GCSE Foundation Mathematics
Practice Test 4: 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 a multiple of 2 when rolling a fair die

    (b) Rolling a 10 on a standard six-sided die

    (c) A student being late for school at least once this term

    (d) Getting a number between 1 and 6 when rolling a standard die

    (e) Choosing a face card from a standard pack of cards

    (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) $P(\text{quite unlikely}) = 0.2$

    (e) $P(\text{very likely}) = \frac{9}{10}$

3. Complete these probability statements:

    (a) All probabilities are between _____ and _____

    (b) If $P(G) = 0.7$, then $P(\text{not } G) = $ _____

    (c) If $P(H) = \frac{7}{12}$, then $P(\text{not } H) = $ _____

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

4. A spinner has 10 equal sections numbered: 5, 10, 15, 20, 25, 30, 35, 40, 45, 50. Write down:

    (a) The sample space

    (b) $P(\text{spinning } 25)$

    (c) $P(\text{spinning a multiple of } 10)$

    (d) $P(\text{spinning a number greater than } 30)$

    (e) $P(\text{spinning a number divisible by } 15)$

Section B: Single Event Probability

5. A fair ten-sided die numbered 0-9 is rolled. Find the probability of rolling:

    (a) A 7

    (b) A single-digit number

    (c) A number greater than 6

    (d) A number less than or equal to 2

    (e) A perfect square

    (f) A number between 3 and 8 (inclusive)

6. A jar contains 14 wooden balls, 8 plastic balls, and 6 metal balls. A ball is drawn at random. Find the probability of drawing:

    (a) A wooden ball

    (b) A plastic ball

    (c) A metal ball

    (d) A wooden or plastic ball

    (e) Not a metal ball

    (f) Not a wooden ball

7. A standard pack of 52 playing cards is shuffled. Find the probability of drawing:

    (a) A queen

    (b) A club

    (c) A black card

    (d) The ace of diamonds

    (e) A 7 or 8

    (f) A red queen

8. The probability that Alex passes a swimming test is $\frac{4}{9}$. What is the probability that he fails?

9. In a youth group of 42 members, 28 play video games. If a member is chosen at random, find the probability they:

    (a) Play video games

    (b) Don't play video games

Section C: Sample Spaces and Outcomes

10. A spinner with 3 sections (A, B, C) is spun twice.

    (a) List all possible outcomes

    (b) How many outcomes are in the sample space?

    (c) Find $P(\text{two As})$

    (d) Find $P(\text{at least one B})$

    (e) Find $P(\text{no Cs})$

11. Two fair dice are rolled and the maximum of their scores is recorded.

    (a) Complete the sample space table showing all possible maximum values:

Max	1	2	3	4	5	6
1	1	2	3	4	5	6
2	2					
3	3					
4	4					
5	5					
6	6					

(b) Find $P(\text{maximum} = 1)$

(c) Find $P(\text{maximum} = 6)$

(d) Find $P(\text{maximum} < 4)$

(e) Find $P(\text{maximum is odd})$

12. A wheel has 5 equal sections: Violet (V), Indigo (I), Cyan (C), Lime (L), Magenta (M). The wheel is spun twice.

   (a) List all possible outcomes

   (b) Find $P(\text{different colours})$

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

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

13. A set contains numbers 6, 8, 10, 12. Two numbers are drawn without replacement.

   (a) List all possible pairs

   (b) Find $P(\text{both numbers even})$

   (c) Find $P(\text{sum of numbers} = 18)$

   (d) Find $P(\text{larger number} - \text{smaller number} = 4)$

Section D: Probability Rules

14. For mutually exclusive events R and S, where $P(R) = 0.35$ and $P(S) = 0.25$:

   (a) Find $P(R \text{ or } S)$

   (b) Find $P(\text{neither } R \text{ nor } S)$

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

15. A card is drawn from a standard pack. Let J = "drawing a spade" and K = "drawing a 10".

   (a) Find $P(J)$

   (b) Find $P(K)$

   (c) Find $P(J \text{ and } K)$

   (d) Find $P(J \text{ or } K)$

   (e) Are events J and K mutually exclusive? Explain.

16. The probability of fog on Sunday is 0.6. The probability of fog on Monday is 0.3. Assuming the events are independent:

   (a) Find the probability of fog on both days

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

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

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

17. A biased coin has $P(\text{heads}) = 0.3$. 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 $P(\text{exactly one tail})$

Section E: Tree Diagrams

18. A box contains 6 triangle pieces and 4 circle pieces. Two pieces are drawn without replacement.

    (a) Draw a tree diagram showing all possibilities

    (b) Find $P(\text{two triangle pieces})$

    (c) Find $P(\text{two circle pieces})$

    (d) Find $P(\text{one triangle and one circle})$

    (e) Find $P(\text{at least one triangle piece})$

19. The probability that a student passes Chemistry is 0.78 and passes Physics is 0.82. 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 library has two printers. Printer A works 93% of the time, Printer B works 87% of the time.

    (a) Draw a tree diagram

    (b) Find the probability both printers work

    (c) Find the probability exactly one printer works

    (d) Find the probability at least one printer works

    (e) Find the probability neither printer works

21. Tin 1 contains 7 square tiles and 3 round tiles. Tin 2 contains 4 square tiles and 6 round tiles. A tin is chosen at random, then a tile is drawn from that tin.

    (a) Draw a tree diagram

    (b) Find the probability of drawing a square tile

    (c) Find the probability of drawing a round tile

    (d) If a round tile is drawn, what is the probability it came from Tin 2?

Section F: Conditional Probability

22. The two-way table shows information about customers and their payment method:

	Cash	Card	Total
Adults	18	42	60
Children	27	13	40
Total	45	55	100

A customer is chosen at random. Find:

(a) P(pays with card)

(b) P(adult)

(c) P(pays with card and is adult)

(d) P(pays with card — adult)

(e) P(adult — pays with card)

23. In a survey of 180 people about social media preferences:

   - 110 people use Instagram
   - 85 people use TikTok
   - 55 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 bucket has red and orange marbles. $P(\text{red}) = \frac{5}{11}$. Two marbles are drawn without replacement.

   If there are 22 marbles in total:

   (a) How many red marbles are there?

   (b) How many orange marbles are there?

   (c) Find P(second marble is red — first marble is red)

   (d) Find P(second marble is red — first marble is orange)

Section G: Experimental vs Theoretical Probability

25. A biased die is rolled 400 times with these results:

Number	1	2	3	4	5	6
Frequency	55	60	70	80	75	60

   (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 1000 times, estimate how many 3s you would expect

26. A lottery machine is tested and gives these results: Blue: 62 times, White: 31 times, Gold: 7 times

   (a) How many times was the machine used?

   (b) Calculate the experimental probability of each colour

   (c) What might these probabilities suggest about the machine design?

   (d) Estimate how many times white would appear in 300 draws

27. A dice is rolled 75 times and shows a 6 exactly 18 times.

   (a) What is the experimental probability of rolling a 6?
   (b) What is the experimental probability of not rolling a 6?
   (c) Is this dice likely to be fair? Explain your reasoning.
   (d) If the dice is rolled 150 more times, estimate how many 6s you would expect

Section H: Problem Solving

28. In a sweepstake, the probability of winning the top prize is $\frac{1}{80000000}$.

   (a) Express this as a decimal (to 3 significant figures)
   (b) What is the probability of not winning?
   (c) If 20 million people enter, estimate how many will win
   (d) Is it sensible to expect to win? Explain.

29. An allergy test is 94% accurate. This means:

   • If someone has the allergy, there's a 94% chance the test is positive
   • If someone doesn't have the allergy, there's a 94% chance the test is negative

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

   (a) Out of 1000 people, how many actually have the allergy?
   (b) How many of those with the allergy will test positive?
   (c) How many without the allergy will test negative?
   (d) How many false positives will there be?

30. Six people each pick a letter from A to F. What is the probability that:

   (a) All six pick the same letter?
   (b) All six pick different letters?
   (c) At least five pick the same letter?
   (d) Everyone avoids picking the letter A?

31. A door lock has a 5-button code. Each button shows a different color and can be pressed once. The order matters.

   (a) How many different codes are possible?
   (b) What is the probability of getting the code right in one attempt?
   (c) If there are 8 colored buttons and you must press exactly 3, how many codes are possible?

32. In a board game, you advance if you roll two dice and get a double (same number on both).

   (a) List all possible doubles
   (b) What is the probability of rolling a double?
   (c) What is the probability of rolling a double 6?
   (d) If you roll 180 times, estimate how many doubles you would get
   (e) If advancing needs a double and moving backwards happens otherwise, is this fair?

Answer Space

Use this space for your working and answers.

END OF TEST

Total marks: 100

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