# Probability & Data – Question Set

## Descriptive Statistics

**Q1** Write the mean, median and mode for the data: 18, 22, 20, 15, 22, 19, 17, 24.

**Q2** Calculate the sample standard deviation of Q1's data (1d.p.).

**Q3** Construct a five–number summary and IQR for heights (cm): 162, 170, 175, 168, 182, 177, 165, 171, 169, 174.

**Q4** State whether the distribution in Q3 is positively skewed, negatively skewed or roughly symmetrical. Justify.

### Visualising Data

**Q5** Describe two features (centre and spread) visible in a box plot.

**Q6** A stem–leaf display shows exam marks clustered near 70 with a long tail to the right. What does this imply about difficulty?

### Basic Probability

**Q7** A bag contains 6 red, 4 blue, 5 green marbles. One is drawn at random. (a) Find $P(\text{green})$

**Q8** A die is biased so $P(6) = 0.30$ and all other faces are equally likely. Determine $P(3)$.

**Q9** Two events $A, B$ are independent with $P(A) = 0.45$ and $P(B) = 0.20$.

**(a)** Find $P(A \cap B)$.

**(b)** Find $P(A \cup B)$.

**Q10** What is the complement of "at least one head in three flips"? State its probability.

### Relative Frequency & Experiments

**Q11** A spinner lands on yellow 64 times in 250 spins. Estimate $P(\text{yellow})$.

**Q12** If the experiment in Q10 is repeated for another 750 spins, how many yellows are expected?

## Two–Way Tables & Conditional Probability

**Q13** Complete the table and answer questions (a) to (c):

| | Owns Car | No Car | Total |
|---|---|---|---|
| Under 25 | 18 | 47 | |
| 25+ | 54 | 21 | |
| Total | | | 140 |

**(a)** Fill the missing frequencies.

**(b)** What is $P(\text{owns car})$?

**(c)** Find $P(\text{under 25} \mid \text{no car})$.

## Expected Value & Games

**Q14** A game pays \$10 for rolling a 1 on a fair die, \$4 for a 2 or 3, and loses \$2 otherwise. Compute the expected gain per roll.

**Q15** Should a player pay \$1 to play the game in Q12? Explain.

## Binomial Model

**Q16** For a fair coin tossed 12 times, find:

**(a)** $P(\text{exactly 7 heads})$

**(b)** $P(\text{at most 3 tails})$

**Q17** A basketballer sinks 75

**Q18** Give the mean and standard deviation of the distribution in Q14.

## Normal Approximation (Intro) *(optional extension)*

**Q19** Explain when the binomial distribution $B(n, p)$ can be approximated by a normal distribution.

## Mixed Practice

**Q20** (a) State two reasons sample data may be biased (b) Name one method to reduce sampling bias

**Q21** A survey finds 35

**Q22** A discrete variable $X$ has pmf $P(X = x) = k(5 - x)$ for $x = 1, 2, 3, 4$.

**(a)** Find $k$.

**(b)** Compute $E(X)$.

# Challenge Question

**Q23 Quality Control** Packets of seeds claim a 90 percent germination rate. A horticulturist tests 120 seeds and 98 germinate.

**(a)** Model the number of germinations with an appropriate distribution and state its mean.

**(b)** Calculate the probability of 98 or fewer germinations.

**(c)** Comment on whether the company's claim appears valid.