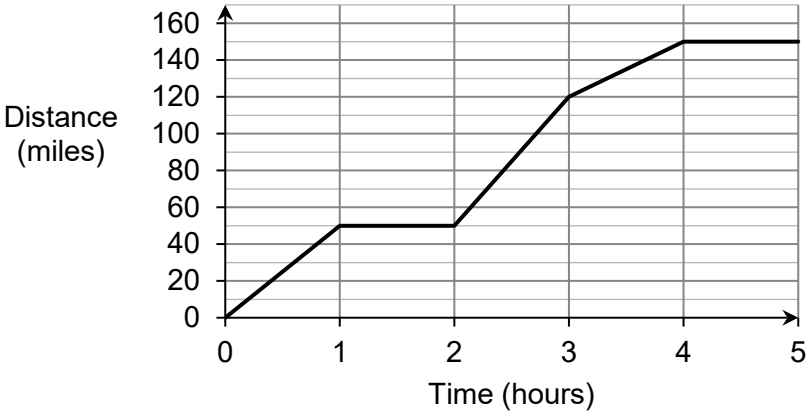
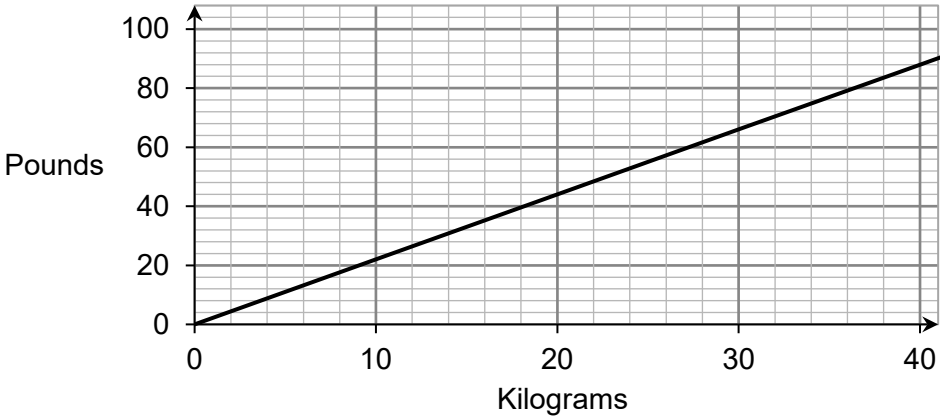
OCR
Oxford Cambridge and RSA

Higher Check In - 7.04 Interpreting graphs

1. Use the distance-time graph below to calculate the average speed in **the first hour** of this journey.

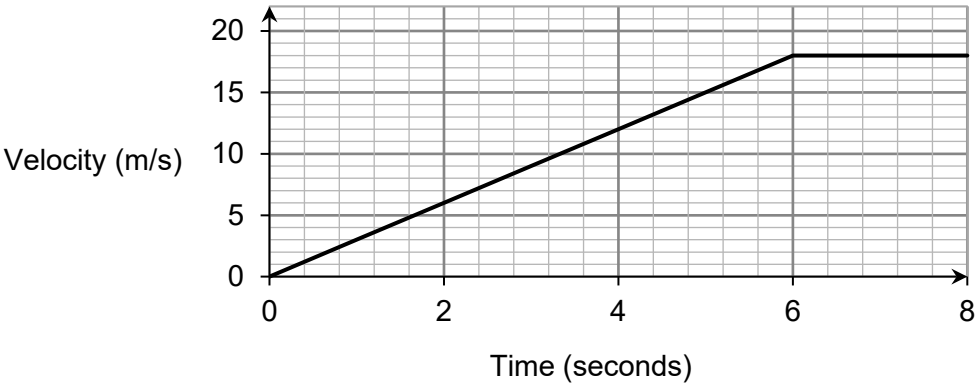


2. Use the conversion graph below to change 29 kilograms to pounds.



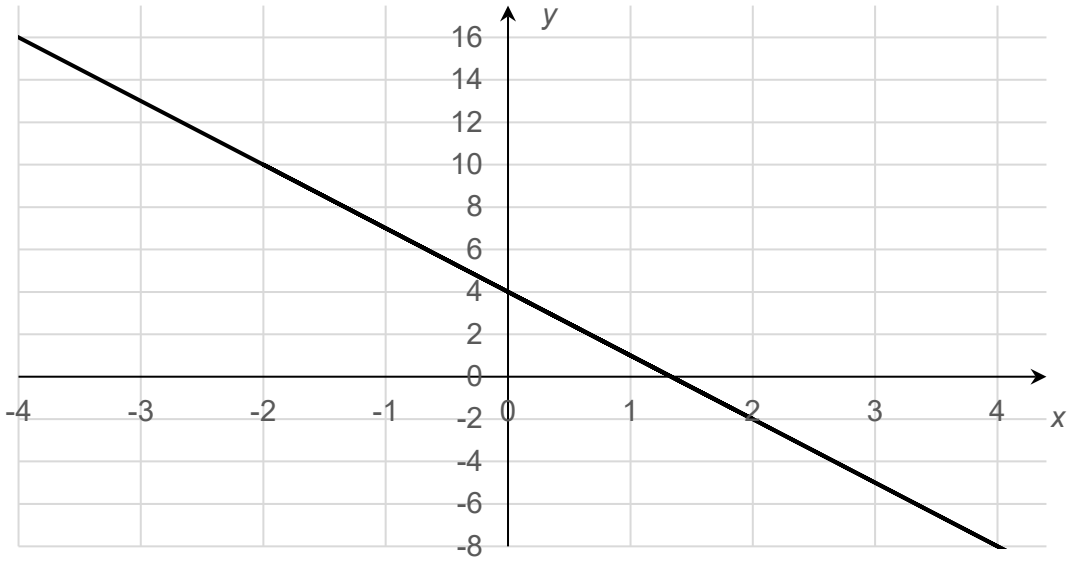
3. Points A and B are both points on a straight line graph that has a gradient of 6. When moving from A to B, the *x*-coordinate increases by 4. Work out the change in the *y*-coordinate when moving from A to B and state whether this will this be an increase or decrease.

4. Use the velocity-time graph below to calculate the acceleration during the first 6 seconds.

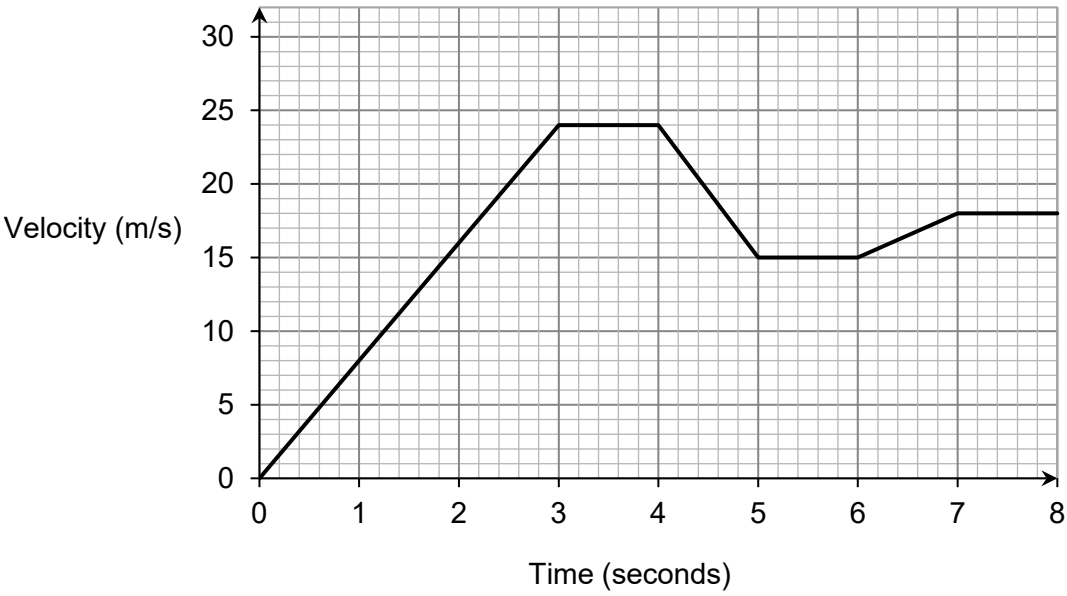


5. Use the graph in question 4 to calculate the distance travelled during the 8 seconds.

6. Frankie is asked to calculate the gradient of the straight line graph below. Her answer is 3. Is she correct? Give a reason for your answer.



Please use the velocity-time graph below for questions 7 and 8.



7. Jamie states that the object is stationary between 3 and 4 seconds. Is he correct? Explain your answer.

8. Show that the distance travelled between 5 and 7 seconds is 31.5 m.

9. Li drives from his house to visit his friend who lives 75 km away. The journey takes Li 1 hour. He stays with his friend for 30 minutes and then leaves to go to the theatre, which is a further 60 km away and takes him 45 minutes. He then spends 2 hours at the theatre. Draw a distance-time graph to show this information. If Li's journey back home from the theatre takes him 150 minutes, calculate the average speed he travels (in kilometres per hour) on his journey home.

10. A car accelerates from 0 to 20 m/s in 8 seconds. It then travels at a constant velocity of 20 m/s for a further 7 seconds. Then, it accelerates to a speed of 30 m/s in 5 seconds. Draw a velocity-time graph for the journey of the car and use it to calculate the acceleration of the car between 15 and 20 seconds.

Extension

Two athletes compete in a 1600 m race by running around a 400 m track. The table shows the overall race time at each lap.

Distance (metres)	Athlete 1 Time (seconds)	Athlete 2 Time (seconds)
0	0	0
400	64	72
800	128	140
1200	204	208
1600	276	264

Draw a distance-time graph showing both athletes. Use your graph to find which athlete ran a lap at the fastest speed and then find the athlete's average speed in this fastest lap (to 2 decimal places).

Answers

1. 50 mph

2. 64 pounds

3. It will be an increase of 24.

4. Acceleration = gradient $= \frac{18}{6} = 3\ \text{m/s}^2$

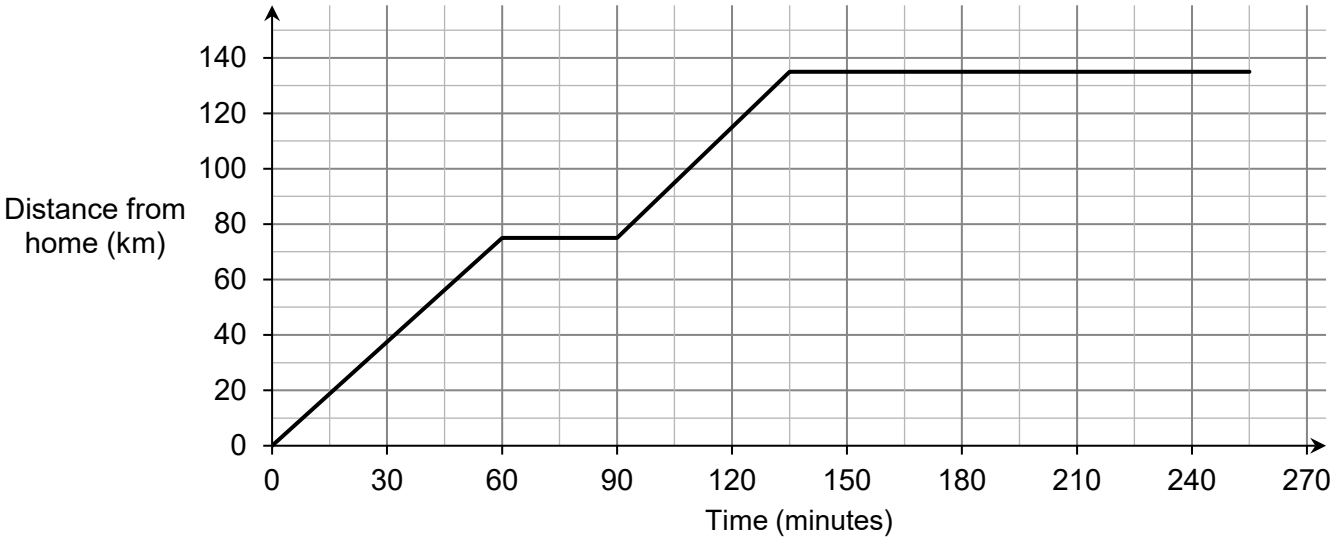
5. Distance = area under graph = 90 m

6. No, she is not correct as the gradient is -3 (negative gradient).

7. No, he is not correct as the object is travelling at a constant velocity of 24 m/s.

8. The area under the graph between 5 and 7 seconds is 31.5 m from either $\left(\frac{1}{2}\times 1\times 3\right)+(2\times 15)$ or $(1\times 15)+\left(\frac{1}{2}\times(15+18)\times 1\right)$.

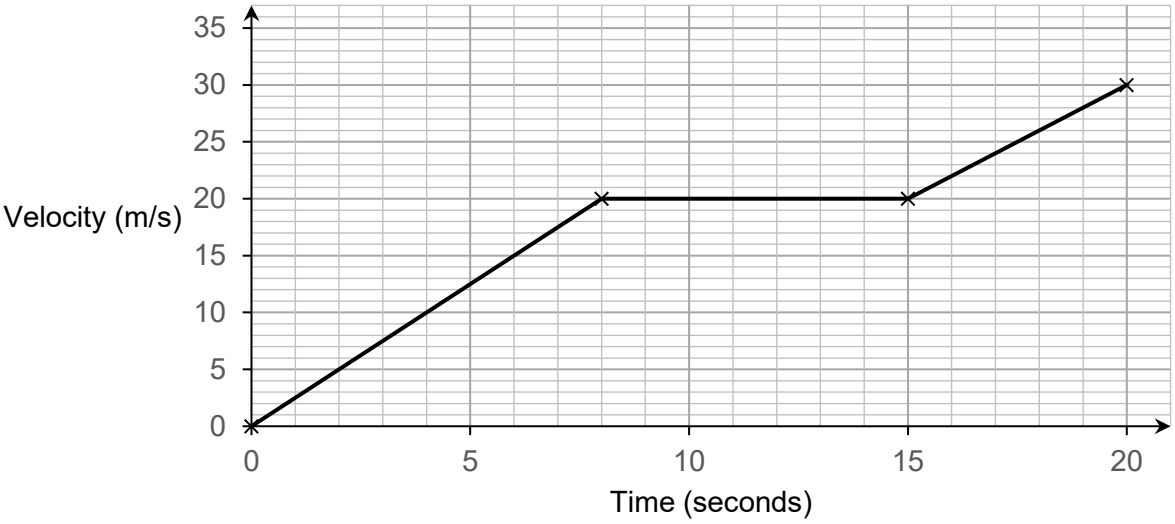
9.



Journey home average speed = $\frac{135}{150}$ = 0.9 km per minute

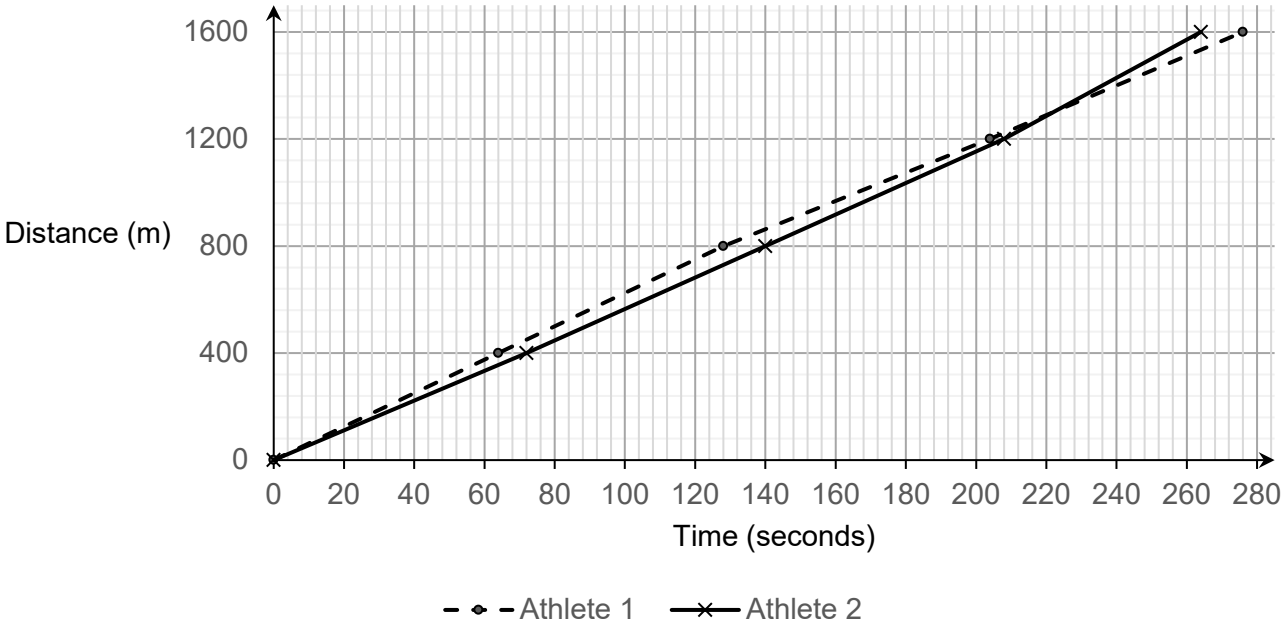
0.9 × 60 = 54 km per hour

10.



$$\text{Acceleration} = \frac{10}{5} = 2\,\text{m/s}^2$$

Extension



Athlete 2 ran a lap at the fastest speed, as the greatest gradient on the graph is their final lap.

Athlete 2 final lap average speed = $\frac{400}{56}$ = 7.14 m/s.

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Assessment Objective	Qu.	Topic	R	A	G
AO1	1	Find an average speed by calculating the gradient of a distance-time graph			
AO1	2	Interpret a conversion graph			
AO1	3	Understand the relationship between gradient and ratio			
AO1	4	Find acceleration by calculating the gradient of a velocity-time graph			
AO1	5	Find a distance by calculating the area under a velocity-time graph			
AO2	6	Understand how to calculate positive and negative gradients			
AO2	7	Interpret a velocity-time graph			
AO2	8	Find a distance by calculating the area under a velocity-time graph			
AO3	9	Draw a distance-time graph and calculate an average speed			
AO3	10	Draw a velocity-time graph and use it to calculate acceleration			

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