-axis at -2 and 5. State its roots.** **[2]**

4. **A graph of $y=x^2$ has y=16 at two points. Solve $x^2=16$.** **[2]**

5. **The lines y=3x-1 and y=8 intersect. Find x.** **[3]**

6. **A graph gives a root between 2.4 and 2.5. State it to 1 decimal place if the crossing is 2.46.** **[2]**

7. **Why might a graph give an approximate rather than exact solution?** **[2]**

8. **State one check for a graphical solution.** **[2]**

REFLECTION

Circle one: secure / almost / reteach. Record the question number of your most useful error and the rule that repairs it.

COMPREHENSIVE LESSON NOTEBOOK

Conversion and comparison graphs

Read and construct graphs connecting two measurement scales.

SPECIFICATION FOCUS

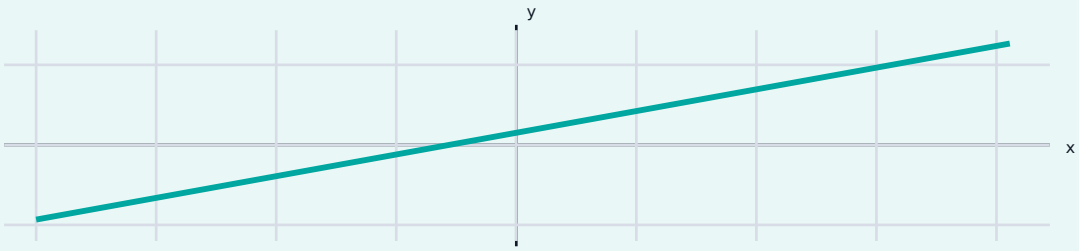
OCR reference OCR 7.04a. This lesson develops representation, accurate calculation, reasoning and interpretation within Foundation Tier.

Understand the idea

A conversion graph links two scales. If zero of one quantity corresponds to zero of the other and the rate is constant, the line passes through the origin. Offset conversions have non-zero intercepts.

KEY VOCABULARY

conversion • scale factor • proportional • unit • origin



Why the method works

- Gradient is the conversion factor.
- Axes allow either direction of conversion.
- Units determine the meaning of the rate.

CHECK BEFORE MOVING ON

Answer mentally: A graph shows £1=$1.25. Convert £48. Then define one key word from this page in your own words.

COMPREHENSIVE LESSON NOTEBOOK

Conversion and comparison graphs — method and examples

Follow the reasoning; do not copy steps mechanically.

Reliable method

- Identify which quantity is on each axis.
- Use a straight proportional line only when zero maps to zero.
- Read across and down carefully, keeping units.

WORKED EXAMPLE 1

A graph shows £1=$1.25. Convert £48.

SOLUTION

1. 48×1.25=60.

ANSWER: $60

WORKED EXAMPLE 2

A conversion graph shows 5 miles=8 km. Convert 30 miles.

SOLUTION

1. Scale factor is 6.
2. 8×6=48 km.

ANSWER: 48 km

SELF-CHECK QUESTION

Which step carries the mathematical reason, and which step carries only arithmetic? Being able to distinguish them makes a solution easier to repair.

COMPREHENSIVE LESSON NOTEBOOK

Conversion and comparison graphs — apply and reason

Connect the method to decisions and common errors.

Where this mathematics appears

Currency, distance, mass and temperature conversions use linked scales.

Common misconceptions

- Reading from the wrong axis.
- Assuming every conversion is direct proportion.
- Dropping units.

GUIDED TRY

A line passes through (4,10) and the origin. Find y when x=7. First predict the form or approximate size of the answer. Then show the complete method.

REASONING PROMPT

Explain how to reverse a conversion graph reading. Explain why each condition or operation you use is valid.

EXAM COMMUNICATION

Use one mathematical statement per line. Label units and restrictions. If the result is approximate, show the unrounded value before the final rounded answer.

COMPREHENSIVE LESSON NOTEBOOK

Independent practice

Conversion and comparison graphs

Complete without notes. Show all working, then use the answer section to diagnose and repair errors.

1. **A graph shows £1=$1.25. Convert £48.** **[2]**

2. **A conversion graph shows 5 miles=8 km. Convert 30 miles.** **[2]**

3. **A line passes through (4,10) and the origin. Find y when x=7.** **[3]**

4. **A temperature graph maps 0°C to 32°F. Is it direct proportion?** **[2]**

5. **On a graph, 12 cm represents 30 km. Find km per cm.** **[2]**

6. **Convert 72 km to miles using 5 miles=8 km.** **[3]**

7. **Why should a conversion graph have labelled units?** **[2]**

8. **Explain how to reverse a conversion graph reading.** **[2]**

REFLECTION

Circle one: secure / almost / reteach. Record the question number of your most useful error and the rule that repairs it.

COMPREHENSIVE LESSON NOTEBOOK

Distance-time graphs

Interpret motion from gradient and horizontal sections.

SPECIFICATION FOCUS

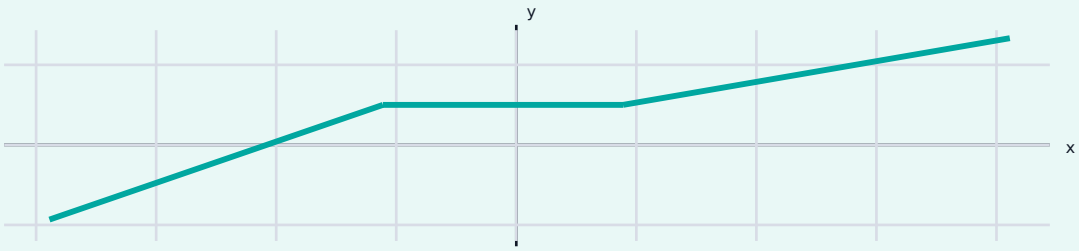
OCR reference OCR 7.04a. This lesson develops representation, accurate calculation, reasoning and interpretation within Foundation Tier.

Understand the idea

A distance-time graph records position relative to a reference point. Its gradient is speed. A horizontal section means time passes without a distance change; a steeper section means faster motion.

KEY VOCABULARY

distance • time • speed • gradient • stationary



Why the method works

- Distance divided by time is speed.
- Gradient measures this same ratio visually.
- Returning toward the reference makes distance fall.

CHECK BEFORE MOVING ON

Answer mentally: A cyclist travels 12 km in 40 minutes. Find average speed in km/h. Then define one key word from this page in your own words.

COMPREHENSIVE LESSON NOTEBOOK

Distance-time graphs — method and examples

Follow the reasoning; do not copy steps mechanically.

Reliable method

- Gradient represents speed: distance divided by time.
- A horizontal section means distance is unchanged, so the object is stopped.
- A steeper section represents greater speed.

WORKED EXAMPLE 1

A cyclist travels 12 km in 40 minutes. Find average speed in km/h.

SOLUTION

1. 40 minutes=2/3 hour.
2. 12÷(2/3)=18 km/h.

ANSWER: 18 km/h

WORKED EXAMPLE 2

What does a horizontal distance-time segment mean?

SOLUTION

1. Time changes but distance does not.

ANSWER: The object is stationary

SELF-CHECK QUESTION

Which step carries the mathematical reason, and which step carries only arithmetic? Being able to distinguish them makes a solution easier to repair.

COMPREHENSIVE LESSON NOTEBOOK

Distance-time graphs — apply and reason

Connect the method to decisions and common errors.

Where this mathematics appears

Travel tracking and race analysis use distance-time graphs to compare journeys.

Common misconceptions

- Treating height as speed.
- Comparing visual steepness when scales differ.
- Mixing minutes and hours.

GUIDED TRY

A car travels 150 km in 2.5 hours. Find average speed. First predict the form or approximate size of the answer. Then show the complete method.

REASONING PROMPT

State two features needed to compare journeys fairly. Explain why each condition or operation you use is valid.

EXAM COMMUNICATION

Use one mathematical statement per line. Label units and restrictions. If the result is approximate, show the unrounded value before the final rounded answer.

COMPREHENSIVE LESSON NOTEBOOK

Independent practice

Distance-time graphs

Complete without notes. Show all working, then use the answer section to diagnose and repair errors.

1. **A cyclist travels 12 km in 40 minutes. Find average speed in km/h.** **[3]**

2. **What does a horizontal distance-time segment mean?** **[1]**

3. **A car travels 150 km in 2.5 hours. Find average speed.** **[2]**

4. **Two lines start together; line A is steeper. Which object is faster?** **[1]**

5. **A walker reaches 6 km at 10:30 after starting 09:00. Find speed.** **[3]**

6. **A journey goes 20 km out then returns to zero distance. What does zero represent?** **[2]**

7. **Why is a vertical segment impossible on a distance-time graph?** **[2]**

8. **State two features needed to compare journeys fairly.** **[2]**

REFLECTION

Circle one: secure / almost / reteach. Record the question number of your most useful error and the rule that repairs it.

COMPREHENSIVE LESSON NOTEBOOK

Cost, filling and temperature graphs

Interpret intercepts, slopes, plateaus and changes of direction.

SPECIFICATION FOCUS

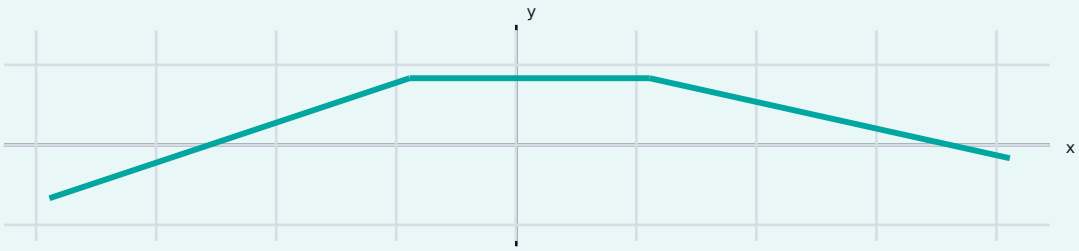
OCR reference OCR 7.04a. This lesson develops representation, accurate calculation, reasoning and interpretation within Foundation Tier.

Understand the idea

Real-world graphs tell stories through intercepts, slopes and turning behaviour. The same numerical feature has different meaning depending on axis labels and units.

KEY VOCABULARY

fixed charge • rate • plateau • curve • context



Why the method works

- An intercept represents an initial amount.
- Gradient represents change per unit input.
- A changing gradient shows a changing rate.

CHECK BEFORE MOVING ON

Answer mentally: A taxi graph starts at £4 when distance is 0. Interpret £4. Then define one key word from this page in your own words.

COMPREHENSIVE LESSON NOTEBOOK

Cost, filling and temperature graphs — method and examples

Follow the reasoning; do not copy steps mechanically.

Reliable method

- Translate each graph feature into the context.
- An intercept can represent a starting amount or fixed charge.
- Changing gradient means the rate changes.

WORKED EXAMPLE 1

A taxi graph starts at £4 when distance is 0. Interpret £4.

SOLUTION

1. It is paid before any distance is travelled.

ANSWER: The fixed starting charge

WORKED EXAMPLE 2

A tank-volume graph is horizontal for 5 minutes. Interpret.

SOLUTION

1. No net liquid enters or leaves.

ANSWER: The volume does not change

SELF-CHECK QUESTION

Which step carries the mathematical reason, and which step carries only arithmetic? Being able to distinguish them makes a solution easier to repair.

COMPREHENSIVE LESSON NOTEBOOK

Cost, filling and temperature graphs — apply and reason

Connect the method to decisions and common errors.

Where this mathematics appears

Bills, tanks, temperature and production are interpreted from graphical features.

Common misconceptions

- Ignoring the context.
- Calling every flat part zero.
- Assuming a curved graph has constant rate.

GUIDED TRY

A cost line has gradient £2.40 per hour and intercept £5. Write the rule. First predict the form or approximate size of the answer. Then show the complete method.

REASONING PROMPT

Give one reason a real-world graph may be curved. Explain why each condition or operation you use is valid.

EXAM COMMUNICATION

Use one mathematical statement per line. Label units and restrictions. If the result is approximate, show the unrounded value before the final rounded answer.

COMPREHENSIVE LESSON NOTEBOOK

Independent practice

Cost, filling and temperature graphs

Complete without notes. Show all working, then use the answer section to diagnose and repair errors.

1. **A taxi graph starts at £4 when distance is 0. Interpret £4.** [1]

2. **A tank-volume graph is horizontal for 5 minutes. Interpret.** [1]

3. **A cost line has gradient £2.40 per hour and intercept £5. Write the rule.** [2]

4. **A cooling graph falls quickly then more slowly. Describe the rate.** [2]

5. **A phone plan costs £12 plus 5p per text. Find cost for 80 texts.** [3]

6. **A tank rises from 100 L to 340 L in 8 min. Find filling rate.** [2]

7. **Why can two graphs with the same shape tell different stories?** [2]

8. **Give one reason a real-world graph may be curved.** [2]

REFLECTION

Circle one: secure / almost / reteach. Record the question number of your most useful error and the rule that repairs it.

COMPREHENSIVE LESSON NOTEBOOK

Gradients and rates of change

Interpret gradient as change per unit in Foundation contexts.

SPECIFICATION FOCUS

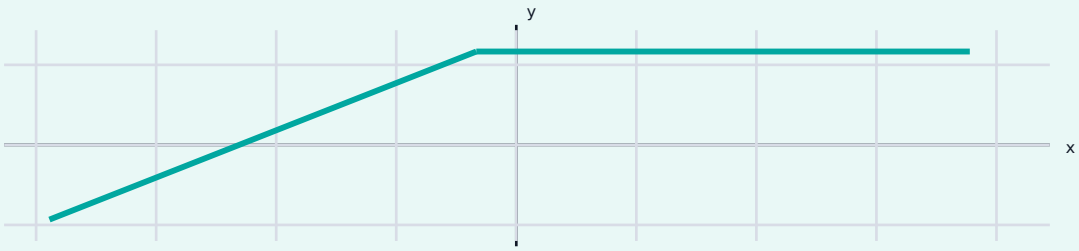
OCR reference OCR 7.04b. This lesson develops representation, accurate calculation, reasoning and interpretation within Foundation Tier.

Understand the idea

Gradient measures output change per input unit. In context, it may represent speed, cost per item, filling rate or temperature change.

KEY VOCABULARY

rate of change • gradient • rise • run • units



Why the method works

- Units confirm a gradient meaning.
- Rise divided by run gives the rate over an interval.
- A zero gradient means no change in the vertical quantity.

CHECK BEFORE MOVING ON

Answer mentally: A distance-time graph rises 18 km in 0.5 h. Find its gradient. Then define one key word from this page in your own words.

COMPREHENSIVE LESSON NOTEBOOK

Gradients and rates of change — method and examples

Follow the reasoning; do not copy steps mechanically.

Reliable method

- Gradient means vertical change divided by horizontal change.
- Attach units by dividing the vertical-axis unit by the horizontal-axis unit.
- Check scales before comparing steepness.

WORKED EXAMPLE 1

A distance-time graph rises 18 km in 0.5 h. Find its gradient.

SOLUTION

1. Gradient=change in distance ÷ change in time.
2. 18÷0.5=36 km/h.

ANSWER: 36 km/h

WORKED EXAMPLE 2

A tank-volume graph rises from 120 L to 300 L in 6 minutes. Find the rate.

SOLUTION

1. Change in volume=180 L.
2. 180÷6=30 L/min.

ANSWER: 30 L/min

SELF-CHECK QUESTION

Which step carries the mathematical reason, and which step carries only arithmetic? Being able to distinguish them makes a solution easier to repair.

COMPREHENSIVE LESSON NOTEBOOK

Gradients and rates of change — apply and reason

Connect the method to decisions and common errors.

Where this mathematics appears

Travel, pricing and filling graphs use gradient to communicate rate.

Common misconceptions

- Comparing visual steepness when scales differ.
- Dividing horizontal change by vertical change.
- Giving a number without rate units.

GUIDED TRY

A graph rises from 4 m/s to 10 m/s over 3 s. Find its gradient. First predict the form or approximate size of the answer. Then show the complete method.

REASONING PROMPT

State one limitation of estimating a gradient from a curve. Explain why each condition or operation you use is valid.

EXAM COMMUNICATION

Use one mathematical statement per line. Label units and restrictions. If the result is approximate, show the unrounded value before the final rounded answer.

COMPREHENSIVE LESSON NOTEBOOK

Independent practice

Gradients and rates of change

Complete without notes. Show all working, then use the answer section to diagnose and repair errors.

1. **A distance-time graph rises 18 km in 0.5 h. Find its gradient.** **[2]**

2. **A tank-volume graph rises from 120 L to 300 L in 6 minutes. Find the rate.** **[3]**

3. **A graph rises from 4 m/s to 10 m/s over 3 s. Find its gradient.** **[3]**

4. **State units of gradient on a distance-km against time-hour graph.** **[2]**

5. **Line A rises 24 units over a run of 6. Line B rises 15 over a run of 5. Which is steeper?** **[3]**

6. **What does zero gradient mean on a temperature-time graph?** **[1]**

7. **A cost graph has gradient 2.8 with cost in pounds and mass in kg. Interpret it.** **[2]**

8. **State one limitation of estimating a gradient from a curve.** **[2]**

REFLECTION

Circle one: secure / almost / reteach. Record the question number of your most useful error and the rule that repairs it.

COMPREHENSIVE LESSON NOTEBOOK

Mixed graphical reasoning

Select coordinates, equations, gradients, intersections and context.

SPECIFICATION FOCUS

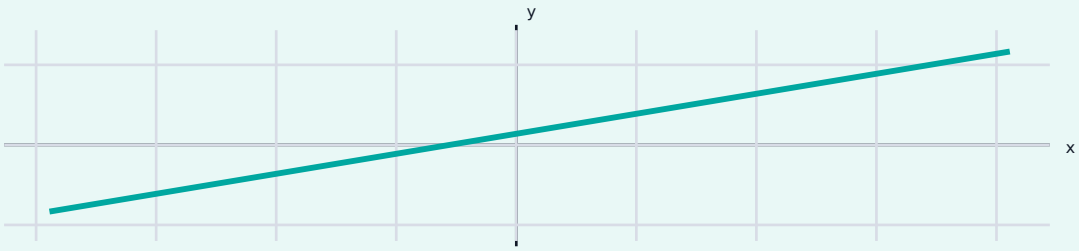
OCR reference OCR 7.01-7.04 synthesis. This lesson develops representation, accurate calculation, reasoning and interpretation within Foundation Tier.

Understand the idea

Mixed graph questions require disciplined reading. Titles and units identify the model; geometry of the graph then determines whether to use a coordinate, rate, crossing or area.

KEY VOCABULARY

axis • scale • coordinate • gradient • intersection • area



Why the method works

- Each feature answers a different mathematical question.
- Units provide an independent check.
- Substitution or trend checks test plausibility.

CHECK BEFORE MOVING ON

Answer mentally: For y=2x+5, find the point when x=-3. Then define one key word from this page in your own words.

COMPREHENSIVE LESSON NOTEBOOK

Mixed graphical reasoning — method and examples

Follow the reasoning; do not copy steps mechanically.

Reliable method

- Read titles, axes, scales and units first.
- Decide whether the task concerns a point, gradient, intercept, intersection or area.
- Check the answer against the visible trend and context.

WORKED EXAMPLE 1

For y=2x+5, find the point when x=-3.

SOLUTION

1. y=2(-3)+5=-1.

ANSWER: (-3, -1)

WORKED EXAMPLE 2

Find the gradient through (-2,1) and (4,13).

SOLUTION

1. Change in y=12; change in x=6.
2. Gradient=2.

ANSWER: 2

SELF-CHECK QUESTION

Which step carries the mathematical reason, and which step carries only arithmetic? Being able to distinguish them makes a solution easier to repair.

COMPREHENSIVE LESSON NOTEBOOK

Mixed graphical reasoning — apply and reason

Connect the method to decisions and common errors.

Where this mathematics appears

Graph literacy supports decisions in travel, finance, science and data monitoring.

Common misconceptions

- Starting calculations before reading scales.
- Giving an answer without units.
- Using a method suited to the wrong graph type.

GUIDED TRY

Write the line with gradient -3 and intercept 4. First predict the form or approximate size of the answer. Then show the complete method.

REASONING PROMPT

State two checks when reading a graph. Explain why each condition or operation you use is valid.

EXAM COMMUNICATION

Use one mathematical statement per line. Label units and restrictions. If the result is approximate, show the unrounded value before the final rounded answer.

COMPREHENSIVE LESSON NOTEBOOK

Independent practice

Mixed graphical reasoning

Complete without notes. Show all working, then use the answer section to diagnose and repair errors.

1. **For y=2x+5, find the point when x=-3.** **[2]**

2. **Find the gradient through (-2,1) and (4,13).** **[3]**

3. **Write the line with gradient -3 and intercept 4.** **[2]**

4. **A quadratic has roots 1 and 6. Solve y=0.** **[2]**

5. **A distance-time line covers 27 km in 45 min. Find km/h.** **[3]**

6. **A conversion line through the origin contains (8,20). Find y when x=14.** **[3]**

7. **A graph crosses the y-axis at -2 and passes (3,7). Find its equation.** **[4]**

8. **State two checks when reading a graph.** **[2]**

REFLECTION

Circle one: secure / almost / reteach. Record the question number of your most useful error and the rule that repairs it.

COMPREHENSIVE LESSON NOTEBOOK

Practice answers and repair notes

Coordinates, scales and plotting points

Use only after a genuine attempt. Rework incorrect questions from a blank line rather than copying the final value.

1. State the coordinates of a point 3 right and 2 up from the origin.

ANSWER: (3, 2)

Method cue: Horizontal movement gives x=3. Check sign, size, accuracy and units.

2. Plot A(-4,3). Which quadrant contains A?

ANSWER: Quadrant II

Method cue: x is negative and y is positive. Check sign, size, accuracy and units.

3. Find the midpoint of (2,4) and (8,10).

ANSWER: (5, 7)

Method cue: Average x-values: (2+8)/2=5. Check sign, size, accuracy and units.

4. Reflect (5,-2) in the x-axis.

ANSWER: (5, 2)

Method cue: The x-coordinate stays fixed. Check sign, size, accuracy and units.

5. A point lies on the y-axis and has y=-6. State it.

ANSWER: (0, -6)

Method cue: Every point on the y-axis has x=0. Check sign, size, accuracy and units.

6. Point B is (-2,-5). Translate it 4 right and 7 up.

ANSWER: (2, 2)

Method cue: New x=-2+4=2. Check sign, size, accuracy and units.

7. Three vertices are (1,1),(5,1),(5,4). Give the fourth vertex of the rectangle.

ANSWER: (1, 4)

Method cue: Match x=1 with y=4 to complete parallel sides. Check sign, size, accuracy and units.

8. Explain why (2,-3) and (-3,2) are different points.

ANSWER: Their x- and y-coordinates are reversed.

Method cue: Coordinates are ordered pairs. Check sign, size, accuracy and units.

COMPREHENSIVE LESSON NOTEBOOK

Practice answers and repair notes

Tables of values and linear graphs

Use only after a genuine attempt. Rework incorrect questions from a blank line rather than copying the final value.

1. Complete y=2x+1 when x=3.

ANSWER: y = 7

Method cue: y=2(3)+1. Check sign, size, accuracy and units.

2. For y=3x-2, find y when x=-2.

ANSWER: y = -8

Method cue: y=3(-2)-2. Check sign, size, accuracy and units.

3. Give three points on y=x+4.

ANSWER: For example (-4,0), (0,4), (2,6)

Method cue: Substitute chosen x-values. Check sign, size, accuracy and units.

4. Does (3,8) lie on y=2x+2?

ANSWER: Yes

Method cue: At x=3, y=2(3)+2=8. Check sign, size, accuracy and units.

5. Find where y=4x-8 crosses the x-axis.

ANSWER: (2, 0)

Method cue: On the x-axis y=0. Check sign, size, accuracy and units.

6. Find where y=-2x+6 crosses the y-axis.

ANSWER: (0, 6)

Method cue: On the y-axis x=0. Check sign, size, accuracy and units.

7. A table for y=5-x has x=-1,0,2. Find the y-values.

ANSWER: 6, 5, 3

Method cue: Substitute each x. Check sign, size, accuracy and units.

8. Why should points for a linear equation be joined by a line?

ANSWER: Every intermediate real x-value has a corresponding y-value.

Method cue: The relationship is continuous. Check sign, size, accuracy and units.

COMPREHENSIVE LESSON NOTEBOOK

Practice answers and repair notes

Quadratic, cubic and reciprocal graphs

Use only after a genuine attempt. Rework incorrect questions from a blank line rather than copying the final value.

1. Name the graph type of $y=x^2$.

ANSWER: Quadratic

Method cue: The highest power of x is 2. Check sign, size, accuracy and units.

2. Find $y=x^2-1$ when $x=3$.

ANSWER: 8

Method cue: $3^2-1=9-1=8$. Check sign, size, accuracy and units.

3. State the y-intercept of $y=x^2+2$.

ANSWER: (0, 2)

Method cue: Set x=0. Check sign, size, accuracy and units.

4. Find $y=x^3$ when $x=-2$.

ANSWER: -8

Method cue: $(-2)^3=-8$. Check sign, size, accuracy and units.

5. For $y=6/x$, find y when $x=3$.

ANSWER: 2

Method cue: Substitute: $y=6\div3=2$. Check sign, size, accuracy and units.

6. Why is x=0 not allowed in $y=6/x$?

ANSWER: Division by zero is undefined.

Method cue: The graph therefore has no point on the y-axis. Check sign, size, accuracy and units.

7. Which graph is symmetric about the y-axis: $y=x^2$ or $y=x^3$?

ANSWER: $y = x^2$

Method cue: Positive and negative x give the same square. Check sign, size, accuracy and units.

8. Describe one feature that distinguishes a quadratic from a straight line.

ANSWER: A quadratic curves and has a turning point.

Method cue: A straight line has constant gradient. Check sign, size, accuracy and units.

COMPREHENSIVE LESSON NOTEBOOK

Practice answers and repair notes

Gradient, intercept and y = mx + c

Use only after a genuine attempt. Rework incorrect questions from a blank line rather than copying the final value.

1. State the gradient and y-intercept of y=3x-4.

ANSWER: Gradient 3; y-intercept -4

Method cue: Compare with y=mx+c. Check sign, size, accuracy and units.

2. Find the gradient through (1,2) and (5,10).

ANSWER: 2

Method cue: Change in y=10-2=8. Check sign, size, accuracy and units.

3. Write the equation of gradient 4 and y-intercept 7.

ANSWER: y = 4x + 7

Method cue: Use y=mx+c with m=4, c=7. Check sign, size, accuracy and units.

4. Find the gradient of y=-5x+2.

ANSWER: -5

Method cue: The coefficient of x is the gradient. Check sign, size, accuracy and units.

5. A line crosses the y-axis at 3 and passes through (2,9). Find its equation.

ANSWER: y = 3x + 3

Method cue: Gradient=(9-3)/(2-0)=3. Check sign, size, accuracy and units.

6. Find the x-intercept of y=2x-6.

ANSWER: (3, 0)

Method cue: Set y=0. Check sign, size, accuracy and units.

7. A horizontal line passes through y=-2. Write its equation.

ANSWER: y = -2

Method cue: Every point has the same y-value. Check sign, size, accuracy and units.

8. Explain the meaning of a negative gradient.

ANSWER: y decreases as x increases.

Method cue: The line falls from left to right. Check sign, size, accuracy and units.

COMPREHENSIVE LESSON NOTEBOOK

Practice answers and repair notes

Solving equations using graphs

Use only after a genuine attempt. Rework incorrect questions from a blank line rather than copying the final value.

1. The graph y=2x-6 crosses the x-axis at x=3. Solve 2x-6=0.

ANSWER: x = 3

Method cue: A root occurs where y=0. Check sign, size, accuracy and units.

2. Graphs y=x+1 and y=7-x intersect at (3,4). Solve x+1=7-x.

ANSWER: x = 3

Method cue: At the intersection both expressions have equal y-values. Check sign, size, accuracy and units.

3. A quadratic crosses the x-axis at -2 and 5. State its roots.

ANSWER: x = -2 and x = 5

Method cue: Each x-intercept has y=0. Check sign, size, accuracy and units.

4. A graph of $y=x^2$ has y=16 at two points. Solve $x^2=16$.

ANSWER: x = -4 or x = 4

Method cue: The horizontal line y=16 intersects twice. Check sign, size, accuracy and units.

5. The lines y=3x-1 and y=8 intersect. Find x.

ANSWER: x = 3

Method cue: At intersection 3x-1=8. Check sign, size, accuracy and units.

6. A graph gives a root between 2.4 and 2.5. State it to 1 decimal place if the crossing is...

ANSWER: 2.5

Method cue: 2.46 rounds to 2.5. Check sign, size, accuracy and units.

7. Why might a graph give an approximate rather than exact solution?

ANSWER: The plotted scale and line thickness limit precision.

Method cue: Reading between grid lines introduces uncertainty. Check sign, size, accuracy and units.

8. State one check for a graphical solution.

ANSWER: Substitute the read x-value into the original equation.

Method cue: The two sides should be close within graph-reading accuracy. Check sign, size, accuracy and units.

COMPREHENSIVE LESSON NOTEBOOK

Practice answers and repair notes

Conversion and comparison graphs

Use only after a genuine attempt. Rework incorrect questions from a blank line rather than copying the final value.

1. A graph shows £1=$1.25. Convert £48.

ANSWER: $60

Method cue: 48×1.25=60. Check sign, size, accuracy and units.

2. A conversion graph shows 5 miles=8 km. Convert 30 miles.

ANSWER: 48 km

Method cue: Scale factor is 6. Check sign, size, accuracy and units.

3. A line passes through (4,10) and the origin. Find y when x=7.

ANSWER: 17.5

Method cue: Rate=10/4=2.5. Check sign, size, accuracy and units.

4. A temperature graph maps 0°C to 32°F. Is it direct proportion?

ANSWER: No

Method cue: The line does not pass through the origin. Check sign, size, accuracy and units.

5. On a graph, 12 cm represents 30 km. Find km per cm.

ANSWER: 2.5 km per cm

Method cue: 30÷12=2.5. Check sign, size, accuracy and units.

6. Convert 72 km to miles using 5 miles=8 km.

ANSWER: 45 miles

Method cue: 72÷8=9 groups. Check sign, size, accuracy and units.

7. Why should a conversion graph have labelled units?

ANSWER: The numerical scales may represent different quantities.

Method cue: Units determine the meaning and direction of conversion. Check sign, size, accuracy and units.

8. Explain how to reverse a conversion graph reading.

ANSWER: Start from the other axis and trace to the same line.

Method cue: The graph represents both directions of the same relationship. Check sign, size, accuracy and units.

COMPREHENSIVE LESSON NOTEBOOK

Practice answers and repair notes

Distance-time graphs

Use only after a genuine attempt. Rework incorrect questions from a blank line rather than copying the final value.

1. A cyclist travels 12 km in 40 minutes. Find average speed in km/h.

ANSWER: 18 km/h

Method cue: 40 minutes=2/3 hour. Check sign, size, accuracy and units.

2. What does a horizontal distance-time segment mean?

ANSWER: The object is stationary

Method cue: Time changes but distance does not. Check sign, size, accuracy and units.

3. A car travels 150 km in 2.5 hours. Find average speed.

ANSWER: 60 km/h

Method cue: Speed=150÷2.5=60. Check sign, size, accuracy and units.

4. Two lines start together; line A is steeper. Which object is faster?

ANSWER: Object A

Method cue: Greater gradient means more distance per unit time. Check sign, size, accuracy and units.

5. A walker reaches 6 km at 10:30 after starting 09:00. Find speed.

ANSWER: 4 km/h

Method cue: Elapsed time=1.5 hours. Check sign, size, accuracy and units.

6. A journey goes 20 km out then returns to zero distance. What does zero represent?

ANSWER: The starting point

Method cue: Distance from the start has returned to zero. Check sign, size, accuracy and units.

7. Why is a vertical segment impossible on a distance-time graph?

ANSWER: It would mean changing distance with no passage of time.

Method cue: That requires infinite speed. Check sign, size, accuracy and units.

8. State two features needed to compare journeys fairly.

ANSWER: Same axis scales/units and gradients over comparable intervals.

Method cue: Check both time and distance scales. Check sign, size, accuracy and units.

COMPREHENSIVE LESSON NOTEBOOK

Practice answers and repair notes

Cost, filling and temperature graphs

Use only after a genuine attempt. Rework incorrect questions from a blank line rather than copying the final value.

1. A taxi graph starts at £4 when distance is 0. Interpret £4.

ANSWER: The fixed starting charge

Method cue: It is paid before any distance is travelled. Check sign, size, accuracy and units.

2. A tank-volume graph is horizontal for 5 minutes. Interpret.

ANSWER: The volume does not change

Method cue: No net liquid enters or leaves. Check sign, size, accuracy and units.

3. A cost line has gradient £2.40 per hour and intercept £5. Write the rule.

ANSWER: C = 2.4h + 5

Method cue: Gradient gives hourly charge. Check sign, size, accuracy and units.

4. A cooling graph falls quickly then more slowly. Describe the rate.

ANSWER: Cooling is fastest at first and then slows

Method cue: The graph is steep initially and becomes less steep. Check sign, size, accuracy and units.

5. A phone plan costs £12 plus 5p per text. Find cost for 80 texts.

ANSWER: £16

Method cue: 80×£0.05=£4. Check sign, size, accuracy and units.

6. A tank rises from 100 L to 340 L in 8 min. Find filling rate.

ANSWER: 30 L/min

Method cue: Change=240 L. Check sign, size, accuracy and units.

7. Why can two graphs with the same shape tell different stories?

ANSWER: Axes, units and scales may differ.

Method cue: Interpretation depends on labelled quantities and context. Check sign, size, accuracy and units.

8. Give one reason a real-world graph may be curved.

ANSWER: The rate changes continuously.

Method cue: A changing gradient produces a curve. Check sign, size, accuracy and units.

COMPREHENSIVE LESSON NOTEBOOK

Practice answers and repair notes

Gradients and rates of change

Use only after a genuine attempt. Rework incorrect questions from a blank line rather than copying the final value.

1. A distance-time graph rises 18 km in 0.5 h. Find its gradient.

ANSWER: 36 km/h

Method cue: Gradient=change in distance ÷ change in time. Check sign, size, accuracy and units.

2. A tank-volume graph rises from 120 L to 300 L in 6 minutes. Find the rate.

ANSWER: 30 L/min

Method cue: Change in volume=180 L. Check sign, size, accuracy and units.

3. A graph rises from 4 m/s to 10 m/s over 3 s. Find its gradient.

ANSWER: 2 m/s²

Method cue: Vertical change=6 m/s. Check sign, size, accuracy and units.

4. State units of gradient on a distance-km against time-hour graph.

ANSWER: km/h

Method cue: Vertical units divided by horizontal units. Check sign, size, accuracy and units.

5. Line A rises 24 units over a run of 6. Line B rises 15 over a run of 5. Which is steeper...

ANSWER: Line A

Method cue: Gradient A=24÷6=4. Check sign, size, accuracy and units.

6. What does zero gradient mean on a temperature-time graph?

ANSWER: Temperature is constant

Method cue: There is no vertical change per unit time. Check sign, size, accuracy and units.

7. A cost graph has gradient 2.8 with cost in pounds and mass in kg. Interpret it.

ANSWER: The cost increases by £2.80 per kilogram.

Method cue: Read vertical units per horizontal unit. Check sign, size, accuracy and units.

8. State one limitation of estimating a gradient from a curve.

ANSWER: The value depends on the chosen interval or tangent.

Method cue: A curve has a changing rate. Check sign, size, accuracy and units.

COMPREHENSIVE LESSON NOTEBOOK

Practice answers and repair notes

Mixed graphical reasoning

Use only after a genuine attempt. Rework incorrect questions from a blank line rather than copying the final value.

1. For y=2x+5, find the point when x=-3.

ANSWER: (-3, -1)

Method cue: y=2(-3)+5=-1. Check sign, size, accuracy and units.

2. Find the gradient through (-2,1) and (4,13).

ANSWER: 2

Method cue: Change in y=12; change in x=6. Check sign, size, accuracy and units.

3. Write the line with gradient -3 and intercept 4.

ANSWER: y = -3x + 4

Method cue: Use y=mx+c. Check sign, size, accuracy and units.

4. A quadratic has roots 1 and 6. Solve y=0.

ANSWER: x = 1 or x = 6

Method cue: Roots are x-intercepts. Check sign, size, accuracy and units.

5. A distance-time line covers 27 km in 45 min. Find km/h.

ANSWER: 36 km/h

Method cue: 45 min=0.75 h. Check sign, size, accuracy and units.

6. A conversion line through the origin contains (8,20). Find y when x=14.

ANSWER: 35

Method cue: Gradient=20÷8=2.5. Check sign, size, accuracy and units.

7. A graph crosses the y-axis at -2 and passes (3,7). Find its equation.

ANSWER: y = 3x - 2

Method cue: Gradient=(7-(-2))/3=3. Check sign, size, accuracy and units.

8. State two checks when reading a graph.

ANSWER: Check scales/units and substitute or compare with the trend.

Method cue: Use the correct axis direction. Check sign, size, accuracy and units.

COMPREHENSIVE LESSON NOTEBOOK

Independent authorship and release check

OCR Foundation Mathematics • Unit 4 Graphs

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- Original vector diagrams and two worked examples appear in every chapter.
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