EP.M153 CSSE Essex Style Problem Solving Paper 2

CSSE CSSE-MOCK-2 · Calculators not allowed · about 70 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 A gardener is planting a rectangular flower bed that is 4.8 metres long and 2.1 metres wide. She lays turf over the whole bed.

(a) Work out the area of the flower bed in square metres. Give your answer to 2 decimal places. **(2)**

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(b) If turf is sold in rolls that each cover 0.75 m^2, how many whole rolls must she buy? **(1)**

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(Total for Question 1 is 3 marks)

2 A school choir sells tickets to a concert. Adult tickets cost £6.50 and child tickets cost £3.80. They sold 72 tickets in total and collected £357.30.

(a) Let A be the number of adult tickets and C the number of child tickets. Write two equations linking A and C. **(1)**

(b) Solve the equations to find how many adult tickets were sold. **(3)**

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(Total for Question 2 is 4 marks)

3 A recipe for a fruit punch serves 8 people and uses 180 ml of orange juice, 120 ml of apple juice and 200 ml of water.

(a) Calculate the total volume of punch the recipe makes. **(1)**

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(b) A party needs 1.8 litres of punch. How many times bigger than the recipe must the quantities be? Give your answer as a decimal to 1 decimal place. **(2)**

.....

(c) Using the factor from part (b), calculate how much orange juice in litres is needed for the party. Give your answer to 2 decimal places. **(1)**

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(Total for Question 3 is 4 marks)

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4 The numbers 1, 2, 3, 5, 7 are written on five cards. Daniel shuffles the cards, then takes the first two cards to form a two-digit number where the first card is the tens digit and the second is the units digit.

(a) How many different two-digit numbers can he make? **(1)**

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(b) What is the probability that the two-digit number Daniel makes is a prime number? Give your answer as a fraction in simplest form. **(2)**

.....

(Total for Question 4 is 3 marks)

5 A local charity runs a cake stall. They sell cupcakes at £0.90 each and slices of cake at £1.50 each. On one day they sold a total of 134 items and raised £148.80.

(a) Let C be the number of cupcakes and S the number of cake slices. Write two equations linking C and S. **(1)**

(b) Solve the equations to find how many cupcakes and how many cake slices were sold. **(7)**

(Total for Question 5 is 8 marks)

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6 A triangular field has sides of lengths 15 m, 20 m and 25 m.

(a) Show that the triangle is a right-angled triangle. State which angle is the right angle. **(3)**

(b) Calculate the area of the triangular field in square metres. **(3)**

(c) A second field is mathematically similar to this one, but larger, with an area of 242 m^2. Calculate the scale factor of the enlargement, then use it to find the length of the longest side of the larger field. Give both answers to 2 decimal places. **(4)**

7 A class of 25 pupils takes a test. The teacher records the following: 40% of the pupils scored at least 70 marks. Of those who scored at least 70, 60% scored at least 85 marks. The rest of the class scored below 70.

(a) How many pupils scored at least 70 marks? **(2)**

.....

(b) How many pupils scored at least 85 marks? **(3)**

.....

(c) The teacher wants to award a prize to one pupil chosen at random from those who scored at least 70. What is the probability that the prize goes to a pupil who scored at least 85? Give your answer as a fraction in simplest form. **(3)**

.....

(d) One of the pupils who scored below 70 is picked at random to receive help. How many pupils are eligible for this help and what is the probability that a particular pupil chosen at random from the whole class is one of those eligible? Give the probability as a decimal to 3 decimal places. **(4)**

.....

(Total for Question 7 is 12 marks)

8 Four friends share a taxi fare. The taxi driver charges a fixed booking fee of £2.40 plus 85 pence per mile. They travel together for 18 miles. They decide to split the fare in the ratio 2:1:1:? where the fourth friend pays the remainder so that the shares are whole numbers of pence. Work through the steps below.

(a) Calculate the total taxi fare in pounds and pence. **(3)**

(b) Express the total fare in pence and show how to divide it into parts following ratio 2:1:1:x where x is chosen so that all shares are whole pence. Find a suitable integer x and explain your choice. **(6)**

(c) Using x = 2, calculate how many pence and how many pounds and pence each friend pays. Give answers for all four friends. **(7)**

(Total for Question 8 is 16 marks)

Mark scheme · EP.M153 CSSE Essex Style Problem Solving Paper 2

Question 1

- (a) **M1** correct method: 4.8 x 2.1 seen or equivalent
- (a) **A1** 10.08 m^2 cao
- **(a) Answer: 10.08**
- (b) **B1** 14 rolls cao
- **(b) Answer: 14**

Question 2

- (a) **B1** Equations A + C = 72 and 6.50A + 3.80C = 357.30 (or equivalent) cao
- **(a) Answer: A + C = 72 ; 6.50A + 3.80C = 357.30**
- (b) **M1** substitute C = 72 - A into money equation or elimination method
- (b) **M1** correct arithmetic leading to 2.70A = 83.70 or equivalent step
- (b) **A1** 31 adults cao
- **(b) Answer: 31**

Question 3

- (a) **B1** 500 ml cao
- **(a) Answer: 500 ml**
- (b) **M1** recognition of ratio 1800/500 or scaling factor
- (b) **A1** 3.6 cao
- **(b) Answer: 3.6**
- (c) **B1** 0.65 L cao (0.648 rounded to 0.65)
- **(c) Answer: 0.65**

Question 4

- (a) **B1** 20 cao
- **(a) Answer: 20**
- (b) **M1** identify prime two-digit numbers from the set and count them
- (b) **A1** 2/5 cao (8/20 simplified)
- **(b) Answer: 2/5**

Question 5

- (a) **B1** C + S = 134 and 0.90C + 1.50S = 148.80 (or equivalent) cao
- **(a) Answer: C + S = 134 ; 0.90C + 1.50S = 148.80**
- (b) **M1** eliminate decimals or substitute S = 134 - C
- (b) **M1** correct substitution to form single equation: 0.90C + 1.50(134 - C) = 148.80
- (b) **M1** correct arithmetic to 0.90C + 201 - 1.50C = 148.80 leading to -0.60C = -52.20 or equivalent
- (b) **M1** correct calculation C = 87 seen
- (b) **M1** find S = 134 - 87 = 47 seen
- (b) **A1** C = 87 cupcakes cao
- (b) **A1** S = 47 cake slices cao, checked against 0.90 x 87 + 1.50 x 47 = 148.80
- **(b) Answer: C = 87 cupcakes, S = 47 cake slices**

Question 6

- (a) **M1** substitute into Pythagoras $a^2 + b^2 = c^2$ using $15^2 + 20^2$ and 25^2
- (a) **A1** $15^2 + 20^2 = 225 + 400 = 625$ and $25^2 = 625$ cao
- (a) **B1** conclude triangle is right-angled with right angle opposite 25 m side (angle between 15 m and 20 m)
- **(a) Answer: Right angle between the 15 m and 20 m sides (opposite 25 m side).**
- (b) **M1** use 1/2 x base x height with legs as base and height (15 and 20)
- (b) **A1** 150 m^2 cao
- (b) **B1** units stated
- **(b) Answer: 150 m^2**
- (c) **M1** recognise similarity scale factor k where outer area = k^2 x inner area
- (c) **M1** compute $k^2 = 242 / 150 = 1.613333...$
- (c) **M1** $k = \sqrt{242/150} = 1.27$ (2 dp)
- (c) **A1** longest side = 25 x k = 31.75 m (2 dp) cao
- **(c) Answer: k = 1.27; longest side = 31.75 m**

Question 7

- (a) **M1** use 40% of 25
- (a) **A1** 10 cao
- **(a) Answer: 10**
- (b) **M1** take 60% of the 10 pupils who scored at least 70
- (b) **M1** correct arithmetic 0.60 x 10 = 6
- (b) **A1** 6 pupils cao
- **(b) Answer: 6**
- (c) **M1** recognise probability = number with ≥85 divided by number with ≥70
- (c) **A1** 3/5 cao
- (c) **B1** fraction simplified and correct
- **(c) Answer: 3/5**
- (d) **M1** calculate number below 70 = 25 - 10 = 15
- (d) **M1** compute probability 15/25
- (d) **M1** convert to decimal 0.6
- (d) **A1** 15 pupils; probability 0.600 cao
- **(d) Answer: 15; 0.600**

Question 8

- (a) **M1** compute variable part 0.85 x 18 = 15.30
- (a) **M1** add fixed fee 2.40 + 15.30 = 17.70
- (a) **A1** £17.70 cao
- **(a) Answer: £17.70**
- (b) **M1** convert £17.70 to pence = 1770 pence
- (b) **M1** set up share as (2 + 1 + 1 + x) parts = (4 + x) parts
- (b) **M1** require 1770 divisible by (4 + x) to give whole pence per part
- (b) **M1** find suitable x, for example x = 5 gives 9 parts and 1770/9 = 196.666 no; x = 2 gives 6 parts 1770/6 = 295 works
- (b) **M1** justify choice x = 2 as it yields whole pence per part
- (b) **A1** x = 2 cao and explanation
- **(b) Answer: x = 2 (total 6 parts, each part 295 pence)**
- (c) **M1** calculate one part = 1770 / 6 = 295 pence
- (c) **M1** calculate friend shares in pence: 2 parts = 590, 1 part = 295, 1 part = 295, 2 parts = 590
- (c) **M1** convert to pounds: 590 pence = £5.90, 295 pence = £2.95
- (c) **M1** assign amounts correctly to each friend in the ratio order 2:1:1:2
- (c) **M1** show totals sum to 1770 pence
- (c) **M1** provide final values for all friends
- (c) **A1** £5.90, £2.95, £2.95, £5.90 cao
- **(c) Answer: Friend 1 £5.90; Friend 2 £2.95; Friend 3 £2.95; Friend 4 £5.90**