Date: _____

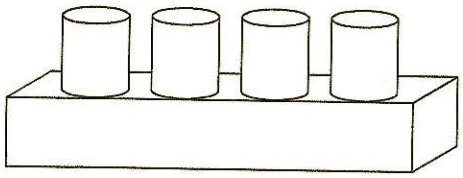
7. Determine the missing values.

a) $\frac{1}{\square} = \frac{5.9}{76.7}$ b) $\frac{1}{0.08} = \frac{2.7}{\square}$

8. Chelsea solved the math problem incorrectly. Identify the step where she made her error. Calculate the correct answer.

$16 \div (-2)^2 + 6(5)^2$
$= 16 \div (-4) + 6 \times 25$ Step 1
$= 16 \div -4 + 150$ Step 2
$= -4 + 150$ Step 3
$= 146$ Step 4

9. A large mega block is made of four cylinders that are 2 cm high and have a diameter of 2.5 cm, and one rectangular prism that measures 2.5 cm wide by 12 cm long by 0.5 cm high. Calculate the surface area, to the nearest hundredth.



10. Simplify.

a) $(a^2 - 7a - 5) - (2 - 4a^2 + 2a)$

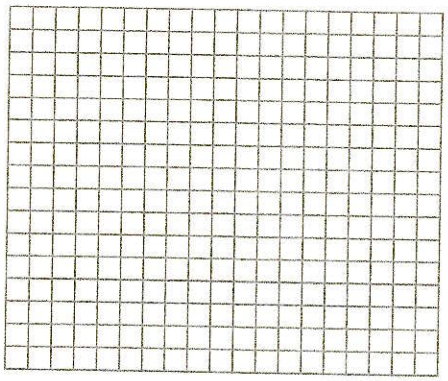
b) $4x^2y - 3xy^2 + 2x^2y - 4xy^2$

11. The surface area of a cube is 127 cm^2. Determine the side length of the cube, to the nearest tenth.

12. A car rental company charges a flat rate of \$30 plus \$0.05 per kilometre.

a) Create a table of values for the first 500 km.

b) Graph the linear relation.



c) Use the graph to approximate how much it would cost to drive the car 250 km.

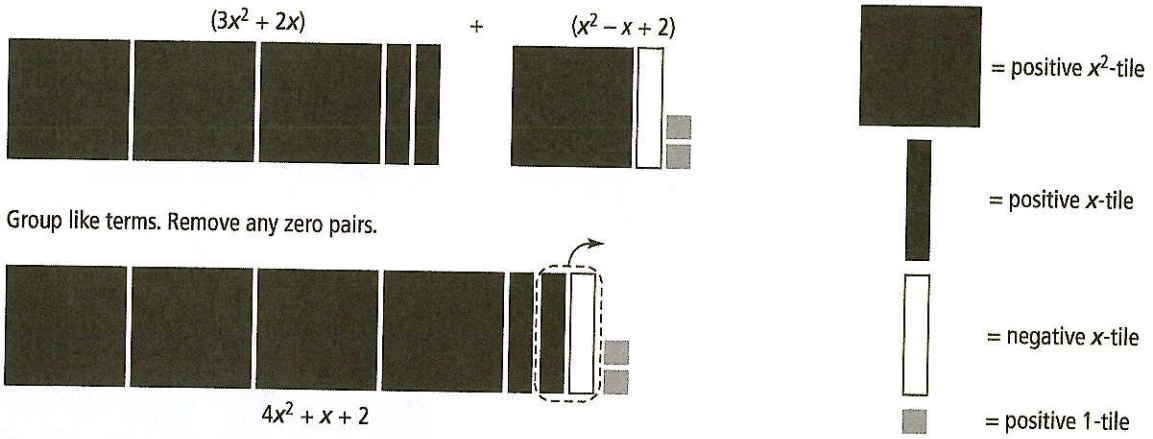
d) Using the graph, approximate how many kilometres you could drive if you had \$52.50.

e) What equation models this situation?

Date: _____

Using a Model to Add and Subtract Polynomials

You can model adding or subtracting polynomials to help simplify the expression.



5. Add the polynomials, using models.

a) $(5x - 7) + (2x - 3)$

b) $(2t^2 - 5) + (3t + 6)$

6. Subtract the polynomials, using models.

a) $(2s - 4) - (2s + 3)$

b) $(-y^2 + 3y - 2) - (-2y^2 - 2y)$

Using Opposites to Subtract Polynomials

To subtract polynomials, you can add the opposite. The opposite of a polynomial is found by taking the opposite of each term. For example, the opposite of $(2x^2 + 3x - 7)$ is $(-2x^2 - 3x + 7)$

$$(4x^2 + x + 2) - (2x^2 + 3x - 7) = (4x^2 + x + 2) + (-2x^2 - 3x + 7)$$
$$= 4x^2 - 2x^2 + x - 3x + 2 + 7$$
$$= 2x^2 - 2x + 9$$

7. Subtract the polynomials.

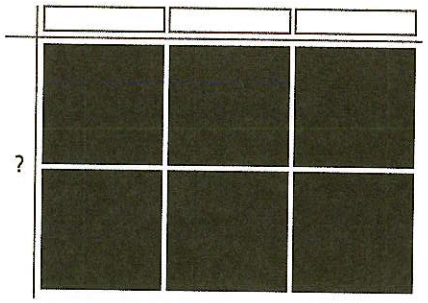
a) $(5x^2 + 3x - 7) - (2x^2 - 5x + 3)$

b) $(2y^2 + 3y - 3) - (2y^2 + 4y + 6)$

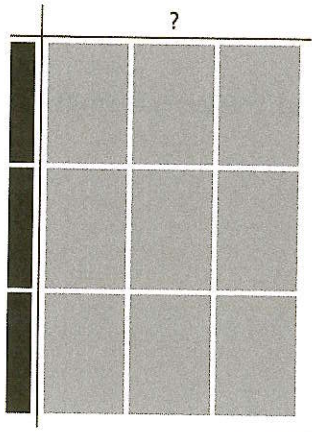
Date: _____

4. Write a division statement for each model and solve. The grey tiles in b) are *xy*-tiles.

a)



b)



5. Use models to solve the following.

a) $10xy \div 5y$

b) $15x^2 \div 5x$

6. Solve.

a) $(-6a)(-4a)$

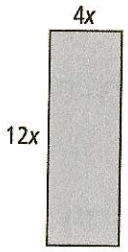
b) $(24x)\frac{x}{2}$

c) $\frac{20x^2}{-x}$

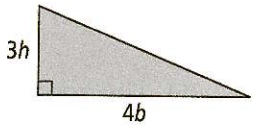
d) $-32ac \div -8ac$

7. Write an expression for the area of each shape. What is the simplified expression for the area of each shape?

a)



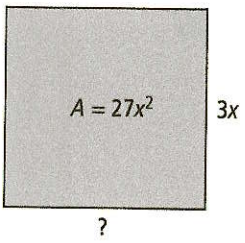
b)



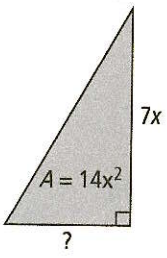
8. A rectangular field is 7 m long and has an area of 84 m^2. Write an equation you can use to determine the field's width. What is the field's width?

9. Determine the missing dimension in each figure. Show your work.

a)



b)



Date: _____

4. Sketch an area model to represent each expression.

   a) $(2.3g)(4.6g + 5)$

   b) $(5 + 7.2f)(2.1f)$

5. Use models to represent each expression.

   a) $(-2d + 3)(-3d)$

   b) $(-s)(-3s - 5)$

6. Use the distributive property to multiply each pair of expressions. Do not simplify.

   a) $(1.2z)(-4z + 2y)$

   b) $(-2e - 3f + 4)(-e)$

7. Multiply. Then, simplify.

   a) $(7v)(-7v - 7x)$

   b) $(-4x)(-7 + 3y)$

   c) $(b)(-0.1a + 8b - 0.7c)$

   d) $\left(\frac{a}{4}\right)(6a - 4)$

8. A rectangular pool has a length 2 m shorter than twice its width.

   a) Write an expression to determine the pool's perimeter. What is its perimeter?

   b) Write an expression to determine the surface area of the pool. What is the surface area?

9. At a restaurant, the menu included the following choices:

Menu	
Coffee	$3.50
Soup of the Day	$5.95
Garden Salad	$6.95
Catch of the Day	Market Value
Cheesecake	$7.75

   a) Sheeyin and Kaitlin each order coffee, soup, a garden salad, the catch of the day, and cheesecake. Write a simplified expression to show the total cost for their meals.

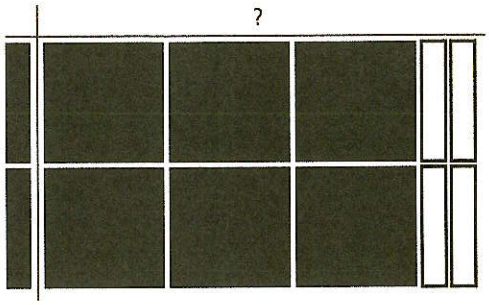
   b) Write an expression to calculate a 15% tip on the total for the meal.

   c) The catch of the day cost $14.95. What was the total bill, including the tip?

Date: _____

Check Your Understanding

5. Sketch the solution for the unknown value. What is the unknown value?



6. Use a model to divide the expression.

$(-8x^2 + 12x) \div (-4x)$

7. Divide.

a) $\frac{-36y^2 + 10.8y}{6y}$

b) $\frac{4s^2 - 8st + 12s}{-8s}$

c) $-(8.1d^2 - 7.2d + 3.6) \div (9)$

d) $(-y^2 - yz - y) \div (-y)$

8. A load of topsoil has a volume of 7.5 m^3. You wish to spread the topsoil over an area measuring $(30x + 22.5)$ m^2. Create an expression for the depth of the topsoil.

9. A triangle has a base of $(3x + 6)$ cm and a height of $24x$ mm. Write an expression you can use to calculate the area of the triangle. What is its area?

10. The formula for the volume of a cylinder is $V = \pi r^2 h$. The volume of a cylinder is $510.5t^2$ cm^3, and its height is 6.5 cm. Calculate the approximate radius of the cylinder.

11. The surface area of a cylinder is represented by the formula $SA = A_1 + A_2$, where $A_1 = 2\pi r^2$ and $A_2 = 2\pi rh$. The surface area of a cylinder is 90π m^2 and $A_1 = 50\pi$ m^2. Answer the following, showing your work.

a) What is A_2? Do not change π to an approximate value.

b) What is the radius of the cylinder?

c) What is the height of the cylinder?

Date: _____

Vocabulary Link

Use the clues to identify Key Words from Chapter 7. Then, write the Key Words in the crossword puzzle blank.

Across

5. This allows you to expand algebraic expressions. For example, $a(b + c) = ab + ac$ and $5(3 + 2) = 5(3) + 5(2)$.

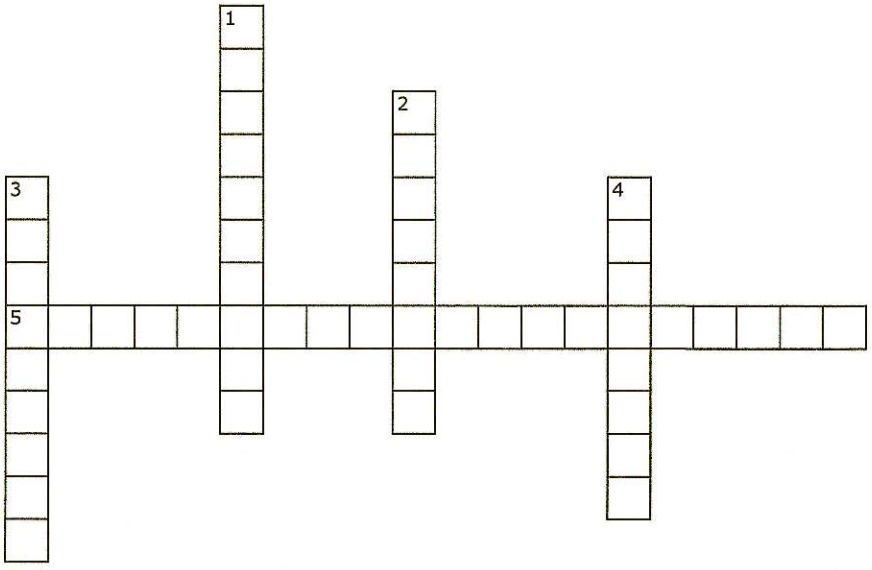
Down

1. This is made up of terms connected by addition or subtraction. Examples include $x + 5$ and $\frac{h^2}{2} - \frac{h}{4}$.

2. This is a type of polynomial that is made up of one term. Examples include $-8cd$ and $3s^2$.

3. This is a type of graphic organizer used to help understand and connect new terms and concepts.

4. This is a type of polynomial that is made up of two terms. Examples include $2x - 5$ and $-8a - 7b$.



Date: _____

6. Evaluate.

a) $(-2)^3 + (-4.7)^2 \times 6 \div 2$

b) $\dfrac{(3^3 - 5) \times 3 \div (-11) + 4}{4^2 - (3^2 \times 6)^0}$

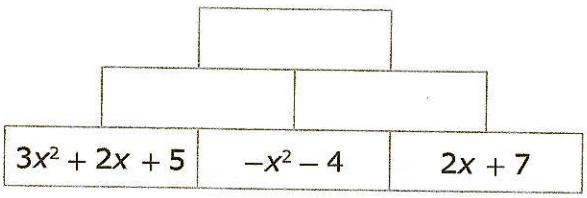
7. A population of bacteria doubles every hour. This relationship is represented by the formula $P = 3(2)^h$ where h is the number of hours. How many bacteria are there after:

a) 3 h?

b) 20 h?

c) 1 day?

8. Complete the subtraction pyramid. Determine the value in any box by subtracting the two expressions in the boxes immediately below it. Subtract in order from left to right.



9. Given the area of each square, determine its side length. Express your answer to the nearest hundredth where appropriate.

a) 1.69 m^2

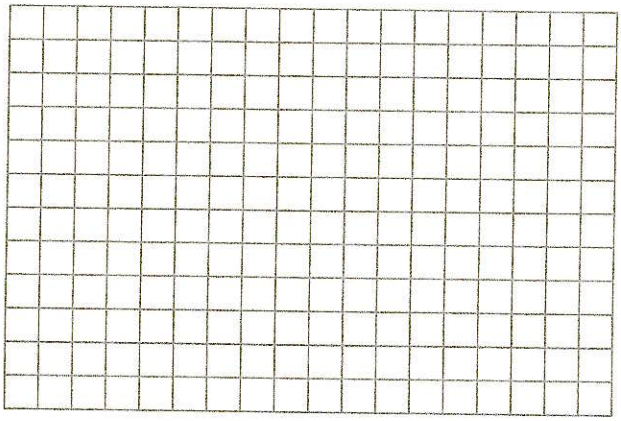
b) 74.3 cm^2

c) $\frac{1}{9}$ m^2

10. Yvonne wants to host a party at a specific hall. This hall charges a flat fee of \$100 plus an additional fee of \$5 per person.

a) Create a table of values showing the costs for the first 40 people.

b) Graph the linear relation.

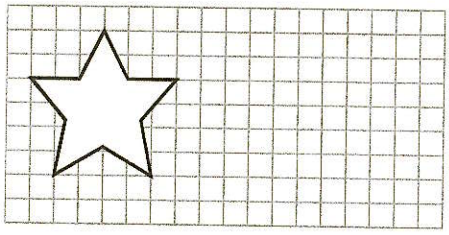


c) Use the graph to approximate how much it would cost for 25 people to come to the party.

d) Using the graph, approximate how many people could come for \$500.

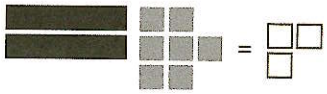
e) What equation models this situation?

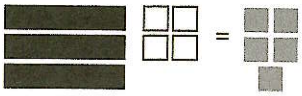
11. Redraw the star, reducing it by a factor of 0.5.



Date: _____

3. Solve each equation modelled by algebra tiles.

a) 

b) 

4. Solve each equation.

a) $\frac{s}{2} = 3$

b) $12 - 2x = -4$

Checking an Equation

You can check your solution to an equation by substituting your answer back into the equation. Both sides should have the same value.

Check if $x = 5$ is the solution to $4x + 3 = 23$.

Left Side $= 4x + 3$
$= 4(5) + 3$
$= 20 + 3$
$= 23$

Right Side $= 23$

Left Side = Right Side

The solution, $x = 5$, is correct.

5. Show whether $x = -4$ is a solution to each equation.

a) $5x + 7 = -13$

b) $12 - 5x = 8$

6. Solve and check.

a) $x - 2 = 5$

b) $3t + 4 = 10$

C) $2g - 7 = -11$

Date: _____

7. Solve and check.

a) $4.8 = \frac{w}{3.2}$ **b)** $-2.8d = 3.15$

c) $\frac{x}{7.5} = -3.1$ **d)** $-8.2m = -2.091$

8. Solve and check.

a) $\frac{8.4}{r} = 4$ **b)** $-1.2 = \frac{4.2}{x}$

9. Solve. Express each solution to the nearest hundredth.

a) $\frac{8.8}{t} = 3.4$ **b)** $-0.7 = \frac{6.41}{y}$

10. Average speed, s, is related to distance travelled, d, and time of travel, t, by the formula $s = \frac{d}{t}$. Write and solve an equation to determine:

a) how far Marko will ride if he travels at 18.5 km/h for 0.75 h

b) how much time it will take Sandra to drive 128 km at 90 km/h

11. A new desk is on sale for 35% off. The sale price of the desk is $168.87. Write and solve an equation to determine the regular price.

12. One 250-mL serving of tomato juice contains $\frac{2}{5}$ the recommended daily intake of vitamin C. How much tomato juice does a person need to consume to get the full recommended daily intake?

13. Lorena is the goalie for her hockey team. During one game, she stopped approximately 86.1% of the shots she faced. She stopped 31 shots. How many goals were scored?

14. On the school rugby team, the number of 14-year-old players is $\frac{2}{3}$ the number of 15-year-old players. If eight players are 14 years old, how many players are on the team in total? Show your thinking.

Date: _____

7. Jasmine solved the equation $2.5x - 0.62 = 1.2$ as shown. Do you agree with her solution? Explain.

$$25x - 62 = 120$$
$$25x - 62 + 62 = 120 + 62$$
$$25x = 182$$
$$\frac{25x}{25} = \frac{182}{25}$$
$$x = 7.28$$

8. Solve.

a) $5x - \frac{3}{2} = \frac{5}{4}$

b) $\frac{x}{3} + \frac{7}{6} = \frac{2}{3}$

c) $1\frac{1}{4} = -2\frac{3}{8} + \frac{3}{5}g$

d) $4 - \frac{2}{3}q = \frac{3}{5}$

9. Solve and check.

a) $0.3x - 1.7 = 0.88$

b) $-1.56 = 3.7f + 5.1$

c) $\frac{b}{-3} + 4.6 = -8.3$

10. A pool contains 300 L of water. It empties at a rate of 6.4 L/min. Write an equation to determine how long it will be until the pool contains only 60 L of water. Then, solve.

11. The area of Banff National Park is 6641.0 km^2. This is 529.6 km^2 less than 5.1 times the area of Kootenay National Park. Write and solve an equation to determine the area of Kootenay National Park.

12. An isosceles triangle with a perimeter of 47.4 cm has one short side and two equal longer sides. The short side is 8.6 cm. Write and solve an equation to determine the length of one longer side.

13. Jasmine has a newspaper delivery job. She earns \$5.70 plus \$0.09 per paper she delivers. How many papers does she need to deliver to earn a total of \$12?

Date: _____

6. Solve.

a) $\frac{x+3}{2} = \frac{3}{8}$

b) $-\frac{6}{5} = \frac{2-x}{4}$

c) $\frac{2(p-3)}{3} = \frac{1}{4}$

d) $\frac{1}{3}(e+3) = \frac{1}{5}$

7. Solve and check.

a) $\frac{K-2.1}{7} = 3.4$

b) $2.4 = \frac{9.3+j}{-3}$

c) $\frac{y+0.139}{-1} = -4.61$

d) $-2.5 = \frac{n+7.34}{-6}$

8. The side length of a small square is s. A larger square has a perimeter of 124.8 cm. Its sides are 3.2 cm longer than those of the small square.

a) Represent the situation with an equation of the form $a(x + b) = c$. Then, determine the side length of the smaller square.

b) Verify your solution by using a model.

9. Valerie bought five packages of golf balls on sale for $29.50. Each package had a discount of $2.75. Write and solve an equation to determine the regular price of each package.

10. Four-fifths of the sum of a number and three is equal to six and a half. What is the number?

11. The distance a boat travels upstream can be found using the formula $d = t(b - r)$, where d is the distance travelled, t is the time of travel, b is the speed of the boat in still water, and r is the speed at which the river is flowing.

a) Determine b when $r = 2.5$ km/h, $d = 2.8$ km, and $t = 0.4$ h

b) Determine r when $d = 5.95$ km, $t = 0.7$ h, $b = 11.7$ km/h

Date: _____

6. Solve. Express each answer to the nearest hundredth.

   a) $8x + 13 = 15x - 2$

   b) $12p - 0.7 = 5p + 3.2$

   c) $2 - 11m = -2m + 21$

7. Solve.

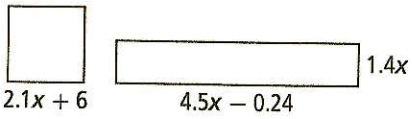
   a) $6(p - 1.5) = 5(2p + 1.8)$

   b) $\frac{2x - 5}{3} = \frac{3x + 1}{2}$

   c) $\frac{3}{4}(2k - 7) = -\frac{1}{8}(5 - 2k)$

8. Brian has \$45.25 saved and earns \$7.25/week. Dakota has \$25.25 saved and earns \$9.75/week. In how many weeks will they have the same amount?

9. Determine the value of x so that the square and the rectangle shown have equal perimeters.



10. Torrin rode his bike to school at 13.5 km/h. He returned home using the same route at 10.5 km/h. Torrin took a total of 36 min to ride to school and back. Express your answer to the nearest hundredth.

    a) How many minutes did Torrin take to ride to school?

    b) How far is it from Torrin's house to school?

11. A local sports centre charges \$8 per visit. For an annual membership fee of \$45, the cost per visit is only \$5.50. What is the least number of visits needed in a year in order for the membership to be a better deal?

Date: _____

Vocabulary Link

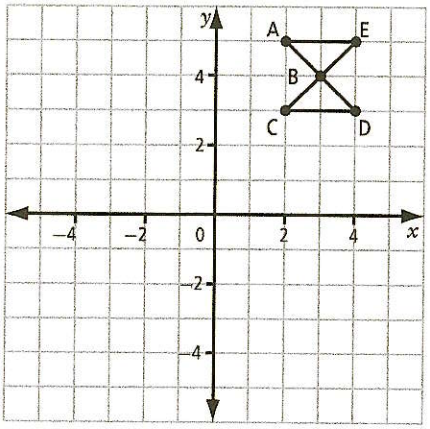
Draw a line from the example in column A to the related term in column B. Then, find each term in the word search.

A	B
1. a, in the expression $\frac{a-1}{5} = \frac{3}{2}$	**a)** constant
2. $\frac{T+(-18.1)}{2} = -13.2$ is one example	**b)** distributive property
3. 2, in the expression $2t = 17$	**c)** equation
4. $5(b + c) = 5b + 5c$	**d)** fraction bar
5. acts as a grouping symbol and a division symbol in $\frac{y+5}{2}$	**e)** numerical coefficient
6. 1.6, in the expression $q + 1.6$	**f)** opposite operations
7. $+$ and $-$ are one pair, $\div$ and $\times$ are another	**g)** variable

G K D Z C D U T D O B I I N N U I E T I
E H S N O I T A R E P O E T I S O P P O
Z I I V L R N D I H S U Z U L P I Q J M
J B W A J K Y S S T J U G M X P A U G K
N U M E R I C A L C O E F F I C I E N T
P B K P L X R Z T F X W A E T O D A C E
O I A I P Z X X R A H I W R K S X T M Q
D V I F A Q N D Z I I N O W I K I N I L
U B L R B V M M R F B B M T P C W T N K
D N O A L A V Z X K U V H F W A Q E O Q
R U W C E R Y E P D T F G X J C L H I D
D I S T R I B U T I V E P R O P E R T Y
Z Q L I B A R T P A I J M N L M C C A P
H F O O M B A X F A V H S Y E K O V U E
I L I N X L K F W N P T K Z U M F V Q A
O E X B I E R I Z V A P F J T R X U E L
L G E A V L B I B N O U T V H I Z I Q A
R Y S R N U R E T C C F K I W N F X J Z

Date: _____

5. Use line symmetry to make a new diagram.

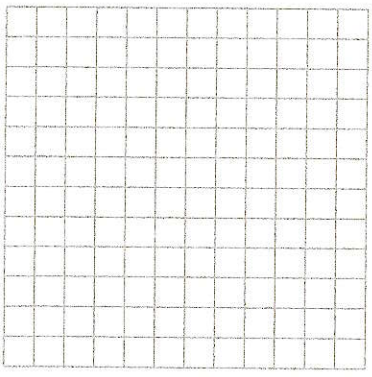


- First, use the y-axis as a line of symmetry.
- Then, use the x-axis as a line of symmetry for both figures.
- Determine the coordinates of each image.

6. Dimitri's Bike Shop sells a tricycle for $40, a two-wheeled children's bike for $90, and an adult mountain bike for $110. One day, the store sold $600 worth of bikes. What number of each item did the store sell? Show that more than one answer is possible.

7. Create a table of values with four values and draw a graph for $y = 3x - 5$.

x	y



8. Solve and check.

a) $\frac{1}{7}c + \frac{5}{2} = \frac{11}{14}c$

b) $-0.35g = 0.6 - 0.65g$

c) $13.7f + 34.6 = 11.8 - 9.1f$

d) $2(3r + 6) = 3(5r - 3)$

e) $\frac{4b + 6}{5} = \frac{3b - 2}{4}$

9. Write $\frac{(-5)^3(-5)^9}{(-5)^6(-5)}$ as a single power. Then, evaluate.

10. If you flipped a coin three times, there would be 2^3 possible combinations. One possible combination is HTT.

a) What does the exponent, 3, represent?

b) What does the base, 2, represent?

c) List the remaining possible combinations.

d) How many combinations are possible if you flip the coin 10 times? Express as a power. Then, evaluate.

Date: _____

Use Inequality Symbols

An *inequality* expresses a relationship between numbers or quantities. Two inequality symbols are $<$ and $>$.

$5 < 6$ means 5 is less than 6. This same information can also be shown as $6 > 5$, which means 6 is greater than 5.

4. Use both the less than, $<$, and greater than, $>$, symbols to write two expressions showing the relationship between the given numbers.

a) 1 and 7

b) 4 and -1

c) 3 and 3.5

d) 0 and 1

5. List the whole numbers that satisfy each statement.

a) $x < 4$

b) between 4 and 8

c) $t > 11$

d) $a < 15$

Solve Equalities

When you are asked to solve an equation, you are being asked to find all values for an unknown that make a true statement.

Solve $2x - 1 = 7$.

Solution

$2x - 1 + 1 = 7 + 1$

$2x = 8$

$x = 4$

Check:

$2(4) - 1 = 7$

$8 - 1 = 7$

$7 = 7$

6. Solve each equation and then verify your answer.

a) $x + 4 = 6$

b) $-2x + 1 = 9$

c) $-5x - 3 = -8$

d) $4x + 9 = 21$

Date: _____

9. Express each inequality shown on the number line algebraically and verbally.

a) 

b) 

c) 

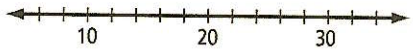
10. For each list of numbers, circle the values that are possible for x in the corresponding combination of inequalities.

a) −9.1, −5.6, 1.7, 3.2, 7.8
$x > -7$ and $x < 5$

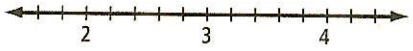
b) −26, −14.5, −12, −4.3, 0
$x \leq 0$ and $x > -14$

11. Sketch each combination of inequalities.

a) $x < 28$ and $x \geq 16$



b) $x > 2.2$ and $x \leq 3.6$



12. Write a combination of inequalities for each.

a) 

b) 

13. Represent each with an inequality.

a) The time spent on the activity can be at most 13 min.

b) The volume of the container must be a minimum of 1.8 L and a maximum of 2.5 L.

14. Label the number line and sketch the inequalities from #13.

a) 

b) 

15. In Canada, by law, any product sold as a *nutritional supplement* or *meal replacement* must provide a minimum of 225 kcal of energy per serving.

a) If c represents the energy content of one serving, write an inequality to represent this regulation.

b) Use the number line below to show the possible energy content values according to the regulation.

16. Danielle's track coach tells the team that to be considered for the 100-m race, a runner has to be able to run 100 m in less than 13 s. Draw and label a number line to represent this situation.

17. On Saltspring Island in British Columbia, the height of the tide varies one day from a low of 0.8 m to a high of 3.2 m.

a) What type of inequality do you need to use to show the range of tide heights? Explain.

b) Express the situation algebraically, and then represent it using a number line.

Date: _____

8. For each list, circle the values that are specific solutions of the corresponding inequality.

   a) 6, 7, 8, 9, 10
   $x + 5 < 13$

   b) 1.5, 2, 2.5, 3
   $2x > 5$

   c) $-25, -20, -15, -10, -5, 0$
   $-5 + x \geq -15$

   d) $-8, -4, 0, 4, 8$
   $-4x \geq 1$

9. Verify whether the number line below is the correct solution to the inequality $10 > x + 4$.

10. Verify whether $x \leq -5$ is the correct solution to the inequality $-8x \geq 40$. Explain.

11. Lauren works for a bookstore. One of the store's suppliers has a promotion in which any in-stock children's book costs $4, including tax. Lauren has been told that she can spend at most $150 on books for the store. How many books can Lauren buy and stay within the store's spending limit?

    a) Use an inequality to represent the situation.

    b) Determine the solution and use it to solve the problem.

    c) Verify your solution.

12. Customers can use a pottery studio's kiln and equipment. They can pay in two ways for access to the studio. How many uses in a year would make the members' plan the better option?

> **Studio Access Rates**
>
> **Single Use:** $37.50 per session
> **Members' Plan:** $285 for unlimited use annually

    a) Use an inequality to represent the situation.

    b) Use the inequality to solve the problem.

    c) Is the boundary point itself a reasonable solution to the problem? YES NO Explain.

13. Serena can rent a video game for $3.49 per day. She can buy the game for $49.95. After how many days does it become cheaper for Serena to buy the game?

    a) Use an inequality to represent the situation.

    b) Use the inequality to solve the problem.

    c) If the game takes Serena 25 h to solve and she plays 1.5 h a day, should she rent or buy the game? Verify your solution.

Date: _____

6. **a)** Verify whether $x \leq 3$ is the solution to the inequality $7x \geq 20x - 39$. Show your work.

b) Verify if $x > 1$ is the solution to the inequality $7 - 4x > -2(3x - 5)$. Show your work.

c) Verify whether $x \leq 3\frac{2}{5}$ is the solution to the inequality $9x - 13\frac{3}{5} < 5x$. Show your work.

d) Verify whether $x < -4.7$ is the solution to the inequality $2x > 5x + 14.1$. Show your work.

7. Ethan can download music from Site A for a flat rate of $29 per month plus $0.80 per download. He can download music from Site B for $17 per month plus $1.19 per download. How many downloads make Site A the better deal?

a) Choose a variable and identify what it represents.

b) Write an inequality to represent the situation.

c) Solve the inequality and answer the question.

8. Trailways Bike Shop offers two options for renting bikes. How many hours would make the all-day plan the better deal?

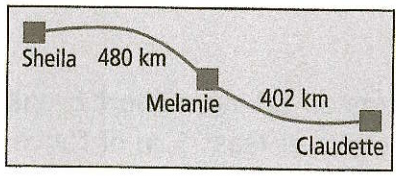
Hourly: $25 plus $8 per hour **All Day:** $55

a) Choose a variable and identify what it represents.

b) Write an inequality to represent the problem.

c) Determine the solution and use it to solve the problem.

9. Sheila, Melanie, and Claudette live in different towns, as shown on the map. Whenever they visit Melanie, Sheila and Claudette leave their houses at exactly the same time. Claudette always travels at 75 km/h.



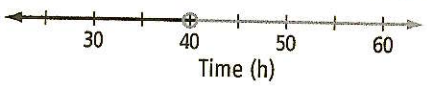
a) If Sheila travels at 105 km/h, use an inequality to determine after what amount of time she is closer to Melanie's house than Claudette is.

b) How fast does Sheila have to travel so that she never arrives at Melanie's later than Claudette? Express your answer to the nearest tenth.

Date: _____

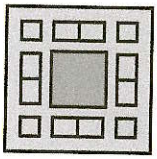
Vocabulary Link

Unscramble the letters of each term. The terms are one to four words long. Use the clues to help you solve the puzzles.

A	B
1. can be written using the symbols $>$, $<$, $\geq$, $\leq$, or $\neq$ _____	IAUINYLEQT
2. shows that the number is not part of the boundary point  _____ _____	EOCINREPCL
3. this is an example  _____ _____ _____	NBCEUISELIQINTAFMNOOAITIO
4. shows that the number is part of the boundary point  _____ _____	LODERILCECSC
5. showing an inequality, using visuals such as diagrams and graphs. Example:  _____	LAHIYRGPACL
6. showing an inequality using words. Example: all numbers greater than 5.5 _____	LRALYBEV
7. showing an inequality using mathematical symbols such as numbers, variables, and operations _____	LIEYAALGRCABL
8. value or set of values that satisfies an inequality _____ _____ _____ _____	IAUINYLEQTFOSNOLUAIONT
9. separates the values less than from the values greater than a specified value. Example:  _____ _____	DUNATOBPROINY

Date: _____

7. For this design, answer the questions below.



a) Does the design have rotation symmetry? If so, what is the order and angle of rotation? Express the angle in degrees and in fractions of a turn.

b) Does the design have line symmetry? If so, draw the lines of symmetry. Describe each line of symmetry using the terms *vertical*, *horizontal*, and *oblique*.

8. Explain the errors in the following solutions. Determine the correct answers.

a) $(-4)^3 + 5 \times 3^4 = -64 + 5 \times 81$

$= -59 \times 81$

$= -4779$

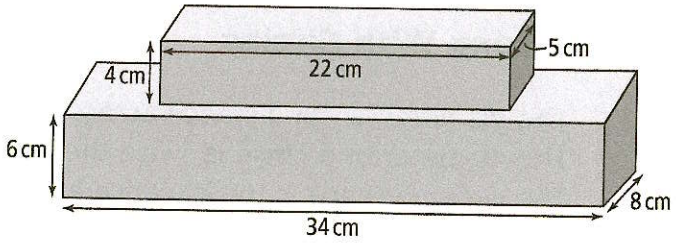
b) $(6 \div 2)^4 + (4 + 3)^2 = (3)^4 + 4^2 + 3^2$

$= 81 + 16 + 9$

$= 97 + 9$

$= 106$

9. Two blocks are placed one on top of the other.



a) What is the total surface area for each of the blocks when separated?

b) What is the exposed surface area of the stacked blocks?

10. Solve and check.

a) $-\frac{a}{54} = -1.5$

b) $7.6(3 - p) = -2.4(p + 10)$

11. **a)** Determine the number with a square root of 3.9.

b) Determine $\sqrt{0.4761}$.

c) Estimate $\sqrt{10}$.

d) Calculate $\sqrt{10}$ to the nearest hundredth.

12. Solve and verify.

$3(2x + 3) > 2(7x + 6)$

Date: _____

3. Estimate the size of each angle.

a) b) c)

4. Measure each angle in #3.

a) b) c)

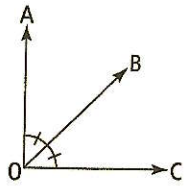
5. Sketch an angle that you estimate has a measure of 55°. Then, use a protractor to draw an angle that measures 55°. How close was your estimate to the actual angle measure?

Bisecting Angles

An *angle bisector* divides an angle into two equal parts. OB bisects ∠AOC, making ∠AOB = ∠BOC.

You can bisect an angle by:

- using paper folding
- using a ruler and a protractor



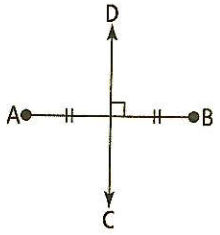
6. Bisect each angle.

a) b) c)

7. What is the measure of the angle created by the bisector in #6a)? How do you know?

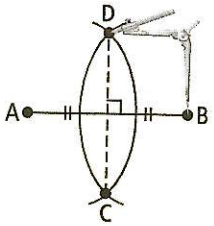
Perpendicular Bisectors

A *perpendicular bisector* is a line that divides a line segment in half and is at right angles (90°) to the line segment. DC is the perpendicular bisector of AB.



You can make a perpendicular bisector using:

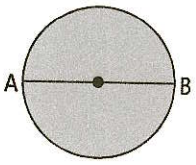
- paper folding
- a ruler and a right triangle
- a compass



8. Draw the perpendicular bisector for each line segment.

a) A B b) D C

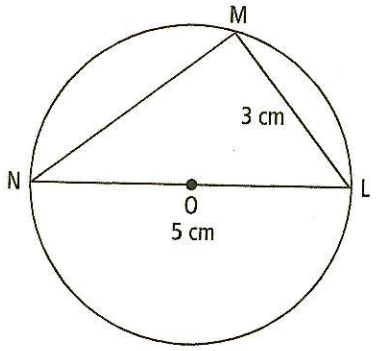
9. Draw the perpendicular bisector for diameter AB. What information do you know for sure about AB or its perpendicular bisector?



Date: _____

c) What is the measure of ∠FJG? Explain your reasoning.

4. Point O is the centre of this circle.
diameter LN = 5 cm
chord LM = 3 cm

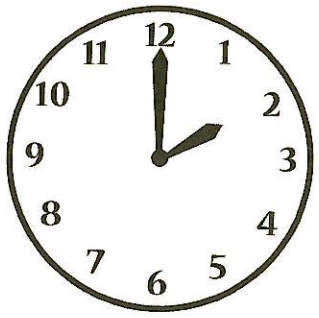


a) What is the measure of angle ∠LMN?

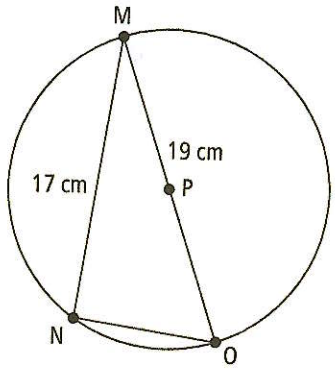
b) How long is chord NM?

5. a) Label the measure of the angle between the hands of this clock.

b) The angle made by the hands is bisected. The bisector is drawn so that it extends across the diameter of the clock. What numbers does the bisector touch on the clock?



6. Point P is the centre of the circle.
diameter MO = 19 cm
chord MN = 17 cm

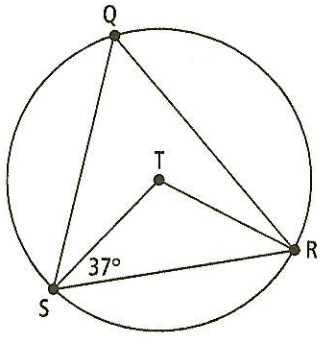


a) How long is the radius?

b) What is the measure of ∠MNO?

c) What is the length of chord NO, to the nearest tenth?

7. Point T is at the centre of this circle. ∠TSR = 37°. Justify your answer to each of the following questions.



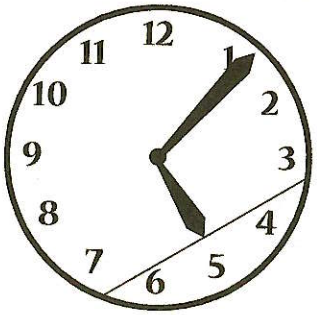
a) What is the measure of ∠RTS?

b) What is the measure of ∠RQS?

Date: _____

4. An archer wants to draw a target in the centre of a 60-cm circle for bow-and-arrow practice. Draw and label a diagram to show him how to find the centre.

5. This clock face has a diameter of 40 cm. The chord shown is 28 cm long.

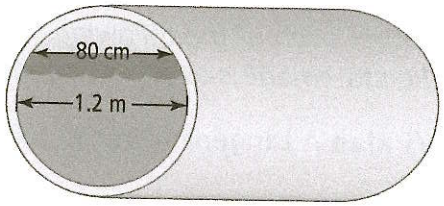


a) How long is the hour hand, to the nearest hundredth?

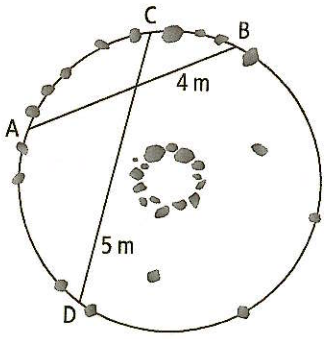
b) How far is it from the midpoint of the chord to the outside of the clock face?

c) Estimate the height of the number 5. Show your thinking.

6. When an engineer inspects a pipeline, she notices a high water mark. How much space is there between the high water level and the top of the pipe, to the nearest hundredth?



7. An archaeologist has found the border of a tipi ring. Some of the stones have been moved.



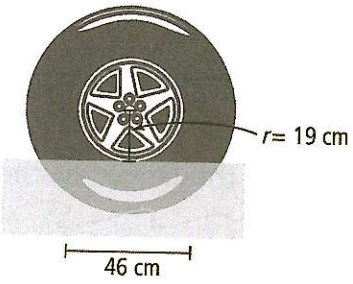
a) Explain or show how four ropes can be used to find the centre of the circle.

b) What is the diameter of the tipi ring, to the nearest tenth of a metre?

Date: _____

6. A rod is connected through the centre of these two pulleys. Calculate the length of the rod between the two centre points. Show your work. Express your answer to the nearest tenth.

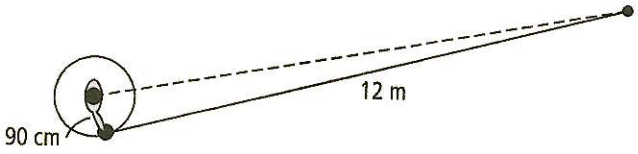
7. A car wheel is frozen in ice. The rim of the wheel has a radius of 19 cm. The chord formed by the ice is 46 cm.



a) How deep is the tire stuck in the ice to the nearest tenth? Show your thinking.

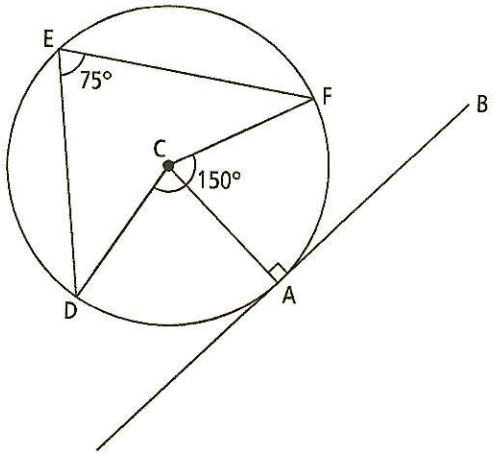
b) What angle is formed between the ice and the radius at the right edge of the tire? Explain your thinking.

8. a) Darcy threw a discus 12 m. His hand is 90 cm from the centre of his body. How far did the discus actually travel from the spot on which Darcy was standing? Express your answer to the nearest hundredth.



b) Explain the relationship of radius, diameter, and tangent using the situation above.

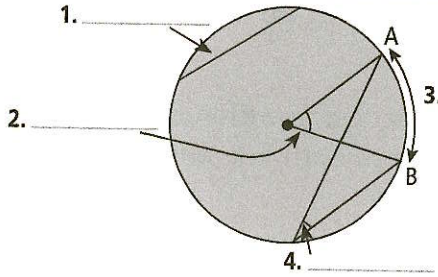
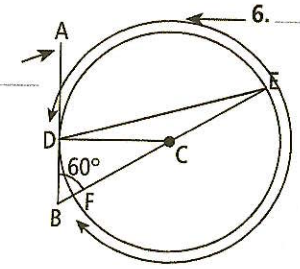
9. In the diagram, $\angle DEF = 75°$ and $\angle DCF = 150°$. Determine the measure of $\angle CFE$.



Date: _____

Vocabulary Link

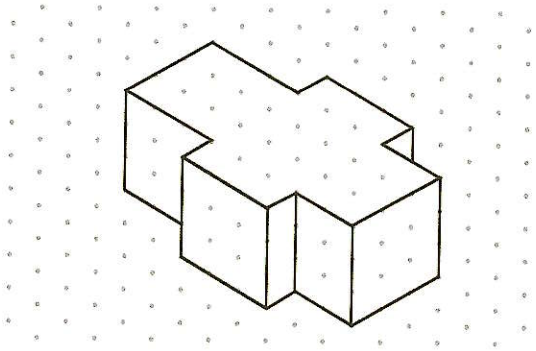
Write the letter of the term in column B that best matches each item in column A. Then, find each term in the word search.

A	B
1. _____ 2. _____ 3. _____ 4. _____  5. _____ 6. _____  7. Angles D and E _____ an arc. 8. ∠BCD is a _____ with ∠ECD. 9. DC is _____ to AB.	**a)** central angle **b)** chord **c)** inscribed angle **d)** major arc **e)** minor arc **f)** perpendicular **g)** subtend **h)** supplementary angle **i)** tangent

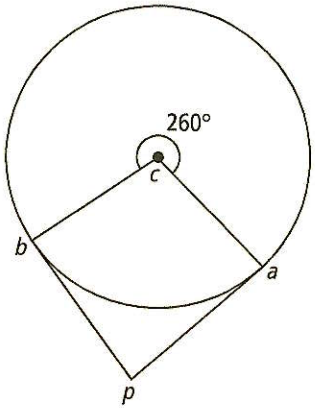
T	A	N	G	E	N	T	C	G	S	W	Q	S	O	F	S	S	A	R	C
J	P	E	R	P	E	N	D	I	C	U	L	A	R	V	C	U	T	C	H
C	I	C	H	C	V	O	D	C	H	V	B	U	T	N	Q	P	Z	A	Z
E	X	L	O	W	M	R	H	R	U	L	M	T	U	H	X	P	A	R	A
N	N	F	X	X	O	J	Y	V	D	W	V	O	E	C	Q	L	W	P	R
T	S	Q	W	H	R	P	H	Y	I	D	J	O	Y	N	O	E	I	E	C
R	A	I	C	J	T	K	C	J	B	D	V	V	M	U	D	M	C	N	O
A	T	J	T	G	K	B	U	O	I	B	F	G	J	R	M	E	N	T	F
L	F	J	X	R	X	Q	M	F	L	H	H	G	E	A	X	N	T	E	A
A	E	B	W	J	N	R	O	P	U	W	R	Y	J	D	C	T	V	R	C
N	R	M	E	O	A	J	Z	F	H	K	V	O	G	O	L	A	B	S	I
G	C	I	C	A	W	M	Z	M	X	C	R	D	B	P	D	R	X	S	R
L	I	N	S	C	R	I	B	E	D	A	N	G	L	E	R	Y	O	Q	C
E	B	O	S	S	S	A	Z	H	R	P	U	I	G	U	M	A	S	U	L
C	B	R	C	I	T	O	V	C	E	M	G	C	D	A	S	N	T	A	E
W	J	A	K	C	V	O	H	Y	T	A	N	Q	S	T	V	G	H	R	R
E	S	R	D	O	P	L	B	S	F	R	G	P	S	M	I	L	N	E	G
R	X	C	T	K	C	J	V	E	R	Q	F	C	L	U	B	E	N	A	I

Date: _____

8. The following object has been drawn on isometric dot paper. The distance between the dots is 2 cm. Determine the surface area of the object.



9. Determine the measurements of angles *a*, *b*, *c*, and *p* if the two lines outside the circle are tangent to it.



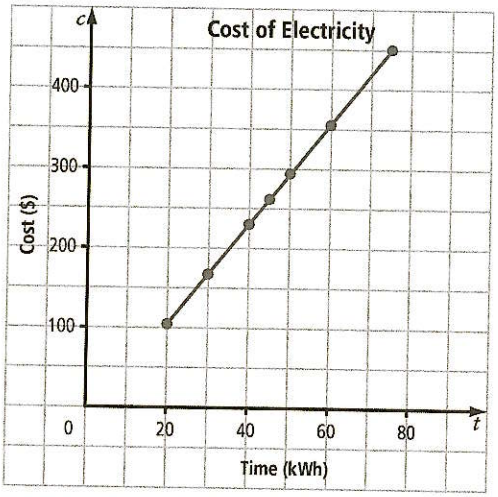
10. Solve each inequality. Verify each solution.

a) $\frac{x}{3} - 7 < 12$

b) $2x \leq 3x + 5$

c) $5(2x + 4) > 2(7x + 4)$

11. The graph represents the relationship between the cost of electricity and the amount used in a house. The electricity is measured in kilowatt hours (kWh).

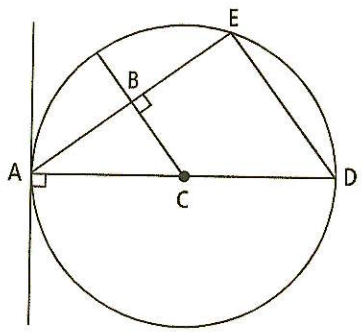


a) Is it reasonable to interpolate or extrapolate values on this graph? Explain.

b) Approximately how much does it cost to use 45 kWh of electricity?

c) Approximately how many kilowatt hours of electricity could you use for $450?

12. In this circle, the chord AE = 6 cm and BC = 4 cm. Determine the size of ∠AED and the length of the radius of this circle.



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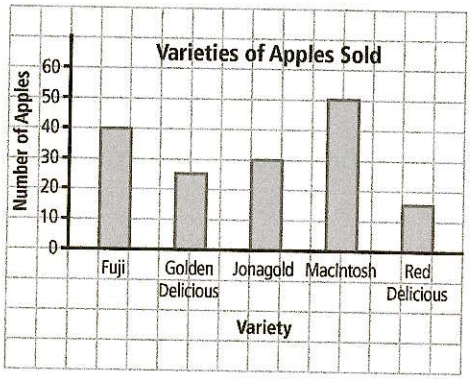
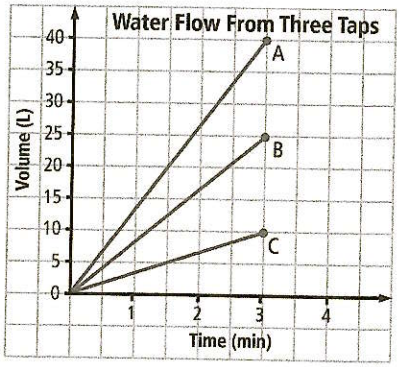
Representing Data

Data can be presented using graphs. Different graphs may display certain types of data better.

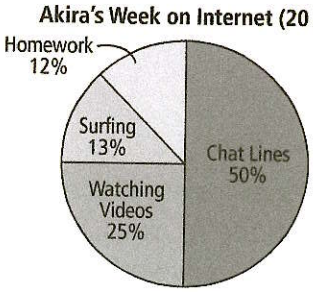
Bar graphs are best for comparing data across categories.



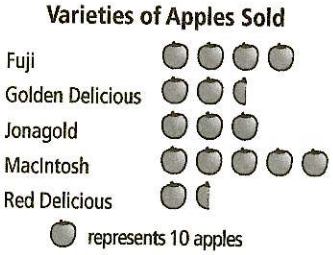
Line graphs are best for showing changes in data over time.



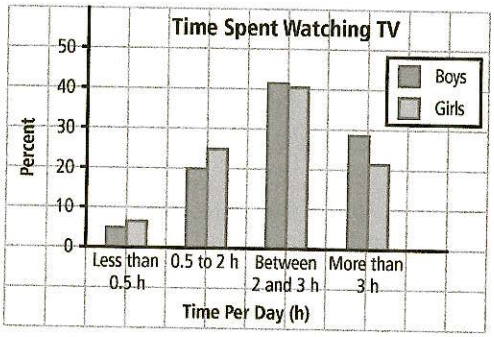
Circle graphs are best for comparing parts of a whole using percents.



Pictographs are best for comparing data that can be counted easily.



5. The school web site posted the results of a survey about the television viewing habits of grade 9 students.



a) What percent of boys watch more than 3 h of TV per day?

b) What percent of girls watch 2 to 3 h of TV per day?

c) If the data in this graph are accurate, how many boys in a population of 500 boys would you expect to watch up to 2 h of TV per day?

Date: _____

b) A sales representative in a grocery store asks customers the following question.

> Which drink do you prefer?
> A Cola
> B Coffee
> C Root beer

Bias: YES NO

Rewrite:

7. In each case, describe the effect of any influencing factors on the collection of data. Then, write an improved survey question.

a) A government party member asks the following question.

> Is the current premier not the best premier in Canadian history?
> YES NO

Influencing factor(s):

Rewrite:

b) A small electronics company asks the following question.

> Do you know about the RC Games Company that supplies the excellent games and systems that you and your friends need?
> YES NO

Influencing factor(s):

Rewrite:

8. For each situation, write two different survey questions that may have resulted in each conclusion.

a) Blue is the most popular car colour.

Question 1:

Question 2:

b) Four out of five mechanics surveyed recommend regular oil changes for family vehicles.

Question 1:

Question 2:

9. Write a survey question for each situation. Identify whom you would ask to participate in the survey.

a) You want to find out which music group teens like best.

Question:

Whom to ask:

b) You want to find out if brand or options is more important when buying a digital music player.

Question:

Whom to ask:

10. Rewrite the survey question so that it collects more helpful data.

> Is lacrosse your favourite sport?
> YES NO

Question:

Date: _____

8. For each context, identify and describe the sample you would select for a survey.

   a) The mayor of a city wants to know what people think about the recreational programs offered to residents.

   b) A school librarian wants to know which fiction books to order for the library.

9. For each context, would you recommend surveying the population or a sample? Justify your choice.

   a) You want to determine the water quality in Shuswap Lake, BC.

   b) You want to test the quality of jet engines.

10. A member of the city council plans to ask every person visiting a local park the following questions.

> Do the park rules need better signs?
> YES NO
> Should the city allow concerts in the park?
> YES NO

   a) Identify the sample.

   b) Identify the population.

   c) Will the results of the survey accurately represent the population? Explain.

   d) Should the same sample be used for both questions? Explain your thinking.

11. a) Anya, Dhara, and Ian plan to ask students the following question: "What mascot would best represent our new school?" How might you improve the survey question? Explain your reasoning.

   b) There are 1400 students enrolled at the school. Anya suggests using a random sample of 30 students. Dhara suggests using a stratified sample to get input from each grade. Ian wants to survey the whole student population. Whose sampling method is better? Explain your reasoning.

Date: _____

7. A school with 5400 students is electing a student council president. A reporter for the student newspaper polled 100 people. The table shows that 45% chose candidate A, 15% chose candidate B, and the rest chose candidate C.

a) According to the poll, how many students will choose each candidate?

Candidate A	Candidate B	Candidate C	Total
45%	15%		100%
			5400

b) What is the experimental probability for candidate C? What is the theoretical probability that a voter will choose candidate C? What assumptions did you make?

Experimental probability:

Theoretical probability:

Assumptions:

c) The reporter predicts that candidate C will win the election. Do you agree with her prediction? Explain your reasoning.

8. Cody records the scores from his ten most recent golf games.

Game	Score
1	70
2	69
3	71
4	73
5	74
6	72
7	73
8	75
9	78
10	74

a) Calculate Cody's mean score based on all ten games.

b) Use the first three game scores as a sample. Calculate the mean.

c) Use the last three game scores as a sample. Calculate the mean to the nearest hundredth.

d) Compare the mean from each sample to the mean for all games. Are the samples a good predictor for Cody's overall score? Explain.

9. Karen read an article claiming that 1 out of every 6 people is born with blue eyes. She predicts that 10 people in a sample of 100 people will have blue eyes. She tested the prediction by rolling a die 100 times for each of 8 trials. Here are the results.

Trial	Blue Eye Colour	Other Eye Colour
1	17	83
2	13	87
3	15	85
4	10	90
5	10	90
6	18	82
7	17	83
8	18	82

Do these experimental results confirm Karen's prediction or the article's claim? Show your thinking.

Date: _____

Step 2: Create a rubric to assess your project.

Use **BLM 11–12 Research Project Rubric** to create your rubric.

Step 3: Continue to develop the project plan.

a) Describe how you will organize and display the data.

b) Describe your method for analysing the data from the studies you find. Consider the following ideas.

- Describe any assumptions that were made. Explain the limitations of each assumption.
- Discuss the accuracy of any predictions made about the population.

c) Describe how you will present your findings. You might choose a written or oral report, use technology, or use a combination of formats.

Step 4: Complete the project according to your plan.

a) Display and analyse the data on separate sheets of paper.

b) Draw a conclusion or a prediction you can make from the data.

Date: _____

Step 6: Self-assess your project.

Use the rubric you developed to assess your research project.

a) For which criteria was your project strong? Explain.

b) For which criteria was your project weak? Explain.

c) Did the project meet the requirements you set? YES NO Explain.

d) Identify two things you liked about your project.

e) Identify one thing you would do differently next time.

f) Have a classmate who read or watched your presentation assess your project using the rubric. Ask for constructive feedback on how to improve the project.

g) List the most useful feedback you received. Use the list to improve your project.

Date: _____

Vocabulary Link

Unscramble the letters of each term in column B. Use the clues in column A to help you. Each term is one to three words long.

A	B
1. affect how data are collected or how responses are obtained	CUEININFLNGTROSCAF
2. sample created by dividing the population into groups, and then choosing the same fraction of members from each group	DIFESRAITTMASPEL
3. sample created by selecting individuals from the population who are easy to reach	VENONENICCEPLEMSA
4. sample in which each individual has an equal chance of being chosen	DNMOARMPLEAS
5. all of the individuals in a group being studied	NOTPIOLAPU
6. used to collect opinions	VURYSE
7. sample that does not represent the population	SEDAIBSPLEAM
8. sample created by selecting individuals at fixed intervals from an ordered list of the population	TAMICSTEYSPLEASM
9. sample created by inviting the population to respond to a survey	RYLTAOVUNPONRESSELEPMAS
10. any group selected from the population	PELSAM
11. make a broad statement from facts	ZEGENALIER

Date: _____

Use this information to answer #6.

A clothing store made a profit of $1.3 million in its first year, lost $400 000 in the second year, and lost $300 000 in the third year.

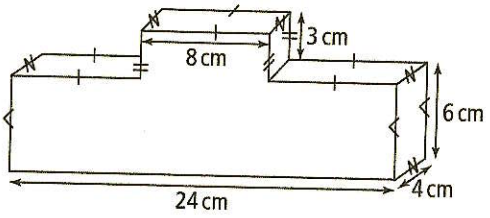
6. What was the average profit (+) or loss (−) over the three years?

A +$200 000 **B** +$600 000

C −$200 000 **D** −$600 000

Use this information to answer #7.

This tiered stand is covered with velvet to display jewellery.



7. What is the surface area of velvet on the exposed faces (all except the base)?

A 348 cm^2 **B** 444 cm^2

C 504 cm^2 **D** 800 cm^2

Use this information to answer #8 to 10.

Waiters at a restaurant are paid $8.00 per shift and $11.25 per hour.

8. Which table of values represents the total wages a waiter is paid in the first 5 h of a shift?

A.

Hours Worked, *h*	Total Wages, *w* ($)
1	11.25
2	19.75
3	30.50
4	41.75
5	53.00

B.

Hours Worked, *h*	Total Wages, *w* ($)
1	19.25
2	38.50
3	57.75
4	77.00
5	96.25

C.

Hours Worked, *h*	Total Wages, *w* ($)
1	19.25
2	22.50
3	33.75
4	45.00
5	56.25

D.

Hours Worked, *h*	Total Wages, *w* ($)
1	19.25
2	30.50
3	41.75
4	53.00
5	64.25

Date: _____

Use this information to answer #16.

A membership at a movie rental store costs $35.00/year. Movie rentals are $4.00 with a membership and $6.95 without a membership.

Numerical Response

16. What is the least number of movies that would need to be rented in a year to make buying a membership worthwhile?

_____

Use this information to answer #17.

A square in the mall has side lengths $2.8x$. An equilateral triangle-shaped water feature with an area of $2.2x^2$ is being cut out of the centre of the square.

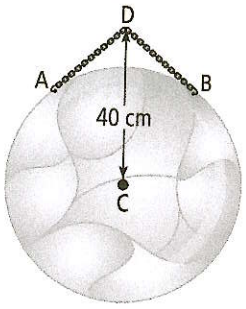
17. Which is the remaining area of the square?

A $0.6x$ **B** $0.6x^2$

C $5.64x$ **D** $5.64x^2$

Use this information to answer #18.

The diameter of the stained-glass hanging for sale is 60 cm. A chain is attached at A and B so that AD and BD are tangent to the circle.



18. Which is the total length of the chain, to the nearest centimetre?

A 27 cm **B** 32 cm

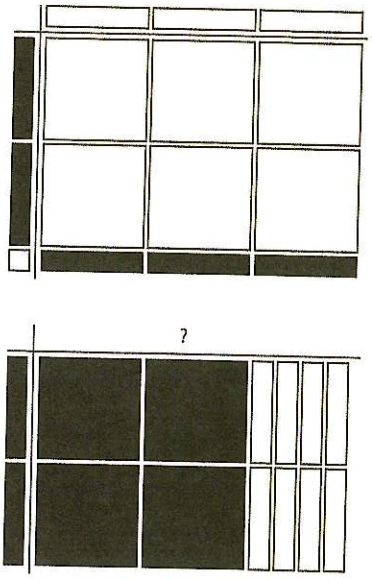
C 53 cm **D** 64 cm

Connections

Many concepts that you study in mathematics are related and can help you solve a variety of problems. Connect the skills and concepts you have learned to solve the following problems.

Use this information to answer #19 to 20.

These algebra tiles model polynomial multiplication and division. Shaded tiles are positive and white tiles are negative.



19. Which multiplication statement is modelled by the top tile arrangement?

A $(3x)(-2x + 1) = -6x^2 + 3x$

B $(-3x)(2x - 1) = -6x^2 + 3x$

C $(-3x)(2x + 1) = -6x^2 - 3x$

D $(3x)(-2x - 1) = -6x^2 - 3x$

20. Which is the quotient of the division modelled by the bottom tile arrangement?

A $-2x - 4$ **B** $-2x + 4$

C $2x + 4$ **D** $2x - 4$

Date: _____

Use this information to answer #28

$x + y + 5$	$x^2 + 2$
$3x^2 - 4x + 1$	$xy + x + 2$

28. Except $x^2 + 2$, all of the expressions are best described as

A polynomials **B** monomials

C binomials **D** trinomials

29. A bacterium triples every 20 min. If there are 35 bacteria present to start, how many will be present in 3 *h*?

A 945 **B** 2835

C 25 515 **D** 688 905

30. What is the value of $2 \times \left(\frac{3}{4}\right)^3$?

A $\frac{18}{12}$ **B** $\frac{27}{32}$ **C** $\frac{27}{64}$ **D** $\frac{18}{128}$

31. Which value is the best estimate for the side length of a square with an area of 6.4 cm^2?

A 0.8 cm **B** 2.5 cm

C 3.2 cm **D** 12.8 cm

Show your work for #32 to 36 on a separate paper. You will also need one sheet of grid paper.

Use this information to answer #32.

A store carries just one brand of jeans. Due to poor sales, the owner is going to switch to a brand that better appeals to 15- to 30-year-olds.

32. How can the owner collect data to decide what brand to switch to? Explain fully, including who and what to ask.

Use this information to answer #33 to 36.

The store switches to a brand that sells for $89.99 before tax. The revenue from jean sales should be at least $1000.00 per day.

33. Define variables and write an equation to model the sale of jeans. Do not include tax.

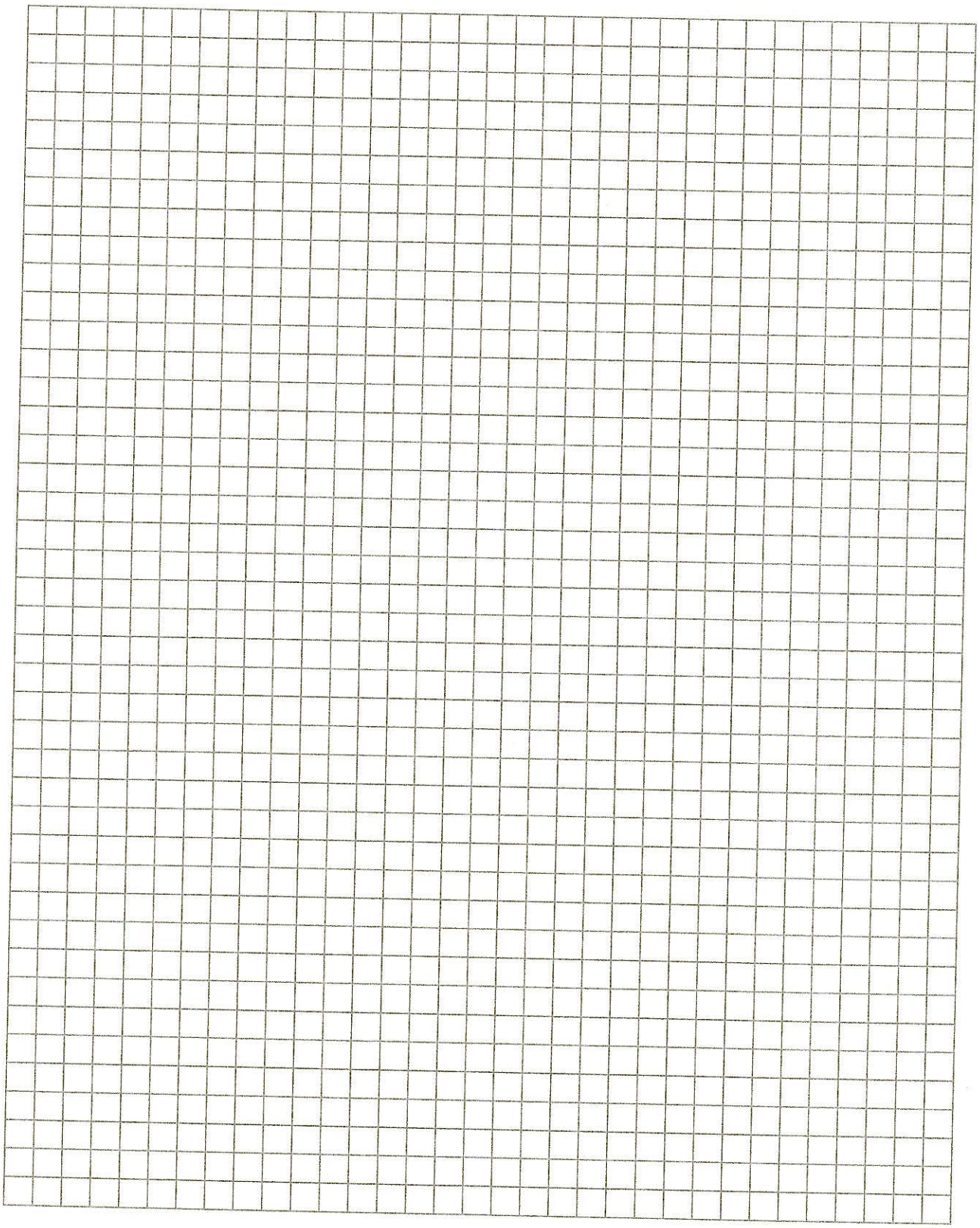
34. Create a table of values for the equation for at least five pairs of jeans. Graph the results.

35. Write an inequality that represents the required sales for the day.

36. How many pairs of jeans must be sold in the day to reach the minimum sales? Justify your answer mathematically.

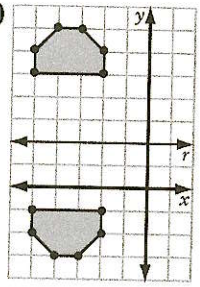
Date: _____

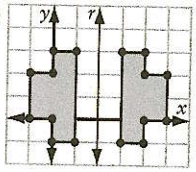
0.5 Centimetre Grid Paper

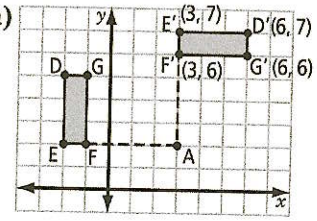


Workbook Answers

1 Get Ready

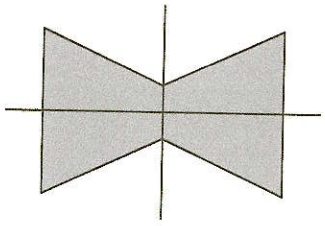
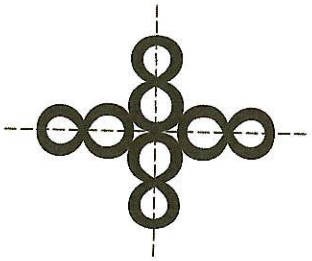
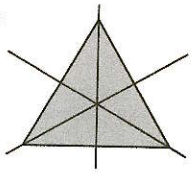
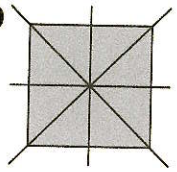
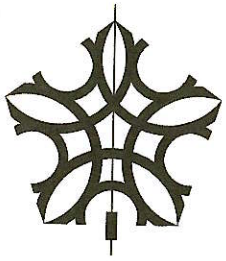
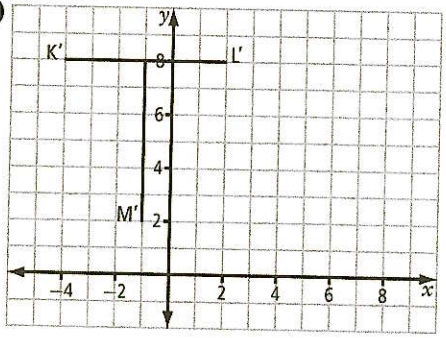
1. Triangle ABC is translated 4 units up.
2. P'(3, 3)
3. a) 

b) 

4. a) 

b) a 270° counter-clockwise rotation
5. 286 cm²
6. a) 5 b) 3

1.1 Line Symmetry

1. True
2. False. Example: An isosceles triangle has one line of symmetry.
3. True
4. False. Examples: A shape that has a line of symmetry is symmetrical. A shape that does not have a line of symmetry is asymmetrical.
5. False. Example: A curved shape may have lines of symmetry.
6. 
7. Example:

8. 
Three lines of symmetry
9. a) 
Four lines of symmetry
b) Two lines are oblique.
10. a) There are none.
b) 
One line
11. a) K(2, 8), L(8, 8), M(5, 2)
b) 

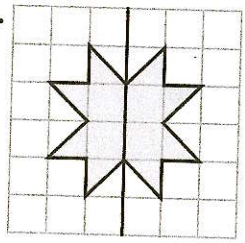
c) K'(−4, 8), L'(2, 8), M'(−1, 2)
d) Yes. They show symmetry along a vertical line.
e) $x = 2$

Chapter 1 Review

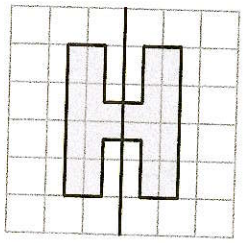
1. a) rotational symmetry

b) horizontal, vertical, and rotational symmetry

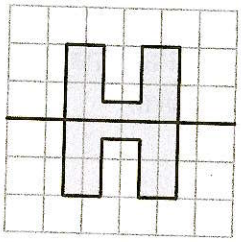
2.



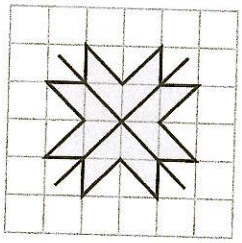
3. a) Example: A type of symmetry where an image can be divided into two identical reflected halves by a vertical line of symmetry.



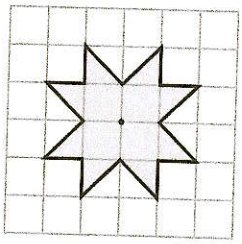
b) Example: A type of symmetry where an image can be divided into two identical reflected halves by a horizontal line of symmetry.



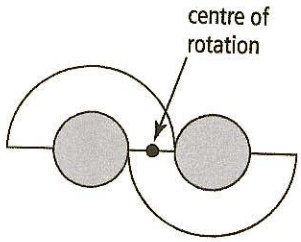
c) Example: A type of symmetry where an image can be divided into two identical reflected halves by a diagonal line of symmetry.



d) Example: A type of symmetry where an image can be turned about its centre of rotation so that it fits onto its outline more than once in a complete turn.

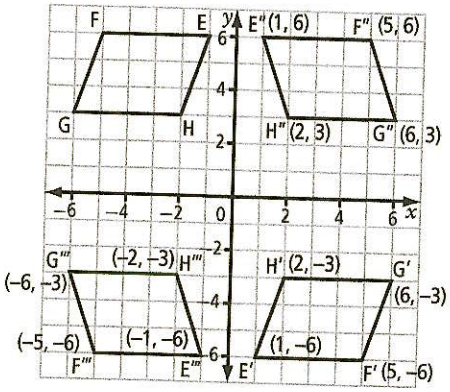


4. a) rotation symmetry



b) This design is not symmetrical. Example: To give the design symmetry, reflect a row of cats. The two rows of cats would then have symmetry along the line of reflection.

5. a)–b)



6. a) 167.5 m² **b)** 277.7 m²

7. a) 128.425 m² **b)** 1285

9. Examples:

$1 - \frac{2}{5} - \frac{1}{3} = \frac{4}{15}$ h,

$60 - \left(\frac{2}{5} \times 60\right) - \left(\frac{1}{3} \times 60\right) = 16$ min

10. $495 **11.** 9.6 m

2.4 Determining Square Roots of Rational Numbers

1. d) **2.** e) **3.** b) **4.** c) **5.** a)

6. a) Any rational number between 25 and 36 is correct. Example: 26

b) Any rational number between 9 and 16 is correct. Example: 12

7. a) 4, 4.84 **b)** 81, 75.69

c) 121, 127.69 **d)** 1, 0.8464

8. a) 196 cm^2, 216.09 cm^2 **b)** 4 km^2, 5.29 km^2

9. a) Yes, both 4 and 9 are perfect squares.

b) $0.4 = \frac{4}{10}$. No, 10 is not a perfect square.

c) $0.81 = \frac{81}{100}$. Yes, both 81 and 100 are perfect squares.

d) No, 2 is not a perfect square.

10. a) $0.16 = \frac{16}{100}$. Yes, both 16 and 100 are perfect squares.

b) No, 90 is not a perfect square.

c) $0.001 = \frac{1}{1000}$. No, 1000 is not a perfect square.

d) $\frac{8}{18} = \frac{4}{9}$. Yes, both 4 and 9 are perfect squares.

11. a) 17 **b)** 0.19 **c)** 35 **d)** 2.3

12. a) 1.5 cm **b)** 19 m

13. a) 5, 6 **b)** 7, 8 **c)** 0.4, 0.5 **d)** 0.8, 0.9

14. a) 5.5 **b)** 7.2 **c)** 0.42 **d)** 0.88

15. 2.3 m **16.** 7.5 cm

17. No, the sides of the room are $\sqrt{15}$ m or approximately 3.87 m, which is larger than the width of the carpet roll.

2 Chapter Link

1. 9 h

2. a) $\frac{9}{10}$, 7.5, $\frac{3}{4}$, 6 h 30 min, $\frac{2}{3}$, $4\frac{2}{8}$, $\frac{4}{9}$ **b)** Saturday

3. a) Example: Estimated bed area of 4 m^2 is less than the area of the room, so it will fit. Room sides are about 1.45 m longer than the bed, so it will fit.

b) Both the flower rug and the geometric rug have sides longer than the bed but shorter than the room.

4. 1 h 25 min

2 Vocabulary Link

Across

6. non-perfect square

Down

1. equivalent numbers

2. parentheses

3. quotient

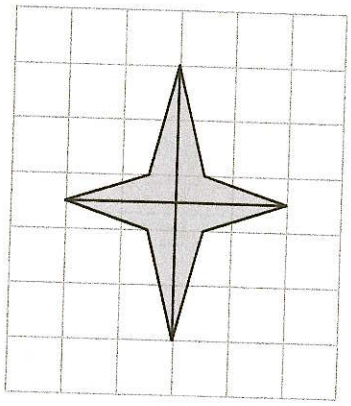
4. rational number

5. perfect square

Chapters 1–2 Review

1. $3\frac{2}{5}$, -2, $\frac{7}{4}$, -0.7, $1\frac{1}{3}$, 2.5

2. Vertical, horizontal, and rotational symmetry of order 2 with an angle of rotation measuring 180°



3. a) < **b)** = **c)** > **d)** > **e)** =

3.3 Order of Operations

1.

Expression	Coefficient	Power	Repeated Multiplication	Value
$-3(7)^2$	-3	7^2	$-3 \times 7 \times 7$	-147
$2(5)^4$	2	5^4	$2 \times 5 \times 5 \times 5 \times 5$	1250

2. Step 1 c), Step 2 a), Step 3 d), Step 4 b)

3. a) 108 **b)** 32 **c)** 700 000 **d)** -108

4. a) $2(3)^3$ **b)** $5(-7)^5$ **c)** $-2(8)^4$ **d)** $6(9)^5$

5. a) 16 **b)** -17 **c)** 3 **d)** 0.7

6. Example: In Step 2, Juan should have multiplied 8 by 8, not by 2. The correct answer is 140.

7. a) -199 **b)** 225

c) undefined; cannot divide by 0 **d)** 20

8. a) 136 **b)** 73

9. 216 mm^2 **10.** -233

11. a) $-5^2 = -25$, $(-5)^2 = 25$

b) Example: The expression -5^2 has an exponent of 2, a base of 5, and a coefficient of -1, so evaluating the power and then multiplying by the coefficient gives an answer of -25. The expression $(-5)^2$ has an exponent of 2, a base of -5, and a coefficient of 1, so the expression has a value of 25.

3.4 Using Exponents to Solve Problems

1. False. A power in a formula represents repeated multiplication.

2. True

3. False. Patterns involving repeated multiplication can be modelled by an expression that contains only powers.

4. 864 cm^2 **5.** 5 mm

6. a) $100(2)^n$ **b)** 3200 **c)** 102 400

7. 2 m **8.** 15.1 cm^2 **9. a)** $6s^2$ **b)** $h^2 = a^2 + b^2$ **c)** s^3

10.

Power(s)	Base(s)	Exponent(s)	Coefficient
a) s^2	s	2	6
b) h^2	h	2	1
a^2	a	2	
b^2	b	2	
c) s^3	s	3	1

11. a) 3.38 m^2 **b)** 22.5 m^2

3 Chapter Link

1.

Time (h)	Population of Bacteria in Sample	
	A	B
0	50	600
1	150	1 200
2	450	2 400
3	1 350	4 800
4	4 050	9 600
5	12 150	19 200
6	36 450	38 400
7	109 350	76 800
8	328 050	153 600

2. a) A, 6 **b)** $50(3)^6$ **c)** 50

3. a) $50(3)^n$ **b)** $600(2)^n$

4. Example: Shortly after hour 6, the populations would be equal since the population of Sample A overtakes that of Sample B during hour 7.

5. a) $600(2)^5 - 50(3)^5$ **b)** 7050

6. a) $50(3)^n + 600(2)^n$ **b)** 74 850 **c)** 3 566 850

3 Vocabulary Link

Across

6. exponential form

Down

1. factored form

2. power

3. exponent

4. base

b) Example: I measured the various parts of the butterfly, multiplied that measurement by 4, and then drew the part in the new measurement. For example, the body is 5.5 mm long. I drew the larger body 22 mm long.

6.

7. a) enlargement

b) approximately 1:2.3. Example: If you measure the A in the newspaper headline and the A in the poster headline, you can find the scale factor.

4.2 Scale Diagrams

1. d) **2.** c) **3.** b) **4.** a)

5. a) divide 85 by 5, then multiply 1 times the answer **b)** divide 132 by 6

6. a) 121.5 **b)** 4 **7. a)** 130.2 cm **b)** 2 mm

8. a) $\frac{1}{7.5}$ **b)** $\frac{1}{4}$ **9. a)** $\frac{1}{16.\overline{3}}$ **b)** $\frac{1}{13\,333.\overline{3}}$

10. a) approximately 1:206 or 1:207, depending on how you measure

b) The scale drawing should be 1.1 cm by 1.5 cm.

c) 1.65 cm²

4.3 Similar Triangles

1. a) angles **b)** sides

2. scale factor, proportion

3. a) Yes. They are similar because the corresponding angles are equal and the corresponding sides are proportional.

b) No. The angles are not equal and the sides are not proportional.

4. a) ∠A and ∠J, ∠B and ∠K, ∠C and ∠L; AB and JK, BC and KL, AC and JL

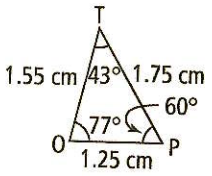
b) ∠P and ∠M, ∠Q and ∠N, ∠R and ∠L; PQ and MN, PR and ML, QR and NL

5. △PQR and △VWX are similar. Example: They are both isosceles right triangles with 45° angles on the legs. Corresponding sides are proportional.

6. No. Example: They are not similar because the corresponding sides are not proportional.

7. a) $x = 21$ **b)** $x = 13.8$

8. Example: Triangle reduced by half.



9. 167 cm

4.4 Similar Polygons

1. False. Polygons that are similar have all corresponding angles equal in measure.

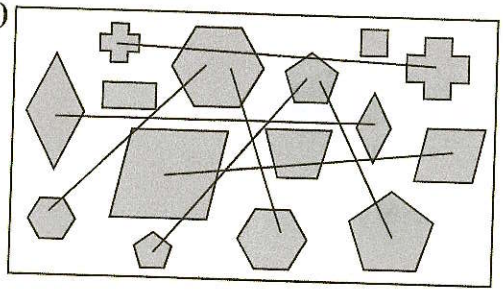
2. False. Example: You can use similar polygons to determine unknown side lengths.

3. False. A polygon is a two-dimensional closed figure made of three or more line segments.

4. a) Yes. Example: They are similar because all side lengths are proportional with a scale factor of 2.

b) Yes. Example: All side lengths are proportional with a scale factor of 1.7.

5. a)



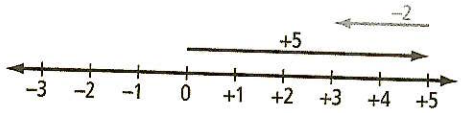
b)

c) Examples:

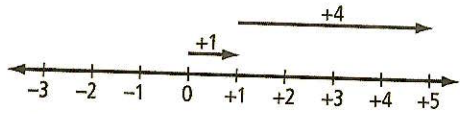
6. a) $x = 1.7$ **b)** $x = 2.25$, $y = 12$

5 Get Ready

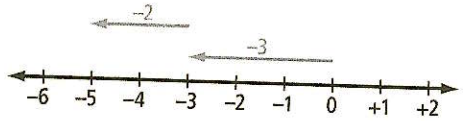
1. a) +3



b) +5



c) −5



2. a) $(-2) + (+5) = +3$ **b)** $(-1) + (-2) = -3$
c) $(-3) + (+7) = +4$

3. a) +5 **b)** −4 **c)** −13 **d)** +2

4. a) +4 **b)** −5 **c)** +3 **d)** +10

5. a) NC: 2, V: x, C: −7
b) NC: −3, V: b, C: +5
c) NC: 1, V: t, C: −4
d) NC: −6, V: r, C: +3

6. Examples:
a) $s - 5$, where s is Sarah's sister's age
b) $2l - 3$, where l is the length
c) $p + 14$, where p is the perimeter of the triangle
d) $\frac{1}{2}n$ or $\frac{n}{2}$, where n is the number of tickets the school expected to sell

7. a) $p + p + p + p$ or $4p$
b) Example: The length of the rectangle is 8 units more than its width.

5.1 The Language of Mathematics

1. symbols, variables

2. polynomial, monomial, binomial, trinomial

3. exponents, highest

4. a) 2; binomial **b)** 1; monomial **c)** 3; trinomial
d) 4; polynomial

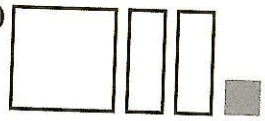
5. a) 2; 2 **b)** 2; 2 **c)** 1; 0 **d)** 2; 3

6. a) $4c^2 - 3c + 2$, $g + h + j$
b) $4c^2 - 3c + 2$, $5p^2 - r$, $4ab$ **c)** −12
d) $4ab$, −12 **e)** $4c^2 - 3c + 2$, $4ab$

7. a) $x^2 + x - 4$ **b)** $-2x^2 - 3$ **c)** $x^2 - 3x$

8. a)

b)



9. a) $x^2 + 7$ **b)** $3x - 9$ **c)** $4x$

10. a) $5n$ **b)** $w(w + 5)$ or $w^2 + 5w$ **c)** $0.8x + 40$

5.2 Equivalent Expressions

1. a) a, b **b)** −7; 1 for w, 2 for x **c)** No

2. x^2 should be circled in each term; $-2x^2$

3. No. They are not like terms because either the variables differ or the exponents of the variables differ.

4. a) 1; 1 **b)** −3; 1 **c)** 6; 2 **d)** no value; 0
e) −1; 2 **f)** 1; 2

5. a) $-cd$, $-xy$ **b)** $-cd$, $-xy$, $-3jk$ **c)** k^2
d) $9r$, $4x$

6. a) $3r$, $-r$ **b)** $-4y$, $0.3y$, $\frac{y}{2}$ **c)** cd, $6cd$

7. Examples:
a) $5c^2 - c^2 - 5c + c + 9 - 8$
b) $3m^2 + 2m^2 + 8m - 6m - 9 + 6$
c) $6d^2 - 5d^2 - 8d + 3d + 7 - 2$

8. The order of the terms may vary.
a) $-b^2 + 5b^2 + 6 - 8 + 9$; $4b^2 + 7$
b) $4t^2 - 3t^2 + 7t + 6t - 5 + 14$; $t^2 + 13t + 9$
c) $-2n^2 - 3n^2 + 9n + 5n + 3 - 7$; $-5n^2 + 14n - 4$
d) $3y^2 - 6y^2 + 3y + 2y + 4 - 6 - 5$; $-3y^2 + 5y - 7$

9. $3b + 6$

6 Get Ready

1. a)

Time, t (h)	Distance, d (km)
0	5
2	8
4	10

b)

Time, t (s)	Speed, s (km/h)
5	60
6	50
7	40

2. a) Yes. Example: It makes sense because there can be times and temperatures between the ones labelled on the graph.

b) No. Example: It does not make sense because you can sell only whole hamburgers, not fractions of a hamburger.

3. a) This is a linear relation because the difference between the consecutive values in each row is the same (15 m in the first row and 2.1 m/s in the second row).

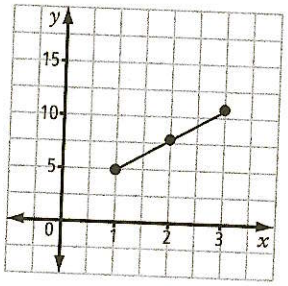
b) This is not a linear relation because the difference between consecutive values of h is not consistent even though the difference between consecutive values of t is consistent.

4. (60, 10.5)

5. Examples:

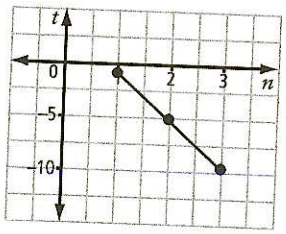
a)

x	y
1	5
2	8
3	11



b)

n	t
1	−1
2	−5
3	−9



6.1 Representing Patterns

1. a) pattern, four rails, posts

b) Example:

Number of Posts, p	Number of Rails, r
1	0
2	4
3	8
4	12

c) Example: To get r, multiply p by 4 and subtract 4.

2. a) equation **b)** Example: $4p - 4 = r$

c) Example: Substitute values of p from the table.

3. a)

Figure Number, f	Perimeter, p
1	8
2	14
3	20
4	26

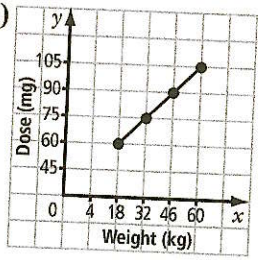
b) $6f + 2 = p$; f = figure number, p = perimeter

c)

Figure Number, f	Perimeter, p
5	32
6	38
7	44
8	50
9	56
10	62

7. Example:

a)

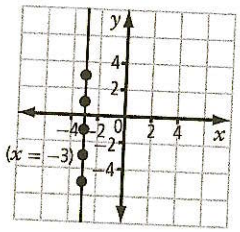


b) 40 kg: 85 mg; 100 kg: 190 mg

c) 50 mg: 8 kg; 120 mg: 74 kg

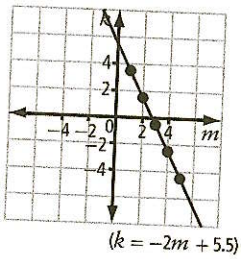
6.3 Graphing Linear Equations

1. equation
2. coordinate, linear relation
3. interpolate, extrapolate (in either order)
4. a) Example:



x	y
−3	−5
−3	−3
−3	−1
−3	1
−3	3

b) Example:



m	k
1	3.5
2	1.5
3	−0.5
4	−2.5
5	−4.5

5. a) $y = -2x + 0.25$ b) $y = -0.5x$
6. a) $y = 0.5x + 1.5$

b) Example: A line passes through points A to N; $y = 2x - 1$

c) Example: A line passes through points A, B, C, D, E, and F; $y = 1$

7. a) Example: $l = 1000 - \frac{99t}{60}$

b) Example: Approximately 450 min or 7.5 h; interpolation

c) Agree. Example: It takes about 7.5 h to pump out 750 L.

8. a) Example:

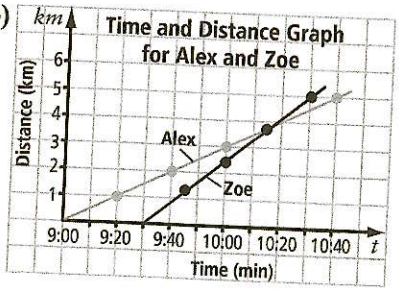
Alex

Time (min)	Distance (km)
9:20	1
9:40	2
10:00	3
10:20	4
10:40	5

Zoe

Time (min)	Distance (km)
9:45	1.25
10:00	2.50
10:15	3.75
10:30	5.00
10:45	6.25

b)



c) 10:15 a.m. d) 0.5 km

6 Chapter Link

1. Examples:

a) Air

Time, t (s)	Distance, d (m)
1	340
2	680
3	1020
4	1360
5	1700
6	2040
7	2380
8	2720
9	3060
10	3400

7. a) 13 **b)** 0.216

8. Error in step 1 ($-2^2 = 4$, not -4).
Correct answer: 154

9. 137.33 cm^2

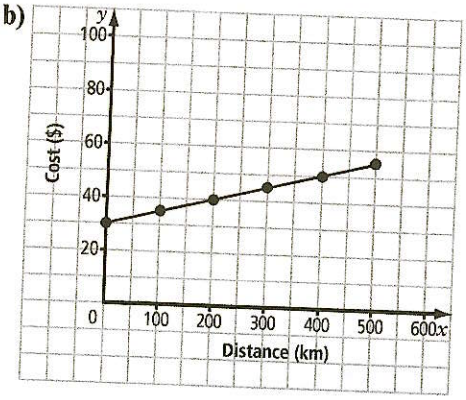
10. a) $5a^2 - 9a - 7$ **b)** $6x^2y - 7xy^2$

11. 4.6 cm

12. a)

Distance (km)	Cost ($)
0	30
100	35
200	40
300	45
400	50
500	55

b)



c) $42.50 **d)** 450 km

e) Example: $C = 0.05d + 30$, where C represents cost in dollars and d represents distance in km.

7 Get Ready

1. a) T; 2 **b)** B; 2 **c)** B; 1 **d)** M; 2

2. Examples: $3x^2 + 2y - 4x$, $3x + 2xy - 4y$

3. b) and d)

4. a) $3x^2 - 6x + 5$ **b)** $3p^2 - p + 2$

5. a) $7x - 10$ **b)** $2t^2 + 3t + 1$

6. a) -7 **b)** $y^2 + 5y - 2$

7. a) $3x^2 + 8x - 10$ **b)** $-y - 9$

7.1 Multiplying and Dividing Monomials

1. a) product; $-x$-tiles

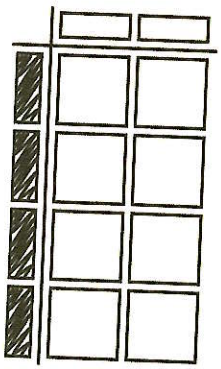
b) division; dividend; x-tiles

c) numerical coefficients; exponent rules

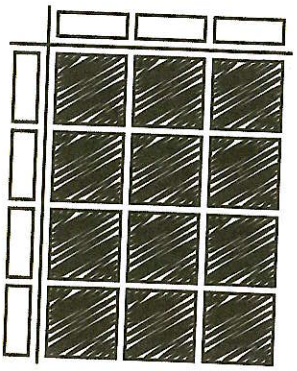
2. Example: To divide monomials algebraically, you can divide the numerical coefficients and then use the exponent rules to divide the variables.

3. Orientation of models may vary.

a) $-8x^2$

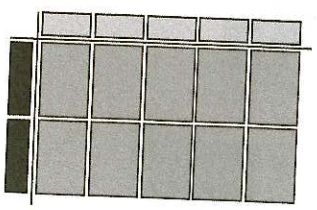


b) $12x^2$



4. a) $6x^2 \div (-3x) = -2x$ **b)** $9xy \div 3x = 3y$

5. a) $2x$



7 Chapter Link

1. a) $768y + 216$ units **b)** $32y + 9$ units
c) $512y^2 + 288y + 40.5$ units^3 **d)** 20 bundles
e) $12\,800y^2 + 7200y + 1012.5$ units^3

2. a) $(4374d^2 + 1458dp + 972d)$ units^2
b) $(81d^2 + 27dp + 18d)$ units^2

3. Example: A square carpet with side length $7.6a + 8.2$ m is cut into 4 square carpets of equal size. What are the side lengths of the smaller carpets?

Answer: $(7.6a + 8.2) \div 4 = (1.9a + 2.05)$ m

7 Vocabulary Link

Across

5. distributive property

Down

1. polynomial

2. monomial

3. spider map

4. binomial

Chapters 1–7 Review

1. a) $5x$; -20 **b)** $5x + y$; $2x^2 - xy$
c) $2x^2 - xy$; $7d^2 - 3cd - 5c + 6$ **d)** c and d
e) -20; $5 + c + d$; $7d^2 - 3cd - 5c + 6$ **f)** 5; none

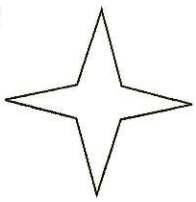
2. a) $y = 2x + 3$ **b)** $y = \frac{-3}{4}x$ or $-0.75x$ **c)** $y = 3$

3. a) $11x^3$ **b)** $15j^2 - 18j$

4. a) $-3x - 2y$ **b)** $32t + 16$

5. Example:

a)



b) 4 **c)** 4 **d)** 90°; $\frac{1}{4}$

6. a) 58.27 **b)** $-\frac{2}{15}$

7. a) 24 **b)** 3 145 728 **c)** 50 331 648

8.

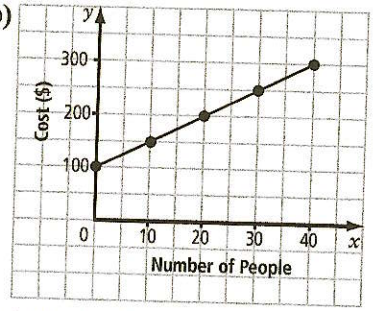
	$5x^2 + 4x + 20$	
$4x^2 + 2x + 9$		$-x^2 - 2x - 11$
$3x^2 + 2x + 5$	$-x^2 - 4$	$2x + 7$

9. a) $1.3m$ **b)** 8.62 cm **c)** $\frac{1}{3}$ m

10. a)

Number of People	Cost ($)
0	100
10	150
20	200
30	250
40	300

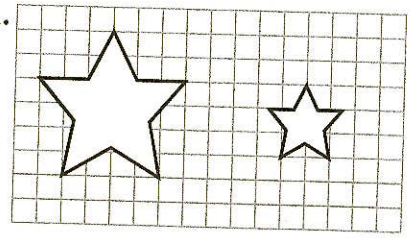
b)



c) $225 **d)** 80

e) Example: $C = 5n + 100$, where C represents the total cost in dollars and n represents the number of people.

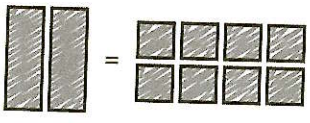
11.



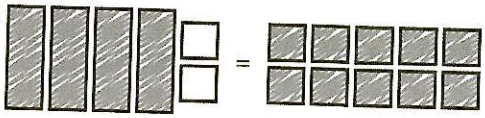
8 Get Ready

1. Examples:

a)



b)



5. a) $x = -\frac{3}{4}$ **b)** $c = \frac{10}{27}$ **c)** $x = \frac{13}{5}$ **d)** $w = \frac{7}{8}$

6. a) $x = 2.14$ **b)** $p = 0.56$ **c)** $m = -2.11$

7. a) $p = -4.5$ **b)** $x = -\frac{13}{5}, -2\frac{3}{5}$, or -2.6 **c)** $k = 3.7$

8. 8 weeks **9.** $x = 7.2$ **10. a)** 15.75 min **b)** 3.54 km

11. 19

8 Chapter Link

1. 2.5 km **2.** 283 km **3.** 157 km

4. No. Example: The left and right sides of $22.50 + 0.15d = 0.28d$ are not equal when d represents 170 km.

5. 49.09 km

8 Vocabulary Link

1. g) **2.** c) **3.** e) **4.** b) **5.** d) **6.** a) **7.** f)

G	K	D	Z	C	D	U	T	D	O	B	I	I	N	N	U	I	E	T	I
E	H	S	N	O	I	T	A	R	E	P	O	E	T	I	S	O	P	P	O
Z	I	I	V	L	R	N	D	I	H	S	U	Z	U	L	P	I	Q	J	M
J	B	W	A	J	K	Y	S	S	T	J	U	G	M	X	P	A	U	G	K
N	U	M	E	R	I	C	A	L	C	O	E	F	F	I	C	I	E	N	T
P	B	K	P	L	X	R	Z	T	F	X	W	A	E	T	O	D	A	C	E
O	I	A	I	P	Z	X	X	R	A	H	I	W	R	K	S	X	T	M	Q
D	V	I	F	A	Q	N	D	Z	I	I	N	O	W	I	K	I	N	I	L
U	B	L	R	B	V	M	M	R	F	B	B	M	T	P	C	W	T	N	K
D	N	O	A	L	A	V	Z	X	K	U	V	H	F	W	A	Q	E	O	Q
R	U	W	C	E	R	Y	E	P	D	T	F	G	X	J	O	L	H	I	D
D	I	S	T	R	I	B	U	T	I	V	E	P	R	O	P	E	R	T	Y
Z	Q	L	I	B	A	R	T	P	A	I	J	M	N	L	M	C	C	A	P
H	F	O	O	M	B	A	X	F	A	V	H	S	Y	E	K	O	V	U	E
I	L	I	N	X	L	K	F	W	N	P	T	K	Z	U	M	F	V	Q	A
O	E	X	B	I	E	R	I	Z	V	A	P	F	J	T	R	X	U	E	L
L	G	E	A	V	L	B	I	B	N	O	U	T	V	H	I	Z	I	Q	A
R	Y	S	R	N	U	R	E	T	C	C	F	K	I	W	N	F	X	J	Z

Chapters 1–8 Review

1. a) $-7x^2 + 2x + 3$; 3, 2, trinomial

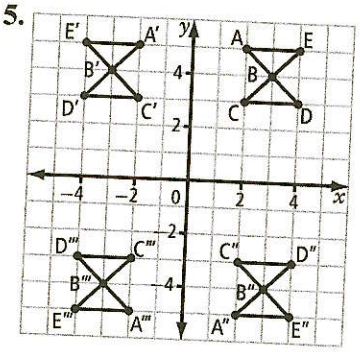
b) $2p + 15$; 2, 1, binomial

2. a) \$380 **b)** $3\frac{3}{5}$ h or 3.6 h

3. a) 2 **b)** 4 **c)** 2 **d)** $\frac{1}{4}$ **e)** $\frac{1}{2}$

4. $6x - 2$

5.



A′(−2, 5), B′(−3, 4), C′(−2, 3), D′(−4, 3) E′(−4, 5)

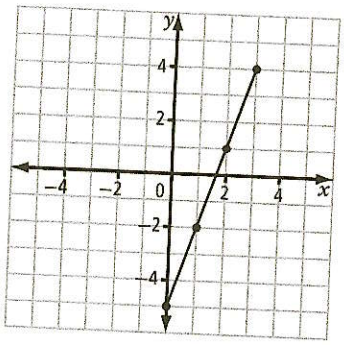
A″(2, −5), B″(3, −4), C″(2, −3), D″(4, −3), E″(4, −5)

A‴(−2, −5), B‴(−3, −4), C‴(−2, −3), D‴(−4, −3), E‴(−4, −5)

6. Example: 10 tricycles, 1 children's bike, and 1 mountain bike; or 5 tricycles, 2 children's bikes, and 2 mountain bikes

7.

x	y
0	−5
1	−2
2	1
3	4



8. a) $c = \frac{35}{9}$ or $3\frac{8}{9}$ **b)** $g = 2$ **c)** $f = -1$ **d)** $r = \frac{7}{3}$ or $2\frac{1}{3}$ **e)** $b = -34$

9. $(-5)^5 = -3125$

10. a) the number of times the coin is flipped

b) the number of possible outcomes

c) HHH, HHT, HTH, TTT, THH, TTH, THT

d) $2^{10} = 1024$

9 Get Ready

1. a) $5 > 2$ **b)** $7 < 20$ **c)** 5×3 **d)** $9 = \frac{18}{2}$

2. a) 4 is less than 8.

b) 8 is greater than 2.

c) 14 divided by 2.

d) 4 does not equal $\frac{8}{3}$.

12. Examples:

a) Let n equal the number of uses; $37.5n > 285$.

b) $n > 7.6$. Eight or more uses make the members' plan cheaper.

c) No. The boundary point of 7.6 is not a reasonable solution because only whole numbers are possible for the number of uses.

13. a) $3.49x > 49.95$

b) It becomes cheaper to buy the game when the number of days is greater than 14.

c) She should buy the game.

9.3 Solving Multi-Step Inequalities

1. isolate; equation; reverse; multiplying; dividing; negative

2. multi-step; left; right

3. comparing; inequalities

4. a) $x < 9$ **b)** $x \geq -18$

c) $x < -\frac{12}{5}$ or $x < -2.4$

d) $-\frac{3}{2} \leq x$ or $x \geq -\frac{3}{2}$ or $-1.5 \leq x$ or $x \geq -1.5$

5. a) $x \leq -12$ **b)** $x > -2$

c) $x \leq -\frac{5}{2}$ or $x \leq -2.5$ **d)** $1 < x$ or $x > 1$

6. a) The solution is correct.

b) The solution is not correct. $x > 1.5$.

c) The solution is not correct. $3\frac{2}{5}$ is the boundary point, not part of the solution.

d) The solution is correct.

7. a) Example: Let d = number of downloads per month.

b) $29 + 0.8d < 17 + 1.19d$

c) $d > 30.769\ldots$. Site A is a better deal when Ethan makes more than 30 downloads.

8. a) Example: Let t = time in hours a bike is rented.

b) $25 + 8t > 55$

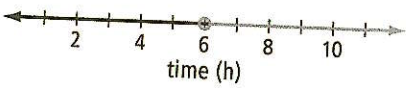
c) $t > 3.75$. The all-day plan is better if renting for at least 4 h.

9. a) Sheila will be closer after 2.6 h (2 h 36 min).

b) Sheila would have to travel at least 89.6 km/h.

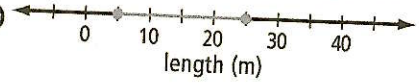
9 Chapter Link

1. Let t = time (h); $t > 6$



2. Examples: **a)** Let L = length painted on Michele's side; $L \geq 5$ and $L \leq 25$

b)



3. a) Let t = time in hours; $3.5t \geq 5$

b) Example: Hani can take a break after a little more than 1.4 h.

4. a) $3.5t > 3t + 5$. Hani will have painted farther after more than 10 h.

b) Example: $3.5(11) > 3(11) + 5$, $38.5 > 38$. True

9 Vocabulary Link

1. inequality

2. open circle

3. combination of inequalities

4. closed circle

5. graphically

6. verbally

7. algebraically

8. solution of an inequality

9. boundary point

Chapters 1–9 Review

1. Example: $5x^2 - 4xy + 6$

2. a) Example: $y = -1.75$ **b)** Example: $x = 3$

c) $y = \frac{3}{2}x - 4$ or $y = 1.5x - 4$

3. a) $8x - 14$ **b)** $4a^2 + 3a - 1$

c) $10t^2 - 12t + 4$ **d)** $-2.3x + 0.2$

4. a) $\frac{1}{48}$ **b)** 604.8 cm

5. a) -2 **b)** $-14mn + 42n^2$ **c)** $9p - 1 + 3q$

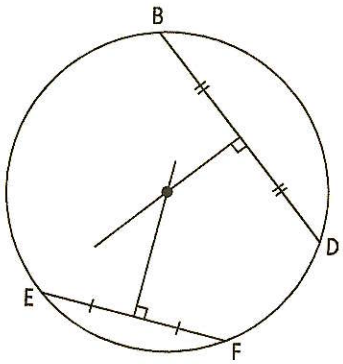
d) $\frac{2}{5}s^2 - \frac{4}{15}s$

6. 3.9 cm

7. a) 106°. Example: △STR is an isosceles triangle because ST and TR are both radii of the circle and therefore equal. 180 − 37 − 37 = 106
   b) 53°. Example: Since they are subtended by the same arc, inscribed angle ∠RQS must be half the measure of the central angle ∠RTS.

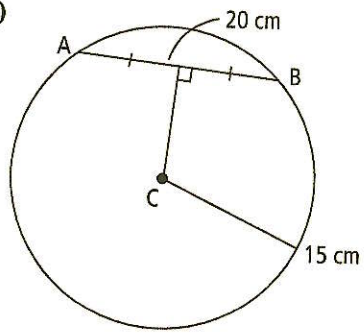
10.2 Exploring Chord Properties

1. a)–c)



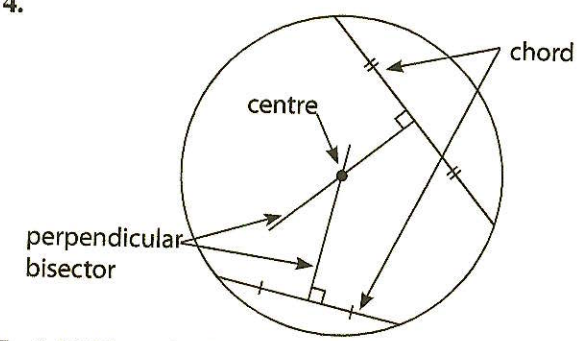
2. a) centre, bisectors, chords
   b) bisector, chord, centre
   c) centre, bisector, chord
   d) centre, chord, bisector

3. a)



   b) 11.2 cm

4.



5. a) 14.28 cm b) 5.72 cm c) approximately 3.5 cm
6. 15.28 cm
7. a) Example: Use the rope to create two chords and their perpendicular bisectors; the centre of the circle is where the bisectors meet.
   b) approximately 5.3 m

10.3 Tangents to a Circle

1. False. A tangent always touches a circle once.
2. False. The place a tangent touches a circle is called the point of tangency.
3. True 4. True
5. a) 90°. Example: Segment FD is tangent to the circle at point F. FG is a radius. Tangents are perpendicular to the related radius.
   b) 30°. Example: △FDG is a right triangle. The sum of angles in a triangle is 180°. 180° − 90° − 60° = 30°
   c) 75°. Example: △FGH is an isosceles triangle and ∠FGH = 30°, and (180° − 30°) ÷ 2 = 75°
6. 73 cm 7. a) 10.8 cm b) 39.5°
8. a) 12.03 m
   b) Example: Darcy's arm forms the radius of his turning circle. This is half the diameter. When he lets the discus go, it leaves along a tangent to the circle he made.
9. 37.5°

10 Chapter Link

1. a) 90° b) central 2. a) 45°
3. Yes. Example: One side of the △HED is the circle's diameter (chord HD).
4. 14.14 m
5. a) 2.93 m b) 18.47 m c) 7.66 m
6. 22.5°. Example: Since angle ∠BJD measures 90° or twice that of ∠BGD (being the inscribed angle subtended by the same arc), and radius JC bisects the chord resulting in ∠DJC measuring half of ∠BJD or 45°; ∠JCD = 180 − ∠DJC ÷ 2, or 67.5°; ∠JCL = 90° because CL is a tangent and GC is the diameter, so ∠DCL = 90 − ∠JCL or 22.5°.

11.1 Factors Affecting Data Collection

1. survey
2. influencing factors
3. bias
4. ethics
5. Examples:
   a) An influencing factor is the choice of people interviewed. Students should also be surveyed; not including them shows bias. When will the cafeteria customers be surveyed? Surveying them after a good meal may affect their response.
   b) There are no influencing factors. Customers at a sporting goods store may have opinions about the brand of snowboard they prefer.
   c) An influencing factor is cost. Offering a digital audio player might be quite costly for the administration.
   d) An influencing factor is ethics. Asking participants about something that they know is not allowed is unethical.
6. Examples:
   a) Bias: Yes. The bias is using language such as "fastest and smoothest" to describe one brand of snowboard. Rewrite: "What brand of snowboard would you buy?" or "What properties of a snowboard do you consider most important?"
   b) Bias: Yes. The bias is assuming that all people drink the three given beverages. Rewrite: "Which drink do you prefer? A Pop, B Coffee/tea, C Root beer, D Other _____ (Please specify.)"
7. Examples:
   a) Influencing factor: The government member may be biased in favour of the current premier. Rewrite: "Who do you think is the best premier in Canadian history?"
   b) Influencing factor: The respondents may be confused by the wording of the question. Rewrite: "What games and systems do you and your friends need?"
8. Examples:
   a) Question 1: "What is your favourite car colour?" Question 2: "What is the most popular car colour on drawings in a grade 9 art class?"
   b) Question 1: "Do you think it is important for family vehicles to have regular oil changes?" Question 2: "How often should family vehicles have an oil change? A Never, B Regularly, C Frequently, D Other _____ (Please specify.)"
9. Examples:
   a) Question: "What music group do you like best?" Whom to ask: Teens aged 13 to 19.
   b) Question: "What is the most important consideration when buying a digital music player?" Whom to ask: Customers shopping for a digital music player.
10. Example: "What is your favourite sport? A Hockey, B Soccer, C Volleyball, D Other _____ (Please specify.)"

11.2 Collecting Data

1. Example:
   - Population: All of the individuals being studied; all of the dogs in an animal shelter
   - Sample: Any group of individuals in a population; all of the mixed-breed dogs in an animal shelter
2. e) voluntary response sample
3. c) stratified sample
4. d) systematic sample
5. a) convenience sample
6. b) random sample
7. a) Population: All students at the school
   Examples:
   - Survey the population: If this is an election, everyone should be invited to vote.
   - Survey a sample: If this is an opinion poll, use a sample to determine the popular candidates.

   b) Population: All players on the lacrosse team.
   Example: Survey the population: Since the team is small in number, survey all team players.

b) experimental probability: 40%; theoretical probability: $33\frac{1}{3}$ %
Sample Assumptions:
- Each candidate has the same chance of winning.
- The sample represents the population of students who will vote in the election.

c) No. If the poll represents the population of voters, then candidate A will win, not candidate C.

8. a) 72.9 **b)** 70 **c)** 75.67

d) Example: Neither of the samples is a close predictor of the overall score. The mean of the first three games is significantly lower than the mean for the overall score. The mean of the last three games is significantly higher than the mean for the overall score.

9. The experimental probability of having blue eyes is 14.75%. This is slightly less than the article's claim for 16.67%, but more than Karen's prediction of 10%. The experimental results are closer to the article's claim.

11.4 Developing and Implementing a Project Plan

The purpose of this section is to assist you in developing and implementing a project plan. Responses will vary according to the research you plan.

11 Chapter Link

1. a) 250 **b)** 95%

c) The theoretical probability is 25%. This assumes that each category of browser has the same chance of being chosen.

d) The theoretical probability of 25% is less than the experimental probability of 27%.

e) Example: Yes. Since a stratified sample of 5000 Canadians was used, the sample appears to represent the population of grade 9 students. Therefore, the result indicating that Internet Explorer is the preferred choice can be generalized to the population.

2. Examples:

a) All grade 9 students in Canada who use the Internet

b) Use a sample. It would be impractical, costly, and time consuming to survey the population.

c)
- Use a random sample by putting all the names of grade 9 students in the school in a box and drawing 50 names.
- Use a systematic sample by selecting every fifth student from a student roster.

d) What is your preferred online activity?
A E-mail/instant messaging, B Browsing, C Downloading and saving music, D Playing games, E Downloading or watching movies/TV, F Other _____ (Please specify.)

11 Vocabulary Link

1. influencing factors
2. stratified sample
3. convenience sample
4. random sample
5. population
6. survey
7. biased sample
8. systematic sample
9. voluntary response sample
10. sample
11. generalize