ASQ CRE Prep course

Lesson II. A. 2. c.

Basic Probability Concepts

Expectation


Just as we suspected
EXPECTATION

Expected Value

- **The expected value is like a weighted average**

$$\mu = E[x] = \int x f(x) dx$$

- **The mean is the expected value of a random variable**

$$\mu = E[x] = \sum p_i x_i$$

Variance and Notes

$$Var(x) = E\left[(x-\mu)^2\right] = \sigma^2$$

X is a random variable and c is a constant, then

$$E[c] = c \qquad Var[c] = 0$$

$$E[x] = \mu \qquad Var[x] = \sigma^2$$

$$E[cx] = cE[x] = c\mu \qquad Var[cx] = c^2 Var[x] = c^2\sigma^2$$

Robustness

- **Some statistical procedures still work well enough even if the underlying assumptions are not totally true**

$$E\left[s^2\right] = \sum \frac{s_i^2}{n} = \sigma^2$$

$$Var\left[s^2\right] = \frac{2\sigma^4}{n-1}$$ normal

$$Var\left[s^2\right] = \frac{2\sigma^4}{n-1}\left(1 + \frac{n-1}{2n}\left(\frac{\mu^4}{\sigma^4} - 3\right)\right)$$ Not normal

Do you see any similarity between histograms and PDFs?

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Lesson II. A. 3. a.

Probability Distributions

The Four Functions