



The table contains important vocabulary terms from Chapter 11. As you work through the chapter, fill in the page number, definition, and a clarifying example.

Term	Page	Definition	Clarifying Example
Binomial Theorem			
compound event			
dependent events			
equally likely outcomes			
Fundamental Counting Principle			



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Term	Page	Definition	Clarifying Example
Binomial Theorem	837	For any positive integer n , $(x + y)^n = \sum_{k=0}^n \binom{n}{k} x^{n-k} y^k =$ $\binom{n}{0} x^n y^0 + \binom{n}{1} x^{n-1} y^1 + \dots$ $+ \binom{n}{n-1} x^1 y^{n-1} + \binom{n}{n} x^0 y^n.$	$(a + 2b)^3 = a^3 + 6a^2b + 12ab^2 + 8b^3$
compound event	819	An event made up of two or more simple events.	In the experiment of tossing a coin and rolling a number cube, the event of the coin landing heads and the number cube landing on 3.
dependent events	812	Events for which the occurrence or nonoccurrence of one event affects the probability of the other event.	From a bag containing 3 red marbles and 2 blue marbles, drawing a red marble, and then drawing a blue marble without replacing the first marble.
equally likely outcomes	802	Outcomes are equally likely if they have the same probability of occurring. If an experiment has n equally likely outcomes, then the probability of each outcome is $\frac{1}{n}$.	If a coin is tossed, and heads and tails are equally likely, then $P(\text{heads}) = P(\text{tails}) = \frac{1}{2}$.
Fundamental Counting Principle	794	For n items, if there are m_1 ways to choose a first item, m_2 ways to choose a second item after the first item has been chosen, and so on, then there are $m_1 \cdot m_2 \cdot \dots \cdot m_n$ ways to choose n items.	If there are 4 colors of shirts, 3 colors of pants, and 2 colors of shoes, then there are $4 \cdot 3 \cdot 2 \cdot 1$ possible outfits.

Term	Page	Definition	Clarifying Example
outcome			
permutation			
probability			
standard deviation			
theoretical probability			

Term	Page	Definition	Clarifying Example
outcome	803	A possible result of a probability experiment.	In the experiment of rolling a number cube, the possible outcomes are 1, 2, 3, 4, 5, and 6.
permutation	795	An arrangement of a group of objects in which order is important.	For objects A, B, C, and D, there are 12 different permutations of 2 objects. AB, AC, AD, BC, BD, CD BA, CA, DA, CB, DB, DC
probability	802	A number from 0 to 1 (or 0% to 100%) that is the measure of how likely an event is to occur.	The probability of tossing a coin and getting heads is $\frac{1}{2}$.
standard deviation	830	A measure of dispersion of a data set. The standard deviation σ is the square root of the variance $\sigma^2 = \frac{1}{n} \sum_{i=1}^n (x_i - \mu)^2$, where μ is the mean and n is the number of values in the data set.	Data set: {6, 7, 7, 9, 11} Mean: $\mu = \frac{6 + 7 + 7 + 9 + 11}{5} = 8$ Variance: $\sigma^2 = \frac{1}{5} \sum_{i=1}^n (x_i - 8)^2 = \frac{1}{5}(16) = 3.2$ Standard deviation: $\sigma = \sqrt{3.2} \approx 1.8$
theoretical probability	802	The ratio of the number of equally likely outcomes in an event to the total number of possible outcomes.	In the experiment of rolling a number cube, the theoretical probability of rolling an odd number is $\frac{3}{6} = \frac{1}{2}$.



11-1 Permutations and Combinations

1. Frank's access code for his garage door consists of 4 digits from 0 through 9. How many possible access codes are there if no digit can be repeated?

2. Kara picks a dozen flowers from her back yard. How many ways can she choose 3 flowers from the bouquet?

3. Find the number of ways to arrange 3 compact discs from a selection of 7 compact discs in a CD player.

11-2 Theoretical and Experimental Probability

4. A candy jar contains 13 peppermint candies, 9 strawberry candies, 4 lemon candies, and 6 root beer flavored candies. If a child selects a candy from the jar without looking, what is the probability that the child will select a lemon candy?

5. Weston has 7 strands of holiday lights in a box. Two of the strands do not work. If he selects 2 strands from the box, what is the probability that both strands do not work?

6. Sue tosses a beanbag onto a rectangular rug. If the beanbag does not touch a line, what is the probability that the beanbag landed in a shaded area?



7. A number cube is rolled 48 times, and a 6 is rolled 14 times. Find the experimental probability of not rolling a 6.

11-3 Independent and Dependent Events

8. Explain why the event of rolling one die and getting a 6 on two turns in a row while playing a board game are independent. Then find the probability.



11-1 Permutations and Combinations

1. Frank's access code for his garage door consists of 4 digits from 0 through 9. How many possible access codes are there if no digit can be repeated?

5040

2. Kara picks a dozen flowers from her back yard. How many ways can she choose 3 flowers from the bouquet?

$${}_{12}C_3 = 220$$

3. Find the number of ways to arrange 3 compact discs from a selection of 7 compact discs in a CD player.

210

11-2 Theoretical and Experimental Probability

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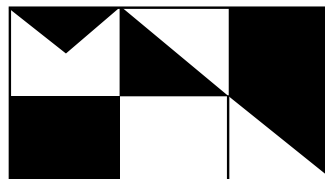
$$\frac{4}{32} = \frac{1}{8}$$

5. Weston has 7 strands of holiday lights in a box. Two of the strands do not work. If he selects 2 strands from the box, what is the probability that both strands do not work?

$$\frac{2}{7} \cdot \frac{1}{6} = \frac{2}{42} = \frac{1}{21}$$

6. Sue tosses a beanbag onto a rectangular rug. If the beanbag does not touch a line, what is the probability that the beanbag landed in a shaded area?

$$\frac{13}{24}$$



7. A number cube is rolled 48 times, and a 6 is rolled 14 times. Find the experimental probability of not rolling a 6.

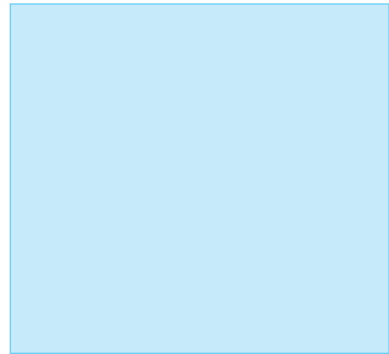
$$\frac{34}{48} = \frac{17}{24}$$

11-3 Independent and Dependent Events

8. Explain why the event of rolling one die and getting a 6 on two turns in a row while playing a board game are independent. Then find the probability.

Rolling a dice on one turn will not affect what is rolled on a second turn.
 $\frac{1}{6} \cdot \frac{1}{6} = \frac{1}{36} \approx 0.028$

9. A golf bag contains 4 white golf balls and 2 yellow golf balls. Explain why the events of “choosing a white golf ball then choosing a yellow golf ball” without replacing the white golf ball are dependent, and find the probability.

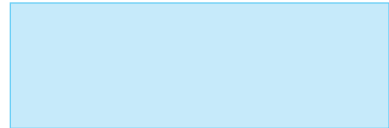


10. The table shows the breakdown by age of preschoolers that were screened by a pediatric optometrist that wear glasses. Find the probability that a 3-year-old preschooler wears glasses.

Preschoolers by Age		
	Wears Glasses	Does Not Wear Glasses
3 yr	2	43
4 yr	3	36
5 yr	5	47



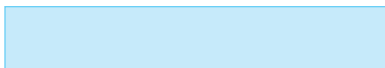
11. A bag contains 15 marbles; 10 red and 5 blue. Determine whether the events “a red marble is selected, not replaced, then a blue marble is selected” is independent or dependent, and find the probability.



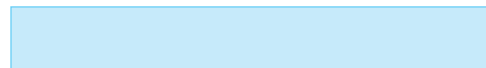
11-4 Compound Events

A standard deck of cards is in a pile face down. One card is drawn. Find each probability.

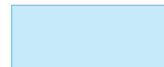
12. drawing a 9 or a queen



13. drawing a red card or an ace



14. A dog pound currently has 35 dogs; 20 are puppies and 15 have collars. Half of the puppies have collars. What is the probability that an adult dog does not have a collar?



9. A golf bag contains 4 white golf balls and 2 yellow golf balls. Explain why the events of “choosing a white golf ball then choosing a yellow golf ball” without replacing the white golf ball are dependent, and find the probability.

Not replacing the white golf ball means that there will be fewer golf balls in the bag, affecting the probability of the second selection.

$$\frac{4}{6} \cdot \frac{2}{5} = \frac{8}{30} = \frac{4}{15}$$

10. The table shows the breakdown by age of preschoolers that were screened by a pediatric optometrist that wear glasses. Find the probability that a 3-year-old preschooler wears glasses.

$$\frac{2}{45}$$

Preschoolers by Age		
	Wears Glasses	Does Not Wear Glasses
3 yr	2	43
4 yr	3	36
5 yr	5	47

11. A bag contains 15 marbles; 10 red and 5 blue. Determine whether the events “a red marble is selected, not replaced, then a blue marble is selected” is independent or dependent, and find the probability.

Dependent;

$$\frac{10}{15} \cdot \frac{5}{14} = \frac{50}{210} = \frac{5}{21}$$

11-4 Compound Events

A standard deck of cards is in a pile face down. One card is drawn. Find each probability.

12. drawing a 9 or a queen

$$\frac{4}{52} + \frac{4}{52} = \frac{8}{52} = \frac{2}{13}$$

13. drawing a red card or an ace

$$\frac{26}{52} + \frac{4}{52} - \frac{2}{52} = \frac{28}{52} = \frac{7}{13}$$

14. A dog pound currently has 35 dogs; 20 are puppies and 15 have collars. Half of the puppies have collars. What is the probability that an adult dog does not have a collar?

$$\frac{10}{35} = \frac{2}{7}$$

11-5 Measures of Central Tendency and Variation

15. In each of the last five days, Jerome has driven 14, 17, 26, 17, and 16 miles. Find the mean, median, and mode of the data set.

16. At a hardware store there are 10 key chains on a rack. On the back of each key chain is a dollar amount that can be saved from your purchase. Use the data provided to find the expected savings for a purchase.

Saving Amounts, n	\$1	\$2	\$5
Probability of n Savings	0.7	0.2	0.1

17. Make a box-and-whisker plot of the data. Find the interquartile range. Hours worked each week at a summer job: 29, 32, 40, 31, 33, 39, 27, and 42.

18. The test scores for a science test, in percents, are given below. Find the percents within 1 standard deviation of the mean. Test scores: 82, 84, 87, 82, 85, 97, 68, 96, 99, and 60.

11-5 Measures of Central Tendency and Variation

15. In each of the last five days, Jerome has driven 14, 17, 26, 17, and 16 miles. Find the mean, median, and mode of the data set.

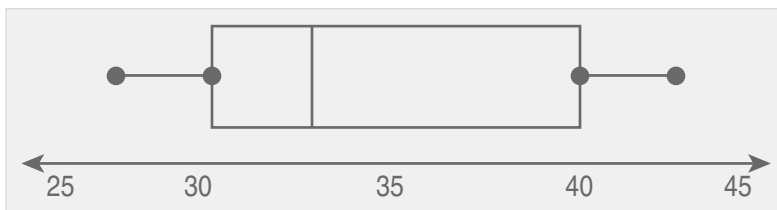
Mean: 18; median: 17; mode: 17

16. At a hardware store there are 10 key chains on a rack. On the back of each key chain is a dollar amount that can be saved from your purchase. Use the data provided to find the expected savings for a purchase.

Saving Amounts, n	\$1	\$2	\$5
Probability of n Savings	0.7	0.2	0.1

$$(\$1)(0.7) + (\$2)(0.2) + (\$5)(0.1) = \$1.60$$

17. Make a box-and-whisker plot of the data. Find the interquartile range. Hours worked each week at a summer job: 29, 32, 40, 31, 33, 39, 27, and 42.



18. The test scores for a science test, in percents, are given below. Find the percents within 1 standard deviation of the mean. Test scores: 82, 84, 87, 82, 85, 97, 68, 96, 99, and 60.

Mean is $84 \pm$ standard deviation = 11.78; 72.22% to 95.78%

The data set shows the average miles per gallon, rounded to the nearest mile, for six consecutive automobiles filling at a fueling station.

26, 30, 16, 28, 29, 27

19. Find the mean and standard deviation of the data.

20. Identify the outlier, and describe how it affects the mean and standard deviation.

11-6 Binomial Distributions

21. Use the binomial theorem to expand $(3x - y)^3$.

At a toy store, 1 out of every 5 action figures contains a free DVD.

22. What is the probability that Jack will get at least 2 DVD's, if he purchases 4 action figures?

23. What is the probability that Jack will get at least 3 DVD's, if he purchases 4 action figures?

The data set shows the average miles per gallon, rounded to the nearest mile, for six consecutive automobiles filling at a fueling station.

26, 30, 16, 28, 29, 27

19. Find the mean and standard deviation of the data.

Mean is 26; standard deviation ≈ 4.7

20. Identify the outlier, and describe how it affects the mean and standard deviation.

Outlier: 16; the mean decreases from 28 to 26, and the standard deviation decreases from 4.7 to 1.4.

11-6 Binomial Distributions

21. Use the binomial theorem to expand $(3x - y)^3$.

$$27x^3 - 27x^2y + 9xy^2 - y^3$$

At a toy store, 1 out of every 5 action figures contains a free DVD.

22. What is the probability that Jack will get at least 2 DVD's, if he purchases 4 action figures?

≈ 0.181

23. What is the probability that Jack will get at least 3 DVD's, if he purchases 4 action figures?

≈ 0.026

A festival game contains a spinning wheel in which is divided into 4 equal sections. Only one section is labeled winner. A person plays the game 10 times. Find the probability of each.

24. The player will win 5 times.

25. The player will win at least 1 time.

26. The player will win at most 7 times.

27. The player wins at most 1 time.

A festival game contains a spinning wheel in which is divided into 4 equal sections. Only one section is labeled winner. A person plays the game 10 times. Find the probability of each.

24. The player will win 5 times.

$$\left(\frac{1}{4}\right)^5 \left(\frac{3}{4}\right)^5 {}_{10}C_5 \approx 0.058$$

25. The player will win at least 1 time.

$$1 - P(0) = 1 - \left(\frac{1}{4}\right)^0 \left(\frac{3}{4}\right)^{10} {}_{10}C_0 \approx 0.94$$

26. The player will win at most 7 times.

$$0.00019$$

27. The player wins at most 1 time.

$$1 - 0.94 = 0.06$$



Answer these questions to summarize the important concepts from Chapter 11 in your own words.

1. Tell how you decide when to use a permutation or a combination.

2. Describe the difference between independent events and dependent events.

3. Describe the difference between mutually exclusive events and inclusive events.

4. Tell what five key points a box-and-whisker plot displays.

For more review of Chapter 11:

- Complete the Chapter 11 Study Guide and Review on pages 848–851 of your textbook.
- Complete the Ready to Go On quizzes on pages 827 and 845 of your textbook.

Answer these questions to summarize the important concepts from Chapter 11 in your own words.

1. Tell how you decide when to use a permutation or a combination.

Answers may vary. Use a permutation if order matters and a combination if order does not matter.

2. Describe the difference between independent events and dependent events.

Answers may vary. Events are independent if the occurrence of one event does not affect the probability of the other. Events are dependent if the occurrence of one event does affect the probability of the other.

3. Describe the difference between mutually exclusive events and inclusive events.

Answers may vary. Mutually exclusive events cannot both occur in the same trial of an experiment. Inclusive events have one or more outcomes in common.

4. Tell what five key points a box-and-whisker plot displays.

1. minimum values
2. maximum values
3. the median
4. first quartile
5. third quartile

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