

## Section 1: Introducing the binomial distribution

### Exercise level 2

1. A multiple choice test consists of ten questions each of which has five possible answers. A particular student decides to select her answers at random. Find the probability of obtaining
  - (i) only one correct answer
  - (ii) exactly five correct answers
  - (iii) fewer than three correct answers
  - (iv) at least two correct answers.
2. In an experiment, a biased coin is thrown ten times. If the probability of obtaining a head on any throw is 0.4, find the probability of obtaining
  - (i) fewer than five heads
  - (ii) exactly five heads
  - (iii) more than three heads.
  - (iv) If the above experiment is performed seven times, what is the probability that exactly five heads are obtained on exactly two occasions?
3. A box contains a large number of bulbs. 20% of the bulbs are white, the rest are red. Bulbs are selected at random.  
How many bulbs must be selected so that the probability that there is at least one white bulb is greater than 0.95?
4. Using recent data provided by the low-cost airline Sneezyjet, the probability that a passenger loses his suitcase on a flight is estimated to be 0.15.  
Each week I make six different flights with Sneezyjet.
  - (i) In a particular week, find the probability that
    - (a) I arrive with my suitcase on all flights,
    - (b) I lose my suitcase exactly once,
    - (c) I lose my suitcase more than once,
    - (d) I lose my suitcase exactly three times.
  - (ii) If I fly for four weeks with six flights each week, what is the probability that I arrive with my suitcase on all flights for three weeks out of the four?
5. Past records show that a particular basketball player scores on 35% of her free shots. In practice the player takes sets of 10 free shots.
  - (i) Comment on the suitability of using the binomial distribution for modelling the number of times she will score from a set of 10 free shots.
  - (ii) Assuming that the binomial distribution is appropriate, find the probability that she will score fewer than four times in a set of 10 free shots.
  - (iii) One day the player takes five sets of 10 free shots. Find the probability that she scores fewer than four times in exactly three of the sets.

## Edexcel AS Maths The binomial distribution 1 Exercise

6. The random variable  $X$  has the distribution  $X \sim B(21, p)$  where  $0 < p < 1$ .  
Given that  $P(X = 10) = P(X = 9)$ , find the value of  $p$ .
7. In a large city one person in five is left-handed.
- (i) Find the probability that in a random sample of ten people, exactly 3 will be left-handed.
  - (ii) Find the probability that in a random sample of fifteen people, more than half of them will be left-handed.
  - (iii) Find the most likely number of left-handed people in a random sample of twelve people.
  - (iv) How large must a random sample be if the probability that it contains no left-handed people is to be less than 0.05 ?