4.19 Probability (Higher): Test Pack

EDEXCEL 1MA1 · Calculator allowed · about 75 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 A spinner has four equal sections coloured red, blue, green and yellow. What is the probability that one spin lands on green?

(Total for Question 1 is 1 mark)

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2 A bag contains 2 white, 4 black and 4 green counters. A counter is chosen at random. Work out the probability the counter is not black.

(Total for Question 2 is 2 marks)

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3 Fatima has a biased coin. She flips it 40 times and records 28 heads.

(a) Calculate the relative frequency of heads. **(1)**

(b) Fatima is going to flip the coin 500 times. Estimate the number of times it will land on heads. **(2)**

(Total for Question 3 is 3 marks)

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4 Two fair coins are flipped at the same time.

(a) List all the possible outcomes. **(2)**

(b) Find the probability of getting at least one head. **(2)**

(Total for Question 4 is 4 marks)

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5 A bag contains only black, white and pink counters. One counter is taken from the bag at random. P(black) = 0.2, P(white) = 0.35, P(pink) = 0.45.

(a) Write down P(black or white). **(1)**

.....

(b) There are 20 counters in the bag. Work out the number of pink counters. **(2)**

.....

(Total for Question 5 is 3 marks)

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6 Spinner A is equally likely to land on 1, 2 or 3. Spinner B is equally likely to land on 1 or 2. Both spinners are spun once and the two scores are added together.

Spinner B

Spinner A	+	1	2
	1		
	2		
	3		

(a) Complete a sample space diagram to show all the possible totals. **(2)**

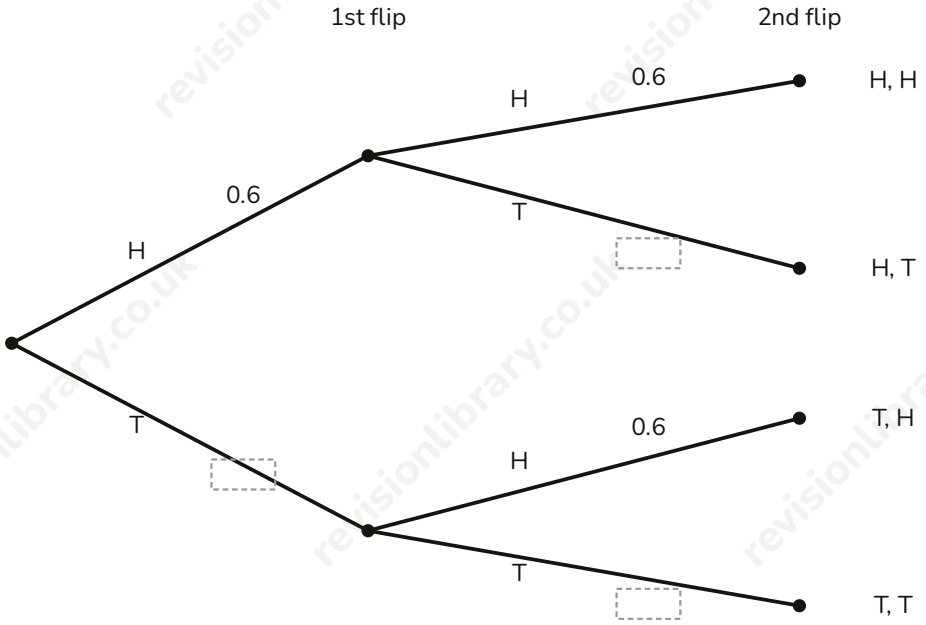
(b) Find the probability that the total is greater than 3. **(2)**

.....

(Total for Question 6 is 4 marks)

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7 A biased coin has P(Heads) = 0.6. The coin is flipped twice. The tree diagram shows the possible outcomes, but some of the probabilities are missing.



(a) Write down the missing probabilities on the tree diagram. **(2)**

(b) Find the probability that the coin lands on heads both times. **(2)**

(c) Find the probability that the coin lands on exactly one head. **(2)**

(Total for Question 7 is 6 marks)

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8 A fair spinner is numbered 1 to 8. It is spun 96 times. Work out an estimate for the number of times it lands on a number greater than 5.

(Total for Question 8 is 2 marks)

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9 A box contains 12 raffle tickets numbered 1 to 12. Two tickets are taken at random from the box, one after the other, without replacement. Show that the probability that both tickets are numbered greater than 9 is 1/22.

(Total for Question 9 is 3 marks)

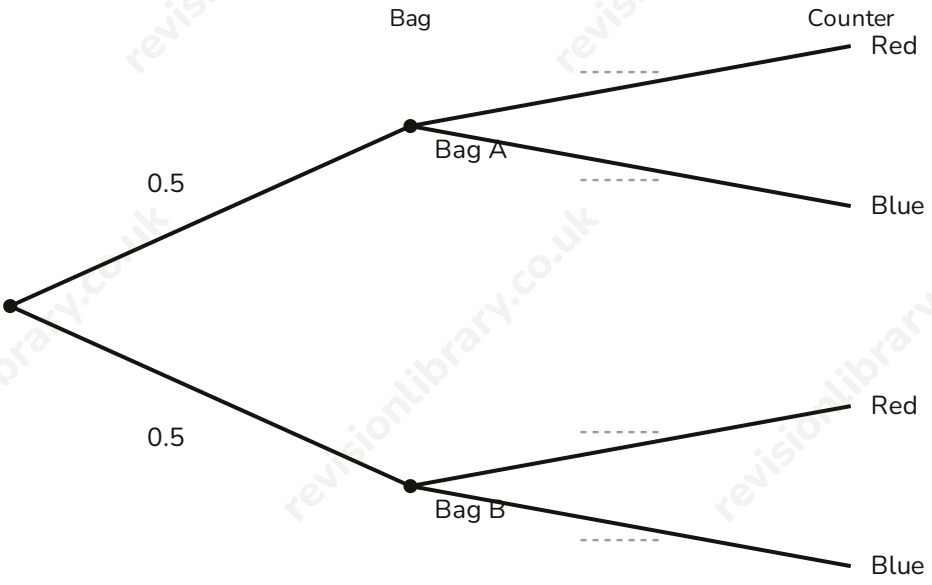
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10 A spinner has three equal sectors labelled A, B and C. The spinner is spun twice. Complete the tree diagram probabilities and then find the probability that the outcome is A on the first spin and not C on the second spin.

(Total for Question 10 is 4 marks)

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11 Bag A contains 4 red counters and 6 blue counters. Bag B contains 3 red counters and 7 blue counters. Aaron picks one of the two bags at random, then takes one counter at random from that bag.



(a) Complete the tree diagram to show this information. **(3)**

(b) Work out the probability that Aaron takes a red counter. **(2)**

.....

(Total for Question 11 is 5 marks)

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12 Events A and B are such that P(A) = 0.4, P(B) = 0.45 and P(A and B) = 0.18. Determine, showing full working, whether events A and B are independent.

(Total for Question 12 is 3 marks)

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13 A biased coin lands heads with probability 0.6. The coin is tossed 5 times.

(a) Find the probability of getting exactly 3 heads. **(5)**

(b) State the most likely number of heads and justify briefly. **(3)**

(Total for Question 13 is 8 marks)

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14 A drawer contains n socks. Exactly 4 of the socks are grey and the rest are black. Priti takes two socks at random from the drawer, without replacement. The probability that she takes two grey socks is 1/6.

(a) Show that $n^2 - n - 72 = 0$. **(3)**

(b) Solve the equation to find the value of n. **(3)**

(Total for Question 14 is 6 marks)

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Mark scheme · 4.19 Probability (Higher): Test Pack

Question 1

1/4 cao **B1**

Answer: 1/4 (or 0.25 or 25%)

Question 2

1 - P(black) or (2+4)/10 shown oe **M1**

6/10 = 3/5 cao **A1**

Answer: 3/5

Question 3

(a) 0.7 oe (accept 7/10, 70%) **B1**

(a) Answer: 0.7

(b) 0.7 x 500 oe, ft their (a) **M1**

(b) 350 cao **A1**

(b) Answer: 350

Question 4

(a) at least 3 correct outcomes shown **M1**

(a) all 4 outcomes listed with no repeats: HH, HT, TH, TT **A1**

(a) Answer: HH, HT, TH, TT

(b) identifies 3 outcomes with at least one head, ft their list **M1**

(b) 3/4 cao **A1**

(b) Answer: 3/4

Question 5

(a) 0.55 oe **B1**

(a) Answer: 0.55

(b) 0.45 x 20 **M1**

(b) 9 cao **A1**

(b) Answer: 9

Question 6

(a) at least 4 of the 6 totals correct **M1**

(a) all 6 totals correct: 2, 3, 3, 4, 4, 5 **A1**

(a) Answer: Totals: 2, 3, 3, 4, 4, 5

(b) identifies 3 outcomes greater than 3, ft their diagram **M1**

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

(b) Answer: 1/2

Question 7

(a) P(Tails) = 0.4 on the first branch **B1**

(a) P(Tails) = 0.4 on both second-level branches **B1**

(a) Answer: 0.4 in each missing space

(b) 0.6 x 0.6 **M1**

(b) 0.36 cao **A1**

(b) Answer: 0.36

(c) (0.6 x 0.4) + (0.4 x 0.6) oe **M1**

(c) 0.48 cao **A1**

(c) Answer: 0.48

Question 8

3/8 x 96 oe **M1**

36 cao **A1**

Answer: 36

Question 9

3/12 oe, identifying 3 tickets greater than 9 out of 12 **M1**

3/12 x 2/11 oe **M1**

6/132 = 1/22 cso (answer given, full correct working must be shown) **A1**

Answer: 1/22 (shown)

Question 10

correct probabilities for branches: 1/3 for each first spin and 1/3 each for second spin **M1**

identify probability for A then not C as 1/3 x (1 - 1/3) or 1/3 x 2/3 **M1**

2/9 cao **A1**

explicit statement 1/3 x 2/3 = 2/9 **B1**

Answer: 2/9

Question 11

(a) first branches Bag A 0.5, Bag B 0.5 **B1**

(a) branches under Bag A: Red 0.4, Blue 0.6 **B1**

(a) branches under Bag B: Red 0.3, Blue 0.7 **B1**

(a) Answer: 0.5/0.5 then 0.4/0.6 (Bag A) and 0.3/0.7 (Bag B)

(b) (0.5 x 0.4) + (0.5 x 0.3) **M1**

(b) 0.35 cao **A1**

(b) Answer: 0.35

Question 12

0.4 x 0.45 oe **M1**

= 0.18 **A1**

correct conclusion: A and B are independent, since P(A) x P(B) = P(A and B) cso **C1**

Answer: Yes, A and B are independent

Question 13

(a) use binomial formula: $C(5,3)*(0.6)^3*(0.4)^2$ **M1**

(a) compute combination 10 or show numeric substitution **M1**

(a) numerical evaluation to 3 significant figures or exact decimal **M1**

(a) 0.3456 cao **A1**

(a) final answer stated with correct rounding if used **B1**

(a) Answer: 0.3456

(b) identify mean of binomial is np = 5*0.6 = 3 **M1**

(b) most likely number is 3 (mode for binomial when (n+1)p is integer state either 3 or 3) cao **A1**

(b) brief justification: compare probabilities or cite that mode ~ floor((n+1)p) = 3 **B1**

(b) Answer: 3, because the mean np = 3 and the binomial mode is 3 (highest probability).

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Question 14

(a) 4/n x 3/(n-1) oe **M1**

(a) sets 12/(n(n-1)) = 1/6 oe and cross-multiplies to 72 = n(n-1) oe **M1**

(a) n^2 - n - 72 = 0 cso (fully correct working shown, answer given) **A1**

(a) Answer: n^2 - n - 72 = 0 (shown)

(b) factorises as (n-9)(n+8) = 0 oe, or uses the quadratic formula correctly **M1**

(b) obtains n = 9 or n = -8 **dM1**

(b) n = 9 cao, rejecting n = -8 since the number of socks cannot be negative **A1**

(b) Answer: n = 9

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