3.6 Proportion: Test Pack

EDEXCEL 1MA1 · Calculator allowed · about 60 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Work out 2/5 of 75.

(Total for Question 1 is 1 mark)

2 A paint mixture uses blue:white in the ratio 3:5. If a total of 40 litres is mixed, work out the volume of blue paint used.

(Total for Question 2 is 2 marks)

3 A car travels 210 miles in 3 hours. At the same speed how far will it travel in 7 hours?

(Total for Question 3 is 2 marks)

4 6 pencils cost £12.06.
Work out the cost of 25 pencils.

(Total for Question 4 is 2 marks)

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5 A car uses 5 litres of petrol to travel 65 km.
How far can it travel on 35 litres of petrol, at the same rate?

(Total for Question 5 is 2 marks)

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6 Here are the ingredients for 4 people.
Tomatoes 225 g, onions 100 g.
Work out how much of each ingredient is needed to make the same pasta sauce for 16 people.

(Total for Question 6 is 3 marks)

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7 18 workers take 14 days to dig a trench. All the workers work at the same rate.
How many days would it take 126 workers to do the same job?

(Total for Question 7 is 3 marks)

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8 y is directly proportional to x. When x = 4, y = 6. Work out y when x = 10.

(Total for Question 8 is 2 marks)

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9 A cake recipe uses 250 ml milk to make 5 slices. Milk costs £0.84 per litre. How much will the milk cost to make 14 slices? Give your answer to the nearest penny.

(Total for Question 9 is 4 marks)

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10 A supermarket sells oats as follows: 750 g tub for £1.80, 1.2 kg bag for £2.92 and a 100 g pack for £0.25.

(a) Work out the price per kg for the 750 g tub and the 1.2 kg bag. **(2)**

(b) Which is best value per kg? Give a reason. **(1)**

(c) Ellie needs exactly 2.5 kg of oats. Find the cheapest combination of the given packs that gives at least 2.5 kg and give the total cost. **(2)**

(Total for Question 10 is 5 marks)

11 A map uses a scale of 1 cm to 7.5 km. A cyclist plans a route that is proportional to the straight-line distance. On the map the route would be 28 cm. Calculate the real distance and then the time taken if the cyclist rides at an average speed of 18 km/h. Give the time in hours and minutes, correct to the nearest minute.

(Total for Question 11 is 4 marks)

12 A retailer sells two sizes of detergent. A 1.8 litre bottle costs £5.58 and a 3.6 litre bottle costs £10.26. Which size is better value per litre? Show your working and justify your answer.

(Total for Question 12 is 4 marks)

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13 A metal rod is stretched so that its length increases in direct proportion to the temperature increase. At 20°C the rod is 1.25 m long. At 80°C the rod is 1.253 m long. Assuming linear proportional change, find an expression for the length L (in metres) as a function of temperature t in °C, of the form $L = m\,t + c$. Give m and c to 6 decimal places.

(Total for Question 13 is 5 marks)

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14 An alloy is made by mixing metals X and Y in the ratio X:Y = 7:3 by mass. A manufacturer needs 560 kg of alloy. However, metal X costs £12.40 per kg and metal Y costs £7.10 per kg. Calculate the minimum total cost to make 560 kg of alloy. Show clear working.

(Total for Question 14 is 6 marks)

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Mark scheme · 3.6 Proportion: Test Pack

Question 1

30 cao **B1**

Answer: 30 (2/5 of 75 = 75 * 2/5 = 150/5 = 30).

Question 2

find fraction for blue = 3/(3+5) = 3/8 oe **M1**

15 litres cao **A1**

Answer: 15 litres (blue = 3/8 of 40 = 15 L).

Question 3

find speed 210/3 = 70 mph oe **M1**

490 miles cao **A1**

Answer: 490 miles (speed = 210/3 = 70 mph; distance = 70 x 7 = 490).

Question 4

£12.06 / 6 = £2.01 for one **M1**

£50.25 **A1**

Answer: £50.25

Question 5

65 / 5 km per litre or scale factor 7 **M1**

455 km **A1**

Answer: 455 km

Question 6

multiplier 16/4 or amounts for one person **M1**

tomatoes 900 g **A1**

onions 400 g **A1**

Answer: tomatoes 900 g and onions 400 g

Question 7

18 x 14 = 252 worker-days **M1**

252 / 126 **M1**

2 days **A1**

Answer: 2 days

Question 8

Find constant of proportionality k: y/x = 6/4 = 3/2, so y = (3/2)x oe **M1**

y = (3/2) x -> y = (3/2)*10 = 15 cao **A1**

Answer: 15

Question 9

find milk per slice: 250/5 = 50 ml oe **M1**

find total milk for 14 slices: 50 x 14 = 700 ml = 0.7 L oe **M1**

multiply litres by price: 0.7 x 0.84 oe **M1**

£0.59 cao (nearest penny) awrt **A1**

Answer: £0.59 (50 ml per slice, 14 slices require 700 ml = 0.7 L; cost = 0.7 x 0.84 = £0.588 -> £0.59).

Question 10

(a) calculate price per kg for both: 1.80/0.75 and 2.92/1.2 oe **M1**

(a) 2.40 and 2.433... per kg cao **A1**

(a) Answer: 750 g tub: £1.80/0.75 = £2.40 per kg; 1.2 kg bag: £2.92/1.2 = £2.433... per kg.

(b) 750 g tub is best value because £2.40 per kg < £2.433... per kg cao **A1**

(b) Answer: 750 g tub is best value because it costs £2.40 per kg compared with £2.433... per kg for the 1.2 kg bag.

(c) consider combinations and compute cost, e.g. 2 x 1.2 kg + 1 x 100 g gives 2.5 kg and cost 2*2.92 + 0.25 **M1**

(c) £6.09 cao **A1**

(c) Answer: Buy 2 x 1.2 kg bags and 1 x 100 g pack: weight = 2.4 + 0.1 = 2.5 kg. Cost = 2 x 2.92 + 0.25 = £6.09.

Question 11

convert map length to real distance: distance = 28 * 7.5 km **M1**

210 km cao **A1**

use time = distance / speed: 210 / 18 hours **M1**

11 hours 40 minutes cao **A1**

Answer: 210 km and 11 hours 40 minutes. Working: distance = 28 * 7.5 = 210 km. Time = 210 / 18 = 11.666... hours = 11 hours + 0.666...*60 = 11 hours 40 minutes. Check: 18 * 11.666... = 210.

Question 12

calculate unit prices: 5.58/1.8 and 10.26/3.6 **M1**

correct numerical comparison of the two unit prices **M1**

state both unit prices correctly, e.g. 5.58/1.8 = 3.10 (to 2 dp) and 10.26/3.6 = 2.85 (to 2 dp) cao **A1**

conclude 3.6 litre bottle is better value cao **A1**

Answer: 3.6 litre bottle is better value. Working: 5.58/1.8 = £3.10 per litre; 10.26/3.6 = £2.85 per litre. Since 2.85 < 3.10 the 3.6 L bottle is cheaper per litre. Check: 1.8 * 3.10 = 5.58 and 3.6 * 2.85 = 10.26.

Question 13

use two points to find gradient m = (1.253 - 1.25) / (80 - 20) **M1**

m = 0.000050 cao to 6 dp **A1**

substitute one point to find c using L = m t + c **M1**

c = 1.249000 cao to 6 dp **A1**

final correct expression L = 0.000050 t + 1.249000 cao **A1**

Answer: L = 0.000050 t + 1.249000. Working: m = (1.253 - 1.25)/(80 - 20) = 0.003/60 = 0.00005 = 0.000050 to 6 dp. Then c = 1.25 - 0.00005*20 = 1.25 - 0.001 = 1.249000. Check: at t = 80, L = 0.00005*80 + 1.249 = 0.004 + 1.249 = 1.253.

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Question 14

find masses from ratio: total parts = 7 + 3 = 10, X = 7/10 * 560 kg, Y = 3/10 * 560 kg	**M1**
calculate mass of X: 7/10 * 560 = 392 kg	**M1**
calculate mass of Y: 3/10 * 560 = 168 kg	**M1**
calculate cost of X: 392 * 12.40 = £4860.80	**M1**
calculate cost of Y: 168 * 7.10 = £1192.80 cao	**A1**
total cost = 4860.80 + 1192.80 = £6053.60 cao	**A1**

Answer: £6053.60. Working: total parts 10 so X = 7/10 * 560 = 392 kg, Y = 168 kg. Cost X = 392 * 12.40 = £4860.80. Cost Y = 168 * 7.10 = £1192.80. Total = 4860.80 + 1192.80 = £6053.60. Check: 392*12 = 4704; 392*0.4 = 156.8; sum 4860.8. 168*7 = 1176; 168*0.1 = 16.8; sum 1192.8. Total 6053.6.

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