

## Section Check In – 2.04 Statistical Distributions

### Questions

- The probability distribution of a discrete random variable  $X$  is given by  
$$P(X = x) = \frac{kx}{4} \text{ for } x = 1, 2, 3, 4$$
Find the value of  $k$  and tabulate the probability distribution of  $X$ .
- If  $X \sim B(14, 0.3)$  find  $P(X = 2)$ .
- An optician has ten appointments a day. The number of these appointments of which someone is classed as being short-sighted is denoted by  $S$ . The variable  $S$  is modelled by the distribution  $S \sim B(10, 0.35)$ . Show that according to this model, the optician is more likely to see four people who are short-sighted in one day than two people.
- John organises a running race around a park. He assumes that the probability of each person entering the race being a male is 0.7.
  - Calculate the probability that the first 20 people to enter are all males.
  - Calculate the probability that the first 6 people to enter the race will comprise three males and three females.

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AS LEVEL and STAGE 1 CONTENT  
**MATHEMATICS A**  
Section Check In

## Worked solutions

1.  $\frac{k}{4} + \frac{2k}{4} + \frac{3k}{4} + \frac{4k}{4} = 1 \Rightarrow \frac{10k}{4} = 1 \Rightarrow k = 0.4$

$X$	1	2	3	4
$P(X = x)$	$\frac{1}{10}$	$\frac{2}{10}$	$\frac{3}{10}$	$\frac{4}{10}$

2.  $P(X = 2) = \binom{14}{2} \times 0.3^2 \times 0.7^{12} = 0.113$  (3sf) or by using calculator probability functions (**BC**).

3.  $P(X = 4) = \binom{10}{4} \times 0.35^4 \times 0.65^6 = 0.238$  (3sf)

$$P(X = 2) = \binom{10}{2} \times 0.35^2 \times 0.65^8 = 0.176$$
 (3sf)

4. (i)  $0.7^{20} = 0.000798$  (3sf)

(ii) Let  $X$  be the number of males in the first 6 to enter the race.

$$X \sim B(6, 0.7) \Rightarrow P(X = 3) = \binom{6}{3} \times 0.7^3 \times 0.3^3 = 0.18522$$

If 3 are male then the other 3 are female.

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