# 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 |

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

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

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

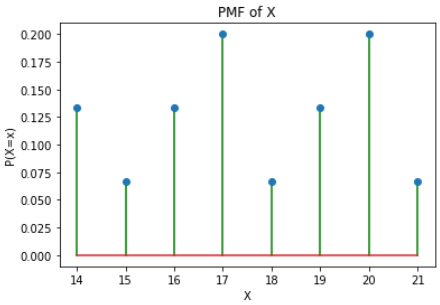
$$P(X=17) = 3 \times \frac{1}{15} = 0.2$$

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

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

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

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




**Mean(Expectation):**

$$E[X] = \sum_{1}^{7} xP(X=x)$$

$$= 14\times0.133+15\times0.0667+16\times0.133+17\times0.2+18\times0.0667+19\times0.133 +20\times0.2+21\times0.0667$$

$$= 17.5188$$

$$E[X^2] = \sum_{1}^{7} x^2P(X=x)$$

$$= 14^2\times0.133+15^2\times0.0667+16^2\times0.133+17^2\times0.2+18^2\times0.0667$$

$$+19^2 \times 0.133 + 20^2 \times 0.2 + 21^2 \times 0.0667$$
$$= 311.962$$

**Varience :**

$$Var(X) = E[X^2] - (E[X])^2$$
$$= 311.962 - 17.5188^2$$
$$= 311.962 - 306.908$$
$$= 5.054$$

**Standard Deviation:**

$$S.D. = \sqrt{Varience}$$
$$= \sqrt{5.054}$$
$$= 2.248$$