5.22H Probability Trees: Higher Tier Practice

Total Marks

EDEXCEL Edexcel 1MA1 · Calculator allowed · about 75 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 A bag contains 4 red counters and 6 blue counters. A counter is chosen at random, its colour noted, and then it is replaced. This process is repeated once more. Draw a probability tree diagram and find the probability that both counters chosen are red.

(Total for Question 1 is 2 marks)

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2 A school has two routes for pupils to arrive by bus: Route X and Route Y. On any day, 60% of pupils use Route X and 40% use Route Y. On Route X a pupil is late with probability 0.05. On Route Y a pupil is late with probability 0.12.

(a) Draw a probability tree and find the probability that a randomly chosen pupil is both using Route Y and is late.

(b) Find the probability that a randomly chosen pupil is late.

(a) Find the probability that the pupil uses Route Y and is late. **(1)**

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(b) Find the probability that the pupil is late (use the tree). **(2)**

.....

(Total for Question 2 is 3 marks)

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3 A factory has two machines producing widgets. Machine A produces 30% of the widgets and Machine B 70%. From Machine A, 2% of widgets are defective. From Machine B, 5% are defective. A widget is chosen at random and inspected.
(a) Draw a probability tree. Find the probability that the widget is defective.
(b) Given that the widget is defective, find the probability it came from Machine A. Give your answer to 3 decimal places.

(a) Find the probability the widget is defective. **(2)**

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(b) Find P(from A | defective). **(2)**

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(Total for Question 3 is 4 marks)

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4 A spinner has three equal sectors labelled 1, 2 and 3. If the spinner lands on 1 or 2, a fair coin is tossed. If it lands on 3, a six-sided die is rolled. Draw a probability tree diagram, then find the probability that the final outcome is an even number.
(When the coin is tossed record 1 for heads and 2 for tails.)

(Total for Question 4 is 4 marks)

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5 A box contains three green balls and n red balls. Two balls are taken at random one after the other without replacement. The probability both are green is 3/10.
(a) Use a probability tree and show that n satisfies an equation. Solve for n, stating any restrictions on n.
(b) Give the probability that the second ball is green.

(a) Show that n satisfies an equation and solve for n. **(3)**

(b) Give the probability that the second ball is green. **(2)**

(Total for Question 5 is 5 marks)

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Mark scheme · 5.22H Probability Trees: Higher Tier Practice

Question 1

- **M1** construct tree with probabilities P(R)=4/10 and P(B)=6/10 on each stage or equivalent
- **A1** Probability both red = (4/10)*(4/10) = 16/100 = 4/25 cao
- **Answer: 4/25 (0.16 or 16/100)**

Question 2

- (a) **B1** 0.4 * 0.12 = 0.048 cao
- **(a) Answer: 0.048**
- (b) **M1** sum probabilities: 0.6*0.05 + 0.4*0.12 or equivalent
- (b) **A1** 0.078 cao
- **(b) Answer: 0.078**

Question 3

- (a) **M1** sum probabilities: 0.3*0.02 + 0.7*0.05
- (a) **A1** 0.041 cao
- **(a) Answer: 0.041**
- (b) **M1** use conditional probability: (0.3*0.02) / 0.041
- (b) **A1** 0.146 cao to 3 dp
- **(b) Answer: 0.146 (3 dp)**

Question 4

- **M1** tree: P(spinner 1)=1/3, P(spinner 2)=1/3, P(spinner 3)=1/3; coin gives 1 or 2 each 1/2; die evens 3/6
- **M1** calculate contributions from spinner 1 and spinner 2: each gives (1/3)*(1/2) for even = 1/6 each
- **M1** calculate contribution from spinner 3: (1/3)*(3/6) = 1/6
- **A1** final probability = 1/6 + 1/6 + 1/6 = 1/2 cao
- **Answer: 1/2**

Question 5

- (a) **M1** write probability both green = (3/(3+n))*((3-1)/(2+n)) = (3/(3+n))*(2/(2+n))
- (a) **M1** set equal to 3/10 and rearrange to (3+n)(2+n) = 20 or equivalent quadratic
- (a) **A1** n = 2 with restriction n is a non-negative integer and n <> -2, -3; reject n = -7
- **(a) Answer: n = 2**
- (b) **M1** use total probability: P(second green) = P(GG) + P(RG) = (3/5)*(2/4) + (2/5)*(3/4)
- (b) **A1** 3/5 = 0.6 cao
- **(b) Answer: 3/5 (0.6)**

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