2.12 Probability (Foundation): Test Pack

EDEXCEL 1MA1 · Calculator allowed · about 75 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 This question is about probability.



(a) Put these words in order of probability, starting with the least likely. **(1)**

evens certain impossible likely

(b) On the probability scale, mark with a cross (X) the probability that a fair coin lands on tails. **(1)**

(Total for Question 1 is 2 marks)

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2 60 people were asked to name their favourite fruit. The results are shown in the table below.
Apple: 24 Banana: 15 Orange: 21
One of these people is chosen at random.

Fruit	Frequency
Apple	24
Banana	15
Orange	21

(a) Work out the probability that this person's favourite fruit is banana. **(1)**

.....

(b) Work out the probability that this person's favourite fruit is not orange. **(1)**

.....

(Total for Question 2 is 2 marks)

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3 50 people were asked whether they prefer tea or coffee. The two-way table shows some of the information.

	Tea	Coffee	Total
Male	12	18	30
Female			20
Total	25	25	50

(a) Complete the two-way table. **(2)**

(b) One of these 50 people is chosen at random. Work out the probability that this person is female and prefers coffee. **(1)**

.....

(Total for Question 3 is 3 marks)

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4 A fair twelve-sided dice is numbered 1 to 12. It is rolled once.
Jake says: "The probability of rolling a factor of 12 is 5/12, because the factors are 1, 2, 3, 4 and 6."
Explain the error in Jake's reasoning and write down the correct probability.

.....

.....

(Total for Question 4 is 2 marks)

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5 A weather forecaster says the probability that it will snow tomorrow is 0.1. It snows. Does this mean the weather forecaster was wrong? Give a reason for your answer.

.....

.....

.....

(Total for Question 5 is 1 mark)

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6 Match each event below to one word from the list: impossible, unlikely, evens, likely, certain.

(a) Rolling a 7 on a fair six-sided dice, numbered 1 to 6. **(1)**

.....

(b) Picking a red card at random from a standard, well-shuffled pack of 52 playing cards. **(1)**

.....

(c) The sun rising over Manchester tomorrow morning. **(1)**

.....

(Total for Question 6 is 3 marks)

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7 150 people at a leisure centre were asked whether they prefer swimming or the gym. The two-way table shows some of the information.

	Swimming	Gym	Total
Adults	38	52	90
Children			60
Total	70		150

(a) Complete the two-way table. **(3)**

(b) One of these 150 people is chosen at random. Work out the probability that this person is a child who prefers the gym. **(1)**

.....

(Total for Question 7 is 4 marks)

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8 Priya has four number cards: 2, 5, 7 and 9. She picks two of the cards, without replacement, and places them side by side to make a two-digit number (the first card picked is the tens digit).

(a) List all the possible two-digit numbers Priya could make. **(2)**

(b) Priya picks two cards at random to make a number. Work out the probability that the number is even. **(1)**

(c) Work out the probability that the number is greater than 70. **(2)**

(Total for Question 8 is 5 marks)

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9 A bag contains only red, blue and green counters, in the ratio 2 : 3 : 5. There are 60 counters in the bag altogether.

(a) Work out the number of green counters in the bag. **(2)**

(b) A counter is taken from the bag at random. Work out the probability that it is not blue. **(2)**

(Total for Question 9 is 4 marks)

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10 A fair spinner has 8 equal sections, numbered 1 to 8. The spinner is spun once.

(a) Find the probability that the spinner lands on a prime number. **(1)**

.....

(b) Find the probability that the spinner lands on a multiple of 3. **(1)**

.....

(c) Find the probability that the spinner lands on a factor of 8. **(1)**

.....

(Total for Question 10 is 3 marks)

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11 A school uniform shop sells polo shirts in 5 colours (white, navy, green, red, black) and caps in 3 colours (grey, blue, orange). A customer buys one polo shirt and one cap.

(a) List all the possible polo-shirt-and-cap colour combinations a customer could buy. **(2)**

(b) A customer buys a random combination. Find the probability that they buy a red shirt and a blue cap. **(1)**

.....

(c) Find the probability that the cap is grey or orange. **(1)**

.....

(Total for Question 11 is 4 marks)

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12 A factory tests a random sample of 80 light bulbs from a production batch of 5000 bulbs. 6 of the sampled bulbs are found to be defective.

(a) Estimate the probability that a bulb from this batch is defective. **(1)**

(b) Use your answer to part (a) to estimate the number of defective bulbs in the whole batch of 5000. **(2)**

(c) The factory manager says: 'Since our sample found 6 defective bulbs out of 80, we can be certain that exactly 375 bulbs in the batch are defective.' Comment on whether the manager is correct. **(1)**

(Total for Question 12 is 4 marks)

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13 In a class of 30 students, 18 are members of the Badminton Club, 15 are members of the Netball Club, and 7 are members of neither club.

(a) Find the number of students who are members of both clubs. **(2)**

.....

(b) One student is selected at random from the class. Find the probability that the student is a member of the Badminton Club but not the Netball Club. **(1)**

.....

(c) Given that a randomly selected student is a member of at least one of the two clubs, find the probability that they are a member of both. **(2)**

.....

(Total for Question 13 is 5 marks)

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14 A fair 20-sided dice is numbered 1 to 20 and rolled once.

(a) Find the probability that the score is a multiple of 3 or a multiple of 5. **(3)**

(b) Explain why the answer to part (a) is not simply P(multiple of 3) + P(multiple of 5). **(1)**

(Total for Question 14 is 4 marks)

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15 A bag contains 10 counters: 6 are teal and 4 are cream. Xin takes two counters from the bag at random, one after the other, without replacement.

(a) Work out the probability that both counters are teal. **(2)**

.....

(b) Work out the probability that the two counters are different colours. **(3)**

.....

(c) Given that the first counter taken is cream, find the probability that the second counter is also cream. **(1)**

.....

(Total for Question 15 is 6 marks)

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16 A pencil case contains n black pens and 4 red pens, and no other pens. Two pens are taken at random from the pencil case, one after the other, without replacement. The probability that both pens are black is 1/3.

(a) Show that $n^2 - 5n - 6 = 0$. **(3)**

(b) Hence find the value of n. **(2)**

.....

(Total for Question 16 is 5 marks)

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Mark scheme · 2.12 Probability (Foundation): Test Pack

Question 1

(a) impossible, evens, likely, certain (all four in the correct order) **B1**

(a) Answer: impossible, evens, likely, certain

(b) cross at the halfway point of the scale, oe **B1**

(b) Answer: 0.5 (halfway between 0 and 1)

Question 2

(a) 1/4 oe (accept 15/60, 0.25, 25%) **B1**

(a) Answer: 1/4

(b) 13/20 oe (accept 39/60, 0.65, 65%) **B1**

(b) Answer: 13/20

Question 3

(a) 25 - 12 (= 13) or 25 - 18 (= 7), a correct method to find one missing value **M1**

(a) Female Tea = 13 and Female Coffee = 7, both correct **A1**

(a) Answer: Female Tea = 13, Female Coffee = 7

(b) 7/50 oe, ft their (a) **B1**

(b) Answer: 7/50

Question 4

identifies that Jake has missed a factor: 12 itself is also a factor of 12, so the factors are 1, 2, 3, 4, 6 and 12 **B1**

1/2 oe (accept 6/12) cao **B1**

Answer: Jake is wrong; the correct probability is 1/2 (he missed the factor 12).

Question 5

any valid reason, e.g. no, because a probability of 0.1 means the event is unlikely but still possible, so it can still happen **B1**

Answer: No, because an event with a probability of 0.1 is unlikely but not impossible, so it can still occur.

Question 6

(a) impossible cao **B1**

(a) Answer: Impossible

(b) evens cao **B1**

(b) Answer: Evens

(c) certain cao **B1**

(c) Answer: Certain

Question 7

(a) 70 - 38 (= 32) to find Children Swimming, or a correct method for another missing value **M1**

(a) 60 - 32 (= 28) to find Children Gym, or 52 + (their Children Gym) for the Gym total **M1**

(a) all values correct: Children Swimming = 32, Children Gym = 28, Gym total = 80 **A1**

(a) Answer: Children Swimming = 32, Children Gym = 28, Gym total = 80

(b) 14/75 oe (accept 28/150), ft their (a) **B1**

(b) Answer: 14/75

Question 8

(a) at least 6 correct, distinct two-digit numbers listed with a systematic attempt **M1**

(a) all 12 numbers listed correctly with no repeats: 25, 27, 29, 52, 57, 59, 72, 75, 79, 92, 95, 97 **A1**

(a) Answer: 25, 27, 29, 52, 57, 59, 72, 75, 79, 92, 95, 97

(b) 1/4 oe (accept 3/12), ft their (a) **B1**

(b) Answer: 1/4

(c) identifies the 6 numbers greater than 70: 72, 75, 79, 92, 95, 97 (or an equivalent method) **M1**

(c) 1/2 oe cao **A1**

(c) Answer: 1/2

Question 9

(a) 60 / 10 (= 6) to find the value of one ratio part **M1**

(a) 30 cao **A1**

(a) Answer: 30

(b) 3 x 6 (= 18) to find the number of blue counters, or 60 - 18 **M1**

(b) 7/10 oe cao (accept 42/60) **A1**

(b) Answer: 7/10

Question 10

(a) 4/8 oe (1/2) **B1**

(a) Answer: 1/2

(b) 2/8 oe (1/4) **B1**

(b) Answer: 1/4

(c) 4/8 oe (1/2) **B1**

(c) Answer: 1/2

Question 11

(a) at least 10 of the 15 combinations listed correctly, in a systematic order **M1**

(a) all 15 combinations listed correctly, oe **A1**

(a) Answer: white-grey, white-blue, white-orange, navy-grey, navy-blue, navy-orange, green-grey, green-blue, green-orange, red-grey, red-blue, red-orange, black-grey, black-blue, black-orange

(b) 1/15 ft from part (a) **B1**

(b) Answer: 1/15

(c) 10/15 oe (2/3), ft from part (a) **B1**

(c) Answer: 2/3

Question 12

(a) 6/80 oe (3/40, 0.075) **B1**

(a) Answer: 3/40

(b) 0.075 x 5000, ft from part (a) **M1**

(b) 375 cao **A1**

(b) Answer: 375

(c) valid reasoning that 375 is only an estimate based on a sample, not a certainty, so the actual number of defective bulbs in the batch could be different, oe **B1**

(c) Answer: The manager is not correct; 375 is only an estimate based on a sample, and the true number of defective bulbs could be different

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Question 13

(a) 18 + 15 - (30 - 7) oe **M1**

(a) 10 cao **A1**

(a) Answer: 10

(b) 8/30 oe (4/15), ft from part (a) **B1**

(b) Answer: 4/15

(c) recognises the reduced sample space of 23 students in at least one club, ft from part (a) **M1**

(c) 10/23 oe **A1**

(c) Answer: 10/23

Question 14

(a) identifies the multiples of 3 (3, 6, 9, 12, 15, 18: 6 values) and the multiples of 5 (5, 10, 15, 20: 4 values) **M1**

(a) recognises 15 is a multiple of both and subtracts the overlap: 6 + 4 - 1 **M1**

(a) 9/20 cao **A1**

(a) Answer: 9/20

(b) because 15 is a multiple of both 3 and 5, so simply adding the two probabilities would count the score of 15 twice, oe **B1**

(b) Answer: Adding P(multiple of 3) and P(multiple of 5) directly would count the score 15 (which is a multiple of both) twice, so the overlap must be subtracted once

Question 15

(a) 6/10 x 5/9 **M1**

(a) 30/90 oe (1/3) **A1**

(a) Answer: 1/3

(b) 6/10 x 4/9 (= 24/90) for one order **M1**

(b) doubles or adds both orders: (6/10 x 4/9) + (4/10 x 6/9) **M1**

(b) 48/90 oe (8/15) **A1**

(b) Answer: 8/15

(c) 3/9 oe (1/3) **B1**

(c) Answer: 1/3

Question 16

(a) sets up n/(n+4) x (n-1)/(n+3) = 1/3 **M1**

(a) correctly clears fractions: 3n(n-1) = (n+4)(n+3) **M1**

(a) correctly expands and simplifies to $n^2 - 5n - 6 = 0$ cso **A1**

(a) Answer: $n^2 - 5n - 6 = 0$

(b) factorises (n - 6)(n + 1) = 0, or uses the quadratic formula **M1**

(b) n = 6 cao, rejecting n = -1 since a negative number of pens is not possible **A1**

(b) Answer: n = 6

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