

Cambridge International AS & A Level

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Mathematics

9709/52

Paper 5 Probability & Statistics 1

May/June 2021

Question No (1)

- 1** An ordinary fair die is thrown repeatedly until a 5 is obtained. The number of throws taken is denoted by the random variable  $X$ .
- (a) Write down the mean of  $X$ .
- (b) Find the probability that a 5 is first obtained after the 3rd throw but before the 8th throw.
- (c) Find the probability that a 5 is first obtained in fewer than 10 throws.

Solution:

(a)

$$P(5) = p = \frac{1}{6}$$

∴ sample space  
is

1, 2, 3, 4, 5, 6

$$P(5) = \frac{1}{6}$$

∴ in G.D

$$\text{mean} = \frac{1}{p}$$

$$\therefore \text{Mean of } X = \frac{1}{p} = \frac{1}{\frac{1}{6}} = 6$$

(b)

$$\text{As } p = \frac{1}{6}, \quad q = 1 - p \\ = 1 - \frac{1}{6} \\ q = \frac{5}{6}$$

By given condition

$P(5 \text{ obtained after 3rd but before 8th throw})$

$$= q^3 p + q^4 p + q^5 p + q^6 p$$

$$= p(q^3 + q^4 + q^5 + q^6)$$

$$= \frac{1}{6} \left[ \left(\frac{5}{6}\right)^3 + \left(\frac{5}{6}\right)^4 + \left(\frac{5}{6}\right)^5 + \left(\frac{5}{6}\right)^6 \right]$$

$$= 0.2996$$

$$\approx 0.300$$

$$\textcircled{c} P(5 \text{ obtained in fewer than 10 throws}) = 1 - \left(\frac{5}{6}\right)^9 \\ = 0.866$$

