GCSE Foundation Mathematics
Practice Test 6: 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 prime number when rolling a fair die

   (b) Rolling a 0 on a standard six-sided die

   (c) A baby being born on a Wednesday

   (d) Getting a number greater than 6 when rolling a standard die

   (e) Choosing a court card (J, Q, K) from a standard pack

   (f) A year having 366 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) $P(\text{fairly likely}) = 0.75$

   (e) $P(\text{rare}) = \frac{1}{8}$

3. Complete these probability statements:

   (a) All probabilities are between _____ and _____

   (b) If $P(W) = 0.35$, then $P(\text{not } W) =$ _____

   (c) If $P(V) = \frac{8}{15}$, then $P(\text{not } V) =$ _____

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

4. A dial has 9 equal segments with these numbers: 7, 14, 21, 28, 35, 42, 49, 56, 63. Write down:

   (a) The sample space

   (b) $P(\text{spinning 42})$

   (c) $P(\text{spinning a multiple of 21})$

   (d) $P(\text{spinning a number greater than 50})$

   (e) $P(\text{spinning a two-digit number})$

Section B: Single Event Probability

5. A fair twenty-sided die numbered 1-20 is rolled. Find the probability of rolling:
   (a) A 15
   (b) A triangular number
   (c) A number greater than 14
   (d) A number less than or equal to 6
   (e) A multiple of 5
   (f) A number between 8 and 13 (inclusive)

6. A pouch contains 13 fabric squares, 10 felt circles, and 5 leather strips. An item is drawn at random. Find the probability of drawing:
   (a) A fabric square
   (b) A felt circle
   (c) A leather strip
   (d) A fabric square or felt circle
   (e) Not a leather strip
   (f) Not a fabric square

7. A standard pack of 52 playing cards is shuffled. Find the probability of drawing:
   (a) An 8
   (b) A spade
   (c) A black card
   (d) The king of hearts
   (e) A 2 or 3
   (f) A red 8

8. The probability that Ben scores in a football match is $\frac{5}{12}$. What is the probability that he doesn't score?

9. In a photography club of 45 members, 32 own digital cameras. If a member is chosen at random, find the probability they:
   (a) Own a digital camera
   (b) Don't own a digital camera

Section C: Sample Spaces and Outcomes

10. A four-sided die (numbered 1-4) is rolled twice.
    (a) List all possible outcomes
    (b) How many outcomes are in the sample space?
    (c) Find P(both rolls show 4)
    (d) Find P(at least one roll shows 1)
    (e) Find P(first roll greater 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 7 equal sections: Aqua (A), Bronze (B), Copper (C), Denim (D), Emerald (E), Frost (F), Gold (G). 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 aqua)

(d) Find P(no bronze)

13. A set contains prime numbers 11, 13, 17, 19. Two numbers are drawn without replacement.

(a) List all possible pairs

(b) Find P(both numbers are prime)

(c) Find P(sum of numbers = 30)

(d) Find P(product of numbers > 200)

Section D: Probability Rules

14. For mutually exclusive events X and Y, where $P(X) = 0.28$ and $P(Y) = 0.42$:

(a) Find $P(X$ or $Y)$

(b) Find P(neither X nor Y)

(c) What is $P(X$ and $Y)$? Explain your answer.

15. A card is drawn from a standard pack. Let P = "drawing a club" and Q = "drawing a face card".

(a) Find $P(P)$

(b) Find $P(Q)$

(c) Find $P(P$ and $Q)$

(d) Find $P(P$ or $Q)$

(e) Are events P and Q mutually exclusive? Explain.

16. The probability of snow on Thursday is 0.4. The probability of snow on Friday is 0.6. Assuming the events are independent:

(a) Find the probability of snow on both days

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

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

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

17. A biased coin has $P(\text{heads}) = 0.65$. The coin is flipped three times.

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

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

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

(d) Find $P(\text{exactly one head})$

Section E: Tree Diagrams

18. A container has 8 smooth stones and 4 rough stones. Two stones are drawn without replacement.

(a) Draw a tree diagram showing all possibilities

(b) Find $P(\text{two smooth stones})$

(c) Find $P(\text{two rough stones})$

(d) Find $P(\text{one smooth and one rough})$

(e) Find $P(\text{at least one smooth stone})$

19. The probability that a student passes French is 0.84 and passes German is 0.76. 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 center has two escalators. Escalator A works 91% of the time, Escalator B works 94% of the time.

(a) Draw a tree diagram

(b) Find the probability both escalators work

(c) Find the probability exactly one escalator works

(d) Find the probability at least one escalator works

(e) Find the probability neither escalator works

21. Pocket 1 contains 5 round buttons and 5 square buttons. Pocket 2 contains 8 round buttons and 2 square buttons. A pocket is chosen at random, then a button is drawn from that pocket.

(a) Draw a tree diagram

(b) Find the probability of drawing a round button

(c) Find the probability of drawing a square button

(d) If a square button is drawn, what is the probability it came from Pocket 1?

Section F: Conditional Probability

22. The two-way table shows information about hotel guests and their room type:

	Single room	Double room	Total
Business travelers	22	38	60
Tourists	48	32	80
Total	70	70	140

A guest is chosen at random. Find:

(a) P(double room)

(b) P(business traveler)

(c) P(double room and business traveler)

(d) P(double room — business traveler)

(e) P(business traveler — double room)

23. In a survey of 240 people about streaming services:

- 150 people use Netflix
- 120 people use Disney+
- 80 people use both Netflix and Disney+

Find the probability that a randomly chosen person:

(a) Uses Netflix or Disney+

(b) Uses neither Netflix nor Disney+

(c) Uses Disney+ given they use Netflix

(d) Uses only Netflix

(e) Uses only Disney+

24. A container has red and silver marbles. $P(\text{red}) = \frac{7}{16}$. Two marbles are drawn without replacement.

If there are 32 marbles in total:

(a) How many red marbles are there?

(b) How many silver marbles are there?

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

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

Section G: Experimental vs Theoretical Probability

25. A biased die is rolled 600 times with these results:

Number	1	2	3	4	5	6
Frequency	80	95	110	120	100	95

(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 1800 times, estimate how many 6s you would expect

26. A carnival wheel is tested and gives these results: Jade: 72 times, Coral: 48 times, Pearl: 36 times, Ruby: 24 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 jade would appear in 540 spins

27. A die is rolled 120 times and shows an even number 78 times.

    (a) What is the experimental probability of rolling an even number?
    (b) What is the experimental probability of rolling an odd number?
    (c) Is this die likely to be fair? Explain your reasoning.
    (d) If the die is rolled 200 more times, estimate how many even numbers you would expect

Section H: Problem Solving

28. In a contest, the probability of winning the jackpot is $\frac{1}{120000000}$.

    (a) Express this as a decimal (to 3 significant figures)
    (b) What is the probability of not winning?
    (c) If 24 million people enter, estimate how many will win
    (d) Is it sensible to expect to win? Explain.

29. A pregnancy test is 99% accurate. This means:

    - If someone is pregnant, there's a 99% chance the test is positive
    - If someone isn't pregnant, there's a 99% chance the test is negative

    In a group where 12% of people are pregnant:

    (a) Out of 1000 people, how many are actually pregnant?
    (b) How many of those who are pregnant will test positive?
    (c) How many who aren't pregnant will test negative?
    (d) How many false positives will there be?

30. Eight friends each pick a playing card suit (hearts, diamonds, clubs, spades). What is the probability that:

    (a) All eight pick the same suit?
    (b) All eight pick different suits? (Impossible - explain why)
    (c) At least seven pick the same suit?
    (d) No one picks hearts?

31. A computer password uses 3 different letters from the alphabet. No letter can be repeated and order matters.

    (a) How many different passwords are possible?
    (b) What is the probability of guessing the password correctly in one attempt?
    (c) If vowels (A, E, I, O, U) cannot be used, how many passwords are possible?

32. In a dice game, you win if you roll four dice and get exactly three of the same number.

(a) In how many ways can you choose which three dice show the same number?

(b) If the three dice all show 6s, how many outcomes are possible for the fourth die?

(c) What is the probability of getting exactly three 6s?

(d) If you play 1296 games, estimate how many you would win with exactly three 6s

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

Answer Space

Use this space for your working and answers.

END OF TEST

Total marks: 100

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