Straight Line Graphs

1 Line **L** passes through the points A (0, –3) and B (5, 7), as shown below.

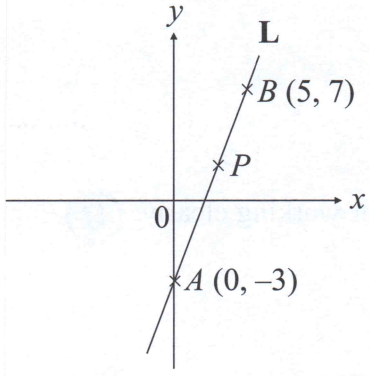


Diagram **NOT** to scale

a) Find the equation of line **L**. (GRADE 5)

.....

[3]

b) Write down the equation of the line which is parallel to line **L** and passes through the point (2, 10). (GRADE 5)

.....

[2]

c) Point P lies on the line segment AB, such that $AP : PB = 2 : 3$ (GRADE 7)
What are the coordinates of P?

.....

[3]

[Total 8 marks]

2 The lines $y = 3x + 4$ and $y = 2x + 6$ intersect at the point M. (GRADE 6)

Line **N** goes through point M and is parallel to the line $y = \frac{1}{2}x + 6$.

Find the equation of line **N**.

.....

[Total 5 marks]

3 A straight line, **S**, passes through the points (a, b) and (c, d). GRADE 7

It is given that: $2a + 4 = 2c$

$b - 6 = d$

a) What is the gradient of **S**?

Gradient = ...

[3]

b) Line **R** is perpendicular to Line **S** and passes through (6, 3). Find the equation of the line.

.....

[2]

[Total 5 marks]

4 James plots the points A (5, 7), B (1, –1), C (13, 4) and D (3, –2). He claims he can draw a line perpendicular to AB that passes through the midpoint of both AB and CD. GRADE 8

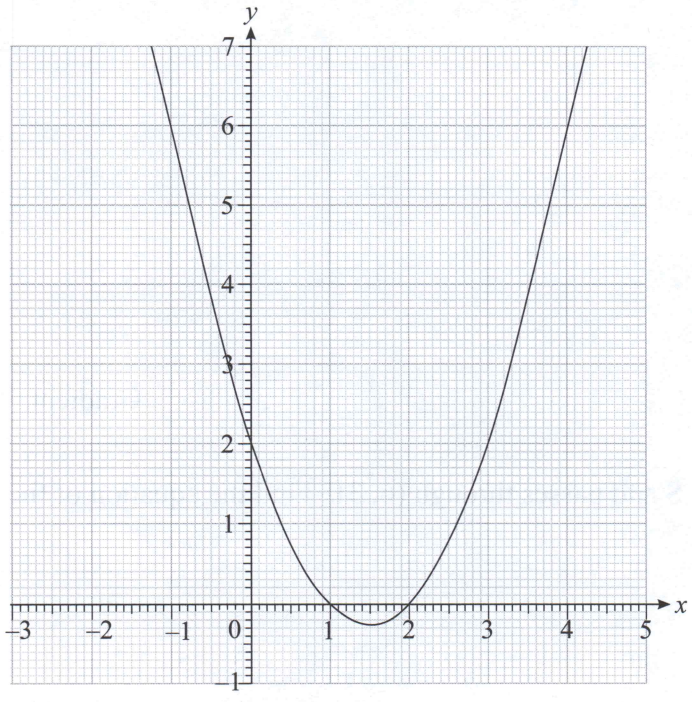
Is he correct? Explain your answer.

[Total 4 marks]

Score: ☐ / **22**

Quadratic Graphs

1 This graph below shows $y = x^2 - 3x + a$.



a) Estimate the coordinates of the turning point of $y = x^2 - 3x + a$

(..... , ...)

[1]

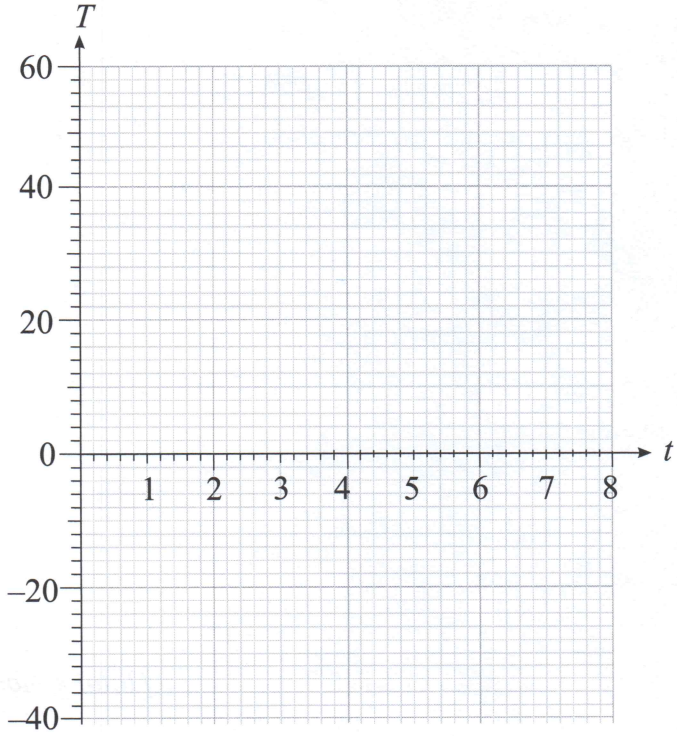
b) Write down the value of a.

$a =$ .....

[1]

[Total 2 marks]

2 The temperature (T) of a piece of metal changes over time (t) as it is rapidly heated and then cooled again. It is modelled by the equation $T = -5t^2 + 40t - 35$.



a) Plot the graph of $T = -5t^2 + 40t - 35$ on the grid.

[3]

b) At what time did the metal reach its highest temperature?

$t =$ .....

[1]

c) Using your graph, solve the equation $-5t^2 + 40t - 35 = 20$.

$t =$ ..... and $t =$ .....

[2]

[Total 6 marks]

3 Sketch the graph of $y = 2x^2 + 10x - 12$. Label the turning point and any points where the curve intersects the axes with their coordinates. GRADE 6

[Total 4 marks]

4 Find the turning point of $f(x) = x^2 - 4x + 6$. GRADE 8

(..... , ...)

[Total 4 marks]

Exam Practice Tip

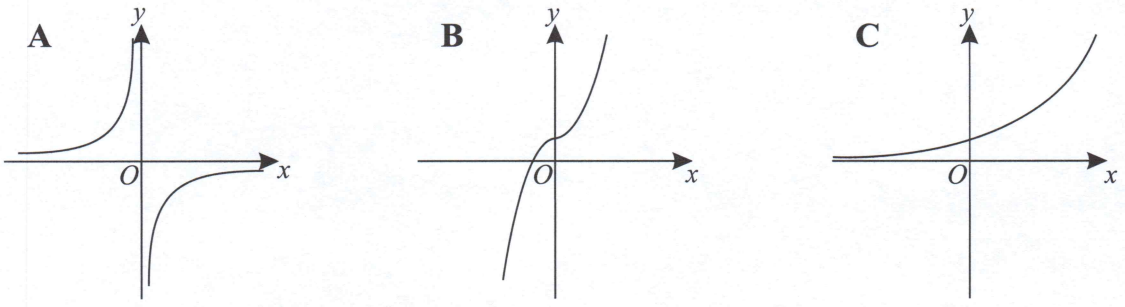
If your curves aren't nice and smooth when you plot your quadratic graphs, you can be pretty sure you've gone wrong somewhere. Also keep an eye out for those sneaky turning point questions — complete the square if you can't find the exact turning point using your values or from the graph.

Score

16

Harder Graphs

1 Sketches of different graphs are shown below. GRADE 6



Match each equation below to one of the graphs above.

a) $x^3 + 1$ ..... b) $y = \left(\frac{3}{2}\right)^x$ ..... c) $y = -\frac{1}{x}$ .....

[Total 3 marks]

2 This question is about the function $y = x^3 - 4x^2 + 4$. GRADE 6

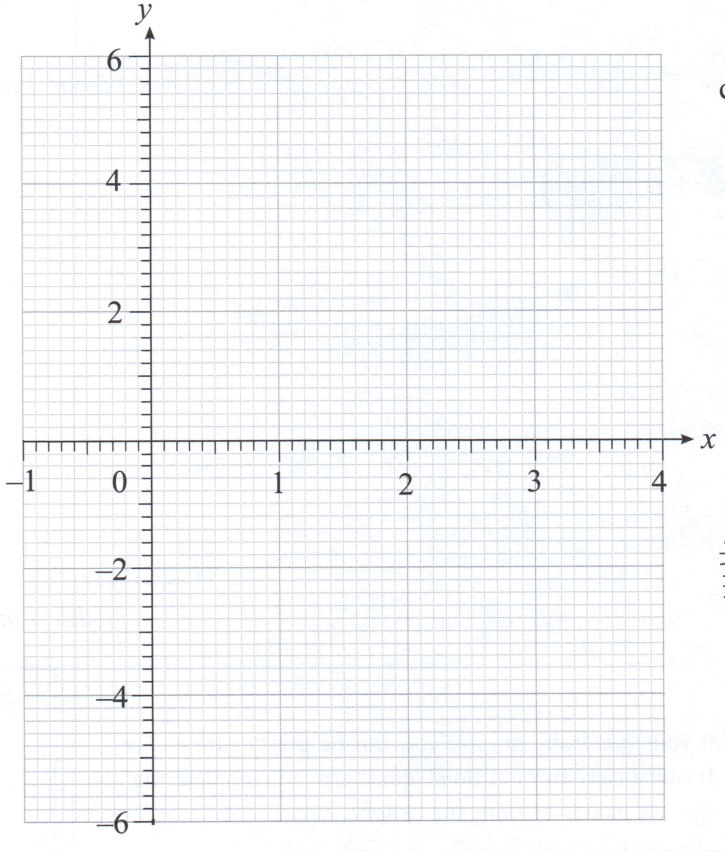
a) Complete the table below.

x	–1	–0.5	0	0.5	1	1.5	2	2.5	3	3.5	4
y	–1	2.875	4	3.125	1	–1.625	–4				

[2]

b) Use your table to draw the graph of $y = x^3 - 4x^2 + 4$ on the grid, for values of x in the range $-1 \leq x \leq 4$.

[2]



c) Estimate the solutions of the equation $x^3 - 4x^2 + 4 = 0$.

.....

[1]

[Total 5 marks]

Don't use a ruler to join up the dots in curved graphs.

3 Sketch the following trigonometric graphs, labelling the points where the graphs cross the x- and y-axes and any points where the graph is undefined. GRADE 7

a) $\cos x$ for $0° \leq x \leq 360°$

[2]

b) $\tan x$ for $-180° \leq x \leq 180°$

[3]

[Total 5 marks]

4 A curve has the equation $x^2 + y^2 = 16$. GRADE 7

a) Does this curve pass through the origin?
Explain your answer.

.....

.....

.....

[2]

b) Find the values of x for which the curve intersects the x-axis.

.....

[1]

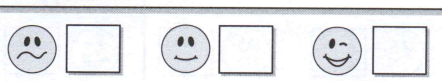
[Total 3 marks]

Exam Practice Tip

There are loads of different types of graphs to learn — it's really just a matter of practising recognising them from their equations until they're all firmly lodged in your noggin. If you're really stuck in the exam, try sticking different values of x into the equation and making a rough plot of the graph to spark your memory.

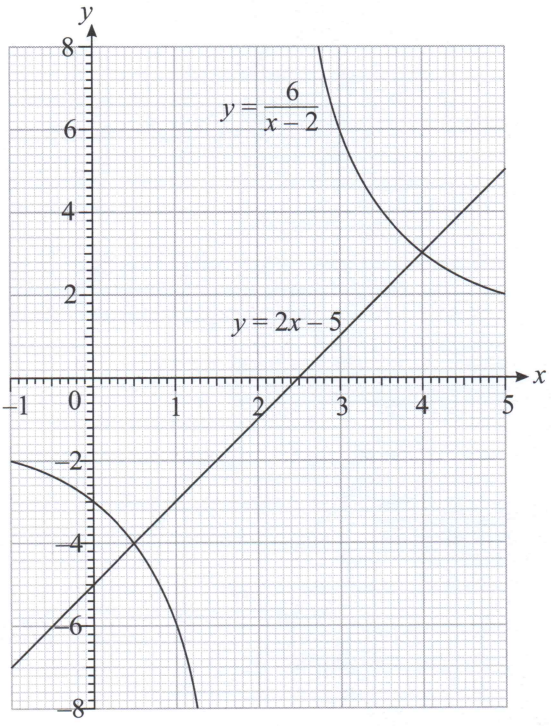
Score

16



Solving Equations Using Graphs

1 The graphs of the equations $y = \frac{6}{x-2}$ and $y = 2x - 5$ are shown below.



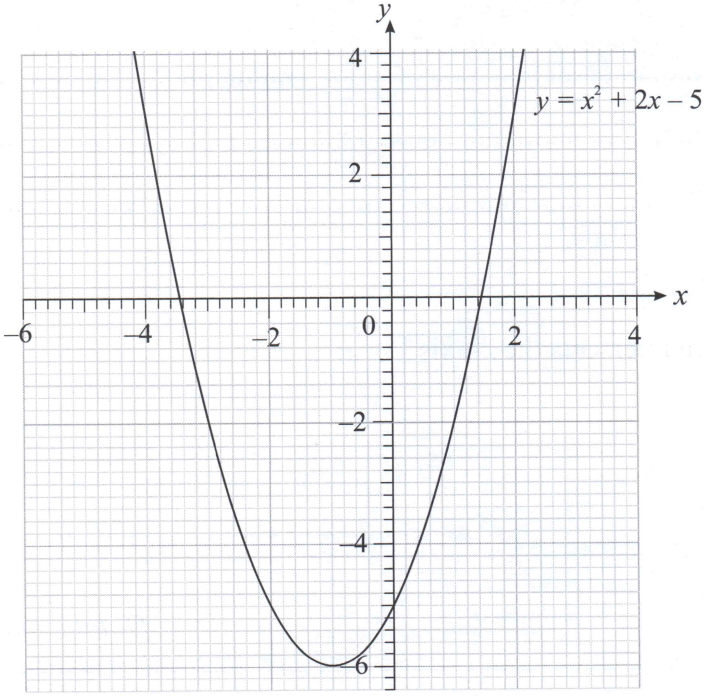
Using the graphs, write down the solutions to the simultaneous equations $y = \frac{6}{x-2}$ and $y = 2x - 5$.

$x =$ ..... , $y =$ .....

$x =$ ..... , $y =$ .....

[Total 2 marks]

2 The graph of the curve $y = x^2 + 2x - 5$ is shown below.
By drawing a suitable line on the graph, find the solutions of $x^2 + x = 6$



$x =$ .....

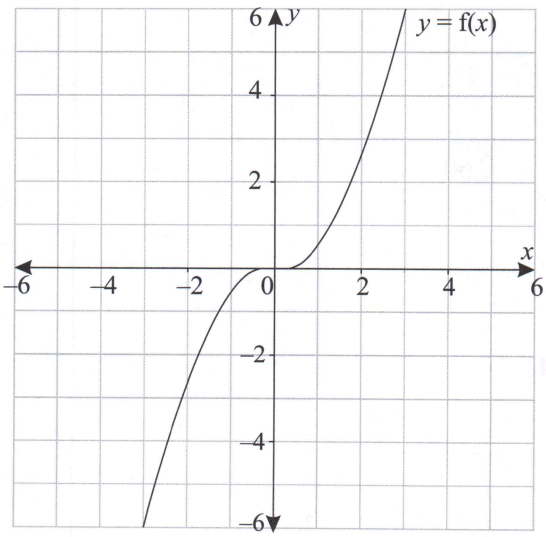
$x =$ .....

[Total 4 marks]

Score: ____ / 6

Graph Transformations

1 The diagram below shows a sketch of the graph $y = f(x)$.



a) On the same axes sketch the graph of $y = f(x - 2)$.

[2]

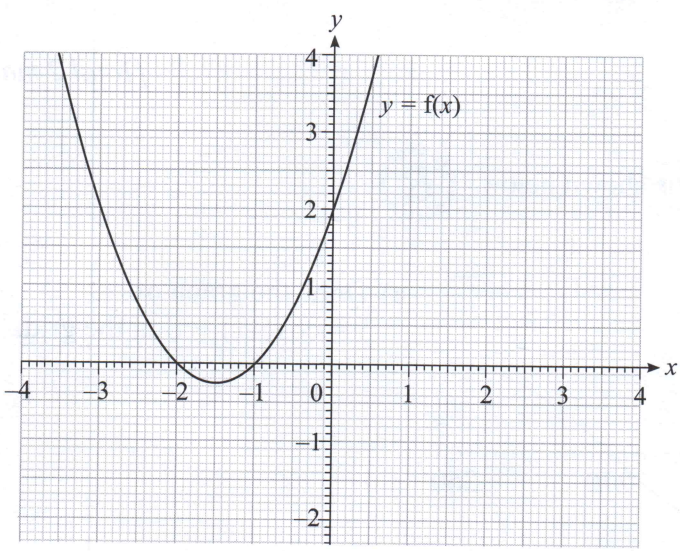
b) Give the coordinates of the point where your curve crosses the x-axis.

(..... , ...)

[1]

[Total 3 marks]

2 The diagram below shows the graph of $f(x)$ for $f(x) = x^2 + 3x + 2$.



a) Determine whether $y = f(x + 1) - 2$ has any real roots. If so, write down their coordinates.

.....

.....

.....

.....

[2]

b) Estimate the minimum point of the graph of $y = f(x - 4) + 1$.

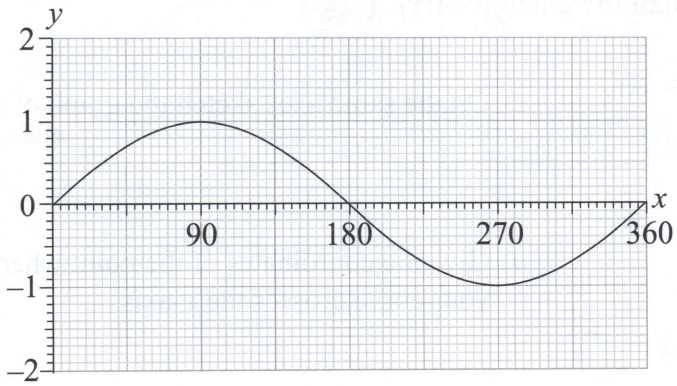
(..... , ...)

[3]

[Total 5 marks]

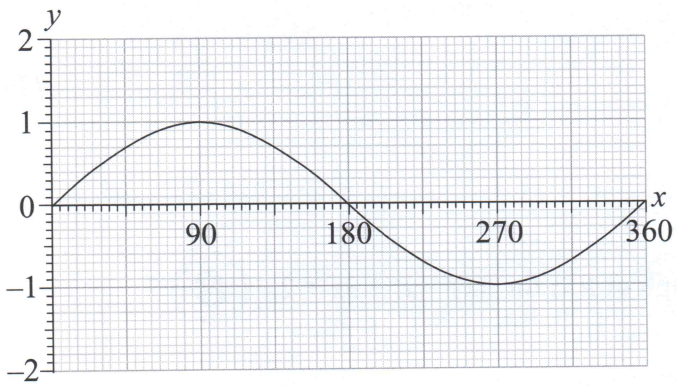
3 The graph of $y = \sin x$ for $0° \leq x \leq 360°$ is shown on the grids below.

a) On this grid draw the graph of $y = \sin(x - 45)°$



[1]

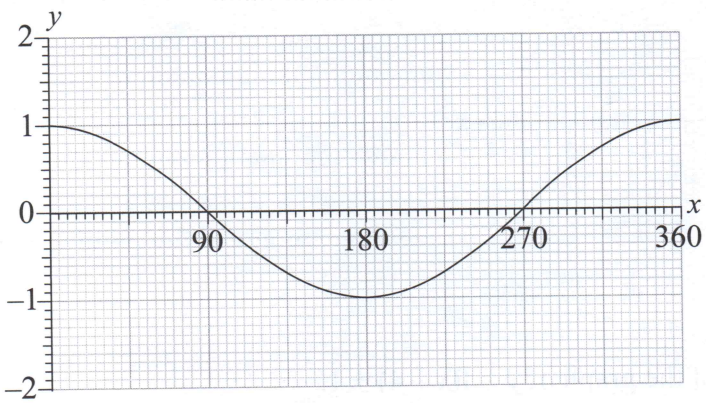
b) On this grid draw the graph of $y = -\sin x$



[1]

[Total 2 marks]

4 The graph of $y = \cos x$ for $0° \leq x \leq 360°$ is shown below.



a) Draw the graph of $y = \cos(-x) + 1$ on the grid.

[2]

b) Write down the x-values of the points where $y = -\cos(x + 30)$ crosses the x-axis.

.....

[2]

[Total 4 marks]

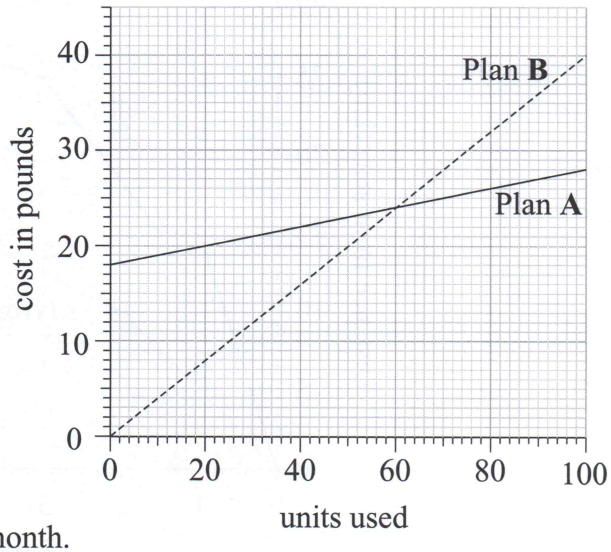
Score: ____ / **14**

Real-Life Graphs

1 An electricity company offers its customers two different price plans. GRADE 3

Plan **A:**
Monthly tariff of £18, plus 10p for each unit used.

Plan **B:**
No monthly tariff, just pay 40p for each unit used.



a) Use the graph to find the cost of using 70 units in a month for each plan.

Plan **A** ..... Plan **B** .....

[2]

b) Mr Barker uses about 85 units of electricity each month.
Which price plan would you advise him to choose? Explain your answer.

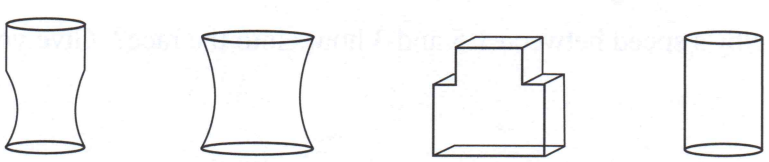
.....

.....

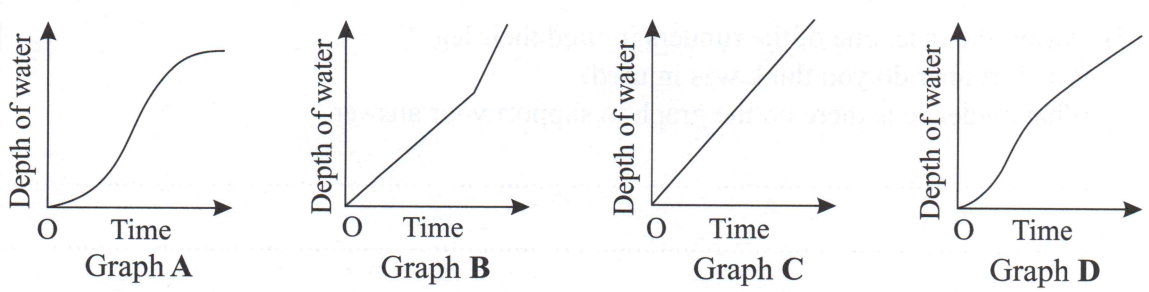
[2]

[Total 4 marks]

2 Each of the vessels below is filled with water at a constant rate. GRADE 6



Each of these graphs show the depth of water within a vessel in relation to time.



Match the vessel with the correct graph.

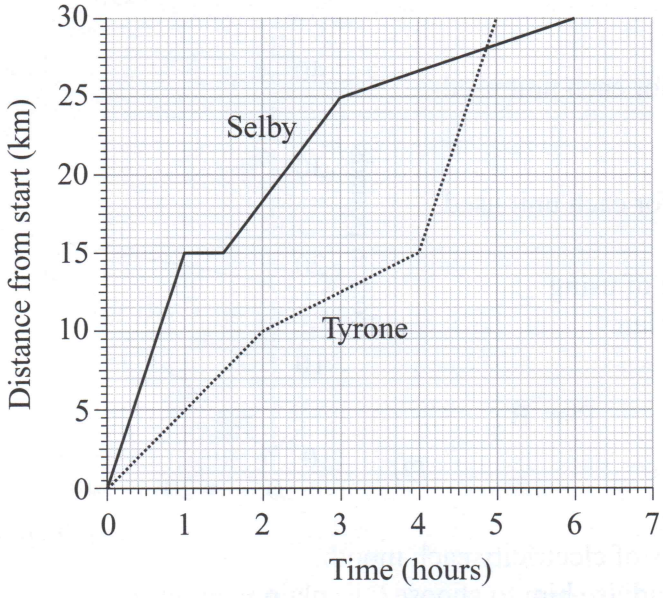
Graph **A** and ..... Graph **B** and ..... Graph **C** and ..... Graph **D** and .....

[Total 2 marks]

Score: ☐/6

Distance-Time Graphs

1 The distance-time graph below shows a 30 km running race between Selby and Tyrone.



a) During the race Selby stops at a bench to get his breath back.
After how many hours did he stop at the bench?

..... hours
[1]

b) Who won the race? How can you tell this from the graph?

.....

[1]

c) What was Selby's speed between 1.5 and 3 hours into the race? Give your answer to 2 d.p.

..... km/h
[2]

d) During the race, one of the runners injured their leg.
Which runner do you think was injured?
What evidence is there on the graph to support your answer?

.....

.....

.....

[2]

[Total 6 marks]

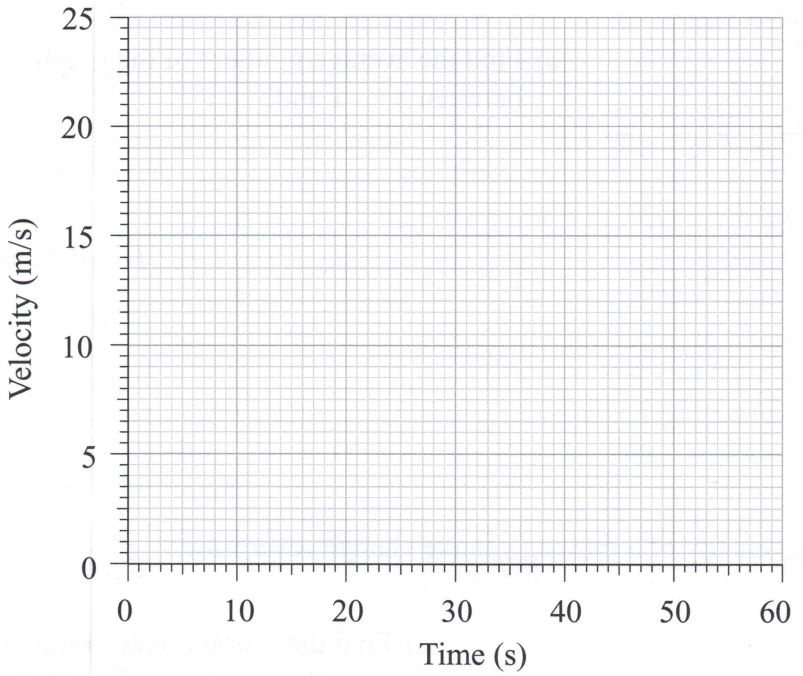
Score: ☐ / **6**

Velocity-Time Graphs

1 The velocity of a motorcycle is recorded over a minute. GRADE 6

a) Draw a velocity-time graph using the following information:
The motorcycle sets off from a standstill, accelerating at a constant rate for 10 seconds until it is moving at 10 m/s. It moves at a constant speed for the next 20 seconds.
The motorcycle then accelerates at a constant rate for 7 seconds until it is moving at 24 m/s.
It moves at the same speed for 15 seconds before decelerating until it stops after 8 seconds.

[3]

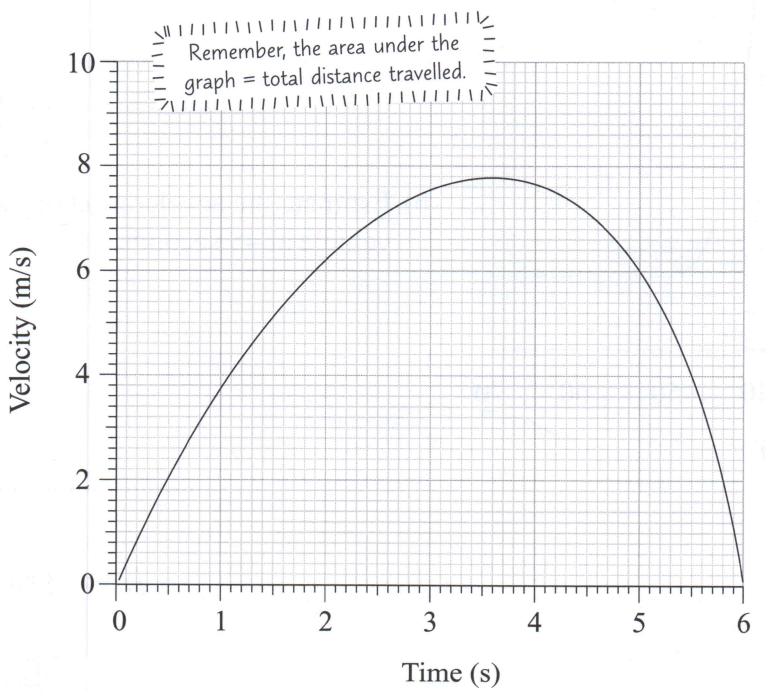


b) Calculate the acceleration of the motorcycle at 35 seconds.

..... m/s^2
[1]

[Total 4 marks]

2 James rolls a ball down a hill and records its velocity.
He plots the results on the velocity-time graph shown below. GRADE 9



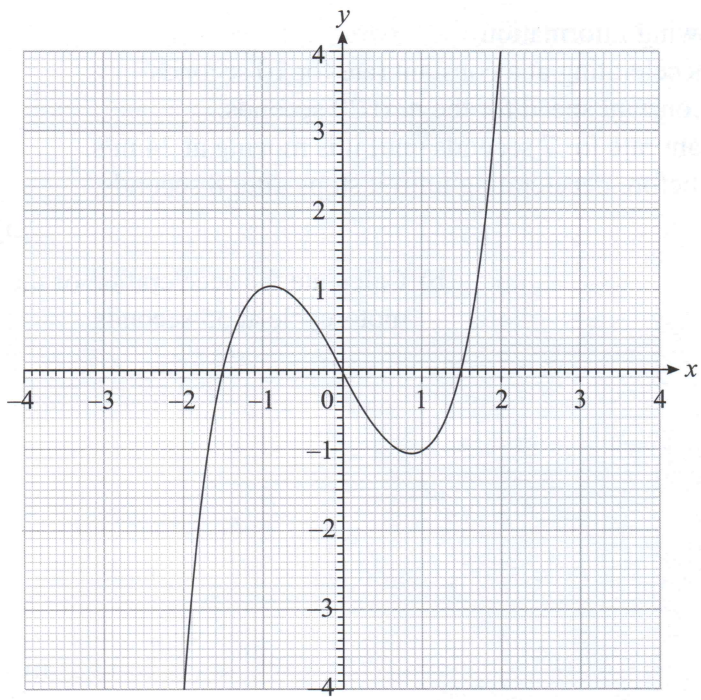
Calculate the average speed of the ball.
Give your answer to 1 s.f.

..... m/s
[Total 4 marks]

Score: ☐ / **8**

Gradients of Curves

1 The graph of $y = x^3 - 2x$ is shown below. GRADE 7



a) Estimate the gradient of the graph at $x = -1$

.....

[2]

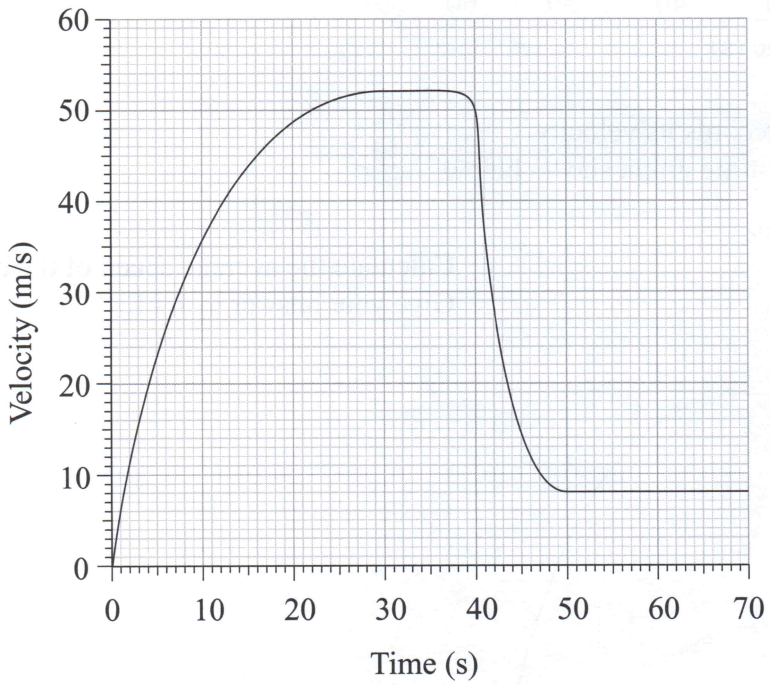
b) Find the average gradient of the graph between $x = -1$ and $x = 1$

.....

[2]

[Total 4 marks]

2 The graph below shows how the velocity of a moving vehicle changes over time. GRADE 8



a) Find the average acceleration of the vehicle between 5 seconds and 25 seconds.

..... m/s^2

[2]

b) Estimate the acceleration of the vehicle at 45 seconds.

..... m/s^2

[2]

[Total 4 marks]

Score: ☐ / **8**