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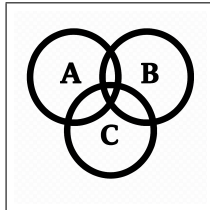
Variance / SD

N



$$X = \{1, 2, 3, 4, 5, 6\}$$

$$P(X = x) = \frac{1}{6}$$



$$E(X) = \sum_{x=1}^6 x \cdot \frac{1}{6} = \frac{1+2+3+4+5+6}{6} = \frac{21}{6} = 3.5$$

$$E(X^2) = \sum_{x=1}^6 x^2 \cdot \frac{1}{6} = \frac{1^2+2^2+3^2+4^2+5^2+6^2}{6} = \frac{91}{6}$$

$$\text{Var}(X) = E(X^2) - [E(X)]^2 = \frac{91}{6} - (3.5)^2 = \frac{91}{6} - \frac{49}{4} = \frac{182-147}{12} = \frac{35}{12} = \frac{35}{12}$$

$$\text{SD}(X) = \sqrt{\text{Var}(X)} = \sqrt{\frac{35}{12}} = \sqrt{\frac{35}{12}} \approx 1.708$$

$$\text{Var}(4X + 2) = 16 \text{Var}(X)$$



$$T = 1 : P(X = 100) = 0.90 : P(X = 500) = 0.08 : P(X = 1000) = 0.02$$

$$T = 2 : P(X = 100) = 0.80 : P(X = 500) = 0.11 : P(X = 1000) = 0.09$$

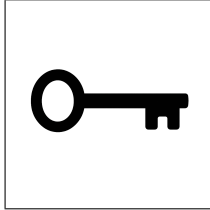
$$T = 3 : P(X = 100) = 0.70 : P(X = 500) = 0.20 : P(X = 1000) = 0.10$$

$$E[X] = ? : E[X^2] = ? : \text{Var}(X) = ? : \sigma_X = ?$$

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Variance / SD

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$$T = 1 : P(X = 100) = 0.90 : P(X = 500) = 0.08 : P(X = 1000) = 0.02$$

$$T = 2 : P(X = 100) = 0.80 : P(X = 500) = 0.11 : P(X = 1000) = 0.09$$

$$T = 3 : P(X = 100) = 0.70 : P(X = 500) = 0.20 : P(X = 1000) = 0.10$$

$$E[X] = ? : E[X^2] = ? : Var(X) = ? : \sigma_X = ?$$

$$E[X | T = 1] = 0.90(100) + 0.08(500) + 0.02(1000) = 90 + 40 + 20 = 150$$

$$E[X | T = 2] = 0.80(100) + 0.11(500) + 0.09(1000) = 80 + 55 + 90 = 225$$

$$E[X | T = 3] = 0.70(100) + 0.20(500) + 0.10(1000) = 70 + 100 + 100 = 270$$

$$E[X] = E[E[X | T]] = \frac{150+225+270}{3} = 215$$

$$E[X^2 | T = 1] = 0.90(100^2) + 0.08(500^2) + 0.02(1000^2) = 9000 + 20000 + 20000 = 49000$$

$$E[X^2 | T = 2] = 0.80(100^2) + 0.11(500^2) + 0.09(1000^2) = 8000 + 27500 + 90000 = 125500$$

$$E[X^2 | T = 3] = 0.70(100^2) + 0.20(500^2) + 0.10(1000^2) = 7000 + 50000 + 100000 = 157000$$

$$E[X^2] = \frac{49000+125500+157000}{3} = 110500$$

$$Var(X) = E[X^2] - (E[X])^2 = 110500 - 215^2 = 110500 - 46225 = 64275$$

$$\sigma_X = \sqrt{Var(X)} = \sqrt{64275} \approx 253.5$$