Cambridge International AS & A Level

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Mathematics 9709/52

Paper 5 Probability & Statistics 1 October/November 2023

Question No (2)

2 George has a fair 5-sided spinner with sides labelled 1, 2, 3, 4, 5. He spins the spinner and notes the number on the side on which the spinner lands.

(a) Find the probability that it takes fewer than 7 spins for George to obtain a 5.

George spins the spinner 10 times.

(b) Find the probability that he obtains a 5 more than 4 times but fewer than 8 times.

Solution:

(a) Let X be a function of geometric distribution

$P(\text{spinner lands on 5}) = p = 0.2$

$\Rightarrow q = 1 - 0.2$

$= 0.8$

$P(X < 7)$ $\quad X \sim Geo(0.2)$

$= 1 - q^6$

$= 1 - (0.8)^6$

$= 0.737856$

≈ 0.738

(b) Let X, number of spins, be a function of binomial distribution

$P(\text{spinner lands on 5}) = p = 0.2$

$P(\text{spinner does not land on 5}) = q = 1 - 0.2$

$= 0.8$

$P(\text{obtains a 5, more than but less than 8 times})$

$\Rightarrow P(X > 4) \text{ or } P(X < 8)$ $\quad X \sim B(10, 0.2)$

$= P(X = 5) + P(X = 6) + P(X = 7)$

$$= \binom{10}{5}(0.2)^5(0.8)^5 + \binom{10}{6}(0.2)^6(0.8)^4 + \binom{10}{7}(0.2)^7(0.8)^3$$

$$= 0.02642 + 0.005505 + 0.000786$$

$$= 0.032711$$

$$\approx 0.0327$$