



5.22F Probability Trees: Foundation Tier Practice

EDEXCEL Edexcel 1MA1 · Calculator allowed · about 45 minutes

Total Marks

Name: _____ Date: ____ / ____ / ____

Answer ALL questions. Show all your working.

- 1** A bag contains 3 red counters and 2 blue counters. A counter is taken at random. Write down the probability that the counter is blue.

(Total for Question 1 is 1 mark)

- 2** A coin is tossed. If it lands heads, Sara picks a red marble from a bag with probability $\frac{1}{4}$ of red; if it lands tails, she picks a red marble with probability $\frac{1}{2}$. Draw a simple probability tree showing the two branches for the coin and the probabilities for picking a red marble on each branch. (No calculation of combined probability is required.)

(Total for Question 2 is 2 marks)

- 3** A spinner has two equal sections: green and yellow. If the spinner lands on green, Tom rolls a 6-sided die. If it lands on yellow, he flips a coin. Write down the probability that Tom spins yellow and then flips tails.

(Total for Question 3 is 2 marks)

- 4** A shop sells two types of sweets: chewy and hard. On Monday, 60% of customers buy chewy sweets. If a customer buys chewy sweets, there is a 0.3 probability they also buy a drink. If a customer buys hard sweets, there is a 0.1 probability they buy a drink. Use a probability tree to find the probability that a customer buys a drink.

(Total for Question 4 is 3 marks)

- 5 A fair 4-sided spinner has faces labelled 1, 2, 3, 4 equally likely. If the spinner lands on 1 or 2, Jamal then tosses a coin. If it lands on 3 or 4, he rolls a fair 4-sided die numbered 1 to 4. Find the probability that Jamal gets a tail on the coin or a 4 on the die.

(Total for Question 5 is 3 marks)

- 6 A bag contains 2 green, 3 red and 5 white beads. Rachel picks a bead at random. If she picks white, she replaces it and then picks again. If she picks green or red, she does not replace it and picks again. Draw a probability tree and find the probability Rachel picks white on the first pick and red on the second pick.

(Total for Question 6 is 4 marks)

- 7 A school lottery has two stages. Stage 1: 30% of entrants win a small prize. Stage 2: those who did not win stage 1 take part in a draw where there is a 5% chance of winning a second prize. Find the probability an entrant wins a prize in stage 2.

(Total for Question 7 is 3 marks)

- 8 A machine makes a small part. The probability a part is faulty is 0.02. If a part is faulty, the probability it fails the final inspection is 0.95. If a part is not faulty, the probability it fails the final inspection is 0.01. Use a probability tree to find the probability that a randomly chosen part fails the final inspection.

(Total for Question 8 is 4 marks)

- 9** A two-stage process: Step 1 has probability 0.7 of success. If Step 1 succeeds, Step 2 succeeds with probability 0.9. If Step 1 fails, Step 2 succeeds with probability 0.4. (a) Use a tree diagram to find the probability both steps succeed. (b) Find the probability exactly one step succeeds.
- (a) Find the probability both steps succeed. (3)

- (b) Find the probability exactly one step succeeds. (3)

(Total for Question 9 is 6 marks)

- 10** A box contains 4 blue cards and 6 yellow cards. A card is chosen at random. If the card is blue, it is replaced and the process ends. If the card is yellow, it is not replaced and a second card is chosen. (a) Draw a probability tree for this process. (b) Find the probability that two cards are chosen and both are yellow. (c) Find the probability that the process ends after the first draw (that is, a blue card is drawn first).
- (a) Draw a probability tree for the process. (2)

- (b) Find the probability that two cards are chosen and both are yellow. (2)

- (c) Find the probability that the process ends after the first draw. (2)

(Total for Question 10 is 6 marks)

Mark scheme · 5.22F Probability Trees: Foundation Tier Practice

Question 1

- **B1** $\frac{2}{5}$ cao
- **Answer:** $\frac{2}{5}$

Question 2

- **M1** tree drawn with two first branches labelled Heads and Tails each with probability $\frac{1}{2}$
- **A1** second stage probabilities shown as $\frac{1}{4}$ on Heads branch and $\frac{1}{2}$ on Tails branch
- **Answer:** Tree with coin branches $\frac{1}{2}$ each; from Heads shows red $\frac{1}{4}$, from Tails shows red $\frac{1}{2}$.

Question 3

- **M1** use of probability rule: $P(\text{spin yellow}) \times P(\text{tails}) = \frac{1}{2} \times \frac{1}{2}$
- **A1** $\frac{1}{4}$ cao
- **Answer:** $\frac{1}{4}$

Question 4

- **M1** tree or method shown multiplying 0.6×0.3 and 0.4×0.1
- **M1** sum of these two probabilities shown
- **A1** $0.18 + 0.04 = 0.22$ cao
- **Answer:** 0.22

Question 5

- **M1** identify $P(\text{spin 1 or 2}) = \frac{2}{4}$ and $P(\text{spin 3 or 4}) = \frac{2}{4}$ and multiply: $\frac{2}{4} \times \frac{1}{2}$ and $\frac{2}{4} \times \frac{1}{4}$
- **M1** add the two probabilities
- **A1** $\frac{1}{4} + \frac{1}{8} = \frac{3}{8}$ cao
- **Answer:** $\frac{3}{8}$

Question 6

- **M1** tree showing first pick probabilities $\frac{2}{10}$, $\frac{3}{10}$, $\frac{5}{10}$ and second pick branches with replacement for white and without replacement otherwise
- **M1** compute probability for white then red: $P(\text{white first}) \times P(\text{red second given white replaced}) = \frac{5}{10} \times \frac{3}{10}$
- **M1** numerical multiplication shown $\frac{1}{2} \times \frac{3}{10}$
- **A1** $\frac{3}{20} = 0.15$ cao
- **Answer:** $\frac{3}{20}$ or 0.15

Question 7

- **M1** recognise $P(\text{not win stage 1}) = 0.7$ and multiply by 0.05
- **M1** compute $0.7 \times 0.05 = 0.035$
- **A1** 0.035 or 3.5% cao
- **Answer:** 0.035 or 3.5%

Question 8

- **M1** tree or method showing $P(\text{faulty and fails}) = 0.02 \times 0.95$ and $P(\text{not faulty and fails}) = 0.98 \times 0.01$
- **M1** compute both products 0.019 and 0.0098 (or equivalent)
- **M1** sum the two probabilities
- **A1** $0.019 + 0.0098 = 0.0288$ cao
- **Answer:** 0.0288

Question 9

- (a) **M1** use $P(\text{both succeed}) = 0.7 \times 0.9$
- (a) **M1** numerical multiplication 0.63
- (a) **A1** 0.63 cao
- **(a) Answer: 0.63**
- (b) **M1** calculate $P(\text{success then fail}) = 0.7 \times 0.1$ and $P(\text{fail then success}) = 0.3 \times 0.4$
- (b) **M1** sum the two probabilities
- (b) **A1** $0.07 + 0.12 = 0.19$ cao
- **(b) Answer: 0.19**

Question 10

- (a) **M1** tree with first branches Blue $4/10$ and Yellow $6/10$ and second branch from Yellow with two outcomes using $5/9$ and $4/9$
- (a) **A1** replacement noted for blue branch (process ends) and no replacement for yellow branch
- **(a) Answer: Tree with first draw Blue $4/10$ ends, Yellow $6/10$ then second draw probabilities $5/9$ blue and $4/9$ yellow.**
- (b) **M1** use $P(Y \text{ then } Y) = 6/10 \times 5/9$ (one yellow removed leaves 5 yellow out of 9)
- (b) **A1** $30/90 = 1/3$ cao
- **(b) Answer: $1/3$**
- (c) **M1** recognise this is $P(\text{first draw is blue}) = 4/10$
- (c) **A1** $2/5$ or 0.4 cao
- **(c) Answer: $2/5$ or 0.4**