5.2 Direct and Inverse Proportion: 1-hour Pack

EDEXCEL 1MA1 · Calculator allowed · about 60 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 y is directly proportional to x. When x = 5, y = 15.

(a) Work out the value of y when x = 8. **(2)**

.....

(b) Work out the value of x when y = 39. **(2)**

.....

(Total for Question 1 is 4 marks)

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2 A map scale says 1 cm represents 5 km. On the map, two towns are 7.2 cm apart. Work out the actual distance in kilometres.

(a) Find the actual distance in kilometres. **(2)**

.....

(b) If a car travels at 60 km/h, how many minutes will it take to travel between the towns? Give your answer to the nearest minute. **(2)**

.....

(Total for Question 2 is 4 marks)

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3 A recipe for 4 people uses 300 g of flour and 120 g of butter. Farah wants to make the recipe for 10 people. Work out how much butter she needs.

(Total for Question 3 is 2 marks)

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4 Tom changes £150 into US dollars. The exchange rate is £1 = 1.28 dollars.

(a) Work out how many dollars Tom gets. **(2)**

.....

(b) Tom's friend changes some pounds into dollars at the same rate and receives 96 dollars. Work out how many pounds she changed. **(2)**

.....

(Total for Question 4 is 4 marks)

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5 The cost, C pounds, of petrol is directly proportional to the number of litres, n, bought.
n (litres): 10, 25, 40
C (pounds): 14.20, ?, ?

(a) Work out the missing value of C when n = 25. **(2)**

.....

(b) Work out the missing value of C when n = 40. **(1)**

.....

(Total for Question 5 is 3 marks)

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6 A shop sells pens in packs. The cost of pens is directly proportional to the number of pens bought. 6 pens cost £4.20.

(a) Work out the cost of 10 pens. **(2)**

.....

(b) Rhys has £6. Work out the greatest number of pens he can buy. **(2)**

.....

(Total for Question 6 is 4 marks)

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7 y is directly proportional to x. When x = 8, y = 20.

(a) Find a formula for y in terms of x. **(2)**

.....

(b) Work out the value of y when x = 14. **(1)**

.....

(c) Work out the value of x when y = 100. **(2)**

.....

(Total for Question 7 is 5 marks)

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8 It takes 5 taps 22 minutes to fill a tank, with all taps flowing at the same constant rate. Work out how many minutes it would take 7 taps, flowing at the same rate, to fill an identical tank. Give your answer correct to 1 decimal place.

(Total for Question 8 is 3 marks)

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9 The braking distance, D metres, of a car is directly proportional to the square of its speed, v mph. A car travelling at 30 mph has a braking distance of 13.5 m.

(a) Find a formula for D in terms of v. **(2)**

(b) A car is travelling at 50 mph. Investigators find that its actual braking distance is 3 times the value predicted by the formula in part (a), due to a wet road surface. Work out the actual braking distance of the car at 50 mph. **(3)**

(Total for Question 9 is 5 marks)

10 The table shows some corresponding values of x and y.

x	1	2	4
y	48	24	12

(a) Show that y is inversely proportional to x. **(2)**

(b) Write down a formula for y in terms of x. **(1)**

(Total for Question 10 is 3 marks)

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11 The time t (in hours) taken to fill a tank with a pump is inversely proportional to the pump's flow rate r (in litres per hour). A pump with flow rate 500 l/h fills the tank in 4 hours.

(a) Find an expression for t in terms of r. **(2)**

(b) Using your expression, show that a pump with flow rate 750 l/h fills the tank in 8/3 hours. **(2)**

(Total for Question 11 is 4 marks)

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12 A scientist measures that the pressure P of a gas varies directly as the temperature T and inversely as the volume V. This can be modelled as $P = k\ T / V$. For a sample, when T = 300 K and V = 0.2 m^3 the pressure is 120 kPa.

(a) Find k. **(2)**

(b) Using this k, calculate the pressure when T = 450 K and V = 0.15 m^3. Give your answer to 3 significant figures. **(4)**

(Total for Question 12 is 6 marks)

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Mark scheme · 5.2 Direct and Inverse Proportion: 1-hour Pack

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

Question 1

(a) finds k = 15/5 = 3, or sets up y = 3x oe **M1**

(a) y = 24 cao **A1**

(a) Answer: y = 24

(b) sets up 39 = 3x oe (ft their k) **M1**

(b) x = 13 cao **A1**

(b) Answer: x = 13

Question 2

(a) calculate 7.2 x 5 or equivalent scaling **M1**

(a) 36 km cao **A1**

(a) Answer: 36 km

(b) time in hours = 36/60 = 0.6 hours or equivalent conversion to minutes **M1**

(b) 36 minutes awrt **A1**

(b) Answer: 36 minutes (awrt).

Question 3

scale factor 10/4 (= 2.5) found, or unitary method 120/4 (= 30) seen oe **M1**

300 (g) cao **A1**

Answer: 300 g

Question 4

(a) 150 x 1.28 oe **M1**

(a) 192 (dollars) cao **A1**

(a) Answer: $192

(b) 96 / 1.28 oe **M1**

(b) 75 (pounds) cao **A1**

(b) Answer: £75

Question 5

(a) unit rate 14.20/10 (= 1.42) found, or correct scaling method oe **M1**

(a) 35.50 cao **A1**

(a) Answer: £35.50

(b) 56.80 (or follow through: their unit rate x 40) **B1**

(b) Answer: £56.80

Question 6

(a) finds unit cost = 4.20/6 = 0.70 oe, or a correct scaling method **M1**

(a) £7.00 cao **A1**

(a) Answer: £7.00

(b) 6/0.70 (= 8.57...) oe, ft their unit cost **M1**

(b) 8 (pens) cao, rounded down to a whole number of pens **A1**

(b) Answer: 8 pens

Question 7

(a) y = kx and 20 = 8k oe seen **M1**

(a) y = 2.5x oe (e.g. y = 5x/2) **A1**

(a) Answer: y = 2.5x

(b) 35 ft from their formula **B1**

(b) Answer: 35

(c) 100 = 2.5x (or equivalent rearrangement) oe **M1**

(c) 40 cao **A1**

(c) Answer: 40

Question 8

finds total tap-minutes = 5 x 22 (= 110) oe **M1**

110/7 oe, dependent on the first M1 **dM1**

15.7 (minutes) awrt 1 d.p. **A1**

Answer: 15.7 minutes (1 d.p.)

Question 9

(a) finds $k = 13.5/30^2 = 0.015$ oe **M1**

(a) $D = 0.015v^2$ oe **A1**

(a) Answer: $D = 0.015v^2$

(b) substitutes v = 50 into their formula to find the predicted D (= 37.5) oe **M1**

(b) multiplies their predicted D by 3, dependent on the first M1 **dM1**

(b) 112.5 m cao **A1**

(b) Answer: 112.5 m

Question 10

(a) finds xy for at least two pairs, e.g. 1 x 48 = 48, 2 x 24 = 48 **M1**

(a) all three products equal 48, so xy is constant, confirming y is inversely proportional to x (dep on showing the constant product) **A1**

(a) Answer: xy = 48 for every pair, confirming inverse proportion

(b) y = 48/x oe (ft their constant from part a) **B1**

(b) Answer: y = 48/x

Question 11

(a) set up inverse proportion t = k/r and use t=4 when r=500 to find k = 2000 **M1**

(a) t = 2000 / r cao **A1**

(a) Answer: t = 2000 / r

(b) substitute r = 750 into t = 2000/r giving 2000/750 **M1**

(b) 8/3 hours cao **A1**

(b) Answer:2000/750 = 8/3 hours.

Working check: 2000/750 simplifies to 8/3 = 2.666... hours.

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Question 12

(a) substitute values into P = k T / V and rearrange: k = P V / T **M1**

(a) k = 0.08 (units kPa*m^3/K) cao **A1**

(a) Answer: k = 0.08

(b) substitute k and values: P = k T / V **M1**

(b) calculate numeric value **M1**

(b) P = 0.08 * 450 / 0.15 = 240 kPa cao **A1**

(b) answer given to 3 s.f. 240.0 kPa or 240 kPa cao **A1**

(b) Answer: 240 kPa

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