Chapter 6: Random Variables

Key Vocabulary:

- random variable
- discrete random variable
- probability distribution
- mean of a random variable
- variance of a random variable
- probability density curve
- continuous random variable
- standard deviation

- binomial setting
- binomial random variable
- binomial distribution
- binomial coefficient
- binomial probability
- linear transformation
- normal approximation
- geometric setting
- geometric distribution
- geometric random variable
- Normal approximation

- geometric probability
- factorial
- expected value
- standard deviation
- μ_X
- μ_Y
- uniform distribution

6.1 Discrete and Continuous Random Variables (pp.341-352)

1. What is a *random variable*?

2. Define *probability distribution*.

3. What is a *discrete* random variable?

4. What are the *two requirements* for the probability distributions of discrete random variables?

5. If X is a *discrete random variable*, what information does the *probability distribution of X* give?

6. In a probability *histogram* what does the height of each bar represent (assuming the width of each bar is the same)?

7. In a probability *histogram,* what is the sum of the height of each bar?

8. What is the mean μ_X of a discrete random variable X?

9. How do you calculate the *mean of a discrete random variable?*

10. Define *expected value*. What notation is used for expected value?

11. Does the expected value of a random variable have to equal one of the possible values of the random variable? Explain.

12. Explain how to *calculate the variance and standard deviation* of a discrete random variable.

13. Explain the meaning of the standard deviation of a random variable X.

14. What is a *continuous random variable* and how is it displayed?

15. If X is a *continuous random variable*, how is the *probability distribution of X* described?

16. What is the area under a *probability density curve* equal to?

17. What is the difference between a *discrete random variable* and a *continuous random variable?*

18. If X is a *discrete random variable*, do $P(X > 2)$ and $P(X \geq 2)$ have the same value? Explain.

19. If X is a *continuous random variable*, do $P(X > 2)$ and $P(X \geq 2)$ have the same value? Explain.

20. How is a *Normal distribution* related to *probability distribution*?

6.2   Transforming and Combining Random Variables (pp.358-375)

1. What is the effect on a random variable of *multiplying or dividing by a constant*?

2. How does *multiplying by a constant* effect the variance?

3. What is the effect on a random variable of *adding or subtracting by a constant?*

4. Define *linear transformation.*

5. What are the effects of a *linear transformation* on the *mean* and *standard deviation*?

6. Define the *mean of the sum of random variables.*

7. What are *independent random variables*?

8. Define the *variance of the sum of independent random variables*. What types of variables does it apply to?

9. When can you *add the variances* of two random variables?

10. State the equation for the *mean of the difference* of random variables?

11. State the formula for the *variance of the difference* of random variables.

12. What happens if two independent Normal random variables are combined?

13. Suppose $\mu_X = 5$ and $\mu_Y = 10$. According to the rules for means, what is μ_{X+Y}?

14. Suppose $\mu_X = 2$. According to the rules for means, what is μ_{3+4X}?

15. 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}?

16. Suppose $\sigma_X^2 = 4$. According to the rules for variances, what is σ_{3+4X}^2? What is σ_{3+4X}?

6.3 Binomial and Geometric Random Variables (pp.382-401)

1. What is a *binomial setting*?

2. Describe the *conditions* of a binomial setting.

3. What is a *binomial random variable* and what are its possible values?

4. Define the *parameters* of a binomial distribution.

5. Explain the meaning of the *binomial coefficient* and state the *formula*.

6. Explain how to *calculate binomial probabilities*.

7. What commands on the calculator are used to calculate binomial probabilities?

8. Explain how to calculate the *mean* and *standard deviation* of a *binomial random variable*.

9. When can the binomial distribution be used to sample without replacement? Explain why this is an issue.

10. What is a *geometric setting*?

11. Describe the *conditions* for a geometric setting.

12. What is a *geometric random variable* and what are its possible values?

13. Describe the *parameters* of a geometric distribution.

14. What is the *formula* for geometric probability?

15. How is the *mean* of a geometric random variable calculated?