

Section 5.2

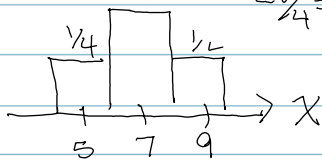
Properties of Expected Value & Variance

Demonstrate Properties through Example

Population 1 (x)

$\{5, 7, 7, 9\}$

x	P(x)	xP(x)	x ² P(x)
5	1/4	5/4	25/4
7	2/4	14/4	98/4
9	1/4	9/4	81/4
		28/4 = 7	204/4 = 51



$$\text{Range} = 9 - 5 = 4$$

Expected Val: $E(x)$

$$\mu = E(x) = \sum x \cdot P(x) = 7$$

$$\text{Std. Dev. } \sigma = \sqrt{\sum x^2 P(x) - \mu^2}$$

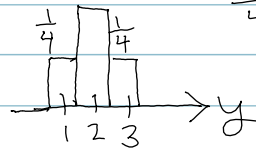
$$\sigma = \sqrt{51 - 7^2} = \sqrt{51 - 49} = \sqrt{2}$$

$$\text{Var}(x) = \sigma^2 = 2$$

Population 2 (y)

$\{1, 2, 2, 3\}$

y	P(y)	yP(y)	y ² P(y)
1	1/4	1/4	1/4
2	2/4	4/4	8/4
3	1/4	3/4	9/4
		8/4 = 2	18/4 = 9/2



$$\text{Range} = 3 - 1 = 2$$

Expected Value: $E(y)$

$$\mu = E(y) = \sum y \cdot P(y) = 2$$

$$\text{Std. Dev. } \sigma = \sqrt{\sum y^2 P(y) - \mu^2}$$

$$\sigma = \sqrt{\frac{9}{2} - 2^2} = \sqrt{\frac{9}{2} - 4} = \sqrt{\frac{1}{2}}$$

$$\text{Var}(y) = \sigma^2 = \frac{1}{2}$$

New Population: $x - y$

Every x minus every y

$x - y \{4, 3, 3, 2, 6, 5, 5, 4, 6, 5, 5, 4, 8, 7, 7, 6\}$ Range = $8 - 2 = 6$

$$\mu = E(x - y) = 5 = 7 - 2 = E(x) - E(y)$$

$$\sigma = 1.5811$$

$$\sigma^2 = \text{Var}(x - y) = \frac{5}{2} = 2.5 = 2 + 0.5$$

$$= \text{Var}(x) + \text{Var}(y)$$

x - y	P(x - y)
2	1/16
3	2/16
4	3/16
5	4/16
6	3/16
7	2/16
8	1/16

