SOLUTION TO 10.13.3.41

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Question: The probability distribution of a discrete random variable X is given as under:

X	1	2	4	$2A$	$3A$	$5A$
p(X)	$\frac{1}{2}$	$\frac{1}{5}$	$\frac{3}{25}$	$\frac{1}{10}$	$\frac{1}{25}$	$\frac{1}{25}$

Calculate:

a) The value of A if $E(X)$ =2.94
b) Variance of X.

Solution: We know,

$$E(X) = \sum_{k=X} k p_X(k) \tag{1}$$

$$\implies 2.94 = \frac{1}{2} + \frac{2}{5} + \frac{12}{25} + \frac{2A}{10} + \frac{3A}{25} + \frac{5A}{25} \tag{2}$$

$$\implies 2.94 = \frac{25 + 20 + 24 + 10A + 6A + 10A}{50} \tag{3}$$

$$\implies 2.94 = \frac{69 + 26A}{50} \tag{4}$$

$$\implies 147 = 69 + 26A \tag{5}$$

$$\implies A = 3 \tag{6}$$

Now , we know

$$Var(X) = E(X^2) - [E(X)]^2 \tag{7}$$

$$= \sum_{K=X} k^2 p_X(k) - [E(X)]^2 \tag{8}$$

$$= \frac{1}{2} + \frac{4}{5} + \frac{48}{25} + \frac{4A^2}{10} + \frac{9A^2}{25} + \frac{25A^2}{25} - [E(X)]^2 \tag{9}$$

$$= \frac{161 + 88A^2}{50} - [E(X)]^2 \tag{10}$$

$$\because A = 3 \;\; E(X) = 2.94 \tag{11}$$

$$= \frac{953}{50} - [2.94]^2 \tag{12}$$

$$= 19.06 - 8.6436 = 10.4164 \tag{13}$$