5.2 Direct and Inverse Proportion: 30-minute Pack

EDEXCEL 1MA1 · Calculator allowed · about 30 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 A car uses 6 litres of petrol to travel 30 miles. Work out how many litres the car will use to travel 50 miles at the same rate.

(Total for Question 1 is 2 marks)

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2 Direct proportion with context. A small plant needs 150 ml of water every 5 days. How much water does it need in 14 days?

(a) Find the water needed in 14 days. **(3)**

.....

(b) If the gardener has a 2 litre bottle, how many full bottles are needed for 14 days? Give your answer as a whole number of full bottles required. **(1)**

.....

(Total for Question 2 is 4 marks)

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3 Three graphs, P, Q and R, show relationships between x and y.
Graph P: a straight line passing through the origin.
Graph Q: a curve that decreases as x increases, getting closer and closer to both axes but never touching them.
Graph R: a straight line that does not pass through the origin.

(a) Which graph could represent y directly proportional to x? **(1)**

(b) Which graph could represent y inversely proportional to x? **(1)**

(c) Explain why graph R cannot represent a proportional relationship between x and y. **(1)**

(Total for Question 3 is 3 marks)

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4 y is directly proportional to x^2. When x = 3, y = 45.

(a) Find a formula for y in terms of x. **(3)**

(b) Work out the value of y when x = 6. **(2)**

(Total for Question 4 is 5 marks)

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5 P is directly proportional to Q^2. Q is increased by 50%. Work out the percentage increase in P.

(Total for Question 5 is 3 marks)

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6 The intensity of light, I lux, from a lamp is inversely proportional to the square of the distance, d metres, from the lamp. At a distance of 3 m, the intensity is 20 lux.

(a) Find a formula for I in terms of d. **(2)**

.....

(b) Work out the intensity at a distance of 5 m. Give your answer to 3 significant figures. **(2)**

.....

(c) For safe reading, the intensity must be at least 8 lux. Find the maximum distance, to 1 decimal place, at which this is possible. **(3)**

.....

(Total for Question 6 is 7 marks)

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Mark scheme · 5.2 Direct and Inverse Proportion: 30-minute Pack

A correct answer earns full marks unless the question asks for working, a method, proof or explanation.

Question 1

find litres per mile: 6/30 = 0.2 or scale 6 x 50/30	**M1**
10 litres cao	**A1**

Answer: 10 litres. (6/30 = 0.2 litres per mile. 0.2 x 50 = 10.)

Question 2

(a) find daily water or scale: 150/5 = 30 ml per day	**M1**
(a) 30 x 14 or equivalent	**M1**
(a) 420 ml cao	**A1**

(a) Answer: 420 ml

(b) 1 bottle cao (2 litres = 2000 ml and 420 ml < 2000 ml, so 1 full 2 litre bottle is enough)	**B1**

(b) Answer: 1 full bottle

Question 3

(a) P	**B1**

(a) Answer: P

(b) Q	**B1**

(b) Answer: Q

(c) valid reason, e.g. it does not pass through the origin, so when x = 0, y is not 0 oe	**B1**

(c) Answer: It does not pass through the origin

Question 4

(a) $y = kx^2$ oe seen	**M1**
(a) $45 = k \times 3^2$ (= 9k) solved (dependent on previous M1)	**dM1**
(a) $y = 5x^2$ oe	**A1**

(a) Answer: $y = 5x^2$

(b) 5×6^2 oe (ft their formula)	**M1**
(b) 180 cao	**A1**

(b) Answer: 180

Question 5

new Q identified as 1.5Q oe	**M1**
$(1.5)^2$ (= 2.25) calculated and applied to P oe	**M1**
125% (increase) cao	**A1**

Answer: 125% increase

Question 6

(a) finds $k = 20 \times 3^2 = 180$ oe	**M1**
(a) $I = 180/d^2$ oe	**A1**

(a) Answer: $I = 180/d^2$

(b) substitutes d = 5 into their formula	**M1**
(b) 7.20 lux awrt 3sf	**A1**

(b) Answer: 7.20 lux (3sf)

(c) sets up $8 = 180/d^2$ oe	**M1**
(c) $d^2 = 180/8$ (= 22.5) oe, dependent on the first M1	**dM1**
(c) 4.7 (m) awrt 1 d.p.	**A1**

(c) Answer: 4.7 m (1 d.p.)

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