HIGHER ONLY

HIGHER TIER

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

A15: Gradients and areas under graphs

Solve problems using gradients and areas of graphs

20 marks · 25 minutes · Non-calculator

1) A train accelerates uniformly from rest to 20 m/s in 8 s, travels at 20 m/s for 30 s, then decelerates uniformly to rest in 12 s. Find the total distance and the average speed.

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[Question 1: 4 marks]

2) A car travelling at 20 m/s must stop within 50 m. Find the least constant deceleration needed.

..... m/s^2

[Question 2: 3 marks]

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3) Use three trapeziums of width 1 to estimate the area under $y = x^2 + 1$ from $x = 0$ to $x = 3$. Is your estimate too big or too small?

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[Question 3: 3 marks]

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4) Distance is $d = 2t^2$. Find the average speed between $t = 2$ and $t = 5$

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[Question 4: 2 marks]

5) A train accelerates from rest at $0.5\,m/s^2$ for 40 seconds. How far does it travel?

..... m

[Question 5: 2 marks]

6) Savings start at £200 and increase by £50 each month. After how many months will they reach £1000?

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[Question 6: 2 marks]

7) A car accelerates for 10 s to 30 m/s, stays at 30 m/s, then decelerates to rest in 10 s. It travels 1200 m in total. How long does it travel at 30 m/s?

..... s

[Question 7: 4 marks]

End of paper – 20 marks in total

Answers and brief mark scheme

Q	Answer	Method / notes
1	800 m; 16 m/s	Areas 80, 600, 120 (P1, P1); 800 (A1); 800 ÷ 50 (A1).
2	4	$\frac{1}{2} \times 20 \times t = 50$ (P1); $t = 5$ (P1); A1.
3	12.5, too big	y: 1, 2, 5, 10 (P1); 12.5 (A1); curve below the trapezium tops (C1).
4	14	$\frac{50 - 8}{3}$ (P1); A1.
5	400	Final speed 20 (P1); area 400 (A1).
6	16	800 ÷ 50 (P1); A1.
7	30	Triangles 150 + 150 (P1); $30T = 900$ (P1, P1); A1.