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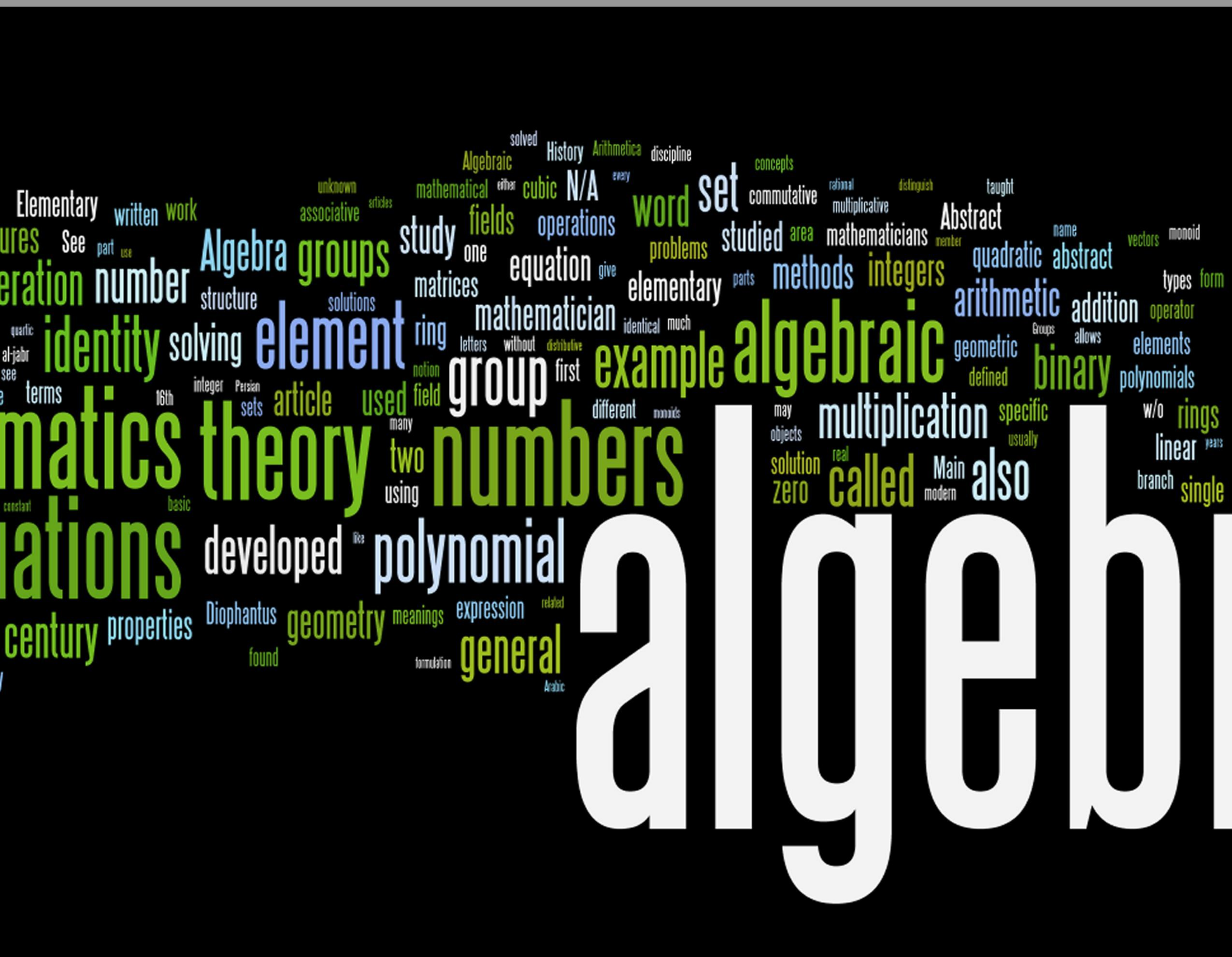
ABSE Math 4 Practice Exercises



ABSE Math 4 Practice Exercises

Julie Pfaff

AUTHOR
Julie Pfaff

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CHAPTER 1 Chapter 1: Real Numbers

Chapter Outline

1.1 Practice: The Real Number System

Here you'll learn how to identify the subsets of real numbers and place a real number into one of these subsets.

Directions: Classify each of the following numbers as real, whole, integer, rational or irrational. Some numbers will have more than one classification.

1. 3.45
2. -9
3. 1,270
4. 1.232323
5. $\frac{4}{5}$
6. -232,323
7. -98
8. 1.98
9. $\sqrt{16}$
10. $\sqrt{2}$

Directions: Answer each question as true or false.

11. An irrational number can also be a real number.
12. An irrational number is a real number and an integer.
13. A whole number is also an integer.
14. A decimal is considered a real number and a rational number.
15. A negative decimal can still be considered an integer.
16. An irrational number is a terminating decimal.
17. A radical is always an irrational number.
18. Negative whole numbers are integers and are also rational numbers.
19. Pi is an example of an irrational number.
20. A repeating decimal is also a rational number.

1.2 Practice: Integer Operations

Here you'll learn the Commutative Property of Addition, Associative Property of Addition, and Identity Property of Addition so that you can effectively add integers.

Subtract.

1. $(-9)-(-2)$
2. $(5)-(+8)$
3. $(5)-(-4)$
4. $(-7)-(-9)$
5. $(6)-(+5)$
6. $(8)-(+4)$
7. $(-2)-(-7)$
8. $(3)-(+5)$
9. $(-6)-(-10)$
10. $(-4)-(-7)$
11. $(-13)-(-19)$
12. $(-6)-(+8)-(-12)$
13. $(14)-(+8)-(-6)$
14. $(18)-(+8)-(+3)$
15. $(10)-(-6)-(+4)-(+2)$

Multiply the following integers.

1. $-6(-8) =$ _____
2. $5(-10) =$ _____
3. $3(-4) =$ _____
4. $-3(4) =$ _____
5. $8(-9) =$ _____
6. $-9(12) =$ _____
7. $8(-11) =$ _____
8. $(-5)(-9) =$ _____
9. $-7(-8) =$ _____
10. $(-12)(12) =$ _____

Divide the following integers.

11. $-12 \div 2 =$ _____
12. $-18 \div -6 =$ _____
13. $-24 \div 12 =$ _____
14. $-80 \div -4 =$ _____
15. $-60 \div -30 =$ _____
16. $\frac{28}{4} =$ _____
17. $\frac{-36}{4} =$ _____
18. $\frac{-45}{-9} =$ _____
19. $-75 \div 25 =$ _____

20. $-68 \div -2 =$ _____

1.3 Practice: Order of Operations

1. Use the order of operations to evaluate the following expressions.
   a. $8-(19-(2+5)-7)$
   b. $2+7\times 11-12\div 3$
   c. $(3+7)\div(7-12)$
   d. $\frac{2\cdot(3+(2-1))}{4-(6+2)}-(3-5)$
   e. $\frac{4+7(3)}{9-4}+\frac{12-3\cdot 2}{2}$
   f. $(4-1)^2+3^2\cdot 2$
   g. $\frac{(2^2+5)^2}{5^2-4^2}\div(2+1)$
2. Evaluate the following expressions involving variables.
   a. $\frac{jk}{j+k}$ when $j=6$ and $k=12$
   b. $2y^2$ when $x=1$ and $y=5$
   c. $3x^2+2x+1$ when $x=5$
   d. $(y^2-x)^2$ when $x=2$ and $y=1$
   e. $\frac{x+y^2}{y-x}$ when $x=2$ and $y=3$
3. Evaluate the following expressions involving variables.
   a. $\frac{4x}{9x^2-3x+1}$ when $x=2$
   b. $\frac{z^2}{x+y}+\frac{x^2}{x-y}$ when $x=1,\ y=-2$, and $z=4$
   c. $\frac{4xyz}{y^2-x^2}$ when $x=3,\ y=2$, and $z=5$
   d. $\frac{x^2-z^2}{xz-2x(z-x)}$ when $x=-1$ and $z=3$
4. Insert parentheses in each expression to make a true equation.
   a. $5-2\times 6-5+2=5$
   b. $12\div 4+10-3\times 3+7=11$
   c. $22-32-5\times 3-6=30$
   d. $12-8-4\times 5=-8$

1.4 Practice: The Distributive Property

Here you'll learn to identify and apply the Distributive Property to evaluate numerical expressions.

Evaluate each expression using the Distributive Property.

1. 4(3 + 6)
2. 5(2 + 8)
3. 9(12 + 11)
4. 7(8 + 9)
5. 8(7 + 6)
6. 5(12 + 8)
7. 7(9 + 4)
8. 11(2 + 9)
9. 12(12 + 4)
10. 12(9 + 8)
11. 10(9 + 7)
12. 13(2 + 3)
13. 14(8 + 6)
14. 14(9 + 4)
15. 15(5 + 7)

1.5 Practice: Square Roots and Irrational Numbers

Here you'll learn how to find and approximate square roots. You'll also learn how to simplify expressions involving square roots.

For 1-10, find the following square roots exactly without using a calculator, giving your answer in the simplest form.

1. $\sqrt{25}$
2. $\sqrt{24}$
3. $\sqrt{20}$
4. $\sqrt{200}$
5. $\sqrt{2000}$
6. $\sqrt{\frac{1}{4}}$ (Hint: The division rules you learned can be applied backwards!)
7. $\sqrt{\frac{9}{4}}$
8. $\sqrt{0.16}$
9. $\sqrt{0.1}$
10. $\sqrt{0.01}$

For 11-20, use a calculator to find the following square roots. Round to two decimal places.

11. $\sqrt{13}$
12. $\sqrt{99}$
13. $\sqrt{123}$
14. $\sqrt{2}$
15. $\sqrt{2000}$
16. $\sqrt{.25}$
17. $\sqrt{1.35}$
18. $\sqrt{0.37}$
19. $\sqrt{0.7}$
20. $\sqrt{0.01}$

CHAPTER 2

Chapter 2: Equations and Inequalities

Chapter Outline

2.1 Practice: Patterns and Equations

Use the table below for problem #1:

TABLE 2.1:

Day	Profit
1	20
2	40
3	60
4	80
5	100

1. The above table depicts the profit in dollars taken in by a store each day.
   a. Write a mathematical equation that describes the relationship between the variables in the table.
   b. What is the profit on day 10?
   c. If the profit on a certain day is $200, what is the profit on the next day?

   (a) Write a mathematical equation that describes the situation: *A full cookie jar has 24 cookies. How many cookies are left in the jar after you have eaten some?*
   (b) How many cookies are in the jar after you have eaten 9 cookies?
   (c) How many cookies are in the jar after you have eaten 9 cookies and then eaten 3 more?

2. Write a mathematical equation for the following situations and solve.
   a. Seven times a number is 35. What is the number?
   b. Three times a number, plus 15, is 24. What is the number?
   c. Twice a number is three less than five times another number. Three times the second number is 15. What are the numbers?
   d. One number is 25 more than 2 times another number. If each number were multiplied by five, their sum would be 350. What are the numbers?
   e. The sum of two consecutive integers is 35. What are the numbers?
   f. Peter is three times as old as he was six years ago. How old is Peter?

3. How much water should be added to one liter of pure alcohol to make a mixture of 25% alcohol?
4. A mixture of 50% alcohol and 50% water has 4 liters of water added to it. It is now 25% alcohol. What was the total volume of the original mixture?
5. In Crystal's silverware drawer there are twice as many spoons as forks. If Crystal adds nine forks to the drawer, there will be twice as many forks as spoons. How many forks and how many spoons are in the drawer right now?

   (a) Mia drove to Javier's house at 40 miles per hour. Javier's house is 20 miles away. Mia arrived at Javier's house at 2:00 pm. What time did she leave?
   (b) Mia left Javier's house at 6:00 pm to drive home. This time she drove 25% faster. What time did she arrive home?
   (c) The next day, Mia took the expressway to Javier's house. This route was 24 miles long, but she was able to drive at 60 miles per hour. How long did the trip take?
   (d) When Mia took the same route back, traffic on the expressway was 20% slower. How long did the return trip take?

6. The price of an mp3 player decreased by 20% from last year to this year. This year the price of the player is \$120. What was the price last year?
7. SmartCo sells deluxe widgets for \$60 each, which includes the cost of manufacture plus a 20% markup. What does it cost SmartCo to manufacture each widget?
8. Jae just took a math test with 20 questions, each worth an equal number of points. The test is worth 100 points total.

    a. Write an equation relating the number of questions Jae got right to the total score he will get on the test.
    b. If a score of 70 points earns a grade of $C-$, how many questions would Jae need to get right to get a $C-$ on the test?
    c. If a score of 83 points earns a grade of B, how many questions would Jae need to get right to get a B on the test?
    d. Suppose Jae got a score of 60% and then was allowed to retake the test. On the retake, he got all the questions right that he got right the first time, and also got half the questions right that he got wrong the first time. What is his new score?

2.2 Practice: Variable Expressions

1. Write the following in a more condensed form by leaving out a multiplication symbol.
    a. $2 \times 11x$
    b. $1.35 \cdot y$
    c. $3 \times \frac{1}{4}$
    d. $\frac{1}{4} \cdot z$
2. Evaluate the following expressions for $a = -3,\ b = 2,\ c = 5$, and $d = -4$.
    a. $2a + 3b$
    b. $4c + d$
    c. $5ac - 2b$
    d. $\frac{2a}{c-d}$
    e. $\frac{3b}{d}$
    f. $\frac{a-4b}{3c+2d}$
    g. $\frac{1}{a+b}$
    h. $\frac{ab}{cd}$
3. Evaluate the following expressions for $x = -1,\ y = 2,\ z = -3$, and $w = 4$.
    a. $8x^3$
    b. $\frac{5x^2}{6z^3}$
    c. $3z^2 - 5w^2$
    d. $x^2 - y^2$
    e. $\frac{z^3+w^3}{z^3-w^3}$
    f. $2x^3 - 3x^2 + 5x - 4$
    g. $4w^3 + 3w^2 - w + 2$
    h. $3 + \frac{1}{z^2}$
4. The weekly cost C of manufacturing x remote controls is given by the formula $C = 2000 + 3x$, where the cost is given in dollars.
    a. What is the cost of producing 1000 remote controls?
    b. What is the cost of producing 2000 remote controls?
    c. What is the cost of producing 2500 remote controls?
5. The volume of a box without a lid is given by the formula $V = 4x(10 - x)^2$, where x is a length in inches and V is the volume in cubic inches.
    a. What is the volume when $x = 2$?
    b. What is the volume when $x = 3$?

2.3 Practice: Equations and Inequalities

1. Define variables and translate the following expressions into equations.
   a. Peter's Lawn Mowing Service charges \$10 per job and \$0.20 per square yard. Peter earns \$25 for a job.
   b. Renting the ice-skating rink for a birthday party costs \$200 plus \$4 per person. The rental costs \$324 in total.
   c. Renting a car costs \$55 per day plus \$0.45 per mile. The cost of the rental is \$100.
   d. Nadia gave Peter 4 more blocks than he already had. He already had 7 blocks.
2. Define variables and translate the following expressions into inequalities.
   a. A bus can seat 65 passengers or fewer.
   b. The sum of two consecutive integers is less than 54.
   c. The product of a number and 3 is greater than 30.
   d. An amount of money is invested at 5% annual interest. The interest earned at the end of the year is greater than or equal to \$250.
   e. You buy hamburgers at a fast food restaurant. A hamburger costs \$0.49. You have at most \$3 to spend. Write an inequality for the number of hamburgers you can buy.
   f. Mariel needs at least 7 extra credit points to improve her grade in English class. Additional book reports are worth 2 extra credit points each. Write an inequality for the number of book reports Mariel needs to do.
3. Check whether the given number is a solution to the corresponding equation.
   a. $a = -3;\ 4a+3 = -9$
   b. $x = \frac{4}{3};\ \frac{3}{4}x + \frac{1}{2} = \frac{3}{2}$
   c. $y = 2;\ 2.5y - 10.0 = -5.0$
   d. $z = -5;\ 2(5-2z) = 20-2(z-1)$
4. Check whether the given number is a solution to the corresponding inequality.
   a. $x = 12;\ 2(x+6) \leq 8x$
   b. $z = -9;\ 1.4z + 5.2 > 0.4z$
   c. $y = 40;\ -\frac{5}{2}y + \frac{1}{2} < -18$
   d. $t = 0.4;\ 80 \geq 10(3t+2)$
5. The cost of a Ford Focus is 27% of the price of a Lexus GS 450h. If the price of the Ford is \$15000, what is the price of the Lexus?
6. On your new job you can be paid in one of two ways. You can either be paid \$1000 per month plus 6% commission of total sales or be paid \$1200 per month plus 5% commission on sales over \$2000. For what amount of sales is the first option better than the second option? Assume there are always sales over \$2000.
7. A phone company offers a choice of three text-messaging plans. Plan A gives you unlimited text messages for \$10 a month; Plan B gives you 60 text messages for \$5 a month and then charges you \$0.05 for each additional message; and Plan C has no monthly fee but charges you \$0.10 per message.
   a. If m is the number of messages you send per month, write an expression for the monthly cost of each of the three plans.
   b. For what values of m is Plan A cheaper than Plan B?
   c. For what values of m is Plan A cheaper than Plan C?
   d. For what values of m is Plan B cheaper than Plan C?
   e. For what values of m is Plan A the cheapest of all? (Hint: for what values is A both cheaper than B and cheaper than C?)

f. For what values of m is Plan B the cheapest of all? (Careful—for what values is B cheaper than A?)
g. For what values of m is Plan C the cheapest of all?
h. If you send 30 messages per month, which plan is cheapest?
i. What is the cost of each of the three plans if you send 30 messages per month?

2.4 Practice: 1-Step Equations

1. Solve the following equations for x.
   a. $x = 11 = 7$
   b. $x - 1.1 = 3.2$
   c. $7x = 21$
   d. $4x = 1$
   e. $\frac{5x}{12} = \frac{2}{3}$
   f. $x + \frac{5}{2} = \frac{2}{3}$
   g. $x - \frac{5}{6} = \frac{3}{8}$
   h. $0.01x = 11$
2. Solve the following equations for the unknown variable.
   a. $q - 13 = -13$
   b. $z + 1.1 = 3.0001$
   c. $21s = 3$
   d. $t + \frac{1}{2} = \frac{1}{3}$
   e. $\frac{7f}{11} = \frac{7}{11}$
   f. $\frac{3}{4} = -\frac{1}{2} - y$
   g. $6r = \frac{3}{8}$
   h. $\frac{9b}{16} = \frac{3}{8}$
3. Peter is collecting tokens on breakfast cereal packets in order to get a model boat. In eight weeks he has collected 10 tokens. He needs 25 tokens for the boat. Write an equation and determine the following information.
   a. How many more tokens he needs to collect, n.
   b. How many tokens he collects per week, w.
   c. How many more weeks remain until he can send off for his boat, r.
4. Juan has baked a cake and wants to sell it in his bakery. He is going to cut it into 12 slices and sell them individually. He wants to sell it for three times the cost of making it. The ingredients cost him $8.50, and he allowed $1.25 to cover the cost of electricity to bake it. Write equations that describe the following statements
   a. The amount of money that he sells the cake for (u).
   b. The amount of money he charges for each slice (c).
   c. The total profit he makes on the cake (w).
5. Jane is baking cookies for a large party. She has a recipe that will make one batch of two dozen cookies, and she decides to make five batches. To make five batches, she finds that she will need 12.5 cups of flour and 15 eggs.
   a. How many cookies will she make in all?
   b. How many cups of flour go into one batch?
   c. How many eggs go into one batch?
   d. If Jane only has a dozen eggs on hand, how many more does she need to make five batches?
   e. If she doesn't go out to get more eggs, how many batches can she make? How many cookies will that be?

2.5 Practice: 2-Step Equations

1. Solve the following equations for the unknown variable.
   a. $1.3x - 0.7x = 12$
   b. $6x - 1.3 = 3.2$
   c. $5x - (3x + 2) = 1$
   d. $4(x + 3) = 1$
   e. $5q - 7 = \frac{2}{3}$
   f. $\frac{3}{5}x + \frac{5}{2} = \frac{2}{3}$
   g. $s - \frac{3s}{8} = \frac{5}{6}$
   h. $0.1y + 11 = 0$
   i. $\frac{5q-7}{12} = \frac{2}{3}$
   j. $\frac{5(q-7)}{12} = \frac{2}{3}$
   k. $33t - 99 = 0$
   l. $5p - 2 = 32$
   m. $10y + 5 = 10$
   n. $10(y + 5) = 10$
   o. $10y + 5y = 10$
   p. $10(y + 5y) = 10$
2. Jade is stranded downtown with only $10 to get home. Taxis cost $0.75 per mile, but there is an additional $2.35 hire charge. Write a formula and use it to calculate how many miles she can travel with her money.
3. Jasmin's Dad is planning a surprise birthday party for her. He will hire a bouncy castle, and will provide party food for all the guests. The bouncy castle costs $150 for the afternoon, and the food will cost $3 per person. Andrew, Jasmin's Dad, has a budget of $300. Write an equation and use it to determine the maximum number of guests he can invite.
4. The local amusement park sells summer memberships for $50 each. Normal admission to the park costs $25; admission for members costs $15.
   a. If Darren wants to spend no more than $100 on trips to the amusement park this summer, how many visits can he make if he buys a membership with part of that money?
   b. How many visits can he make if he does not?
   c. If he increases his budget to $160, how many visits can he make as a member?
   d. And how many as a non-member?
5. For an upcoming school field trip, there must be one adult supervisor for every five children.
   a. If the bus seats 40 people, how many children can go on the trip?
   b. How many children can go if a second 40-person bus is added?
   c. Four of the adult chaperones decide to arrive separately by car. Now how many children can go in the two buses?

2.6 Practice: Equations with Variables on Both Sides

1. Solve the following equations for the unknown variable.
   a. $3(x-1)=2(x+3)$
   b. $7(x+20)=x+5$
   c. $9(x-2)=3x+3$
   d. $2\left(a-\frac{1}{3}\right)=\frac{2}{5}\left(a+\frac{2}{3}\right)$
   e. $\frac{2}{7}\left(t+\frac{2}{3}\right)=\frac{1}{5}\left(t-\frac{2}{3}\right)$
   f. $\frac{1}{7}\left(v+\frac{1}{4}\right)=2\left(\frac{3v}{2}-\frac{5}{2}\right)$
   g. $\frac{y-4}{11}=\frac{2}{5}\cdot\frac{2y+1}{3}$
   h. $\frac{z}{16}=\frac{2(3z+1)}{9}$
   i. $\frac{q}{16}+\frac{q}{6}=\frac{(3q+1)}{9}+\frac{3}{2}$
   j. $\frac{3}{x}=\frac{2}{x+1}$
   k. $\frac{5}{2+p}=\frac{3}{p-8}$
2. Manoj and Tamar are arguing about a number trick they heard. Tamar tells Andrew to think of a number, multiply it by five and subtract three from the result. Then Manoj tells Andrew to think of a number, add five and multiply the result by three. Andrew says that whichever way he does the trick he gets the same answer.
   a. What was the number Andrew started with?
   b. What was the result Andrew got both times?
   c. Name another set of steps that would have resulted in the same answer if Andrew started with the same number.
3. Manoj and Tamar try to come up with a harder trick. Manoj tells Andrew to think of a number, double it, add six, and then divide the result by two. Tamar tells Andrew to think of a number, add five, triple the result, subtract six, and then divide the result by three.
   a. Andrew tries the trick both ways and gets an answer of 10 each time. What number did he start out with?
   b. He tries again and gets 2 both times. What number did he start out with?
   c. Is there a number Andrew can start with that will *not* give him the same answer both ways?
   d. **Bonus:** Name another set of steps that would give Andrew the same answer every time as he would get from Manoj's and Tamar's steps.
4. I have enough money to buy five regular priced CDs and have \$6 left over. However, all CDs are on sale today, for \$4 less than usual. If I borrow \$2, I can afford nine of them.
   a. How much are CDs on sale for today?
   b. How much would I have to borrow to afford nine of them if they weren't on sale?
5. Five identical electronics components were connected in series. A fixed but unknown voltage placed across them caused a 2.3 amp current to flow. When two of the components were replaced with standard 10Ω resistors, the current dropped to 1.9 amps. What is the resistance of each component?
6. Solve the following resistance problems. Assume the same voltage is applied to all circuits.
   a. Three unknown resistors plus 20Ω give the same current as one unknown resistor plus 70Ω.
   b. One unknown resistor gives a current of 1.5 amps and a 15Ω resistor gives a current of 3.0 amps.
   c. Seven unknown resistors plus 18Ω gives twice the current of two unknown resistors plus 150Ω.
   d. Three unknown resistors plus 1.5Ω gives a current of 3.6 amps and seven unknown resistors plus seven 12Ω resistors gives a current of 0.2 amps.

2.7 Practice: Multi-Step Equations

1. Solve the following equations for the unknown variable.
   a. $3(x-1)-2(x+3)=0$
   b. $3(x+3)-2(x-1)=0$
   c. $7(w+20)-w=5$
   d. $5(w+20)-10w=5$
   e. $9(x-2)-3x=3$
   f. $12(t-5)+5=0$
   g. $2(2d+1)=\frac{2}{3}$
   h. $2\left(5a-\frac{1}{3}\right)=\frac{2}{7}$
   i. $\frac{2}{9}\left(i+\frac{2}{3}\right)=\frac{2}{5}$
   j. $4\left(v+\frac{1}{4}\right)=\frac{35}{2}$
   k. $\frac{g}{10}=\frac{6}{3}$
   l. $\frac{s-4}{11}=\frac{2}{5}$
   m. $\frac{2k}{7}=\frac{3}{8}$
   n. $\frac{7x+4}{3}=\frac{9}{2}$
   o. $\frac{9y-3}{6}=\frac{5}{2}$
   p. $\frac{r}{3}+\frac{r}{2}=7$
   q. $\frac{p}{16}-\frac{2p}{3}=\frac{1}{9}$
   r. $\frac{m+3}{2}-\frac{m}{4}=\frac{1}{3}$
   s. $5\left(\frac{k}{3}+2\right)=\frac{32}{3}$
   t. $\frac{3}{z}=\frac{2}{5}$
   u. $\frac{2}{r}+2=\frac{10}{3}$
   v. $\frac{12}{5}=\frac{3+z}{z}$
2. An engineer is building a suspended platform to raise bags of cement. The platform has a mass of 200 kg, and each bag of cement is 40 kg. He is using two steel cables, each capable of holding 250 kg. Write an equation for the number of bags he can put on the platform at once, and solve it.
3. A scientist is testing a number of identical components of unknown resistance which he labels $x\Omega$. He connects a circuit with resistance $(3x+4)\Omega$ to a steady 12 volt supply and finds that this produces a current of 1.2 amps. What is the value of the unknown resistance?
4. Lydia inherited a sum of money. She split it into five equal parts. She invested three parts of the money in a high-interest bank account which added 10% to the value. She placed the rest of her inheritance plus $500 in the stock market but lost 20% on that money. If the two accounts end up with exactly the same amount of money in them, how much did she inherit?
5. Pang drove to his mother's house to drop off her new TV. He drove at 50 miles per hour there and back, and spent 10 minutes dropping off the TV. The entire journey took him 94 minutes. How far away does his mother live?

2.8 Practice: Rational Equations Using Proportions

Here you'll learn how to use proportions to find the solutions to rational equations.

Solve the following equations.

1. $\frac{2x+1}{4} = \frac{x-3}{10}$
2. $\frac{4x}{x+2} = \frac{5}{9}$
3. $\frac{5}{3x-4} = \frac{2}{x+1}$
4. $\frac{2}{x+3} - \frac{1}{x+4} = 0$

Mixed Review

5. Divide: $-2\frac{9}{10} \div -\frac{15}{8}$.
6. Solve for $g: -1.5\left(-3\frac{4}{5} + g\right) = \frac{201}{20}$.

2.9 Practice: Solving Rational Equations using the LCD

Here you'll use the LCD of the expressions in a rational equation in order to solve for x.

Determine if the following values for are solutions for the given equations.

1. $\frac{4}{x-3}+2=\frac{3}{x+4},\ x=-1$
2. $\frac{2x-1}{x-5}-3=\frac{x+6}{2x},\ x=6$

What is the LCD for each set of numbers?

3. $4-x,\ x^2-16$
4. $2x,\ 6x-12,\ x^2-9$
5. $x-3,\ x^2-x-6,\ x^2-4$

Solve the following equations.

6. $\frac{6}{x+2}+1=\frac{5}{x}$
7. $\frac{5}{3x}-\frac{2}{x+1}=\frac{4}{x}$
8. $\frac{12}{x^2-9}=\frac{8x}{x-3}-\frac{2}{x+3}$
9. $\frac{6x}{x^2-1}+\frac{2}{x+1}=\frac{3x}{x-1}$
10. $\frac{5x-3}{4x}-\frac{x+1}{x+2}=\frac{1}{x^2+2x}$
11. $\frac{4x}{x^2+6x+9}-\frac{2}{x+3}=\frac{3}{x^2-9}$
12. $\frac{x^2}{x^2-8x+16}=\frac{x}{x-4}+\frac{3x}{x^2-16}$
13. $\frac{5x}{2x-3}+\frac{x+1}{x}=\frac{6x^2+x+12}{2x^2-3x}$
14. $\frac{3x}{x^2+2x-8}=\frac{x+1}{x^2+4x}+\frac{2x+1}{x^2-2x}$
15. $\frac{x+1}{x^2+7x}+\frac{x+2}{x^2-3x}=\frac{x}{x^2+4x-21}$

2.10 Practice: Radical Equations

Here you'll learn how to find the solutions to radical equations.

In 1-16, find the solution to each of the following radical equations. Identify extraneous solutions.

1. $\sqrt{x+2}-2=0$
2. $\sqrt{3x-1}=5$
3. $2\sqrt{4-3x}+3=0$
4. $\sqrt[3]{x-3}=1$
5. $\sqrt[4]{x^2-9}=2$
6. $\sqrt[3]{-2-5x}+3=0$
7. $\sqrt{x^2-5x}-6=0$
8. $\sqrt{3x+4}=-6$
9. The area of a triangle is 24 in^2 and the height of the triangle is twice as long and the base. What are the base and the height of the triangle?
10. The volume of a square pyramid is given by the formula $V=\frac{A(h)}{3}$, where $A = \textit{area of the base}$ and $h = \textit{height of the pyramid}$. The volume of a square pyramid is 1,600 cubic meters. If its height is 10 meters, find the area of its base.
11. The volume of a cylinder is 245 cm^3 and the height of the cylinder is one-third the diameter of the cylinder's base. The diameter of the cylinder is kept the same, but the height of the cylinder is increased by two centimeters. What is the volume of the new cylinder? $(\text{Volume} = \pi r^2 \cdot h)$
12. The height of a golf ball as it travels through the air is given by the equation $h=-16t^2+256$. Find the time when the ball is at a height of 120 feet.

2.11 Practice: Solving Real-World Problems Using Multi-Step Equations

Here you'll learn how to translate words into to multi-step equations. You'll then solve such equations for their unknown variable.

For 1-6, solve for the variable in the equation.

1. $\frac{s-4}{11} = \frac{2}{5}$
2. $\frac{2k}{7} = \frac{3}{8}$
3. $\frac{7x+4}{3} = \frac{9}{2}$
4. $\frac{9y-3}{6} = \frac{5}{2}$
5. $\frac{r}{3} + \frac{r}{2} = 7$
6. $\frac{p}{16} - \frac{2p}{3} = \frac{1}{9}$
7. An engineer is building a suspended platform to raise bags of cement. The platform has a mass of 200 kg, and each bag of cement is 40 kg. He is using two steel cables, each capable of holding 250 kg. Write an equation for the number of bags he can put on the platform at once, and solve it.
8. A scientist is testing a number of identical components of unknown resistance which he labels $x\Omega$. He connects a circuit with resistance $(3x+4)\Omega$ to a steady 12 volt supply and finds that this produces a current of 1.2 amps. What is the value of the unknown resistance?
9. Lydia inherited a sum of money. She split it into five equal parts. She invested three parts of the money in a high-interest bank account which added 10% to the value. She placed the rest of her inheritance plus $500 in the stock market but lost 20% on that money. If the two accounts end up with exactly the same amount of money in them, how much did she inherit?
10. Pang drove to his mother's house to drop off her new TV. He drove at 50 miles per hour there and back, and spent 10 minutes dropping off the TV. The entire journey took him 94 minutes. How far away does his mother live?

Chapter 3: Graphing

CHAPTER 3

Chapter Outline

3.1 Practice: The Coordinate Plane

1. Identify the coordinates of each point, $A-F$, on the graph to the right.
2. Plot the following points on a graph and identify which quadrant each point lies in:
   (a) $(4,2)$
   (b) $(-3,5.5)$
   (c) $(4,-4)$
   (d) $(-2,-3)$
3. The following three points are three vertices of square $ABCD$. Plot them on a graph then determine what the coordinates of the fourth point, D, would be. Plot that point and label it.
   A $(-4,-4)$
   B $(3,-4)$
   C $(3,3)$
4. Becky has a large bag of MMs that she knows she should share with Jaeyun. Jaeyun has a packet of Starburst. Becky tells Jaeyun that for every Starburst he gives her, she will give him three MMs in return. If x is the number of Starburst that Jaeyun gives Becky, and $y$is the number of MMs he gets in return then complete each of the following.
   (a) Write an algebraic rule for y in terms of x
   (b) Make a table of values for y with x values of $0,1,2,3,4,5$.
   (c) Plot the function linking x *and* y on the following scale $0 \leq x \leq 10, 0 \leq y \leq 10$.

3.2 Practice: Graphing Using Intercepts

Find the intercepts for the following equations.

1. $y = 3x - 6$
2. $y = -2x + 4$
3. $y = 14x - 21$
4. $y = 7 - 3x$
5. $5x - 6y = 15$
6. $3x - 4y = -5$
7. $2x + 7y = -11$
8. $5x + 10y = 25$

Find the intercepts and then graph the following equations.

9. $y = 2x + 3$
10. $6(x - 1) = 2(y + 3)$
11. $x - y = 5$
12. $x + y = 8$
13. At the local grocery store strawberries cost $3.00 per pound and bananas cost $1.00 per pound. If I have $10 to spend between strawberries and bananas, draw a graph to show what combinations of each I can buy and spend exactly $10.
14. A movie theater charges $7.50 for adult tickets and $4.50 for children. If the theater takes $900 in ticket sales for a particular screening, draw a graph which depicts the possibilities for the number of adult tickets and the number of child tickets sold.
15. Why can't we use the intercept method to graph the following equation? $3(x + 2) = 2(y + 3)$

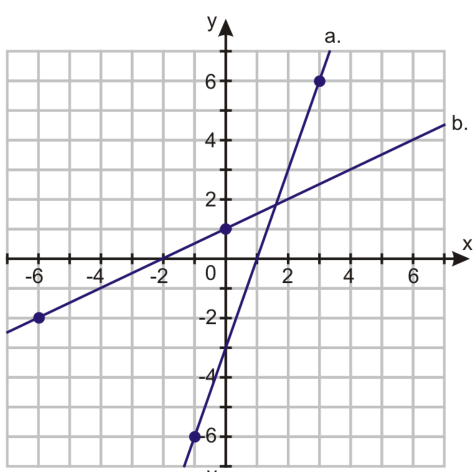
3.3 Practice: Slope

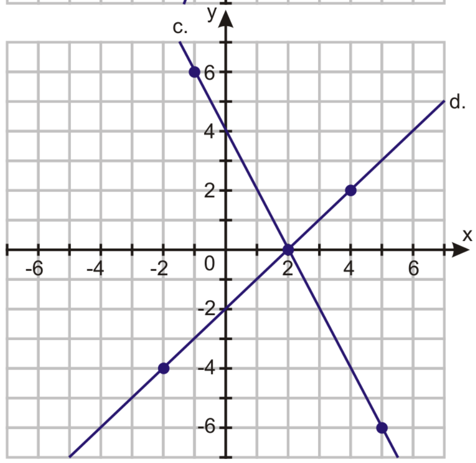
Here you'll learn how to find the slope of a line given the line's graph or two of its points.

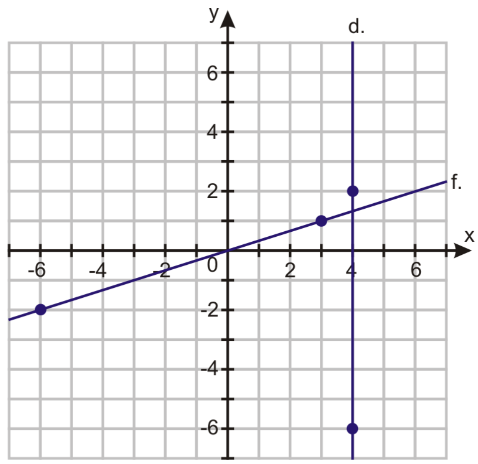
Use the slope formula to find the slope of the line that passes through each pair of points.

1. (-5, 7) and (0, 0)
2. (-3, -5) and (3, 11)
3. (3, -5) and (-2, 9)
4. (-5, 7) and (-5, 11)
5. (9, 9) and (-9, -9)
6. (3, 5) and (-2, 7)
7. (2.5, 3) and (8, 3.5)

For each line in the graphs below, use the points indicated to determine the slope.

8. 

9. 

10. 

11. For each line in the graphs above, imagine another line with the same slope that passes through the point (1, 1), and name one more point on that line.

3.4 Practice: Slope-Intercept Form

Here you'll use slope-intercept form and identify the slope and the y-intercept.

1. $y = 2x + 4$
2. $y = 3x - 2$
3. $y = 4x + 3$
4. $y = 5x - 1$
5. $y = \frac{1}{2}x + 2$
6. $y = -2x + 4$
7. $y = -3x - 1$
8. $y = \frac{-1}{3}x + 5$

Directions: Use what you have learned to write each in slope –intercept form and then answer each question.

9. $2x + 4y = 12$
10. Write this equation in slope –intercept form.
11. What is the slope?
12. What is the y –intercept?
13. $6x + 3y = 24$
14. Write this equation in slope –intercept form.
15. What is the slope?
16. What is the y –intercept?
17. $5x + 5y = 15$
18. Write this equation in slope –intercept form.
19. What is the slope?
20. What is the y –intercept?

3.5 Practice: Direct Variation Models

1. Plot the following direct variations on the same graph.
   (a) $y = \frac{4}{3}x$
   (b) $y = -\frac{2}{3}x$
   (c) $y = -\frac{1}{6}x$
   (d) $y = 1.75x$
2. Dasans mom takes him to the video arcade for his birthday. In the first 10 minutes, he spends \$3.50 playing games. If his allowance for the day is \$20.00, how long can he keep playing games before his money is gone?
3. The current standard for low-flow showerheads heads is 2.5 gallons per minute. Calculate how long it would take to fill a 30 gallon bathtub using such a showerhead to supply the water.
4. Amen is using a hose to fill his new swimming pool for the first time. He starts the hose at 10 P.M. and leaves it running all night. At 6 AM he measures the depth and calculates that the pool is four sevenths full. At what time will his new pool be full?
5. Land in Wisconsin is for sale to property investors. A 232 acre lot is listed for sale for \$200500. Assuming the same price per acre, how much would a 60 acre lot sell for?
6. The force (F) needed to stretch a spring by a distance x is given by the equation $F = k \cdot x$, where k is the spring constant (measured in Newtons per centimeter, N/cm). If a 12 Newton force stretches a certain spring by 10 cm, calculate:
   (a) The spring constant, k
   (b) The force needed to stretch the spring by 7 cm .
   (c) The distance the spring would stretch with a 23 Newton force.

3.6 Practice: Forms of Linear Equations

Example 1

A line has a slope of $\frac{3}{5}$, and the point (2, 6) is on the line. Write the equation of the line in point-slope form.

Example 2

A line contains the points (3, 2) and (-2, 4). Write an equation for the line in point-slope form; then write an equation in $y-$intercept form.

Example 5

Make a graph of the line given by the equation $y+2=\frac{2}{3}(x-2)$.

Example 6

Rewrite the following equations in standard form:

a) $y=5x-7$

b) $y-2=-3(x+3)$

c) $y=\frac{2}{3}x+\frac{1}{2}$

Example 7

Find the slope and the $y-$intercept of the following equations written in standard form.

a) $3x+5y=6$

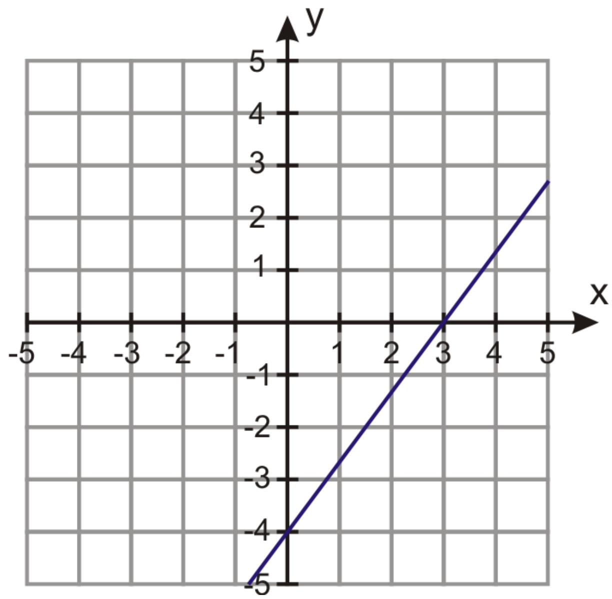
b) $2x-3y=-8$

c) $x-5y=10$

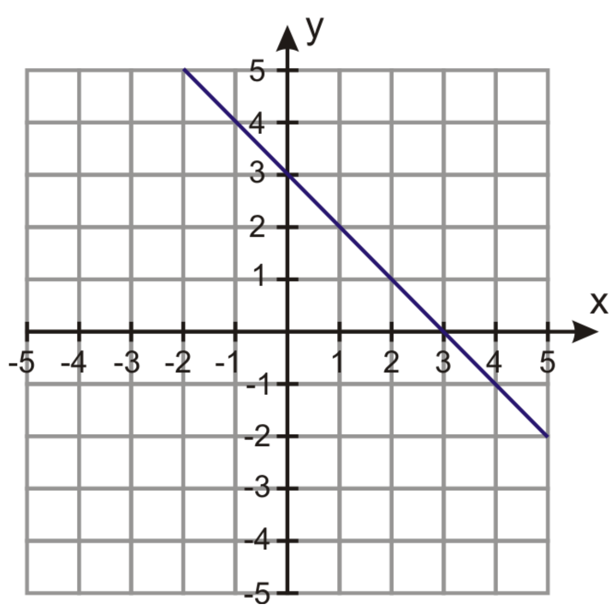
Example 8

Find the equation of each line and write it in standard form.

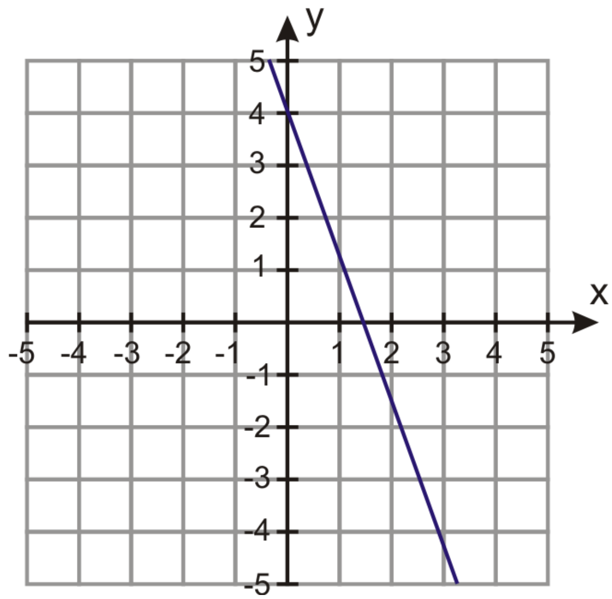
a)



b)



c)



Example 9

Marciel rented a moving truck for the day. Marciel only remembers that the rental truck company charges $40 per day and some number of cents per mile. Marciel drives 46 miles and the final amount of the bill (before tax) is $63. What is the amount per mile the truck rental company charges? Write an equation in point-slope form that describes this situation. How much would it cost to rent this truck if Marciel drove 220 miles?

Example 10

Anne got a job selling window shades. She receives a monthly base salary and a $6 commission for each window shade she sells. At the end of the month she adds up sales and she figures out that she sold 200 window shades and made $2500. Write an equation in point-slope form that describes this situation. How much is Anne's monthly base salary?

Example 11

Nadia buys fruit at her local farmer's market. This Saturday, oranges cost $2 per pound and cherries cost $3 per pound. She has $12 to spend on fruit. Write an equation in standard form that describes this situation. If she buys 4 pounds of oranges, how many pounds of cherries can she buy?

Example 12

Peter skateboards part of the way to school and walks the rest of the way. He can skateboard at 7 miles per hour and he can walk at 3 miles per hour. The distance to school is 6 miles. Write an equation in standard form that describes this situation. If he skateboards for $\frac{1}{2}$ *an hour, how long does he need to walk to get to school?*

3.7 Practice: Equations of Parallel and Perpendicular Lines

Here you will learn about parallel and perpendicular lines and how to determine whether or not two lines are parallel or perpendicular using slope.

Practice

For each pair of given equations, determine if the lines are parallel, perpendicular or neither.

1. $y = 2x - 5$ and $y = 2x + 3$
2. $y = \frac{1}{3}x + 5$ and $y = -3x - 5$
3. $x = 8$ and $x = -2$
4. $y = 4x + 7$ and $y = -4x - 7$
5. $y = -x - 3$ and $y = x + 6$
6. $3y = 9x + 8$ and $y = 3x - 4$

Determine the equation of the line satisfying the following conditions:

7. through the point (5, –6) and parallel to the line $y = 5x + 4$
8. through the point (–1, 7) and perpendicular to the line $y = -4x + 5$
9. containing the point (–1, –5) and parallel to $3x + 2y = 9$
10. containing the point (0, –6) and perpendicular to $6x - 3y + 8 = 0$
11. through the point (2, 4) and perpendicular to the line $y = -\frac{1}{2}x + 3$
12. containing the point (–1, 5) and parallel to $x + 5y = 3$
13. through the point (0, 4) and perpendicular to the line $2x - 5y + 1 = 0$

If $D(4, -1), E(-4, 5)$ and $F(3, 6)$ are the vertices of ΔDEF determine:

14. the equation of the line through D and parallel to EF.
15. the equation of the line containing the altitude from D to EF (the line perpendicular to EF that contains D).

CHAPTER 4 Chapter 4: Functions

Chapter Outline

4.1 Practice: Function Notation Practice

Here you'll learn how to use function notation when working with functions.

If $g(x) = 4x^2 - 3x + 2$, find expressions for the following:

1. $g(a)$
2. $g(a-1)$
3. $g(a+2)$
4. $g(2a)$
5. $g(-a)$

If $f(y) = 5y - 3$, determine the value of 'y' when:

6. $f(y) = 7$
7. $f(y) = -1$
8. $f(y) = -3$
9. $f(y) = 6$
10. $f(y) = -8$

The value of a Bobby Orr rookie card n years after its purchase is $V(n) = 520 + 28n$.

11. Determine the value of $V(6)$ and explain what the solution means.
12. Determine the value of n when $V(n) = 744$ and explain what this situation represents.
13. Determine the original price of the card.

Let $f(x) = \frac{3x}{x+2}$.

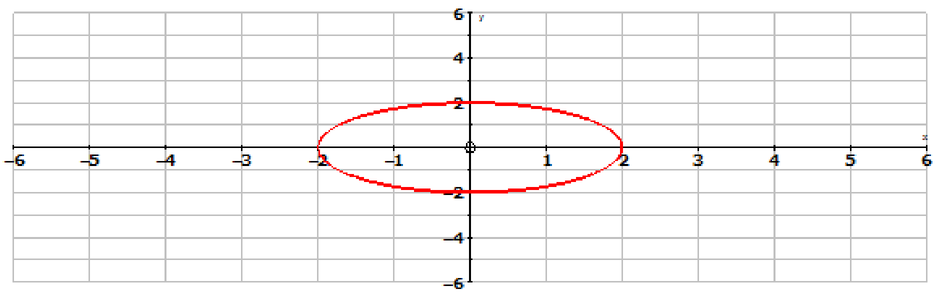
14. When is $f(x)$ undefined?
15. For what value of x does $f(x) = 2.4$?

4.2 Practice Exercises: Domain and Range

Here you'll learn how to find the domain and range of a relation.

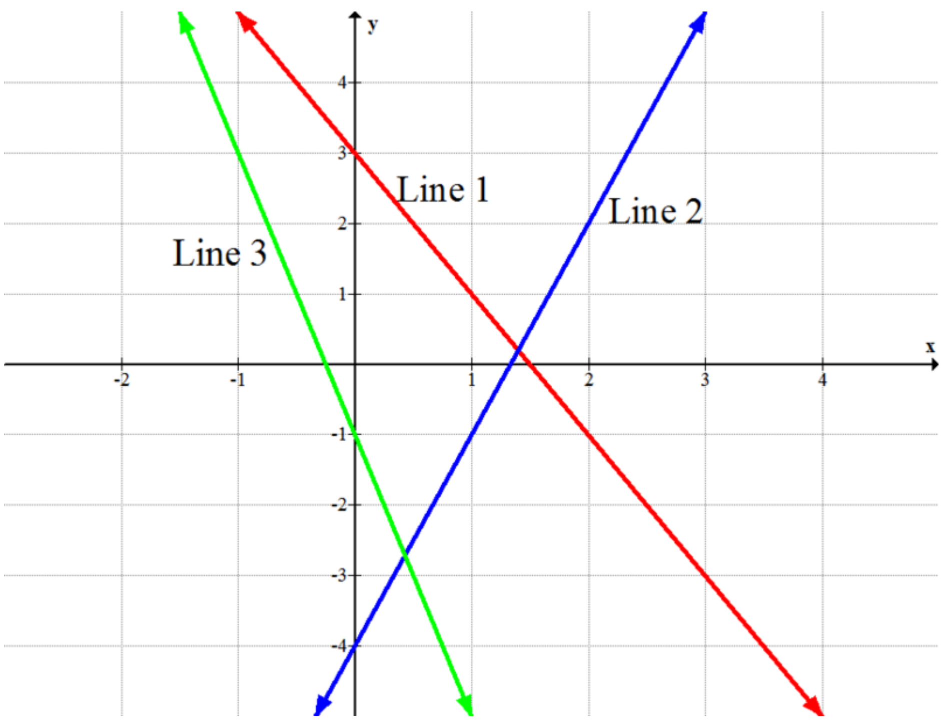
Practice

Use the graph below for #1 and #2.



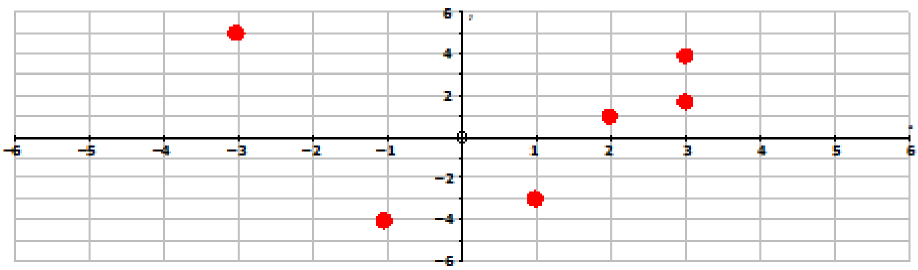
1. Is the relation discrete, continuous, or neither?
2. Find the domain and range for the relation.

Use the graph below for #3 and #4.



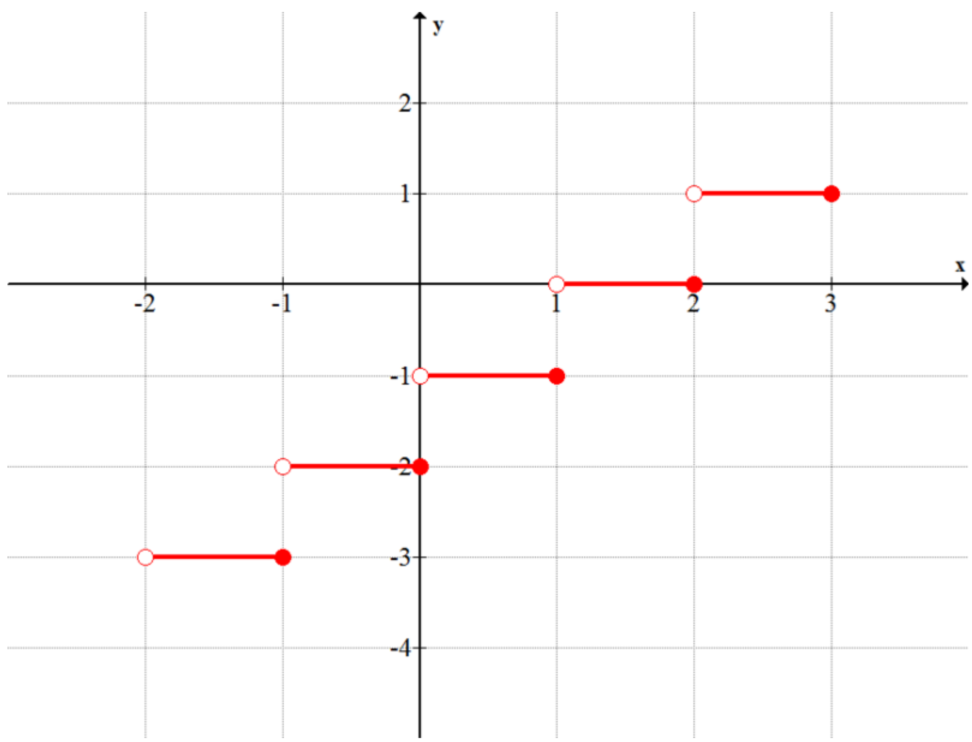
3. Is the relation discrete, continuous, or neither?
4. Find the domain and range for each of the three relations.

Use the graph below for #5 and #6.



5. Is the relation discrete, continuous, or neither?
6. Find the domain and range for the relation.

Use the graph below for #7 and #8.



7. Is the relation discrete, continuous, or neither?
8. Find the domain and range for the relation.

Examine the following pattern.

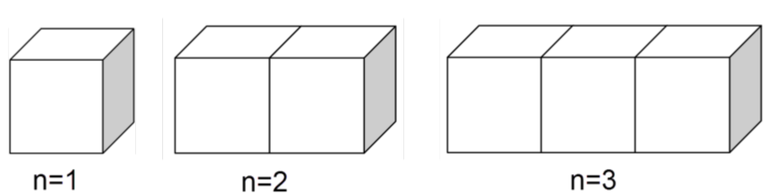


TABLE 4.1:

Number of Cubes (n)	1	2	3	4	5	...	n	...	200
Number of visible faces (f)	6	10	14						

9. Complete the table below the pattern.
10. Is the relation discrete, continuous, or neither?
11. Write a suitable domain and range for the pattern.

Examine the following pattern.

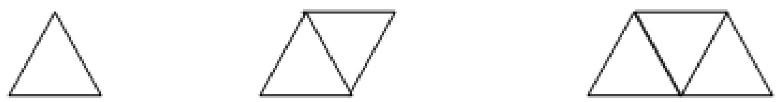


TABLE 4.2:

Number of triangles (n)	1	2	3	4	5	...	n	...	100
Number of toothpicks (t)									

12. Complete the table below the pattern.
13. Is the relation discrete, continuous, or neither?
14. Write a suitable domain and range for the pattern.

Examine the following pattern.

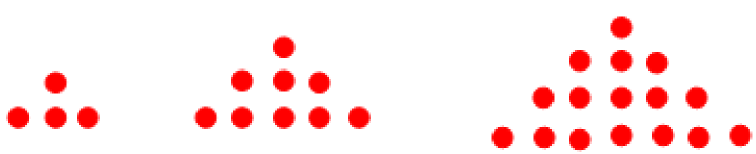


TABLE 4.3:

Pattern Number (n)	**1**	**2**	**3**	**4**	**5**	**...**	n	**...**	**100**
Number of dots (d)									

15. Complete the table below the pattern.
16. Is the relation discrete, continuous, or neither?
17. Write a suitable domain and range for the pattern.

4.3 Practice: Graphs of Functions based on Rules

Here you'll learn how to graph a function from a given rule.

Graph the following functions.

1. Vanson spends $20 a month on his cat.
2. Brandon is a member of a movie club. He pays a $50 annual membership and $8 per movie.
3. $f(x) = (x-2)^2$
4. $f(x) = 3.2^x$
5. $f(t) = 27t - t^2$
6. $f(w) = \frac{w}{4} + 5$
7. $f(x) = t + 2t^2 + 3t^3$
8. $f(x) = (x-1)(x+3)$
9. $f(x) = \frac{x}{3} + \frac{x^2}{5}$
10. $f(x) = \sqrt{2x}$

4.4 Practice: Linear Interpolation & Extrapolation

Use the table below (Median Age of First Marriage) for questions 1-3.

TABLE 4.4:

Year	Median age of males	Median age of females
1890	26.1	22.0
1900	25.9	21.9
1910	25.1	21.6
1920	24.6	21.2
1930	24.3	21.3
1940	24.3	21.5
1950	22.8	20.3
1960	22.8	20.3
1970	23.2	20.8
1980	24.7	22.0
1990	26.1	23.9
2000	26.8	25.1

1. Use the data from Example 1 (Median age at first marriage) to estimate the age at marriage for females in 1946. Fit a line, by hand, to the data before 1970.
2. Use the data from Example 1 (Median age at first marriage) to estimate the age at marriage for females in 1984. Fit a line, by hand, to the data from 1970 on in order to estimate this accurately.
3. Use the data from Example 1 (Median age at first marriage) to estimate the age at marriage for males in 1995. Use linear interpolation between the 1990 and 2000 data points.

Use the table below (Winning Times of Women's 100m Dash) for question 4.

TABLE 4.5:

Winner	Country	Year	Time (seconds)
Mary Lines	UK	1922	12.8
Leni Schmidt	Germany	1925	12.4
Gerturd Glasitsch	Germany	1927	12.1
Tollien Schuurman	Netherlands	1930	12.0
Helen Stephens	USA	1935	11.8
Lulu Mae Hymes	USA	1939	11.5
Fanny Blankers-Koen	Netherlands	1943	11.5
Marjorie Jackson	Australia	1952	11.4
Vera Krepkina	Soviet Union	1958	11.3
Wyomia Tyus	USA	1964	11.2
Barbara Ferrell	USA	1968	11.1
Ellen Strophal	East Germany	1972	11.0
Inge Helten	West Germany	1976	11.0
Marlies Gohr	East Germany	1982	10.9
Florence Griffith Joyner	USA	1988	10.5

4. Use the data from Example 3 (Winning times) to estimate the winning time for the female 100-meter race in 1920. Use linear extrapolation because the first two or three data points have a different slope than the rest of the data.

Use the table below to answer questions 5 and 6.

TABLE 4.6:

Year	Percent of pregnant women smokers
1990	18.4
1991	17.7
1992	16.9
1993	15.8
1994	14.6
1995	13.9
1996	13.6
2000	12.2
2002	11.4
2003	10.4
2004	10.2

5. Use the data from Example 2 (Pregnant women and smoking) to estimate the percentage of pregnant smokers in 1997. Use linear interpolation between the 1996 and 2000 data points.

6. Use the data from Example 2 (Pregnant women and smoking) to estimate the percentage of pregnant smokers in 2006. Use linear extrapolation with the final two data points.

The table below shows the highest temperature vs. the hours of daylight for the

15^{th}

day of each month in the year 2006 in San Diego, California. Use this table to answer question #7.

TABLE 4.7:

Hours of daylight	High temperature (F)
10.25	60
11.0	62
12	62
13	66
13.8	68
14.3	73
14	86
13.4	75
12.4	71
11.4	66
10.5	73
10	61

7. (a) What would be a better way to organize this table if you want to make the relationship between daylight hours and temperature easier to see?

(b) Estimate the high temperature for a day with 13.2 hours of daylight using linear interpolation.

(c) Estimate the high temperature for a day with 9 hours of daylight using linear extrapolation. Is the prediction accurate?

(d) Estimate the high temperature for a day with 9 hours of daylight using a line of best fit.

The table below lists expected life expectancies based on year of birth (US Census Bureau). Use it to answer questions 8-15.

TABLE 4.8:

Birth year	Life expectancy in years
1930	59.7
1940	62.9
1950	68.2
1960	69.7
1970	70.8
1980	73.7
1990	75.4
2000	77

8. Make a scatter plot of the data.

9. Use a line of best fit to estimate the life expectancy of a person born in 1955.

10. Use linear interpolation to estimate the life expectancy of a person born in 1955.

11. Use a line of best fit to estimate the life expectancy of a person born in 1976.

12. Use linear interpolation to estimate the life expectancy of a person born in 1976.

13. Use a line of best fit to estimate the life expectancy of a person born in 2012.

14. Use linear extrapolation to estimate the life expectancy of a person born in 2012.

15. Which method gives better estimates for this data set? Why?

The table below lists the high temperature for the fist day of the month for the year 2006 in San Diego, California (Weather Underground). Use it to answer questions 16-21.

TABLE 4.9:

Month number	Temperature (F)
1	63
2	66
3	61
4	64
5	71
6	78
7	88
8	78
9	81
10	75
11	68
12	69

16. Draw a scatter plot of the data.

17. Use a line of best fit to estimate the temperature in the middle of the

4^{th}

month (month 4.5).

18. Use linear interpolation to estimate the temperature in the middle of the

4^{th}

month (month 4.5).

19. Use a line of best fit to estimate the temperature for month 13 (January 2007).

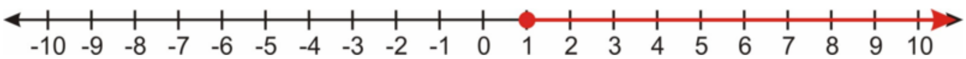
20. Use linear extrapolation to estimate the temperature for month 13 (January 2007).

21. Which method gives better estimates for this data set? Why?

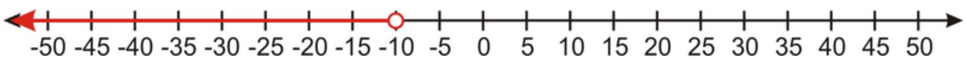
4.5 Practice: Inequality Expressions

Here you'll learn how to write and graph inequalities in one variable on a number line.

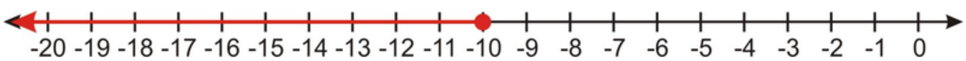
1. Write the inequality represented by the graph.



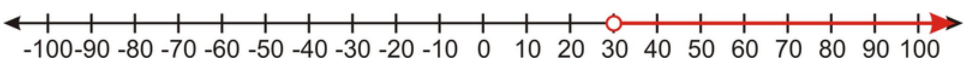
2. Write the inequality represented by the graph.



3. Write the inequality represented by the graph.



4. Write the inequality represented by the graph.



Graph each inequality on the number line.

5. $x < -35$
6. $x > -17$
7. $x \geq 20$
8. $x \leq 3$
9. $x \geq -5$
10. $x > 20$

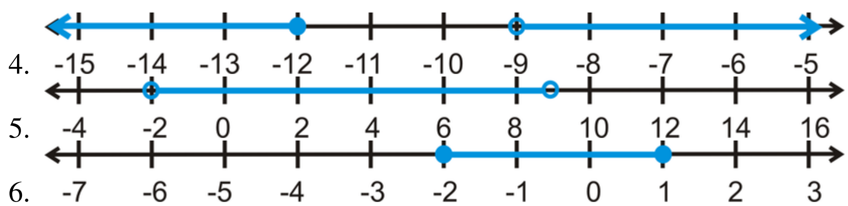
4.6 Practice: Compound Inequalities

Here you will solve two inequalities that have been joined together by the words “and” and “or.”

Graph the following compound inequalities. Use an appropriate scale.

1. $-1 < x < 8$
2. $x > 5$ or $x \leq 3$
3. $-4 \leq x \leq 0$

Write the compound inequality that best fits each graph below.



Solve each compound inequality and graph the solution.

7. $-11 < x - 9 \leq 2$
8. $8 \leq 3 - 5x < 28$
9. $2x - 7 > -13$ or $\frac{1}{3}x + 5 \leq 1$
10. $0 < \frac{x}{5} < 4$
11. $-4x + 9 < 35$ or $3x - 7 \leq -16$
12. $\frac{3}{4}x + 7 \geq -29$ or $16 - x > 2$
13. $3 \leq 6x - 15 < 51$
14. $-20 < -\frac{3}{2}x + 1 < 16$
15. **Challenge** Write a compound inequality whose solutions are all real numbers. Show why this is true.

4.7 Practice: Absolute Value Equations with One Variable

Determine if the following numbers are solutions to the given absolute value equations.

1. $|x-7|=16;9$
2. $|\frac{1}{4}x+1|=4;-8$
3. $|5x-2|=7;-1$

Solve the following absolute value equations.

1. $|x+3|=8$
2. $|2x|=9$
3. $|2x+15|=3$
4. $\left|\frac{1}{3}x-5\right|=2$
5. $\left|\frac{x}{6}+4\right|=5$
6. $|7x-12|=23$
7. $\left|\frac{3}{5}x+2\right|=11$
8. $|4x-15|+1=18$
9. $|-3x+20|=35$
10. $|12x-18|=0$
11. What happened in #13? Why do you think that is?
12. Challenge When would an absolute value equation have no solution? Give an example.

4.8 Practice: Solving Absolute Value Inequalities

Here you'll learn how to solve absolute value inequalities.

Determine if the following numbers are solutions to the given absolute value inequalities.

1. $|x-9|>4; 10$
2. $\left|\frac{1}{2}x-5\right|\leq 1; 8$
3. $|5x+14|\geq 29; -8$

Solve and graph the following absolute value inequalities.

4. $|x+6|>12$
5. $|9-x|\leq 16$
6. $|2x-7|\geq 3$
7. $|8x-5|<27$
8. $\left|\frac{5}{6}x+1\right|>6$
9. $|18-4x|\leq 2$
10. $\left|\frac{3}{4}x-8\right|>13$
11. $|6-7x|\leq 34$
12. $|19+3x|\geq 46$

Solve the following absolute value inequalities. a **is greater than zero.**

13. $|x-a|>a$
14. $|x+a|\leq a$
15. $|a-x|\leq a$

4.9 Practice: Linear Inequalities in Two Variables

Here you'll learn how to graph linear inequalities in two variables of the form $y > mx + b$ or $y < mx + b$. You'll also solve real-world problems involving such inequalities.

Graph the following inequalities on the coordinate plane.

1. $y \leq 4x + 3$
2. $y > -\frac{x}{2} - 6$
3. $3x - 4y \geq 12$
4. $x + 7y < 5$
5. $6x + 5y > 1$
6. $y + 5 \leq -4x + 10$
7. $x - \frac{1}{2}y \geq 5$
8. $6x + y < 20$
9. $30x + 5y < 100$
10. Remember what you learned in the last chapter about families of lines.
    a. What do the graphs of $y > x + 2$ and $y < x + 5$ have in common?
    b. What do you think the graph of $x + 2 < y < x + 5$ would look like?
11. How would the answer to problem 6 change if you subtracted 2 from the right-hand side of the inequality?
12. How would the answer to problem 7 change if you added 12 to the right-hand side?
13. How would the answer to problem 8 change if you flipped the inequality sign?
14. A phone company charges 50 cents per minute during the daytime and 10 cents per minute at night. How many daytime minutes and nighttime minutes could you use in one week if you wanted to pay less than $20?
15. Suppose you are graphing the inequality $y > 5x$.
    a. Why can't you plug in the point (0, 0) to tell you which side of the line to shade?
    b. What happens if you do plug it in?
    c. Try plugging in the point (0, 1) instead. Now which side of the line should you shade?
16. A theater wants to take in at least $2000 for a certain matinee. Children's tickets cost $5 each and adult tickets cost $10 each.
    a. If x represents the number of adult tickets sold and y represents the number of children's tickets, write an inequality describing the number of tickets that will allow the theater to meet their minimum take.
    b. If 100 children's tickets and 100 adult tickets have already been sold, what inequality describes how many *more* tickets of both types the theater needs to sell?
    c. If the theater has only 300 seats (so only 100 are still available), what inequality describes the *maximum* number of additional tickets of both types the theater can sell?

CHAPTER 5 Chapter 5: Systems

Chapter Outline

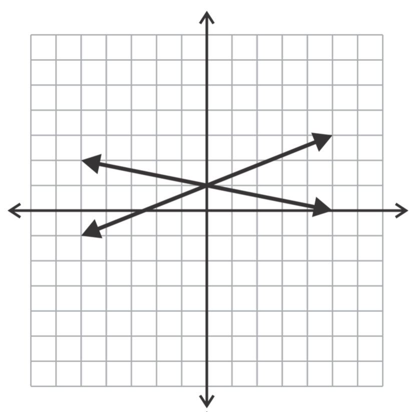
5.1 Practice: Solving Systems with One Solution Using Graphing

Here you'll learn how to graph lines to identify the unique solution to a system of linear equations.

Match the system of linear equations to its graph and state the solution.

1.

$$3x+2y=-2$$
$$x-y=-4$$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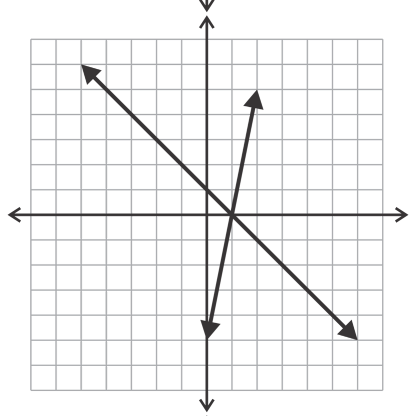
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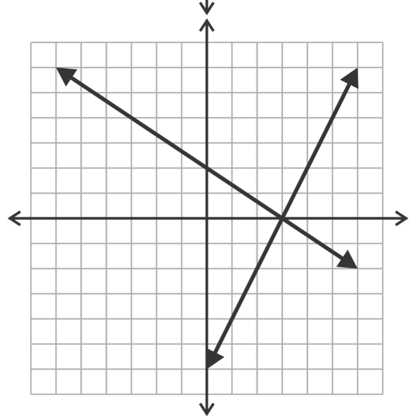
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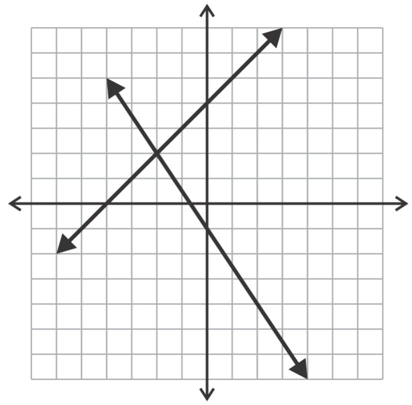
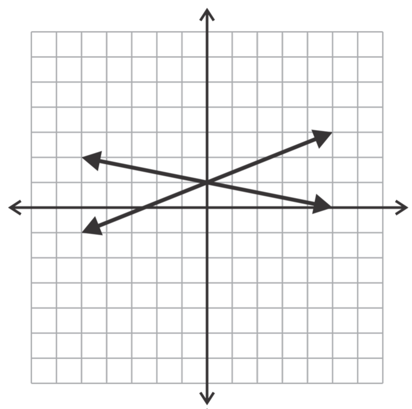


d.

2.

$$2x - y = 6$$
$$2x + 3y = 6$$



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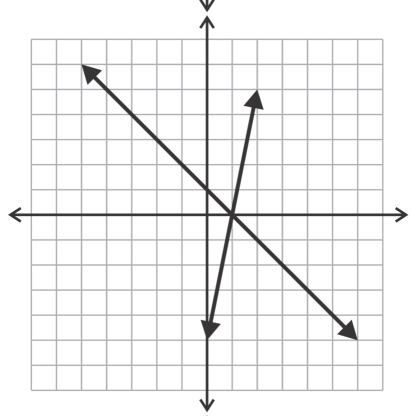

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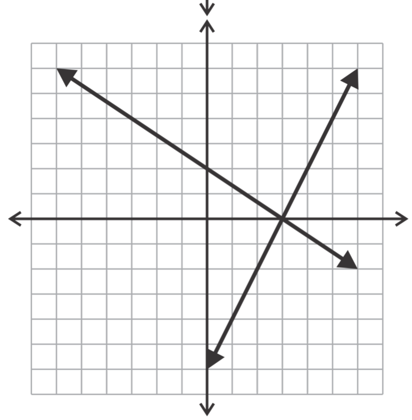

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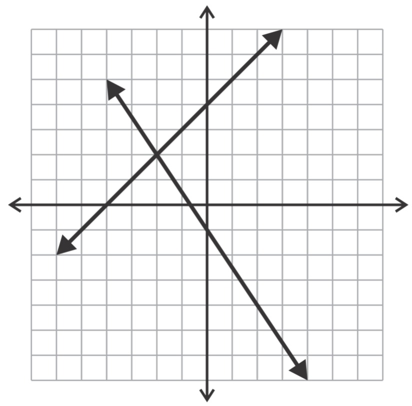
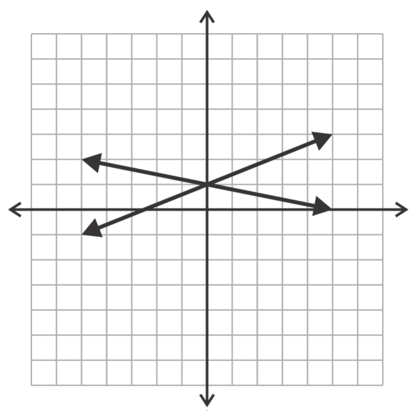

d.

3.

$$2x-5y=-5$$
$$x+5y=5$$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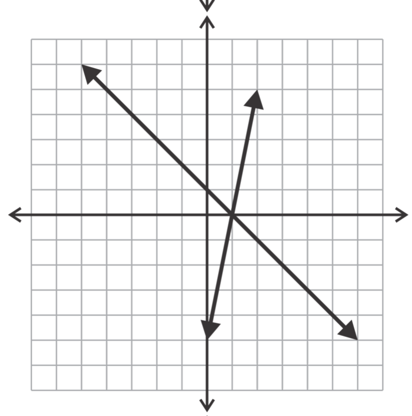
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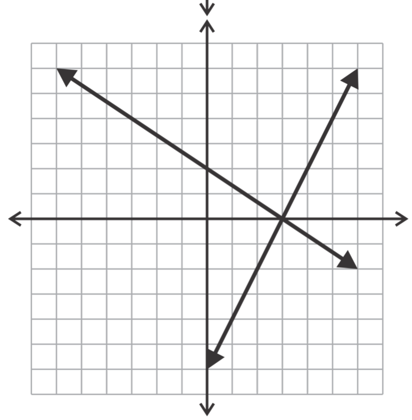
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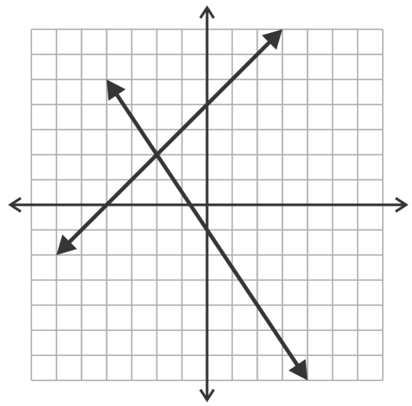
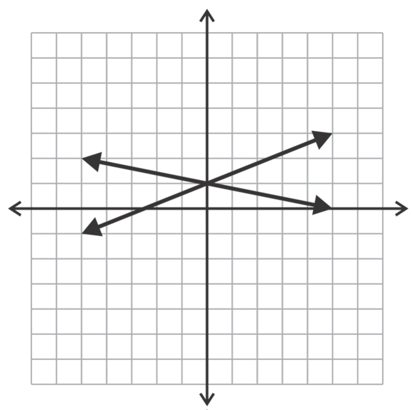


d.

4.

$$y = 5x - 5$$
$$y = -x + 1$$



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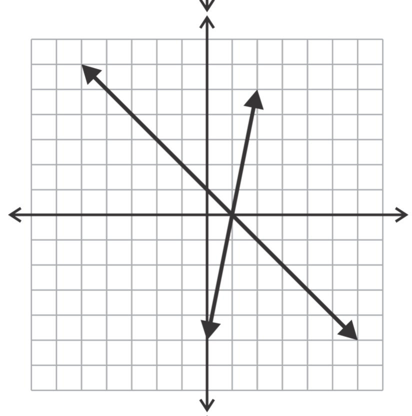

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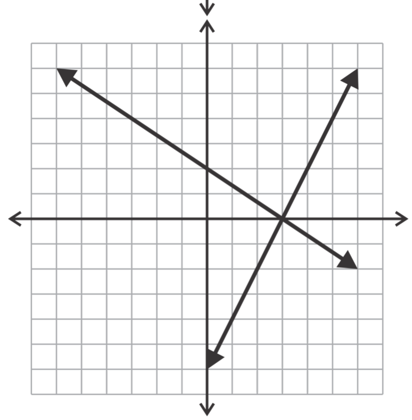

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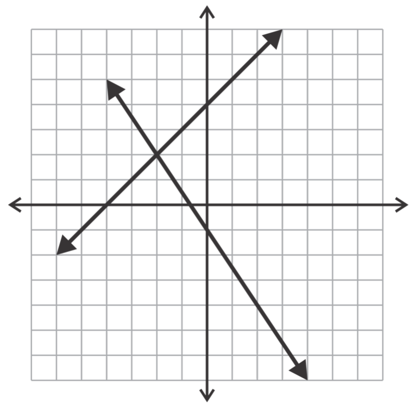
d. 

Solve the following linear systems by graphing. Use graph paper and a straightedge to insure accuracy. You are encouraged to verify your answer algebraically.

5.

$$y = -\frac{2}{5}x + 1$$
$$y = \frac{3}{5}x - 4$$

6.

$$y = -\frac{2}{3}x + 4$$
$$y = 3x - 7$$

7.

$$y = -2x + 1$$
$$x - y = -4$$

8.

$$3x + 4y = 12$$
$$x - 4y = 4$$

9.

$$7x - 2y = -4$$
$$y = -5$$

10.

$$x - 2y = -8$$
$$x = -3$$

Solve the following linear systems by graphing using technology. Solutions should be rounded to the nearest hundredth as necessary.

11.

$$y = \frac{3}{7}x + 11$$
$$y = -\frac{13}{2}x - 5$$

12.

$$y = 0.95x - 8.3$$
$$2x + 9y = 23$$

13.

$$15x - y = 22$$
$$3x + 8y = 15$$

Use the following information to complete exercises 14-17.

Clara and her brother, Carl, are at the beach for vacation. They want to rent bikes to ride up and down the boardwalk. One rental shop, Bargain Bikes, advertises rates of \$5 plus \$1.50 per hour. A second shop, Frugal Wheels, advertises a rate of \$6 plus \$1.25 an hour.

14. How much does it cost to rent a bike for one hour from each shop? How about 10 hours?
15. Write equations to represent the cost of renting a bike from each shop. Let x represent the number of hours and y represent the total cost.
16. Solve your system to figure out when the cost is the same.
17. Clara and Carl want to rent the bikes for about 3 hours. Which shop should they use?

5.2 Practice: Substitution Method for Systems of Equations

Here you'll learn how to solve systems of linear equations algebraically using the substitution method.

Solve the following systems of linear equations using the substitution method.

1. $$\begin{Bmatrix} y = 3x \\ 5x - 2y = 1 \end{Bmatrix}$$

2. $$\begin{Bmatrix} y = 3x + 1 \\ 2x - y = 2 \end{Bmatrix}$$

3. $$\begin{Bmatrix} x = 2y \\ x = 3y - 3 \end{Bmatrix}$$

4. $$\begin{Bmatrix} x - y = 6 \\ 6x - y = 40 \end{Bmatrix}$$

5. $$\begin{Bmatrix} x + y = 6 \\ x + 3(y + 2) = 10 \end{Bmatrix}$$

6. $$\begin{Bmatrix} 2x + y = 5 \\ 3x - 4y = 2 \end{Bmatrix}$$

7. $$\begin{Bmatrix} 5x - 2y = -4 \\ 4x + y = -11 \end{Bmatrix}$$

8.

$$\left\{\begin{matrix} 3y-x=-10 \\ 3x+4y=-22 \end{matrix}\right\}$$

9.

$$\left\{\begin{matrix} 4e+2f=-2 \\ 2e-3f=1 \end{matrix}\right\}$$

10.

$$\left\{\begin{matrix} \frac{1}{4}x+y=-\frac{7}{2} \\ \frac{1}{2}x-\frac{1}{4}y=1 \end{matrix}\right\}$$

11.

$$\left\{\begin{matrix} x=-4+y \\ x=3y-6 \end{matrix}\right\}$$

12.

$$\left\{\begin{matrix} 3y-2x=-3 \\ 3x-3y=6 \end{matrix}\right\}$$

13.

$$\left\{\begin{matrix} 2x=5y-12 \\ 3x+5y=7 \end{matrix}\right\}$$

14.

$$\left\{\begin{matrix} 3y=2x-5 \\ 2x=y+3 \end{matrix}\right\}$$

15.

$$\left\{\begin{matrix} \frac{x+y}{3}+\frac{x-y}{2}=\frac{25}{6} \\ \frac{x+y-9}{2}=\frac{y-x-6}{3} \end{matrix}\right\}$$

5.3 Practice: Elimination Method for Systems

Solve the following systems of linear equations using the elimination method.

$$\left\{\begin{matrix} 16x - y - 181 = 0 \\ 19x - y = 214 \end{matrix}\right\}$$

1.

$$\left\{\begin{matrix} 3x + 2y + 9 = 0 \\ 4x = 3y + 5 \end{matrix}\right\}$$

2.

$$\left\{\begin{matrix} x = 7y + 38 \\ 14y = -x - 46 \end{matrix}\right\}$$

3.

$$\left\{\begin{matrix} 2x + 9y = -1 \\ 4x + y = 15 \end{matrix}\right\}$$

4.

$$\left\{\begin{matrix} x - \frac{3}{5}y = \frac{26}{5} \\ 4y = 61 - 7x \end{matrix}\right\}$$

5.

$$\left\{\begin{matrix} 3x - 5y = 12 \\ 2x + 10y = 4 \end{matrix}\right\}$$

6.

$$\left\{\begin{matrix} 3x + 2y + 9 = 0 \\ 4x = 3y + 5 \end{matrix}\right\}$$

7.

$$\left\{\begin{matrix} x = 69 + 6y \\ 3x = 4y - 45 \end{matrix}\right\}$$

8.

$$\left\{\begin{matrix} \frac{3}{4}x - \frac{2}{5}y = 2 \\ \frac{1}{7}x + \frac{3}{2}y = \frac{113}{7} \end{matrix}\right\}$$

9.

$$\left\{\begin{matrix} 3x + 5y = 17 \\ 2x + 3y = 11 \end{matrix}\right\}$$

10.

$$\begin{Bmatrix} 3x-5y=-29 \\ 2x-8y=-42 \end{Bmatrix}$$

11.

$$\begin{Bmatrix} 7x-8y=-26 \\ 5x-12y=-45 \end{Bmatrix}$$

12.

$$\begin{Bmatrix} 6x+5y=5.1 \\ 4x-2y=-1.8 \end{Bmatrix}$$

13.

.

5.4 Practice: Special Types of Linear Systems

Express each equation in slope-intercept form. Without graphing, state whether the system of equations is consistent, inconsistent or dependent.

1.

$$3x - 4y = 13$$
$$y = -3x - 7$$

2.

$$\frac{3}{5}x + y = 3$$
$$1.2x + 2y = 6$$

3.

$$3x - 4y = 13$$
$$y = -3x - 7$$

4.

$$3x - 3y = 3$$
$$x - y = 1$$

5.

$$0.5x - y = 30$$
$$0.5x - y = -30$$

6.

$$4x - 2y = -2$$
$$3x + 2y = -12$$

Find the solution of each system of equations using the method of your choice. Please state whether the system is inconsistent or dependent.

7.

$$3x + 2y = 4$$
$$-2x + 2y = 24$$

8.

$$5x - 2y = 3$$
$$2x - 3y = 10$$

9.

$$3x - 4y = 13$$
$$y = -3x - y$$

10.

$$5x - 4y = 1$$
$$-10x + 8y = -30$$

11.

$$4x + 5y = 0$$
$$3x = 6y + 4.5$$

12.

$$-2y + 4x = 8$$
$$y - 2x = -4$$

13.

$$x - \frac{y}{2} = \frac{3}{2}$$
$$3x + y = 6$$

14.

$$0.05x + 0.25y = 6$$
$$x + y = 24$$

15.

$$x + \frac{2}{3}y = 6$$
$$3x + 2y = 2$$

16. A movie house charges \$4.50 for children and \$8.00 for adults. On a certain day, 1200 people enter the movie house and \$8, 375 is collected. How many children and how many adults attended?

17. Andrew placed two orders with an internet clothing store. The first order was for thirteen ties and four pairs of suspenders, and totaled \$487. The second order was for six ties and two pairs of suspenders, and totaled \$232. The bill does not list the per-item price but all ties have the same price and all suspenders have the same price. What is the cost of one tie and of one pair of suspenders?

18. An airplane took four hours to fly 2400 miles in the direction of the jet-stream. The return trip against the jet-stream took five hours. What were the airplane's speed in still air and the jet-stream's speed?

19. Nadia told Peter that she went to the farmer's market and she bought two apples and one banana and that it cost her \$2.50. She thought that Peter might like some fruit so she went back to the seller and bought four more apples and two more bananas. Peter thanked Nadia, but told her that he did not like bananas, so will only pay her for four apples. Nadia told him that the second time she paid \$6.00 for fruit. Please help Peter figure out how much to pay Nadia paid for four apples.

5.5 Practice: Systems of Linear Inequalities

Here you'll learn how to graph and solve a system of two or more linear inequalities. You'll also determine if such systems are consistent or inconsistent.

1. Consider the system

$$y < 3x - 5$$
$$y > 3x - 5$$

. Is it consistent or inconsistent? Why?

2. Consider the system

$$y \leq 2x + 3$$
$$y \geq 2x + 3$$

. Is it consistent or inconsistent? Why?

3. Consider the system

$$y \leq -x + 1$$
$$y > -x + 1$$

. Is it consistent or inconsistent? Why?

4. In example 3 in this lesson, we solved a system of four inequalities and saw that one of the inequalities, $y > 3x - 4$, didn't affect the solution set of the system.
   a. What would happen if we changed that inequality to $y < 3x - 4$?
   b. What's another inequality that we could add to the original system without changing it? Show how by sketching a graph of that inequality along with the rest of the system.
   c. What's another inequality that we could add to the original system to make it inconsistent? Show how by sketching a graph of that inequality along with the rest of the system.
5. Recall the compound inequalities in one variable that we worked with back in chapter 6. Compound inequalities with "and" are simply systems like the ones we are working with here, except with one variable instead of two.
   a. Graph the inequality $x > 3$ in two dimensions. What's another inequality that could be combined with it to make an inconsistent system?
   b. Graph the inequality $x \leq 4$ on a number line. What two-dimensional system would have a graph that looks just like this one?

Find the solution region of the following systems of inequalities.

6.

$$x - y < -6$$
$$2y \geq 3x + 17$$

7.

$$4y - 5x < 8$$
$$-5x \geq 16 - 8y$$

8.

$$\begin{aligned} 5x - y &\geq 5 \\ 2y - x &\geq -10 \end{aligned}$$

9.

$$\begin{aligned} 5x + 2y &\geq -25 \\ 3x - 2y &\leq 17 \\ x - 6y &\geq 27 \end{aligned}$$

10.

$$\begin{aligned} 2x - 3y &\leq 21 \\ x + 4y &\leq 6 \\ 3x + y &\geq -4 \end{aligned}$$

11.

$$\begin{aligned} 12x - 7y &< 120 \\ 7x - 8y &\geq 36 \\ 5x + y &\geq 12 \end{aligned}$$

5.6 Practice: Linear Programming

Here you'll learn how to analyze and find the feasible solution(s) to a system of inequalities under a given set of constraints.

Solve the following linear programming problems.

1. Given the following constraints, find the maximum and minimum values of $z = -x + 5y$:

$$\begin{aligned} x + 3y &\leq 0 \\ x - y &\geq 0 \\ 3x - 7y &\leq 16 \end{aligned}$$

Santa Claus is assigning elves to work an eight-hour shift making toy trucks. Apprentice elves draw a wage of five candy canes per hour worked, but can only make four trucks an hour. Senior elves can make six trucks an hour and are paid eight candy canes per hour. There's only room for nine elves in the truck shop, and due to a candy-makers' strike, Santa Claus can only pay out 480 candy canes for the whole 8-hour shift.

2. How many senior elves and how many apprentice elves should work this shift to maximize the number of trucks that get made?
3. How many trucks will be made?
4. Just before the shift begins, the apprentice elves demand a wage increase; they insist on being paid seven candy canes an hour. Now how many apprentice elves and how many senior elves should Santa assign to this shift?
5. How many trucks will now get made, and how many candy canes will Santa have left over?

In Adrian's Furniture Shop, Adrian assembles both bookcases and TV cabinets. Each type of furniture takes her about the same time to assemble. She figures she has time to make at most 18 pieces of furniture by this Saturday. The materials for each bookcase cost her $20 and the materials for each TV stand costs her $45. She has $600 to spend on materials. Adrian makes a profit of $60 on each bookcase and a profit of $100 on each TV stand.

6. Set up a system of inequalities. What $x-$ and $y-$values do you get for the point where Adrian's profit is maximized? Does this solution make sense in the real world?
7. What two possible real-world $x-$values and what two possible real-world $y-$values would be closest to the values in that solution?
8. With two choices each for x and y, there are four possible combinations of $x-$ and $y-$values. Of those four combinations, which ones actually fall within the feasibility region of the problem?
9. Which one of those feasible combinations seems like it would generate the most profit? Test out each one to confirm your guess. How much profit will Adrian make with that combination?
10. Based on Adrian's previous sales figures, she doesn't think she can sell more than 8 TV stands. Now how many of each piece of furniture should she make, and what will her profit be?
11. Suppose Adrian is confident she can sell all the furniture she can make, but she doesn't have room to display more than 7 bookcases in her shop. Now how many of each piece of furniture should she make, and what will her profit be?
12. Here's a "linear programming" problem on a line instead of a plane: Given the constraints $x \leq 5$ and $x \geq -2$, maximize the value of y where $y = x + 3$.

CHAPTER 6

Chapter 6: Exponential Functions

Chapter Outline

6.1 Practice: Product Rules for Exponents

Here you'll learn how to multiply two terms with the same base and how to find the power of a product.

Simplify each of the following expressions, if possible.

1. $4^2 \times 4^4$
2. $x^4 \cdot x^{12}$
3. $(3x^2y^4)(9xy^5z)$
4. $(2xy)^2(4x^2y^3)$
5. $(3x)^5(2x)^2(3x^4)$
6. $x^3y^2z \cdot 4xy^2z^7$
7. $x^2y^3 + xy^2$
8. $(0.1xy)^4$
9. $(xyz)^6$
10. $2x^4(x^2 - y^2)$
11. $3x^5 - x^2$
12. $3x^8(x^2 - y^4)$

Expand and then simplify each of the following expressions.

13. $(x^5)^3$
14. $(x^6)^8$
15. $(x^a)^b$ *Hint: Look for a pattern in the previous two problems.*

6.2 Practice: Quotient Rules for Exponents

Here you'll learn how to divide two terms with the same base and find the power of a quotient.

Simplify each of the following expressions, if possible.

1. $\left(\frac{2}{5}\right)^6$
2. $\left(\frac{4}{7}\right)^3$
3. $\left(\frac{x}{y}\right)^4$
4. $\frac{20x^4y^5}{5x^2y^4}$
5. $\frac{42x^2y^8z^2}{6xy^4z}$
6. $\left(\frac{3x}{4y}\right)^3$
7. $\frac{72x^2y^4}{8x^2y^3}$
8. $\left(\frac{x}{4}\right)^5$
9. $\frac{24x^{14}y^8}{3x^5y^7}$
10. $\frac{72x^3y^9}{24xy^6}$
11. $\left(\frac{7}{y}\right)^3$
12. $\frac{20x^{12}}{-5x^8}$

13. Simplify using the laws of exponents: $\frac{2^3}{2^5}$
14. Evaluate the numerator and denominator separately and then simplify the fraction: $\frac{2^3}{2^5}$
15. Use your result from the previous problem to determine the value of a: $\frac{2^3}{2^5} = \frac{1}{2^a}$
16. Use your results from the previous three problems to help you evaluate 2^{-4}.

6.3 Practice: Power Rule for Exponents

Here you'll learn how to find the power of a power.

Simplify each of the following expressions.

1. $\left(\frac{x^4}{y^3}\right)^5$
2. $\frac{(5x^2y^4)^5}{(5xy^2)^3}$
3. $\frac{x^8y^9}{(x^2y)^3}$
4. $(x^2y^4)^3$
5. $(3x^2)^2 \cdot (4xy^4)^2$
6. $(2x^3y^5)(5x^2y)^3$
7. $(x^4y^6z^2)^2(3xyz)^3$
8. $\left(\frac{x^2}{2y^3}\right)^4$
9. $\frac{(4xy^3)^4}{(2xy^2)^3}$
10. True or false: $(x^2+y^3)^2 = x^4+y^6$
11. True or false: $(x^2y^3)^2 = x^4y^6$
12. Write 64 as a power of 4.
13. Write $(16)^3$ as a power of 2.
14. Write $(9^4)^2$ as a power of 3.
15. Write $(81)^2$ as a power of 3.
16. Write $(25^3)^4$ as a power of 5.

6.4 Practice: Exponential Growth Function

Here you'll learn how to analyze an exponential growth function and its graph.

Graph the following exponential functions. Find the y-intercept, the equation of the asymptote and the domain and range for each function.

1. $y = 4^x$
2. $y = (-1)(5)^x$
3. $y = 3^x - 2$
4. $y = 2^x + 1$
5. $y = 6^{x+3}$
6. $y = -\frac{1}{4}(2)^x + 3$
7. $y = 7^{x+3} - 5$
8. $y = -(3)^{x-4} + 2$
9. $y = 3(2)^{x+1} - 5$
10. What is the y-intercept of $y = a^x$? Why is that?
11. What is the range of the function $y = a^{x-h} + k$?
12. March Madness is a single-game elimination tournament of 64 college basketball teams. How many games will be played until there is a champion? Include the championship game.
13. In 2012, the tournament added 4 teams to make it a field of 68 and there are 4 "play-in" games at the beginning of the tournament. How many games are played now?
14. An investment grows according the function $A = P(1.05)^t$ where P represents the initial investment, A represents the value of the investment and t represents the number of years of investment. If $10,000 was the initial investment, how much would the value of the investment be after 10 years, to the nearest dollar?
15. How much would the value of the investment be after 20 years, to the nearest dollar?

CHAPTER 7 Chapter 7: Polynomials

Chapter Outline

7.1 Practice: Standard Form of Polynomials

Indicate whether each expression is a polynomial.

1. $x^2 + 3x^{\frac{1}{2}}$
2. $\frac{1}{3}x^2y - 9y^2$
3. $3x^{-3}$
4. $\frac{2}{3}t^2 - \frac{1}{t^2}$
5. $\sqrt{x} - 2x$
6. $\left(x^{\frac{3}{2}}\right)^2$

Express each polynomial in standard form. Give the degree of each polynomial.

7. $3 - 2x$
8. $8 - 4x + 3x^3$
9. $-5 + 2x - 5x^2 + 8x^3$
10. $x^2 - 9x^4 + 12$
11. $5x + 2x^2 - 3x$

7.2 Practice: Polynomial Addition and Subtraction

Determine if the following expressions are polynomials. If not, state why. If so, write in standard form and find the degree and leading coefficient.

1. $\frac{1}{x^2} + x + 5$
2. $x^3 + 8x^4 - 15x + 14x^2 - 20$
3. $x^3 + 8$
4. $5x^{-2} + 9x^{-1} + 16$
5. $x^2\sqrt{2} - x\sqrt{6} + 10$
6. $\frac{x^4 + 8x^2 + 12}{3}$
7. $\frac{x^2 - 4}{x}$
8. $-6x^3 + 7x^5 - 10x^6 + 19x^2 - 3x + 41$

Add or subtract the following polynomials.

1. $(x^3 + 8x^2 - 15x + 11) + (3x^3 - 5x^2 - 4x + 9)$
2. $(-2x^4 + x^3 + 12x^2 + 6x - 18) - (4x^4 - 7x^3 + 14x^2 + 18x - 25)$
3. $(10x^3 - x^2 + 6x + 3) + (x^4 - 3x^3 + 8x^2 - 9x + 16)$
4. $(7x^3 - 2x^2 + 4x - 5) - (6x^4 + 10x^3 + x^2 + 4x - 1)$
5. $(15x^2 + x - 27) + (3x^3 - 12x + 16)$
6. $(2x^5 - 3x^4 + 21x^2 + 11x - 32) - (x^4 - 3x^3 - 9x^2 + 14x - 15)$
7. $(8x^3 - 13x^2 + 24) - (x^3 + 4x^2 - 2x + 17) + (5x^2 + 18x - 19)$

7.3 Practice: Multiplication of Polynomials

Here you will learn how to multiply polynomials using the distributive property.

Use the distributive property and/or FOIL to find the product of each of the following polynomials:

1. $(x+4)(x+6)$
2. $(x+3)(x+5)$
3. $(x+7)(x-8)$
4. $(x-9)(x-5)$
5. $(x-4)(x-7)$
6. $(x+3)(x^2+x+5)$
7. $(x+7)(x^2-3x+6)$
8. $(2x+5)(x^2-8x+3)$
9. $(2x-3)(3x^2+7x+6)$
10. $(5x-4)(4x^2-8x+5)$
11. $9a^2(6a^3+3a+7)$
12. $-4s^2(3s^3+7s^2+11)$
13. $(x+5)(5x^3+2x^2+3x+9)$
14. $(t-3)(6t^3+11t^2+22)$
15. $(2g-5)(3g^3+9g^2+7g+12)$

7.4 Practice: Special Products of Polynomials

Here you'll learn how to find two special polynomial products: 1) the square of a binomial and 2) two binomials where the sum and difference formula can be applied. You'll also learn how to apply special products of polynomials to solve real-world problems.

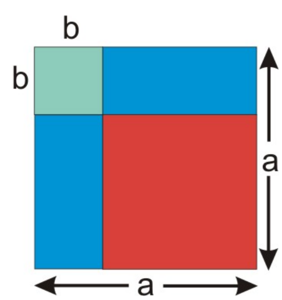
Use the special product rule for squaring binomials to multiply these expressions.

1. $(x+9)^2$
2. $(3x-7)^2$
3. $(5x-y)^2$
4. $(2x^3-3)^2$
5. $(4x^2+y^2)^2$
6. $(8x-3)^2$
7. $(2x+5)(5+2x)$
8. $(xy-y)^2$

Use the special product of a sum and difference to multiply these expressions.

9. $(2x-1)(2x+1)$
10. $(x-12)(x+12)$
11. $(5a-2b)(5a+2b)$
12. $(ab-1)(ab+1)$
13. $(z^2+y)(z^2-y)$
14. $(2q^3+r^2)(2q^3-r^2)$
15. $(7s-t)(t+7s)$
16. $(x^2y+xy^2)(x^2y-xy^2)$

Find the area of the lower right square in the following figure.

17. 

Multiply the following numbers using special products.

18. 45×55
19. 56^2
20. 1002×998
21. 36×44
22. 10.5×9.5
23. 100.2×9.8
24. -95×-105
25. 2×-2

7.5 Practice: Monomial Factors of Polynomials

Here you will learn to find a common factor in a polynomial and factor it out of the polynomial.

Factor the following polynomials by looking for a common factor:

1. $7x^2+14$
2. $9c^2+3$
3. $8a^2+4a$
4. $16x^2+24y^2$
5. $2x^2-12x+8$
6. $32w^2x+16xy+8x^2$
7. $12abc+6bcd+24acd$
8. $15x^2y-10x^2y^2+25x^2y$
9. $12a^2b-18ab^2-24a^2b^2$
10. $4s^3t^2-16s^2t^3+12st^2-24st^3$

Find the common factors of the following expressions and then factor:

1. $2x(x-5)+7(x-5)$
2. $4x(x-3)+5(x-3)$
3. $3x^2(e+4)-5(e+4)$
4. $8x^2(c-3)-7(c-3)$
5. $ax(x-b)+c(x-b)$

7.6 Practice: Factoring with Leading Coefficient of 1

Multiply the following factors together.

1. $(x+2)(x-8)$
2. $(x-9)(x-1)$
3. $(x+7)(x+3)$

Factor the following quadratic equations. If it cannot be factored, write not factorable . You can use either method presented in the examples.

1. x^2-x-2
2. $x^2+2x-24$
3. x^2-6x
4. x^2+6x+9
5. $x^2+8x-10$
6. $x^2-11x+30$
7. $x^2+13x-30$
8. $x^2+11x+28$
9. $x^2-8x+12$
10. $x^2-7x-44$
11. $x^2-8x-20$
12. x^2+4x+3
13. $x^2-5x+36$
14. $x^2-5x-36$
15. x^2+x

Challenge: Fill in the

X

's below with the correct numbers.

1. 

2. 

7.7 Practice: Factoring When the Leading Coefficient Doesn't Equal 1

Here you'll learn how to factor a quadratic equation in standard form, by expanding the x-term.

Multiply the following expressions.

1. $(2x-1)(x+5)$
2. $(3x+2)(2x-3)$
3. $(4x+1)(4x-1)$

Factor the following quadratic equations, if possible. If they cannot be factored, write *not factorable*. Don't forget to look for any GCFs first.

4. $5x^2+18x+9$
5. $6x^2-21x$
6. $10x^2-x-3$
7. $3x^2+2x-8$
8. $4x^2+8x+3$
9. $12x^2-12x-18$
10. $16x^2-6x-1$
11. $5x^2-35x+60$
12. $2x^2+7x+3$
13. $3x^2+3x+27$
14. $8x^2-14x-4$
15. $10x^2+27x-9$
16. $4x^2+12x+9$
17. $15x^2+35x$
18. $6x^2-19x+15$
19. Factor x^2-25. What is b?
20. Factor $9x^2-16$. What is b? What types of numbers are a and c?

7.8 Practice: Factoring Special Quadratic Expressions

Factor the following quadratics, if possible.

1. $x^2 - 1$
2. $x^2 + 4x + 4$
3. $16x^2 - 24x + 9$
4. $-3x^2 + 36x - 108$
5. $144x^2 - 49$
6. $196x^2 + 140x + 25$
7. $100x^2 + 1$
8. $162x^2 + 72x + 8$
9. $225 - x^2$
10. $121 - 132x + 36x^2$
11. $5x^2 + 100x - 500$
12. $256x^2 - 676$
13. Error Analysis

Spencer is given the following problem: Multiply

$$(2x-5)^2$$

.

Here is his work:

$$(2x-5)^2 = (2x)^2 - 5^2 = 4x^2 - 25$$

His teacher tells him the answer is

$$4x^2 - 20x + 25$$

. What did Spencer do wrong? Describe his error and correct the problem.

7.9 Practice: Solving Quadratics with the Zero Product Principle

Solve the following polynomial equations.

1. $x(x+12)=0$
2. $(2x+1)(2x-1)=0$
3. $(x-5)(2x+7)(3x-4)=0$
4. $2x(x+9)(7x-20)=0$
5. $x(3+y)=0$
6. $x(x-2y)=0$
7. $18y-3y^2=0$
8. $9x^2=27x$
9. $4a^2+a=0$
10. $b^2-\frac{5}{3}b=0$
11. $4x^2=36$
12. $x^3-5x^2=0$

7.10 Practice: Quadratic Formula

Here you'll learn how to use the quadratic formula to find the vertex and solution of quadratic equations.

Solve the following quadratic equations using the quadratic formula.

1. $x^2+4x-21=0$
2. $x^2-6x=12$
3. $3x^2-\frac{1}{2}x=\frac{3}{8}$
4. $2x^2+x-3=0$
5. $-x^2-7x+12=0$
6. $-3x^2+5x=2$
7. $4x^2=x$
8. $x^2+2x+6=0$
9. $5x^2-2x+100=0$
10. $100x^2+10x+70=0$

7.11 Practice: Vertex, Intercept, and Standard Form

Here you'll explore the different forms of the quadratic equation. **Find the vertex and $x-$intercepts of each function below. Then, graph the function. If a function does not have any $x-$intercepts, use the symmetry property of parabolas to find points on the graph.**

1. $y=(x-4)^2-9$
2. $y=(x+6)(x-8)$
3. $y=x^2+2x-8$
4. $y=-(x-5)(x+7)$
5. $y=2(x+1)^2-3$
6. $y=3(x-2)^2+4$
7. $y=\frac{1}{3}(x-9)(x+3)$
8. $y=-(x+2)^2+7$
9. $y=4x^2-13x-12$

Change the following equations to intercept form.

10. $y=x^2-3x+2$
11. $y=-x^2-10x+24$
12. $y=4x^2+18x+8$

Change the following equations to vertex form.

13. $y=x^2+12x-28$
14. $y=-x^2-10x+24$
15. $y=2x^2-8x+15$

Change the following equations to standard form.

16. $y=(x-3)^2+8$
17. $y=2\left(x-\frac{3}{2}\right)(x-4)$
18. $y=-\frac{1}{2}(x+6)^2-11$