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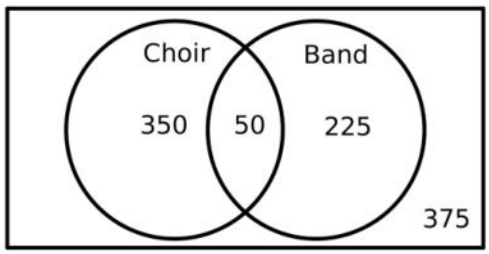
Math II: Unit 10, Ready, Set, Go

Lesson 1

Ready

For problems 1–5, use the Venn diagram about choir and band enrollments.



1. How many students were surveyed?

2. What were the students asked?

3. How many students are in both choir and band?

4. How many students are not in either choir or band?

5. What is the probability that a randomly selected student would be in band?

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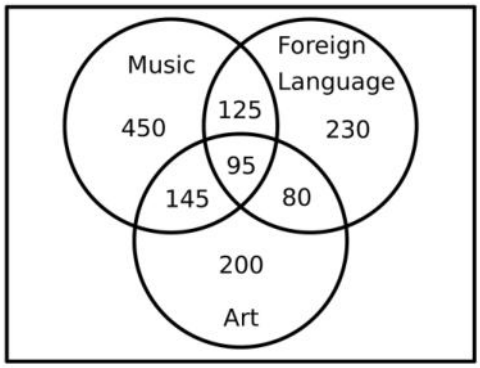
For problems 6–9, use the Venn diagram about music, art, and foreign language enrollments.



6. What does the 95 in the center tell you?

7. What does the 145 tell you?

8. How many total students are represented in the diagram?

9. Which elective class has the least number of students enrolled?

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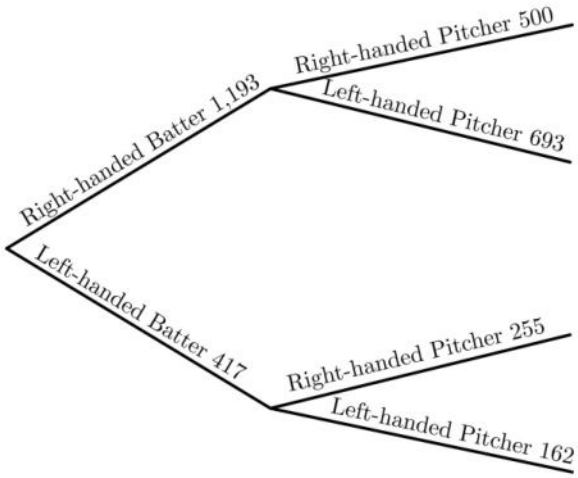
Set

For problems 10–14, use the tree diagram to determine the probabilities. The diagram represents the number of plate appearances during the first month of a minor league baseball season.



10. Based on this data, if you are a left-handed batter, what is the probability that you will face a right-handed pitcher?

11. Based on this data, if you are a right-handed batter, what is the probability that you will face a left-handed pitcher?

12. Based on this data, what is the probability a batter will face a pitcher of the same hand (left on left, right on right)?

13. What is the probability that a left-handed pitcher will be throwing for any given plate appearance?

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14. What is the probability that a left-handed batter would be at the plate for any given plate appearance?

15. What observations do you make about the data? Is there any amount that seems to be overly abundant? What might account for this?

Go

Find the probability of achieving success with each of the events.

16. Rolling an even number on a standard six-sided die.

17. Drawing a black card from a standard deck of cards.

18. Flipping a coin and getting heads three times in a row.

19. Rolling a die and getting a four.

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20. Drawing an ace from a deck of cards.

21. Rolling a die twice in a row and getting two threes.

22. Pulling out a red marble from a bag containing 3 blue, 2 red, and 5 white marbles.

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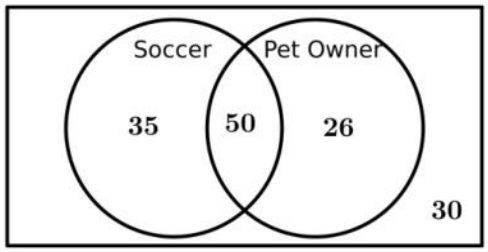
Lesson 2

Ready

Use the Venn diagrams to respond to the problems. (Hint: You may use the same data provided in the two-way table from problem 3 to help make sense of the Venn diagram.) For problems 1–5, use the Venn diagram, which represents the relationship between favorite sport (soccer or baseball) and pet ownership (own a pet or doesn't own a pet).



1. How many people said soccer is their favorite sport?

2. How many pet owners are in the data?

3. How many of those who don't own pets chose baseball?

4. What is the probability that a person would say soccer is their favorite sport?

   $P(\text{soccer}) =$

5. What is the probability that a pet owner would say soccer is their favorite sport? ("Out of all pet owners, % say soccer is their favorite sport.")

   $P(\text{soccer}|\text{pet owner}) =$

   Explain how your response fits with the given model.

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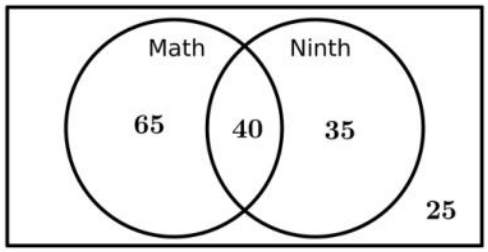
For problems 6–10, use the Venn diagram, which represents the relationship between favorite subject (math or science) and grade level (ninth or tenth). Using this data, respond to the following problems.



6. How many people said math is their favorite subject?

7. How many tenth graders are in the data?

8. How many ninth graders chose science?

9. What is the probability that a person would say science is their favorite subject?

   $P(s) =$

10. What is the probability that a tenth grader would say science is their favorite subject? ("If you are a tenth grader, then the probability of science being your favorite subject is %.")

    $P(\text{science}|\text{tenth}) =$

    Explain how your response fits with the given model.

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Set

11. Complete the table and write three conditional probability statements.

	Soccer	Baseball	Total
9th Grade		30	
10th Grade	50		76
Total	85		

12. Complete the table about the preferred genre of reading, fiction or non-fiction, and write three conditional probability statements.

	Fiction	Non-fiction	Total
Adults		10	
Teens	50		60
Total	85		

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13. Complete the two-way frequency table containing information about favorite color of M&Ms and whether people were left-handed or right-handed. Write three conditional probability statements.

	Blue	Green	Red	Other	Total
Left-handed	15	20	15		60
Right-handed	30	20		10	
Total	45				130

14. Use the information provided to make a tree diagram, a two-way table, and a Venn diagram. Use the representations to support your interpretation of the data and write two statements about the data.

    - Data was collected at the movie theater last fall, not about movies but clothes.
    - 6,525 people were observed.
    - 3,123 were wearing shorts and the rest were wearing long pants.
    - 45% of the shorts were made of denim.
    - 88% of the long pants were made of denim.

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Go

Answer the following.

15. What is half of one-third?

16. What is one-third of two-fifths?

17. What is one-fourth of four-sevenths?

18. What percent is $\frac{5}{8}$?

19. What is 35% of 50?

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20. Seventy is 60% of what number?

21. Write $\frac{7}{12}$ as a percent.

22. Write $\frac{1}{6}$ as a percent.

23. What is 52% of 1,200?

24. What percent is 32 of 160?

25. Sixty is what percent of 250?

26. What percent of 350 is 50?

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Lesson 3

Ready

In some of the situations described below, the first event affects the subsequent event (dependent events). In other situations, the two events are completely independent (independent events). Determine which situations are dependent and which are independent.

1. A coin is flipped twice. The first event is the first flip, and the second event is the next flip.

    A. Dependent events

    B. Independent events

2. A bag of marbles contains 3 blue marbles, 6 red marbles, and 2 yellow marbles. Two of the marbles are drawn out of the bag. The first event is the first marble taken out and not returned to the bag. The second event is the second marble taken out.

    A. Dependent events

    B. Independent events

3. A batter's swing is either right-handed or left-handed. The first event is the first batter to come to the plate. The second event is the second batter to come up to the plate.

    A. Dependent events

    B. Independent events

4. A standard die is rolled twice. The first event is the first roll and the second event is the second roll.

    A. Dependent events

    B. Independent events

5. Two cards are drawn from a standard deck of cards. The first event is the first card that is drawn and not returned to the deck. The second event is the second card that is drawn.

    A. Dependent events

    B. Independent events

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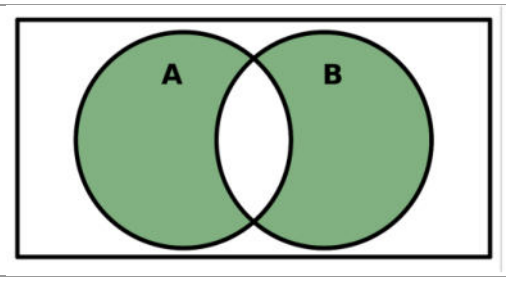
Set

6. Sally was assigned to create a Venn diagram to represent $P(A \text{ or } B)$. Sally first writes $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$; what does this mean? Explain each part.

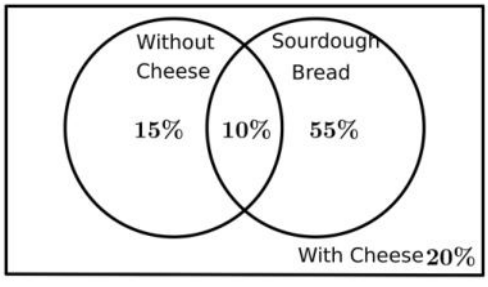
$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

7.

Sally then creates the following diagram. Sally's Venn diagram is incorrect. Why?



The Venn diagram shows the data collected at a sandwich shop for the last six months. It shows the type of bread people ordered (sourdough or wheat) and whether or not they got cheese on their sandwich. Use this data to create a two-way frequency table and answer the problems.



8. Two-way frequency table.

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9. What is the probability that a randomly selected customer would order sourdough bread?

   $P(\text{sourdough bread}) =$

10. What is the probability that a randomly selected customer would order sourdough bread without cheese?

    $P(\text{sourdough} \cap \text{no cheese}) = P(\text{sourdough and no cheese}) =$

11. What is the probability that a person prefers wheat bread without cheese?

    $P(\text{wheat} \cap \text{no cheese}) = P(\text{wheat and no cheese}) =$

12. What is the estimated probability that a randomly selected customer would want their sandwich with cheese?

    $P(\text{sourdough cheese and wheat cheese}) = P(\_) =$

13. If they serve 100 sandwiches at lunch on a particular day, how many orders with sourdough should be prepared without cheese?

14. What is the probability that a randomly selected person would choose sourdough or no cheese?

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$P(\text{sourdough} \cup \text{no cheese}) = P(\text{sourdough or no cheese}) =$

15. What is the probability that a randomly selected person would NOT choose sourdourgh or no cheese?

Go

Use the given ratio to set up a proportion and find the desired value.

16. If 3 out of 5 students eat school lunch, then how many students would be expected to eat school lunch at a school with 750 students?

17. In a survey, it was found that 6 out of 10 students have a pair of sunglasses. How many students would you expect to have a pair of sunglasses out of a group of 45 students?

18. Data collected at a local mall indicated that 7 out of 20 men observed were wearing a hat. How many men would you expect to be wearing hats if 7,500 men were at the mall on a similar day?

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Lesson 4

Ready

Find the products or quotients below.

1. $\frac{1}{2} \cdot \frac{2}{3}$

2. $\frac{3}{5} \cdot \frac{1}{3}$

3. $\frac{7}{10} \cdot \frac{2}{5}$

4. $\frac{8}{7} \cdot \frac{3}{4}$

5. $\frac{\frac{1}{3}}{\frac{1}{2}}$

6. $\frac{2}{5} \div \frac{2}{3}$

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7. $P(A) = \frac{3}{4}, P(B) = \frac{1}{2}$

   $P(A) \cdot P(B) = \frac{3}{8}$

8. $P(A) = \frac{1}{6}, P(B) = \frac{1}{3}$

   $P(A) \cdot P(B) =$

Set

For each situation, one of the representations (two-way table, Venn diagram, tree diagram, context, or probability notation) is provided. Use the information to complete the remaining representations.

9. Researchers surveyed residents of both the Northern and Southern Hemispheres. The residents were asked if they lived on the coast or inland. The results are provided.

Notation	Two-way Table
Key: Northern $= N$ Southern $= S$ On Coast $= C$ Inland $= I$ Sample size $= 200$ $P(C) = \frac{84}{200}$ $P(N) = \frac{64}{200}$ $P(S\|C) = \frac{48}{84}$ $P(C\|S) =$ $P(N \cap C) =$ $P(N \text{ or } C) =$	

	Coast	Inland	Total
Northern			
Southern			
Total			

Venn diagram	Tree Diagram

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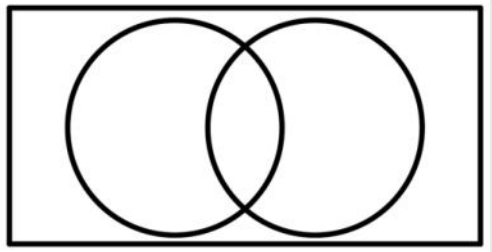
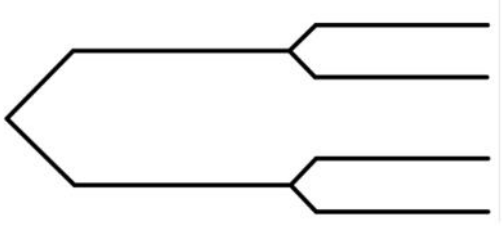


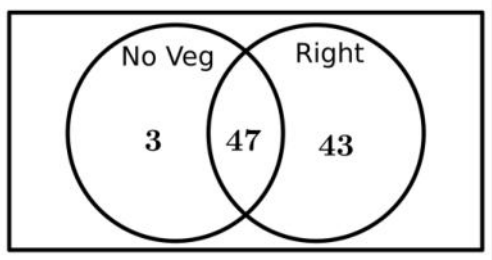
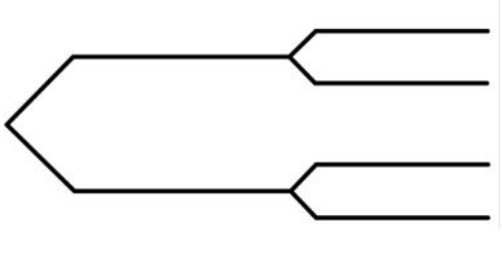


Write three observations you can make about this data:

10. A group of people were asked if they were left-handed or right-handed and whether they like vegetables.

Notation	Two-way Table
Key: Like Vegetables $= V$ Don't Like Vegetables $= D$ Lefty $= L$ Righty $= R$ Sample size $= 100$ people $P(L) =$ $P(V) =$ $P(D) =$ $P(L\|D) =$ $P(L\|V) =$	

	Lefty	Righty	Total
Veggies			
No Veggies			
Total			

Venn diagram	Tree Diagram
	

Write three conditional probability statements regarding this data:

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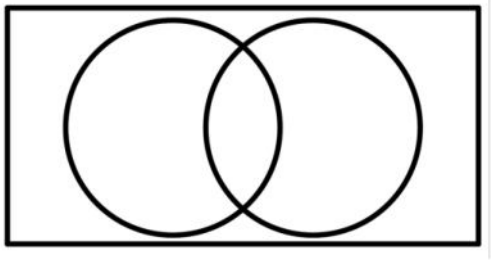
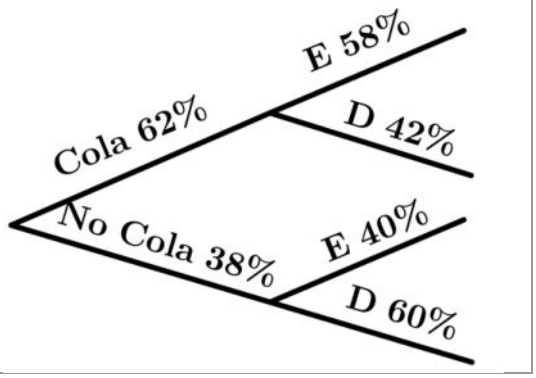
11. A sample of people were asked if they drink cola drinks or not and if they eat breakfast or not.

Notation	Two-way Table
Key: Cola Drinkers $= C$ No Cola Drinks $= N$ Eats Breakfast $= E$ Doesn't Eat Breakfast $= D$ Sample size $=$ $P(E) =$ $P(E\|C) =$ $P(E \cap C) =$ $P(E\|N) =$ $P(E \cap N) =$	

	Eats	Doesn't	Total
Cola			
No Cola			
Total			685

Venn diagram	Tree Diagram
	

Does this data surprise you? Why or why not?

Go

12. Complete the table and find the conditional probabilities, then interpret the data and probabilities to respond to the problem.

	Biking	**Swimming**	**Total**

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10th Grade		50	
11th Grade	35		76
Total	85		

$P(10\text{th}|\text{Biking}) =$

$P(\text{Swimming}|11\text{th}) =$

Are the 11th grade students more into biking or swimming?

13. Complete the table about preferred genre of reading and dessert preference. Find the conditional probabilities, then interpret the data and probabilities to respond to the problem.

	Ice Cream	Cake	Total
Teen		20	
Adult	10		60
Total	85		

$P(\text{Teen}|\text{Cake}) =$

$P(\text{Adult or Ice Cream}) =$

Who prefers eating ice cream most, adults or teens?

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14. Fill in the missing values for the frequency table containing data from a sample of adults. The table shows voting turnout and household income for a recent election. Find the indicated probabilities, then interpret the data and probabilities to respond to the problem.

	Voted	Didn't Vote	Total
Income Over $67,500	340		410
Income Under $67,500			
Total	584		840

$P(\text{Voted}|\text{Income Over \$67,500}) =$

$P(\text{Voted and Income Under \$67,500}) =$

$P(\text{Didn't Vote or Income Under \$67,500}) =$

Based on the sample of data, are all income levels participating in the election equally?

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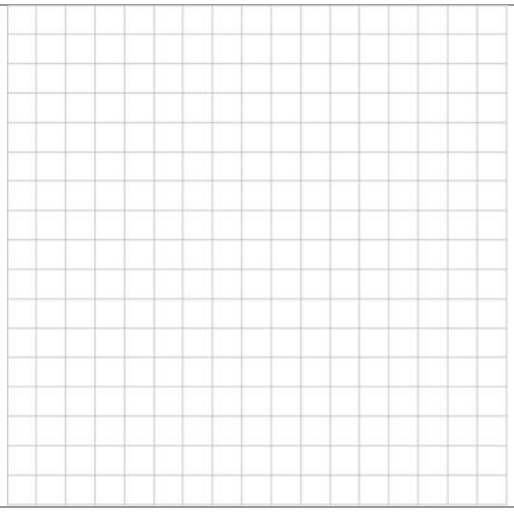
Lesson 5

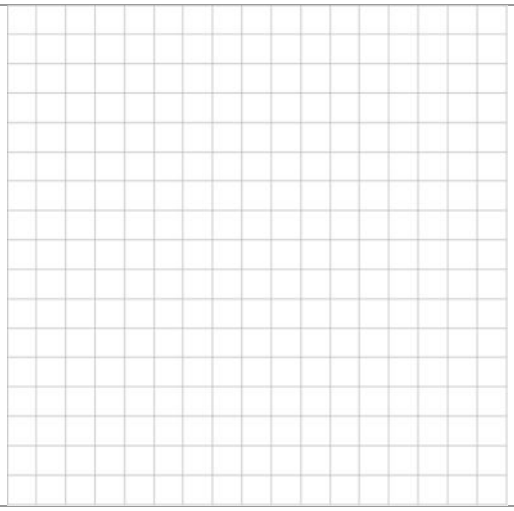
Ready

Find the x-intercepts, y-intercept, line of symmetry, and vertex for the quadratic functions, and then graph them on the coordinate grid.

1. $f(x) = x^2 + 8x - 9$

x-intercepts: y-intercept: line of symmetry: vertex:	

2. $g(x) = x^2 - 3x - 5$

x-intercepts: y-intercept: line of symmetry: vertex:	

3. $h(x) = 2x^2 + 5x - 3$

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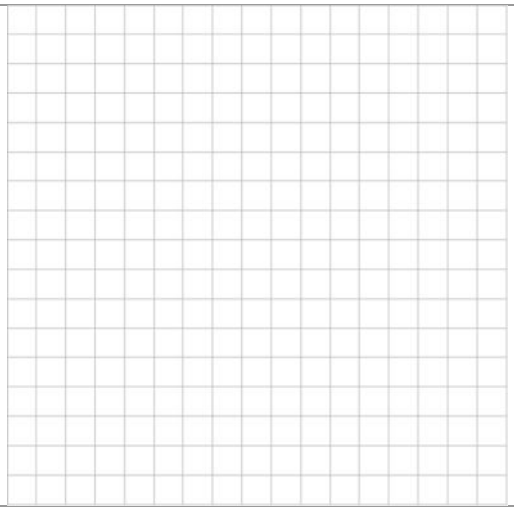
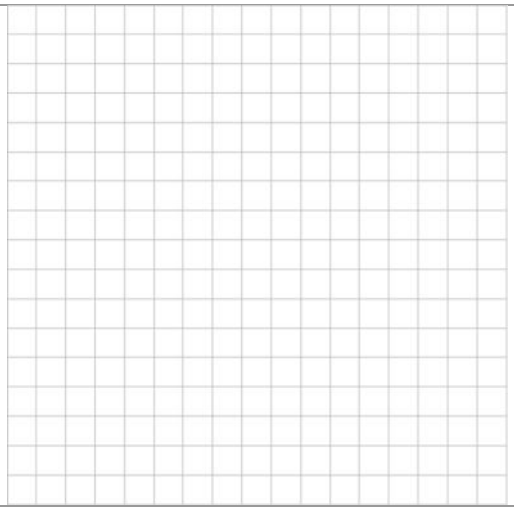
x-intercepts:
y-intercept:
line of symmetry:
vertex:



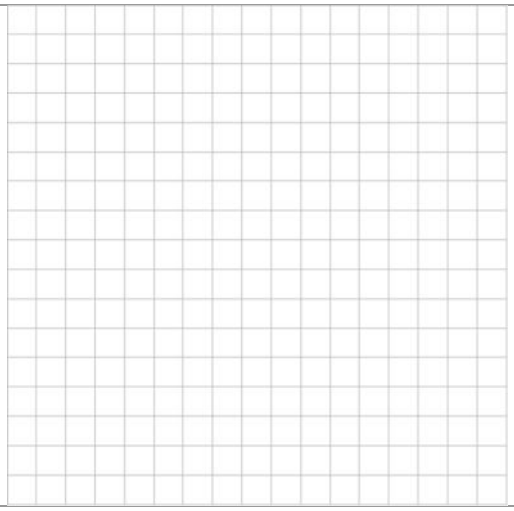
4. $k(x) = x^2 - 6x + 9$

x-intercepts:
y-intercept:
line of symmetry:
vertex:



5. $p(x) = (x + 5)^2 - 2$

x-intercepts:
y-intercept:
line of symmetry:
vertex:



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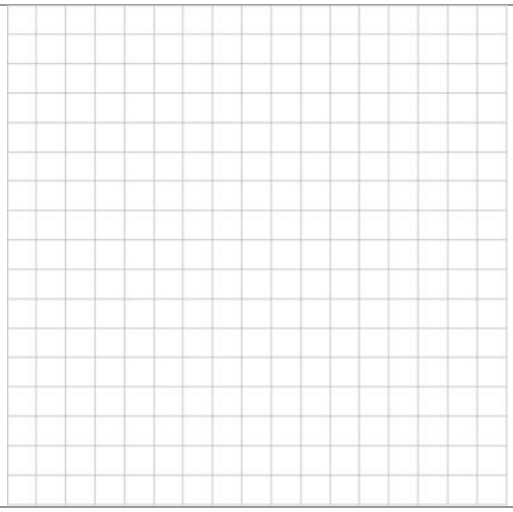
6. $q(x) = (x + 7)(x - 5)$

x-intercepts: y-intercept: line of symmetry: vertex:	

Set

Determining the independence of events can sometimes be done by becoming familiar with the context in which the events occur and the nature of the events. There are also some ways of determining independence of events based on equivalent probabilities.

- Two events, A and B, are independent if $P(A \text{ and } B) = P(A) \cdot P(B)$.
- Additionally, two events, A and B, are independent if $P(A|B) = \frac{P(A \text{ and } B)}{P(B)} = P(A)$.

Use these two ways of determining independent events to determine independence in the problems below and answer the problems.

7. $P(A \text{ and } B) = \frac{3}{5}$

   $P(A) = \frac{1}{2}$

   $P(B) = \frac{3}{10}$

8. $P(A) = \frac{1}{5}$

   $P(A \text{ and } B) = \frac{1}{6}$

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$P(B) = \frac{1}{3}$

9. $P(A) = \frac{1}{2}$

   $P(A \text{ and } B) = \frac{1}{5}$

   $P(B) = \frac{2}{5}$

10. $P(A \text{ and } B) = \frac{2}{5}$

    $P(A) = \frac{1}{4}$

    $P(B) = \frac{4}{5}$

The table shows the results of a survey of automobile preferences for different age groups. Participants were asked whether they would prefer owning a car or a truck. Use the table for problems 11–15.

	Truck	Car	Total
16–35	10	40	50
36–55	40	160	200
Total	50	200	250

11. Find $P(\text{Truck}|\text{Age Range } 16-35)$.

12. Find $P(\text{Age Range } 16-35|\text{Truck})$.

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13. Find $P(\text{Truck})$.

14. Find $P(\text{Age Range } 16\text{–}35)$.

15. Based on the random survey, are preferring a truck and belonging to the age range of $16\text{–}35$ years old independent or dependent events? Provide justification.

Go

The following data represents the number of men and women passengers aboard the *Titanic* and whether or not they survived.

	Survived	Did Not Survive	Total
Men	146	659	805
Women	296	106	402
Total	442	765	1,207

16. $P(w) =$

17. $P(s) =$

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18. $P(s|w) =$

19. $P(w \text{ or } s) =$

20. $P(w \text{ or } m) =$

21. $P(ns|w) =$

22. $P(m \text{ and } ns) =$

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Lesson 6

Ready

Solve each quadratic equation.

1. $m^2 + 15m + 56 = 0$

2. $5x^2 - 3x + 7 = 0$

3. $x^2 - 10x + 21 = 0$

4. $6x^2 + 7x - 5 = 0$

Set

5. A group of students was observed to determine whether or not they wear glasses and whether or not they wear a hooded sweatshirt. The data is shown in the table. Use the data to respond to the problems.

	Glasses	No Glasses	Total
Hoodie	20	10	30
No Hoodie	10	20	30
	30	30	60

   a. How many total outcomes are possible?

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b. $P(\text{Glasses}) =$

c. $P(\text{Hoodie}) =$

d. $P(\text{Glasses and Hoodie}) =$

e. $P(\text{Glasses}|\text{Hoodie}) =$

f. For this sample, are wearing glasses and wearing a hoodie independent events? Why or why not?

6. The principal at a school checked student class schedules to see if they were enrolled in world languages or music classes. She compiled the data in the table below. Use the data to find the probabilities and answer the following problems.

	Music	No Music	Total
Language	60	40	100
No Language	60	40	100
	120	80	200

a. How many total outcomes are possible?

NAME DATE PERIOD

b. $P(\text{Music}) =$

c. $P(\text{Language}) =$

d. $P(\text{Music and Language}) =$

e. $P(\text{Music}|\text{Language}) =$

f. Is scheduling of music and world language classes a set of independent events? Why or why not?

7.

	Shorts	No Shorts	Total
Hat	10	50	60
No Hat	30	10	40
	40	60	100

a. How many total outcomes are possible?

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b. $P(\text{Shorts}) =$

c. $P(\text{Hat}) =$

d. $P(\text{Shorts and Hat}) =$

e. $P(\text{Shorts}|\text{Hat}) =$

f. Are wearing shorts and wearing a hat independent events? Why or why not?

8. People at an amusement park were surveyed to see if they rode the roller coaster and if they had purchased a souvenir. The data is shown in the table below. Use the data to find the probabilities and respond to the following problems.

	Souvenir	No Souvenir	Total
Ride Coasters	400	400	800
Not Ride	100	100	200
	500	500	1000

a. How many total outcomes are possible?

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b. $P(\text{Souvenir}) =$

c. $P(\text{Ride}) =$

d. $P(\text{Souvenir and Ride}) =$

e. $P(\text{Souvenir}|\text{Ride}) =$

f. Are purchasing a souvenir and riding roller coasters independent events? Why or why not?

Go

Data gathered on the shopping patterns during the months of April and May of high school students from Peanut Village revealed the following. 38% of students purchased a new pair of shorts (call this event H), 15% of students purchased a new pair of sunglasses (call this event G), and 6% of students purchased both a pair of shorts and a pair of sunglasses.

9. Find the probability that a student purchased a pair of sunglasses given that you know they purchased a pair of shorts.

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$P(G|H) =$

10. Find the probability that a student purchased a pair of shorts or purchased a new pair of sunglasses.

    $P(H \text{ or } G) =$

11. Given that you know a student has purchased at least one of the items, what is the probability that they purchased only one of the items?

12. Are the two events, H and G, independent of one another? Why or why not?

The table provided displays data collected from 200 individuals concerning whether or not to extend the length of the school year. Use the table to respond to problems 13–15.

	For	Against	No Opinion	Total
Youth (5 to 19)	7	35	12	
Adults (20 to 55)	30	27	20	
Seniors (55+)	25	16	28	
Total				200

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13. Given the condition that a person is an adult, what is the probability that they are in favor of extending the school year?

    $P(\text{For}|\text{Adult}) =$

14. Given the condition that a person is against extending the school year, what is the probability they are a senior?

    $P(\text{Senior}|\text{Against}) =$

15. What is the probability that a person has no opinion given that they are a youth?

    $P(\text{No Opinion}|\text{Youth}) =$

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