

Cambridge International AS & A Level

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Mathematics

9709/52

Paper 5 Probability & Statistics 1

October/November 2023

Question No (1)

- 1 A competitor in a throwing event has three attempts to throw a ball as far as possible. The random variable X denotes the number of throws that exceed 30 metres. The probability distribution table for X is shown below.

x	0	1	2	3
$P(X = x)$	0.4	p	r	0.15

- (a) Given that $E(X) = 1.1$, find the value of p and the value of r .
- (b) Find the numerical value of $\text{Var}(X)$.

Solution:

$$\textcircled{a} \text{ AS } \sum p_i = 1$$

$$\Rightarrow 0.4 + p + r + 0.15 = 1$$

$$p + r = 1 - 0.4 - 0.15$$

$$p + r = 0.45$$

$$p = 0.45 - r \rightarrow \textcircled{1}$$

$$\text{AS } E(X) = 1.1 \quad \text{given}$$

$$\Rightarrow (0)(0.4) + (1)(p) + 2(r) + 3(0.15) = 1.1$$

$$p + 2r + 0.45 = 1.1$$

$$p + 2r = 1.1 - 0.45$$

$$= 0.65$$

$$p = 0.65 - 2r \rightarrow \textcircled{2}$$

solving $\textcircled{1}$ & $\textcircled{2}$

$$0.45 - r = 0.65 - 2r$$

$$2r - r = 0.65 - 0.45$$

$$r = 0.2$$

substitute value of r in to $\textcircled{1}$

$$p = 0.45 - 0.2$$

$$p = 0.25$$

$$\therefore r = 0.2, p = 0.25$$

$$(b) \quad \text{Var}(X) = \sum_{i=1}^n P_i \cdot x_i^2 - [E(X)]^2$$

$$= (0.4)(0)^2 + (0.25)(1)^2 + (0.2)(2)^2 + (0.15)(3)^2 - (1.1)^2$$

$$= 2.4 - 1.21$$

$$\text{Var}(X) = 1.19$$