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# Linear motion 2 worksheet

AQA AS 7407 and first-year A Level 7408 | OCR A AS H156 and A Level H556

*35–40 minutes independent practice + 15–20 minutes review | 36 marks*

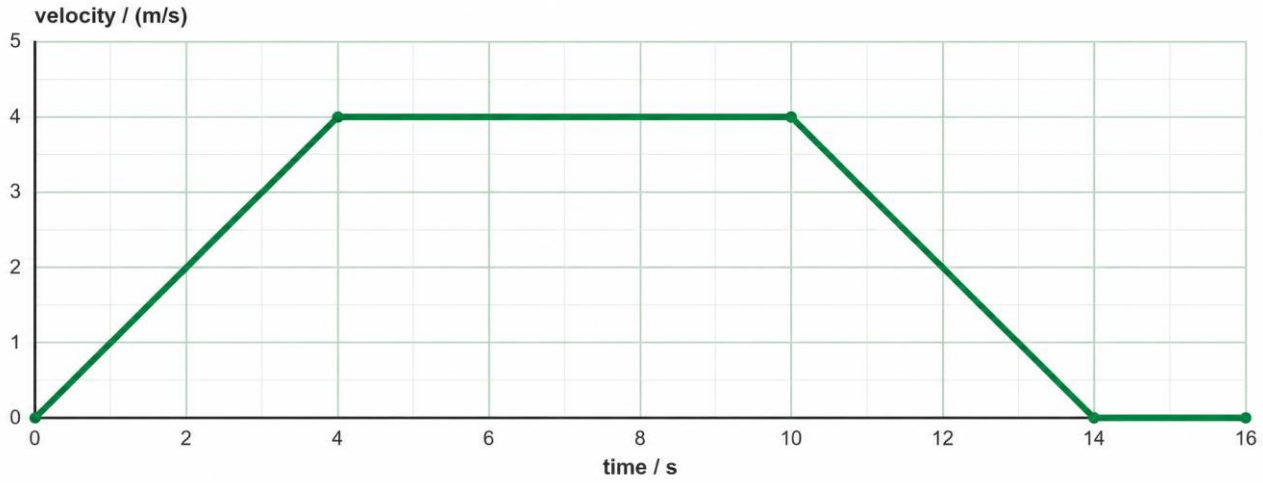
## Specification points covered

AQA 7407 / 7408: 3.4.1.3 selected motion skills — graphical gradients and signed areas, acceleration–time graphs, journey comparisons and the constant-acceleration condition for SUVAT.
OCR A H156 / H556: 3.1.1(a)–(d); 3.1.2(a)(i) — displacement, velocity, acceleration, graphical motion and the constant-acceleration condition. No free-fall practical is assessed here.

Graph language and review focus
Use gradients and signed areas to interpret a logistics trial. Name the quantity, say whether it increases, decreases or stays constant, and identify linear changes.
36 marks. Acceleration–time area is change in velocity; velocity–time area is displacement. Accept equivalent valid methods and consistent consequential work.

## A Delivery cart velocity and acceleration

**Context**
A robotic delivery cart moves east along a straight warehouse aisle. East is the positive direction.



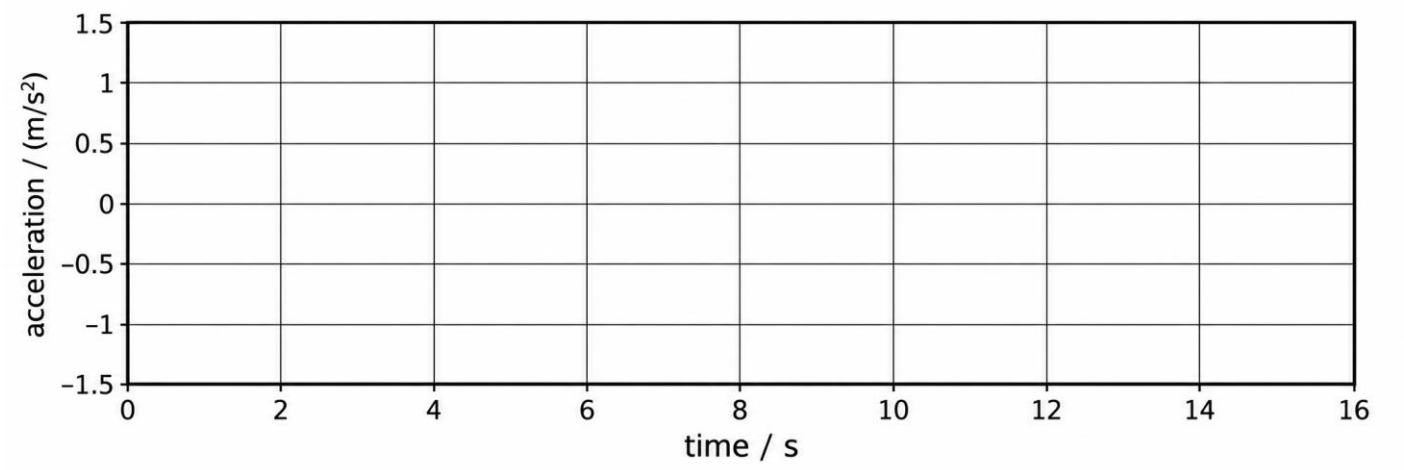

**1. State the velocity of the delivery cart at t = 2.0 s. [1 mark]**

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**2. From t = 0 to t = 4.0 s, describe the cart's velocity and acceleration. Use precise scientific language. [2 marks]**

## A Acceleration graph and signed areas

**3. Draw the delivery cart's acceleration–time graph on the axes provided, for the full 0–16 s run. Treat the changes between straight-line stages as instantaneous. [4 marks]**




**4. Calculate the acceleration of the cart from t = 10 s to t = 14 s. [1 mark]**

**5. Calculate the displacement of the cart from t = 0 to t = 14 s. [3 marks]**

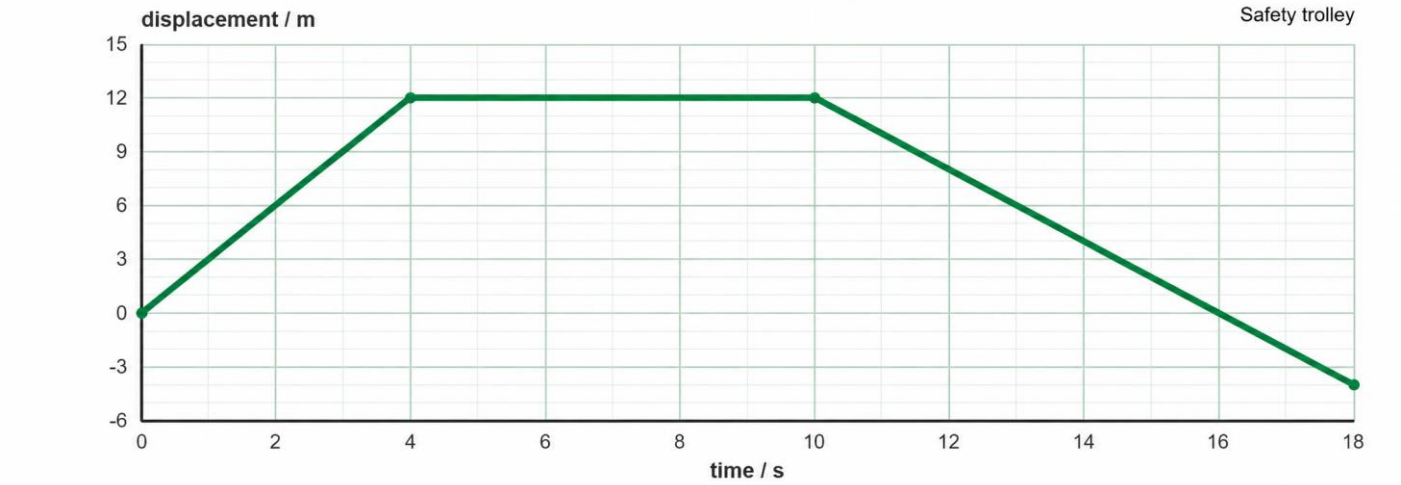
**6. Use the signed areas under your acceleration–time graph to determine the cart's final velocity at 16 s. Explain whether zero net area would mean that the cart travelled zero distance. [3 marks]**

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# B Safety trolley displacement and direction

**Context**

The safety trolley travels on the same straight aisle. East is positive. It returns past its starting point during the final section.




**7. Use the graph to calculate the velocity of the safety trolley from t = 0 to t = 4.0 s. [1 mark]**

**8. From t = 4.0 s to t = 10 s, describe the trolley's displacement and velocity. [2 marks]**

**9. Use the graph to calculate the velocity of the safety trolley from t = 10 s to t = 18 s. [1 mark]**

**10. From t = 10 s to t = 18 s, describe the trolley's motion. Include the direction of travel. [2 marks]**

**11. Calculate the total distance travelled by the trolley from t = 0 to t = 18 s. [2 marks]**

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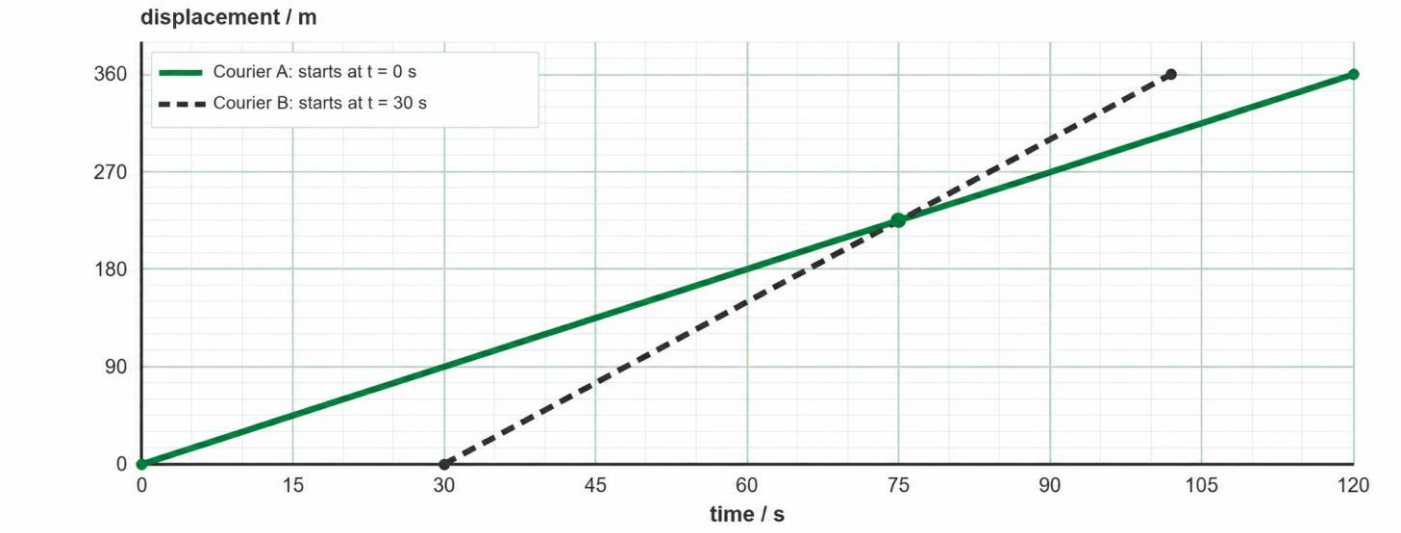
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## C Courier journey comparisons

**Context**

Two bicycle couriers travel from the same gate to a marker 360 m away. Courier A starts at t = 0 s. Courier B starts at t = 30 s.




**12. At t = 30 s, calculate how far ahead of Courier B Courier A is. [1 mark]**

**13. Use the graph to determine (i) the time at which Courier B overtakes Courier A and (ii) their displacement then. [2 marks]**

**14. Each courier reaches the marker at a displacement of 360 m. Determine the time each courier spends moving from the gate to the marker. [2 marks]**

**15. Calculate the gradient of each courier's displacement-time line. State what each gradient represents. [2 marks]**

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## C Journey decisions and model limits

**16. Explain why Courier B overtakes Courier A even though Courier B starts later. [2 marks]**

**17. A trainee applies one constant-acceleration SUVAT equation to the cart's whole 0–14 s run. Because it starts and finishes at rest, the trainee uses a = 0 and concludes that its displacement is zero. Explain why this reasoning is invalid. [2 marks]**

**18. In a separate courier trial, A and B initially follow the velocities and start times in the graph. At t = 60 s, A stops for 10 s and then resumes its original velocity. B continues unchanged. Ignore the short stopping and restarting transitions. Determine whether B overtakes A while A is stationary. Find the clock time and displacement of this event. [3 marks]**

Review: distinguish clock time from elapsed time, distance from displacement, and zero net change in velocity from no motion.

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