Algebra 2 Module 1 Foundations of Algebra

Section 1.1 Graphs of Real Numbers

Practice Problems 1.1

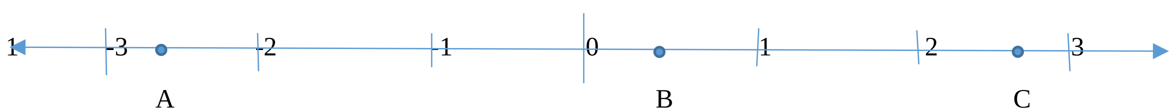
Find the approximate location of each point on the number line.

1. $\sqrt{2}$ $-\sqrt{2}$ -1.5 1.5

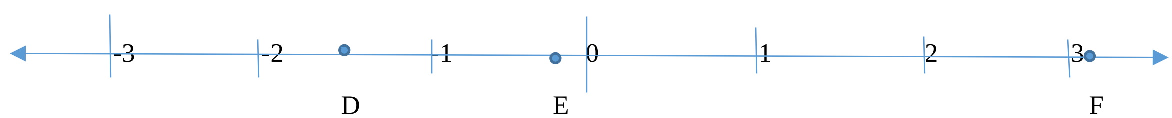
2. 4 3¼ $-\sqrt{3}$ $\frac{0}{4}$

Estimate the coordinate for each point on the number line within 0.5 or ½ units.

3.



4. 0



Simplify each absolute value expression.

5. | 5 – 5 |

6. | 2 – 2.7 |

7. | 27 – 18 |

8. - | 3 – 16 |

9. - | 19 – 7 |

10. | 2 – 6 | + | 6 + (-2) |

11. | 3.1 – 4 | - | 2 – 0 |

List the numbers in order from least to greatest. Write all the numbers as decimal approximations first.

12. $-\frac{3}{4}$ $\sqrt{5}$ -0.8 ½ $\frac{7}{5}$

13. 22 56.8 $\frac{8}{3}$ -14.6 0

List the numbers in order from greatest to least. Write all the numbers as decimal approximations first.

14. -2.3 -5.6 -¼ 2¾ $-\sqrt{3}$

15. $-\frac{1}{8}$ $-\frac{1}{2}$ $\frac{5}{4}$ $-\sqrt{3}$ 2¾

Find the point approximately halfway between the two points given.

16. 12 and -6.3

17. $\frac{1}{3}$ and $\frac{1}{6}$

Find the distance between the two points. Use absolute value.

18. -8 and -15

19. $1\frac{1}{2}$ and $6\frac{3}{4}$

20. The temperature at 9:00 p.m. was - 5°F. By 8:00 a.m. the next day the temperature was - 22°F. How much did the temperature drop in that eleven hours?

Section 1.2 Properties of Real Numbers

Practice Problems 1.2

Simplify each expression.

1. $(14 - 2)\,(2^2 - 1)$

2. $\frac{(14-4)^2}{3(10)-2(4)}$

3. $6^2 + \frac{14}{(20-6)}$

4. $2(3^2)(4)^2 - (2 + 3)(5 - 2)$

5. $(8 - 6)\frac{1}{2} + (8 + 6)\,\frac{1}{2}$

Name the operation that is performed first, then second, and then simplify the expression.

6. $3^2 + \frac{16}{5}$

7. $5^2 - (4 - 2)$

8. $3(5 + 4)$

9. $2(13 - 4(2))$

10. $\frac{7+7}{14}$

Evaluate each expression if $m = 4$ and $n = 2$.

11. $\frac{mn}{8}$

12. $(m + n)\,(m - n)$

13. $\frac{m+n}{m-n}$

14. $22mn$

15. $|m| + |n|$

16. $\frac{|m|}{|n|}$

17. Find the perimeter of the picture from Example 5 and tell how much it would cost to frame a picture if the frame was $1.25 per linear inch.

18. Solve Problem 17 using a formula for perimeter when the length of the picture is known (that would make the width $w = l - 2$). Let the known length be $14\frac{1}{2}$ inches.

19. If a pencil sharpener costs $1.00 more than a pencil, and they cost $2.00 together, how much is the pencil? How much is the sharpener?

20. A picture is 12 inches long by 8 inches wide. The picture will be coated with shellac such that $\frac{1}{2}$ ounce of shellac coats 1 square inch of the picture. If the shellac costs $0.15 per ounce, how much will it cost to cover the entire picture with shellac?

Section 1.3 Adding and Subtracting Real Numbers

Practice Problems 1.3

Perform the operations.

1. - 2.10 + - 6.18
2. - 22 + - 22
3. 18 + - (18)
4. 36 + (- 2)
5. 5 – 8
6. 17 – 10
7. (6 + 8) – 15
8. - 3 – (- 4)
9. - 3 – 4
10. 4 – (- 3)

Fill in the blank to make each statement true.

11. - 5 + ___ = - 7
12. - 2 + ___ = 4
13. - 10 + ___ + 3 = 0
14. (3 – 2 – 4) + (4 – 2 – 3) = ___
15. -3 + ___ + 1 = -8
16. - 2.9 + ___ = - 5.3

17. A plane has 83 passengers. At the first layover, 13 passengers get off to board another plane. Five new passengers get aboard the plane. How many passengers will that plane have on board at this next take-off?

18. A football is on the opposing teams 20-yard line. On the next play, they gain 5 yards. They get a penalty and lose 15 yards on the next play. On what yard line will they have the ball for the third play?

19. A lake is 84 feet deep, and a diver jumps from a cliff 42 feet above the center of the lake, how far must he travel to reach bottom part of the lake?

20. A car depreciates by $2,400.00 according to the blue book price as soon as the new owner drives it off the lot. If the blue book value sale price of the car is $18,600.00, how much did the owner pay for it?

Section 1.4 Multiplying and Dividing Real Numbers

Practice Problems 1.4

Simplify using the properties of real numbers.

1. (4) (- 2) (6) (3)

2. (1.2) (0.4) (- 6)

3. (- h) (- j) (- k)

4. (- h) (- j)

5. (- m) (- n) – mn

6. 5 (3 – 2t)

7. $\frac{-8}{-4} + \frac{-4}{8}$

8. $2\left(\frac{-1}{2}s + \frac{1}{2}t\right)$

9. $6\left(\frac{1}{12}t\right)\left(\frac{-1}{4}\right)(0)(-7t)$

10. $\frac{-1}{4}\left(\frac{-1}{4}m + 2n - 8p\right)$

Answer the questions and support your answer.

11. Is -a always a negative number?

12. Is a^2 always, sometimes, or never equal to $|a^2|$?

13. Can $-(-a)$ ever be negative?

14. Can a^3 ever be positive?

15. Can a^2 ever be negative?

Evaluate each expression when $s = -4$ and $t = 2$.

16. $\frac{s}{t} + (s)(t)$

17. $(s^2)(t^3) + (t^2)(s^3)$

18. $\frac{t-s}{s-t}$

19. $st + t^3$

20. $st - t^3$

Section 1.5 Using Symbols to Think Algebraically

Practice Problems 1.5

Simplify each expression.

1. $(m^4)\,(m^3)\,(m^2)$

2. $(n)^4\,(n^3)\,(m^8)$

3. $\frac{n^8}{n^6}$

4. $\frac{n^6}{n^8}$

5. $\frac{24x^6y^3}{18x^2y^4}$

6. $\frac{5x^4}{10x^3} + \frac{22y^6}{11}$

7. $-\frac{1}{2}(m^3)^4$

8. $(x^2)^3\,(y^3)^2$

9. $2n^8 - 6n^4 + 8n^8 - 3n^4$

10. $-10x^2 + 5y + 3x - 2y^2$

True or False.

11. $\frac{1}{x^2} = \frac{x^4}{x^2}$

12. $\frac{m^3}{m^5} = \frac{m^5}{m^3}$

13. $-10n^2 + 14n^4 = 4n^6$

14. Using the derived formulas for the area of the triangle in Example 2, find the area of the triangle if the height is 12 cm. Check your answer.

Fill in the blanks or identify the property used in each step to prove the Multiplication Property of -1.

15. $-a = -(a \cdot 1)$ ____

16. $-(a \cdot 1) = a$ (___) Multiplication of Opposites Property

17. $a(-1) = (-1)a$ ____

18. $-a = (-1)a$ ____

19. $(-1)a =$ (___) Symmetric Property

20. Write each expression using mathematics symbols. Let the unknown number be *n*.

a) 2.5 less than a number

b) 4.2 more than a number

c) One-tenth of a number

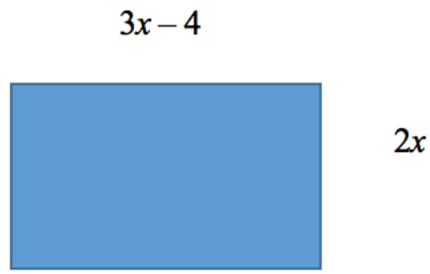
Section 1.6 Solving Equations with One Variable

Practice Problems 1.6

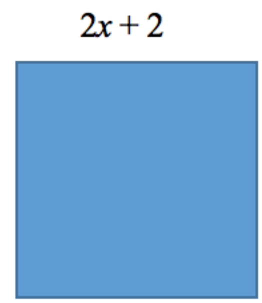
Solve for the unknown variable. Check your answer.

1. $m - 15 = 9$
2. $m + 3.6 = 7.6$
3. $\frac{a}{2.1} = -6.4$
4. $\frac{1}{3}b = -21$
5. $12 = \frac{n}{4} + 2$
6. $-14 = 8 - 4t$
7. $\frac{x-3}{11} = 5$
8. $-5(y - 11) = 50$
9. $\frac{3t}{4} = -21$
10. $-18 = -3 + m + 2m$
11. $-4(y + 3)^2 = -64$
12. $\frac{1}{3}(t + 16) = 41$
13. $2m - 22 = 30$
14. $-5m - 2 = -12$
15. Solve for x in the equation $-\frac{1}{4}(x - 2) = 9$ by first multiplying by - 4 on both sides of the equation. Now solve for x in the equation by first using the distributive property to multiply $-\frac{1}{4}$ by everything in the parenthesis. Did you get the same answer? Which method did you find easier?

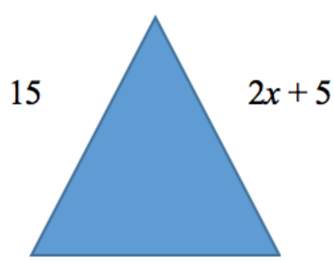
16. The rectangle has a perimeter of 78 inches. Find the length of each side.



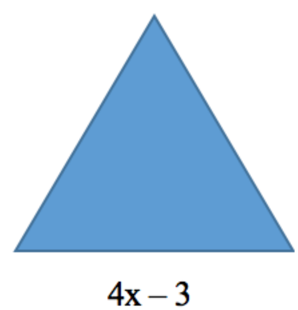
17. The square has a perimeter of 80 inches. Find the area.



18. The triangle is isosceles. Find the value of *x*.



19. The triangle is equilateral. Find perimeter in terms of *x*.



20. Sevelia is cutting potatoes for a Christmas dinner for the community. She can peel two potatoes in a minute. One person eats approximately half a potato. Write a formula for how long it will take her to peel the potatoes if n people attend (let m = minutes). When should she start peeling if they need to begin boiling by 3:15 p.m. to be ready in time and 60 people signed up to attend the dinner?

Section 1.7 Using Equations to Solve Problems

Practice Problems 1.7

Use an algebraic expression to write each word phrase.

1. Eight more than three times a number.

2. Three less than six times a number.

3. The sum of a number less three and the same number plus eight.

4. The product of a number and a third of that number.

5. The quotient of a number and its' square.

Let *w* = women and *m* = men for Problem 6-9. For each problem, write…
a) men in terms of women
b) women in terms of men

6. There are four times as many men as women.

7. There are three less women than men.

8. There are six more men than women.

9. The ratio of men to women is 1:5.

10. Example 2 stated that there are 36 delegates attending a conference. The ratio of men to women must be 3:1 to accommodate housing. How many men and how many women may attend the conference. Let *x* represent men and solve the problem.

11. Jaelyn and J'da meet for lunch and arrive at the restaurant at the same time. Jaelyn left home at 10:00 a.m. and J'da left home at 12:00 p.m. If Jaelyn's time is represented by t, what is J'da's time in terms of t?

12. In Problem 11, if Jaelyn left at 11:00 a.m., and J'da left at 9:00 a.m., what is J'da's time in terms of t?

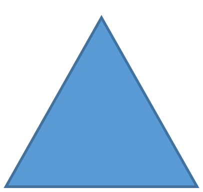
13. In Example 5, the pep club sold student rally tickets for \$3.00 each and thirty-three fewer adult tickets for \$6.00 each. They made \$540.00 for the rally. How many student tickets did they sell? How many adult tickets did they sell? Let a represents adult tickets sold, and s represents the number of student tickets sold, write the number of student tickets sold in terms of adult tickets.

14. Substitute the value for s from Problem 13 in the equation from Example 5 and solve for a.

15. The sum of three consecutive even integers is 42. Let the first even integer be represented by e.
Write an equation to find the three integers and solve the equation for each integer.

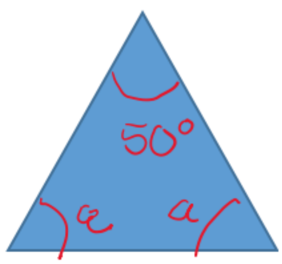
16. A rectangle has a length that is twice three less than the width. Find the length and width if the perimeter is 72 inches.

17. An equilateral triangle has a perimeter of 24 cm. and a height of 3 cm. Find the area of the triangle.



18. A small plane left Loveland airport flying at 100 km/h at 11:00 a.m. and traveled east. Another larger airplane left the same airport at 1:00 p.m. traveling west at 280 km/h. At what time will they be 580 km. apart? Draw a diagram and make a table to solve.

19. The base angles of an isosceles triangle are equal. Find the degree of the base angles in the isosceles triangle.



20. Leonardo de Pisa is famous for the Fibonacci sequence where each number in the sequence is the sum of the previous two numbers. He is also known for the famous rabbit problem. Another problem that he proposed in his book from 1202 is as follows:

If *B* gives *A* seven denars, *A* will have five times as much money as *B*. However, if instead *A* gives *B* five denars, then *B* will have seven times as much money as *A*. How much money does each begin with?

Section 1.8 Solving Inequalities in One Variable

Practice Problems 1.8

True or False.

1. $-3 > -1$

2. $6.1 \leq 6.1$

3. $-4\,(3 + -1) < 16\left(-\frac{1}{4}\right)$

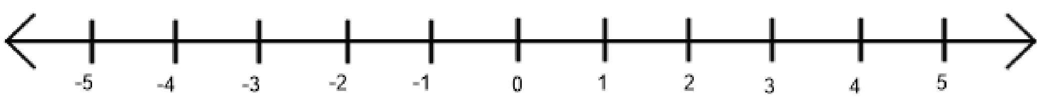
Tell whether each statement is always, sometimes, or never true.

4. $2m \leq 10m$

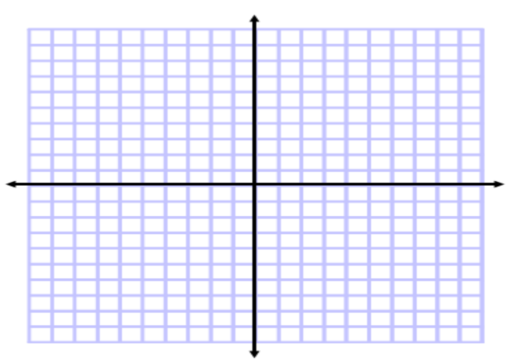
5. $-2 + c \leq -5.1 + c$

6. $\frac{8}{b} > \frac{4}{b}$

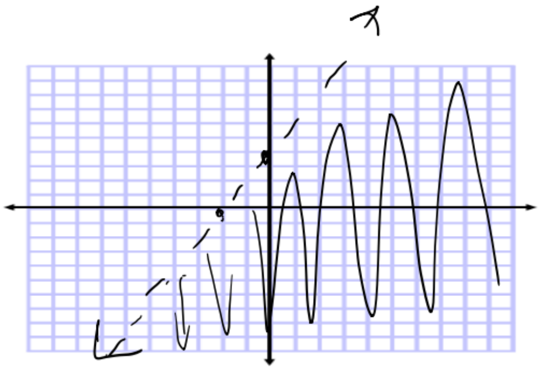
7. Graph the inequality $7 + y > 2(3 + 2y)$ on the number line.



8. Graph the inequality $7 + y > 2(3 + 2y)$ on the coordinate plane.

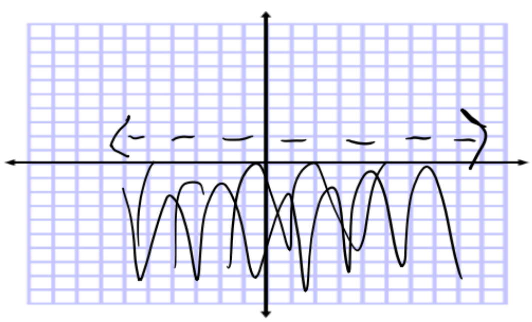


9. The dashed line on the graph is the line $y = 3x + 4$. Write an inequality to represent the shaded region.



10. Graph one point in the solution set of Problem 9 and show that it satisfies the inequality.

11. Is the point (2, -3) a solution of the linear inequality shown?



12. Is the point (4, 4) a solution of the inequality $y > -5x + 8$?

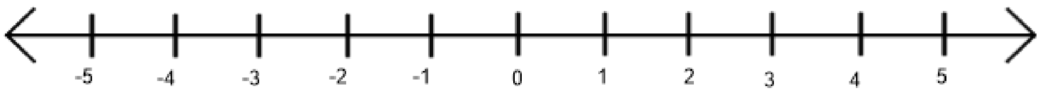
Solve each inequality.

13. $16 + (m - 2) \leq 3m + 8$

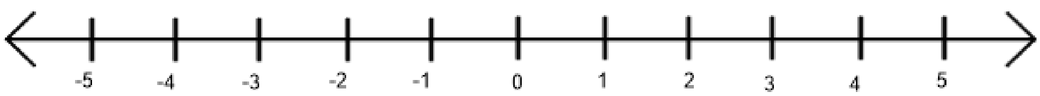
14. $-3(t + 4) > 12$

Solve each inequality and graph the solution on the number line.

15. $-3m + 2(-8) \geq -19$

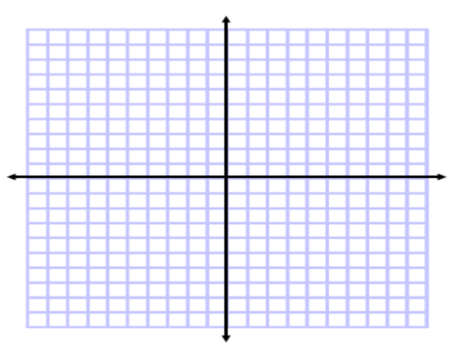


16. $8c + 2c < -5$

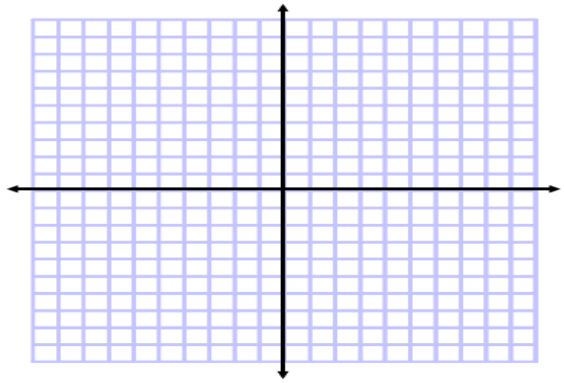


Solve each inequality and graph the solution on the coordinate plane.

17. $2(x + 3) < -2(x - 3)$



18. $-y > 2(y - 9)$



19. A village in Haiti must make at least \$90 to buy livestock for their farmers. The women make jewelry from cardboard boxes. They will sell bracelets for \$8.00 each. How many must they sell in order to buy livestock?

20. Joanna has \$32.00 to buy chocolate covered peanuts for Fred for his birthday. They cost \$5.99 a pound. At most, how many pounds can she buy?

Section 1.9 Solving Inequalities in Two Variables
Practice Problems 1.9

Write inequalities for the following situations and solve the inequality.

1. Buffy usually jogs 8 miles a day, but she ran less than 6 miles today because she lost a quarter of a mile every time a dog chased her. About how many times did the dogs chase her?

2. Shane eats at most 3,450 calories a day. Today he just drank protein drinks, which are 650 calories each, and ate one large meal of 1,200 calories. What is the maximum number of protein drinks Shane could have drank?

For Problem 3-6, write inequalities for the situations.

3. Each employee may spend \$5.00 or less on a white elephant gift. (Let c = cost of gift.)

4. The frigid weekly temperatures are 12° and below. (Let t = termperature.)

5. Each athlete may have drinks with fewer than 60 calories. (Let c = calories of drink.)

6. Erin drinks at least six 8-oz. glasses of water daily. (Let g = glasses of water.)

Solve the inequalities for y in terms of x.

7. $2x - 3y \leq 21$

8. $5.1x + y \geq 3.2$

9. $2(x - 1) + 3(y + 8) < 6$

10. $x > - 2y + 4$

Using the coordinates (-1, 3) for (x, y), fill in the blanks for each equation or inequatlity (use =, <, or >).

11. $y \bigcirc x + 8$

12. $y \bigcirc - 2x$

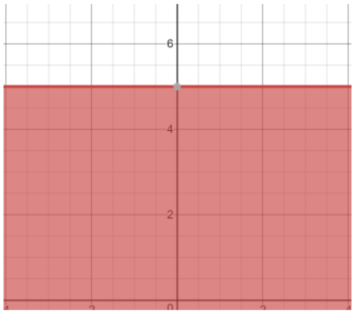
13. $y \bigcirc - 3x + 3$

14. Which ordered pair is a solution for $4x + 2y < 6$?

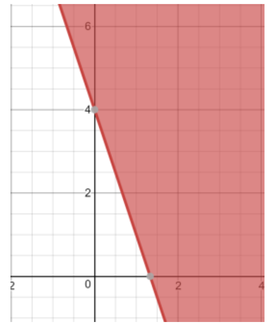
a) (0, 5) b) (- 2, 7) c) (1, - 2) d) (1, 1)

Write an inequality for each graph.

15.

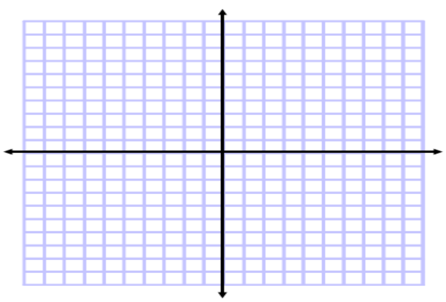


16.

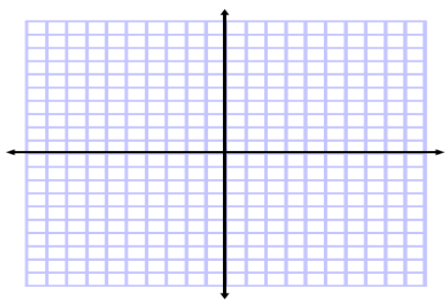


Graph the inequalities on the coordiante plane.

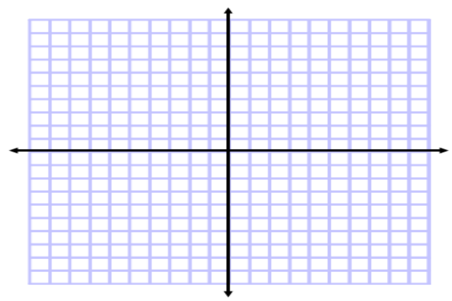
17. $y < -\frac{1}{2}x + 3$



18. $6x + 3y \geq -9$



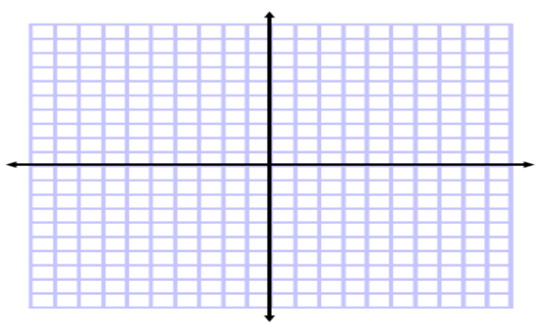
19. $20x + 20y \leq -20$



20. A teacher gives a test with true-false questions that are worth 2 points each, and multiple choice questions worth three points each. The test is worth less than 64 points.

a) Let t = true or false questions and let m = multiple choice questions. Write an inequality representing the total possible point combinations.

b) Draw the graph of the inequality with t on the x-axis and m on the y-axis.

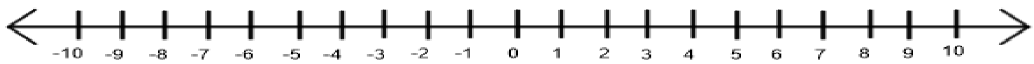


c) List at least three combinations of questions that would work on the test.

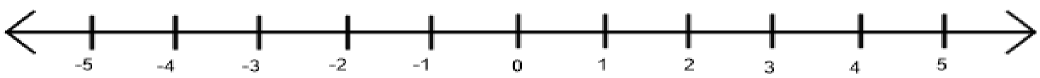
d) Why don't the values in Quadrants II, III and IV make sense?

Section 1.10 Solving Conjunctions, Disjunctions and Absolute Value Inequalities
Practice Problems 1.10

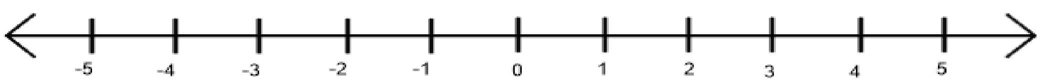
1. Write $m \leq -6$ as a disjunction using the word "or." Graph it on the number line.



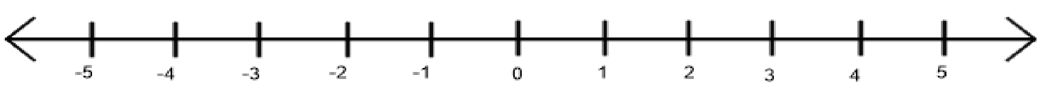
2. Graph the disjunction $p > -1$ or $p < 2$. What is the solution set? Use the number line to help you find the solution set.



3. Graph the conjunction $p > -1$ and $p > 2$. What is the solution set? Use the number line to help you find the solution set.

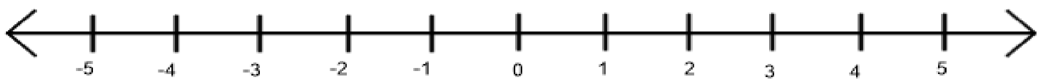


4. Graph the conjunction $-6t < -18$ and $3t + 9 \leq 3$. What is the solution set? Use the number line to help you find the solution set.

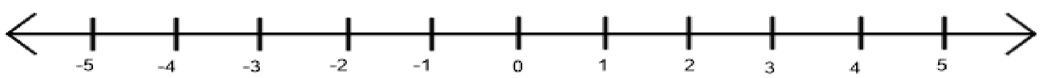


For Problem 5-8 graph the solution set of the inequalities on the number line.

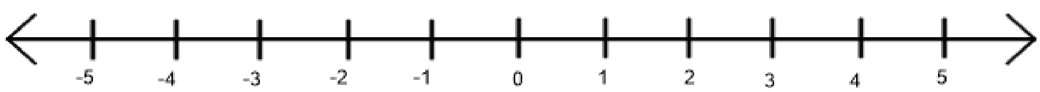
5. $-1 \leq w < 3.5$



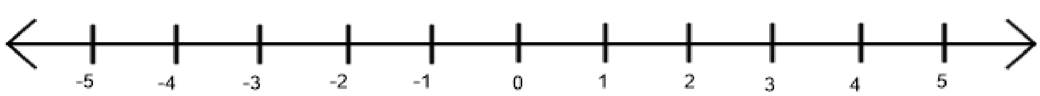
6. $p > 2\frac{1}{2}$ or $p < -2.25$



7. $4 > t + 1 > -2$



8. $2m + 1 < 5$ or $-4 + m > 1$



For Problem 9-12 set up an inequality to find each solution.

9. Libby passes six tolls on the way to college in Chicago. Each one costs about \$1.50. She can buy an annual pass for \$65.00 and not pay a toll fee. She has to make the trip 5 times her freshman year (there and back). Would a pass save her money?

10. A trip to New Zealand is \$2,500.00 for each student if at least ten students attend. For every student over ten, the trip costs \$250.00 less. How many students must attend to make the trip less than \$1,000.00 per student?

11. Allysa scored 46 points on a quiz. Her previous quiz was 6 points higher than the one before. She averaged an A on all three quizzes. An A on a quiz is from 45 to 50 points. What score did her first quiz fall between for this to happen?

12. Three consecutive odd numbers have sums between 15 and 35. What are the possible numbers?

For Problem 13-15 find the solutions for the absolute value equations.

13. $| 5m - 4 | = 21$

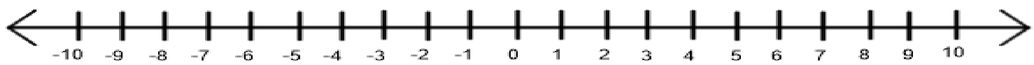
14. $| n - 2 | = 17$

15. $| 2p - 6 | = 0$

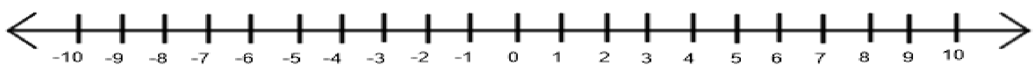
16. How many solutions are there in Problem 13-15 and why?

For Problem 17-19 solve the absolute value inequalities and graph them on the number line.

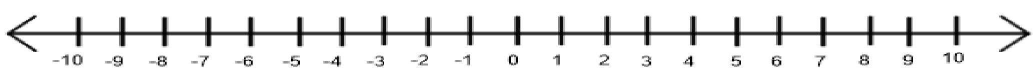
17. $| w + 4 | \geq 10$



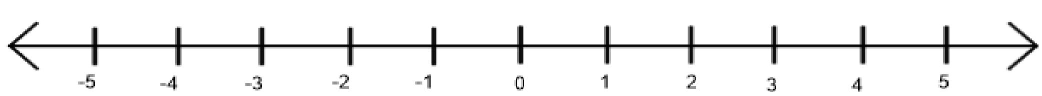
18. $| t - 4 | \leq 7$



19. $| 2\, m - 3 | \geq 10$



20. Find the solutions of the inequality $-5\,| t | - 3 \leq 7$. Isolate the variable t in the absolute value first. Graph the solutions.



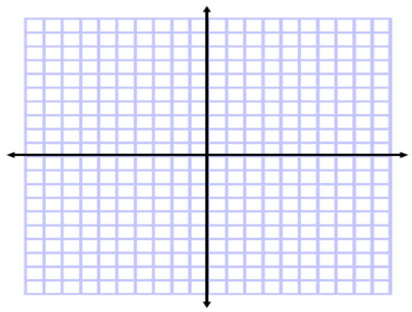
Section 1.11 Solving Systems of Equations Using Graphs

Practice Problems 1.11

1. Use the graph to see if (2, 3) is a point that satisfies both equations.

   $y = -2x + 7$

   $y = 3$

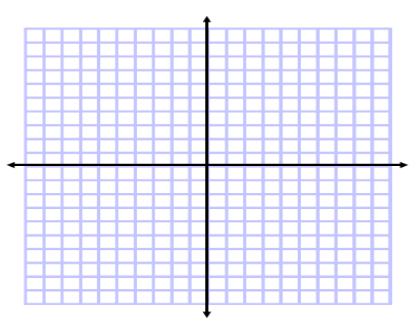


2. Find another method other than graphing to determine if the point (2, 3) is the intersection of the equations in Problem 1.

3. If you add 10 to a number you get the same sum as if you quadruple the number and add 7, what is the number and what is the sum? Use the variable n to represent the number.

4. Let n be the number in Problem 3, and let s be the sum. Write two equations to represent the two sums in Problem 3.

5. Solve the system of equations for Problem 3 using the graph to find n and s. Put n on the x-axis and s on the y-axis. Are these the same answers you got in Problem 3?



6. Bonnie puts $11.00 in a bank account and adds $5.00 each week. Jerrie puts $20.00 in a bank account and adds $2.00 each week. When will they have the same amount of money? Let t = total amount of money and w = weeks. Graph w on the x-axis and t on the y-axis. Find (w, t) at the point of intersection.

Without drawing a graph, decide whether each system of equations has one solution, no solutions, or infinite solutions.

7. $2x + y = -8$

$4x + 2y = -8$

8. $x - 3y = 3$

$3x - 9y = 9$

9. $y = -5x$

$5x + 2y = 4$

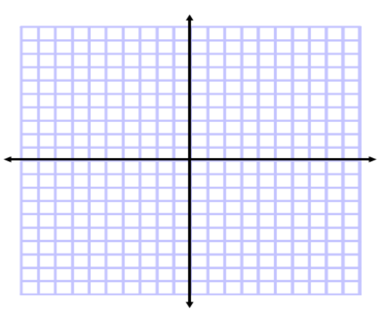
10. If $a < b$ in the system of equations $y = ax + 7$ and $y = bx - 9$, is there one solution, no solutions, or infinite solutions? Explain your reasoning.

11. If $a \geq b$ in the system of equations $y = ax - 2$ and $y = bx + 4.2$, does the system have one solution always, sometimes, or never? Explaing your reasoning.

Solve the following problems by graphing and check the solutions.

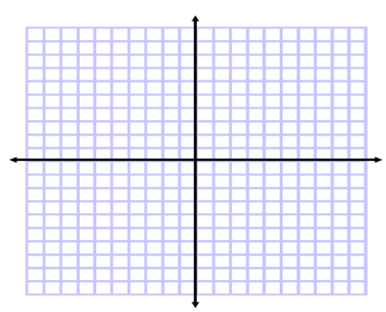
12. $y = x - 7$

$2x + y = 5$



13. $3x + 6y = -6$

$4x + y = -8$



14. Kiana wanted to graph the inequality so she solved for *y* in terms of *x*. Dion said she made a mistake. What is the mistake?

$5x + 10y \geq 20$

$5x + y \geq 2$

$y \geq -5x + 2$

15. Dion showed Kiana how to write the inequality with *y* in terms of *x*. His work is shown below. He made a mistake as well. What is the mistake?

$$5x + 10y \geq 20$$

$$10y \geq -5x + 20$$

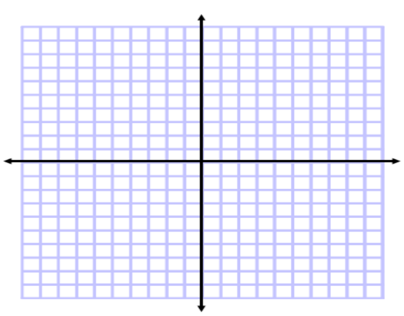
$$\left(\frac{1}{10}\right) 10y \geq \left(\frac{1}{10}\right)(-5x) + 20$$

$$y \geq \frac{1}{2}x + 20$$

Solve the system of inequalities. Darken in the double shade to show the solution set.

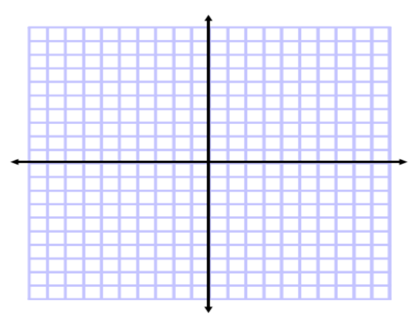
16. $x + y \geq 5$

$y \leq x + 2$



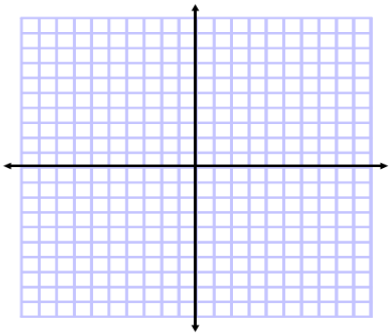
17. $x > 4$

$y \leq x + 2$



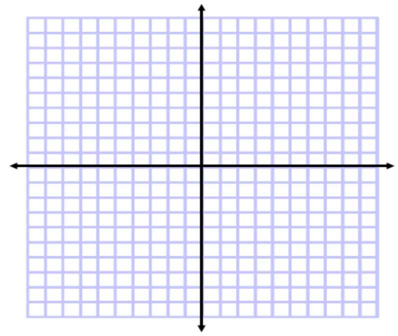
18. $y < 3 + 3x$

$y > 3 + 3x$



19. $2x - y > 3$

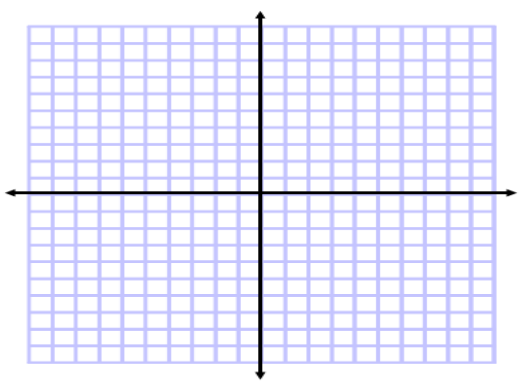
$y < 5x + 1$



20. Optimization problems are when you try to find a feasible region that will maximize area, volume, sales, or profits. Sometimes the feasible region also shows boundaries, constraints (what is not profitable, for example), and possiblities.

This problem will demonstrate possible point combinations in a basketball game. Each player scores one point for free throws and two points for a basket. These are intramural teams that eliminated the three point shot in their rules.

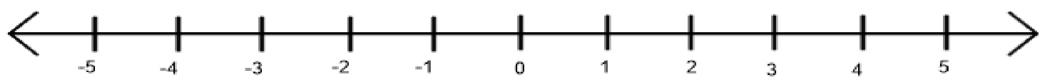
The basketball team scored less than 78 points in each game all season, but never scored less than 42 points in one game. Graph the inequality for the point combinations during the basketball season. Let b = 2 point baskets and t = 1 point free throws. Graph t on the x-axis and b on the y-axis. Name two possible point combinations in terms of (t, b). Is it possible the team scored only 12 baskets and 8 free throws in one game?



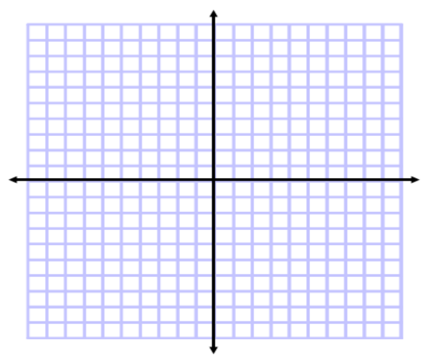
Section 1.12 Solving Systems of Equations Using Substitution

Practice Problems 1.12

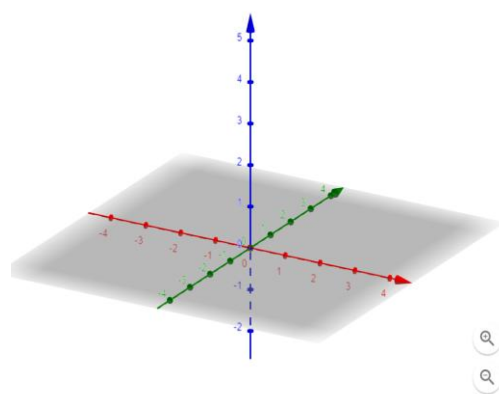
1. Place the point $x = -4$ on the number line. The number line represents ____________ dimension(s).



2. Place the coordinate pair (- 3, 2) on the coordinate plane. The coordinate plane represents ___________ dimension(s).

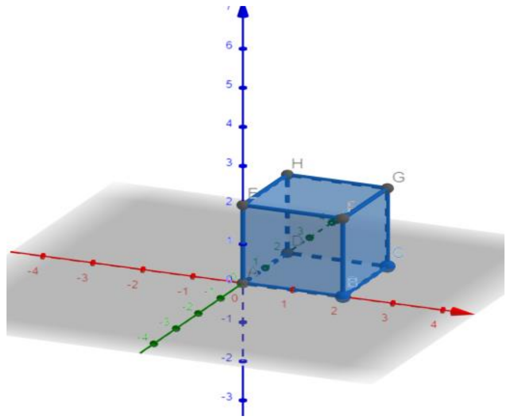


3. The coordinate triple (x, y, z) can be represented on the x-y-z plane. A positive z coordinate is above the x-y plane. A negative z coordinate is below the x-y plane. Mark Point A (- 2, - 3, 4) on the coordinate plane. Move left two spaces on the x-axis (red). Move forward three spaces on the y-axis (green). Move up four spaces on the z-axis (blue). The ordered triple represents ____________ dimension(s).



4. What color represents the x-y plane in the three-dimensional coordinate plane?

Use the three-dimensional cube in the figure below to answer Problem 5-10.



5. How many spaces and in which direction do you first move on the *x*-axis to get to Point B? ____ __________

6. How many spaces do you move on the *y*-axis to get to Point B? ____________

7. How many spaces do you move on the *z*-axis to get to Point B? ____________

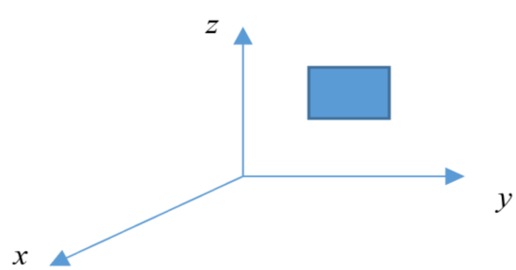
8. What is the ordered triple for Point B? ____________

9. What point is the ordered triple (0, 2, 2)? _____________

10. Which point other than A is on the *z*-axis? _____________.

11. Two lines intersect in a point, but two planes intersect in a _____________.

Looking at the corner of a room, you can see the *x*-*y*-*z* plane. Two walls and the floor form the three planes. Use the model to answer Problem 12-14.

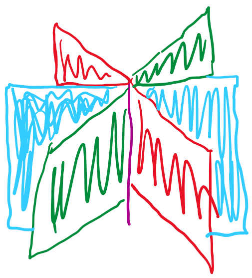


12. Is the floor on the x-y, y-z, or x-z plane? ___________

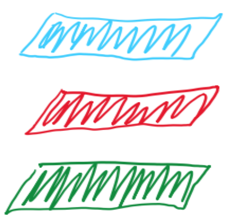
13. What is the plane where the window is located? ___________

14. The three planes in the model intersect in a point. What is the ordered triple for the point? __________

15. When three planes meet in one line, how many solutions are there? _______________



16. The graph of an equation with three variables is an equation of the form Ax + By + Cz = D where A, B, and C are not all zero. If the graphs of the three equations of a three-variable system are parallel, how many solutions are there?

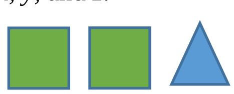


17. Use substitution to find the intersection point of the system of equations. Check the solutions.

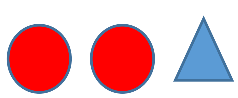
$x + 3y = 9$

$2x - y = 4$

18. Use the drawing to find the values of x, y, and z.

$2x + z = 46$  = 46

$3z = 18$  = 18

$2y + z = 40$  = 40

19. Use substitution to find the values of x, y, and z.

$2x + 2y = 50$

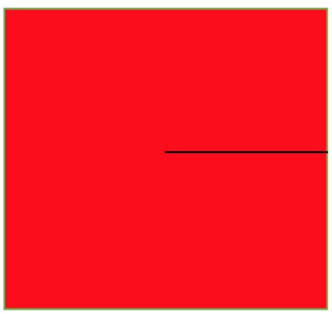
$2x + y = 42$

$y + 2z = 18$

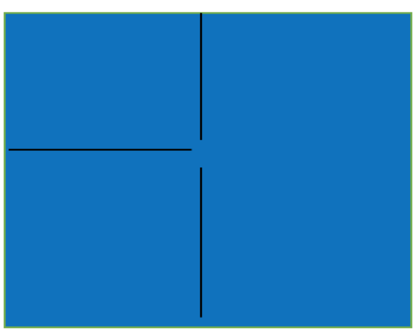
20. Follow the instructions given to build a 3-dimensional plane. You will need white cardboard and scissors.

First cut out three pieces of white 8" by 8" cardboard and color one red on the front and the back, color the second one blue on the front and back, and color the third one green on the front and back.

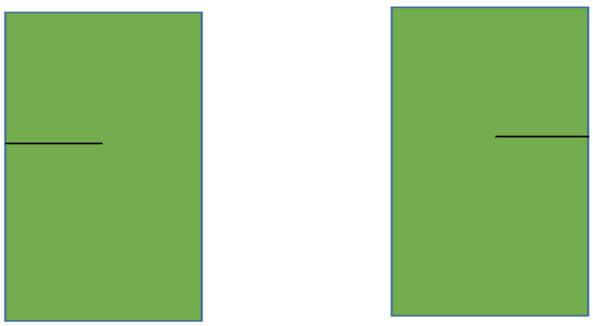
a. On the red piece of cardboard, cut out a ¼ " slot on the middle of the right side so that it extends close to the center of the cardboard.



b. On the blue piece of cardboard, cut out a ¼ " slot on the middle of the left side so that it extends close to the center of the cardboard. Do the same on the upper and lower sides.



c. Cut the green piece of cardboard in two from top to bottom. Cut out a ¼ " slot on the middle of the left side so that it extends close to the center of the half piece. Do the same on the right side of the other piece.



Construction

Step 1

Stand the red piece perpendicular to a table with the cut-out slot facing the right.

Step 2

Hold the blue piece perpendicular to the red piece and parallel to the table. Insert the slot on the left side of the blue piece into the slot on the right side of the red piece so that they interlock.

Step 3

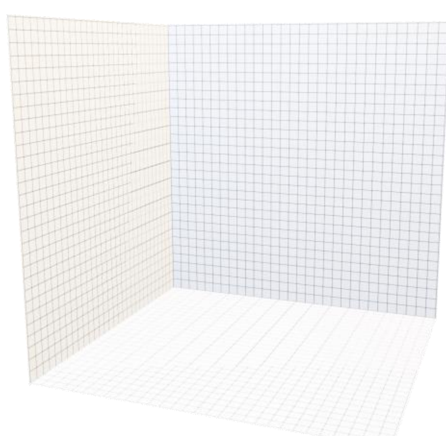
Insert the cut-out slot on the left side of the green piece into one cut-out slot on the blue piece.

Step 4

Insert the cut-out slot on the right side of the green piece into the remaining cut-out slot of the blue piece.

When finished, you will have a model of the three-dimensional plane to reference in future mathematics courses.

There will be eight quadrants and one quadrant of your model will look like a corner of a room. The walls of your model and the floor will be green, blue and red.



Section 1.13 Solving Systems of Equations Using Elimination

Practice Problems 1.13

Use the system of equations to answer Problem 1-4.

Equation 1: $x - y - 2z = 8$
Equation 2: $-x + 2y + z = 2$
Equation 3: $-x + y - 3z = 22$

1. Add Equation 1 and Equation 3 and solve for z.

2. Add Equation 1 and Equation 2 and solve for y in terms of z.

3. Substitute the value for z in the new equation derived in Problem 2 and solve for y.

4. Now substitute the numerical values for y and z in any of the three equations above and solve for x.

5. The girls' basketball team paid \$5 each for a pair of socks last year and \$13 for a pair of shorts for a total purchase of \$216. This year the socks cost \$6 each and the shorts cost \$15 each. The total purchase this year was \$252. How many socks and shorts did the team purchase?

6. To furnish a computer lab, a school spent \$3,200.00 on tables and chairs. Each table cost \$400 and each chair costs \$50. Each lab table has 8 chairs around it. How many tables and how many chairs will the school buy for the lab?

The student council at a school sells tickets to the school play. Adult tickets are \$15 each and student tickets are \$10 each. They want to make at least \$3,500.00 in profit. The auditorium seats 300 people. Use this information to answer Problem 7-10.

7. Two inequalities that represent constraints are $a \geq 0$ and $s \geq 0$ (let a = adults and s = students). Write two more inequalities that satisfy the conditions of the ticket sales (number of tickets and cost of tickets).

8. What is the number of adult and student ticket sales that will maximize profit?

9. If 120 adult tickets and 80 student tickets are sold, will the constraints be satisfied?

10. Is it easier to use elimination or substitution to find x, y, and z in the system of equations. Explain why and then solve the system using the chosen method.

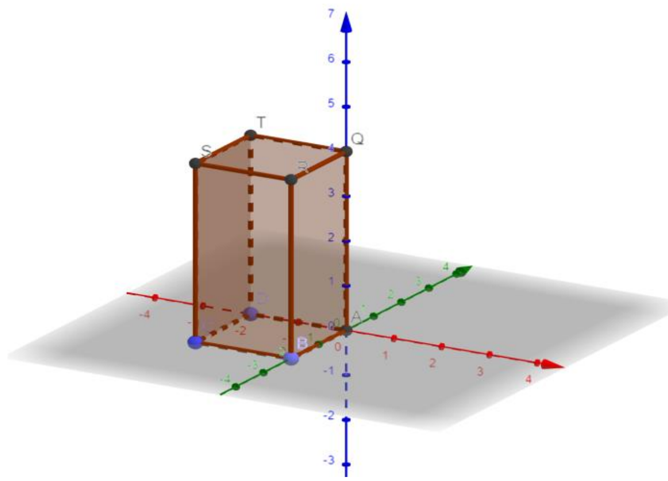
$$x + 2y = 48$$
$$y + 3z = 43$$
$$3z = 27$$

Use elimination to solve the system of equations in Problem 11 and 12. Find the solution for x, y, and z for all three equations.

11.
$$\begin{aligned} x \quad\quad + z &= 8 \\ x + y + z &= 5 \\ -3y + 2z &= 5 \end{aligned}$$

12.
$$\begin{aligned} x + y - 2z &= 4 \\ -x + y + 3z &= 2 \\ z &= -2 \end{aligned}$$

Use the rectangular prism in the three-dimensional plane to answer Problem 13-20 and find the length of the diagonal CQ.



13. Draw a diagonal from C to Q. It is not on the face of the rectangular prism but connects vertices on opposite faces. This length must be found indirectly. The triangle formed is triangle CQA. Two of the sides are unknown. Which of the three sides has a known length? What is the length?

14. Since CA is not known, we cannot use the Pythagorean Theorem to find CQ. In order to use the theorem, you need to know the lengths of __________ sides of a ___________ triangle.

15. We can use the Pythagorean Theorem to find the length of side CA, which is the hypotenuse of the two triangles in the base of the prism. Name the two triangles that share the base of triangle CQA.

16. One triangle in the base looks acute and one looks obtuse. How do we know that the two triangles are right triangles?

17. What is the length of the side AB? What is the length of the side BC?

18. What other side of the base has the same length as side AB? What other side of the base has the same length as side BC?

19. Use the Pythagorean Theorem to find the length of the diagonal CA.

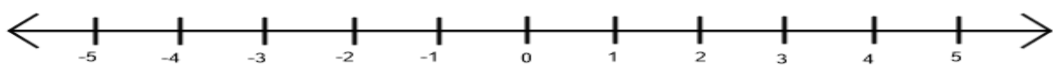
20. Now that you know the length of the legs of Triangle CQA (namely AQ and now CA), use this information with the Pythagorean Theorem to find the length of the diagonal CQ. Name another diagonal that has that same length.

Section 1.14 Module Review

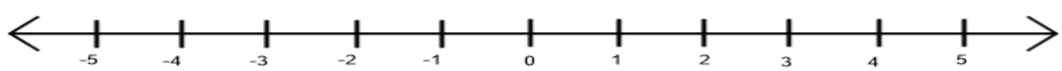
Find the approximate location of each number on the number line.

1. -0.2 0.1 $\frac{7}{10}$ $\sqrt{5}$

2. $-\frac{1}{4}$ -2.8 $\sqrt{3}$ $\frac{0}{3}$



3. 2.4 $3.\overline{6}$ $-\frac{1}{3}$ $-1\frac{3}{4}$



Choose the correct answer for Problem 4-6.

4. Which letter is not in the set of rational numbers?

   A) $\frac{1}{2}$ B) $3.\overline{6}$ C) -0.4 D) - $\frac{7}{0}$

5. Which is the simplified form of |-9| - 2|13 - 19|?

   A) - 7 B) - 21 C) 3 D) - 3

6. Which is the point halfway between - 2 and - 3.1?

   A) - 1.1 B) - 0.55 C) - 2.55 D) 2.55

7. Evaluate $\frac{(3a)(-2b)}{a^2}$ when a = 4 and b = -1.

Simplify each expression.

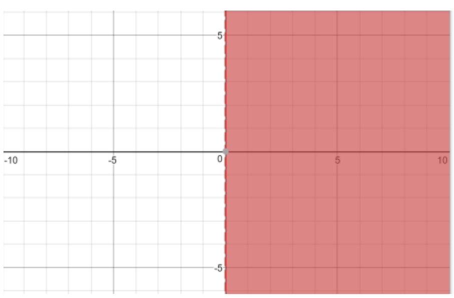
8. The product of 4 more than a number and 3 less than the same number.

9. The sum of one-third of a number and quadruple the number.

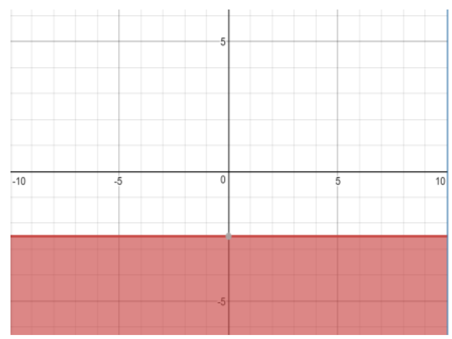
10. Solve for s in the equation $\frac{s^3 + 2}{5} + \frac{4}{5} = 1$.

Write an inequality to represent the shaded region.

11.

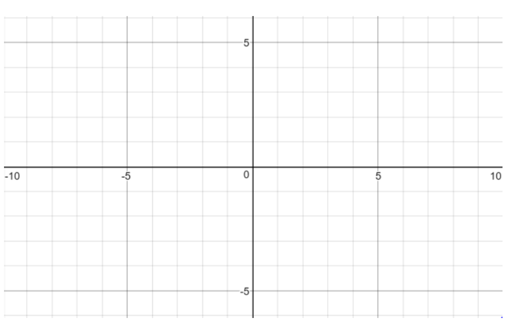


12.

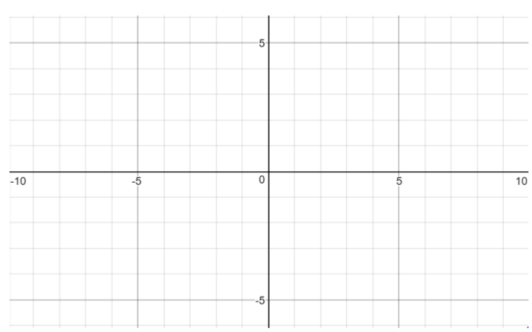


Double shade the region that is a solution to the system of inequalities.

13. $y \leq -x + \frac{3}{2}$
$y > x + 0.5$

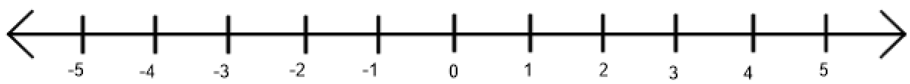


14. $x + 2y < -8$
$2x + y > -4$

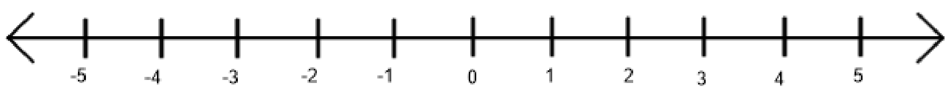


Solve the conjunctions or disjunctions and graph the solution on the number line.

15. $-1 \leq \frac{-2q+3}{7}$ or $q - 5 \leq -3$

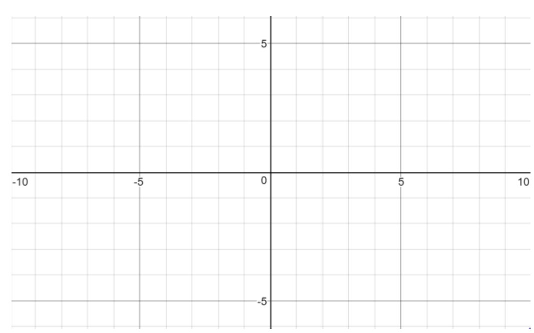


16. $-2(n+5) \geq -16$ and $\frac{n}{5} + 12 \leq 13$



17. Use a graph to find the solution of the two systems of equations. Find the point (x, y) that is a solution of both equations.

$2x - 3y = 5$ $6x - 9y = -15$



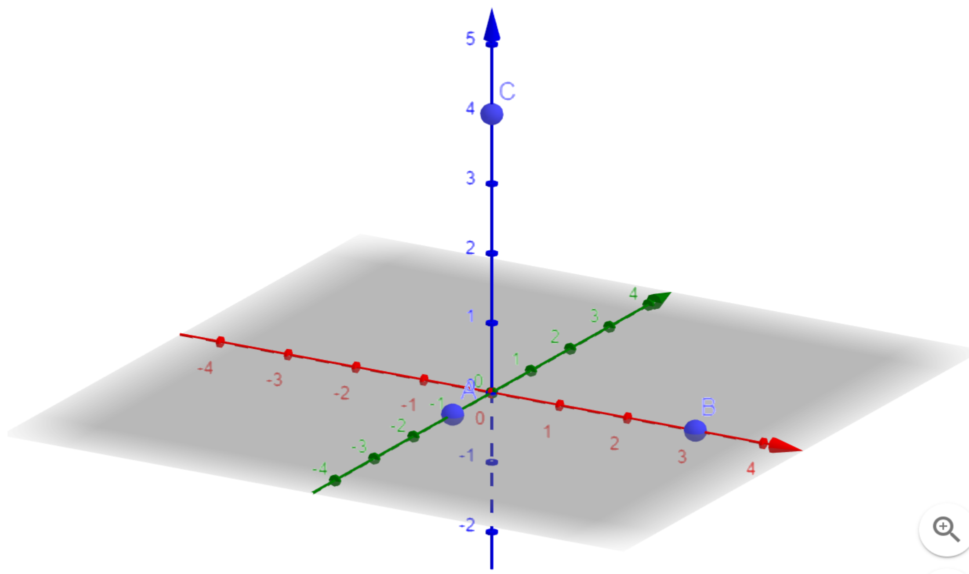
18. Use the substitution and elimination method to solve the system of three equations. Find (x, y, z) that is a solution to all three equations.

$x - 2y + z = 7$

$3x + y - z = 2$

$y = -1$

19. Find the ordered triple for Point A____________, Point B______________, and Point C________________.

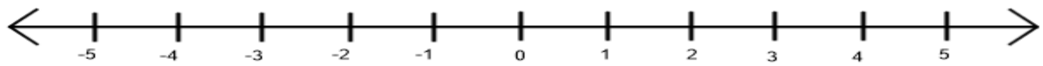


20. Connect Point A to Point B. Connect Point B to Point C. Connect Point C to Point A. Find AB_______________, BC___________________, and CA________________.

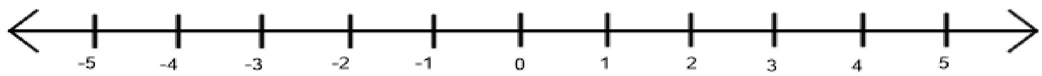
<u>Section 1.15 Module Test</u>

Find the approximate location of each number on the number line.

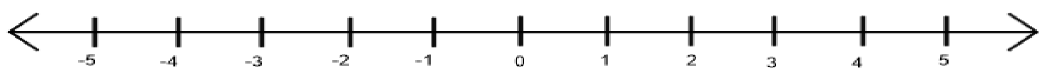
1. $-1.\bar{1}$ $1.\bar{1}$ $2\sqrt{2}$ $-\frac{1}{5}$



2. $-\frac{1}{8}$ $2\frac{1}{8}$ $\sqrt{4}$ $\frac{1}{4}$



3. 0.3 - 0.4 $\frac{1}{2}$ $\sqrt{7}$



Choose the correct answer for Problem 4-6.

4. Which of the following numbers is irrational?

A) $-1.\bar{1}$ B) $1.\bar{1}$ C) $2\sqrt{2}$ D) $-2\frac{1}{4}$

5. Which is the simplified form of - |3 - 2| - |2 - 3|· 4?

A) -5 B) -3 C) 5 D) 3

6. Which is the distance between -7 and -13.2 on the number line?

A) 2.3 B) - 2.3 C) 20.2 D) 6.2

7. Evaluate $(a)(b) + a^2b - ab^2$ when a = - 3 and b = 5.

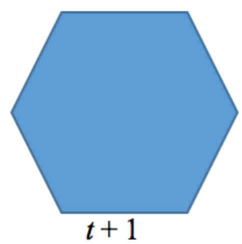
Simplify each expression.

8. The total amount of money in savings when twice as much is deposited as is already there.

9. The quotient of 3 times a number and 11 more than the same number.

10. Solve for t in the equation $4(t + 2)^2 = (t + 2)20$.

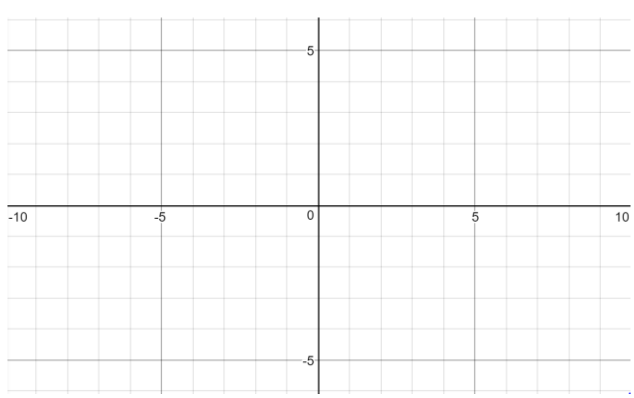
11. Solve for t in the hexagonal window. The perimeter of the window is 54."



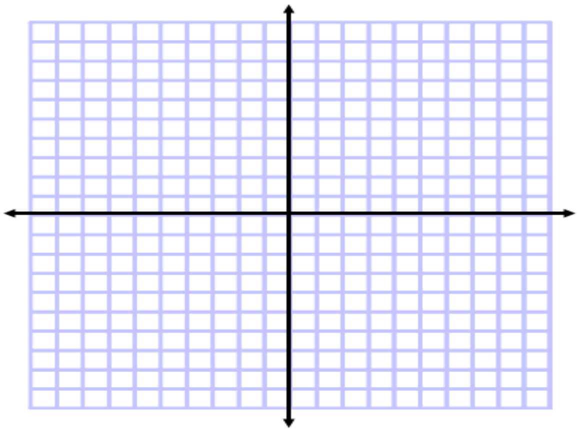
12. Graph the inequalities on the coordinate plane.

$x \leq -2.5$

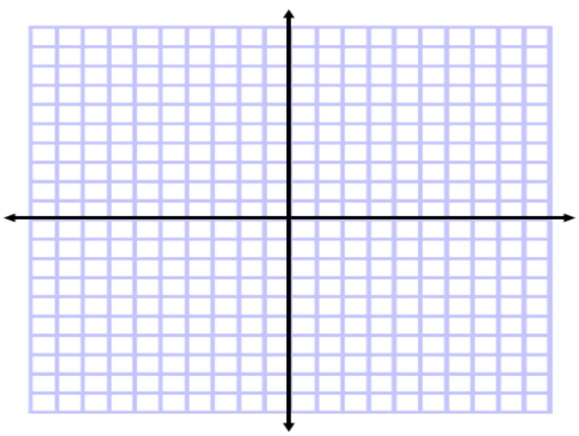
$y > 0$



13. Candy is going to sell candy samples to promote a new business. She has enough chocolate to make at least 125 bite size pieces. She has enough caramel to make at least 175 bite size pieces. She must sell at least 100 pieces of candy to cover her costs. Set up a system of inequalities and shade the feasible region that shows the combination of candies possible to meet the constraints.

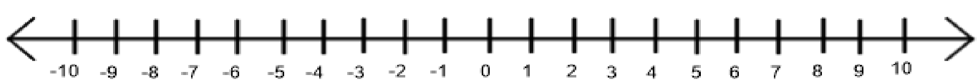


14. If Candy sells chocolates for \$0.25 each and caramels for \$0.15 each, show the feasible region of all possible combinations that will allow her to make at least \$40.00 to cover her costs. Write the inequalities firstly, and then graph them.

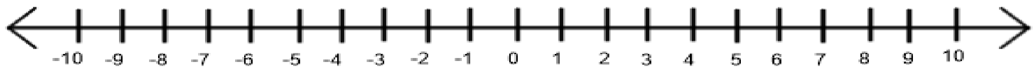


Solve the conjunctions or disjunctions and graph them on the number line.

15. $-4t \leq 16$ and $2t + 3 \geq 21$



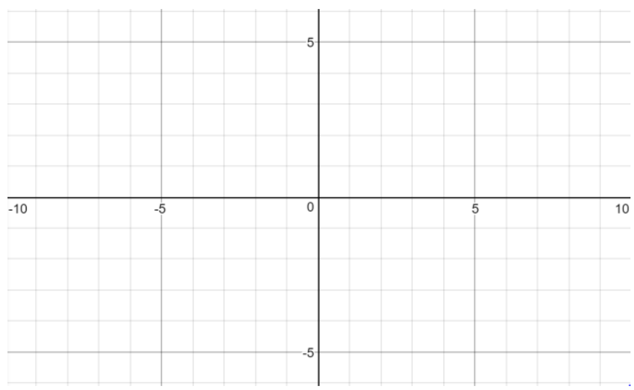
16. $-7(m-1) < 14$ or $-\frac{m}{3} - 4 \geq -7$



17. Use a graph to find the solution of the two systems of equations. Find the point (x, y) that is a solution to both equations.

$x + 4y = 1$

$3x - y = -10$



18. Use the substitution and elimination method to solve the system of three equations. Find (x, y, z) that is a solution to all three equations.

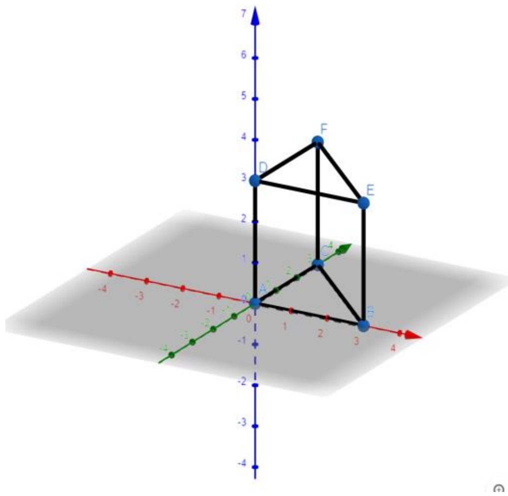
$x + y + 2z = 11$

$x - 2y - 3z = 2$

$x + z = 6$

(Hint: To start, multiply everything in the first equation by 2 firstly, and then add it to the second equation to eliminate y. In the third equation, solve x in terms of z, or z in terms of x.)

Use the triangular prism to answer Problem 19-20.



19. The coordinate for Point F is (0, 3, 3). Find the ordered triples for the other vertices of the triangular prism.

a) Point A

b) Point B

c) Point C

d) Point D

e) Point E

20. What is the length of the diagonal line from Point D to Point C?