Assignment 6

Parvez Alam : AI21RESCH01005

March 2021

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

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

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

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

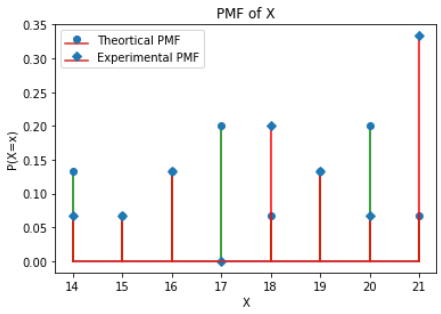
$$P(X=17) = 3 \times \frac{1}{15} = 0.2$$

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

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

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

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



Mean(Expectation):

$$\begin{aligned} E[X] &= \sum_{1}^{7} xP(x=x) \\ &= 14 \times 0.133 + 15 \times 0.0667 + 16 \times 0.133 + 17 \times 0.2 \\ &\quad + 18 \times 0.0667 + 19 \times 0.133 + 20 \times 0.2 + 21 \times 0.0667 \\ &= 17.5188 \end{aligned}$$

$$
\begin{aligned}
E[X^2] &= \sum_{1}^{7} x^2 P(X = x) \\
&= 14^2 \times 0.133 + 15^2 \times 0.0667 \\
&+ 16^2 \times 0.133 + 17^2 \times 0.2 \\
&+ 18^2 \times 0.0667 + 19^2 \times 0.133 \\
&+ 20^2 \times 0.2 + 21^2 \times 0.0667 \\
&= 311.962
\end{aligned}
$$

Varience :

$$
\begin{aligned}
Var(X) &= E[X^2] - (E[X])^2 \\
&= 311.962 - 17.5188^2 \\
&= 311.962 - 306.908 \\
&= 5.054
\end{aligned}
$$

Standard Deviation:

$$
\begin{aligned}
S.D. &= \sqrt{Varience} \\
&= \sqrt{5.054} \\
&= 2.248
\end{aligned}
$$