GCSE Foundation Mathematics
Practice Test 5: Probability

Instructions:
Answer all questions. Show your working clearly.
Calculators may be used unless stated otherwise.
Time allowed: 90 minutes

Section A: Basic Probability Concepts

1. State whether these events are certain, likely, even chance, unlikely, or impossible:

   (a) Getting an odd number when rolling a fair die

   (b) Rolling a 13 on a standard six-sided die

   (c) A person celebrating a birthday this year

   (d) Getting a number less than 1 when rolling a standard die

   (e) Choosing an ace from a standard pack of cards

   (f) Tomorrow being a weekday when today is Friday

2. Express these probabilities as fractions, decimals, and percentages:

   (a) $P(\text{certain}) = 1$

   (b) $P(\text{impossible}) = 0$

   (c) $P(\text{even chance}) = 0.5$

   (d) $P(\text{moderately likely}) = 0.6$

   (e) $P(\text{quite unlikely}) = \frac{1}{6}$

3. Complete these probability statements:

   (a) All probabilities are between _____ and _____

   (b) If $P(M) = 0.8$, then $P(\text{not } M) =$ _____

   (c) If $P(N) = \frac{2}{9}$, then $P(\text{not } N) =$ _____

   (d) The sum of all probabilities in a sample space equals _____

4. A wheel has 12 equal sectors with these letters: A, A, A, B, B, C, C, C, C, D, E, E. Write down:

   (a) The sample space

   (b) $P(\text{spinning A})$

   (c) $P(\text{spinning C})$

   (d) $P(\text{spinning D or E})$

   (e) $P(\text{not spinning B})$

Section B: Single Event Probability

5. A fair sixteen-sided die numbered 1-16 is rolled. Find the probability of rolling:
   (a) A 12
   (b) A factor of 16
   (c) A number greater than 10
   (d) A number less than or equal to 5
   (e) A multiple of 4
   (f) A number between 6 and 12 (inclusive)

6. A basket contains 11 ceramic tiles, 9 glass tiles, and 7 stone tiles. A tile is drawn at random. Find the probability of drawing:
   (a) A ceramic tile
   (b) A glass tile
   (c) A stone tile
   (d) A ceramic or glass tile
   (e) Not a stone tile
   (f) Not a ceramic tile

7. A standard pack of 52 playing cards is shuffled. Find the probability of drawing:
   (a) A 5
   (b) A heart
   (c) A red card
   (d) The jack of spades
   (e) A 9 or 10
   (f) A black 5

8. The probability that Zoe wins a chess game is $\frac{3}{8}$. What is the probability that she loses or draws?

9. In a dance class of 36 students, 24 are beginners. If a student is chosen at random, find the probability they are:
   (a) A beginner
   (b) Not a beginner

Section C: Sample Spaces and Outcomes

10. Two coins are flipped and a die is rolled simultaneously.
    (a) List all possible outcomes for the coins
    (b) How many outcomes are in the complete sample space?
    (c) Find P(two heads and 1)
    (d) Find P(at least one tail and even number)
    (e) Find P(two tails and number less than 4)

11. Two fair dice are rolled and the minimum of their scores is recorded.
    (a) Complete the sample space table showing all possible minimum values:

Min	1	2	3	4	5	6
1	1	1	1	1	1	1
2	1					
3	1					
4	1					
5	1					
6	1					

(b) Find $P(\text{minimum} = 6)$

(c) Find $P(\text{minimum} = 1)$

(d) Find $P(\text{minimum} > 2)$

(e) Find $P(\text{minimum is even})$

12. A bag has 6 equal sections: Crimson (C), Navy (N), Amber (A), Teal (T), Coral (O), Rust (R). The bag is selected twice.

(a) How many possible outcomes are there?

(b) Find $P(\text{both selections the same})$

(c) Find $P(\text{at least one crimson})$

(d) Find $P(\text{no navy})$

13. A deck contains numbers 15, 20, 25, 30. Two numbers are drawn without replacement.

(a) List all possible pairs

(b) Find $P(\text{both numbers divisible by 5})$

(c) Find $P(\text{sum of numbers} = 45)$

(d) Find $P(\text{difference between numbers} = 10)$

Section D: Probability Rules

14. For mutually exclusive events T and U, where $P(T) = 0.45$ and $P(U) = 0.15$:

(a) Find $P(T \text{ or } U)$

(b) Find $P(\text{neither } T \text{ nor } U)$

(c) What is $P(T \text{ and } U)$? Explain your answer.

15. A card is drawn from a standard pack. Let L = "drawing a heart" and M = "drawing a 7".

(a) Find $P(L)$

(b) Find $P(M)$

(c) Find $P(L \text{ and } M)$

(d) Find $P(L \text{ or } M)$

(e) Are events L and M mutually exclusive? Explain.

16. The probability of traffic jams on Tuesday is 0.7. The probability of traffic jams on Wednesday is 0.5. Assuming the events are independent:

(a) Find the probability of traffic jams on both days

(b) Find the probability of no traffic jams on either day

(c) Find the probability of traffic jams on at least one day

(d) Find the probability of traffic jams on exactly one day

17. A biased coin has $P(\text{heads}) = 0.8$. The coin is flipped three times.

    (a) Find P(three heads)

    (b) Find P(three tails)

    (c) Find P(at least one tail)

    (d) Find P(exactly two heads)

Section E: Tree Diagrams

18. A bag contains 7 star stickers and 3 heart stickers. Two stickers are drawn without replacement.

    (a) Draw a tree diagram showing all possibilities

    (b) Find P(two star stickers)

    (c) Find P(two heart stickers)

    (d) Find P(one star and one heart)

    (e) Find P(at least one star sticker)

19. The probability that a student passes Geography is 0.72 and passes Biology is 0.88. Assume the subjects are independent.

    (a) Draw a tree diagram

    (b) Find the probability of passing both subjects

    (c) Find the probability of failing both subjects

    (d) Find the probability of passing exactly one subject

    (e) Find the probability of passing at least one subject

20. A hospital has two elevators. Elevator A works 96% of the time, Elevator B works 89% of the time.

    (a) Draw a tree diagram

    (b) Find the probability both elevators work

    (c) Find the probability exactly one elevator works

    (d) Find the probability at least one elevator works

    (e) Find the probability neither elevator works

21. Case 1 contains 9 pentagon shapes and 1 hexagon shape. Case 2 contains 3 pentagon shapes and 7 hexagon shapes. A case is chosen at random, then a shape is drawn from that case.

    (a) Draw a tree diagram

    (b) Find the probability of drawing a pentagon shape

    (c) Find the probability of drawing a hexagon shape

    (d) If a pentagon shape is drawn, what is the probability it came from Case 1?

Section F: Conditional Probability

22. The two-way table shows information about library visitors and their activity:

	Reading	Using computer	Total
Students	35	25	60
Adults	40	20	60
Total	75	45	120

A visitor is chosen at random. Find:

(a) P(using computer)
(b) P(student)
(c) P(using computer and student)
(d) P(using computer — student)
(e) P(student — using computer)

23. In a survey of 200 people about music preferences:

- 130 people like pop music
- 95 people like rock music
- 65 people like both pop and rock music

Find the probability that a randomly chosen person:

(a) Likes pop or rock music
(b) Likes neither pop nor rock music
(c) Likes rock given they like pop
(d) Likes only pop music
(e) Likes only rock music

24. A bowl has red and purple marbles. $P(\text{red}) = \frac{6}{13}$. Two marbles are drawn without replacement. If there are 26 marbles in total:

(a) How many red marbles are there?
(b) How many purple marbles are there?
(c) Find P(second marble is red — first marble is red)
(d) Find P(second marble is red — first marble is purple)

Section G: Experimental vs Theoretical Probability

25. A biased die is rolled 500 times with these results:

Number	1	2	3	4	5	6
Frequency	70	85	90	95	80	80

(a) Calculate the experimental probability for each number
(b) Which number is most likely to appear?
(c) Compare with theoretical probabilities for a fair die
(d) If the die is rolled 1500 times, estimate how many 1s you would expect

26. A game spinner is tested and gives these results: Purple: 84 times, Orange: 56 times, Silver: 28 times, Bronze: 12 times

(a) How many times was the spinner used?
(b) Calculate the experimental probability of each colour
(c) What do these results suggest about the spinner design?
(d) Estimate how many times orange would appear in 450 spins

27. A coin is flipped 90 times and lands tails 63 times.

(a) What is the experimental probability of tails?
(b) What is the experimental probability of heads?
(c) Is this coin likely to be fair? Explain your reasoning.
(d) If the coin is flipped 180 more times, estimate how many tails you would expect

Section H: Problem Solving

28. In a prize draw, the probability of winning the main prize is $\frac{1}{75000000}$.

    (a) Express this as a decimal (to 3 significant figures)

    (b) What is the probability of not winning?

    (c) If 15 million people enter, estimate how many will win

    (d) Is it sensible to expect to win? Explain.

29. A food sensitivity test is 92% accurate. This means:

    - If someone has the sensitivity, there's a 92% chance the test is positive
    - If someone doesn't have the sensitivity, there's a 92% chance the test is negative

    In a population where 6% of people have the sensitivity:

    (a) Out of 1000 people, how many actually have the sensitivity?

    (b) How many of those with the sensitivity will test positive?

    (c) How many without the sensitivity will test negative?

    (d) How many false positives will there be?

30. Seven students each choose a day of the week. What is the probability that:

    (a) All seven choose the same day?

    (b) All seven choose different days?

    (c) At least six choose the same day?

    (d) No one chooses Sunday?

31. A bike lock uses 4 symbols from a set of 6 different symbols. No symbol can be repeated and order matters.

    (a) How many different combinations are possible?

    (b) What is the probability of getting the combination right in one attempt?

    (c) If there were 10 symbols and you needed exactly 3, how many combinations would be possible?

32. In a carnival game, you win if you roll three dice and get a sum of 5 or 6.

    (a) List all ways to get a sum of 5

    (b) List all ways to get a sum of 6

    (c) What is the probability of winning?

    (d) If you play 216 times, estimate how many you would win

    (e) If the entry fee is £2 and the prize is £20, is this fair for players?

Answer Space

Use this space for your working and answers.

END OF TEST

Total marks: 100

For more resources and practice materials, visit:
stepupmaths.co.uk