HIGHER

8.11 Probability Equation Questions: 1-hour Pack

Total Marks

EDEXCEL 1MA1 · Calculator allowed · about 60 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 A bag contains 6 red counters and x blue counters. One counter is chosen at random. The probability it is blue is 4/7. Work out x.

(Total for Question 1 is 2 marks)

2 A game wheel is split into equal sections. The wheel has 2 red sections, r blue sections and 1 green section. The probability of landing on blue is 1/2. Find r.

(Total for Question 2 is 3 marks)

3 A bag contains blue and red counters. There are twice as many blue counters as red counters. The probability of drawing a blue counter is 0.6. Find the number of red counters, r, or explain why no integer solution exists.

(Total for Question 3 is 2 marks)

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4 A game uses a bag of counters. There are a red, b blue and 2 white counters. A player wins if they draw a blue counter. The probability of winning is 1/3. Given a and b are positive integers and a = 2, find b.

(Total for Question 4 is 3 marks)

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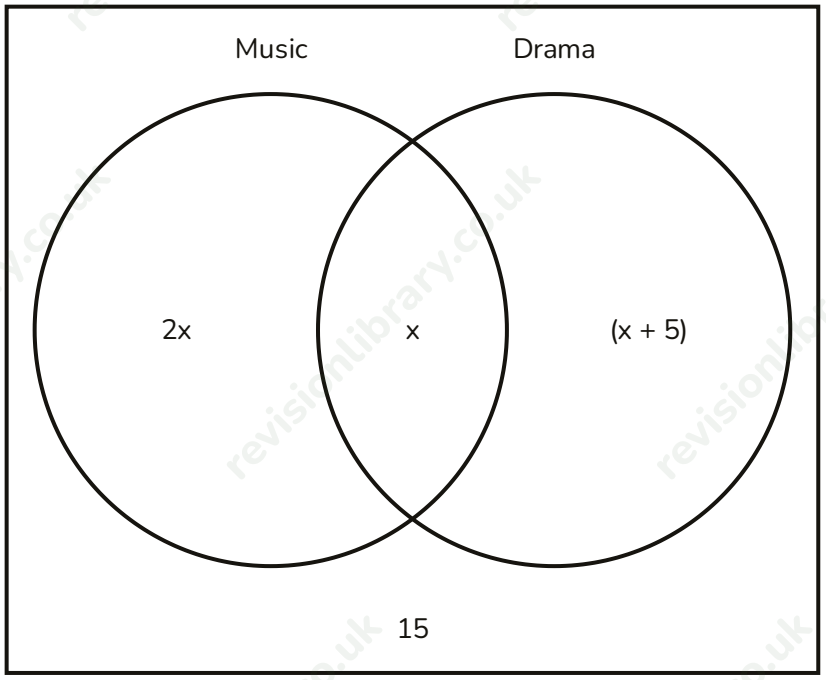
5 A box contains 3 purple cards and p orange cards. Two cards are drawn at random with replacement. The probability both are purple is 9/64. Form an equation and find p.

(Total for Question 5 is 3 marks)

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6 In a class of 60 students, the number who study Music only is 2x, the number who study Drama only is (x + 5), the number who study both Music and Drama is x, and the number who study neither is 15.

Diagram NOT accurately drawn



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

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(b) A student from the class is selected at random. Find the probability that the student studies Music (Music only or both Music and Drama). **(2)**

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(Total for Question 6 is 5 marks)

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7 A deck contains only cards numbered 1 to n, one of each. A card is chosen at random. The probability it is a multiple of 3 is 1/4. Find the smallest possible value of n, given n is a positive integer and the deck starts at 1.

(Total for Question 7 is 4 marks)

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8 A biased dice lands on a 6 with probability p on each roll, independently of any other roll. The dice is rolled three times. The probability of getting at least one 6 is 0.657.

(a) Show that $(1 - p)^3 = 0.343$. **(2)**

(b) Hence find the value of p, giving your answer to 3 significant figures. **(2)**

(Total for Question 8 is 4 marks)

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9 A biased spinner can land on 3 colours. P(gold) = 3x + 0.05; P(silver) = 3x + 0.1; P(bronze) = 0.25. Work out the value of x.

(Total for Question 9 is 3 marks)

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10 A bag contains x gold beads and 11 silver beads. A bead is taken at random. The probability that it is gold is 5/16. Work out the value of x.

(Total for Question 10 is 3 marks)

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11 A bag contains n marbles. 2 of the marbles are yellow. Two marbles are taken at random without replacement. The probability that both are yellow is 1/78. Show that $n^2 - n = 156$ and hence find the value of n.

(Total for Question 11 is 4 marks)

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12 A bag contains 11 marbles. x of the marbles are yellow and the rest are purple. Two marbles are taken at random without replacement. The probability that both are yellow is 21/55. Work out the value of x.

(Total for Question 12 is 4 marks)

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13 A bag contains n counters. 4 of the counters are red, the rest are yellow. There are more yellow counters than red counters. Two counters are taken from the bag at random, without replacement. The probability that one counter is red and one counter is yellow is 8/15.

(a) Show that $n^2 - 16n + 60 = 0$. **(4)**

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

(Total for Question 13 is 7 marks)

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Mark scheme · 8.11 Probability Equation Questions: 1-hour Pack

Question 1

form x/(x + 6) = 4/7 or equivalent	**M1**
x = 8 cao	**A1**

Answer: 8

Question 2

form r/(2 + r + 1) = 1/2 or r/(r + 3) = 1/2	**M1**
solve 2r = r + 3 or equivalent rearrangement	**M1**
r = 3 cao	**A1**

Answer: 3

Question 3

form equation 2r/(2r + r) = 0.6 or equivalent simplifying to 2/3 = 0.6	**M1**
state no integer r satisfies 2/3 = 0.6 or explicitly state contradiction oe	**A1**

Answer: No integer r satisfies the equation (2/3 does not equal 0.6).

Question 4

form equation b/(a + b + 2) = 1/3 with a and b as the numbers of counters	**M1**
substitute a = 2 to obtain b/(b + 4) = 1/3 or equivalent rearrangement	**M1**
b = 2 cao	**A1**

Answer: 2

Question 5

form $(3/(p + 3))^2 = 9/64$ or equivalent	**M1**
take square root and solve 3/(p + 3) = 3/8 leading to p + 3 = 8	**M1**
p = 5 cao	**A1**

Answer: 5

Question 6

(a) 2x + (x + 5) + x + 15 = 60 oe	**M1**
(a) 4x + 20 = 60 (correct collection of terms)	**M1**
(a) x = 10 cao	**A1**

(a) Answer: x = 10

(b) Music total = 2x + x = 3x = 30 ft from (a)	**M1**
(b) 30/60 = 1/2 oe cao	**A1**

(b) Answer: 1/2

Question 7

identify count of multiples of 3 as floor(n/3) and form equation floor(n/3)/n = 1/4 or reason using integer k such that number of multiples = k and k/n = 1/4	**M1**
use integer reasoning to set k = n/4 so n divisible by 4 and test small multiples of 4 against floor(n/3) = n/4	**M1**
find smallest n satisfying integer constraints or demonstrate n = 4 is valid	**M1**
n = 4 cao	**A1**

Answer: 4

Question 8

(a) $1 - (1-p)^3 = 0.657$ oe (complement method)	**M1**
(a) $(1 - p)^3 = 0.343$ cso, answer printed	**A1**

(a) Answer: $(1 - p)^3 = 0.343$ (shown)

(b) 1 - p = cube root of 0.343	**M1**
(b) p = 0.300 (3sf) cao	**A1**

(b) Answer: p = 0.300

Question 9

sum of probabilities = 1	**M1**
6x + 0.4 = 1 and collects terms	**M1**
x = 0.1	**A1**

Answer: x = 0.1

Question 10

x/(x + 11) = 5/16	**M1**
cross multiplies and collects terms	**M1**
x = 5	**A1**

Answer: x = 5

Question 11

2/n x 1/(n - 1)	**M1**
$n(n - 1) = 156$ or $n^2 - n - 156 = 0$	**M1**
solves the quadratic	**M1**
n = 13	**A1**

Answer: n = 13

Question 12

x/11 x (x - 1)/10	**M1**
$x^2 - x = 42$ or $x^2 - x - 42 = 0$	**M1**
solves the quadratic	**M1**
x = 7	**A1**

Answer: x = 7

Question 13

(a) P(red then yellow) + P(yellow then red) = 2 x (4/n) x ((n-4)/(n-1)) oe	**M1**
(a) 8(n-4)/(n(n-1)) = 8/15 oe, set up ready to cross multiply	**M1**
(a) correct expansion/simplification, e.g. 15(n-4) = n(n-1)	**M1**
(a) $n^2 - 16n + 60 = 0$ cso, answer printed, all working shown	**A1**

(a) Answer: $n^2 - 16n + 60 = 0$ (shown)

(b) (n - 10)(n - 6) = 0 oe, or correct use of the quadratic formula	**M1**
(b) n = 10 or n = 6 (both roots found)	**A1**
(b) 6 cao, with n = 10 selected since yellow (6) must exceed red (4); n = 6 rejected as it gives only 2 yellow counters	**A1**

(b) Answer: 6 yellow counters

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