

EXERCISE 32.2

Question. 1(i)

Solution:

We know that, Mean of any probability distribution = $\sum x_i p_i$

x_i	p_i	$x_i p_i$	$x_i^2 p_i$
2	0.2	0.4	0.8
3	0.5	1.5	4.5
4	0.3	1.2	4.8
		$\sum x_i p_i = 3.1$	$\sum x_i^2 p_i = 10.1$

$$\begin{aligned} \text{Then, Variance} &= \sum p_i x_i^2 - (\sum x_i p_i)^2 \\ &= 10.1 - (3.1)^2 \\ &= 0.49 \end{aligned}$$

$$\begin{aligned} \text{Therefore, Standard deviation} &= \sqrt{\text{Variance}} \\ &= \sqrt{0.49} \\ &= 0.7 \end{aligned}$$

Question. 1(ii)

Solution:

We know that, Mean of any probability distribution = $\sum x_i p_i$

x_i	p_i	$x_i p_i$	$x_i^2 p_i$
1	0.4	0.4	0.4
3	0.1	0.3	0.9
4	0.2	0.8	3.2
5	0.3	1.5	7.5
		$\sum x_i p_i = 3$	$\sum x_i^2 p_i = 12$

$$\begin{aligned} \text{Then, Variance} &= \sum p_i x_i^2 - (\sum x_i p_i)^2 \\ &= 12 - (3)^2 \\ &= 3 \end{aligned}$$

$$\begin{aligned} \text{Therefore, Standard deviation} &= \sqrt{\text{Variance}} \\ &= \sqrt{3} \\ &= 1.732 \end{aligned}$$

Question. 1(iii)

Solution:

We know that, Mean of any probability distribution = $\sum x_i p_i$

x_i	p_i	$x_i p_i$	$x_i^2 p_i$
-5	$\frac{1}{4}$	$-\frac{5}{4}$	$\frac{25}{4}$
-4	$\frac{1}{8}$	$-\frac{1}{2}$	2
1	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$
2	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{1}{2}$
		$\sum x_i p_i = -1$	$\sum x_i^2 p_i = \frac{37}{4}$

$$\begin{aligned} \text{Then, Variance} &= \sum p_i x_i^2 - (\sum x_i p_i)^2 \\ &= \frac{37}{4} - (-1)^2 \\ &= \frac{33}{4} \end{aligned}$$

$$\begin{aligned} \text{Therefore, Standard deviation} &= \sqrt{\text{Variance}} \\ &= \sqrt{\frac{33}{4}} \\ &= 2.9 \end{aligned}$$

Question. 1(iv)
Solution:

We know that, Mean of any probability distribution = $\sum x_i p_i$

x_i	p_i	$x_i p_i$	$x_i^2 p_i$
-1	0.3	-0.3	0.3
0	0.1	0	0
1	0.1	0.1	0.1
2	0.3	0.6	1.2
3	0.2	0.6	1.8
		$\sum x_i p_i = 1$	$\sum x_i^2 p_i = 3.4$

$$\begin{aligned} \text{Then, Variance} &= \sum p_i x_i^2 - (\sum x_i p_i)^2 \\ &= 3.4 - (1)^2 \\ &= 2.4 \end{aligned}$$

$$\begin{aligned} \text{Therefore, Standard deviation} &= \sqrt{\text{Variance}} \\ &= \sqrt{2.4} \\ &= 1.5 \end{aligned}$$

Question. 1(v)
Solution:

We know that, Mean of any probability distribution = $\sum x_i p_i$

x_i	p_i	$x_i p_i$	$x_i^2 p_i$
1	0.4	0.4	0.4
2	0.3	0.6	1.2
3	0.2	0.6	1.8
4	0.1	0.4	1.6
		$\sum x_i p_i = 2$	$\sum x_i^2 p_i = 5$

$$\begin{aligned} \text{Then, Variance} &= \sum p_i x_i^2 - (\sum x_i p_i)^2 \\ &= 5 - (2)^2 \\ &= 1 \end{aligned}$$

$$\begin{aligned} \text{Therefore, Standard deviation} &= \sqrt{\text{Variance}} \\ &= \sqrt{1} \\ &= 1 \end{aligned}$$

Question. 1(vi)
Solution:

We know that, Mean of any probability distribution = $\sum x_i p_i$

x_i	p_i	$x_i p_i$	$x_i^2 p_i$
0	0.2	0	0
1	0.5	0.5	0.5
3	0.2	0.6	1.8
5	0.1	0.4	2.5
		$\sum x_i p_i = 1.6$	$\sum x_i^2 p_i = 4.8$

$$\begin{aligned} \text{Then, Variance} &= \sum p_i x_i^2 - (\sum x_i p_i)^2 \\ &= 4.8 - (1.6)^2 \\ &= 4.8 - 2.56 \\ &= 2.24 \end{aligned}$$

$$\begin{aligned} \text{Therefore, Standard deviation} &= \sqrt{\text{Variance}} \\ &= \sqrt{2.24} \\ &= 1.497 \end{aligned}$$

Question. 1(vii)
Solution:

We know that, Mean of any probability distribution = $\sum x_i p_i$

x_i	p_i	$x_i p_i$	$x_i^2 p_i$
-2	0.1	-0.2	0.4
-1	0.2	-0.2	0.2
0	0.4	0	0
1	0.2	0.2	0.2
2	0.1	0.2	0.4
		$\sum x_i p_i = 0$	$\sum x_i^2 p_i = 1.2$

$$\begin{aligned}
 \text{Then, Variance} &= \sum p_i x_i^2 - (\sum x_i p_i)^2 \\
 &= 1.2 - (0)^2 \\
 &= 1.2 - 0 \\
 &= 1.2
 \end{aligned}$$

$$\begin{aligned}
 \text{Therefore, Standard deviation} &= \sqrt{\text{Variance}} \\
 &= \sqrt{1.2} \\
 &= 1.095
 \end{aligned}$$

Question. 1(viii)
Solution:

We know that, Mean of any probability distribution = $\sum x_i p_i$

x_i	p_i	$x_i p_i$	$x_i^2 p_i$
-3	0.05	-0.15	0.45
-1	0.45	-0.45	0.45
0	0.20	0	0
1	0.25	0.25	0.25
3	0.05	0.15	0.45
		$\sum x_i p_i = -0.2$	$\sum x_i^2 p_i = 1.6$

$$\begin{aligned}
 \text{Then, Variance} &= \sum p_i x_i^2 - (\sum x_i p_i)^2 \\
 &= 1.6 - (-0.2)^2 \\
 &= 1.6 - 0.04 \\
 &= 1.56
 \end{aligned}$$

$$\begin{aligned}
 \text{Therefore, Standard deviation} &= \sqrt{\text{Variance}} \\
 &= \sqrt{1.56} \\
 &= 1.249
 \end{aligned}$$