GCSE Foundation Mathematics
Practice Test 9: 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 even number when rolling a fair die

   (b) Rolling a 7 on a standard six-sided die

   (c) A baby being born on a Friday

   (d) Getting a number less than 7 when rolling a standard die

   (e) Choosing an ace from a standard pack

   (f) A month having 32 days

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

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

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

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

   (d) $P(\text{quite likely}) = 0.8$

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

3. Complete these probability statements:

   (a) All probabilities are between _____ and _____

   (b) If $P(A) = 0.42$, then $P(\text{not } A) =$ _____

   (c) If $P(B) = \frac{9}{16}$, then $P(\text{not } B) =$ _____

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

4. A wheel has 8 equal segments with these numbers: 6, 12, 18, 24, 30, 36, 42, 48. Write down:

   (a) The sample space

   (b) $P(\text{spinning 30})$

   (c) $P(\text{spinning a multiple of 18})$

   (d) $P(\text{spinning a number greater than 35})$

   (e) $P(\text{spinning a number less than 20})$

Section B: Single Event Probability

5. A fair thirty-sided die numbered 1-30 is rolled. Find the probability of rolling:
   (a) A 22
   (b) A square number
   (c) A number greater than 25
   (d) A number less than or equal to 8
   (e) A multiple of 6
   (f) A number between 12 and 18 (inclusive)

6. A jar contains 15 glass beads, 12 wooden beads, and 8 metal beads. A bead is drawn at random. Find the probability of drawing:
   (a) A glass bead
   (b) A wooden bead
   (c) A metal bead
   (d) A glass bead or wooden bead
   (e) Not a metal bead
   (f) Not a glass bead

7. A standard pack of 52 playing cards is shuffled. Find the probability of drawing:
   (a) A queen
   (b) A diamond
   (c) A red card
   (d) The ace of clubs
   (e) A 7 or 9
   (f) A black queen

8. The probability that Maya wins a tennis match is $\frac{7}{11}$. What is the probability that she loses?

9. In a chess club of 56 members, 42 play competitive chess. If a member is chosen at random, find the probability they:
   (a) Play competitive chess
   (b) Don't play competitive chess

Section C: Sample Spaces and Outcomes

10. A five-sided die (numbered 1-5) is rolled twice.
    (a) List all possible outcomes
    (b) How many outcomes are in the sample space?
    (c) Find P(both rolls show 3)
    (d) Find P(at least one roll shows 5)
    (e) Find P(first roll less than second roll)

11. Two fair dice are rolled and their scores are compared. Record whether the first die is greater than (¿), less than (¡), or equal to (=) the second die.
    (a) Complete the sample space table:

Compare	1	2	3	4	5	6
1	=	¡	¡	¡	¡	¡
2	¿					
3	¿					
4	¿					
5	¿					
6	¿					

(b) Find P(first die > second die)

(c) Find P(dice show equal values)

(d) Find P(first die < second die)

(e) What do you notice about these three probabilities?

12. A spinner has 6 equal sections: Red (R), Orange (O), Yellow (Y), Green (G), Blue (B), Purple (P). The spinner is used twice.

(a) How many possible outcomes are there?

(b) Find P(same color both times)

(c) Find P(at least one red)

(d) Find P(no yellow)

13. A set contains consecutive odd numbers 15, 17, 19, 21. Two numbers are drawn without replacement.

(a) List all possible pairs

(b) Find P(both numbers are odd)

(c) Find P(sum of numbers = 36)

(d) Find P(product of numbers > 300)

Section D: Probability Rules

14. For mutually exclusive events M and N, where $P(M) = 0.36$ and $P(N) = 0.48$:

(a) Find $P(M$ or $N)$

(b) Find P(neither M nor $N)$

(c) What is $P(M$ and $N)$? Explain your answer.

15. A card is drawn from a standard pack. Let R = "drawing a heart" and S = "drawing a picture card".

(a) Find $P(R)$

(b) Find $P(S)$

(c) Find $P(R$ and $S)$

(d) Find $P(R$ or $S)$

(e) Are events R and S mutually exclusive? Explain.

16. The probability of rain on Saturday is 0.3. The probability of rain on Sunday is 0.5. Assuming the events are independent:

(a) Find the probability of rain on both days

(b) Find the probability of no rain on either day

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

(d) Find the probability of rain on exactly one day

17. A biased coin has $P(\text{heads}) = 0.72$. The coin is flipped three times.

    (a) Find $P(\text{three heads})$

    (b) Find $P(\text{three tails})$

    (c) Find $P(\text{at least two heads})$

    (d) Find $P(\text{exactly two tails})$

Section E: Tree Diagrams

18. A box has 9 white chocolates and 6 dark chocolates. Two chocolates are drawn without replacement.

    (a) Draw a tree diagram showing all possibilities

    (b) Find $P(\text{two white chocolates})$

    (c) Find $P(\text{two dark chocolates})$

    (d) Find $P(\text{one white and one dark})$

    (e) Find $P(\text{at least one white chocolate})$

19. The probability that a student passes History is 0.78 and passes Geography is 0.85. 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 shopping mall has two elevators. Elevator X works 88% of the time, Elevator Y works 92% 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. Bag 1 contains 7 red tokens and 3 blue tokens. Bag 2 contains 4 red tokens and 6 blue tokens. A bag is chosen at random, then a token is drawn from that bag.

    (a) Draw a tree diagram

    (b) Find the probability of drawing a red token

    (c) Find the probability of drawing a blue token

    (d) If a blue token is drawn, what is the probability it came from Bag 2?

Section F: Conditional Probability

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

	Student	Adult	Total
Full member	35	45	80
Day member	55	25	80
Total	90	70	160

A visitor is chosen at random. Find:

(a) $P(\text{adult})$

(b) $P(\text{full member})$

(c) $P(\text{adult and full member})$

(d) $P(\text{adult} \mid \text{full member})$

(e) $P(\text{full member} \mid \text{adult})$

23. In a survey of 300 people about social media platforms:

- 180 people use Instagram
- 150 people use TikTok
- 90 people use both Instagram and TikTok

Find the probability that a randomly chosen person:

(a) Uses Instagram or TikTok

(b) Uses neither Instagram nor TikTok

(c) Uses TikTok given they use Instagram

(d) Uses only Instagram

(e) Uses only TikTok

24. A box has black and white counters. $P(\text{black}) = \frac{9}{20}$. Two counters are drawn without replacement.

If there are 40 counters in total:

(a) How many black counters are there?

(b) How many white counters are there?

(c) Find $P(\text{second counter is black} \mid \text{first counter is black})$

(d) Find $P(\text{second counter is black} \mid \text{first counter is white})$

Section G: Experimental vs Theoretical Probability

25. A biased die is rolled 800 times with these results:

Number	1	2	3	4	5	6
Frequency	120	140	130	150	140	120

(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 2400 times, estimate how many 4s you would expect

26. A lottery wheel is tested and gives these results: Silver: 96 times, Gold: 64 times, Bronze: 48 times, Copper: 32 times

    (a) How many times was the wheel spun?

    (b) Calculate the experimental probability of each colour

    (c) What pattern do you notice in the frequencies?

    (d) Estimate how many times silver would appear in 720 spins

27. A coin is flipped 150 times and shows heads 93 times.

    (a) What is the experimental probability of getting heads?

    (b) What is the experimental probability of getting tails?

    (c) Is this coin likely to be fair? Explain your reasoning.

    (d) If the coin is flipped 250 more times, estimate how many heads you would expect

Section H: Problem Solving

28. In a lottery, the probability of winning the top prize is $\frac{1}{85000000}$.

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

    (b) What is the probability of not winning?

    (c) If 17 million people enter, estimate how many will win

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

29. A medical test is 98% accurate. This means:

    - If someone has the condition, there's a 98% chance the test is positive
    - If someone doesn't have the condition, there's a 98% chance the test is negative

    In a population where 8% of people have the condition:

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

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

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

    (d) How many false positives will there be?

30. Six friends each choose a day of the week (Monday through Sunday). What is the probability that:

    (a) All six choose the same day?

    (b) All six choose different days?

    (c) At least five choose the same day?

    (d) No one chooses Saturday?

31. A security code uses 4 different digits from 0-9. No digit can be repeated and order matters.

    (a) How many different codes are possible?

    (b) What is the probability of guessing the code correctly in one attempt?

    (c) If the code cannot start with 0, how many codes are possible?

32. In a card game, you win if you draw five cards and get exactly four of the same suit.

    (a) In how many ways can you choose which four cards are the same suit?

(b) If the four cards are all hearts, how many suits are possible for the fifth card?

(c) What is the probability of getting exactly four hearts?

(d) If you play 2197 games, estimate how many you would win with exactly four hearts

(e) Is this game fair if you need exactly four of any suit to win?

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