

Homework Helpers

Grade 5

Module 6



G5-M6-Lesson 1

1. Answer the following questions using number line P , below.

The origin is always zero.

- a. What is the coordinate, or the distance from the origin, of the  ?

20

The coordinate tells the distance from the zero to the shape on the number line.

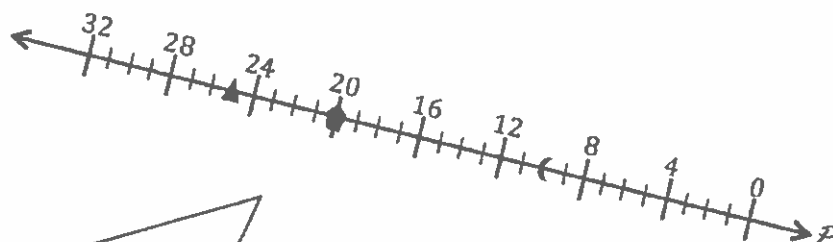
- b. What is the coordinate of  ?

25

- c. What is the coordinate at the midpoint between  and  ?

15

The distance from the moon to the pentagon is 10 units, so the midpoint will be 5 units from each shape.



This number line increases from right to left. Number lines can go in any direction.

2. Use the number line to answer the questions.

- a. Plot P so its distance is $\frac{2}{10}$ from the origin.

- b. Plot Q 12 tenths farther from the origin than point P .

- c. Plot R so its distance is 1 closer to the origin than point Q .

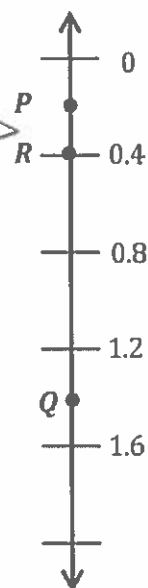
- d. What is the distance from P to R ?

The distance from P to R is 0.2.

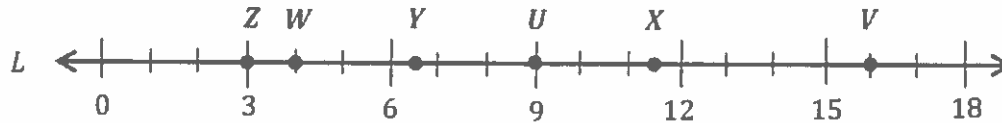
I can think of 1 as 10 tenths.

The first tick mark is 0, and the second is 0.4. The distance between tick marks is 0.4, or $\frac{4}{10}$.

12 tenths more than 2 tenths is 14 tenths, or 1.4.



3. Number line L shows 18 units. Use number line L , below, to answer the questions.



- a. Plot a point at 3. Label it Z .

- b. Label point Y at point $6\frac{1}{2}$.

The units are one, and they are indicated by the tick marks on the number line.

- c. Plot a point X that is 5 units farther from zero than point Y .

"Closer to the origin" means I have to move to the left along this number line.

- d. Plot W $\frac{5}{2}$ closer to the origin than point Y . What is the coordinate of point W ?

The coordinate of point W is 4.

- e. What is the coordinate of the point that is 4.5 units farther from the origin than point X ? Label this point V .

The coordinate of point V is 16.

$$11\frac{1}{2} + 4\frac{1}{2} = 16$$

- f. Label point U midway between point Y and point X . What is the coordinate of this point?

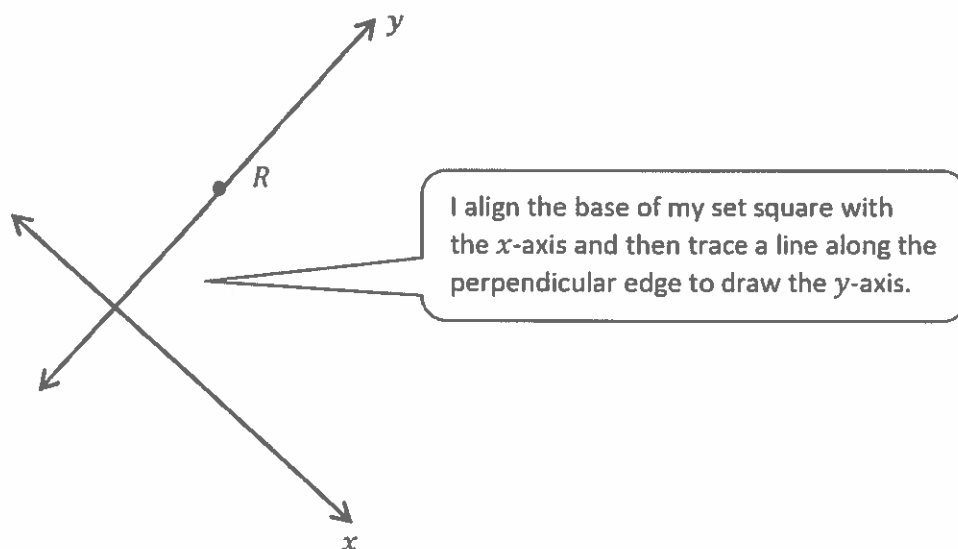
The coordinate midway between points Y and X is 9.

4. A pirate buried stolen treasure in a vacant lot. He made a note that he buried the treasure 15 feet from the only tree on the lot. Later he could not find the treasure. What did he do wrong?

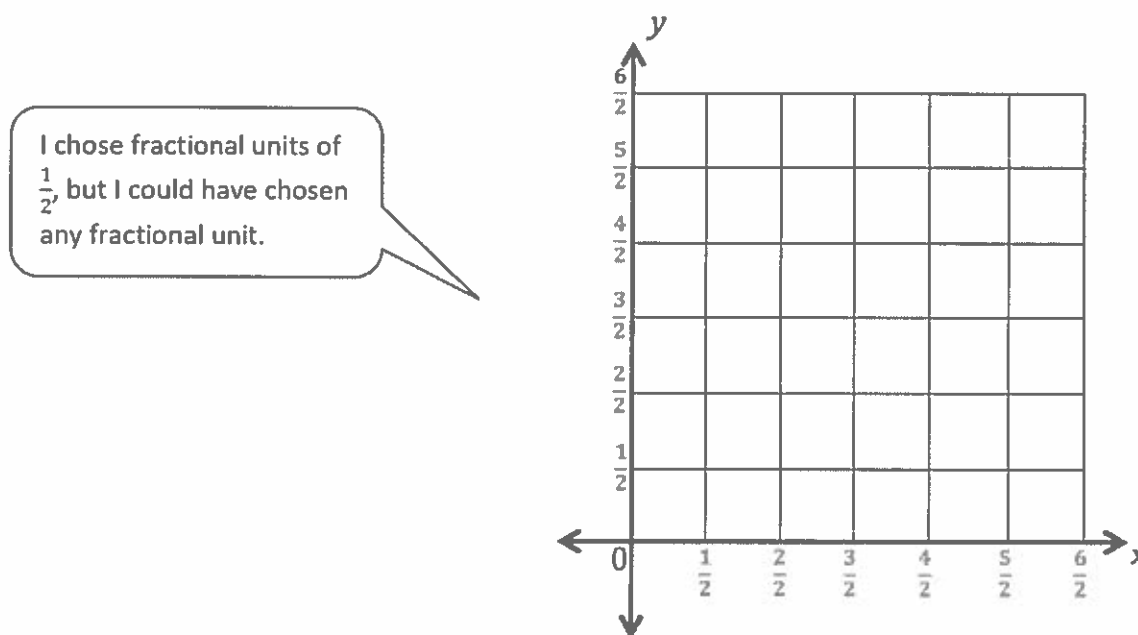
He did not indicate what direction from the tree he buried the treasure. If he just says fifteen feet from the tree, he'd have to dig a circle around the tree to find the treasure.

G5-M6-Lesson 2

1. Use a set square to draw a line perpendicular to the x -axis through point R . Label the new line as the y -axis.



2. Use the perpendicular lines below to create a coordinate plane. Mark 6 units on each axis, and label them as fractions.



3. Use the coordinate plane to answer the following.

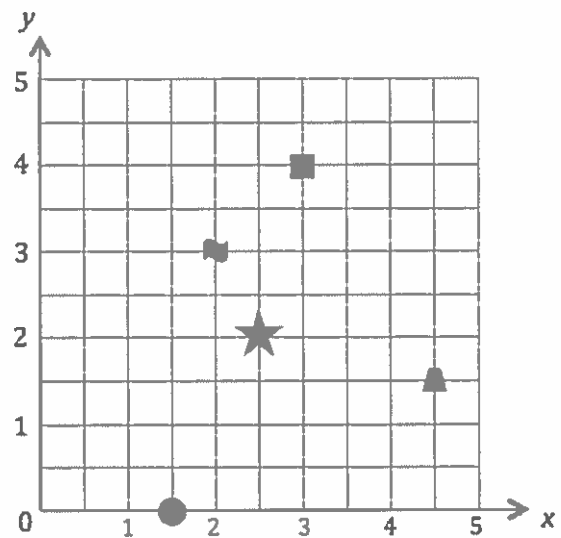
x-coordinate	y-coordinate	Shape
$1\frac{1}{2}$	0	circle
4.5	1.5	trapezoid
2	3	flag
3	4	square

$1\frac{1}{2}$ is not one of the numbers on the x -axis, but I know that $1\frac{1}{2}$ falls halfway between 1 and 2.

- a. Name the shape at each location.
 b. What shape is 3 units from the x -axis?
The flag is 3 units from the x -axis.

- c. Which shape has a y -coordinate of 3?
The flag has a y -coordinate of 3.

Problems 3(b) and 3(c) are asking the same question in different ways.



- d. Draw a star at $(2\frac{1}{2}, 2)$.

The numbers in the parentheses are *coordinate pairs*. Coordinate pairs are written in parentheses with a comma separating the two coordinates. The x -coordinate is given first.

G5-M6-Lesson 3

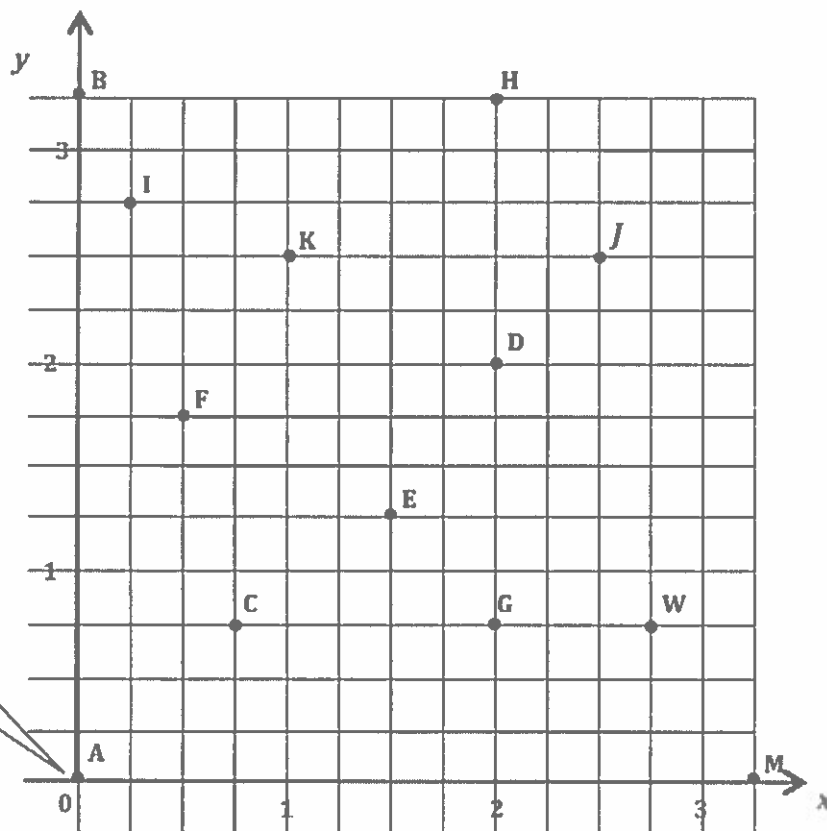
The y -axis is a vertical line. The x -axis is a horizontal line.

The origin, or $(0, 0)$, is where the x - and y -axes meet.

1. Use the grid below to complete the following tasks.
 - a. Construct a y -axis that passes through points A and B . Label this axis.
 - b. Construct an x -axis that is perpendicular to the y -axis that passes through points A and M .
 - c. Label the origin.
 - d. The x -coordinate of point W is $2\frac{3}{4}$. Label the whole numbers along the x -axis.
 - e. Label the whole numbers along the y -axis.

The y -axis must be labeled the same way as the x -axis. On the x -axis, the distance between grid lines is $\frac{1}{4}$. I can use the same units for the y -axis.

I find point W on the coordinate plane. I can trace down with my finger to locate this spot on the x -axis. I count back to 0 and see that each line on the grid is $\frac{1}{4}$ more than the previous line.



This is the origin.

2. For the following problems, consider all the points on the previous page.

- a. Identify all the points that have a y -coordinate of $\frac{3}{4}$.

C, G, and W

I look for all of the points that are $\frac{3}{4}$ units from the x -axis.

- b. Identify all the points that have an x -coordinate of 2.

G, D, and H

I look for points that are 2 units from the y -axis.

- c. Name the point, and write the coordinate pair that is $2\frac{1}{2}$ units above the x -axis and 1 unit to the right of the y -axis.

K $(1, 2\frac{1}{2})$

- d. Which point is located $1\frac{1}{4}$ units from the x -axis? Give its coordinates.

E $(1\frac{1}{2}, 1\frac{1}{4})$

- e. Which point is located $\frac{1}{4}$ units from the y -axis? Give its coordinates.

I $(\frac{1}{4}, 2\frac{3}{4})$

- f. Give the coordinates for point *C*.

$(\frac{3}{4}, \frac{3}{4})$

- g. Plot a point where both coordinates are the same. Label the point *J*, and give its coordinates.

$(2\frac{1}{2}, 2\frac{1}{2})$

There are infinite correct answers to this question. I could name coordinates that are not on the grid lines. For example, $(1.88, 1.88)$ would be correct.

- h. Name the point where the two axes intersect. Write the coordinates for this point.

A $(0, 0)$

This point is also known as the origin. The axes meet at the origin.

- i. What is the distance between points W and G , or WG ?

$$\frac{3}{4} \text{ unit}$$

I count the units between the points. The distance between each grid line is $\frac{1}{4}$.

- j. Is the length of \overline{HG} greater than, less than, or equal to $CG + KJ$?

$$HG = 2\frac{1}{2} \text{ units} \quad CG = 1\frac{1}{4} \text{ units} \quad KJ = 1\frac{1}{2} \text{ units} \quad CG + KJ = 2\frac{3}{4} \text{ units} \quad HG < CG + KJ$$

- k. Janice described how to plot points on the coordinate plane. She said, "If you want to plot $(1, 3)$, go 1, and then go 3. Put a point where these lines intersect." Is Janice correct?

Janice is not correct. She should give a starting point and a direction. She should say, "Start at the origin. Along the x -axis, go 1 unit to the right, and then go up 3 units parallel to the y -axis."

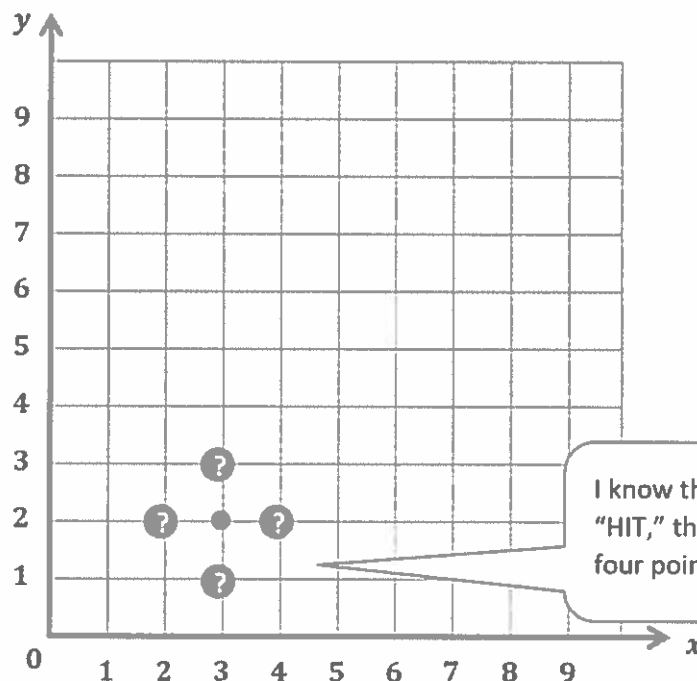
G5-M6-Lesson 4

Lesson Notes

The rules for playing *Battleship*, a popular game, are at the end of this Homework Helper.

1. While playing *Battleship*, your friend says, "Hit!" when you guess point $(3, 2)$. How do you decide which points to guess next?

If I get a hit at point $(3, 2)$, then I know I should try to guess one of the four points around $(3, 2)$ because the ship has to lie either vertically or horizontally according to the rules. I would guess one of these points: $(2, 2)$, $(3, 1)$, $(4, 2)$, or $(3, 3)$.



I know that if my partner says, "HIT," then I should guess one of the four points around my last guess.

2. What changes to the game could make it more challenging?

The game is easiest when I count by ones on the coordinate grid's axes. If I changed the axes to count by another number like 7's or 9's on each grid line, the game would be more challenging. It would also be more challenging if I skip-count on the axes by fractions such as $\frac{1}{2}$ or $2\frac{1}{2}$.

Battleship Rules

Goal: To sink all of your opponent's ships by correctly guessing their coordinates.

Materials

- 1 My Ships grid sheet (per person/per game)
- 1 Enemy Ships grid sheet (per person/per game)
- Red crayon/marker for hits
- Black crayon/marker for misses
- Folder to place between players

Ships

- Each player must mark 5 ships on the grid.
 - Aircraft Carrier—Plot 5 points
 - Battleship—Plot 4 points
 - Cruiser—Plot 3 points
 - Submarine—Plot 3 points
 - Patrol Boat—Plot 2 points

Setup

- With your opponent, choose a unit length and fractional unit for the coordinate plane.
- Label chosen units on both grid sheets.
- Secretly select locations for each of the 5 ships on your My Ships grid.
 - All ships must be placed horizontally or vertically on the coordinate plane.
 - Ships can touch each other, but they may not occupy the same coordinate.

Play

- Players take turns firing one shot to attack enemy ships.
- On your turn, call out the coordinates of your attacking shot. Record the coordinates of each attack shot.
- Your opponent checks his My Ships grid. If that coordinate is unoccupied, your opponent says, "Miss." If you named a coordinate occupied by a ship, your opponent says, "Hit."
- Mark each attempted shot on your Enemy Ships grid. Mark a black ✕ on the coordinate if your opponent says, "Miss." Mark a red ✓ on the coordinate if your opponent says, "Hit."
- On your opponent's turn, if he hits one of your ships, mark a red ✓ on that coordinate of your My Ships grid. When one of your ships has every coordinate marked with a ✓, say, "You've sunk my [name of ship]."

Victory

- The first player to sink all (or the most) opposing ships wins.

G5-M6-Lesson 5

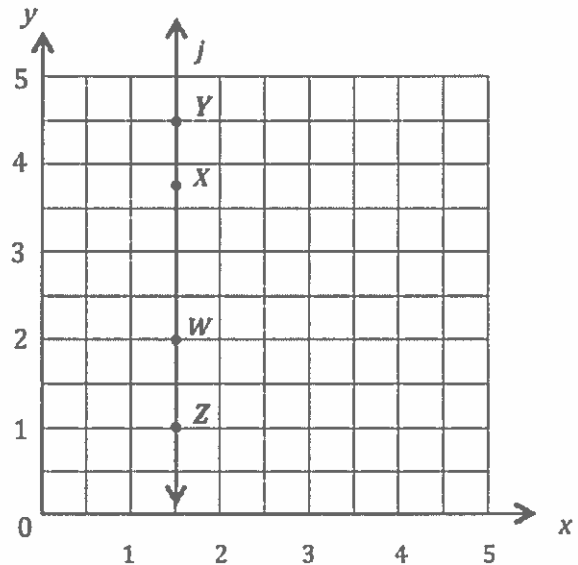
1. Use the coordinate plane to answer the questions.
- a. Use a straight edge to construct a line that goes through points Z and Y . Label this line j .

- b. Line j is perpendicular to the x -axis, and is parallel to the y -axis.

Parallel lines will never cross.

Perpendicular lines form 90° angles.

- c. Draw two more points on line j . Name these points X and W .
- d. Give the coordinates of each point below.



2. a. W : $(1\frac{1}{2}, 2)$ X : $(1\frac{1}{2}, 3\frac{3}{4})$ Y : $(1\frac{1}{2}, 4\frac{1}{2})$ Z : $(1\frac{1}{2}, 1)$

- b. What do all these points on line j have in common?

The x -coordinate is always $1\frac{1}{2}$.

This line is perpendicular to the x -axis and parallel to the y -axis because the x -coordinate is the same in every coordinate pair.

- c. Give the coordinate pair of another point that falls on line j with a y -coordinate greater than 10.

$(1\frac{1}{2}, 12)$

As long as the x -coordinate is $1\frac{1}{2}$, the point will fall on line j .

3. For each pair of points below, think about the line that joins them. Will the line be parallel to the x -axis or y -axis? Without plotting them, explain how you know.

a. $(1.45, 2)$ and $(66, 2)$

Since these coordinate pairs have the same y -coordinate, the line that joins them will be a horizontal line and parallel to the x -axis.

b. $(\frac{1}{2}, 19)$ and $(\frac{1}{2}, 82)$

Since these coordinate pairs have the same x -coordinate, the line that joins them will be a vertical line and parallel to the y -axis.

4. Write the coordinate pairs of 3 points that can be connected to construct a line that is $3\frac{1}{8}$ units above and parallel to the x -axis.

$(7, 3\frac{1}{8})$

$(6\frac{1}{8}, 3\frac{1}{8})$

$(79, 3\frac{1}{8})$

In order for the line to be $3\frac{1}{8}$ units above the x -axis, the coordinate pairs must have a y -coordinate of $3\frac{1}{8}$. I can use any x -coordinate.

5. Write the coordinate pairs of 3 points that lie on the x -axis.

$(7, 0)$

$(11.1, 0)$

$(100, 0)$

G5-M6-Lesson 6

1. Plot and label the following points on the coordinate plane.

$K (0.7, 0.6)$

$P (0.7, 1.1)$

$M (0.2, 0.3)$

$H (0.9, 0.3)$

- a. Use a straightedge to construct line segments KP and MH .
- b. Name the line segment that is perpendicular to the x -axis and parallel to the y -axis.

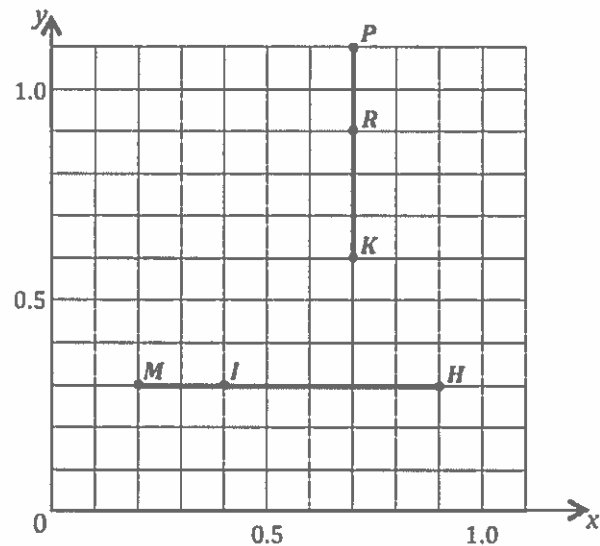
\overline{KP}

Because the x -coordinates of K and P are the same, segment KP is parallel to the y -axis.

- c. Name the line segment that is parallel to the x -axis and perpendicular to the y -axis.

\overline{MH}

Because the y -coordinates of M and H are the same, segment MH is perpendicular to the y -axis.



- d. Plot a point on \overline{KP} , and name it R .
- e. Plot a point on \overline{MH} , and name it I .
- f. Write the coordinates for points R and I .

$R (0.7, 0.9)$

$I (0.4, 0.3)$

2. Construct line j such that the y -coordinate of every point is $2\frac{1}{4}$, and construct line k such that the x -coordinate of every point is $1\frac{3}{4}$.

Since all the y -coordinates are the same, line j will be a horizontal line.
Since all the x -coordinates are the same, line k will be a vertical line.

- a. Line j is $2\frac{1}{4}$ units from the x -axis.

- b. Give the coordinates of the point on line j that is 1 unit from the y -axis.

$(1, 2\frac{1}{4})$

"1 unit from the y -axis" gives the value of the x -coordinate.

- c. With a colored pencil, shade the portion of the grid that is less than $2\frac{1}{4}$ units from the x -axis.

I use blue to shade the grid below line j .

- d. Line k is $1\frac{3}{4}$ units from the y -axis.

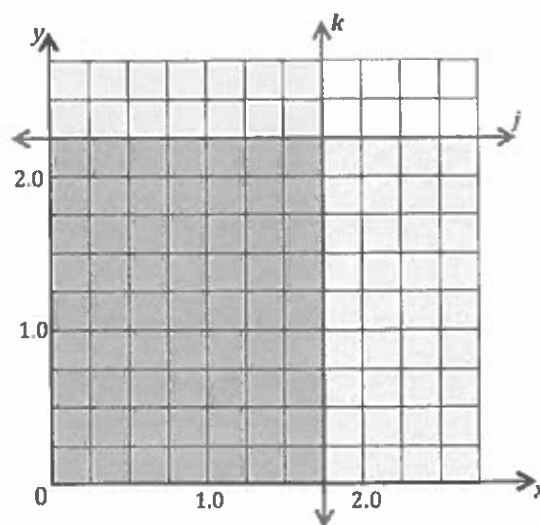
- e. Give the coordinates of the point on line k that is $1\frac{1}{2}$ units from the x -axis.

$(1\frac{3}{4}, 1\frac{1}{2})$

" $1\frac{1}{2}$ units from the x -axis" gives the value of the y -coordinate.

- f. With another colored pencil, shade the portion of the grid that is less than $1\frac{3}{4}$ units from the y -axis.

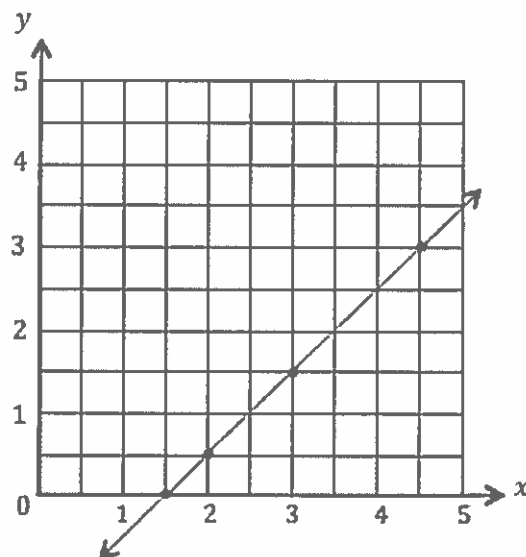
I use pink to shade the grid to the left of line k . The area of the grid that is below line j and to the left of line k now looks purple.



G5-M6-Lesson 7

1. Complete the chart. Then, plot the points on the coordinate plane.

x	y	(x, y)
3	$1\frac{1}{2}$	$(3, 1\frac{1}{2})$
$1\frac{1}{2}$	0	$(1\frac{1}{2}, 0)$
2	$\frac{1}{2}$	$(2, \frac{1}{2})$
$4\frac{1}{2}$	3	$(4\frac{1}{2}, 3)$



- Use a straightedge to draw a line connecting these points.
- Write a rule showing the relationship between the x -coordinates and y -coordinates of points on this line.

I could have also said that the y -coordinates are $1\frac{1}{2}$ less than the corresponding x -coordinates.

Each x -coordinate is $1\frac{1}{2}$ more than its corresponding y -coordinate.

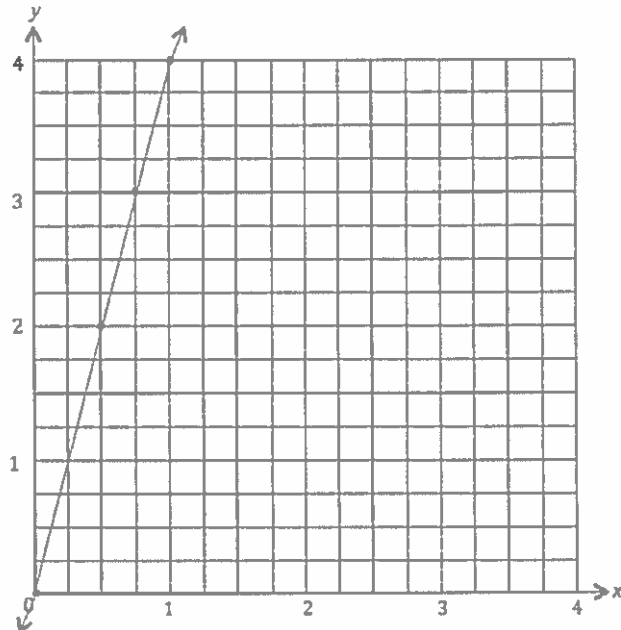
- Name the coordinates of two other points that are also on this line.

$(2\frac{1}{2}, 1)$ and $(5, 3\frac{1}{2})$

As long as the x -coordinate is $1\frac{1}{2}$ more than the y -coordinate, the point will fall on this line.

2. Complete the chart. Then, plot the points on the coordinate plane.

x	y	(x, y)
$\frac{3}{4}$	3	$(\frac{3}{4}, 3)$
1	4	$(1, 4)$
$\frac{1}{2}$	2	$(\frac{1}{2}, 2)$
0	0	$(0, 0)$



- a. Use a straightedge to draw a line connecting these points.
- b. Write a rule showing the relationship between the x -coordinates and y -coordinates for points on the line.

Each y -coordinate is four times as much as its corresponding x -coordinate.

- c. Name two other points that are also on this line.

$(2, 8)$ and $(\frac{5}{8}, 2\frac{1}{2})$

This rule is also correct: Each x -coordinate is 1 fourth as much as its corresponding y -coordinate.

3. Use the coordinate plane to answer the following questions.

- a. For any point on line r , the x -coordinate is 18.

The x -coordinate tells the distance from the y -axis.

- b. Give the coordinates for 3 points that are on line s .

(4, 8) (10, 14) (20, 24)

- c. Write a rule that describes the relationship between the x -coordinates and y -coordinates on line s .

Each y -coordinate is 4 more than its corresponding x -coordinate.

I could also say, "Each x -coordinate is 4 less than the y -coordinate."

- d. Give the coordinates for 3 points that are on line u .

(6, 2) (12, 4) (24, 8)

- e. Write a rule that describes the relationship between the x -coordinates and y -coordinates on line u .

Each x -coordinate is 3 times as much as the y -coordinate.

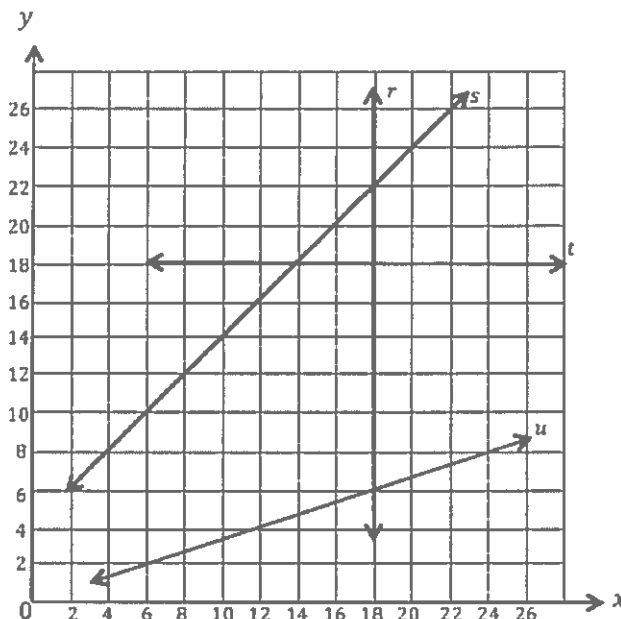
I could also say, "Each y -coordinate is $\frac{1}{3}$ the value of the x -coordinate."

- f. Each of these points lies on at least 1 of the lines shown in the plane above. Identify a line that contains the following points.

(18, 16.3) r (9.5, 13.5) s $(16, 5\frac{1}{3})$ u (22.3, 18) t

All of the points on line r have an x -coordinate of 18.

All of the points on line t have a y -coordinate of 18.

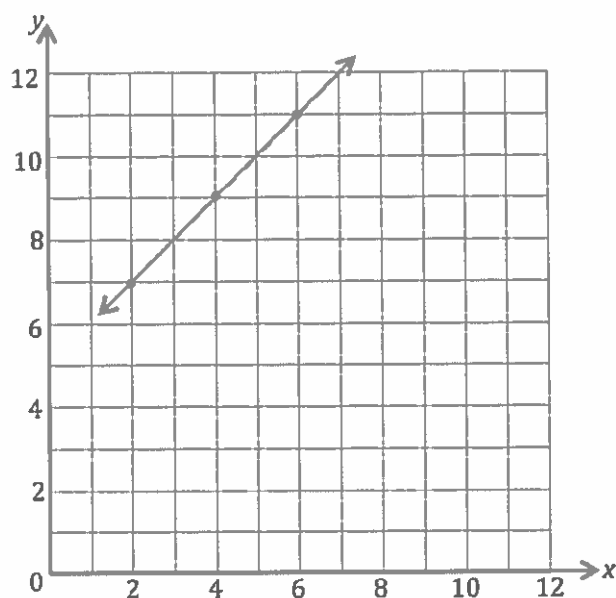


G5-M6-Lesson 8

Complete this table such that each y -coordinate is 5 more than the corresponding x -coordinate.

x	y	(x, y)
2	7	$(2, 7)$
4	9	$(4, 9)$
6	11	$(6, 11)$

I choose coordinate pairs that satisfy the rule and will fit on the coordinate plane.



- Plot each point on the coordinate plane.
- Use a straightedge to construct a line connecting these points.
- Give the coordinate of 3 other points that fall on this line with x -coordinates greater than 15.

$(17, 22)$ $(20\frac{1}{2}, 25\frac{1}{2})$ $(100, 105)$

Although I can't see these points on the plane, I know they will fall on the line because each y -coordinate is 5 more than the x -coordinate.

G5-M6-Lesson 9

1. Complete the table with the given rules.

Line a

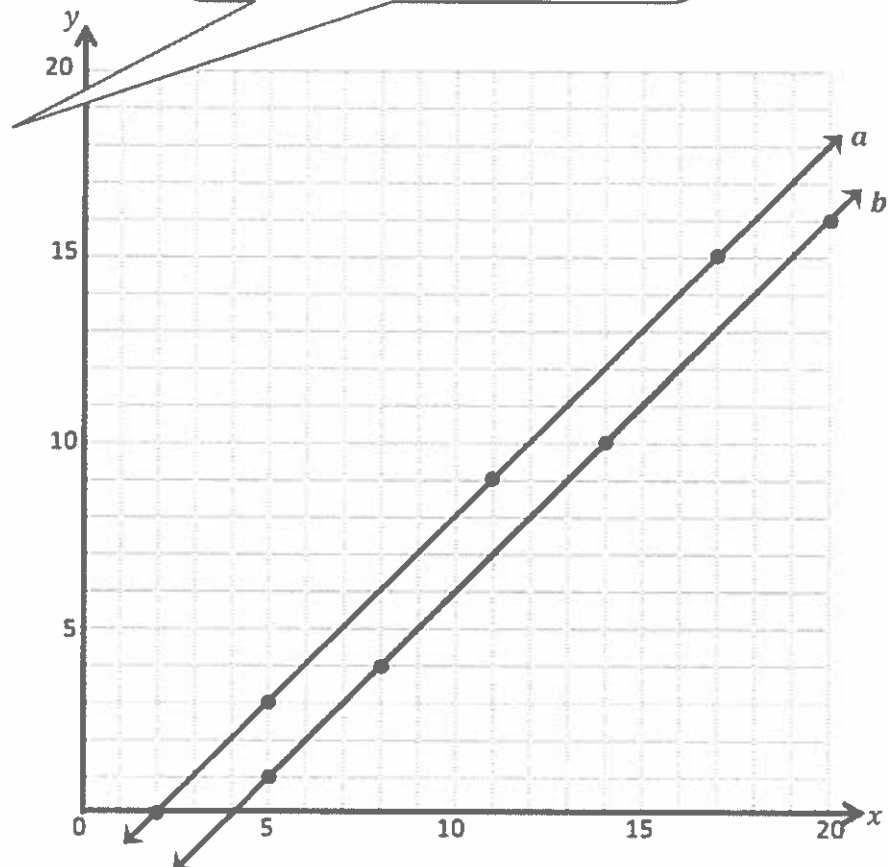
Rule: y is 2 less than x .

x	y	(x, y)
2	0	(2, 0)
5	3	(5, 3)
10	8	(10, 8)
17	15	(17, 15)

Line b

Rule: y is 4 less than x .

x	y	(x, y)
5	1	(5, 1)
8	4	(8, 4)
14	10	(14, 10)
20	16	(20, 16)



- Construct each line on the coordinate plane.
- Compare and contrast these lines.

The lines are parallel. Neither line passes through the origin. Line b looks like it is closer to the x-axis or farther down and to the right. Line a is closer to the y-axis and farther up and to the left.

- Based on the patterns you see, predict what line c, whose rule is y is 6 less than x , would look like.

Since the rule for line c is also a subtraction rule, I think it will also be parallel to lines a and b. But, since the rule is "y is 6 less than x," I think it will be even farther to the right than line b.

2. Complete the table for the given rules.

Line *e*

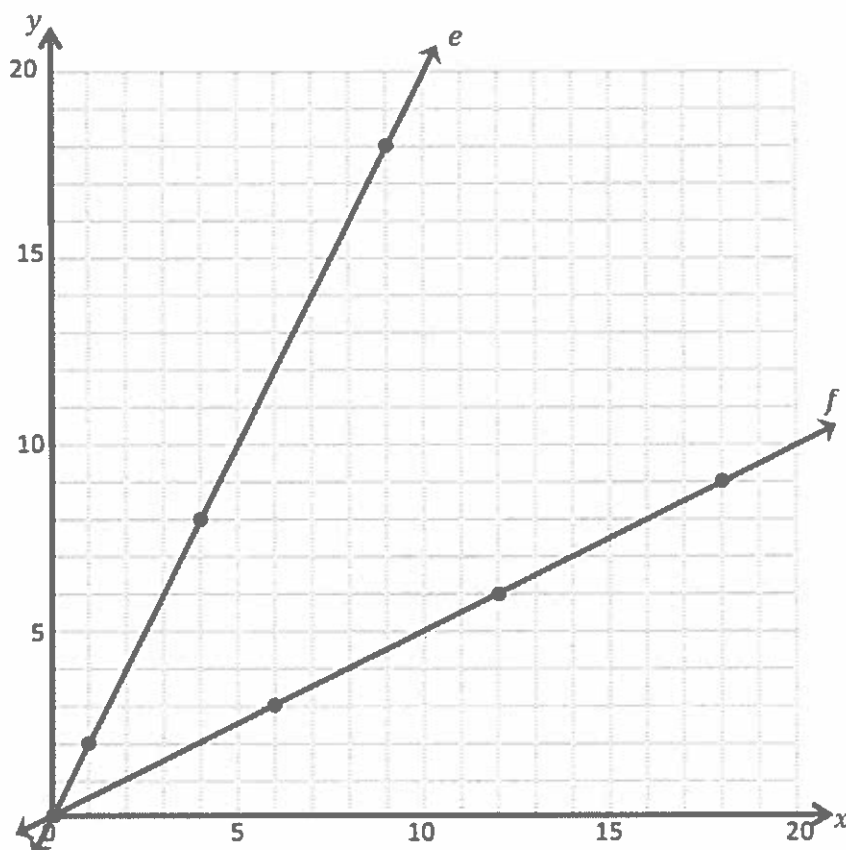
Rule: *y* is 2 times as much as *x*.

<i>x</i>	<i>y</i>	(<i>x</i> , <i>y</i>)
0	0	(0, 0)
1	2	(1, 2)
4	8	(4, 8)
9	18	(9, 18)

Line *f*

Rule: *y* is half as much as *x*.

<i>x</i>	<i>y</i>	(<i>x</i> , <i>y</i>)
0	0	(0, 0)
6	3	(6, 3)
12	6	(12, 6)
18	9	(18, 9)



In order to find the *y*-coordinates, I just follow the rule, "*y* is 2 times as much as *x*." So when *x* is 4, I find the number that is 2 times as much as 4: $4 \times 2 = 8$. So when *x* is 4, *y* is 8.

- a. Construct each line on the coordinate plane.

- b. Compare and contrast these lines.

Both lines go through the origin, and they are not parallel. Line e is steeper than line f.

- c. Based on the patterns you see, predict what line *g*, whose rule is *y* is 3 times as much as *x*, and line *h*, whose rule is *y* is a third as much as *x*, would look like.

Since the rule for line g is also a multiplication rule, I think it will also pass through the origin. But, since the rule is "y is 3 times as much as x," I think it will be even steeper than lines e and f.

G5-M6-Lesson 10

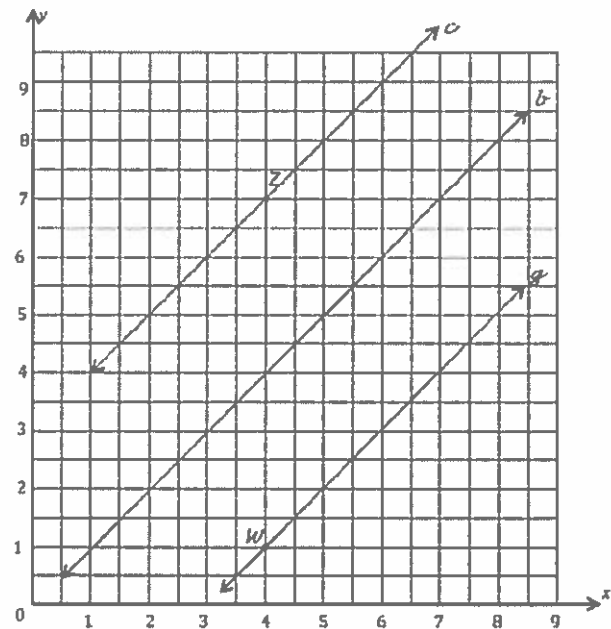
1. Use the coordinate plane to complete the following tasks.

- a. The rule for line b is "x and y are equal."
Construct line b .

Some coordinate pairs that follow this rule are
(1, 1) (3, 3) (6.5, 6.5)

- b. Construct a line, c , that is parallel to line b and contains point Z .

Since line c needs to be parallel to line b , the rule for line c must be an addition or subtraction rule. The coordinate pair for Z is (4, 7), so I can draw line c along other coordinate pairs that have a y-coordinate that is 3 more than the x-coordinate.



- c. Name 3 coordinate pairs on line c .

(2, 5) (3, 6) (6, 9)

- d. Identify a rule to describe line c .
 x is 3 less than y .

Another way to describe this rule is: y is 3 more than x .

- e. Construct a line, g , that is parallel to line b and contains point W .

- f. Name 3 points on line g .

(3.5, 0.5) (6, 3) (7, 4)

- g. Identify a rule to describe line g .
 x is 3 more than y .

Again, since line g needs to be parallel to line b , the rule for line g must be an addition or subtraction rule. The coordinate pair for W is (4, 1), so I can draw line g along other coordinate pairs that have a y-coordinate that is 3 less than the x-coordinate.

- h. Compare and contrast lines c and g in terms of their relationship to line b .

Lines c and g are both parallel to line b .

Line c is above line b because the points on line c have y -coordinates greater than the x -coordinates.

Line g is below line b because the points on line g have y -coordinates less than the x -coordinates.

2. Write a rule for a fourth line that would be parallel to those in Problem 1 and that would contain the point $(5, 6)$.

y is 1 more than x .

Because this line is parallel to the others, I know it has to be an addition rule. In the given coordinate pair, the y -coordinate is 1 more than the x -coordinate.

3. Use the coordinate plane below to complete the following tasks.

- a. Line b represents the rule " x and y are equal."

I can also think of this as a multiplication rule.
" x times 1 is equal to y ."

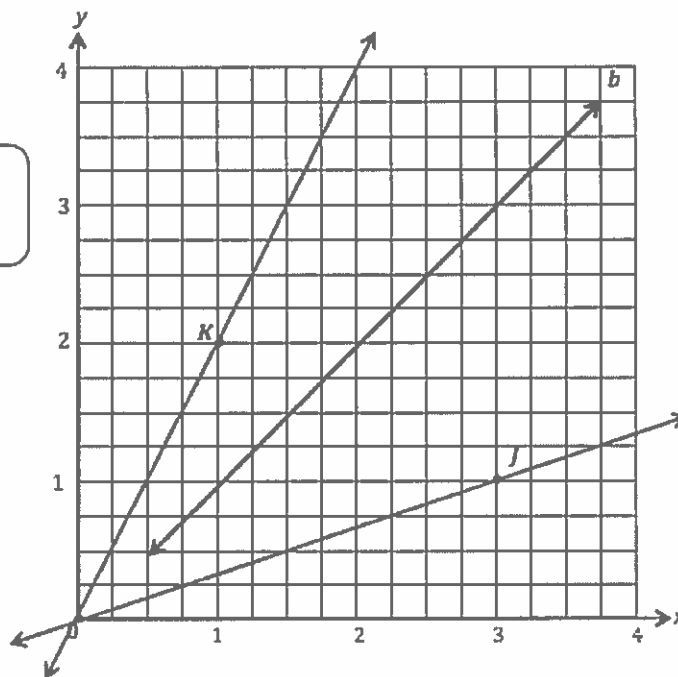
- b. Construct a line, j , that contains the origin and point J .

- c. Name 3 points on line j .

$(3, 1)$ $(1\frac{1}{2}, \frac{1}{2})$ $(\frac{3}{4}, \frac{1}{4})$

- d. Identify a rule to describe line j .
 x is 3 times as much as y .

As I analyze the relationship between the x - and y -coordinates on line j , I can see that each y -coordinate is $\frac{1}{3}$ the value of its corresponding x -coordinate.



e. Construct a line, k , that contains the origin and point K .

f. Name 3 points on line k .

$(\frac{1}{2}, 1)$ $(1\frac{1}{2}, 3)$ $(2, 4)$

g. Identify a rule to describe line k .
 x is half of y .

As I analyze the relationship between the x -coordinates and y -coordinates on line k , I can see that each y -coordinate is twice the value of its corresponding x -coordinate.

G5-M6-Lesson 11

1. Complete the tables for the given rules.

Line p

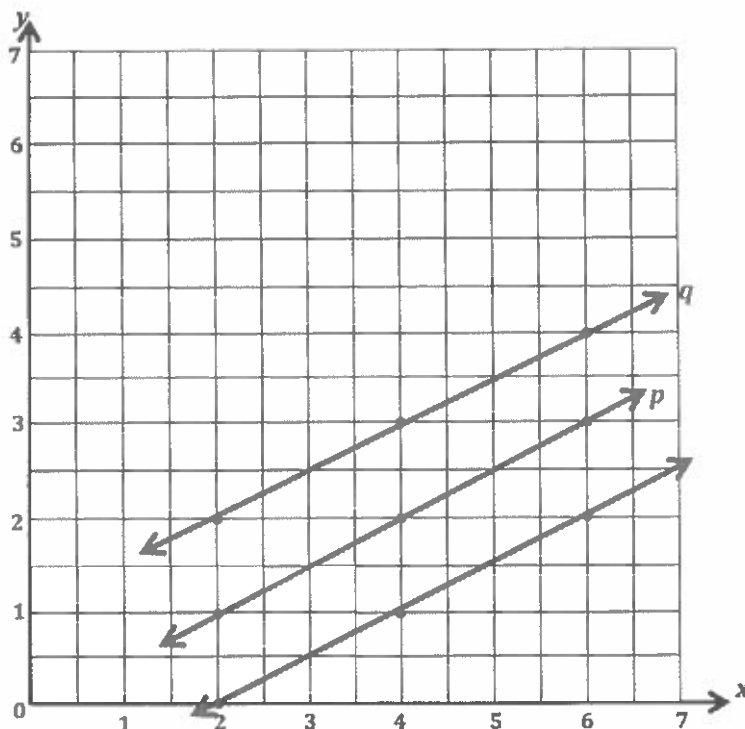
Rule: *Halve x .*

x	y	(x, y)
2	1	(2, 1)
4	2	(4, 2)
6	3	(6, 3)

Line q

Rule: *Halve x , and then add 1.*

x	y	(x, y)
2	2	(2, 2)
4	3	(4, 3)
6	4	(6, 4)



- a. Draw each line on the coordinate plane above.

- b. Compare and contrast these lines.

Line q is above line p because the rule says, "then add 1."

They are parallel lines. Line q is above line p . The distance between the two lines is 1 unit.

- c. Based on the patterns you see, predict what the line for the rule "halve x , and then subtract 1" would look like. Draw your prediction on the plane above.

I predict the line will be parallel to lines p and q .

It will be 1 unit below line p because the rule says, "then subtract 1."

I need to look for coordinate pairs that follow the rule, "double x , and then add $\frac{1}{2}$."

2. Circle the point(s) that the line for the rule "double x , and then add $\frac{1}{2}$ " would contain.

$(0, 1)$

$(3, 6\frac{1}{2})$

$(2, \frac{1}{2})$

$(\frac{3}{4}, 2)$

$(0, \frac{1}{2})$

$(2, 4\frac{1}{4})$

$$3 \times 2 = 6$$

$$6 + \frac{1}{2} = 6\frac{1}{2}$$

$$\frac{3}{4} \times 2 = \frac{6}{4}$$

$$= 1\frac{1}{2}$$

$$0 \times 2 = 0$$

$$0 + \frac{1}{2} = \frac{1}{2}$$

3. Give two other points that fall on this line.

$(\frac{1}{2}, 1\frac{1}{2})$

$(1, 2\frac{1}{2})$

I choose values for the x -coordinates. Then I doubled them and added $\frac{1}{2}$ to get the y -coordinates.

G5-M6-Lesson 12

1. Write a rule for the line that contains the points (0.3, 0.5) and (1.0, 1.2).

y is 0.2 more than x.

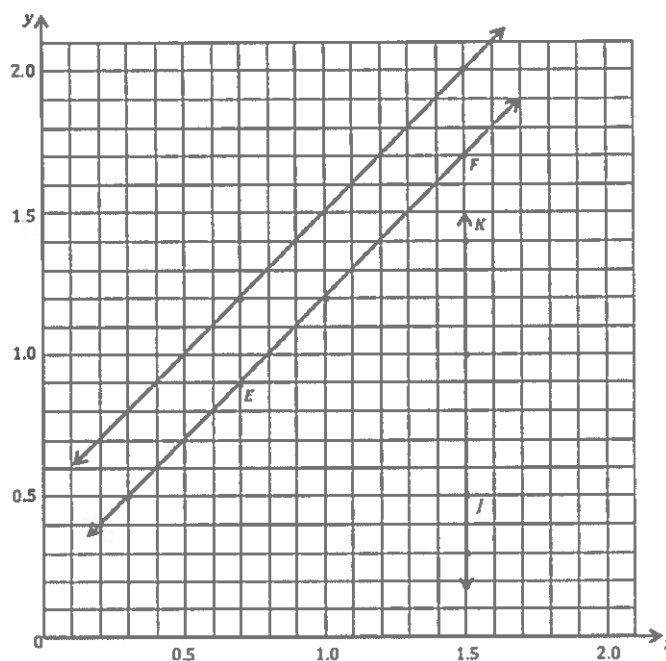
- a. Identify 2 more points on this line. Then draw it on the grid below.

Point	x	y	(x, y)
E	0.7	0.9	(0.7, 0.9)
F	1.5	1.7	(1.5, 1.7)

- b. Write a rule for a line that is parallel to \overline{EF} and goes through point (0.7, 1.2). Then draw the line on the grid.

y is 0.5 more than x.

Since this line needs to be parallel to \overline{EF} , it must be an addition rule. In the coordinate pair (0.7, 1.2), I can see that the y-coordinate is 0.5 more than the x-coordinate.



2. Give the rule for the line that contains the points (1.5, 0.3) and (1.5, 1.0).

x is always 1.5.

- a. Identify 2 more points on this line. Draw the line on the grid above.

Point	x	y	(x, y)
J	1.5	0.5	(1.5, 0.5)
K	1.5	1.4	(1.5, 1.4)

- b. Write a rule for a line that is parallel to \overline{JK} .
x is always 1.8.

Since this line must be parallel to \overline{JK} , it must be another vertical line where the x-coordinate is always the same.

3. Give the rule for a line that contains the point $(0.3, 0.9)$ using the operation or description below. Then, name 2 other points that would fall on each line.

a. Addition: y is 0.6 more than x .

Point	x	y	(x, y)
T	0.4	1	$(0.4, 1)$
U	1	1.6	$(1, 1.6)$

b. A line parallel to the x -axis: y is always 0.9.

Point	x	y	(x, y)
G	0.4	0.9	$(0.4, 0.9)$
H	1	0.9	$(1, 0.9)$

A line parallel to the x -axis is a horizontal line.
Horizontal lines have y -coordinates that do not change.

c. Multiplication: y is x tripled.

Point	x	y	(x, y)
A	0.2	0.6	$(0.2, 0.6)$
B	0.5	1.5	$(0.5, 1.5)$

d. A line parallel to the y -axis: x is always 0.3.

Point	x	y	(x, y)
V	0.3	1.3	$(0.3, 1.3)$
W	0.3	2	$(0.3, 2)$

A line parallel to the y -axis is a vertical line. Vertical lines have x -coordinates that do not change.

e. Multiplication with addition: Double x , and then add 0.3.

Point	x	y	(x, y)
R	0.4	1.1	$(0.4, 1.1)$
S	0.5	1.3	$(0.5, 1.3)$

I can use the original coordinate pair, $(0.3, 0.9)$, to help me generate a multiplication with addition rule.

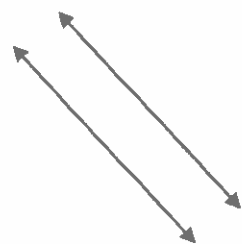
$$0.3 \times 2 = 0.6 \quad (\text{This is the "Double } x" \text{ part of the rule.})$$

$$0.6 + 0.3 = 0.9 \quad (\text{This is the "then add 0.3" part of the rule.})$$

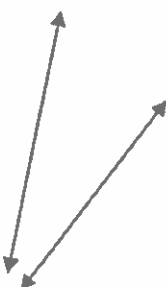
G5-M6-Lesson 13

1. Maya and Ruvio used their right angle templates and straightedges to draw sets of parallel lines. Who drew a correct set of parallel lines and why?

Maya:

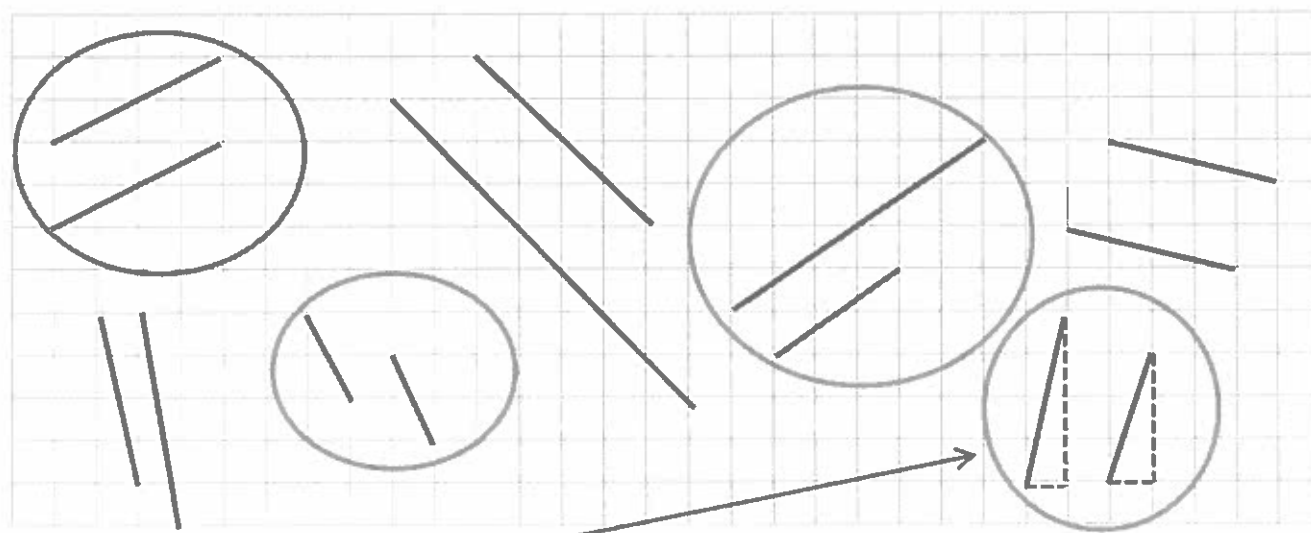


Ruvio:



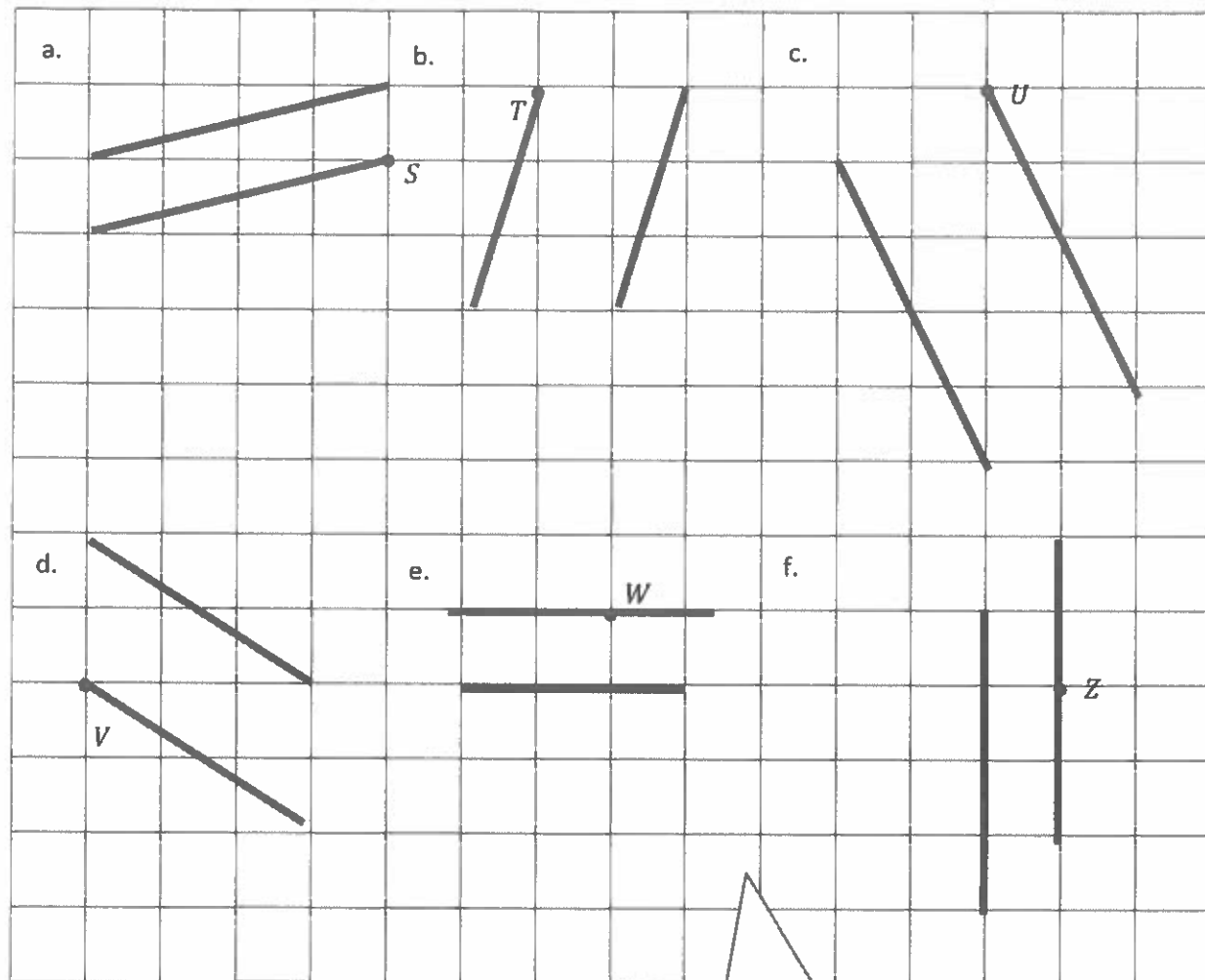
Maya drew a correct set of parallel lines because if you extend her lines, they will never intersect (cross). If you extend Ruvio's lines, they will intersect.

2. On the grid below, Maya circled all the sets of segments that she thought were parallel. Is she correct? Why or why not?



Maya is not completely correct. This set is not parallel. I drew a horizontal and vertical dotted line near each segment to complete a triangle. Even though both triangles have a base of 1, the left triangle is taller. I can see that if I were to extend these segments, they would eventually intersect. These segments are not parallel. Also, Maya did not circle all of the parallel sets of segments.

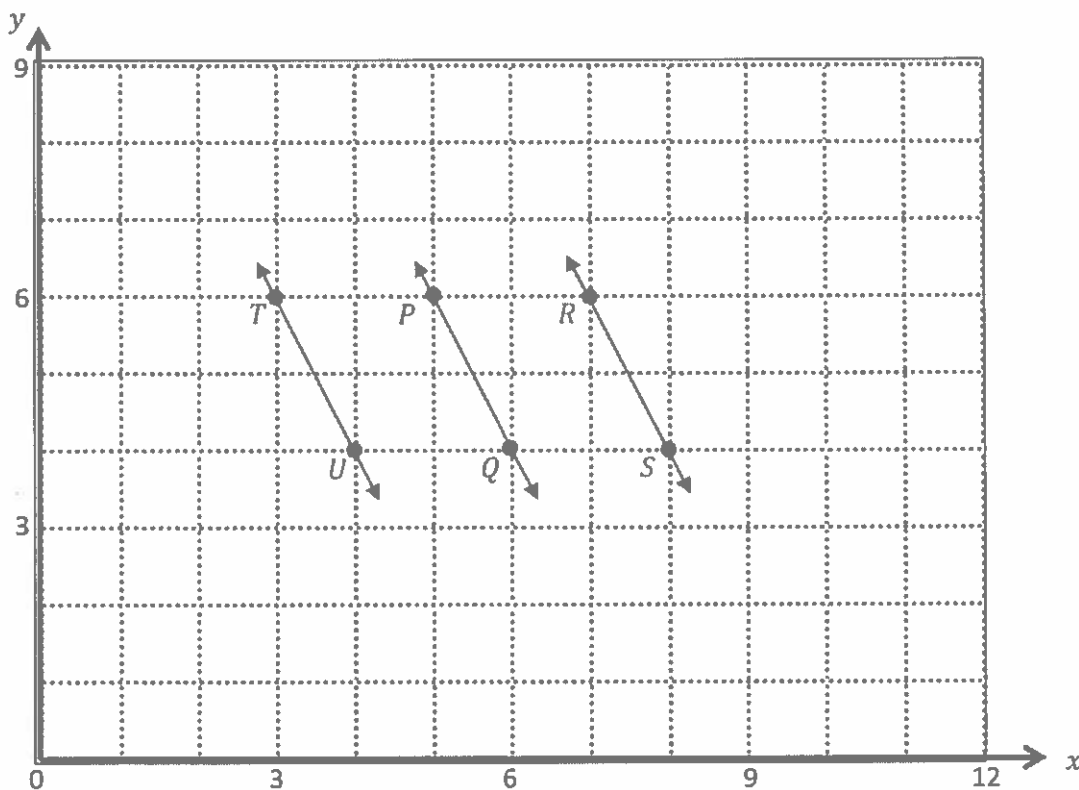
3. Use your straightedge to draw a segment parallel to each segment through the given point.



I know that the lines do not have to be exactly the same length as long as they are always the same distance apart at every point.

G5-M6-Lesson 14

1. Use the coordinate plane below to complete the following tasks.



- a. Identify the locations of P and Q . P (5, 6) Q (6, 4)
- b. Draw \overline{PQ} .
- c. Plot the following coordinate pairs on the plane: R (7,6) S (8,4)
- d. Draw \overline{RS} .
- e. Circle the relationship between \overline{PQ} and \overline{RS} . $\overline{PQ} \perp \overline{RS}$ $\overline{PQ} \parallel \overline{RS}$

The symbol \perp means perpendicular.
The symbol \parallel means parallel.

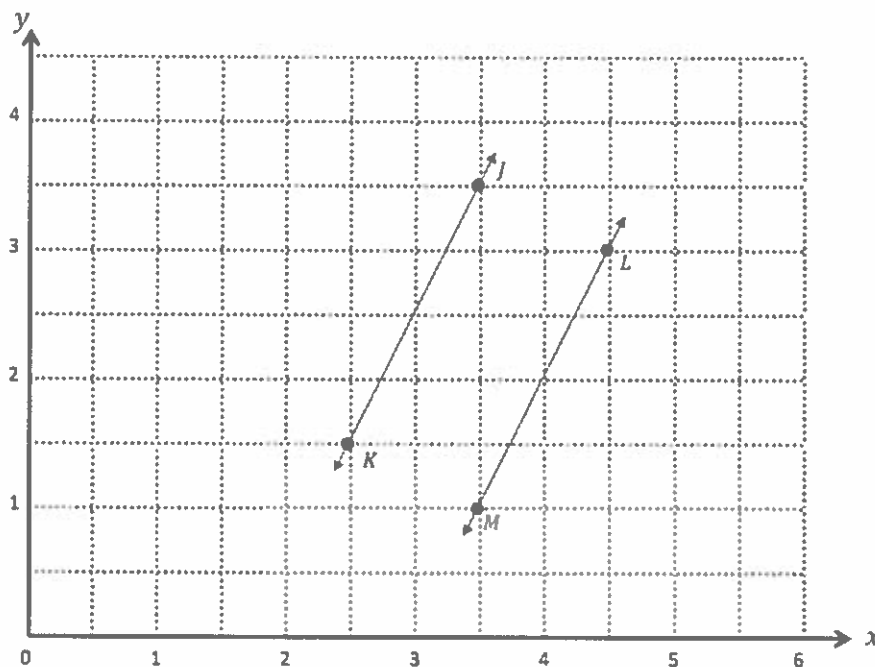
- f. Give the coordinates of a pair of points, T and U , such that $\overline{TU} \parallel \overline{PQ}$.

T (3, 6) U (4, 4)

There are many possible sets of coordinates that would make \overline{TU} parallel to \overline{PQ} . I can keep the y -coordinates the same and move the x -coordinates 2 units to the left.

- g. Draw \overline{TU} .

2. Use the coordinate plane below to complete the following tasks.



- a. Identify the locations of J and K . J $(3\frac{1}{2}, 3\frac{1}{2})$ K $(2\frac{1}{2}, 1\frac{1}{2})$
- b. Draw \overline{JK} .
- c. Generate coordinate pairs for L and M such that $\overline{JK} \parallel \overline{LM}$. L $(4\frac{1}{2}, 3)$ M $(3\frac{1}{2}, 1)$
- d. Draw \overline{LM} .
- e. Explain the pattern you used when generating coordinate pairs for L and M .

I visualized shifting points J and K one unit to the right, which is two grid lines. As a result, the x -coordinates of L and M are 1 greater than those of J and K .

Then I visualized shifting both points down one-half unit, which is one grid line. As a result, the y -coordinates of L and M are $\frac{1}{2}$ less than those of J and K .

G5-M6-Lesson 15

Perpendicular segments intersect and form 90° , or right, angles.

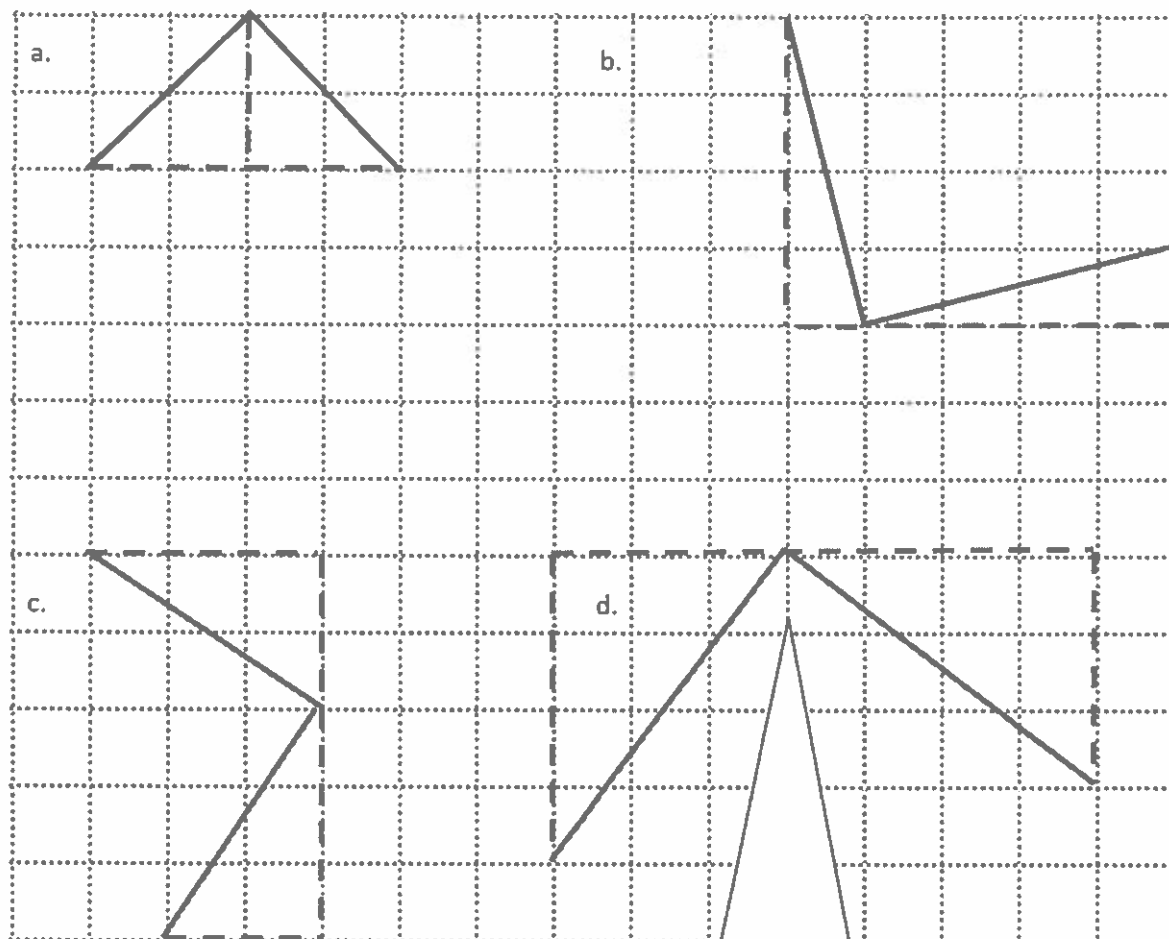
1. Circle the pairs of segments that are perpendicular.

The angle formed by these segments is greater than 90° . These segments are *not* perpendicular.

The angle formed by these segments is less than 90° . These segments are *not* perpendicular.

I can use anything that is a right angle, such as the corner of a paper, to see if it fits in the angle where the lines intersect. If it fits perfectly, then I know that the lines are perpendicular.

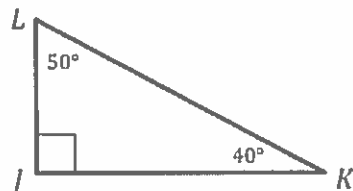
2. Draw a segment perpendicular to each given segment. Show your thinking by sketching triangles as needed.



I can sketch 2 missing sides to create a triangle. Then if I visualize rotating it and sliding it, I can draw a perpendicular segment by sketching the longest side of the triangle.

G5-M6-Lesson 16

1. In the right triangle below, the measure of angle L is 50° . What is the measure of angle K ?

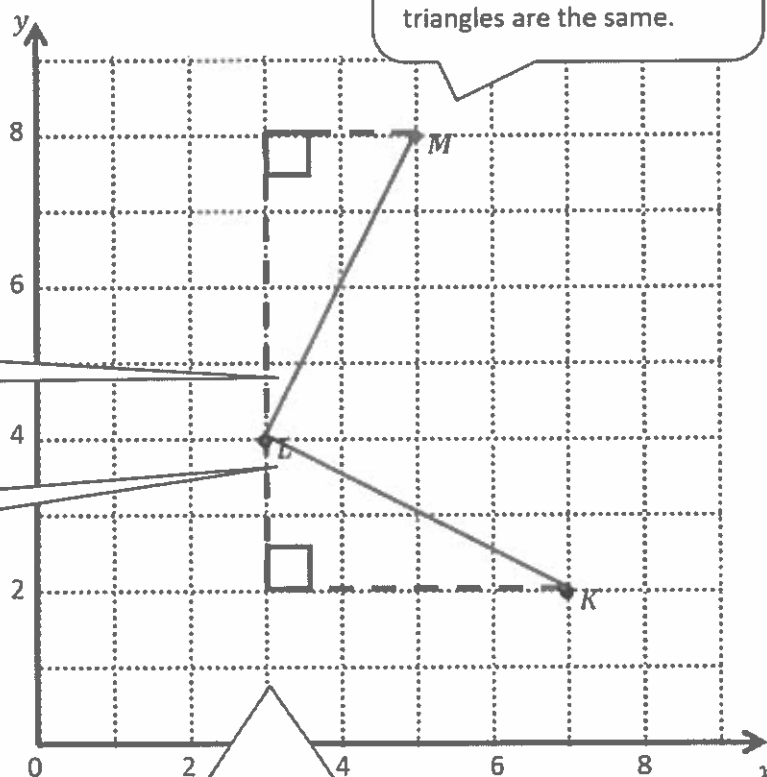


$$\angle K = 40^\circ$$

The sum of the interior angles of *all* triangles is 180° . Triangle JKL is a right triangle. Since $\angle J$ is 90° , and $\angle L$ is 50° , $\angle K$ must be 40° .
 $180^\circ - 90^\circ - 50^\circ = 40^\circ$

2. Use the coordinate plane below to complete the following tasks.

- Draw \overline{KL} .
- Plot point $(5, 8)$.
- Draw \overline{LM} .



This is an acute angle, like $\angle K$, in Problem 1.

This is an acute angle, like $\angle L$, in Problem 1.

After I sketch the right triangle, I can visualize it sliding and rotating. These triangles are the same.

The two triangles I sketched are aligned to create a 180° , or straight angle, along the vertical grid line. So if the two acute angles of the triangles add up to 90° , the angle in between them, $\angle MLK$, must also be 90° .

- d. Explain how you know $\angle MLK$ is a right angle without measuring it.

I used the grid lines to sketch a right triangle with side \overline{LK} , just like in Problem 1. Then I visualized sliding and rotating the triangle so side \overline{LK} matched up with side \overline{LM} .

I know that the measures of the 2 acute angles of a right triangle add up to 90° . So when the long side of the triangle and the short side of the triangle form a straight angle, 180° , the angle in between them, $\angle MLK$, is also 90° .

- e. Compare the coordinates of points L and K . What is the difference of the x -coordinates? The y -coordinates?

$L(3, 4)$ and $K(7, 2)$

The difference of the x -coordinates is 4.

The difference of the y -coordinates is 2.

- f. Compare the coordinates of points L and M . What is the difference of the x -coordinates? The y -coordinates?

$L(3, 4)$ and $M(5, 8)$

The difference of the x -coordinates is 2.

The difference of the y -coordinates is 4.

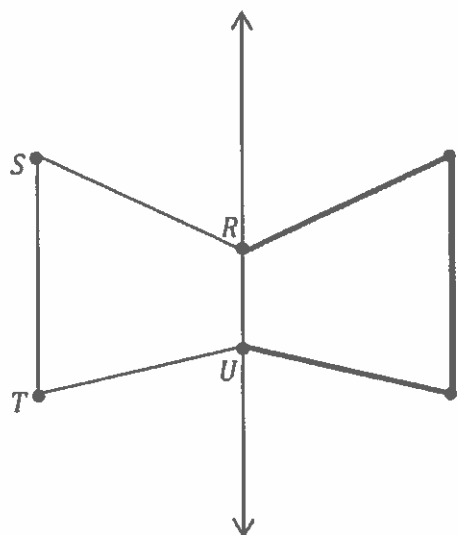
- g. What is the relationship of the differences you found in parts (e) and (f) to the triangles of which these two segments are a part?

The difference in the value of the coordinates is either 2 or 4. That makes sense to me because the triangles that these two segments are part of have a height of either 2 or 4 and a base of either 2 or 4.

When I visualize the triangle sliding and rotating, it makes sense that the x -coordinates and y -coordinates will change by a value of 2 or 4 because that's the length of the triangle's height and base.

G5-M6-Lesson 17

1. Draw to create a figure that is symmetric about \overleftrightarrow{UR} .



In order to create a figure that is symmetric about \overleftrightarrow{UR} , I need to find points that are drawn using a line *perpendicular to and equidistant from* (the same distance from) the line of symmetry, \overleftrightarrow{UR} .

The distance from this point to the line of symmetry is the same as the distance from the line of symmetry to point S , when measured on a line perpendicular to the line of symmetry.

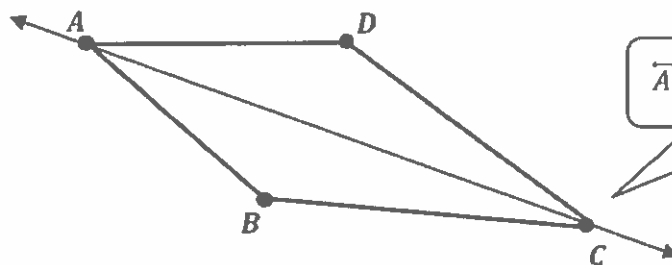
2. Complete the following construction in the space below.

a. Plot 3 non-collinear points, A , B , and C .

b. Draw \overline{AB} , \overline{BC} , and \overline{AC} .

I know that collinear means that the points are "lying on the same straight line," so non-collinear must mean that the three points are *not* on the same straight line.

c. Plot point D , and draw the remaining sides, such that quadrilateral $ABCD$ is symmetric about \overleftrightarrow{AC} .



\overleftrightarrow{AC} is the line of symmetry.

G5-M6-Lesson 18

Use the plane to the right to complete the following tasks.

This will be a vertical line.

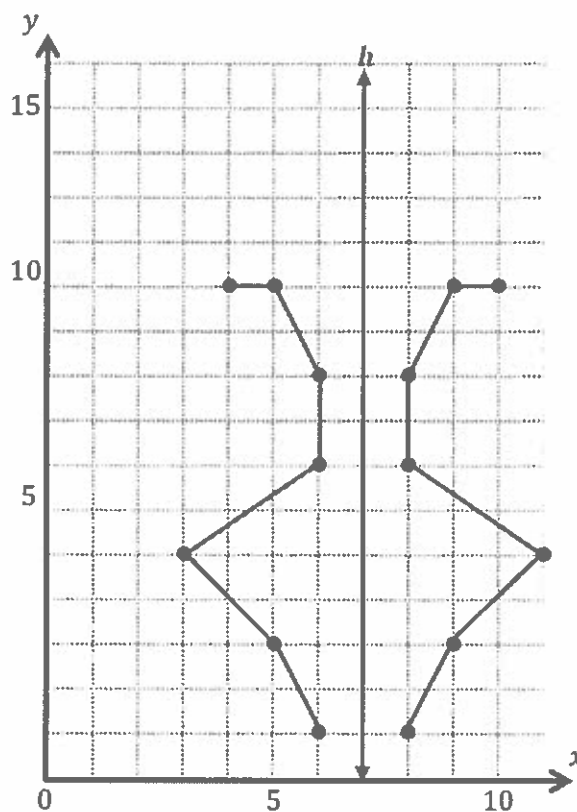
- Draw a line h whose rule is x is always 7.
- Plot the points from Table A on the grid in order. Then, draw line segments to connect the points in order.

Table A

(x, y)
(6, 1)
(5, 3)
(3, 5)
(6, 7)
(6, 9)
(5, 11)
(4, 11)

Table B

(x, y)
(8, 1)
(9, 3)
(11, 5)
(8, 7)
(8, 9)
(9, 11)
(10, 11)



- Complete the drawing to create a figure that is symmetric about line h . For each point in Table A, record the symmetric point on the other side of h .
- Compare the y -coordinates in Table A with those in Table B. What do you notice?

The y -coordinates in Table A are the same as in Table B. Because the line of symmetry is a vertical line, only the x -coordinates will change.

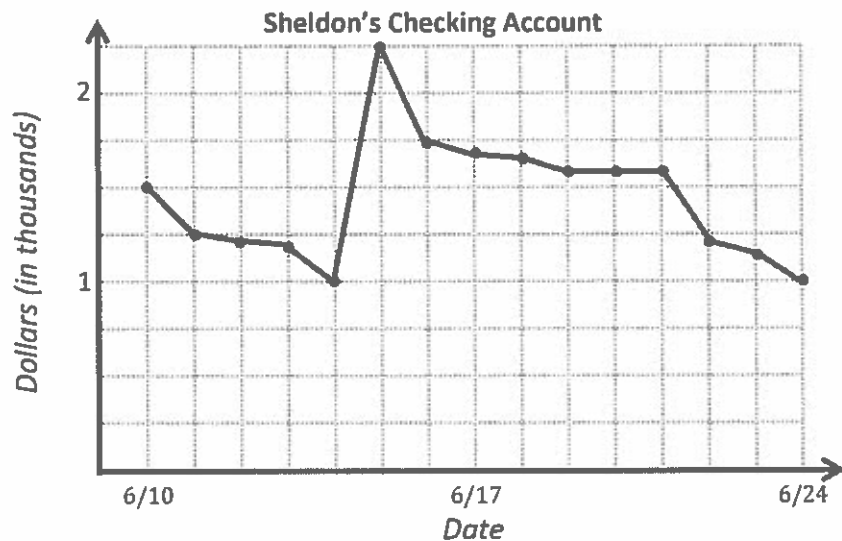
- Compare the x -coordinates in Table A with those in Table B. What do you notice?

I notice that the difference in the x -coordinates is always an even number because the distance that a point is from line h has to double.

G5-M6-Lesson 19

The line graph below tracks the balance of Sheldon's checking account at the end of each day between June 10 and June 24. Use the information in the graph to answer the questions that follow.

I know that it is important to read the scale on the vertical axis so that I know what units the data is referring to. In this graph, the 1 means \$1,000, and the 2 means \$2,000. I can tell that each grid line skip-counts by \$250.



- a. About how much money does Sheldon have in his checking account on June 10?

Sheldon has \$1,500 in his account on June 10. I can tell because the point is on the line exactly between \$1,000 and \$2,000.

- b. If Sheldon spends \$250 from his checking account on June 24, about how much money will he have left in his account?

Sheldon will have \$750 left.

$$\$1,000 - \$250 = \$750$$

- c. Sheldon received a payment from his job that went directly into his checking account. On which day did this most likely occur? Explain how you know.

The amount of money in his account increased by \$1,250 on June 15. This is most likely the day he was paid by his job.

- d. Sheldon paid rent for his apartment during the time shown in the graph. On which day did this most likely occur? Explain how you know.

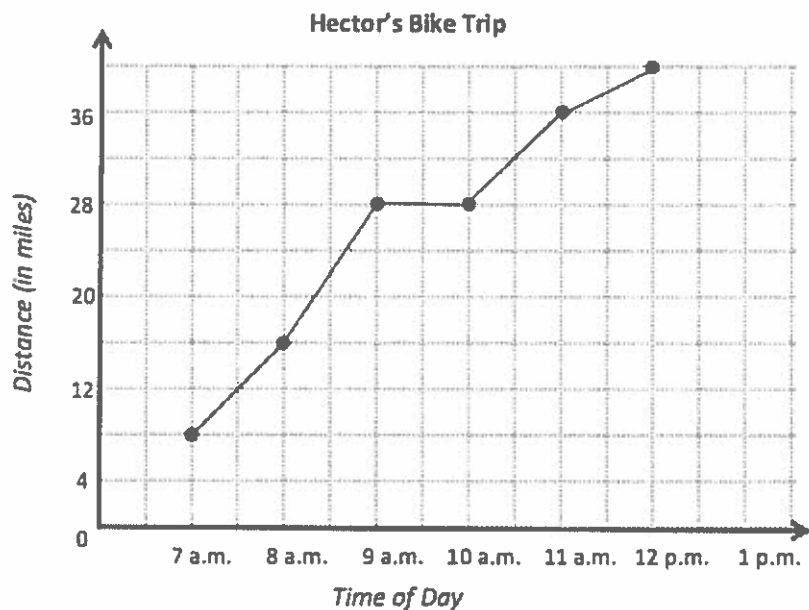
Sheldon might have paid his rent on either June 15 or June 21. These are the two days where Sheldon's account went down most quickly.

G5-M6-Lesson 20

Use the graph to answer the questions.

Hector left his home at 6:00 a.m. to train for a bicycle race. He used his GPS watch to keep track of the number of miles he traveled at the end of each hour of his trip. He uploaded the data to his computer, which gave him the line graph below:

Even though the line does not start at 0, I know that he started at 6:00 a.m., so he had traveled 0 miles at that point.



- a. How far did Hector travel in all? How long did it take?

Hector traveled 40 miles in 6 hours.

Hector started at 6:00 a.m. and stopped at noon. That's 6 hours.

The last data point at 12:00 p.m. shows 40 miles.

- b. Hector took a one-hour break to have a snack and take some pictures. What time did he stop? How do you know?

Hector took his break from 9 a.m. to 10 a.m. The horizontal line at this time tells me that Hector's distance did not change; therefore, he wasn't biking for that hour.

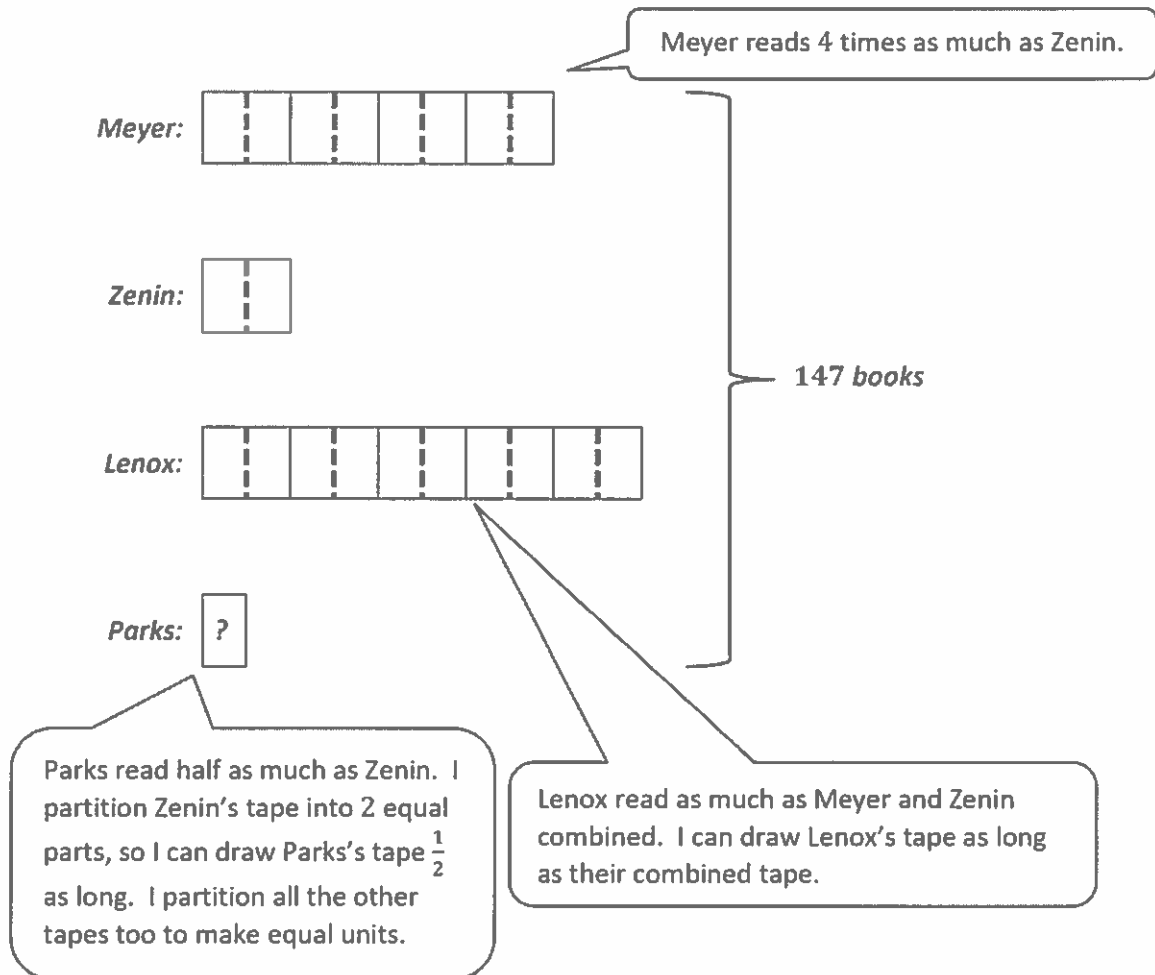
- c. During which hour did Hector ride the slowest?

Hector's slowest hour was his last one between 11:00 a.m. and noon. He only rode 4 miles in that last hour whereas in the other hours he rode at least 8 miles (except when he took his break).

I also know I can look at how steep the line is between two points to help me know how fast or slow Hector rode. The line is not very steep between 11:00 a.m. and noon, so I know that was his slowest hour.

G5-M6-Lesson 21

Meyer read four times as many books as Zenin. Lenox read as many as Meyer and Zenin combined. Parks read half as many books as Zenin. In total, all four read 147 books. How many books did each child read?



$$21 \text{ units} = 147 \text{ books}$$

$$1 \text{ unit} = 147 \text{ books} \div 21 = 7 \text{ books}$$

Parks read 7 books.

$$7 \times 8 = 56$$

Meyer read 56 books.

$$7 \times 2 = 14$$

Zenin read 14 books.

$$56 + 14 = 70$$

Lenox read 70 books.

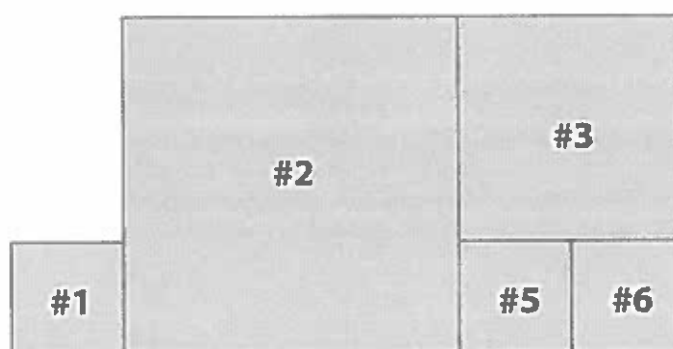
G5-M6-Lesson 22

Solve using any method. Show all your thinking.

I know that squares have all 4 sides of equal length.

Study this diagram showing all the squares. Fill in the table.

Figure	Area in Square Centimeters
1	9 cm^2
2	81 cm^2
3	36 cm^2
5	9 cm^2
6	9 cm^2



The table says the area of Figure 1 is 9 cm^2 .
 $3 \text{ cm} \times 3 \text{ cm} = 9 \text{ cm}^2$
 I know that each side of Figure 1 is 3 cm long.

Figures 5 and 6 are the same size as Figure 1. They also have an area of 9 cm^2 .

Figure 3:

$$3 \text{ cm} + 3 \text{ cm} = 6 \text{ cm}$$

$$6 \text{ cm} \times 6 \text{ cm} = 36 \text{ cm}^2$$

Figure 3 shares a side with Figures 5 and 6. Since the side lengths of Figures 5 and 6 are 3 cm each, the side length of Figure 3 must be 6 cm.

Figure 2:

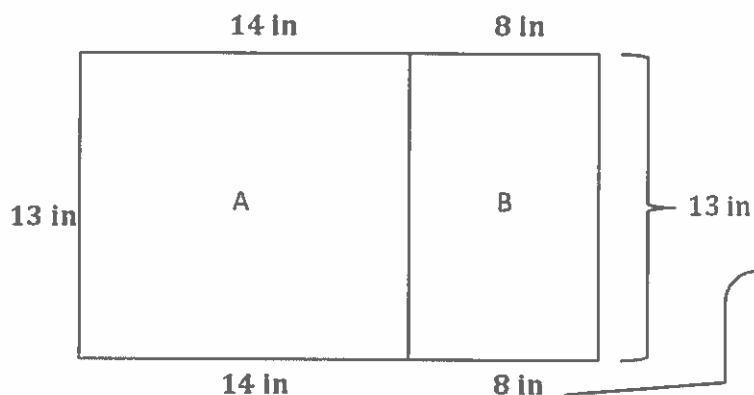
$$6 \text{ cm} + 3 \text{ cm} = 9 \text{ cm}$$

$$9 \text{ cm} \times 9 \text{ cm} = 81 \text{ cm}^2$$

Figure 2 shares a side with Figures 3 and 5. Since the side lengths of Figures 3 and 5 are 6 cm and 3 cm, respectively, the side length of Figure 2 must be 9 cm.

G5-M6-Lesson 23

In the diagram, the length of Figure B is $\frac{4}{7}$ the length of Figure A. Figure A has an area of 182 in^2 . Find the perimeter of the entire figure.



I can label the missing side lengths as I find their values.

I can find the length of Figure A by dividing the area by the width.

Figure A:

$$\text{Area} = \text{length} \times \text{width}$$

$$182 = \underline{\quad} \times 13$$

$$182 \div 13 = 14$$

The length of Figure A is 14 inches.

Now that I know the length of Figure A, I can use it to find the length of Figure B.

Figure B:

$$\frac{4}{7} \text{ of } 14 \text{ inches}$$

$$\frac{4}{7} \times 14$$

$$= \frac{4 \times 14}{7}$$

$$= \frac{56}{7}$$

$$= 8$$

The length of Figure B is 8 inches.

I can find the perimeter of the entire figure by adding up all of the sides.

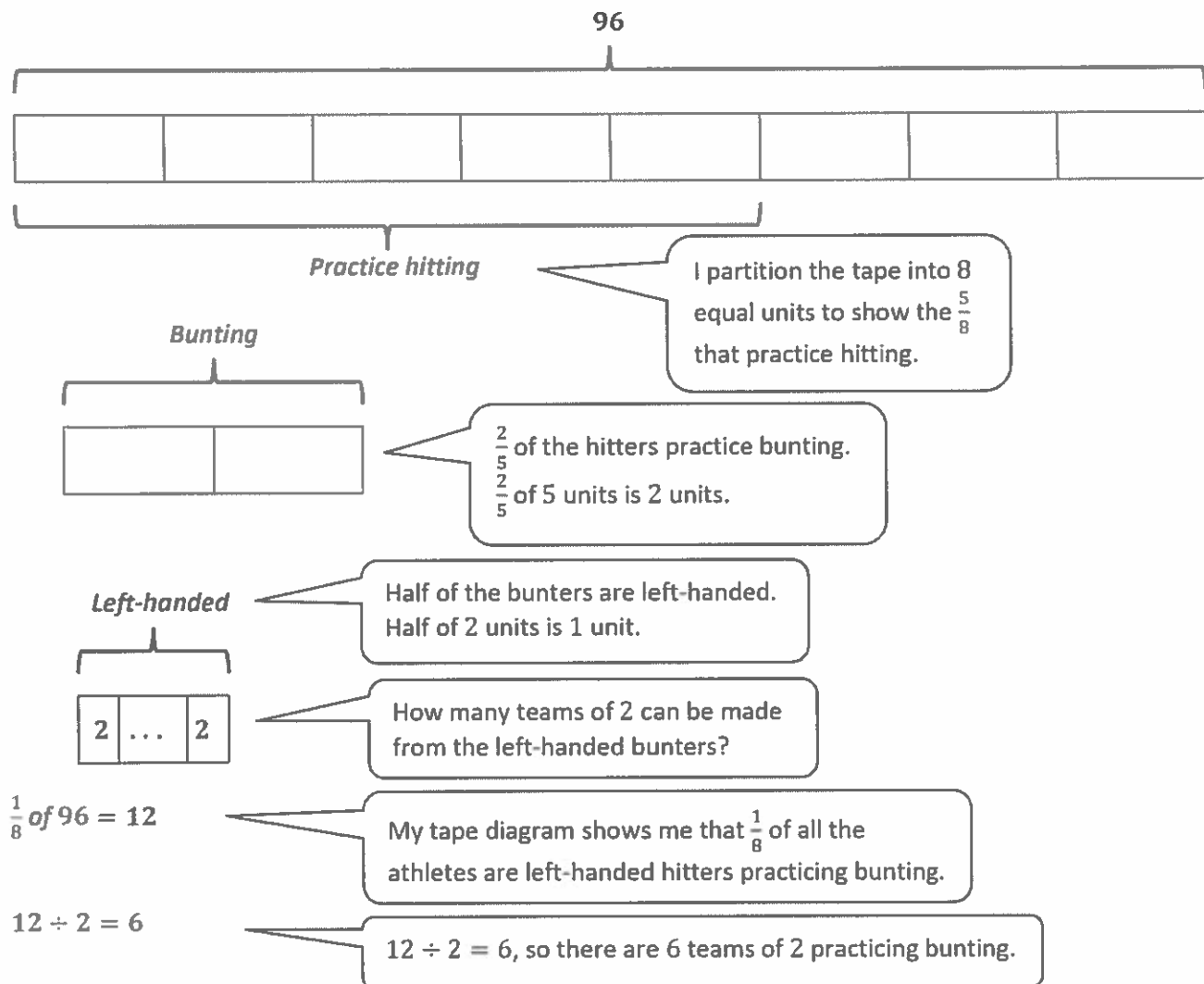
Entire Figure:

$$14 + 8 + 13 + 8 + 14 + 13 = 70$$

The perimeter of the entire figure is 70 inches.

G5-M6-Lesson 24

Howard's Baseball Camp welcomed 96 athletes on the first day of camp. Five-eighths of the athletes began practicing hitting. The hitting coach sent $\frac{2}{5}$ of the hitters to work on bunting. Half of the bunters were left-handed hitters. The left-handed bunters were put into teams of 2 to practice together. How many teams of 2 were practicing bunting?



There are 6 teams of 2 practicing bunting.

G5-M6-Lesson 25

Jason and Selena had \$96 altogether at first. After Jason spent $\frac{1}{5}$ of his money and Selena lent \$15 of her money, they had the same amount of money left. How much money did each of them have at first?

This is important. *After Jason spends and Selena lends, then they have the same amount left.* I need to make sure that my model shows this.

I partition the tape representing Jason's money into 5 equal parts to show the $\frac{1}{5}$ that he spent.

Jason:



Selena:



\$96

My model shows me that 9 units, plus the \$15 that Selena lent, is equal to \$96.

To show that Selena and Jason have the same amount of money left, I partition the tape representing Selena's money the same way that I did Jason's.

$$9 \text{ units} + \$15 = \$96$$

$$9 \text{ units} = \$81$$

$$1 \text{ unit} = \$81 \div 9 = \$9$$

Now that I know the value of 1 unit, I can find out how much money they each had at first.

Jason:

$$1 \text{ unit} = \$9$$

$$5 \text{ units} = 5 \times \$9 = \$45$$

Jason had \$45 at first.

Selena:

$$1 \text{ unit} = \$9$$

$$4 \text{ units} = 4 \times \$9 = \$36$$

$$\$36 + \$15 = \$51$$

Selena had \$51 at first.

G5-M6-Lesson 26

1. For the phrase below, write a numerical expression, and then evaluate your expression.

Subtract three halves from one sixth of forty-two.

$$\begin{aligned} & \frac{1}{6} \times 42 - \frac{3}{2} \\ &= \frac{42}{6} - \frac{3}{2} \\ &= 7 - \frac{3}{2} \\ &= 7 - 1\frac{1}{2} \\ &= 5\frac{1}{2} \end{aligned}$$

Even though it says the word “*subtract*” first, I need to have something to subtract from. So I won’t subtract until I find the value of “*one sixth of forty-two*.”

2. Write at least 2 numerical expressions for the phrase below. Then, solve.

Two fifths of nine

$$\frac{2}{5} \times 9$$

$$\left(\frac{1}{5} \times 9\right) \times 2$$

$$\begin{aligned} & \frac{2}{5} \times 9 \\ &= \frac{2 \times 9}{5} \\ &= \frac{18}{5} \\ &= 3\frac{3}{5} \end{aligned}$$

This is “*one fifth of nine, doubled*,” which is equal to “*two fifths of nine*.”

“*Two fifths of nine*” is equal to $3\frac{3}{5}$.

3. Use $<$, $>$, or $=$ to make true number sentences without calculating. Explain your thinking.

a. $\left(481 \times \frac{9}{16}\right) \times \frac{2}{10}$ \bigcirc $\left(481 \times \frac{9}{16}\right) \times \frac{7}{10}$

Both expressions have the same first factor, $\left(481 \times \frac{9}{16}\right)$.

Since the second factor, $\frac{7}{10}$, is greater than $\frac{2}{10}$, the expression on the right is greater.

b. $\left(4 \times \frac{1}{10}\right) + \left(9 \times \frac{1}{100}\right)$ \bigcirc 0.409

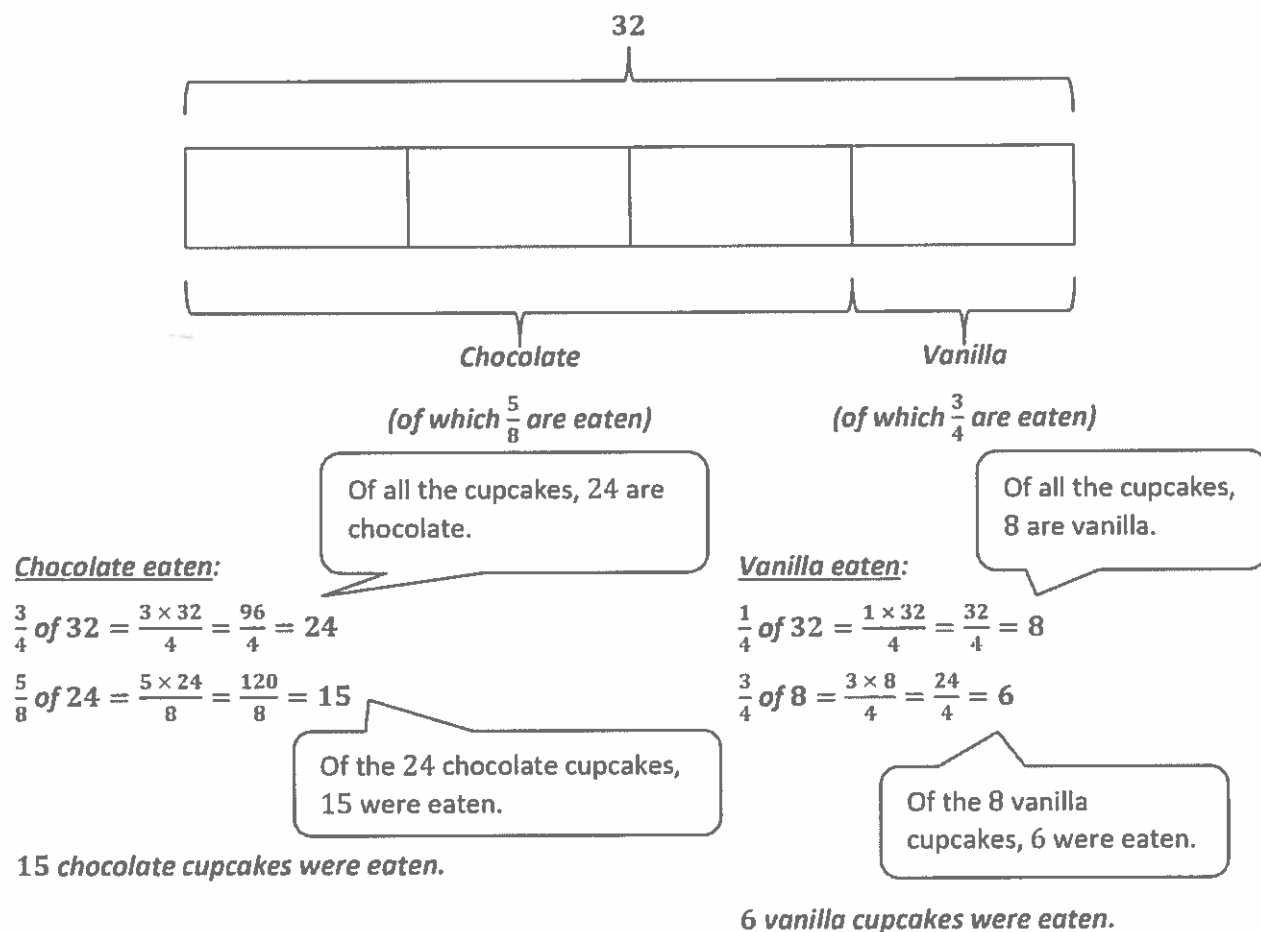
The expression on the left is equal to 0.49.

The expression on the right also has 0 ones and 4 tenths, but there are 0 hundredths in 0.409.

G5-M6-Lesson 27

1. Use the RDW process to solve the word problem below.

Daquan brought 32 cupcakes to school. Of those cupcakes, $\frac{3}{4}$ were chocolate, and the rest were vanilla. Daquan's classmates ate $\frac{5}{8}$ of the chocolate cupcakes and $\frac{3}{4}$ of the vanilla. How many cupcakes are left?



Cupcakes left:

$$32 - (15 + 6) = 32 - 21 = 11$$

11 cupcakes are left.


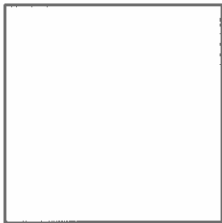
I find the number of leftover cupcakes by subtracting those that were eaten from the 32 original cupcakes.

2. Write and solve a word problem for the expression in the chart below.

Expression	Word Problem	Solution
$5 - \left(\frac{5}{12} + \frac{1}{3}\right)$	<i>During her 5-day work week, Mrs. Gomez spends $\frac{5}{12}$ of one day and $\frac{1}{3}$ of another in meetings. How much of her work week is <u>not</u> spent in meetings?</i>	$5 - \left(\frac{5}{12} + \frac{1}{3}\right)$ $= 5 - \left(\frac{5}{12} + \frac{4}{12}\right)$ $= 5 - \frac{9}{12}$ $= 4\frac{3}{12}$ $= 4\frac{1}{4}$ <p>$4\frac{1}{4}$ days of Mrs. Gomez' work week was not spent in meetings.</p>

G5-M6-Lesson 29

Use your ruler, protractor, and set square to help you give as many names as possible for each figure below. Then, explain your reasoning for how you named each figure.

Figure	Names	Reasoning for Names
<p>a.</p> 	<p><i>quadrilateral</i> <i>trapezoid</i></p>	<p><i>This figure is a <u>quadrilateral</u> because it is a closed figure with 4 sides.</i></p> <p><i>It's also a <u>trapezoid</u> because it has at least one pair of parallel sides. The top and bottom sides are parallel.</i></p>
<p>b.</p> <p>I use my protractor and ruler to measure the angles and the side lengths.</p>  <p>This shape has four 90° angles and four equal sides. That means it's a square, but it has other names, too.</p>	<p><i>quadrilateral</i> <i>trapezoid</i> <i>parallelogram</i> <i>rectangle</i> <i>rhombus</i> <i>kite</i> <i>square</i></p>	<p><i>This figure is a <u>quadrilateral</u> because it is a closed figure with 4 sides.</i></p> <p><i>It's also a <u>trapezoid</u> because it has at least one pair of parallel sides. This shape actually has 2 pairs.</i></p> <p><i>This shape is also a <u>parallelogram</u> because opposite sides are both parallel and equal in length.</i></p> <p><i>It's also a <u>rectangle</u> because it has 4 right angles.</i></p> <p><i>It's a <u>rhombus</u> because all 4 sides are equal in length.</i></p> <p><i>It's also a <u>kite</u> because it has 2 pairs of adjacent sides that are equal in length.</i></p> <p><i>But most specifically, it's a <u>square</u> because it has 4 right angles and 4 sides of equal length.</i></p>

G5-M6-Lesson 31

Lesson Notes

To get a better understanding of the Fibonacci numbers, watch the short video, "Doodling in Math: Spirals, Fibonacci, and Being a Plant" by Vi Hart (<http://youtu.be/ahXIMUKSXX0>).

1. In your own words, describe what you know about the Fibonacci numbers.

The Fibonacci numbers are really interesting. They're a list of numbers. You can always find the next number in the series by adding together the 2 numbers that come before it.

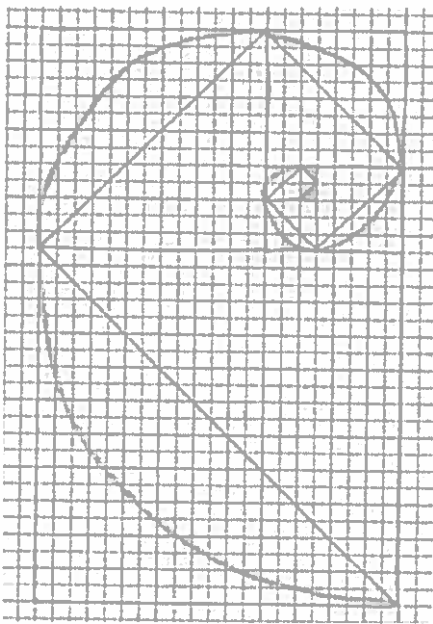
For example, if part of the series is 13 and then 21, then the next number in the list will be 34 because $13 + 21 = 34$.

I can remember the first few Fibonacci numbers:

1, 1, 2, 3, 5, 8, 13, 21, 34.

2. Describe what the drawing you did in class today looked like.

I can visualize what we drew in class. It looked like this:



At first, the drawing just looked like a bunch of square boxes drawn near one another that had a side in common. But then we drew a diagonal line across each square. Then we drew a more curved line inside each square, and it created this really neat spiral pattern, kind of like a seashell.

After we drew it, we wrote down the side length of each square we drew and realized that they were the Fibonacci numbers. In other words, the first 2 squares we drew had a side length of 1, then the next square had a side length of 2, then 3, then 5, and so on.

G5-M6-Lesson 32

Lesson Notes

To get a better understanding of the Fibonacci numbers, watch the short video, “Doodling in Math: Spirals, Fibonacci, and Being a Plant” by Vi Hart (<http://youtu.be/ahXIMUKSXX0>).

1. Complete the Fibonacci sequence in the table below.

The values in the top row tell the order of the numbers in the sequence. For example, this is the 6th number in the sequence.

1	2	3	4	5	6	7	8	9
1	1	2	3	5	8	13	21	34

I can find the value of the next number in the sequence by adding together the two previous numbers. $5 + 8 = 13$; therefore, the 7th number in the sequence is 13.

2. If the 12th and 13th numbers in the sequence are 144 and 233, respectively, what is the 11th number in the series?

$$\underline{\quad} + 144 = 233$$

$$233 - 144 = 89$$

What number plus 144 is equal to 233? I can use subtraction to solve.

The 11th number in the series is 89.

G5-M6-Lesson 33

Find a rectangular box at your home. Use a ruler to measure the dimensions of the box to the nearest centimeter. Then, calculate the volume of the box.

I find the volume of rectangular prisms, or boxes, by multiplying the 3 dimensions together.
 $\text{Volume} = \text{length} \times \text{width} \times \text{height}$

Item	Length	Width	Height	Volume
<i>Toy Shoe Box</i>	8 cm	3 cm	6 cm	144 cm^3

The length of the shoe box was exactly 7.5 cm, but the directions said to measure to the nearest centimeter. I round 7.5 up to 8.

$8 \times 3 \times 6 = 24 \times 6 = 144$
The volume of the shoe box is 144 cubic centimeters.