

## GCSE / IGCSE Maths – Probability

GCSE/IGCSE (Higher) · Total marks: 56 · Answers on the last page

Covers listing outcomes, expected frequency, independent and combined events, tree diagrams with and without replacement, Venn diagrams and conditional probability. Calculator allowed; give answers as fractions or decimals; allow about 60 minutes.

### Section A – Skills (Short questions.)

1. A biased four-sided spinner has  $P(1) = 0.2$  and  $P(2) = 0.35$ . The probability of landing on 4 is twice the probability of landing on 3.
  - (a) Find  $P(3)$ .
  - (b) The spinner is spun 200 times. Estimate the number of times it lands on 4. [4]
2. Two fair six-sided dice are rolled and the scores are recorded.
  - (a) Find the probability that the sum of the scores is 8.
  - (b) Find the probability that the product of the scores is 12. [4]
3. Events  $A$  and  $B$  are independent with  $P(A) = 0.4$  and  $P(B) = 0.5$ .
  - (a) Find  $P(A \text{ and } B)$ .
  - (b) Find  $P(A \text{ or } B)$ . [3]
4. Three fair coins are flipped.
  - (a) List all 8 possible outcomes.
  - (b) Find the probability of getting at least two heads. [3]
5. A drawing pin is dropped 50 times and lands point up 16 times.
  - (a) Write down the relative frequency of landing point up.
  - (b) The pin is dropped 300 times. Estimate how many times it lands point up.
  - (c) Explain how the estimate of the probability could be made more reliable. [4]

### Section B – Exam-style (Show full working; tree or Venn diagrams may be drawn.)

6. A bag contains 5 red and 3 blue counters. Two counters are taken at random without replacement.
  - (a) Draw a tree diagram to show the probabilities.
  - (b) Find the probability that both counters are red.
  - (c) Find the probability that the counters are different colours. [6]
7. The probability that it rains on a given morning is 0.3. If it rains, the probability that Amira is late for school is 0.6. If it does not rain, the probability that she is late is 0.1.
  - (a) Find the probability that Amira is late for school.
  - (b) Given that Amira is late, find the probability that it rained. [5]
8. In a class of 40 students, 22 study French, 18 study History and 7 study both.
  - (a) Draw a Venn diagram to show this information.
  - (b) Find the probability that a student chosen at random studies neither subject.
  - (c) A student who studies French is chosen at random. Find the probability that they also study History. [6]
9. A box contains 4 green and 6 yellow sweets. Two sweets are chosen at random without replacement. Find the probability that at least one sweet is green. [4]

10. A fairground game costs \$1 to play. The probability of winning is 0.15 and a winner receives \$5.
- (a) Find the expected winnings, in dollars, from one game (ignoring the cost).
  - (b) Show that a player who plays 200 times can expect to lose \$50 overall. [4]

**Section C – Challenge** (Extended problems.)

11. A bag contains  $x$  red counters and 6 blue counters. Two counters are taken at random without replacement. The probability that both counters are blue is  $\frac{1}{3}$ .
- (a) Show that  $(x + 6)(x + 5) = 90$ .
  - (b) Hence find the value of  $x$ . [5]
12. 60 people were asked whether they drink tea (T) or coffee (C). 25 drink only tea, 15 drink only coffee, 12 drink both and the rest drink neither.
- (a) Find how many people drink neither.
  - (b) One person is chosen at random. Find  $P(T \cap C)$ .
  - (c) A tea drinker is chosen at random. Find the probability that they also drink coffee.
  - (d) Two different people are chosen at random. Find the probability that neither of them drinks tea. [8]

## Answers

Check your working against these. If an answer does not match, try the question again before looking for the method.

1. (a)  $3x = 0.45$ , so  $P(3) = 0.15$   
(b)  $0.3 \times 200 = 60$
2. (a)  $\frac{5}{36}$   
(b)  $\frac{4}{36} = \frac{1}{9}$
3. (a) 0.2  
(b)  $0.4 + 0.5 - 0.2 = 0.7$
4. (a) HHH, HHT, HTH, THH, HTT, THT, TTH, TTT  
(b)  $\frac{4}{8} = \frac{1}{2}$
5. (a)  $\frac{16}{50} = 0.32$   
(b) 96  
(c) Carry out more trials
6. (a) First pick: R  $\frac{5}{8}$ , B  $\frac{3}{8}$ ; second pick after R: R  $\frac{4}{7}$ , B  $\frac{3}{7}$ ; after B: R  $\frac{5}{7}$ , B  $\frac{2}{7}$   
(b)  $\frac{5}{8} \times \frac{4}{7} = \frac{20}{56} = \frac{5}{14}$   
(c)  $2 \times \frac{5}{8} \times \frac{3}{7} = \frac{30}{56} = \frac{15}{28}$
7. (a)  $0.3 \times 0.6 + 0.7 \times 0.1 = 0.18 + 0.07 = 0.25$   
(b)  $\frac{0.18}{0.25} = 0.72$
8. (a) French only 15, both 7, History only 11, neither 7  
(b)  $\frac{7}{40}$   
(c)  $\frac{7}{22}$
9.  $1 - \frac{6}{10} \times \frac{5}{9} = 1 - \frac{30}{90} = \frac{2}{3}$
10. (a)  $0.15 \times 5 = \$0.75$   
(b) Expected loss per game =  $1 - 0.75 = \$0.25$ ;  $200 \times 0.25 = \$50$
11. (a)  $\frac{6}{x+6} \times \frac{5}{x+5} = \frac{1}{3}$ , so  $30 \times 3 = (x+6)(x+5)$   
(b)  $x^2 + 11x - 60 = 0$ ,  $(x+15)(x-4) = 0$ , so  $x = 4$
12. (a)  $60 - 52 = 8$   
(b)  $\frac{12}{60} = \frac{1}{5}$   
(c)  $\frac{12}{37}$   
(d) 23 non-tea drinkers:  $\frac{23}{60} \times \frac{22}{59} = \frac{506}{3540} = \frac{253}{1770}$

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