3.13 Motion: Speed, Velocity and Acceleration: Test Pack

AQA 8464 · Calculator allowed · about 25 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 State one difference between speed and velocity.

(Total for Question 1 is 2 marks)

2 A go-kart driven by Leon starts from rest. The table shows its velocity at different times after starting.

Time (s): 0, 2, 4, 6

Velocity (m/s): 0, 3, 6, 9

Calculate the go-kart's acceleration during two different time intervals, and use your results to explain why its acceleration is constant.

(Total for Question 2 is 4 marks)

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3 Higher tier only. Callum's remote-control car accelerates uniformly from rest. After accelerating for 8.0 s, it reaches a velocity of 12 m/s.

(a) Calculate the car's acceleration during this time, using $a = (v - u) / t$. **(2)**

.....

(b) Calculate the distance travelled during the 8.0 s of acceleration, using $v^2 = u^2 + 2as$. **(2)**

.....

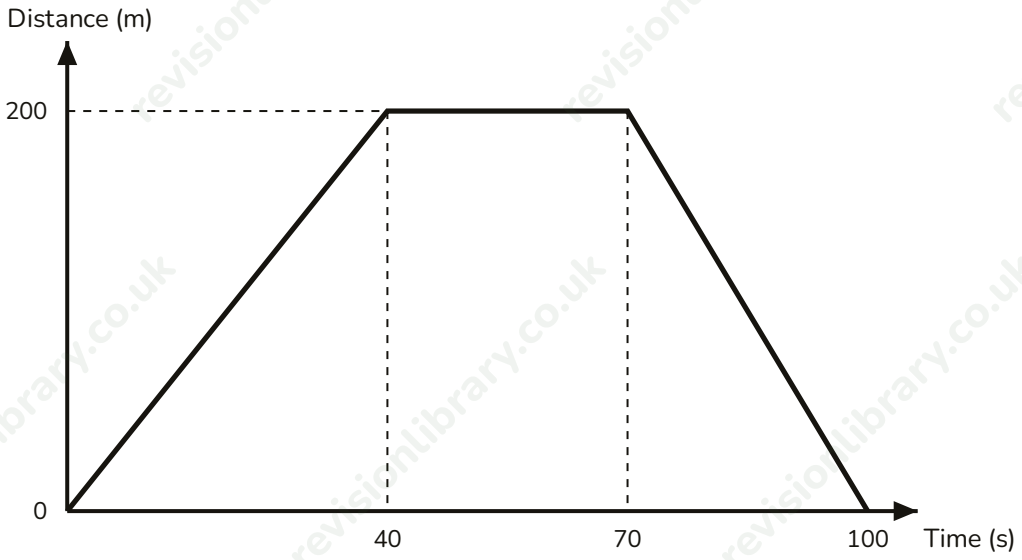
(c) Check your answer to part (b) by instead calculating the distance using the area under a velocity-time graph for this section of the journey. State whether the two methods agree. **(2)**

.....

(Total for Question 3 is 6 marks)

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4 The graph shows the distance of a cyclist, Kwame, from his starting point during a 100 second journey along a straight, flat road.



(a) Describe Kwame's motion between t = 40 s and t = 70 s. **(1)**

(b) Calculate Kwame's speed during the first 40 seconds of the journey. **(2)**

(c) Calculate Kwame's speed between t = 70 s and t = 100 s, and state what the shape of the graph in this section tells you about the direction he is travelling in. **(2)**

(Total for Question 4 is 5 marks)

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Mark scheme · 3.13 Motion: Speed, Velocity and Acceleration: Test Pack

Question 1

speed has a magnitude only (it is a scalar quantity) **B1**

velocity has a magnitude and a stated direction (it is a vector quantity) **B1**

Answer: Speed has magnitude only (a scalar); velocity has both magnitude and a stated direction (a vector).

Question 2

calculates acceleration for one interval, e.g. (3 - 0) / (2 - 0) = 1.5 m/s^2 **M1**

calculates acceleration for a different interval, e.g. (9 - 6) / (6 - 4) = 1.5 m/s^2 **M1**

both intervals (and the interval 4-6s to 2-4s, or overall) give the same value, 1.5 m/s^2, cao **A1**

acceleration is constant because the velocity increases by equal amounts (3 m/s) in each equal time interval (2 s), oe **B1**

Answer: 1.5 m/s^2 (constant)

Question 3

(a) substitutes: a = (12 - 0) / 8.0 **M1**

(a) 1.5 m/s^2 cao **A1**

(a) Answer: 1.5 m/s^2

(b) ft substitutes and rearranges: $12^2 = 0^2 + 2$ x (their a) x s **M1**

(b) 48 m cao (ft) **A1**

(b) Answer: 48 m

(c) ft calculates area of the triangle: 0.5 x 8.0 x 12 = 48 (m) **M1**

(c) 48 m matches the answer to part (b), so the two methods agree, oe **B1**

(c) Answer: 48 m; this agrees with part (b).

Question 4

(a) he is stationary/at rest (not moving); his distance from the start stays constant at 200 m, oe **B1**

(a) Answer: He is stationary; his distance from the start stays at 200 m.

(b) substitutes: speed = 200 / 40 **M1**

(b) 5.0 m/s cao **A1**

(b) Answer: 5.0 m/s

(c) awrt 6.7 m/s (200 / 30) **B1**

(c) he is travelling back towards his starting point; the negative gradient shows his distance from the start is decreasing, oe **B1**

(c) Answer: 6.7 m/s; he is travelling back towards his starting point.

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