FOUNDATION & HIGHER

SAME AT BOTH TIERS

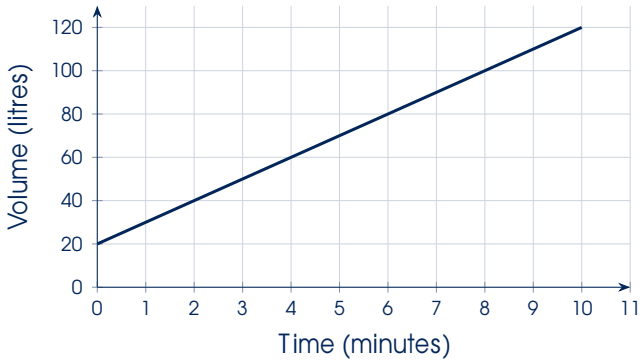
Name ..... Class .....

R14: Rates of change

Interpret gradients as rates of change; proportion graphs

20 marks · 25 minutes · Non-calculator

1) Water is added to a tank at a steady rate.



(a) Show that water is added at 10 litres per minute.

(2)

(b) Explain what the intercept on the volume axis means.

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(1)

(c) Is the volume directly proportional to the time? Explain.

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(2)

[Question 1: 5 marks]

2) Explain why a straight-line graph through the origin shows direct proportion.

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[Question 2: 2 marks]

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3) Describe the shape of the graph of an inverse proportion and explain why it never touches the axes.

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[Question 3: 2 marks]

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4) A distance–time graph is a straight line from $(0, 0)$ to $(3, 240)$, with time in hours and distance in km. Show that the speed is 80 km/h.

[Question 4: 2 marks]

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5) The temperature falls steadily from 25 °C to 10 °C in 5 hours. Show that the rate of change is −3 °C per hour.

[Question 5: 2 marks]

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6) Kim says a steeper line on a distance–time graph means a slower speed. Explain her mistake.

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[Question 6: 2 marks]

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7) A cost graph is a straight line through (0, 0) and (5, 7.5), with mass in kg and cost in pounds. Show that the cost is £1.50 per kg and that 8 kg cost £12.

[Question 7: 3 marks]

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8) A graph shows volume in litres against time in minutes. What are the units of its gradient? Explain.

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[Question 8: 2 marks]

End of paper – 20 marks in total

Answers and brief mark scheme

Q	Answer	Method / notes
1	(a) Shown (b) 20 litres at the start (c) No	(a) $\frac{100}{10}$ (M1); C1. (b) C1. (c) Does not pass through the origin (M1); C1.
2	Explanation	$y = kx$ (C1); constant ratio and 0 gives 0 (C1).
3	Explanation	A curve that gets closer to the axes (C1); $xy = k$ so neither can be 0 (C1).
4	Shown	$240 \div 3$ (M1); C1.
5	Shown	$\frac{10 - 25}{5}$ (M1); C1.
6	Explanation	Steeper means more distance per unit time (C1); faster (C1).
7	Shown	$7.5 \div 5$ (M1); C1; $8 \times 1.5 = 12$ (C1).
8	Litres per minute	Gradient is litres $\div$ minutes (C2).