



Chapter 7: Random Variables

Key Vocabulary:

- random variable
- discrete random variable
- probability distribution
- probability histogram
- density curve
- probability density curve
- continuous random variable
- uniform distribution
- normal distribution
- μ_X
- μ_Y
- expected value
- Law of Large Numbers
- variance
- standard deviation

7.1 Discrete and Continuous Random Variables (pp.464-480)

1. What is a **discrete** random variable?
2. If X is a *discrete random variable*, what information does the *probability distribution of X* give?
3. In a *probability histogram* what does the height of each bar represent (assuming the width of each bar is the same)?
4. In a *probability histogram* what is the sum of the height of each bar?
5. What is a **continuous** random variable?
6. If X is a *continuous random variable*, how is the *probability distribution of X* described?
7. What is the area under a *probability density curve* equal to?

8. What is the difference between a *discrete random variable* and a *continuous random variable*?
9. If X is a *discrete random variable*, do $P(X > 2)$ and $P(X \geq 2)$ have the same value? Explain.
10. If X is a *continuous random variable*, do $P(X > 2)$ and $P(X \geq 2)$ have the same value? Explain.
11. How is a *normal distribution* related to *probability distribution*?
12. If a *normal distribution* is always a *probability distribution*, is a *probability distribution* always a *normal distribution*?

7.2 Means and Variances of Random Variables (pp.481-509)

1. Explain the difference between the notations \bar{x} and μ_x .
2. What is meant by the *expected value* of X ?
3. How do you calculate the mean of a *discrete random variable* X ?
4. Explain how to calculate the *variance* of a *discrete random variable* X using the formula
$$\sigma_x^2 = \sum (x_i - \mu_x)^2 p_i.$$
5. Given the *variance* of a *random variable*, explain how to calculate the *standard deviation*.

6. Explain the *Law of Large Numbers*.
7. Suppose $\mu_X = 5$ and $\mu_Y = 10$. According to the rules for means, what is μ_{X+Y} ?
8. Suppose $\mu_X = 2$. According to the rules for means, what is μ_{3+4X} ?
9. Suppose $\sigma_X^2 = 2$ and $\sigma_Y^2 = 3$ and X and Y are independent random variables. According to the rules for variances, what is σ_{X+Y}^2 ? What is σ_{X+Y} ?
10. Suppose $\sigma_X^2 = 4$. According to the rules for variances, what is σ_{3+4X}^2 ? What is σ_{3+4X} ?
15. What is the best way to combine standard deviations?