HIGHER

8.11 Probability Equation Questions: Test Pack

Total Marks

EDEXCEL 1MA1 · Calculator allowed · about 60 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 A bag contains 3 blue and 9 red counters. One counter is chosen at random. Write down the probability it is red.

(Total for Question 1 is 1 mark)

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2 A box contains 24 pens. x of the pens are green.

(a) Write down an expression, in terms of x, for the probability that a pen taken at random from the box is green. **(1)**

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(b) Given that the probability the pen is green is 0.375, find the value of x. **(2)**

.....

(Total for Question 2 is 3 marks)

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3 A biased spinner can land on red, blue or green only. The probability that the spinner lands on red is 2y. The probability that it lands on blue is 3y. The probability that it lands on green is 0.25.

(a) Form and solve an equation to find the value of y. **(3)**

.....

(b) Hence write down the probability that the spinner lands on blue. **(1)**

.....

(Total for Question 3 is 4 marks)

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4 A darts player hits the bullseye with probability x on each throw, independently of any other throw. She throws twice. The probability that she hits the bullseye on both throws is 0.36.

(a) Form an equation and solve it to find the value of x. **(2)**

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(b) Find the probability that she hits the bullseye on at least one of the two throws. **(2)**

.....

(Total for Question 4 is 4 marks)

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5 A jar contains x black sweets and 6 white sweets. Two sweets are chosen without replacement. The probability of drawing one black then one white in that order is 3/14. Form an equation and find the possible value(s) of x.

(Total for Question 5 is 3 marks)

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6 A biased dice is rolled twice. The probability that it lands on a 6 on each roll is p, where $p < 0.5$. The probability that it lands on at least one 6 in the two rolls is 0.19.

(a) Show that $p^2 - 2p + 0.19 = 0$. **(3)**

(b) Hence find the value of p. **(3)**

.....

(Total for Question 6 is 6 marks)

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7 A bag contains red and green counters. The probability of drawing a red counter is $(x + 1)/(2x + 3)$. If this probability equals 2/5, find x.

(Total for Question 7 is 4 marks)

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8 Bag A contains 4 red counters and 6 blue counters. Bag B contains x red counters and 5 blue counters. A counter is taken at random from Bag A and a counter is taken at random from Bag B. The probability that both counters are red is 0.2.

(a) Form and solve an equation to find the value of x. **(3)**

(b) Hence find the probability that a counter taken at random from Bag B is blue. **(2)**

(Total for Question 8 is 5 marks)

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9 A bag contains 7 discs. x of the discs are black and the rest are white. Two discs are taken at random without replacement. The probability that both are black is 2/7. Work out the value of x.

(Total for Question 9 is 4 marks)

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10 A bag contains 16 beads. x of the beads are gold and the rest are silver. There are fewer gold beads than silver beads. One bead is taken at random, its colour is noted and it is put back. A second bead is then taken at random. The probability that both beads are the same colour is 5/8. Work out the value of x.

(Total for Question 10 is 5 marks)

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11 A bag contains 3 red counters, 2 blue counters and x green counters. Two counters are taken from the bag at random, without replacement. The probability that both counters are the same colour is 5/18.

(a) Show that $13x^2 - 63x + 44 = 0$. **(4)**

(b) Hence find the number of green counters in the bag. **(3)**

(Total for Question 11 is 7 marks)

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Mark scheme · 8.11 Probability Equation Questions: Test Pack

Question 1

9/12 or 3/4 cao	**B1**
Answer: 3/4	

Question 2

(a) x/24 oe	**B1**
(a) Answer: x/24	
(b) x/24 = 0.375 oe, or 0.375 x 24	**M1**
(b) x = 9 cao	**A1**
(b) Answer: x = 9	

Question 3

(a) 2y + 3y + 0.25 = 1 oe	**M1**
(a) 5y = 0.75 (correct rearrangement)	**M1**
(a) y = 0.15 cao	**A1**
(a) Answer: y = 0.15	
(b) 0.45 ft from part (a)	**B1**
(b) Answer: 0.45	

Question 4

(a) $x^2 = 0.36$ oe	**M1**
(a) x = 0.6 cao (rejecting x = -0.6 since 0 ≤ probability ≤ 1)	**A1**
(a) Answer: x = 0.6	
(b) $1 - (1 - 0.6)^2$ oe, or $2(0.6)(0.4) + 0.6^2$	**M1**
(b) 0.84 cao	**A1**
(b) Answer: 0.84	

Question 5

form x/(x + 6) * 6/(x + 5) = 3/14 or equivalent	**M1**
multiply out to obtain the quadratic $x^2 - 17x + 30 = 0$ (or equivalent) and factorise/solve	**M1**
x = 2 and x = 15 cao (both values needed)	**A1**
Answer: x = 2 or x = 15 (both values satisfy the equation).	

Question 6

(a) $1 - (1 - p)^2 = 0.19$ oe (complement method)	**M1**
(a) correct expansion $(1 - p)^2 = 1 - 2p + p^2$	**M1**
(a) $p^2 - 2p + 0.19 = 0$ cso, answer printed, all working shown	**A1**
(a) Answer: $p^2 - 2p + 0.19 = 0$ (shown)	
(b) correct use of the quadratic formula (or equivalent method) with a = 1, b = -2, c = 0.19	**M1**
(b) p = 1.9 or p = 0.1 (both values found)	**A1**
(b) p = 0.1 cao (selecting the root with p < 0.5)	**A1**
(b) Answer: p = 0.1	

Question 7

form (x + 1)/(2x + 3) = 2/5 or equivalent	**M1**
cross-multiply to get 5(x + 1) = 2(2x + 3) and expand correctly	**M1**
rearrange to get linear equation and solve for x	**M1**
x = 1 cao	**A1**
Answer: 1	

Question 8

(a) (4/10) x (x/(x+5)) = 0.2 oe	**M1**
(a) correct rearrangement, e.g. x = 0.5x + 2.5	**M1**
(a) x = 5 cao	**A1**
(a) Answer: x = 5	
(b) total in Bag B = x + 5 = 10 ft from (a)	**M1**
(b) 5/10 = 1/2 oe cao	**A1**
(b) Answer: 1/2	

Question 9

x/7 x (x - 1)/6	**M1**
$x^2 - x = 12$ or $x^2 - x - 12 = 0$	**M1**
solves the quadratic	**M1**
x = 4	**A1**
Answer: x = 4	

Question 10

x/16 x x/16 + (16 - x)/16 x (16 - x)/16	**M1**
$x^2 + (16 - x)^2 = 160$	**M1**
expands and rearranges to a quadratic	**M1**
solves the quadratic	**M1**
x = 4 with the other solution rejected	**A1**
Answer: x = 4	

Question 11

(a) same-colour probability found by adding the three colours, e.g. 3/(5+x) x 2/(4+x) + 2/(5+x) x 1/(4+x) + x/(5+x) x (x-1)/(4+x) oe; or number of same-colour pairs = 3 + 1 + x(x-1)/2 oe	**M1**
(a) common denominator (5+x)(4+x) with numerator 3 x 2 + 2 x 1 + x(x-1); or total number of pairs = (5+x)(4+x)/2 oe	**M1**
(a) sets up [8 + x(x-1)] / [(5+x)(4+x)] = 5/18 and cross multiplies correctly	**M1**
(a) $13x^2 - 63x + 44 = 0$ cso, answer printed, all working shown	**A1**
(a) Answer: $13x^2 - 63x + 44 = 0$ (shown)	
(b) (13x - 11)(x - 4) = 0 oe, or correct use of the quadratic formula	**M1**
(b) x = 4 or x = 11/13 (both roots found)	**A1**
(b) x = 4 cao (rejecting x = 11/13 since the number of counters must be a positive integer)	**A1**
(b) Answer: 4 green counters	

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