Math 6

Summer Review Packet

Name: ____

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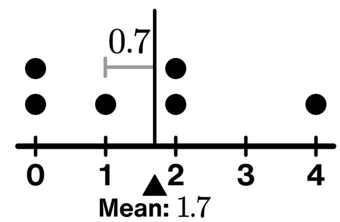
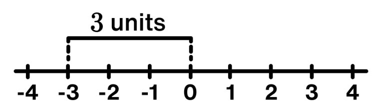
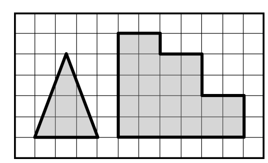
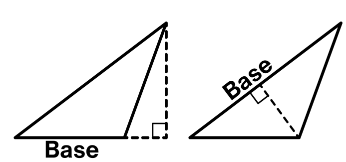
Math 6 Glossary

Term	Definition
absolute deviation (from the mean)	Absolute deviation is the distance between a value and the mean of a data set. If a class's mean number of pets is 1.7, then the absolute deviation of a student who has 1 pet is 0.7. 
absolute value	The absolute value of a number is its distance from 0 on the number line. The absolute value of -3 is 3 because -3 is 3 units away from 0. This is written as $\|-3\| = 3$. $\|4\| = 4$ and $\|-4\| = 4$. They are both 4 units away from 0. 
area	Area measures the space inside a two-dimensional figure. It is expressed in square units. The area of the left shape is 6 square units. The area of the right shape is 22 square units. 
at the same rate	*At the same rate* means that something continues in the same way. Example: • If Michael walks 3 meters in 2 seconds, how many seconds will it take him to walk 30 meters at the same rate? Here, *at the same rate* means Michael will not slow down or speed up. He will continue walking 3 meters every 2 seconds.
base (of a parallelogram or triangle)	The base of a parallelogram or triangle is one side. We can choose any side to be the base. The base can also refer to the length of this side. The height of a shape is perpendicular to the base. 

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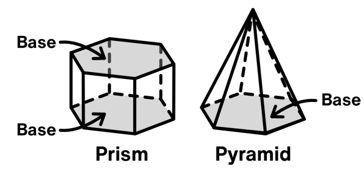
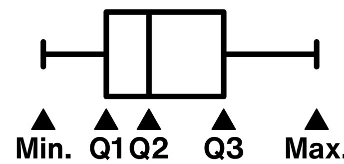
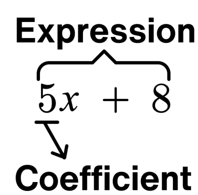
Term	Definition
base (of a pyramid or prism)	The base of a pyramid or prism is the face that gives the solid its name. A prism has two identical bases that are parallel. A pyramid has one base. 
box plot	A box plot is one way to visualize numerical data. The data is divided into four sections using five numbers: the minimum, Q1, Q2 (or the median), Q3, and the maximum. The box is drawn between Q1 and Q3, and the line inside the box represents the median. 
categorical data	Categorical data has values that are words instead of numbers. *What kind of pet do you have?* is a question that asks for categorical data.
coefficient	A coefficient is a number multiplied by a variable, usually without a symbol in between the number and the variable. In the expression $5x + 8$, the coefficient of x is 5. 
common denominator	Two fractions have a common denominator when the denominator (the bottom number in each fraction) is the same. For example, $\frac{3}{4}$ and $\frac{5}{4}$ have a common denominator because they each split the whole into fourths. $\frac{1}{2}$ and $\frac{1}{4}$ do not have a common denominator, but you can write $\frac{1}{2}$ as $\frac{2}{4}$ to create a common denominator.

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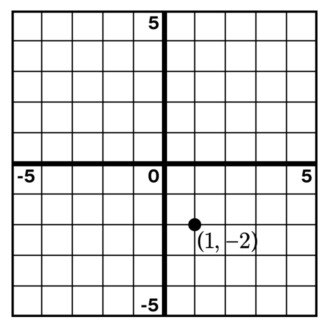
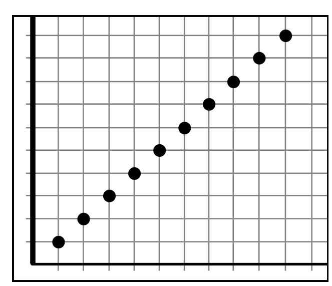
common factor	A common factor of two numbers is a number that is a factor of both numbers. For example, 2 is a factor of 8 and also of 12, so 2 is a common factor of 8 and 12. **Factors of** 8 1, 2, 4, 8 **Factors** 12 1, 2, 3, 4, 6, 12
common multiple	A common multiple of two numbers is a number that is a multiple of both numbers. For example, 12 is a multiple of 2 and also of 3, so 12 is a common multiple of 2 and 3. **Multiples of** 2 2, 4, 6, 8, 10, 12, . . . **Multiples of** 3 3, 6, 9, 12, 15, 18, . . .
coordinate plane	The coordinate plane consists of two axes, one vertical and one horizontal, that intersect at 0. Locations are described by coordinate pairs such as $(1, -2)$, where 1 is the location on the horizontal number line and -2 is the location on the vertical number line. 
dependent variable	The dependent variable is the variable in a relationship that is the effect or result. For example, if we are exploring the distance a boat can travel in different amounts of time, the dependent variable is the distance traveled, d. The dependent variable is typically on the vertical axis of a graph and the right-hand column of a table. 

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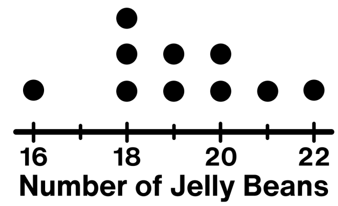
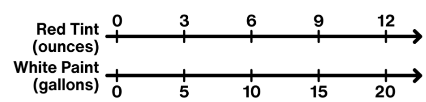
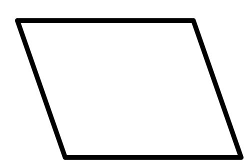
Term	Definition
dot plot	A dot plot is one way to visualize data. Each data point is shown as a dot above its value, stacking on top of other dots with the same value. For example, this dot plot shows that 3 students guessed that there were 18 jelly beans in a jar. 
double number line diagram	A double number line diagram is a pair of parallel number lines showing equivalent ratios. The tick marks are labeled so that the marks that line up vertically are equivalent ratios. This double number line diagram shows a ratio of 3 ounces of red tint : 5 gallons of white paint. 
edge	Each straight side of a polygon is called an edge. This parallelogram has four edges. 
equivalent expressions	Equivalent expressions are different ways of describing the same quantity. $x + x + x$ is equivalent to $3x$ because they both describe three copies of an unknown number, x.

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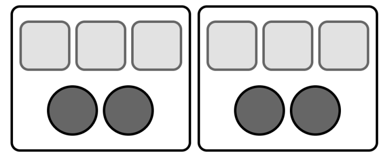
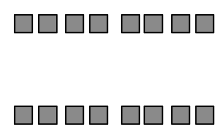
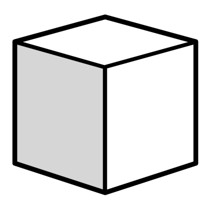
Term	Definition
equivalent ratio	Two ratios are equivalent if you can multiply each of the values in the first ratio by the same number to get the values in the second ratio. $3:2$ is equivalent to $6:4$ because $3 \cdot 2 = 6$ and $2 \cdot 2 = 4$. One lemonade uses 3 cups of water and 2 lemons. Another uses 6 cups of water and 4 lemons. The second recipe will make twice as much lemonade but both recipes will taste the same. 
exponent	Exponents describe repeated multiplication. For example, $2^4 = 2 \cdot 2 \cdot 2 \cdot 2 = 16$. 2^4 is called “2 to the power of 4” or “2 to the fourth.” In 2^4, 2 is called the base and 4 is called the exponent.  2^4
face	Each flat side of a polyhedron is called a face. A cube has six faces and they are all squares. 
greatest common factor (GCF)	The greatest common factor (GCF) is the largest number that is a common factor of two numbers. The common factors of 8 and 12 are $1,\ 2,$ and 4. The greatest common factor is 4.

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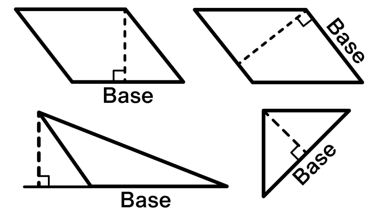
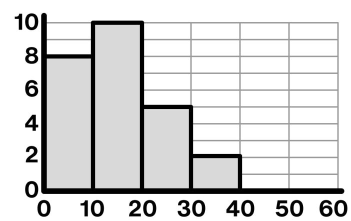
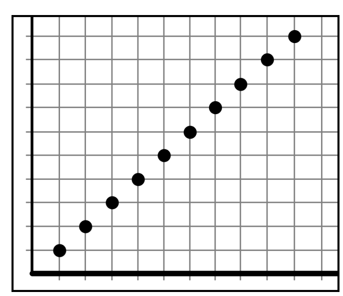
Term	Definition
height	The height of a parallelogram is the perpendicular distance between a base and its opposite side. The height of a triangle is the perpendicular distance between a base and its opposite vertex. Sometimes, the height falls outside the shape. Here, the height is shown by a dotted line. 
histogram	A histogram is one way to visualize numerical data. The data in a histogram is grouped into bins each shown by a rectangle. The height of each rectangle shows how many values are in that bin. For example, this histogram shows that there are 8 values between 0 and 10. 
independent variable	The independent variable is the variable in a relationship that is the cause. For example, if we are exploring the distance a boat can travel in different amounts of time, the independent variable is the amount of time, t. The independent variable is typically on the horizontal axis of a graph and the left-hand column of a table. 

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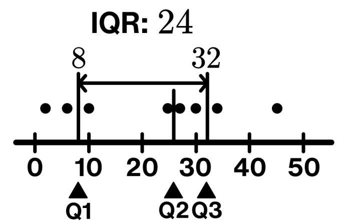
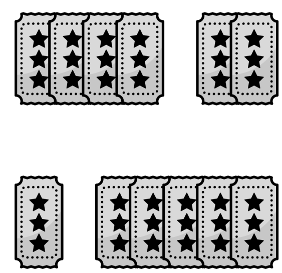
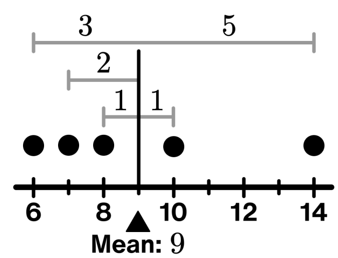
Term	Definition
interquartile range (IQR)	Interquartile range (or IQR) is a measure of spread. It is the distance from Q1 to Q3 and the width of the box in a box plot. For example, the IQR of this data set is $32 - 8 = 24$. 
least common multiple (LCM)	The least common multiple (LCM) is the smallest number that is a common multiple of two numbers. The common multiples of 2 and 3 are $6,\ 12,\ 18,\ ...$ The least common multiple is 6.
mean	The mean or average is a measure of center. The mean is the number of items in each group if the items are distributed equally or the balance point of a dot plot. To calculate the mean, you can add up all the data values, and divide by the number of data points. In this situation, the mean is 3 tickets.  $4 + 2 + 1 + 5 = 12$ $12 \div 4 = 3$
mean absolute deviation (MAD)	The mean absolute deviation (or MAD) is one way to measure how spread out a data set is. It is the average of all of the absolute deviations of the points in a data set. To calculate the MAD, determine the distance between each data point and the mean, then calculate the mean of those distances. In this example, the MAD is 2.4 because $3 + 2 + 1 + 1 + 5 = 12$ and $12 \div 5 = 2.4$. 

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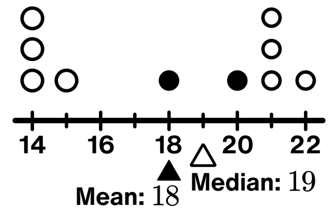
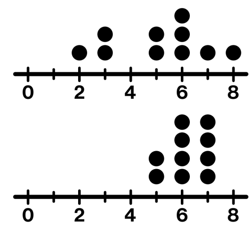
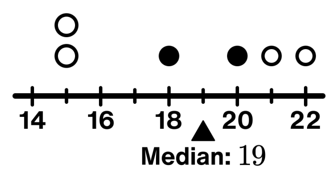
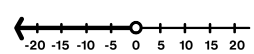
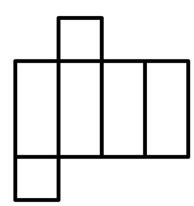
Term	Definition	
measure of center	A measure of center is a single number that summarizes all of its values. It is usually a typical value for a data set. Mean and median are measures of center.	
measure of spread	A measure of spread tells us how bunched up or spread out the values in a data set are. Range, interquartile range, and mean absolute deviation are measures of spread. For example, the dot plot on the top has a larger spread than the dot plot on the bottom.	
median	Median is a measure of center. It is the middle value of a data set when the values are in numerical order. If there are two values in the middle of the data set, then the median is the mean of those two values.	
negative number	A negative number is a number that is **less** than 0. On a horizontal number line, negative numbers are to the left of 0.	
net	A net is a two-dimensional figure that can be folded to make a polyhedron. Here is a net for a rectangular prism.	

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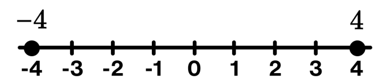
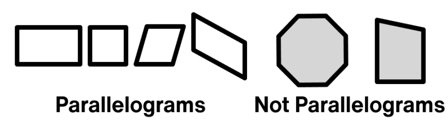
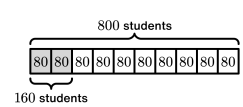
Term	Definition
numerical data	Numerical data has values that are numbers and can be measured. *How many pets do you have?* is a question that asks for numerical data.
opposite	Two numbers are opposites if they are the same distance from 0 and on different sides of the number line. For example, 4 is the opposite of -4, and -4 is the opposite of 4. 
parallelogram	A parallelogram is a quadrilateral that has two pairs of parallel sides. The opposite sides of a parallelogram are the same length. 
per	The word *per* means "for each." For example, if the price is $\$5$ per ticket, that means that each ticket costs $\$5$. Buying 4 tickets would cost $\$5 \cdot 4 = \$20$.
percent	*Percent* means *for every* 100. It is represented by the percent symbol: $\%$. We use percents to represent ratios and fractions. 25% means $25:100$. 25% of something means $\frac{25}{100}$ or $\frac{1}{4}$ of it. Example: • There are 800 students in a school. If 20% of them are on a field trip, then that is 160 students because 20 are on the trip for every 100 students total. 
percentage	*Percentage* is part of every 100. It is similar to percent. Examples: • Only a small percentage of students went on the trip. • If a goalie saves 96 out of 100 shots, his percentage of saves is 96%.

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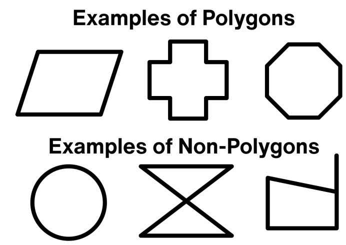
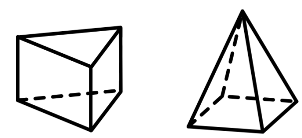
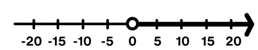
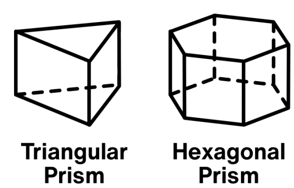
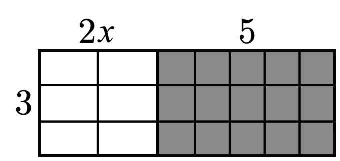
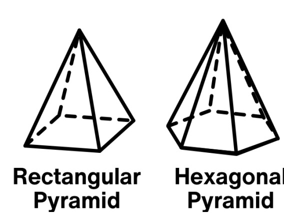
Term	Definition	
polygon	A polygon is a closed two-dimensional shape with straight sides that do not cross each other.	
polyhedron	A polyhedron is a closed three-dimensional shape with flat sides. When we have more than one polyhedron, we call them polyhedra. Here are some drawings of polyhedra.	
positive number	A positive number is a number that is **greater** than 0. On a horizontal number line, positive numbers are to the right of 0.	
prism	A prism is a solid that has two bases that are identical copies. The bases are connected by rectangles or parallelograms.	
product	A product describes two or more quantities that are being multiplied together. For example, the area of this rectangle is the product of 3 and $2x + 5$ or $3(2x + 5)$.	 **Area as a Product** $3(2x + 5)$
pyramid	A pyramid is a solid in which the base is a polygon. All of the other faces are triangles that meet at a single vertex.	

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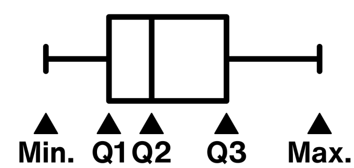
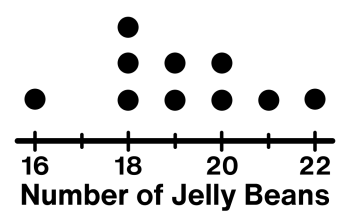
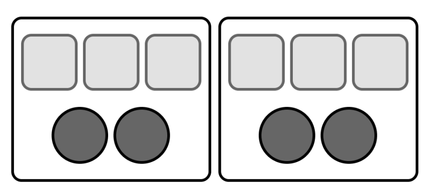
Term	Definition
quadrilateral	A quadrilateral is a type of polygon that has four sides. Parallelograms and rectangles are examples of quadrilaterals.
quartile	Quartiles divide a data set into four sections. Quartile 1 is the median of the lower half of the data. Q2 is also the median. Q3 is the median of the upper half of the data. Q4 is also the maximum. 
quotient	A quotient is the result of dividing two numbers. In the equation $12 \div 3 = 4$, 4 is the quotient.
range	Range is a measure of spread. It is the difference between the maximum and minimum values in a data set. For example, the range of this data set is 6 jelly beans because $22 - 16 = 6$. 
ratio	A ratio a: b is a relationship between two quantities. For every a of the first, there are b of the second. If the ratio of apples to oranges in a fruit bowl is 2: 3, then for every 2 apples, there are 3 oranges.  There are several ways to describe ratios. • For every 3 squares, there are 2 circles. • The ratio of squares to circles is 3 to 2. • The ratio of squares to circles is 3: 2.

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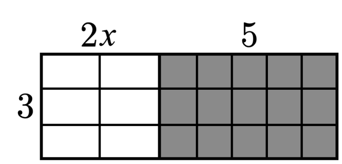
sign	The sign of a number (other than 0) is either positive or negative. For example, the sign of 4 or $+\ 4$ is positive. The sign of -4 is negative. Zero does not have a sign. It is not positive or negative.
solution to an equation	A solution to an equation is a value of a variable that makes the equation true. For example, 5 is a solution to the equation $3x = 15$ because $3(5) = 15$. 6 is not a solution to the equation $3x = 15$ because $3(6) = 15$ is not true. $3x = 15$ $x = 5$ $3(5) = 15$
solution to an inequality	A solution to an inequality is any value of a variable that makes the inequality true. For example, 5 is a solution to the inequality $x < 10$ because $5 < 10$. Some other solutions to $x < 10$ are 9.99, 0, and -4.
statistic	A statistic is a single number that measures something about a data set. Examples of statistics: mean, median, MAD and IQR.
statistical question	A statistical question requires more than one piece of data to answer it. Here are some examples of statistical questions: ● *What is the most popular band at your school?* ● *When do students in your class typically eat dinner?*
sum	A sum describes two or more quantities that are being added together. For example, the area of this rectangle is the sum of $6x$ and 15 or $6x + 15$.  **Area as a Sum** $6x + 15$

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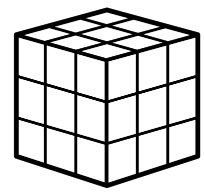
<table>
<tr><th>Term</th><th>Definition</th></tr>
<tr><td>surface area</td><td>
The surface area of a polyhedron is the sum of the areas of its faces.

If the six faces of a cube each have an area of 9 square centimeters, then the surface area of the cube is $6 \cdot 9$, or 54 square centimeters.

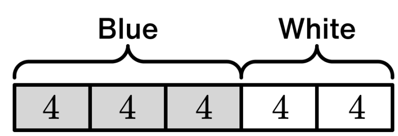

</td></tr>
<tr><td>table</td><td>
A table organizes information into horizontal rows and vertical columns. The first row or column usually tells what the numbers represent.

Here is a table showing the tail lengths of three different pets. This table has four rows and two columns.

<table>
<tr><th>Pet</th><th>Tail Length (in.)</th></tr>
<tr><td>Dog</td><td>22</td></tr>
<tr><td>Cat</td><td>12</td></tr>
<tr><td>Mouse</td><td>2</td></tr>
</table>
</td></tr>
<tr><td>tape diagram</td><td>
A tape diagram is a long, skinny rectangle cut into shorter lengths. It is used to show relationships between quantities.

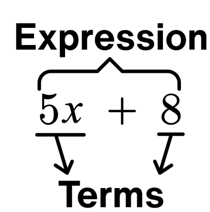
This tape diagram shows a ratio of 12 gallons of blue paint to 8 gallons of white paint.

If each rectangle were labeled 5 instead of 4, then the picture would represent the ratio 15 gallons blue : 10 gallons white.



</td></tr>
<tr><td>term</td><td>
A term is a part of an expression that involves addition. It can be a single number, a variable, or a variable and a number multiplied together.

For example, the expression $5x + 8$ has two terms. The first term is $5x$ and the second term is 8.



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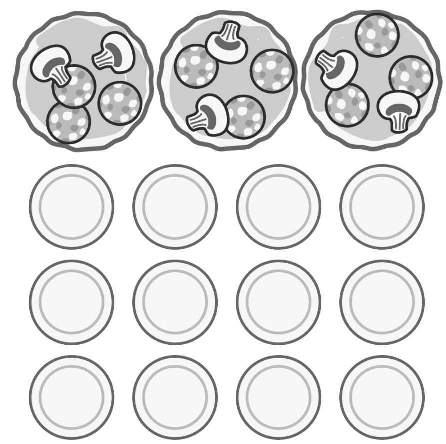
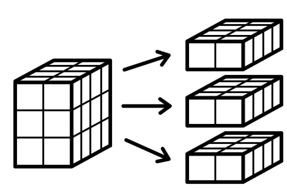
Math 6 Glossary

Term	Definition
unit price	The *unit price* is the cost for one item or the cost per item. For example, if 4 avocados cost $\$12$, then the unit price is $\frac{\$12}{4} = \$3$ per avocado.
unit rate	A *unit rate* is a rate per 1. If 12 people share 3 pizzas equally, then one unit rate is 4 people per pizza. Another unit rate is $\frac{1}{4}$ pizza per person. 
variable	A variable is a letter or symbol that represents a number. You can choose different numbers for the value of the variable. In the expression $10 - x$, the variable is x. If $x = 3$, then $10 - x = 7$. If $10 - x = 4$, then $x = 6$.
volume	Volume is the number of cubic units that fill a solid without any gaps or overlaps. The volume of this rectangular prism is 24 cubic units because it is composed of 3 layers that are each 8 cubic units. 

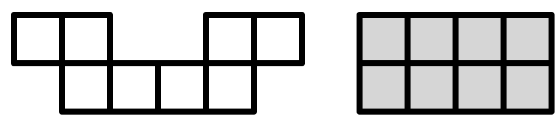
Unit 1 Summary

Prior Learning	**Math 6, Unit 1**	**Future Learning**
Grades 3–5 ● Area of rectangles ● Classifying quadrilaterals ● Parallel and perpendicular lines ● Volume of rectangular prisms	● Area (parallelograms, triangles, and polygons) ● Surface area	Math 7 ● Area and circumference of circles ● Volume and surface area of prisms Math 8 ● Volume of cylinders, cones, and spheres

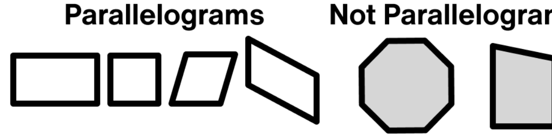
Areas of Parallelograms

Area measures the number of square units that cover a shape without gaps or overlaps.

The area of each shape here is 8 square units.

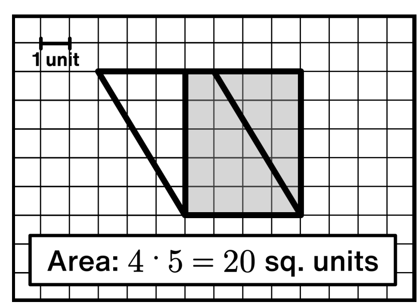


Parallelograms are four-sided shapes whose opposite sides are parallel and the same length.



The area of a parallelogram is equal to the area of the rectangle with the same base and height.

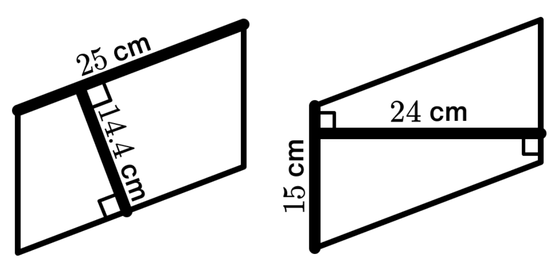
$$Area = base \cdot height$$



The base of a parallelogram can be any side.

The height is the perpendicular distance from the base to the opposite side.

The area of this parallelogram is $25 \cdot 14.4 = 360$, or $15 \cdot 24 = 360$ square centimeters.



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Unit 6.1, Family Resource

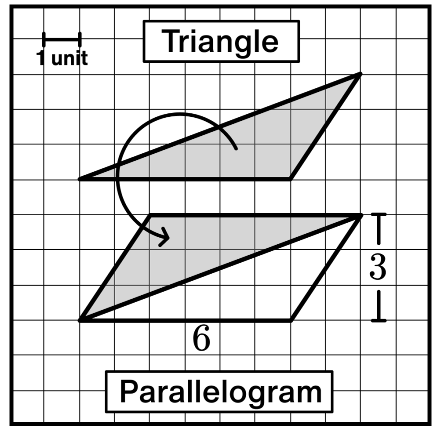
Areas of Triangles

We can use our knowledge of parallelograms to determine the areas of triangles.

If we make a copy of a triangle, we can use the two triangles to form a parallelogram.

The area of this parallelogram is $6 \cdot 3 = 18$ square units, so the area of the triangle is $\frac{1}{2} \cdot 18 = 9$ square units.

We can write this in a formula as $Area = \frac{1}{2} \cdot base \cdot height$.

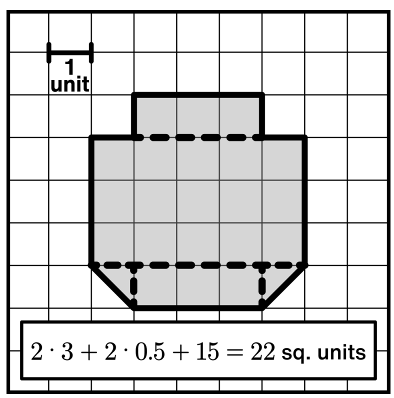


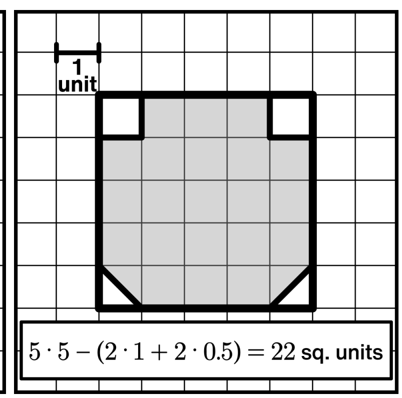
Areas of Polygons

Polygons are a category of 2-D shapes that have straight sides that do not cross or leave gaps.

To determine the area of a polygon, we can **decompose** (break) it into smaller pieces, then add the areas of each piece.

We can also **surround** the polygon with a shape whose area we know and then **subtract** the unshaded parts.



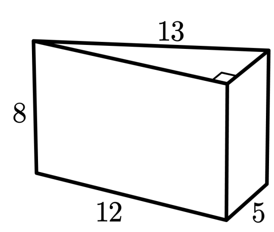


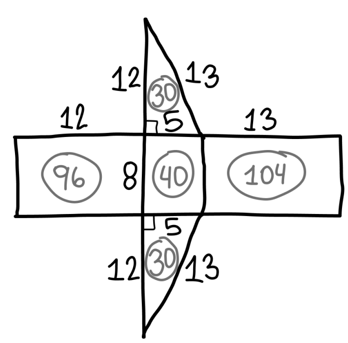
Surface Area

The *surface area* of a solid (also called a *polyhedron*) is the sum of the areas of its faces.

One way to determine the surface area of a polyhedron is to draw its *net*, a 2-D figure that can be folded to make a prism, pyramid, or other solid.

The surface area of this *triangular prism* is $30 \cdot 2 + 40 + 96 + 104 = 300$ square units.

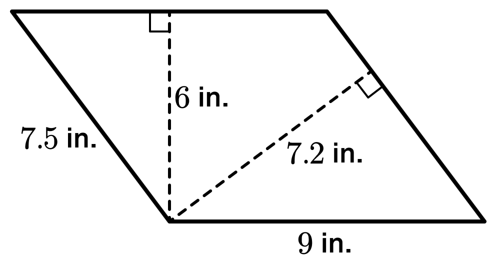




Try This at Home

Areas of Parallelograms

Andrea and Elena are investigating this parallelogram.



1.1 Andrea says that 9 inches is the base and 6 inches is the height. Elena says that 7.5 inches is the base and 7.2 inches is the height. Who do you agree with?

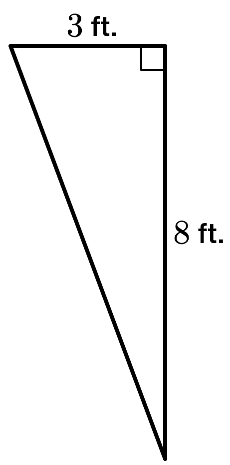
Explain your reasoning.

1.2 Calculate the area of the parallelogram.

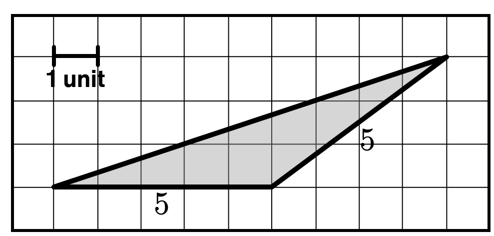
Areas of Triangles

Calculate the area of each triangle.

2.1



2.2



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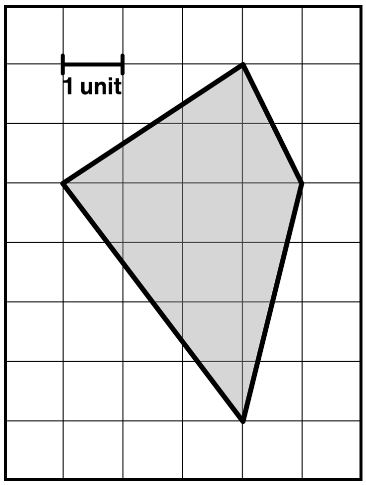
Unit 6.1, Family Resource

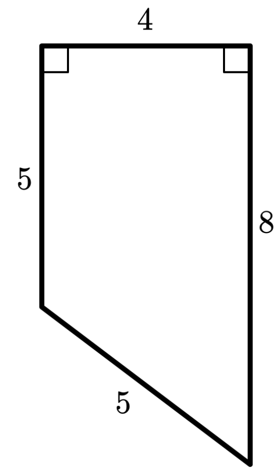
Areas of Polygons

Calculate the area of each polygon.

3.1

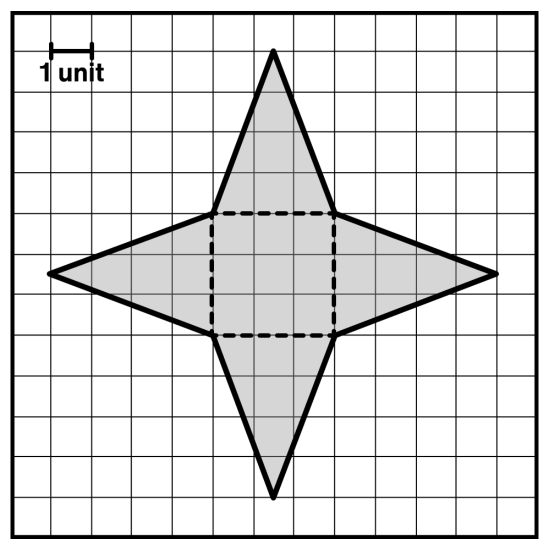


3.2



Surface Area

Nia drew this net of a polyhedron.



4.1 If this net were folded, what type of polyhedron would it make?

A. Triangular prism
B. Triangular pyramid
C. Square prism
D. Square pyramid

4.2 Nia said the surface area was 57 square units because she calculated $9 \cdot 1 + 12 \cdot 4 = 57$.

What did Nia do well? What could you say or ask to help her see her mistake?

4.3 Calculate the surface area of the polyhedron.

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Unit 6.1, Family Resource

Solutions:

1.1 They are both correct.

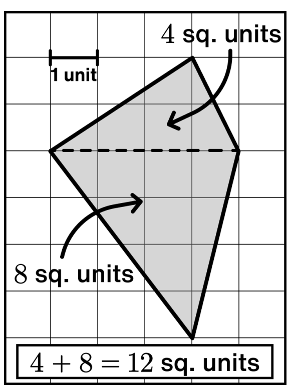
Explanations vary. Andrea and Elena each used a different side of the parallelogram as the base. They each chose the height that was perpendicular to the base.

1.2 54 square inches. $9 \cdot 6 = 54$ and $7.5 \cdot 7.2 = 54$.

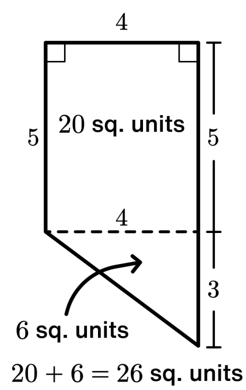
2.1 12 square feet. The area of the triangle is half the area of an 8-by-3-foot rectangle. The area of the rectangle is $8 \cdot 3 = 24$ square feet, so the area of the triangle is $\frac{1}{2} \cdot 24 = 12$ square feet.

2.2 7.5 square units. A base of the triangle is 5 units. The height for this base is 3 units, so the area is $\frac{1}{2} \cdot 5 \cdot 3 = 7.5$ square units.

3.1 12 square units



3.2 26 square units



4.1 D. Square pyramid. The base of the polyhedron is a square, and the rest of the faces are triangles that come to a point, so it is a pyramid.

4.2 Nia calculated the area of the square in the middle of the net correctly and recognised that if she found the area of one triangle, she could multiply it by 4 and add it to the area of the square to find the total surface area.
I would ask her to explain how she calculated the area of each triangle to see if she can notice the error she made for herself.

4.3 33 square units. The area of the square is 9 square units. The area of each triangle is $\frac{1}{2} \cdot 3 \cdot 4 = 6$ square units, so the surface area is $9 \cdot 1 + 6 \cdot 4 = 33$ square units.

Unit 2 Summary

Prior Learning

Grades 2–5
- Number lines
- Equivalent fractions
- Multiplicative relationships

Math 6, Unit 2

- Introducing ratios
- Equivalent ratios
- Solving ratio and rate problems
- Part-part-whole ratios

Future Learning

Math 6, Unit 3
- Unit conversions
- Rates
- Percentages

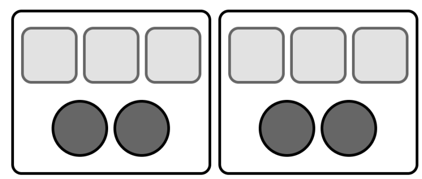
Math 7, Unit 2
- Proportional relationships

Introducing Ratios

A ratio $a: b$ is a relationship between two quantities.

For every a of the first quantity, there is/are b of the second quantity.

This diagram shows two circles for every three squares.



There are several ways to describe the ratio in this diagram.

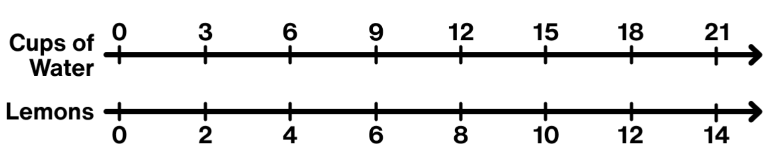
- For every 3 squares, there are 2 circles.
- The ratio of squares to circles is 3 to 2.
- The ratio of squares to circles is $3: 2$.

Equivalent Ratios

Two ratios are *equivalent* if you can multiply each of the values in the first ratio by the same number to get the values in the second ratio.

For example, a recipe for lemonade uses 3 cups of water and 2 lemons. $3: 2$, $6: 4$, and $21: 14$ are *equivalent ratios* because each ratio of water to lemons would make a drink that tastes the same.

We can represent equivalent ratios using double number line diagrams (where each set of tick marks represents an equivalent ratio) and using tables. Here is an example in a lemonade situation.



Cups of Water	Lemons
3	2
6	4
21	14

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Unit 6.2, Family Resource

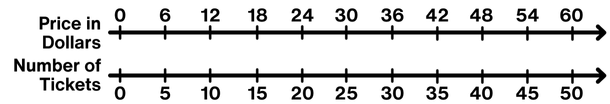
Solving Ratio and Rate Problems

There are many different strategies for solving problems with ratios.

For example, a 6th grade class is selling raffle tickets at a price of $\$6$ for 5 tickets.

We can use this double number line to answer questions like:

- *How much will it cost for* 30 *tickets?* ($\$36$)
- *How many tickets can I buy for* $\$30$*?* ($25$ tickets)



A table can be helpful for large unknown quantities and for figuring out *unit rates* (how many per 1).

We can use a table to answer questions like:

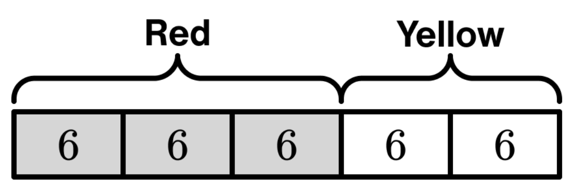
- *How much does each ticket cost?* ($\$1.20$)
- *How much do* 300 *tickets cost?* (360)
- *How many tickets could I get for* $\$120$*?* ($100$ tickets)

	Price in Dollars	Number of Tickets	
	6	5	
$\div 5$	1.20	1	$\div 5$
$\cdot 300$	360	300	$\cdot 300$
$\div 3$	120	100	$\div 3$

Part-Part-Whole Ratios

A shade of orange paint is made by mixing 3 cups of red paint with 2 cups of yellow paint, which makes 5 cups of orange paint. These types of ratios (where the parts of a ratio make up a whole) are called *part-part-whole ratios*.

You can represent the orange paint situation with a tape diagram divided into 3 red sections and 2 yellow sections.



If you want 30 cups of orange paint, each section represents 6 cups of paint because $6 \cdot 5 = 30$.

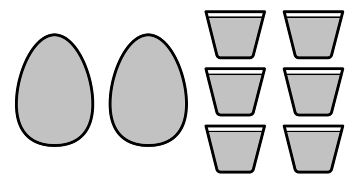
To make 30 cups of orange paint, you need 18 cups of red paint and 12 cups of yellow paint.

Try This at Home

Introducing Ratios

Here is a diagram that represents the ratio of eggs to cups of flour in a recipe for pasta.

Fill in the blanks based on this ratio.



1.1 The ratio of eggs to cups of flour is ____ to ____.

1.2 The ratio of cups of flour to eggs is ____ : ____.

1.3 For every egg, use ______ cups of flour.

1.4 Make a drawing of a new ratio: 3 eggs : 2 cups of flour.

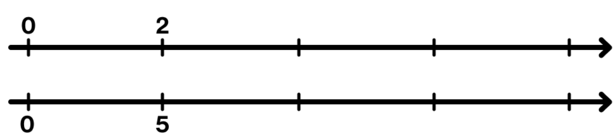
Equivalent Ratios

2.1 Select **all** of the ratios that are equivalent to $2:5$.

☐ $1:4$ ☐ $4:10$ ☐ $1:2.5$ ☐ $6:15$ ☐ $12:15$

2.2 Write a different ratio that is equivalent to $2:5$.

2.3 Complete this double number line diagram so it shows the ratio $2:5$.



Solving Ratio and Rate Problems

A train travels 45 miles in 60 minutes. At this rate:

3.1 How long would it take the train to travel 90 miles?

3.2 How far does the train travel in 12 minutes?

3.3 How far does the train travel in 150 minutes?

Part-Part-Whole Ratios

4. Tyrone makes milk coffee popsicles with 4 parts coffee and 3 parts sweetened condensed milk.

   Tyrone needs 21 ounces of milk coffee to make popsicles this week.

   How much of each ingredient will he need?

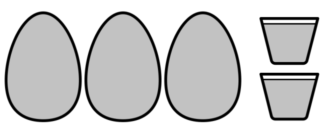
Solutions:

1.1 1 to 3 or 2 to 6

1.2 $3:1$ or $6:2$

1.3 3

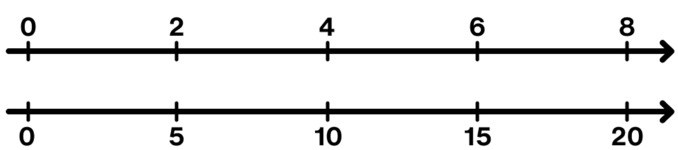
1.4 *Responses vary*.



2.1 $4:10$, $1:2.5$, $6:15$

2.2 *Responses vary*. $20:50$, $18:45$

2.3



3.1 120 minutes

3.2 9 miles

3.3 112.5 miles

4. 12 ounces of coffee and 9 ounces of sweetened condensed milk

Unit 3 Summary

Prior Learning	Math 6, Unit 3	Future Learning
Grades 2–5 • Measuring length, volume, mass, or weight • Multiplication as scaling • Multiplication of fractions and decimals Math 6, Unit 2 • Introduction to ratios	• Units and measurement • Unit rates • Percentages	Math 6, Unit 5 • Operations with decimals Math 7, Unit 4 • Proportional relationships • Percent increase and decrease

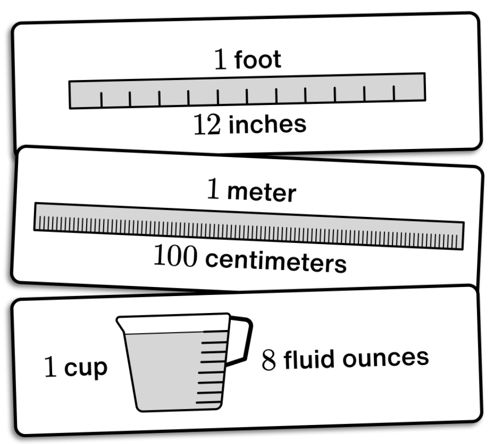
Units and Measurement

Sometimes, measurements are given in one unit and they would be more helpful in a different unit.

When converting, it can be helpful to think about which unit is larger. For example, one foot is larger than one inch, so you would need more inches to measure the same length.

Since there are 12 inches in a foot, you can convert from feet to inches by multiplying by 12.

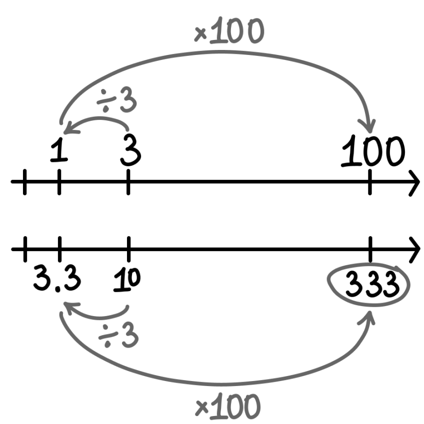
You can convert from inches to feet by multiplying by $\frac{1}{12}$.



Sometimes the conversions aren't as neat.

If you want to know how many feet a 100-meter race is, you can use the relationship 3 meters $\approx$ 10 feet.

You can use the ratio strategies from the previous unit, like making a double number line diagram or a table, to convert 100 meters to feet.



100 meters $\approx$ 333 feet

Unit Rates

A *unit rate* is a ratio expressed as something “per 1.” Every ratio has two unit rates.

For example, a parking meter says the price is $\$3$ for 60 minutes.

You can use a double number line or table to determine two unit rates for this situation:

20 minutes per dollar and $\$0.05$ per minute

	Dollars	Time (min.)	
	3	60	
÷3	1	20	÷3

	Dollars	Time (min.)	
	3	60	
÷60	0.05	1	÷60

Different unit rates are useful depending on the problem you’re solving.

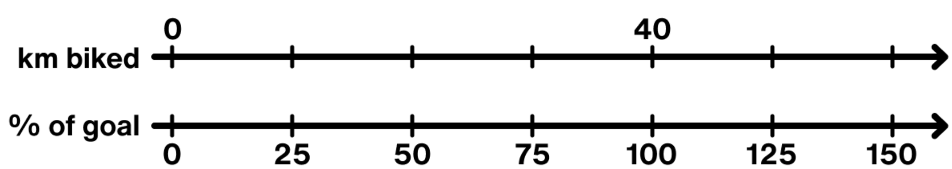
- If you have $\$1.35$ in your pocket, you can get $1.35 \bullet 20 = 27$ minutes of parking.
- If you need 45 minutes of parking, you should pay the meter $45 \bullet 0.05 = \$2.25$.

Percentages

Unit rates are “rates per 1.” *Percentages* are “rates per 100.” For example, 5% means 5 per 100.

You can use ratio strategies like tape diagrams, double number lines, and tables to reason about percentages.

For example, if Binta’s goal is to ride 40 kilometers, you can create a double number line where 40 kilometers lines up with 100%. Then, 50% of the ride is 20 kilometers, 75% is 30 kilometers, etc.



For more complicated percentages, expressions can help. To calculate 83% of 40 kilometers, you can first calculate 1% of 40 ($\frac{40}{100}$) and then multiply by 83. In all, $\frac{40}{100} \cdot 83 = 33.2$ kilometers.

Try This at Home

Units and Measurement

10 kilograms weighs about the same as 22 pounds.

1.1 Which is heavier: 1 pound or 1 kilogram?

1.2 A canoe weighs 88 pounds. About how many kilograms does it weigh?

1.3 A watermelon weighs 13 kilograms. About how many pounds does it weigh?

Unit Rates

A store sells a 12-ounce bag of pistachios for $\$15$.

2.1 What is the cost **per ounce**?

2.2 How many ounces of pistachios do you get **per dollar**?

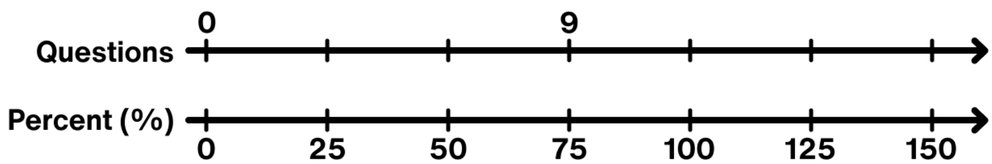
2.3 Customers may choose to buy pistachios in other amounts at the same rate. How much would 17 ounces of pistachios cost?

2.4 How many ounces of pistachios can you buy for $\$7$?

Percentages

3. Arturo gets a burger and fries for $\$12$. He wants to give a 20% tip. How much is the tip?

4. Sadia got 75% of the questions right in a trivia game. If she got 9 questions right, how many questions are in the game? Use the double number line if it helps with your thinking.



5. Chloe set a goal to run 8 miles. She ended up running 12 miles. What percent of her goal did she run? Make a double number line if it helps with your thinking.

Unit 6.3, Family Resource

Solutions:

1.1 1 kilogram

1.2 About 40 kilograms

1.3 About 28.6 pounds

2.1 $\$1.25$ per ounce

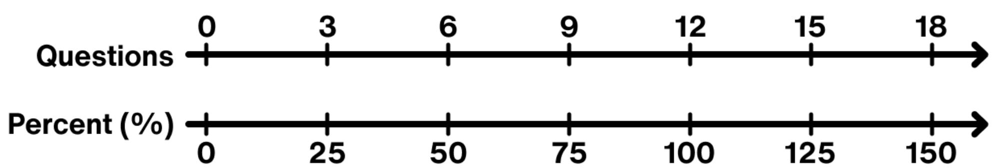
2.2 0.8 ounces per dollar

2.3 $\$21.25$

2.4 5.6 ounces

3. $\$2.40$

4. 12 questions



5. 150%

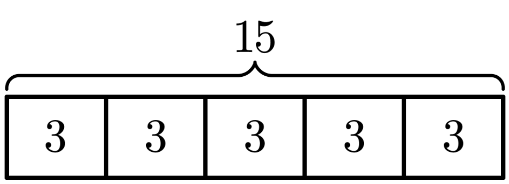
Unit 4 Summary

Prior Learning	Math 6, Unit 4	Future Learning
Grades 3–5 • Equivalent fractions • Calculating volumes of prisms • Interpreting fractions as division • Multiplying fractions • Dividing unit fractions and whole numbers Math 6, Unit 1 • Calculating areas of parallelograms	• Dividing fractions • Area and volume with fractions	Math 6, Units 5 and 6 • Dividing decimals • Solving equations with fractions Math 7 • Operations with positive and negative numbers • Scale drawings and scaled areas • Proportional relationships

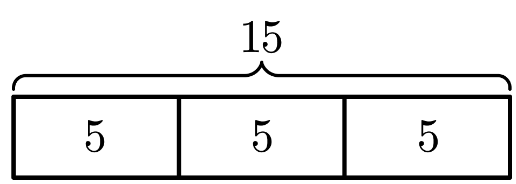
Introduction to Dividing Fractions

Here are two ways to think about $15 \div 3 = 5$.

How many groups of 3 fit into 15?

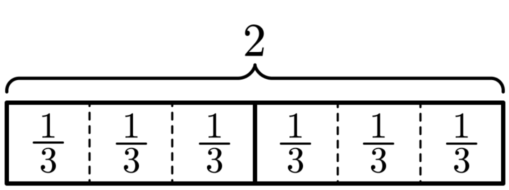


There are 15 in 3 groups.
How many are in 1 group?



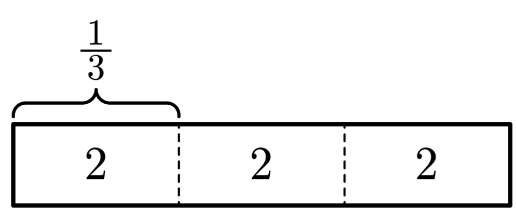
Here are two ways to think about $2 \div \frac{1}{3} = 6$.

How many groups of $\frac{1}{3}$ fit into 2?



There are 2 in $\frac{1}{3}$ of a group.

How many are in 1 group?

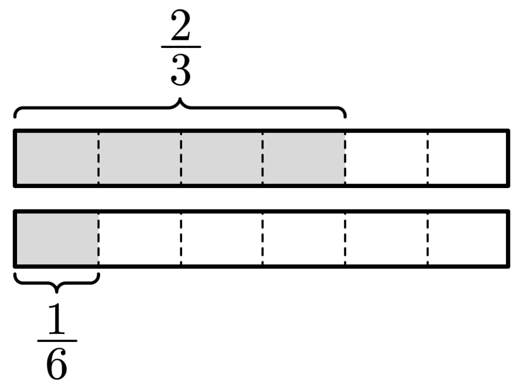


Dividing Fractions

One strategy for dividing fractions is to rewrite both fractions with *a common denominator*.

For $\frac{2}{3} \div \frac{1}{6}$, it can be helpful to rewrite $\frac{2}{3}$ as $\frac{4}{6}$.

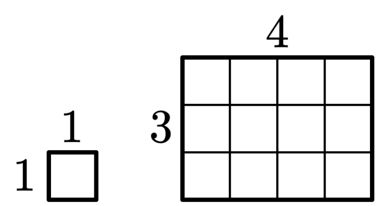
This is now $\frac{4}{6} \div \frac{1}{6}$, which is equivalent to $4 \div 1$ or 4.



Area and Volume With Fractions

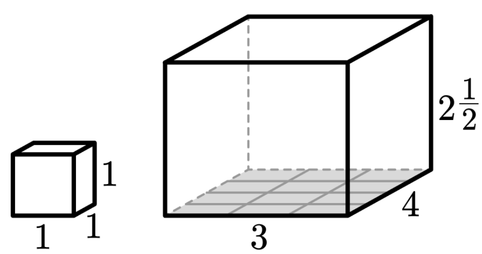
Area is the number of unit squares needed to cover a shape without gaps or overlaps.

Area of the base: $3 \cdot 4 = 12$ square units



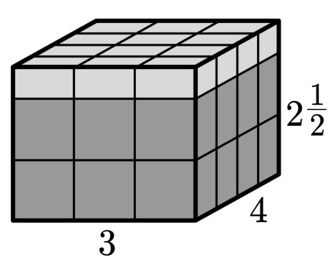
Volume is the number of unit cubes needed to fill a container.

The volume of a prism is the area of the base multiplied by the height.



There are $2\frac{1}{2}$ layers of 12 cubic units.

Volume: $12 \cdot 2\frac{1}{2} = 30$ cubic units.



Try This at Home

Introduction to Dividing Fractions

Here is an expression: $3 \div \frac{1}{4}$.

1.1 Describe two different situations that could be represented by this expression

1.2 Estimate the value of the quotient: Is it less than 1, equal to 1, or greater than 1? Explain how you know.

1.3 Draw a diagram that could help you evaluate this expression.

1.4 What is $3 \div \frac{1}{4}$?

Dividing Fractions

Determine the value of each expression. Show your thinking.

2.1 $\frac{2}{9} \div \frac{4}{9}$

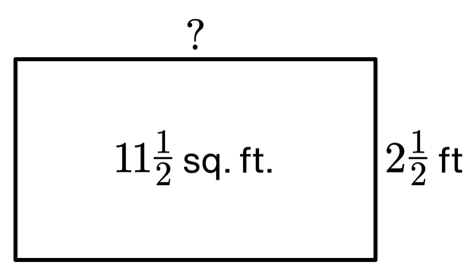
2.2 $\frac{1}{3} \div \frac{5}{9}$

2.3 $3 \div \frac{1}{7}$

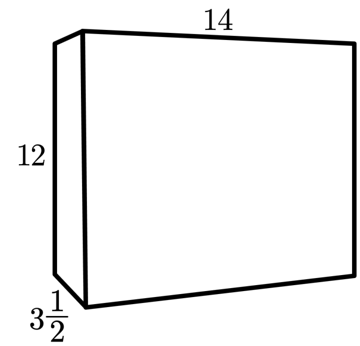
2.4 $3 \div \frac{4}{7}$

Area and Volume With Fractions

3.1 What is the length of a rectangular planter if its width is $2\frac{1}{2}$ feet and its area is $11\frac{1}{2}$ square feet?



3.2 What is the volume of a box that is 14 inches by 12 inches by $3\frac{1}{2}$ inches?



Solutions:

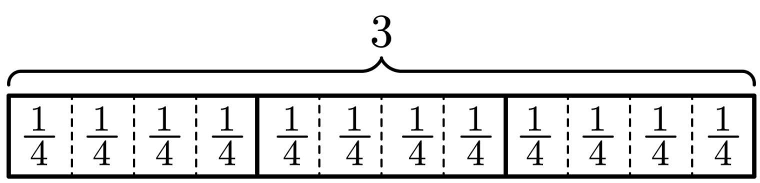
1.1 *Responses vary.*

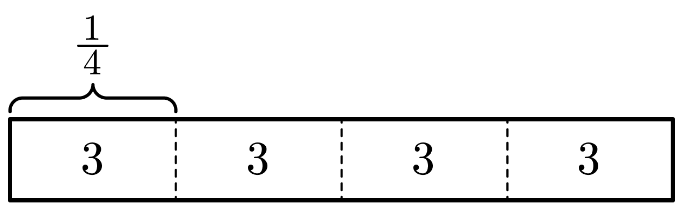
- How many $\frac{1}{4}$-cup scoops would it take to get 3 cups?
- If 3 flowers fill $\frac{1}{4}$ of a big planter, how many flowers fill 1 big planter box?

1.2 Greater than 1.

Explanations vary. You can think of this as "how many groups of $\frac{1}{4}$ fit into 3?" Since that will require more than 1 group, the quotient is greater than 1.

1.3 *Responses vary.*

- 

- 

1.4 12

2.1 $\frac{1}{2}$

2.2 $\frac{3}{5}$

2.3 21

2.4 $\frac{21}{4}$ or $5\frac{1}{4}$

3.1 $4\frac{1}{2}$ feet

3.2 588 cubic inches

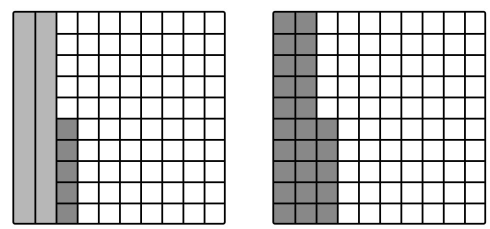
Unit 5 Summary

Prior Learning	Math 6, Unit 5	Future Learning
Grades 4–5 • Rewriting decimals as fractions • Multiplying and dividing whole numbers • Place value with decimals Math 6, Unit 4 • Dividing fractions	• Adding and subtracting decimals • Multiplying and dividing decimals • Least common multiple and greatest common factor	Math 6, Unit 6 • Solving equations with decimals and fractions Math 7 and 8 • Operations with positive and negative numbers • Converting fractions to decimals

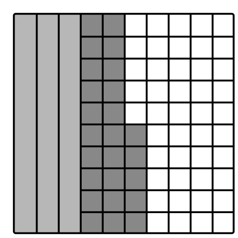
Adding and Subtracting Decimals

When adding and subtracting decimals, it is important to consider the **place value** of each digit.

We can think about 0.25 as 2 tenths and 5 hundredths or as 25 hundredths.



We can think about $0.3 + 0.25$ as 3 tenths and 25 hundredths. This is the same as 30 hundredths$+25$ hundredths, which is 55 hundredths, or 0.55.



$$\begin{array}{r} 0.3 \\ +\,0.25 \\ \hline 0.55 \end{array}$$

Rewriting addition and subtraction problems vertically can help us keep the place values organized.

On the left, we are correctly subtracting 2 tenths from 34 hundredths. On the right, we are subtracting 2 hundredths instead of 2 tenths.

✓

$$\begin{array}{r} 0.34 \\ -\,0.2 \\ \hline 0.14 \end{array}$$

×

$$\begin{array}{r} 0.34 \\ -\,0.2 \\ \hline 0.32 \end{array}$$

Multiplying and Dividing Decimals

It can be helpful to rewrite multiplication and division problems that have decimals by changing the decimals into whole numbers.

Multiplication

When we write $0.3 \cdot 0.04$ as fractions we can multiply whole numbers, and then think about the place value.

$$0.3 \cdot 0.04 = 3 \cdot 4 \cdot \frac{1}{10} \cdot \frac{1}{100}$$
$$= 12 \cdot \frac{1}{1000}$$
$$= 0.012$$

Division

When we write 3 as $\frac{30}{10}$ in the problem below, we are setting up a common denominator so that we can divide whole numbers.

$$3 \div 0.2 = \frac{30}{10} \div \frac{2}{10}$$
$$= 30 \div 2$$
$$= 15$$

Least Common Multiple and Greatest Common Factor

Here are lists of multiples of 3 and 4.

Common multiples of 3 and 4 are 12 and 24.

So the *least common multiple (LCM)* is 12.

Multiples of 3
$3,\ 6,\ 9,\ 12,\ 15,\ 18,\ 21,\ 24,\ldots$

Multiples of 4
$4,\ 8,\ 12,\ 16,\ 20,\ 24,\ 28,\ 32,\ \ldots$

$1,\ 2,\ 4$, and 8 all divide into 8 evenly. These are called its factors.

Here are lists of factors of 8 and 12.

Common factors of 8 and 12 are $1,\ 2$, and 4.

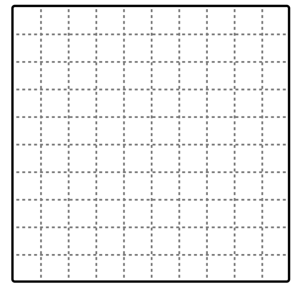
So the *greatest common factor (GCF)* is 4.

Factors of 8
$1,\ 2,\ 4, 8$

Factors 12
$1,\ 2,\ 3,\ 4,\ 6, 12$

Try This at Home

Adding and Subtracting Decimals



1.1 Add $0.6 + 0.32$.

1.2 Add $0.125 + 5.42$.

1.3 Subtract $0.6 - 0.32$.

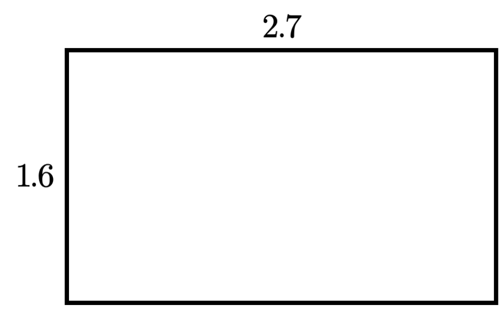
1.4 Subtract $1 - 0.238$.

1.5 If you are checking out at the grocery store, make a prediction about the total bill. What other operations with decimals can you find on the receipt?

Multiplying and Dividing Decimals

2.1 Multiply $0.6 \cdot 0.02$.

2.2 Find the area of the rectangle.



2.3 Divide $0.27 \div 0.03$.

2.4 Divide $45 \div 0.9$.

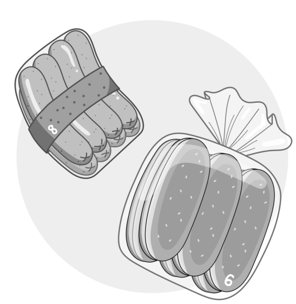
2.5 If you are at a gas station, make a prediction about how much the gas will cost. How close did you get? How might you improve your prediction?

Least Common Multiple and Greatest Common Factor

3.1 What is the least common multiple of 6 and 8?

3.2 What is the greatest common factor of 12 and 30?

3.3 If you are grocery shopping, how many hot dogs come in each pack? What about buns? Discuss what combinations of packs could help you avoid leftovers.



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Unit 6.5, Family Resource

Solutions:

1.1 0.92

1.2 5.545

1.3 0.28

1.4 0.762

1.5 *Responses vary*.

2.1 0.012

2.2 4.32 square units

2.3 9

2.4 50

2.5 *Responses vary*.

3.1 24

3.2 6

3.3 *Responses vary*.

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Unit 6.6, Family Resource

Unit 6 Summary

Prior Learning

Grades 1–5
- Basic operations ($+$, $-$, $\times$, $\div$)
- Operations with grouping symbols
- Graphing positive numbers
- Powers of 10

Math 6
- Dividing fractions (Unit 4)
- Decimal operations (Unit 5)

Math 6, Unit 6

- Solving equations
- Equivalent expressions
- Expressions involving exponents
- Introduction to representing relationships

Future Learning

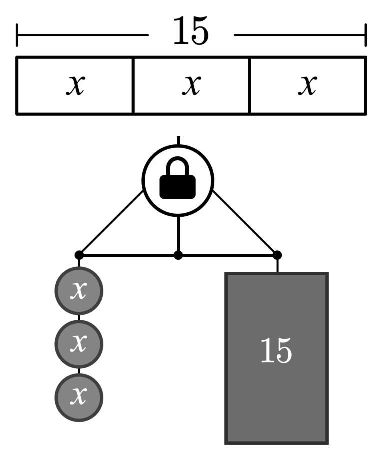
Math 6, Unit 7
- Graphing with positive and negative numbers

Math 7
- Proportional relationships
- Solving more complex equations
- Factoring and expanding expressions

Solving Equations

A *solution* is a value of a variable that makes an equation true.

Tape diagrams and hangers can help us make sense of equations. Here is a tape diagram and a hanger that show the equation $3x = 15$.



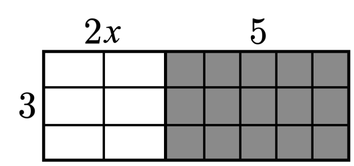
Solving an equation is the process of determining a solution. In the equation $3x = 15$, the solution is $x = 5$ because $3(5) = 15$.

Replacing x with 5 in the hanger will keep the hanger balanced.

Equivalent Expressions

Equivalent expressions are different ways of describing the same quantity. $x + x + x$ is equivalent to $3x$ because they both describe three copies of an unknown number, x.

The area of this rectangle can be written in two different ways.



$3(2x + 5)$ — the length times width

$6x + 15$ — the sum of two smaller areas

$$3(2x + 5) = 3(2x) + 3(5) = 6x + 15$$

This is an example of the *distributive property.*

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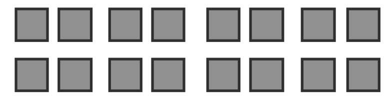
Unit 6.6, Family Resource

Expressions Involving Exponents

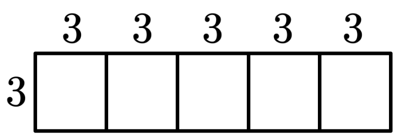
Exponents are a way to describe repeated multiplication.

2^4 is called “2 to the power of 4” or “2 to the fourth”.

In 2^4, 2 is called the base and 4 is called the exponent.



$$2^4 = 2 \cdot 2 \cdot 2 \cdot 2 = 16$$



$$5 \cdot 3^2 = 5 \cdot 9 = 45$$

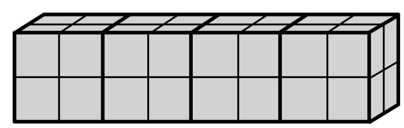
Diagrams can help make sense of expressions that involve exponents and other operations.

For example, $5 \cdot 3^2$ can describe 5 copies of a 3–by–3 square.

Exponents can also appear in expressions with variables.

What is the value of $4x^3$ when $x = 2$?

$$4(2)^3 = 4(2 \cdot 2 \cdot 2) = 4(8) = 32$$



32 unit cubes

Introduction to Representing Relationships

Math can help make sense of the relationship between two different quantities or variables.

Tables, equations, and graphs can each show the same relationship in different ways.

Here is an example:

n = the number of quarters in my pocket v = the value of my quarters (in cents)

Description

Every quarter in my pocket is worth 25 cents.

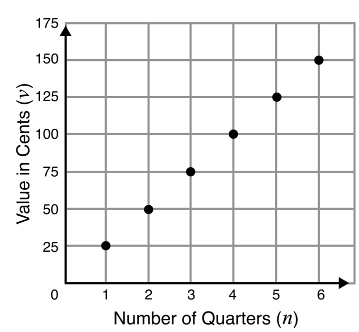
Table

n	v
1	25
2	50
3	75

Equation

$$v = 25n$$

Graph



Try This at Home

Solving Equations

1.1 Determine the solution to each equation. Draw a diagram if it helps you with your thinking.

$x + 2 = 11$ $\qquad$ $2x = 11$ $\qquad$ $x - 11 = 2$

Matias bought 2 plants, which cost $\$11$ total. x represents the cost of each plant.

1.2 Which of the equations above represents this situation? Explain how you know.

1.3 Explain what the solution to the equation means in this situation.

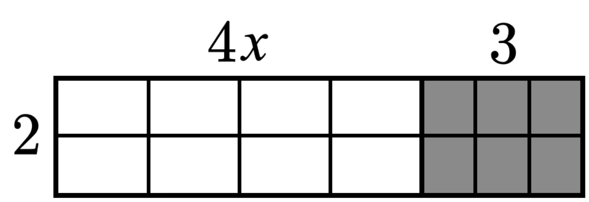
Equivalent Expressions

2. At Kai's pizza shop, they charge $\$4$ for delivery on top of the cost of the pizza.
How much would the total charge be if the cost of the pizza was:

$\$15$? $\qquad$ $\$24$? $\qquad$ d dollars?

3. Select all the expressions that describe the area of this rectangle.

- ☐ $2(4x + 3)$
- ☐ $2(4x + 6)$
- ☐ $8x + 6$
- ☐ $(4x + 3) + (4x + 3)$
- ☐ $6x + 5$



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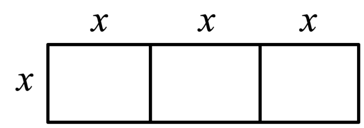
Unit 6.6, Family Resource

Expressions Involving Exponents

4.1 Which expression represents the diagram on the right?

☐ $3 + x^2$ ☐ $(3 + x)^2$ ☐ $3x^2$



4.2 Determine the value of each expression when $x = 4$.

5. What is $2(4)^3$? Explain how you know.

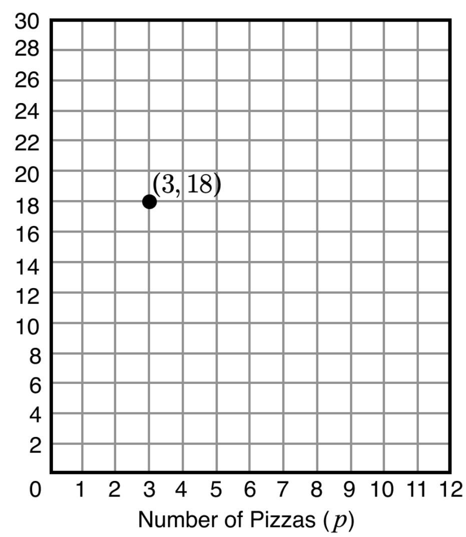
Introduction to Representing Relationships

Kai uses 6 mushrooms on every large Super Mushroom Pizza. They are wondering about the relationship between the number of pizzas made, p, and the number of mushrooms they use, m.

6.1 They started making a graph of the relationship. What does the point $(3, 18)$ mean in Kai's situation?

6.2 Add at least three more points to Kai's graph. Use a table if it helps you with your thinking.

p	m



6.3 Write an equation to represent the relationship between p and m.

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Unit 6.6, Family Resource

Solutions:

1.1 $x = 9$ $x = 5.5$ (or equivalent) $x = 13$

1.2 $2x = 11$

Explanations vary. Since each plant costs the same amount, we are doubling the cost of one plant, which we can show with $2x$.

1.3 *Responses vary.* This means that each plant that Matias bought cost $\$5.50$.

2. $\$19$ $\$28$ $d + 4$

3. ✓ $2(4x + 3)$
✓ $8x + 6$
✓ $(4x + 3) + (4x + 3)$

4.1 ✓ $3x^2$

4.2 $3 + (4)^2 = 3 + 16 = 19$
$(3 + 4)^2 = (7)^2 = (7 \cdot 7) = 49$
$3(4)^2 = 3(4 \cdot 4) = 3(16) = 48$

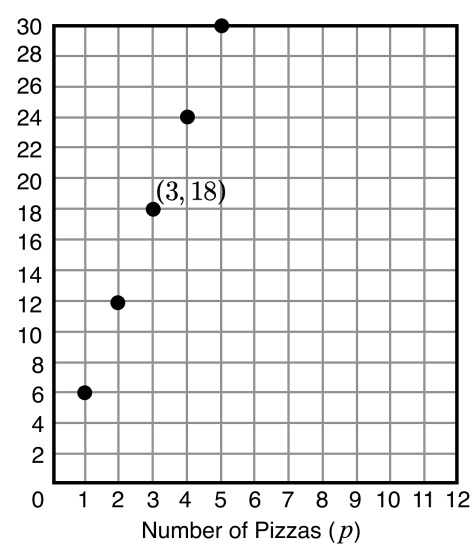
5. $2(4)^3 = 128.$

Explanations vary. Any number to the power of 3 is $\# \cdot \# \cdot \#$, so $4^3 = 4 \cdot 4 \cdot 4 = 64$. The 2 in front means that there are two of the 64s and $64 \cdot 2 = 128$.

6.1 *Responses vary.* $(3, 18)$ means that when Kai makes 3 pizzas, they use 18 mushrooms.

6.2 *Responses vary.* See the graph to the right.

p	m
1	6
2	12
4	24



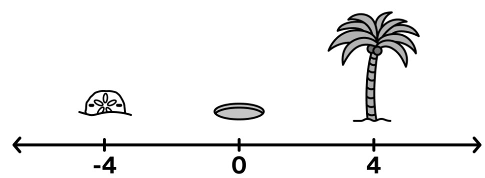
6.3 $m = 6p$

Unit 7 Summary

Prior Learning	Math 6, Unit 7	Future Learning
Grades 3–5 ● Inequalities with numbers ● Comparing fractions and decimals ● Graphing points with positive coordinates Math 6 ● Intro to polygons (Unit 1) ● Equations with variables (Unit 6)	● Negative numbers and absolute value ● Inequalities with variables ● The coordinate plane (with positive and negative coordinates)	Math 7, Units 5 and 6 ● Operations with negative numbers ● Solving inequalities Math 8 ● Transformations in the plane ● Pythagorean theorem and distance

Negative Numbers and Absolute Value

We can use *positive* and *negative* numbers to describe locations on the number line.



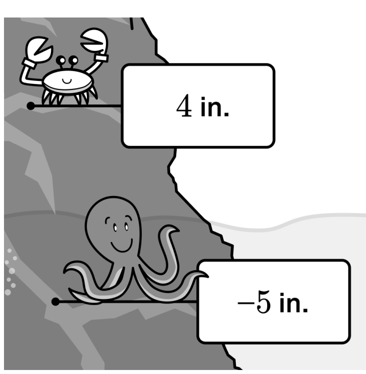
The tree is at $+\ 4$ because it is 4 units to the right of 0.

The sand dollar is at $-\ 4$ because it is 4 units to the left of 0.

4 and $-\ 4$ are *opposites* because they are the same distance from 0 on different sides of the number line.

$|\ x\ |$ is pronounced the *absolute value* of x and describes a number's distance from 0.

$|-\ 4| =\ 4$ and $|4| =\ 4$ because both numbers are 4 units away from 0.



We often compare positive and negative numbers when talking about temperatures or elevations.

The crab has a higher elevation than the octopus, so $4\ >\ -5$.

The crab is closer to the surface than the octopus, so $|4| < |-5|$.

Inequalities

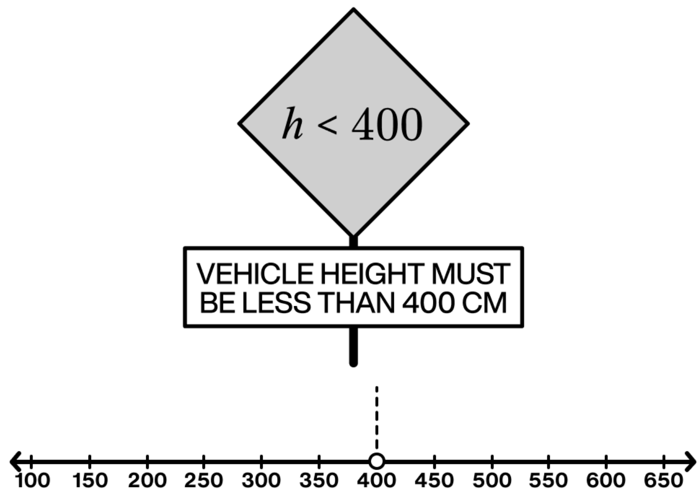
We can compare numbers using the words and symbols *less than* (<) and *greater than* (>). We can also write inequalities with variables to show any number greater than or less than a value.

The inequality $h < 400$ and the graph represent **all** vehicle heights less than 400 centimeters tall.

There is an open circle on the graph because 400 centimeters is not included.

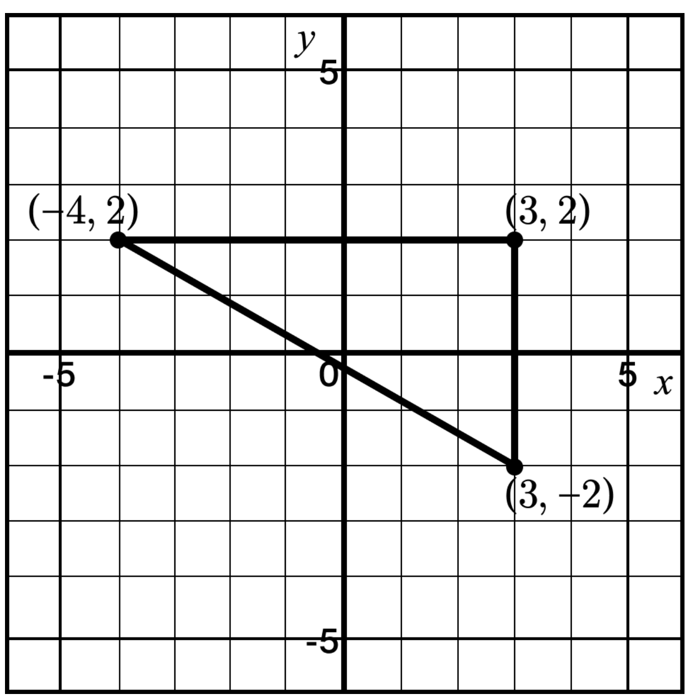
Any value that makes an inequality true is a *solution to the inequality*.

There are infinite solutions to $h < 400$, including $300,\ 1,\ 200.5$, and 399.9.



The Coordinate Plane

In previous grades, students learned to plot points with positive coordinates. In this unit, students learn to plot points that have both positive and negative coordinates.



The leftmost point is located at $(-4,\ 2)$ because it is 4 to the left of the vertical axis and 2 above the horizontal axis.

The side connecting $(-4,\ 2)$ and $(3,\ 2)$ is 7 units long. Because the side is horizontal, we only need to compare the x–coordinates. It takes 4 units to get from -4 to 0 and another 3 units to get from 0 to 3.

Try This at Home

Negative Numbers and Absolute Value

1.1 Complete each statement below.

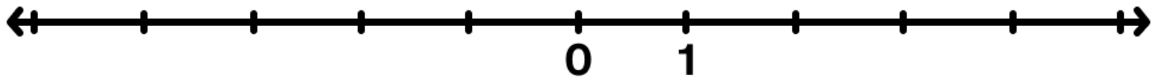
The opposite of 3 is _____.

The opposite of $\frac{4}{5}$ is _____.

The opposite of -2.5 is _____.

The opposite of 0 is _____.

1.2 Plot and label each number from the statements above **and** its opposite on the number line.



2.1 A duck is sitting at the surface of the ocean. What is the duck's elevation?

2.2 The duck dives 15 feet into the water looking for food. What is the duck's elevation now?

2.3 The duck comes back up 5 feet and catches a fish. How far away is the duck from the surface of the ocean? Write this in words and using the symbols | |.

Inequalities

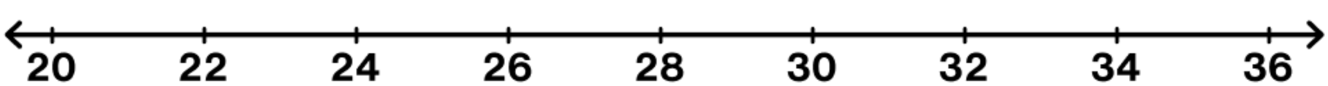
A sign at the fair says, "You must be taller than 32 inches to ride."

3.1 List three possible heights of someone who can ride.

_______ _______ _______

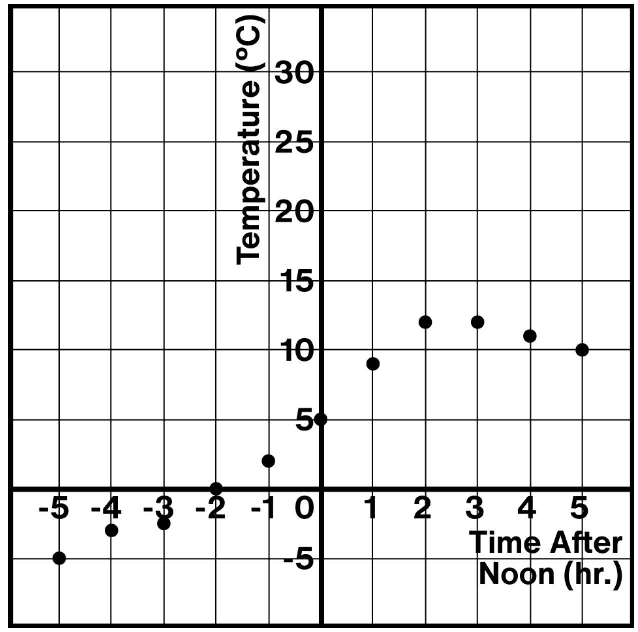
3.2 Write an inequality to show heights, h, for people who can ride the Ferris wheel.

3.3 Make a graph of all the possible heights you could be in order to ride the Ferris wheel.



The Coordinate Plane

Did you know that in the southern hemisphere, it is winter in July? Here is a graph of temperatures in the Andes in Peru for one day in July.



4.1 What was the temperature at noon?

4.2 What was the temperature at 10 a.m.?

4.3 When was it colder than freezing (0°C)?

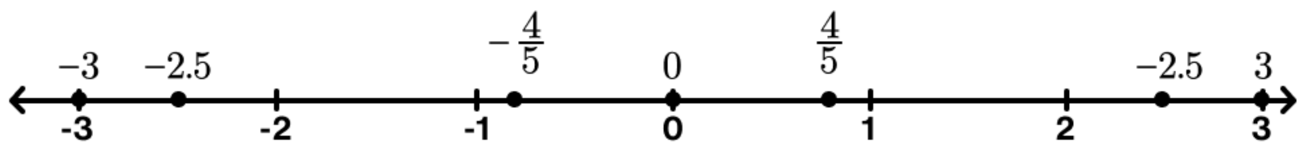
4.4 Tell a story about the temperature that day.

Unit 6.7, Family Resource

Solutions:

1.1 $3, -\frac{4}{5}, 2.5, 0$

1.2



2.1 0 feet

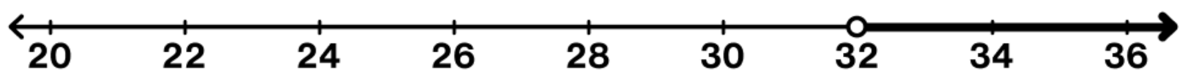
2.2 -15 feet

2.3 The duck's elevation is -10 feet. This means the duck is 10 feet away from the surface, or $|-10| = 10$.

3.1 *Responses vary*. 33 inches, 40 inches, 80 inches.

3.2 $h > 32$

3.3



4.1 5°C

4.2 0°C

4.3 It was colder than freezing at 7, 8, and 9 a.m.

4.4 *Stories vary*. At 7 a.m., it was so cold at −5°C. It got warmer throughout the morning. At 10 a.m., temperatures went from below freezing to above freezing. By the afternoon, the temperature was up to 12°C. After 3 p.m., the temperature started to go slightly down again.

Unit 8 Summary

Prior Learning	Math 6, Unit 8	Future Learning
Grades 3–5 • Fractions and decimals on a number line • Visualizing data using line plots • Calculating distances on a number line Math 6, Unit 3 • Calculating percentages	• Visualizing data • Measuring data: mean and MAD • Measuring data: median and IQR	Math 7, Unit 8 • Probability and sampling data Math 8, Unit 6 • Associations in bivariate data High School • Standard deviation and outliers

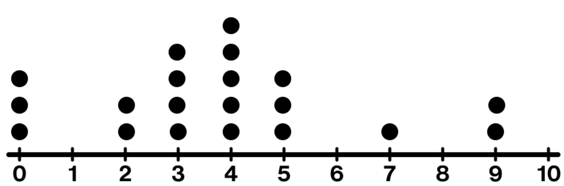
Visualizing Data

Asking questions and collecting data can help us make claims about a group.

Visualizing the data we collected can help us interpret the responses.

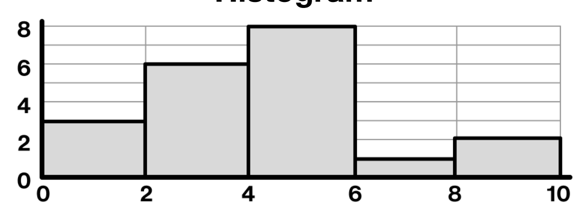
This *dot plot* and *histogram* show the number of hours a day that 20 adults spend on their phone.

Dot Plot



In a dot plot, each data point is represented by a dot above the number line.

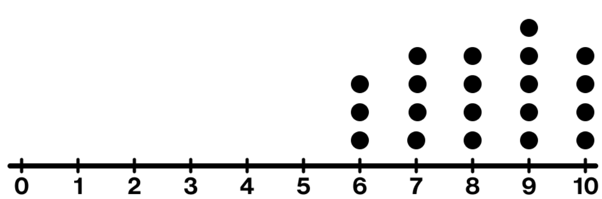
Histogram

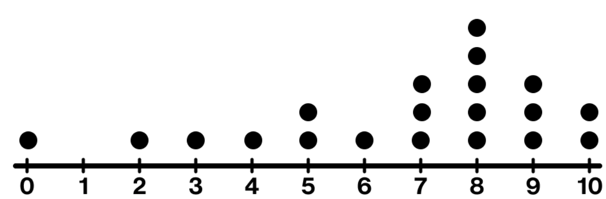


In a histogram, the data is grouped into bins. The height of each rectangle shows how many data points are in that bin.[1]

Visualizing the data can also help us describe its *shape, center,* and *spread*.

For example, the *centers* of these data sets are around 8 and the *spreads* are different.





[1]In this unit, data on the edges, such as 2, are sorted into the bin immediately to the right of it.

This data set has a smaller spread.

This data set has a larger spread.

Mean and MAD

One way to measure the center of a data set is the *mean*, or the average.

The mean can be thought of as the equal share.

For example, the mean is the number of stickers five friends would get if they shared them equally.

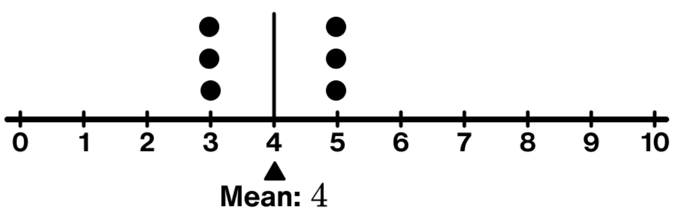
To calculate the mean, add the data and divide the total by the number of data points.

The mean of $7, 8, 10, 7,$ and 8 is:

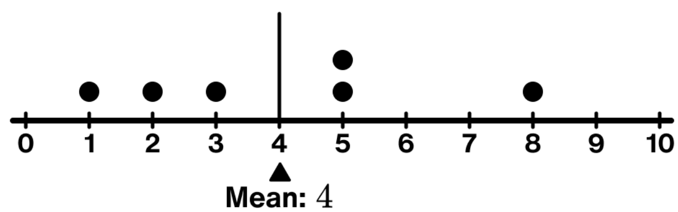
$$\frac{7+8+10+7+8}{5} = \frac{40}{5} \text{ or } 8$$

One way to measure the spread of a data set is the *mean absolute deviation (MAD)*.

The MAD is how far away the data is from the mean on average. The higher the MAD, the more spread out the data.



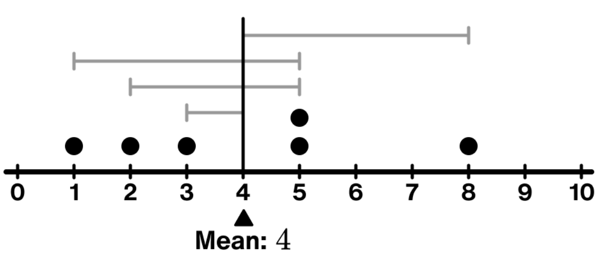
The MAD of this data set is 1.



The MAD of this data set is 2.

To calculate the MAD, first measure the distances between each data point and the mean (these are called *absolute deviations*). Then, calculate the mean of the absolute deviations.

This table shows the distances from each point to the mean.



Data Point	1	2	3	5	5	8
Absolute Deviation (distance from 4)	3	2	1	1	1	4

The MAD of this data is $\frac{3+2+1+1+1+4}{6} = \frac{12}{6}$ or 2.

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Unit 6.8, Family Resource

Median and IQR

The center of a data set can also be measured by the *median*.

The median is the middle value of a data set when the values are listed in order.

A student kept track of the number of hours they slept each night for a week. The median of this data is 9 hours because it is in the middle of the list.

Median

6 8 8 **9** 9 10 11

Quartiles (Q1, Q2, Q3) divide a data set into four sections.

- Quartile 1 is the median of the lower half of the data.
- Quartile 2 is the median of the entire data.
- Quartile 3 is the median of the upper half of the data.

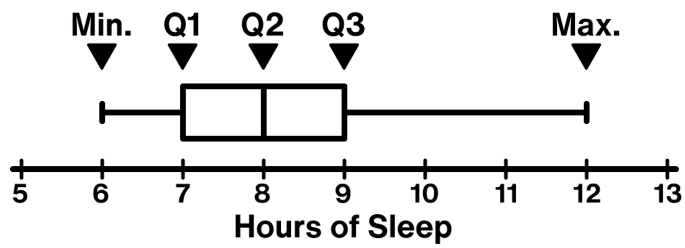
This data set shows the number of hours 15 students slept on a school night. The first, second, and third quartiles are labeled.

6 6 7 **7** 7 8 8 **8** 8 8 9 **9** 10 12 12

Q1 (7) **Q2** (8) **Q3** (9)

The quartiles, along with the minimum and maximum values, can be used to create a *box plot*.

This box plot visualizes the number of hours each student slept on a school night.



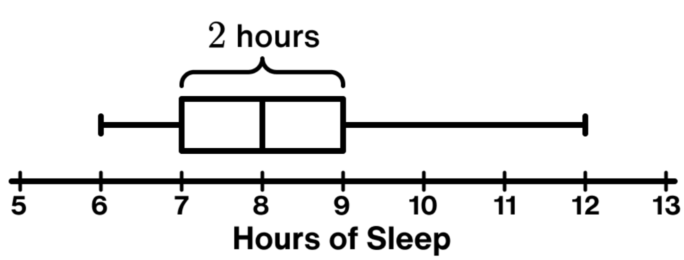
The spread of a data set can also be measured by the *interquartile range (IQR)*.

The IQR is the difference between Q1 and Q3.

It is where the middle half of the data lies.

The IQR of this data is 2 because $9 - 7 = 2$.

The middle half of the data lies within 2 hours.



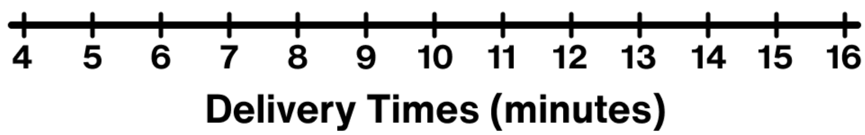
Try This at Home

Visualizing Data

The owner of a pizza shop wanted to know more about how long it took to deliver their pizzas. One day, they recorded the time, in minutes, of 10 pizza deliveries. They organized their data into a table.

5	7	10	16	9	12	9	10	11	9

1.1 Create a dot plot of the delivery times.



1.2 Which statement best describes the data set?

A. The center is around 3 and the spread is small.

B. The center is around 3 and the spread is large.

C. The center is around 9 and the spread is small.

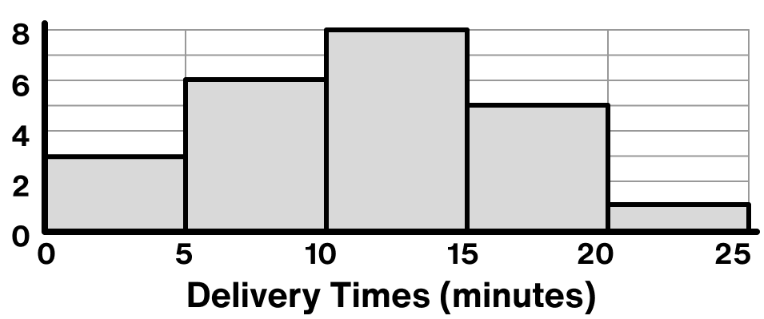
D. The center is around 9 and the spread is large.

This histogram shows the delivery times for a restaurant in a day.

2.1 Dylan says that there were 5 deliveries that day.

Do you agree with Dylan?

2.2 How many deliveries were made in less than 10 minutes?



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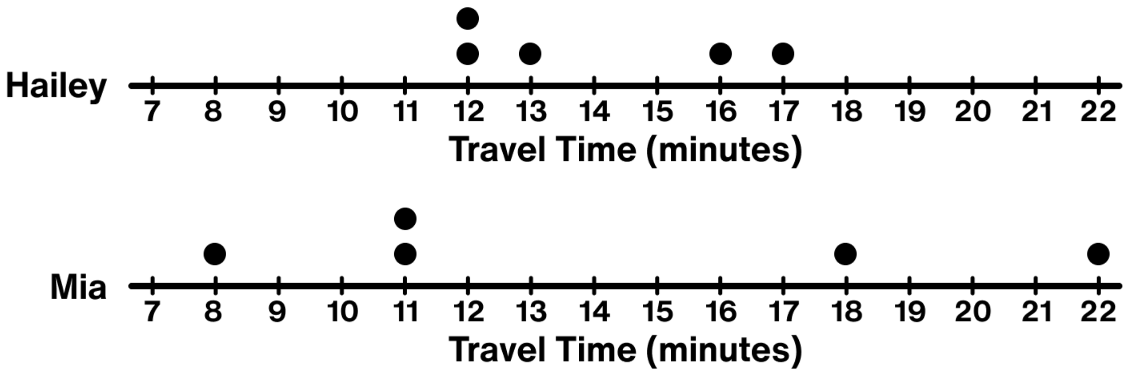
Unit 6.8, Family Resource

Hailey and Mia are curious about how long it takes them to travel to school. For one week, they decide to record their travel times. The dot plots show their data from the week.



Mean and MAD

3.1 What is the mean of Hailey’s travel times?

3.2 What is the mean of Mia’s travel times?

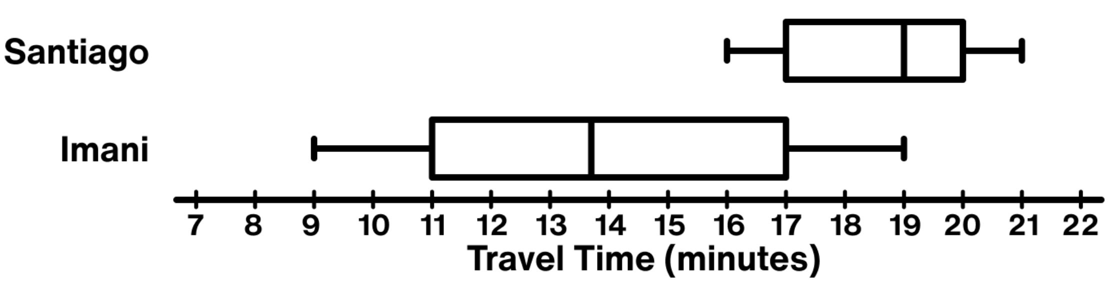
3.3 Without calculating, whose data set has a higher MAD? Explain your thinking.

Median and IQR

4.1 What is the median of Hailey’s travel times?

4.2 What is the median of Mia’s travel times?

Two new students recorded their travel times and visualized their data as box plots.



5.1 Label the first, second, and third quartiles of Santiago’s box plot with Q1, Q2, and Q3.

5.2 What is the IQR of Santiago’s data?

5.3 Who had a more consistent travel time to school? How do you know?

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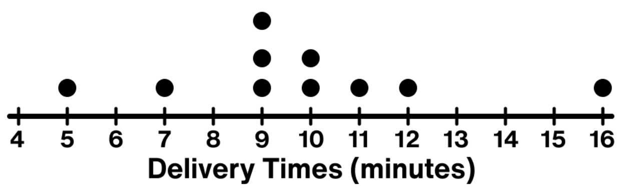
Unit 6.8, Family Resource

Solutions:

1.1



1.2 **D**

2.1 Disagree. *Explanations vary*. Dylan probably counted the number of bins. There were $2 + 6 + 8 + 5 + 1$ or 22 deliveries that day.

2.2 8 deliveries

3.1 14 minutes

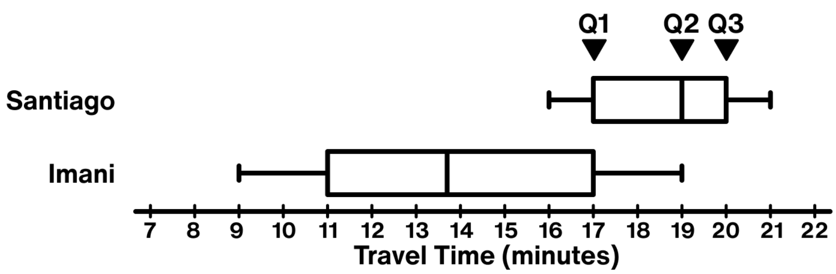
3.2 14 minutes

3.3 Mia. *Explanations vary*. Mia's data is more spread out.

4.1 13 minutes

4.2 11 minutes

5.1



5.2 3 minutes

5.3 Santiago. *Explanations vary*. Santiago's IQR is smaller than Imani's, which means that Santiago's data is closer together.