



ACHIEVE ACADEMY

GCSE Maths — Higher Tier

Real-Life Graphs · Practice Booklet

NAME:

CLASS:

DATE:

☐ Developing

☒ Secure

☐ Greater Depth

Answer every question in the working space provided. Method marks are available for correct working even if the final answer is wrong. Check the time allowed with your tutor before you start.

Real-Life Graphs

Total marks available: 136

● Real-Life Graphs

✓ (a) 8, 11, 17; (b) graph drawn (see below);
(c) 1 mile

Q1 · ● Developing · 5 marks

METHOD

(a) 4 miles: $£2 + 4 \times £1.50 = £8$; 6 miles: $£2 + 6 \times £1.50 = £11$; 10 miles: $£2 + 10 \times £1.50 = £17$

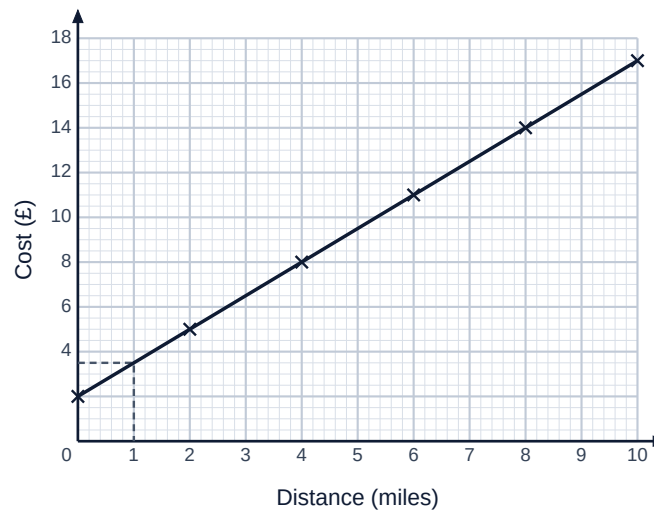
B2 all correct (B1 for one or two)

Plot the points from the table and join them with a ruled straight line starting at (0, 2).

B1 points · B1 line

(c) Across from £3.50 to the line, then down: 1 mile · B1

Distance (miles)	0	2	4	6	8	10
Cost (£)	2	5	8	11	14	17



✓ (a) 6 km/h; (b) 4 km/h

Q2 · ● Developing · 5 marks

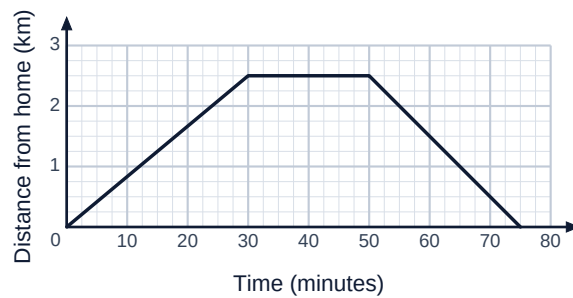
METHOD

(a) 2.5 km in 25 minutes: $2.5 \times (60 \div 25) = 6 \text{ km/h}$

(b) Total distance = $2.5 + 2.5 = 5 \text{ km}$, total time = 75 minutes

Average speed = $5 \div (75 \div 60) = 4 \text{ km/h}$

M1 A1 · M1 M1 A1



✓ (a) 20 km/h; (b) 13.3 km/h

Q3 · ● Developing · 5 marks

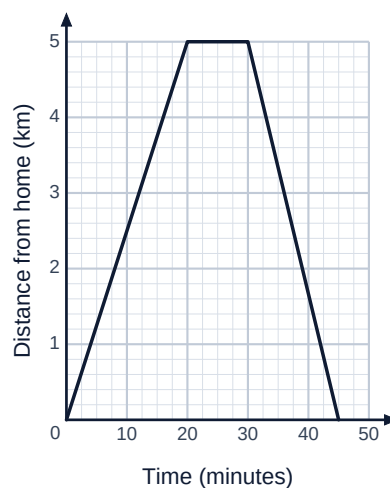
METHOD

(a) 5 km in 15 minutes: $5 \times (60 \div 15) = 20 \text{ km/h}$

(b) Total distance = $5 + 5 = 10 \text{ km}$, total time = 45 minutes

Average speed = $10 \div (45 \div 60) = 13.3 \text{ km/h}$

M1 A1 · M1 M1 A1



✓ (a) 6 km/h; (b) 3.4 km/h

Q4 · ● Developing · 5 marks

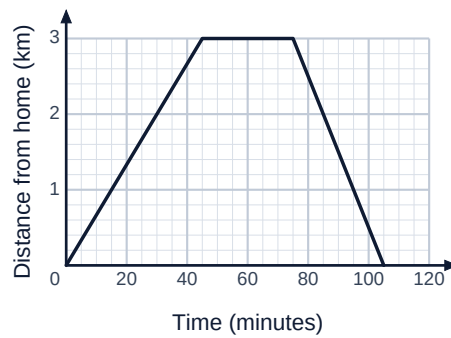
METHOD

(a) 3 km in 30 minutes: $3 \times (60 \div 30) = 6 \text{ km/h}$

(b) Total distance = $3 + 3 = 6 \text{ km}$, total time = 105 minutes

Average speed = $6 \div (105 \div 60) = 3.4 \text{ km/h}$

M1 A1 · M1 M1 A1



✓ (a) 60, 90, 150; (b) graph drawn (see below); (c) 2.5 hours

Q5 · ● Developing · 5 marks

METHOD

(a) 1 hour: $\pounds 30 + 1 \times \pounds 30 = \pounds 60$; 2 hours: $\pounds 30 + 2 \times \pounds 30 = \pounds 90$; 4 hours: $\pounds 30 + 4 \times \pounds 30 = \pounds 150$

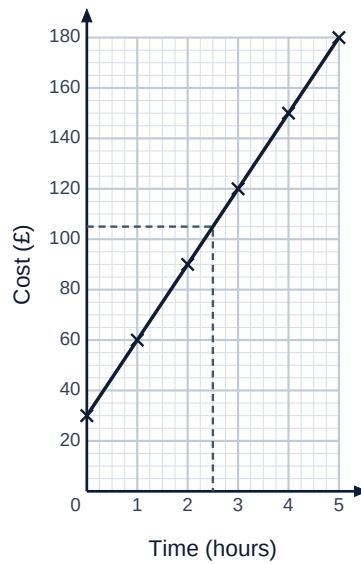
B2 all correct (B1 for one or two)

Plot the points from the table and join them with a ruled straight line starting at (0, 30).

B1 points · B1 line

(c) Across from $\pounds 105$ to the line, then down: 2.5 hours · B1

Time (hours)	0	1	2	3	4	5
Cost (£)	30	60	90	120	150	180



✓ (a) £30; (b) Paris, by £15

Q6 · ● Developing · 3 marks

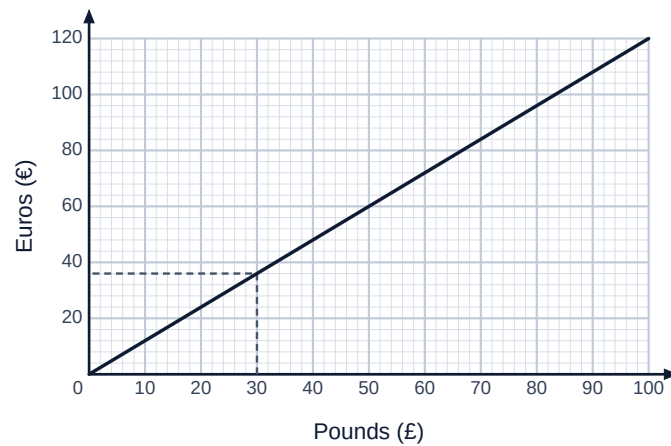
METHOD

(a) Across from €36 to the line, then down: £30

(b) $€144 = 4 \times €36 = 4 \times £30 = £120$

$£120 < £135$: cheaper in Paris by £15

B1 · M1 · A1



✓ (a) £30; (b) London, by £10

Q7 · ● Developing · 3 marks

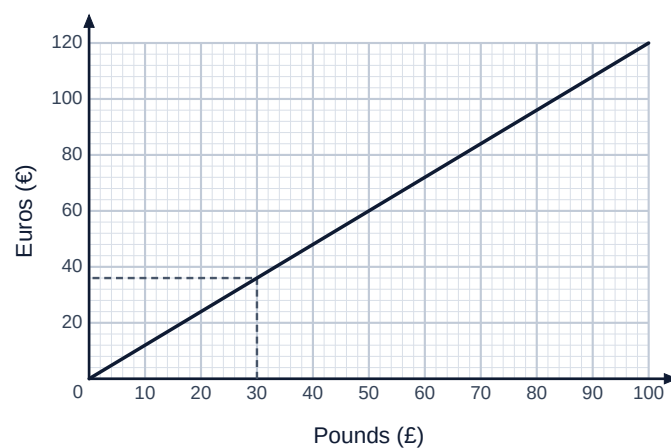
METHOD

(a) Across from €36 to the line, then down: £30

(b) $€144 = 4 \times €36 = 4 \times £30 = £120$

$£120 > £110$: cheaper in London by £10

B1 · M1 · A1



✓ (a) £50; (b) Paris, by £15

Q8 · ● Developing · 3 marks

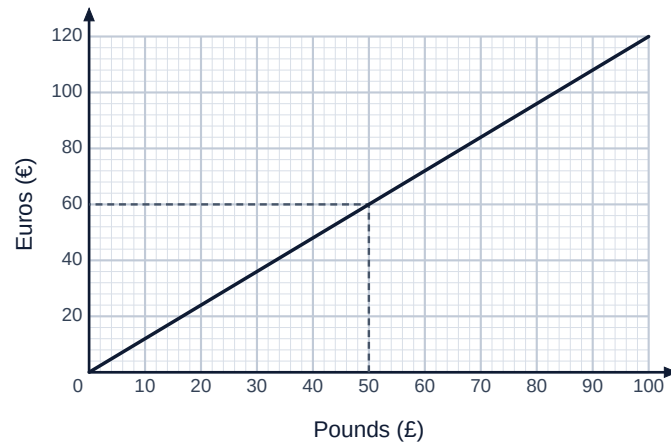
METHOD

(a) Across from €60 to the line, then down: £50

(b) €180 = $3 \times €60 = 3 \times £50 = £150$

£150 < £165: cheaper in Paris by £15

B1 · M1 · A1



✓ (a) 6 km/h; (b) 4.8 km/h

Q9 · ● Developing · 5 marks

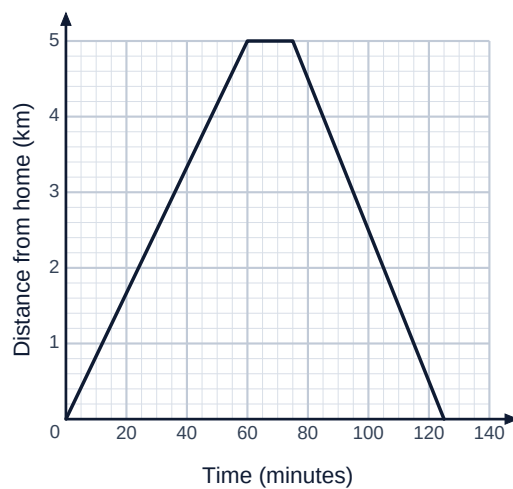
METHOD

(a) 5 km in 50 minutes: $5 \times (60 \div 50) = 6$ km/h

(b) Total distance = $5 + 5 = 10$ km, total time = 125 minutes

Average speed = $10 \div (125 \div 60) = 4.8$ km/h

M1 A1 · M1 M1 A1



✓ (a) 5, 11, 14; (b) graph drawn (see below);
(c) 3 miles

Q10 · ● Developing · 5 marks

METHOD

(a) 2 miles: $\pounds 2 + 2 \times \pounds 1.50 = \pounds 5$; 6 miles: $\pounds 2 + 6 \times \pounds 1.50 = \pounds 11$; 8 miles: $\pounds 2 + 8 \times \pounds 1.50 = \pounds 14$

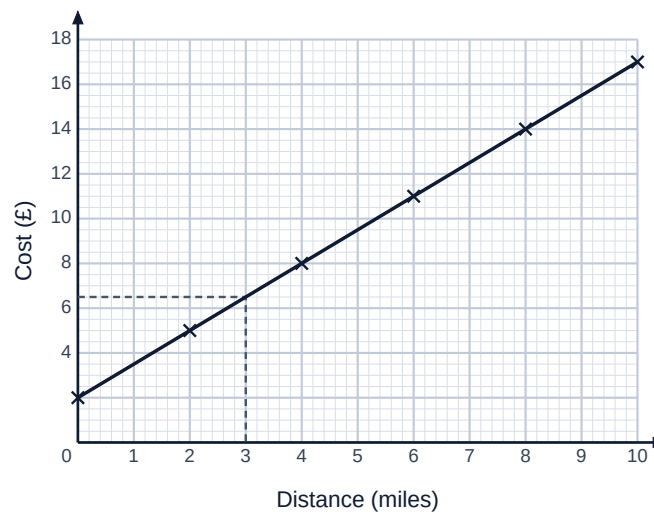
B2 all correct (B1 for one or two)

Plot the points from the table and join them with a ruled straight line starting at (0, 2).

B1 points · B1 line

(c) Across from $\pounds 6.50$ to the line, then down: 3 miles · B1

Distance (miles)	0	2	4	6	8	10
Cost (£)	2	5	8	11	14	17



✓ (a) 1.75 m/s^2 ; (b) 546 m

Q11 · ● Secure · 5 marks

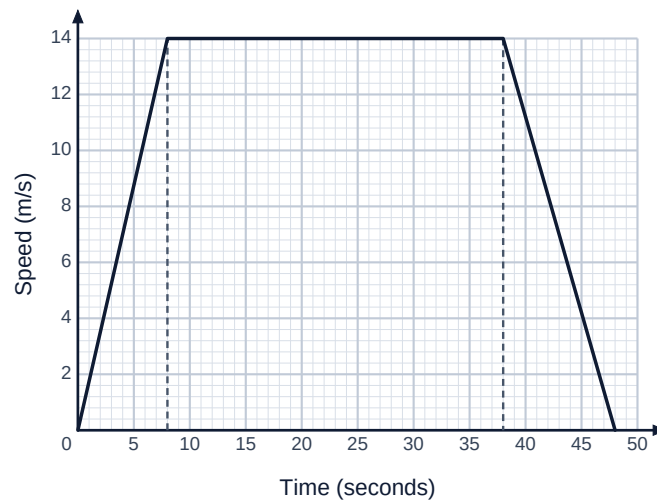
METHOD

(a) Acceleration = gradient = $14 \div 8 = 1.75 \text{ m/s}^2$

(b) Distance = area under the graph = $\frac{1}{2} \times 8 \times 14 + 30 \times 14 + \frac{1}{2} \times 10 \times 14 = 56 + 420 + 70 = 546 \text{ m}$

(or trapezium: $\frac{1}{2} \times (30 + 48) \times 14$)

M1 A1 · M1 M1 A1



✓(a) 1.5 m/s^2 ; (b) 198 m

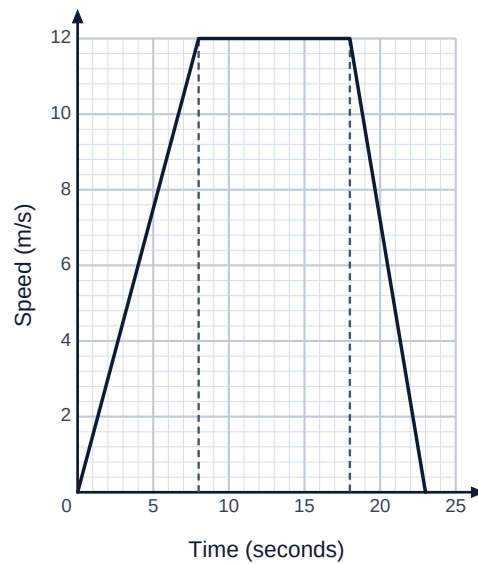
Q12 · ● Secure · 5 marks

METHOD

(a) Acceleration = gradient = $12 \div 8 = 1.5 \text{ m/s}^2$

(b) Distance = area under the graph = $\frac{1}{2} \times 8 \times 12 + 10 \times 12 + \frac{1}{2} \times 5 \times 12 = 48 + 120 + 30 = 198 \text{ m}$ Cor
trapezium: $\frac{1}{2} \times (10 + 23) \times 12$

M1 A1 · M1 M1 A1



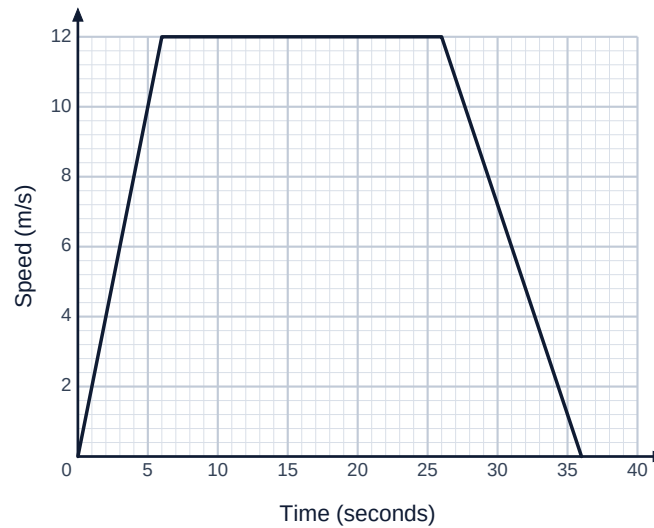
✓ (a) graph drawn (see below); (b) 336 m

Q13 · ● Secure · 4 marks

METHOD

(a) Straight lines joining $(0, 0)$, $(6, 12)$, $(26, 12)$ and $(36, 0)$ · B2

(b) Area of the trapezium = $\frac{1}{2} \times (20 + 36) \times 12 = 336 \text{ m}$ · M1 A1



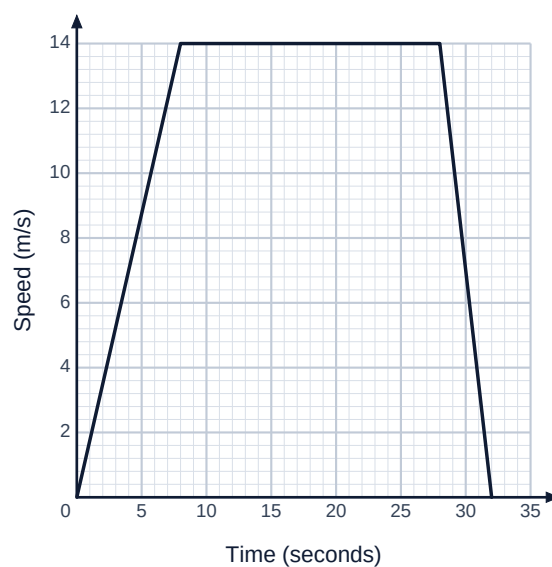
✓ (a) graph drawn (see below); (b) 364 m

Q14 · ● Secure · 4 marks

METHOD

(a) Straight lines joining $(0, 0)$, $(8, 14)$, $(28, 14)$ and $(32, 0)$ · B2

(b) Area of the trapezium = $\frac{1}{2} \times (20 + 32) \times 14 = 364 \text{ m}$ · M1 A1



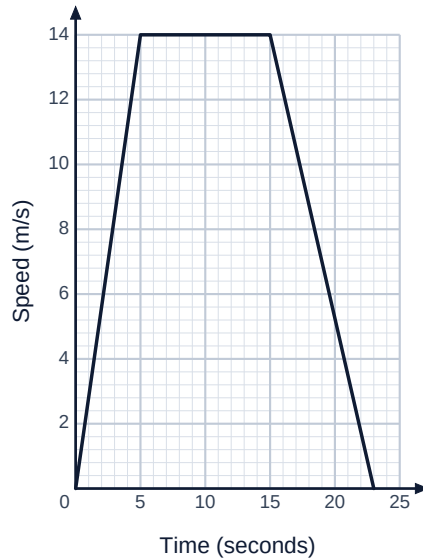
✓ (a) graph drawn (see below); (b) 231 m

Q15 · ● Secure · 4 marks

METHOD

(a) Straight lines joining $(0, 0)$, $(5, 14)$, $(15, 14)$ and $(23, 0)$ · B2

(b) Area of the trapezium = $\frac{1}{2} \times (10 + 23) \times 14 = 231 \text{ m}$ · M1 A1



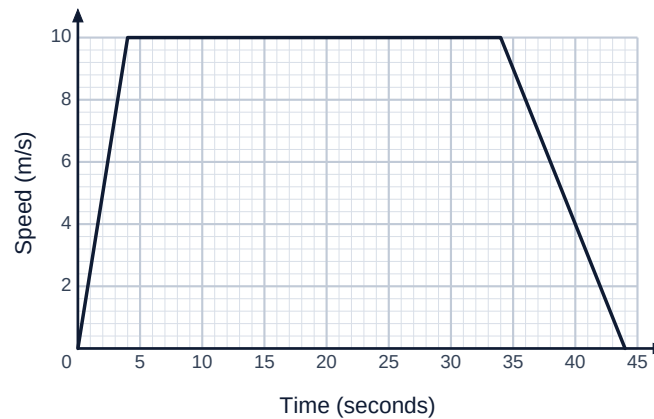
✓ (a) graph drawn (see below); (b) 370 m

Q16 · ● Secure · 4 marks

METHOD

(a) Straight lines joining $(0, 0)$, $(4, 10)$, $(34, 10)$ and $(44, 0)$ · B2

(b) Area of the trapezium = $\frac{1}{2} \times (30 + 44) \times 10 = 370 \text{ m}$ · M1 A1



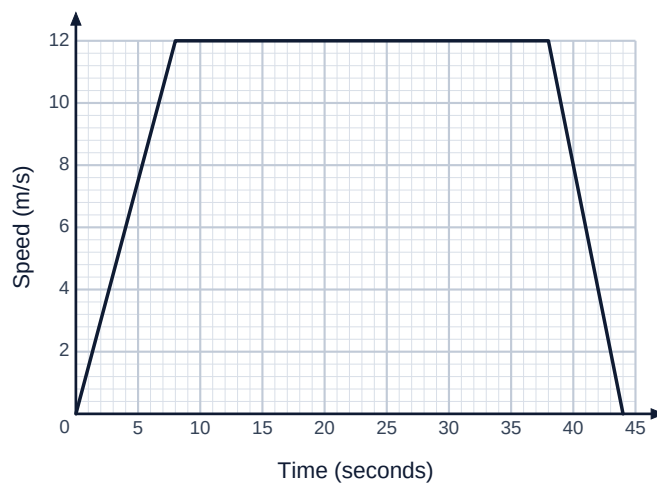
✓ (a) graph drawn (see below); (b) 444 m

Q17 · ● Secure · 4 marks

METHOD

(a) Straight lines joining (0, 0), (8, 12), (38, 12) and (44, 0) · B2

(b) Area of the trapezium = $\frac{1}{2} \times (30 + 44) \times 12 = 444 \text{ m}$ · M1 A1



✓ (a) 1 m/s^2 ; (b) 370 m

Q18 · ● Secure · 5 marks

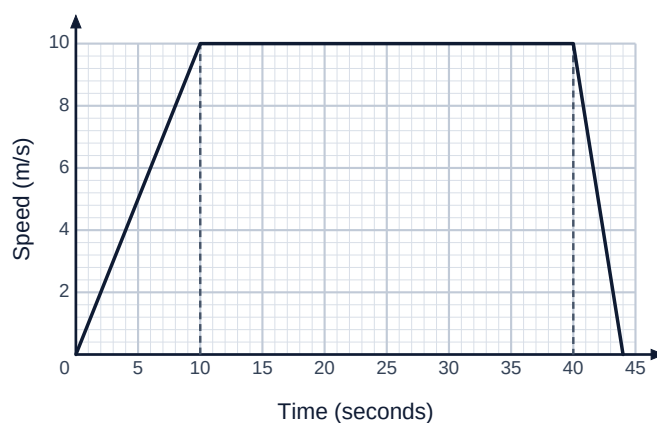
METHOD

(a) Acceleration = gradient = $10 \div 10 = 1 \text{ m/s}^2$

(b) Distance = area under the graph = $\frac{1}{2} \times 10 \times 10 + 30 \times 10 + \frac{1}{2} \times 4 \times 10 = 50 + 300 + 20 = 370 \text{ m}$

(or trapezium: $\frac{1}{2} \times (30 + 44) \times 10$)

M1 A1 · M1 M1 A1



✓ (a) 1.75 m/s^2 ; (b) 371 m

Q19 · ● Secure · 5 marks

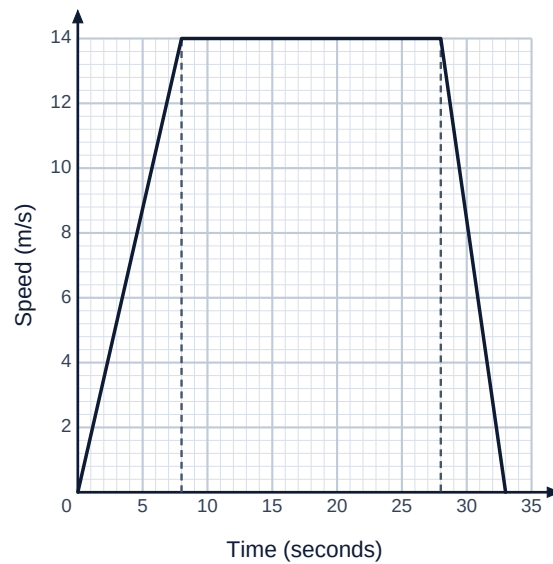
METHOD

(a) Acceleration = gradient = $14 \div 8 = 1.75 \text{ m/s}^2$

(b) Distance = area under the graph = $\frac{1}{2} \times 8 \times 14 + 20 \times 14 + \frac{1}{2} \times 5 \times 14 = 56 + 280 + 35 = 371 \text{ m}$

Cor trapezium: $\frac{1}{2} \times (20 + 33) \times 14$

M1 A1 · M1 M1 A1



✓ (a) 2 m/s^2 ; (b) 216 m

Q20 · ● Secure · 5 marks

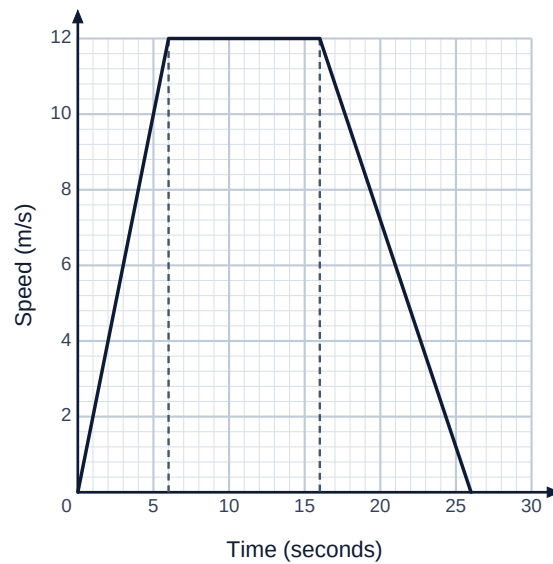
METHOD

(a) Acceleration = gradient = $12 \div 6 = 2 \text{ m/s}^2$

(b) Distance = area under the graph = $\frac{1}{2} \times 6 \times 12 + 10 \times 12 + \frac{1}{2} \times 10 \times 12 = 36 + 120 + 60 = 216 \text{ m}$

(or trapezium: $\frac{1}{2} \times (10 + 26) \times 12$)

M1 A1 · M1 M1 A1



✓ (a) 44 m; (b) overestimate

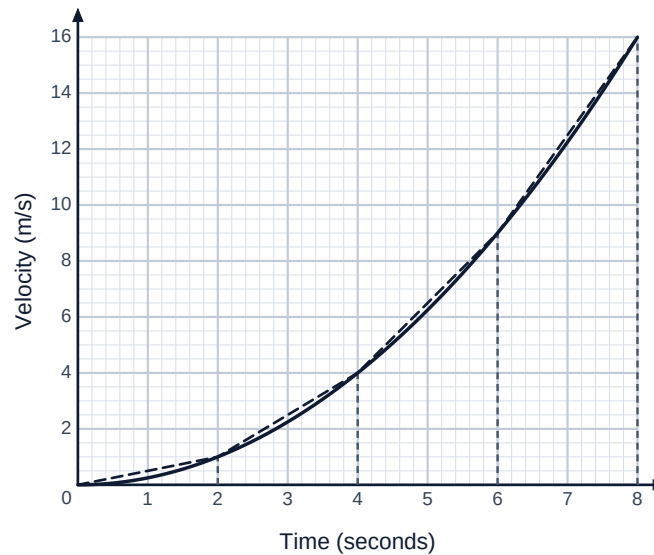
Q21 · ● Greater Depth · 4 marks

METHOD

(a) Strip width 2 s; velocities at 0, 2, 4, 6, 8 s: 0, 1, 4, 9, 16

Area $\approx \frac{1}{2} \times 2 \times (0 + 2 \times (1 + 4 + 9) + 16) = 44 \text{ m}$ · M1 M1 A1

(b) overestimate: the straight tops of the trapezia lie above the curve · B1



✓ (a) 2 m/s; (b) 3 m/s

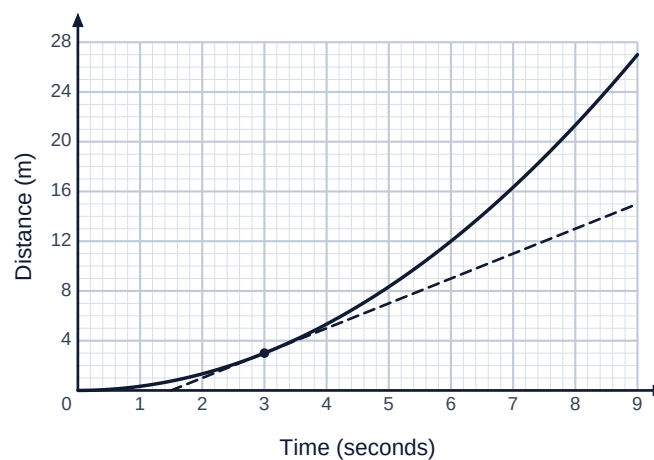
Q22 · ● Greater Depth · 5 marks

METHOD

(a) Draw the tangent at (3, 3) and find its gradient (change in distance ÷ change in time).

Speed $\approx 2 \text{ m/s}$ (accept 1.7 to 2.3) · M1 tangent · M1 gradient · A1

(b) The chord from (0, 0) to (9, 27): $27 \div 9 = 3 \text{ m/s}$ · M1 A1



✓ (a) 3 m/s; (b) 0.5 m/s

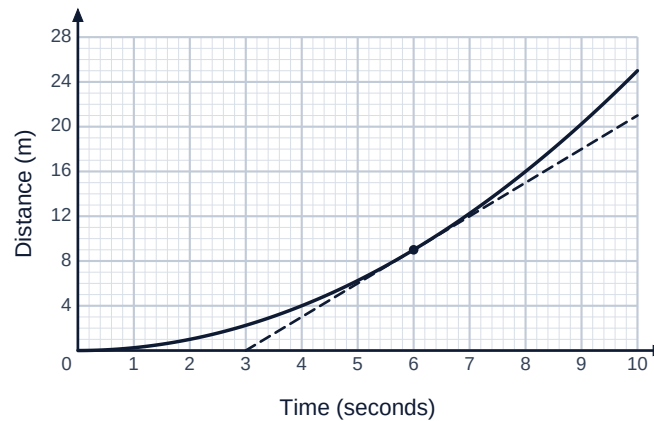
Q23 · ● Greater Depth · 5 marks

METHOD

(a) Draw the tangent at (6, 9) and find its gradient (change in distance ÷ change in time).

Speed $\approx$ 3 m/s (accept 2.6 to 3.4) · M1 tangent · M1 gradient · A1

(b) The chord from (0, 0) to (2, 1): $1 \div 2 = 0.5$ m/s · M1 A1



✓ (a) 6 m/s; (b) 4 m/s

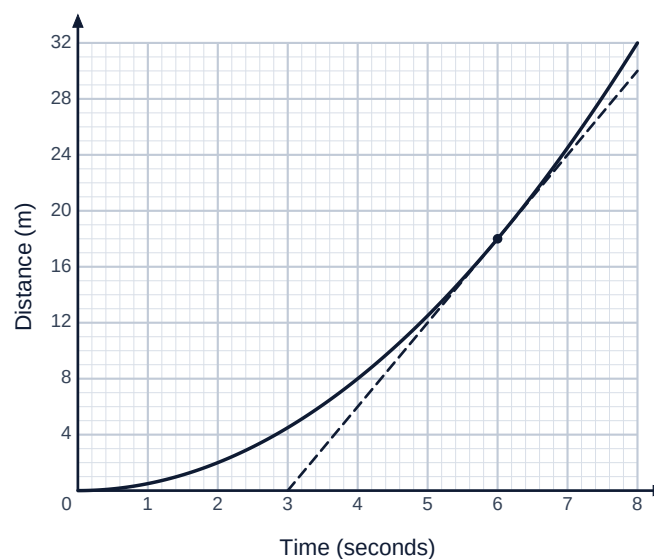
Q24 · ● Greater Depth · 5 marks

METHOD

(a) Draw the tangent at (6, 18) and find its gradient (change in distance ÷ change in time).

Speed $\approx$ 6 m/s (accept 5.1 to 6.9) · M1 tangent · M1 gradient · A1

(b) The chord from (0, 0) to (8, 32): $32 \div 8 = 4$ m/s · M1 A1



✓(a) 5 m/s; (b) 1 m/s

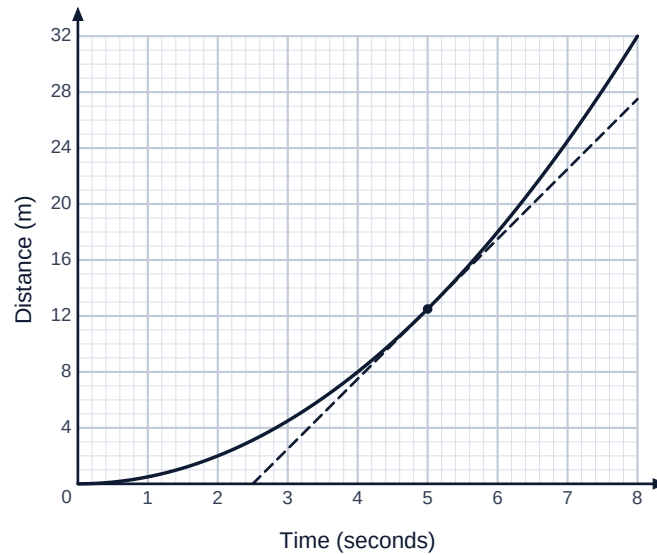
Q25 · ● Greater Depth · 5 marks

METHOD

(a) Draw the tangent at (5, 12.5) and find its gradient (change in distance $\div$ change in time).

Speed $\approx$ 5 m/s (accept 4.3 to 5.8) · M1 tangent · M1 gradient · A1

(b) The chord from (0, 0) to (2, 2): $2 \div 2 = 1$ m/s · M1 A1



✓ (a) 428 m; (b) 14.8 m/s

Q26 · ● Greater Depth · 5 marks

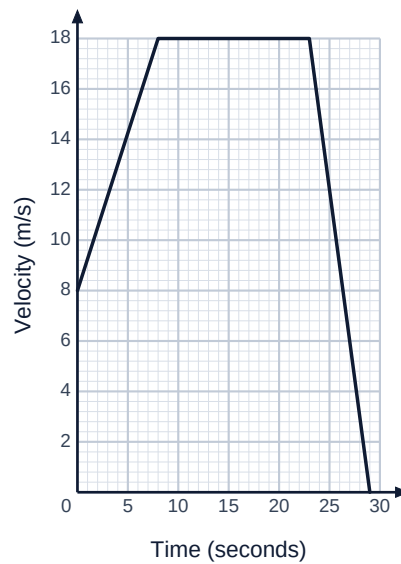
METHOD

(a) Trapezium $\frac{1}{2} \times (8 + 18) \times 8 = 104$; rectangle $18 \times 15 = 270$; triangle $\frac{1}{2} \times 6 \times 18 = 54$

Total = 428 m

(b) $428 \div 29 = 14.8$ m/s

M1 M1 A1 · M1 A1



✓ (a) 31 m; (b) overestimate

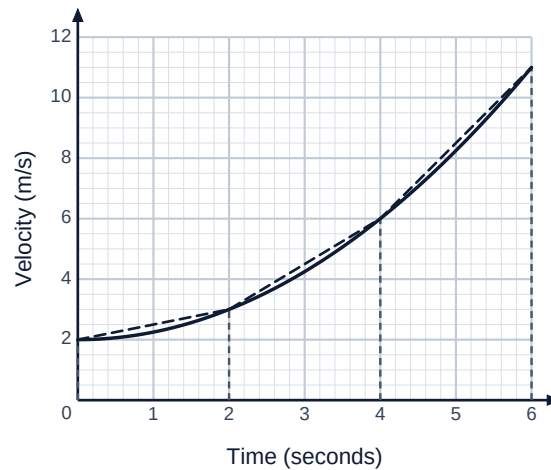
Q27 · ● Greater Depth · 4 marks

METHOD

(a) Strip width 2 s; velocities at 0, 2, 4, 6 s: 2, 3, 6, 11

Area $\approx \frac{1}{2} \times 2 \times (2 + 2 \times (3 + 6) + 11) = 31 \text{ m}$ · M1 M1 A1

(b) overestimate: the straight tops of the trapezia lie above the curve · B1



✓ (a) 176 m; (b) 6.8 m/s

Q28 · ● Greater Depth · 5 marks

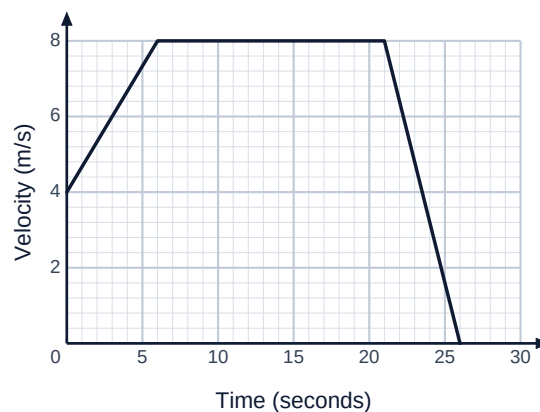
METHOD

(a) Trapezium $\frac{1}{2} \times (4 + 8) \times 6 = 36$; rectangle $8 \times 15 = 120$; triangle $\frac{1}{2} \times 5 \times 8 = 20$

Total = 176 m

(b) $176 \div 26 = 6.8 \text{ m/s}$

M1 M1 A1 · M1 A1



✓ (a) 250 m; (b) 10.4 m/s

Q29 · ● Greater Depth · 5 marks

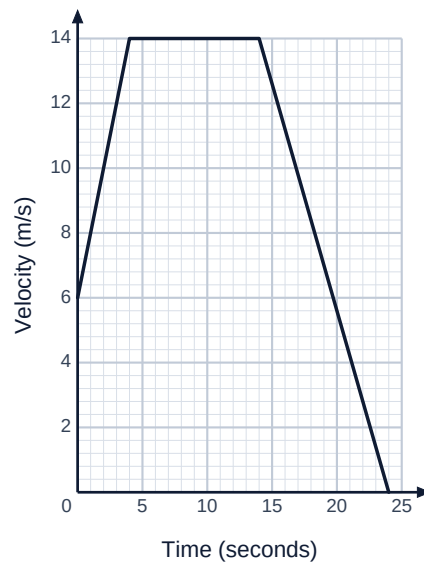
METHOD

(a) Trapezium $\frac{1}{2} \times (6 + 14) \times 4 = 40$; rectangle $14 \times 10 = 140$; triangle $\frac{1}{2} \times 10 \times 14 = 70$

Total = 250 m

(b) $250 \div 24 = 10.4$ m/s

M1 M1 A1 · M1 A1



✓ (a) 53 m; (b) underestimate

Q30 · ● Greater Depth · 4 marks

METHOD

(a) Strip width 2 s; velocities at 0, 2, 4, 6 s: 12, 11, 8, 3

Area $\approx \frac{1}{2} \times 2 \times (12 + 2 \times (11 + 8) + 3) = 53 \text{ m}$ · M1 M1 A1

(b) Underestimate: the straight tops of the trapezia lie below the curve · B1

