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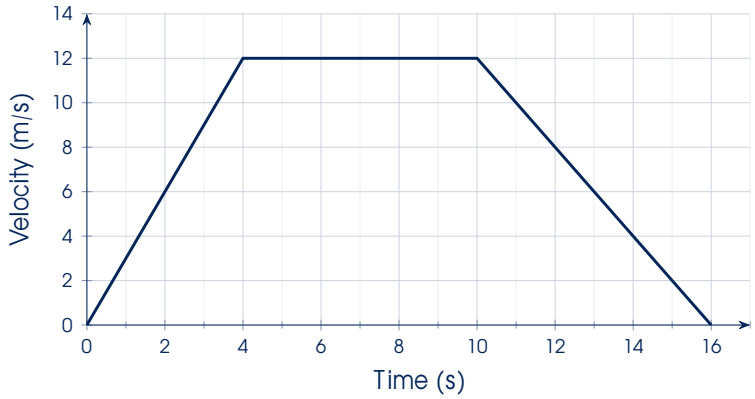
Name ..... Class .....

A15: Gradients and areas of graphs

Rates of change and areas under graphs

20 marks · 25 minutes · Non-calculator

1) The velocity–time graph shows a car's journey.



(a) Find the acceleration in the first 4 seconds.

..... m/s^2

(2)

(b) Find the total distance travelled.

..... m

(3)

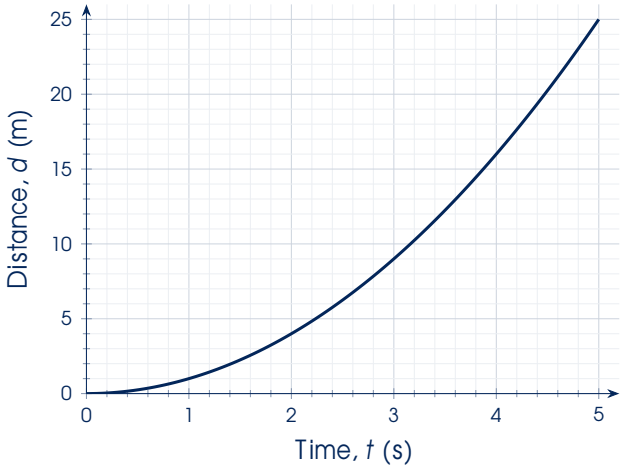
(c) Find the deceleration in the last 6 seconds.

..... m/s^2

(1)

[Question 1: 6 marks]

2) The graph shows the distance, d metres, travelled by a trolley after t seconds.



By drawing a tangent, estimate the speed of the trolley at $t = 3$ seconds.

..... m/s

[Question 2: 2 marks]

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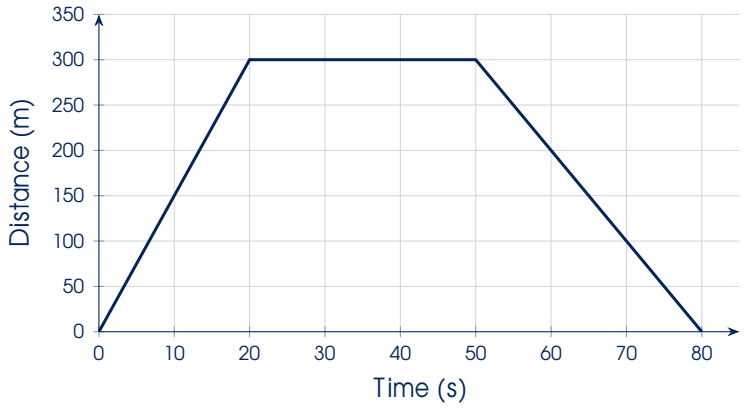
3) Split the region under $y = x^2$ from $x = 0$ to $x = 4$ into four trapeziums of width 1
Use them to estimate the area of the region.

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[Question 3: 2 marks]

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4) The distance–time graph shows a cyclist's journey.



(a) Find the speed in the first 20 seconds.

..... m/s

(2)

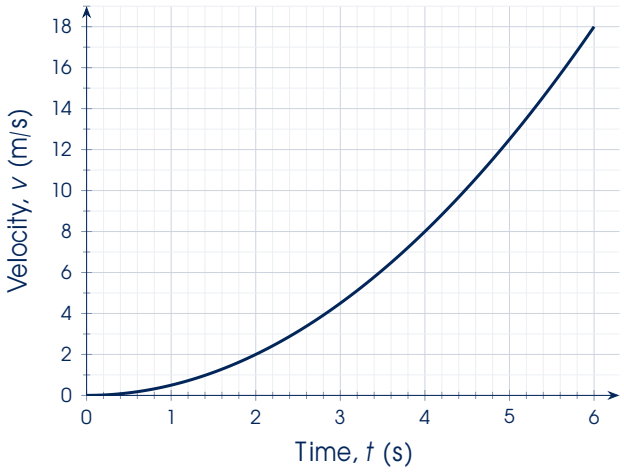
(b) Find the average speed for the whole journey.

..... m/s

(2)

[Question 4: 4 marks]

5) The graph shows the velocity, v m/s, of an object after t seconds.



(a) By drawing a tangent, estimate the acceleration at $t = 4$ seconds.

..... m/s^2

(2)

(b) Split the area under the graph from $t = 0$ to $t = 6$ into 3 trapeziums of equal width. Use them to estimate how far the object moves in this time.

..... m

(3)

(c) Is your answer to (b) an overestimate or an underestimate?

.....

(1)

[Question 5: 6 marks]

End of paper – 20 marks in total

Answers and brief mark scheme

Q	Answer	Method / notes
1	(a) 3 (b) 132 (c) 2	(a) $\frac{12}{4}$ (M1); A1. (b) Splits into shapes (M1); $24 + 72 + 36$ (M1); 132 (A1). (c) B1.
2	about 6	Tangent drawn at $t = 3$ (M1); answer 5 to 7 (A1).
3	22	Heights 0, 1, 4, 9, 16 and trapezium areas 0.5, 2.5, 6.5, 12.5 (M1); 22 (A1).
4	(a) 15 (b) 7.5	(a) $\frac{300}{20}$ (M1); A1. (b) $\frac{600}{80}$ (M1); A1.
5	(a) about 4 (b) 38 (c) overestimate	(a) Tangent at $t = 4$ (M1); 3 to 5 (A1). (b) $v = 0, 2, 8, 18$ (M1); trapeziums $2 + 10 + 26$ (M1); 38 (A1). (c) The curve bends below the straight tops of the trapeziums (B1).