

Assignment 6

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Python Code link : <https://github.com/ParvezAlam123/Assignment-6>

1 Prob. misc. 5.11

A class has 15 students whose ages are 14,17,15,14,21,17,19,20,16,18,20,17,16,19 and 20 years. One student is selected in such a manner that each has the same chance of being chosen and the age X of the selected student is recorded. What is the probability distribution of the random variable X ? Find mean, variance and the standard deviation of X.

Solution :

Age(X)	No of Student
14	2
15	1
16	2
17	3
18	1
19	2
20	3
21	1

$$P(X = 14) = 2 \times \frac{1}{15} = 0.133$$

$$P(X = 15) = \frac{1}{15} = 0.0667$$

$$P(X = 16) = 2 \times \frac{1}{15} = 0.133$$

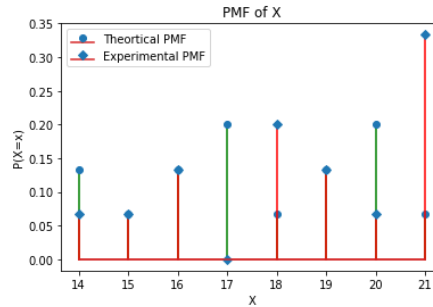
$$P(X = 17) = 3 \times \frac{1}{15} = 0.2$$

$$P(X = 18) = \frac{1}{15} = 0.0667$$

$$P(X = 19) = 2 \times \frac{1}{15} = 0.133$$

$$P(X = 20) = 3 \times \frac{1}{15} = 0.2$$

$$P(X = 21) = \frac{1}{15} = 0.0667$$



Mean(Expectation):

$$\begin{aligned} E[X] &= \sum_{i=1}^7 xP(X = x) \\ &= 14 \times 0.133 + 15 \times 0.0667 + 16 \times 0.133 + 17 \times 0.2 + 18 \times 0.0667 + 19 \times 0.133 \\ &\quad + 20 \times 0.2 + 21 \times 0.0667 \end{aligned}$$

$$= 17.5188$$

$$\begin{aligned} E[X^2] &= \sum_{i=1}^7 x^2 P(X = x) \\ &= 14^2 \times 0.133 + 15^2 \times 0.0667 + 16^2 \times 0.133 + 17^2 \times 0.2 + 18^2 \times 0.0667 \end{aligned}$$

$$+19^2 \times 0.133 + 20^2 \times 0.2 + 21^2 \times 0.0667 = 5.054$$

$$= 311.962$$

Standard Deviation:

Variance :

$$Var(X) = E[X^2] - (E[X])^2$$

$$= 311.962 - 17.5188^2$$

$$= 311.962 - 306.908$$

$$S.D. = \sqrt{Variance}$$

$$= \sqrt{5.054}$$

$$= 2.248$$