# 6th Grade
# Math Standards Help Sheets
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## Websites

- IXL
- khanacademy.org
- learnzillion.com
- https://www.teachingchannel.org
- http://www.commoncoresheets.com
- www.mathisfun.com

# Aug 8th

**6.M.NS.B.03** I can use estimation strategies to fluently add, subtract, multiply and divide multi-digit decimals

**Big Ideas**

- Students use estimation strategies to see if their answer is reasonable.
- Students should use patterns when multiplying and dividing by powers of ten.

**Common Misconceptions**

- Students won't follow the algorithms for decimals.
- They won't line up the decimals when adding or subtracting.
- When dividing, they forget to move the decimal.
- When multiplying, they forget to place the decimal in the product.

The use of estimation strategies supports student understanding of operating on decimals.

First, students estimate the sum and then find the exact sum of 14.4 and 8.75. An estimate of the sum might be 14 + 9 or 23. Students may also state if their estimate is low or high. They would expect their answer to be greater than 23. They can use their estimates to self-correct.

| Problem | Estimation: leave off decimal part or round to whole number | Actual | Algorithm |
|---|---|---|---|
| **Add Decimals**<br><br>345.2 + 2.35 | 345 + 2 = ______ | 345.2<br>+ 2.35 | 1. Line up decimal points before adding.<br>2. Sum has decimal in same position. |
| **Subtract Decimals**<br><br>345.2 - 2.35 | 345 - 2 = ______ | 345.2<br>- 2.35 | 1. Line up decimal points before subtracting.<br>2. Answer has its decimal in the same position. |
| **Multiply Decimals**<br><br>345.2 x 2.35 | 345<br>x 2 | 345.2<br>x 2.35 | 1. Ignore all decimals until after multiplying.<br>2. Count the digits after any decimals in the original problem.<br>3. Put the same number of digits after the decimal in the answer. |
| **Divide Decimals**<br><br>811.22 ÷ 2.35 | 2 ) 811 | 2.35 ) 811.22 | 1. Move decimal in the divisor all the way to the right.<br>2. Move the decimal in the dividend the same number of spaces.<br>3. Divide, being careful to line up the quotient's digits.<br>4. Place quotient's decimal directly above dividend's decimal. |

**Song to Remember Rule for Decimals - Tune: "If You're Happy"**

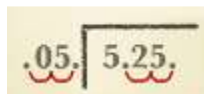
When you **add or subtract**, line 'em up!
When you **add or subtract**, line 'em up!
Keep your ones with your ones
And your tenths with your tenths
When you **add or subtract**, line 'em up

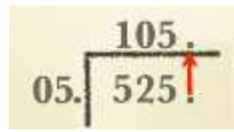
| |
|---|
| 45.06 |
| + .04 |
| 45.10 |

| |
|---|
| 45.06 |
| - .04 |
| 45.02 |

When you **multiply** remember just to count
When you **multiply** remember just to count
So the digits on the top
Match the digits down below
When you **multiply** remember just to count!

| |
|---|
| 45.06 |
| x .04 |
| 1.8024 |






Bounce the ball to the wall to **divide**!
Bounce the ball to the wall to **divide**!
Then you bounce it in the house
And you throw it on the roof
Bounce the ball to the wall to **divide**!

**Multiplication Estimation Strategies with Decimals**

**Sample Problem**: If gasoline costs $4.50 per gallon and your tank holds 15.5 gallons, how much will you pay to fill your gas tank?

**Strategy 1**: Round both factors to the nearest one.
15.5 - 16.00
x 4.5 - 5.00
$80.00

**Strategy 2**: Round one factor up and one factor down.
15.5 - 15.00
x 4.5 - 5.00
$75.00

**Note**: This strategy of rounding one up and one down works better when each factor is halfway between in the rounding process.

**Strategy 3**: Compatible numbers to estimate.
46.5 - 50! ! **Compatible numbers make it easier to do mental math.
x 2.4 – x 2
100

**Strategy 4**: Round both factors down and then both factors up to find a range for the product.

74.8 - 70
x 5.7 – x 5
350

74.8 - 80
x 5.7 – x 6
480

The Range is between 350 - 480.

# Aug 4th

**[ 6.M.NS.B.02]** I can divide multi-digit numbers and justify my answer using place value.

**Big Ideas**

- Divisors can be any number of digits at this grade level.
- Students should be able to explain their reasoning using place value.
- This is a deeper understanding of division, not just the computations.

**Common Misconceptions**

- Students do not line up the digits correct. (Use graph paper to help or turn the lined paper sideways.)
- Students forget to bring down the next digit.
- They also forget to put zero on the quotient if needed.
- They have trouble estimating.

Students are expected to fluently and accurately divide multi-digit whole numbers. Divisors can be any number of digits at this grade level. As students divide they should continue to use their understanding of place value to describe what they are doing. When using the standard algorithm, students' language should reference place value. For **example**, when dividing 16 into 2912, as they write a 1 in the quotient they should say, "there are 100 sixteens in 2912 " and could write 1600 beneath the 2912 rather than only writing 16.

| | |
|---|---|
| **1**<br>**16 )2912** | There are 100 16s in 2912. |
| **1**<br>**16 )2912**<br>**- 1600**<br>**1312** | 100 x 16 = 1600<br>2912 - 1600 = 1312 |
| **18**<br>**16 )2912**<br>**- 1600**<br>**1312**<br>**- 1280**<br>**32** | There are 80 16s in 1312.<br>80 x 16 = 1280<br>1312 - 1280 = 32 |
| **182**<br>**16 )2912**<br>**- 1600**<br>**1312**<br>**- 1280**<br>**32**<br>**-32**<br>**0** | There are 2 16s in 32.<br>2 x 16 = 32<br>32 - 32 = 0 |

# Aug $22^{nd}$

**[ 6.M.NS.B.04]** I can use prime factorization to express a whole number as a product of its prime factors and determine the GCF and LCM of two whole numbers.

**Big Ideas**

- A composite number is a number that has factors other than one and itself.
- A composite number can be broken down into prime factors.
- A number can be expressed as the product of its prime numbers.
- Repeated prime factors can be expressed as an exponent.
- The greatest common factor is the largest factor that two numbers have in common.
- The least common multiple is the smallest multiple that two numbers have in common.
- Prime factorization can be used to determine the greatest common factor and least common multiple of two or more numbers.
- The distributive property lets you multiply a sum by multiplying each addend separately and then add the products.

**Important Information about Prime Numbers:**

- 1 is neither prime or composite (it's a factor of all numbers)
- 2 is the ONLY even prime number

**Factor 54 with prime factorization**

- **Step 1**- Begin with the first prime factor that works with 54 — 2 x 27
- **Step 2**- Factor 27 using prime factors — 3 x 9
- **Step 3**- Factor 9 using prime factors — 3 x 3
- **The prime factorization of 54 is 2 x 3 x 3 x 3 or 2 x $3^2$**

Find the **GCF**…Step 1, Create a factor tree….

12
2 x 6
2 x 3

18
2 x 9
3 x 3

36
4 x 9
2 x 2 x 3 x 3

**Factors**
12 = 2 • 2 • 3
18 = 2 • 3 • 3
36 = 2 • 2 • 3 • 3

The **GCF** is whatever numbers are the same in each Prime Factorization
Side Note: The ***GCF will NEVER be larger than the smallest number***!

The **LCM** is the MOST of each Prime Factorization…
Side Note: The ***LCM will NEVER be smaller than the largest number***!
So the LCM is the max of each….therefore, 2 • 2 • 3 • 3 = 36

The **GCF** is 2 x 3 = **6**
So the GCF of 12, 18, & 36 is 6

The **LCM** is 2 x 2 x 3 x 3 = **36**
So the LCM of 12, 18, & 36 is 36

**This is how Distributive property works:**
Joe wants to join a plywood rectangle with dimensions of 2 feet by 7 feet to another one that is 2 feet by 4 feet. What is the total area?
2(7) + 2(4) = 14 + 8 = 22 square feet OR 2(7 + 4) = 2(11) = 22 square feet

# Aug $29^{th}$ – 2 standards this week

**[ 6.M.NS.C.09]** I can convert between, fractions, decimals, percents and ratios.
**Big Ideas**

- Fractions, decimals, ratios and percents are different ways to represent the same value.
- Each conversion requires a specific procedure.

**Common Misconceptions**

- Students don't understand percentages as being part of 100.

- Students confuse the algorithms to convert.
- Students are not comfortable with place value. (EX: .8 = .8000)

**Sample Problem**: A baseball player's batting average is 0.625. What does the batting average mean? Explain the batting average in terms of a fraction, ratio, and percent.

**Solution**:

- The player hit the ball $^{5}/_{8}$ of the time he was at bat;
- The player hit the ball 62.5% of the time; or The player has a ratio of 5 hits to 8 batting attempts (5:8).

**Fractions, decimals, ratios and percents are different ways to represent the same value.**
Each conversion requires a specific procedure.

- **To convert (change) a fraction to a decimal**, divide the numerator by the denominator.
- ¾ = 3 ÷ 4 = 0.75
- **To convert a decimal to a fraction**, use the place value of the last digit to determine the denominator and put the numbers to the right of the decimal point in the numerator. Reduce to lowest terms.
- 0.75 = $^{75}/_{100}$ = ¾
- The 5 is in the hundredths place. Then, reduce to lowest terms.
- **To convert a decimal to a percent**, move the decimal point two places to the right and add the % sign.
- 0.75 = 75%
- **To convert a percent to a decimal**, move the decimal point two places to the left and remove the % sign.
- 75.% = 0.75

**[6.M.RP.A.01]** I can describe two quantities using a ratio. Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. For example, "the ratio of wings to beaks in the bird house at the zoo was 2:1, because of every two wings there was 1 beak"

**Big Ideas**

- Identify two quantities to be compared. Correctly represent the comparison using the ratio symbol (:). Be able to describe them using "For every____, there are_____."

**Common Misconceptions**

- Student does not account for the unit. (Part to Part vs. Part to Whole)
- Student changes the order of the ratio or cannot describe the order using correct vocabulary

**Sample Problem**: Mrs. Caldwell bought 5 packages of colored pencils and 6 packages of markers for an art project for the 6th grade. Write a ratio of colored pencils to markers. Write the ratio using words, as a fraction and with a colon.

| | |
|---|---|
| 5 to 6 | number of colored pencils **to** number of markers |
| $^{5}/_{6}$ | $^{\textbf{number of colored pencils}}/_{\textbf{number of markers}}$ |
| 5:6 | number of colored pencils: number of markers |

You could also write a ratio comparing part to whole. Write the number of colored pencils to all art supplies. Write the ratio three ways.

| | |
|---|---|
| 5 to 11 | number of colored pencils **to** colored pencils and markers |
| $^{5}/_{11}$ | $^{\textbf{number of colored pencils}}/_{\textbf{number of colored pencils and markers}}$ |
| 5:11 | number of colored pencils: colored pencils and markers |

# Aug 5th

**Add RP.A.02]** I can use a ratio relationship to understand unit rate.

**Big Ideas**

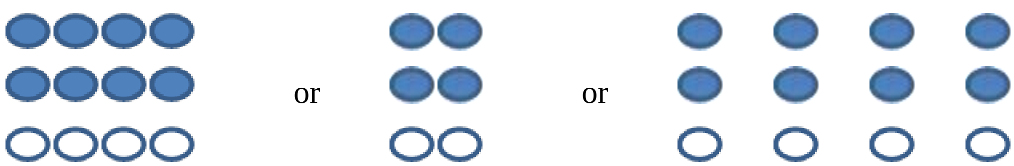
- Unit rate compares a quantity in terms of one unit of another quantity.
- Use unit rates to solve missing value problems.
- Related unit rates are reciprocals.
- A ratio is a comparison of two quantities.

**Common Misconceptions**

- Students will set up the ratio incorrectly.

A rate is a ratio where two measurements are related to each other. When discussing measurement of different units, the word rate is used rather than ratio. Understanding rate, however, is complicated and there is no universally accepted definition. When using the term rate, contextual understanding is critical. Students need many opportunities to use models to demonstrate the relationships between quantities before they are expected to work with rates numerically.

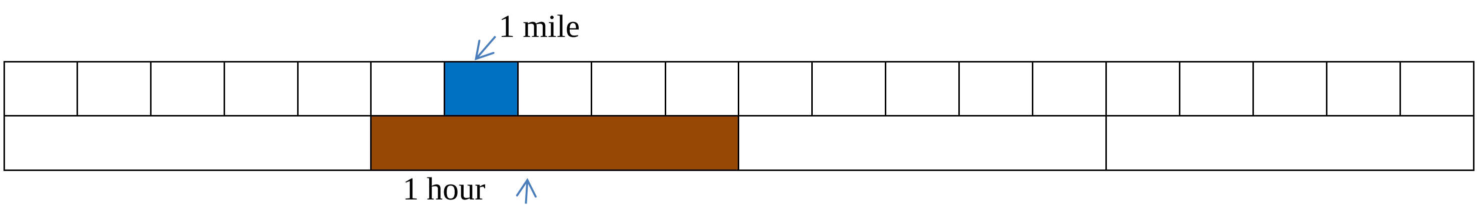
A comparison of 8 black circles to 4 white circles can be written as the ratio of 8:4 and can be regrouped into 4 black circles to 2 white circles (4:2) and 2 black circles to 1 white circle (2:1).




Students should be able to identify all these ratios and describe them using "For every…., there are …"

On a bicycle you can travel 20 miles in 4 hours. What are the unit rates in this situation, (the distance you can travel in 1 hour and the amount of time required to travel 1 mile)?

Solution: You can travel 5 miles in 1 hour written as $^{5mi}/_{1hr}$ and it takes $^{1}/_{5}$ of a hour to travel each mile written as $^{1/5\ mi}/_{1hr}$ . Students can represent the relationship between 20 miles and 4 hours.




# September 12th (this standard appears here & on March 6th)

**[ 6.M.RP.A.03]** I can solve real world problems involving rate and ratio using diagrams

**Big Ideas**

- Rates and ratios can be used in real-world situations.
- Using ratio and rate reasoning you can find missing values in a diagram.

**Common Misconceptions**

- Students will set up ratios and problems incorrectly.
- Students will have trouble extracting information from diagrams.

**Sample Problem**: Using the information in the table, find the number of yards in 24 feet.

| Feet | 3 | 6 | 9 | 15 | 24 |
|---|---|---|---|---|---|
| Yards | 1 | 2 | 3 | 5 | ? |

There are several strategies that students could use to determine the solution to this problem.

- Add quantities from the table to total 24 feet (9 feet and 15 feet); therefore the number of yards must be 8 yards (3 yards and 5 yards).
- Use multiplication to find 24 feet: 1) 3 feet x 8 = 24 feet; therefore 1 yard x 8 = 8 yards, or 2) 6 feet x 4 = 24 feet; therefore 2 yards x 4 = 8 yards.

**Sample Problem**: Compare the number of gray to white squares. If the ratio remains the same, how many gray squares will you have if you have 60 white circles?

| | | | | | |
|---|---|---|---|---|---|
| Gray | 4 | 40 | 20 | 60 | ? |
| White | 3 | 30 | 15 | 45 | 60 |

**Sample Problem**: A credit card company charges 17% interest on any charges not paid at the end of the month. Make a ratio table to show how much the interest would be for several amounts. If your bill totals $450 for this month, how much interest would you have to pay if you let the balance carry to the next month? Show the relationship on a graph and use the graph to predict the interest charges for a $300 balance.

| | | | | | |
|---|---|---|---|---|---|
| Charges | $1 | $50 | $100 | $200 | $450 |
| Interest | $0.17 | $8.50 | $17.00 | $34.00 | ? |

**Sample Problem**: 8% of 90

$8\% = {}^{8}/_{100}$

${}^{8}/_{100} \text{ x } 90 = {}^{720}/_{100} = 7.2$

**Find 8% of 90**

**Step 1** Write the % as a rate per 100

**Step 2** Write the multiplication problem

**Step 3** Multiply

**So** 8% of 90 is 720/100 or 7.2

**Sample Problem**: 0.9% of 30

$0.9\% = {}^{0.9}/_{100}$

${}^{0.9}/_{100} \text{ x } {}^{10}/_{10} = {}^{9}/_{1000}$

${}^{9}/_{1000} \text{ x } 30 = {}^{270}/_{1000} = {}^{27}/_{100} = 0.27$

**Find 0.9% of 30**

**Step 1** Write the $ as a rate per 100

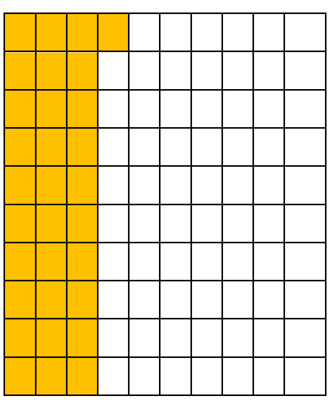
**Step 2** multiply by a fraction equivalent to 1 to get a whole number in the numerator

**Step 3** Write the multiplication problem

**Step 4** Multiply

**So** 0.9% of 30 is 0.27

Model the percent and write it as a ratio: 31%



${}^{31}/_{100}$

31 to 100

31:100

## Sept 19th

**[ 6.M.NS.A.01]** I can use models to divide fractions. I can create and solve word problems to divide fractions.

**Big Ideas**

- The quotient is related to the whole.

- Visual models help students understand quotients of fractions and see the relationship between multiplication and division.

**Common Misconceptions**

- Students forget to take the reciprocal of the second fraction.
- They switch the order and sometimes 'flip' the wrong fraction.
- Students have trouble when dividing a whole number by a fraction.
- Students have trouble conceptually understanding this objective.

Contexts and visual models can help students to understand quotients of fractions and begin to develop the relationship between multiplication and division. Model development can be facilitated by building from familiar scenarios with whole or friendly number dividends or divisors. Computing quotients of fractions build upon and extends student understandings developed in Grade 5. Students make drawings, model situations with manipulatives, or manipulate computer generated models.

**Sample Problem**: 3 people share ½ pound of chocolate. How much of a pound of chocolate does each person get? **Solution**: Each person gets $^{1}/_{6}$ lb of chocolate.

| | |
|---|---|
| ½ lb of chocolate | |

| | | | | | |
|---|---|---|---|---|---|
| $^{1}/_{6}$ of a pound | $^{1}/_{6}$ of a pound | $^{1}/_{6}$ of a pound | | | |

**Sample Problem:** Manny has ½ yard of fabric to make book covers. Each book is made from $^{1}/_{8}$ yard of fabric. How many book covers can Manny make? **Solution**: Manny can make 4 book covers.

| | |
|---|---|
| ½ yard of fabric | |

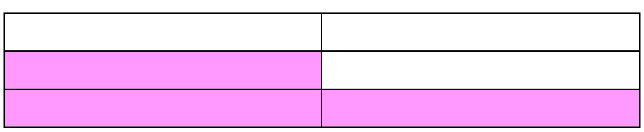
| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1/8 yard | 1/8 yard | 1/8 yard | 1/8 yard | | | | |

Represent ½ ÷ $^{2}/_{3}$ in a problem context and draw a model to show your solution.

Context: You are making a recipe that calls for $^{2}/_{3}$ cup of yogurt. You have $^{1}/_{2}$ cup of yogurt from a snack pack. How much of the recipe can you make?

| | |
|---|---|
| ½ cup of yogurt | |

| | |
|---|---|
| $^{1}/_{3}$ of ½ cup | |
| $^{1}/_{3}$ of ½ cup | |
| $^{1}/_{3}$ of ½ cup | |



**The first model** shows ½ cup. The shaded squares in all three models show ½ cup.

**The second model** shows ½ cup and also shows 1/3 cups horizontally.

**The third model** shows ½ cup moved to fit in only the area shown by 2/3 of the model.

2/3 is the new referent unit (whole).
3 out of the 4 squares in the 2/3 portion are shaded.
A ½ cup is only ¾ of a 2/3 cup portion, so you can only make ¾ of the recipe

**Dividing by a fraction is the same as multiplying by its reciprocal.**

$$^{a}/_{b} \div {}^{c}/_{d} = {}^{ad}/_{bc}$$

**Sample Problem**: Maggie is planning a party. She knows that a pitcher of juice holds 3/4 gallon. Each serving is $^{1}/_{8}$ gallon. How many servings does the pitcher hold?

**Solution**: ¾ ÷ $^{1}/_{8}$ = ¾ x $^{8}/_{1}$ = $^{24}/_{4}$ = 6 servings

**Sample Problem**: 1 ÷ $^{3}/_{2}$

**Step 1)** $^{1}/_{1}$
**Step 2)** $^{1}/_{1}$ x $^{3}/_{2}$
**Step 3)** $^{1}/_{1}$ x $^{2}/_{3}$
**Step 4)** 1 x 2 = $^{2}/$
**Step 5)** 1 x 3= $/_{3}$
**Step 6)** $^{2}/_{3}$ (check to see if numerator is larger than denominator- if not , reduce using GCF)
**ANSWER** = $^{2}/_{3}$

**STEPS FOR DIVIDING FRACTIONS**

Step 1 Write the whole number as a fraction (if needed)

Step 2 Change the division sign to a multiplication X sign

Step 3 Invert (flip) the second fraction. DO NOT CHANGE THE FIRST FRACTION

Step 4 Multiply the numerators

Step 5 Multiply the denominators

Step 6 Simplify/reduce if possible using Greatest Common Factor (GCF)

*If numerator is larger than the denominator, divide the bottom into the top

## Sept 26th

## Benchmark #1 Test

## Benchmark 2 Standards

## Oct 3rd

**[ 6.M.NS.C.05]** I can describe quantities in real-world situations using positive and negative numbers.

Understand that positive and negative numbers are used together to describe quantities having opposite directions or values. (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation

**Big Ideas**

- How do positive and negative numbers relate to Zero.
- Positive and negative integers apply to real-world situations.

**Common Misconceptions**

- Students don't understand comparing and ordering negative numbers. (e.g., -15 < -5)

**Vocabulary**: Attaching a negative sign to a number means reflecting that number across zero on the number line. A **negative number** is always written with a negative sign. You can write a positive number with a positive sign or without any sign. For example, positive 5 can be written as +5 or 5.

The **integers** are the set of whole numbers with their opposites. The integers can be represented by the set {...,-3, -2, -1, 0, 1, 2, 3,...}. Notice the three periods before and after the number set. These three periods are called an ellipsis.

**Vocabulary**

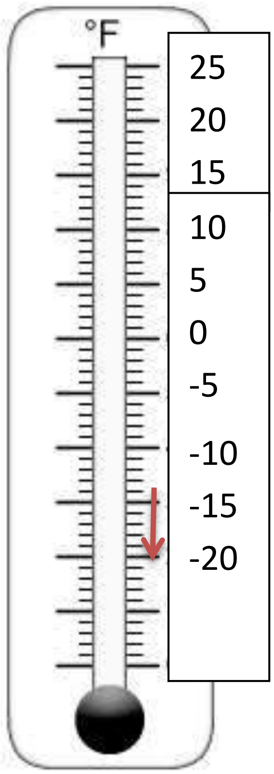
- **Infinity**: A quantity without bound or end. ( ∞ )
- **Positive Integer**: A whole number that is always greater than zero and is located to the right of zero.
- **Negative Integer**: A whole number that is always less than zero and is located to the left of zero.
- **Absolute value**: The distance a number is from zero on a number line. | 3 |
- **Opposites**: Every positive integer has an opposite negative integer of the same numerical digit. ( 3, -3 ) The opposite of 0 is 0.
- **Least value**: On the number line, the integer farthest to the left is less than all other integers.

**Note**: Positive and negative numbers are used together to describe quantities having opposite directions or values. **Examples**: Temperature, above/below zero; Elevation, above/below sea level; Credits/debits; Positive/negative electric charge.

**Sample Problem**: Mt. Everest, the highest elevation in Asia, is 29,028 feet above sea level. The Dead Sea, the lowest elevation, is 1,312 feet below sea level. What is the difference between these two elevations?

29,028
+1,312
30,340 feet

To solve this problem you must add 1,312 feet to 29,028 because the Dead Sea is below sea level.




**Sample Problem**: In Buffalo, New York, the temperature was -14°F in the morning. If the temperature dropped 7°F, what is the temperature now?

$-14^o - 7^o = -21^o$

**Sample Problem**: Within 24 hours in Montana, in 1916, the temperature went from 44ºF to -56ºF. How many degrees did the temperature fall?

$44^o$ $0^o$ $-56^o$

From $44^o$ to zero is $44^o$ and from zero to $-56^o$ is an additional $56^o$. So $44^o + -56^o = 100^o$ difference in 24 hours.

**Sample Problem**: Helen and Grace started a company called Top Notch. They calculated the company's profit and loss each week. The table shown represents the first 10 weeks of operation. Losses are represented by amounts within parentheses. For example, ($25) denotes a loss of $25. Amounts that are not in parentheses are profits.

| Week | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Total Profit |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Profit or loss | $159 | ($201) | $231 | ($456) | ($156) | ($12) | $281 | $175 | $192 | $213 | ? |

**Solution:**
Step 1 – add all the profits = $159 + $231 + $281 + $175 + $192 + $213 = $1251
Step 2 – add all the losses = $201 + $456 + $ 156 + $ 12 = $825
Step 3 – Subtract the losses from the profits = $1251 - $825 = $426 total profit

## Oct $10^{th}$

**[ 6.M.NS.C.06a]** I can order and position rational numbers on a number line.

Students need to understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates.

- Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line;
- Recognize that the opposite of the opposite of a number is the number itself, e.g., -(-3) = 3, and that 0 is its own opposite.
- Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane.

**Big Ideas**
- Number lines can be used to show numbers and their opposites.
- Use number lines to model movement across a coordinate plane.
- Zero is its own opposite.

**Common Misconceptions**
- Students confuse the x and y axes.
- Students confuse which number is listed first in the coordinate pair.
- Students will struggle with placement of fractions/mixed numbers on a number line.

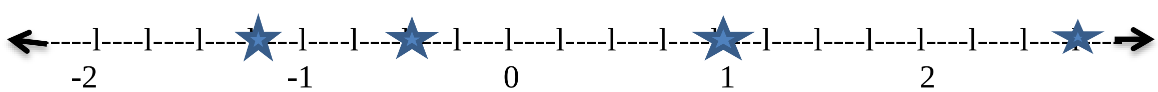
Number lines can be used to show numbers and their opposites. Both 3 and -3 are 3 units from zero on the number line. Graphing points and reflecting across zero on a number line extends to graphing and reflecting points across axes on a coordinate grid.
The use of both horizontal and vertical number line models facilitates the movement from number lines to coordinate grids.

**3 is opposite of a -3**
**-3 is opposite of 3**

**Sample Problem**: Which expression shows the absolute value of a $35.00 debt?

a. l35l = 35
**b. l-35l = 35**
c. l-35l = -35
d. l35l = -35

**Sample Problem**: Name the set of numbers that are graphed.



The set of numbers is: { -1 ¼, $-^{1}/_{2}$, 1, 2 ¾ }

**Sample Problem**: Place these numbers on the number line: -3 ½, -2 $-^{1}/_{2}$, 2, 4 ½, 6, 7 ½

-----l----l----l----l----l----l----l----l----l----l----l----l----l----l----l----l-----
-7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8

# Oct 17$^{th}$

**[ 6.M.EE.A.01]** I can create and simplify numerical expressions.

**Big Ideas**
- Numerical expressions are solved using PEMDAS. (Parentheses, Exponents, Multiply/Divide, Add/Subtract)
- Exponents are how many times you multiply a number by itself.

**Common Misconceptions**
- Students get confused if there is more than one operation within a parentheses.
- They also get confused if only one value is enclosed in parentheses. ex (2)6
- They don't apply 'first come first served' when multiplying/dividing and adding/subtracting.
- Students don't apply rules for exponents. EX: $2^3$ = 6 instead of 8

**Sample Problems:**

• Write the following as a numerical expressions using exponential notation.

- The area of a square with a side length of 8 m (Solution: $8^2$ $m^2$)
- The volume of a cube with a side length of 5 ft: (Solution: $5^3$ $ft^3$ )
- Mignon has a pair of mice. The mice each have 2 babies. The babies grow up and have two babies of their own: (Solution: $2^3$ mice)

• **Evaluate**:

- $4^{3\,=}$ (Solution: 64)
- $5 + 2^4 \bullet 6 =$ (Solution: 101)
- $7^2 - 24 \div 3 + 26$ (Solution: 67)

**PEMDAS**

P Do all parentheses first

E Apply any exponents

MD Do all multiplication and division, working from left to right

AS Do all addition and subtraction, working from left to right

**Sample Problems:** Write out each step

| | | |
|---|---|---|
| 9 + 6 x (8 - 5) = | (14 - 5) ÷ (9 - 6) | $3^2$ x (4 - 2) = |
| 9 + 6 x 3 | 9 ÷ (9 - 6) | $3^2$ x 2 |
| 9 + 18 | 9 ÷ 3 | 9 x 2 |
| 27 | 3 | 18 |

# Oct 19th – 23rd

**[ 6.M.EE.A.02abc]** I can write and evaluate algebraic expressions for real-world contextual situations.

A. Write expressions that record operations with numbers and with letters standing for numbers. For example, express the calculation "Subtract y from 5" as 5 – y.
B. Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity. For example, describe the expression 2(8+7) as a product of two factors. View (8+7) as both a single entity and a sum of two terms.
C. Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations). For example, use the formulas $V = s^3$ and $A = 6s^2$ to find the volume and surface area of a cube with sides of length $s = {}^1/_2$.

**Big Ideas**

- Unknowns are represented using letters in Algebra.
- Written words can be translated into a mathematical sentence using numbers, symbols and variables.
- Students can use information given in a contextual situation to create an algebraic expression.
- Recognize that the coefficient is a multiplication factor connected to the variable in a mathematical expression, and a constant is a value that doesn't change based on the value of the variable.
- Algebraic expressions can be evaluated by substituting given values for variables.
- Order of Operations is used to evaluate expressions.

**Common Misconceptions**

- Students will mix up Order of Operations when evaluating.
- In contextual problems, students will not set up the problem correctly so you need to focus on key words.
- Students may forget mathematical terms and mix up the order during application

**Vocabulary**: A **numerical expression** contains only numbers and operations. An **algebraic expression** may contain numbers, operations, and one or more variables. Here are some examples.

| **Numerical Expression** | **Algebraic Expression** |
|---|---|
| 15 + 9 · 3 | 45 ÷ p − q |

To evaluate an algebraic expression, substitute a number for each variable. Then use the order of operations to find the value of the numerical expression.

- A **term** is one part of an algebraic expression which might be a number, a variable, or a product of both. Only like terms can be added to each other. Like terms can be numbers without variables, or they can be terms that have the same variable which can be combined by adding their coefficients. Combine the like terms: 4 + 3a + 5 + 2a = (4 + 5) + (3a + 2a) = 9 + 5a
- An **expression** is a group of mathematical symbols that represent a quantity; it may include numbers, variables, operation signs, and grouping symbols. Simplify the expressions: (4 + 3)a + 2a = 7a + 2a = 9a
- A **product** is the result when two numbers are multiplied. 4 (a+ 5) + 2 a
- A **sum** is the result when two numbers are added. Find the sum of each pair of terms. (4, 5) 4 + 5 = 9
- A **difference** is the result when one number is subtracted from another. Write an equation and find the difference between each pair of numbers: (5, 4) 5 - 4 = 1
- A **quotient** is the result when one number is divided by another. Write an equation and find the quotient for each pair of numbers: (12, 4) 12 ÷ 4 = 3
- A **variable** is a letter or symbol that represents a varying number. A **coefficient** is a number which multiplies a variable. A **constant** is a term or number that does not contain a variable and does not change. 4 + a + 5 + 2 a
- A **factor** is a whole number that divides exactly into another number (also, a whole number that multiplies with another number to make a third number.) Underline each factor below. Example: 4 (a + 5) 4 is multiplied by the sum of a and 5.

**Evaluate k + 10 when k = 25.**

k + 10 = 25 + 10 = 35 ← Substitute 25 for k.

Add 25 and 10.

**Evaluate 4 · n when n = 12.**

4 · n = 4 · 12 = 48 ← Substitute 12 for n

Multiply 4 and 12.

You can write the product of 4 and n in several ways.
4 · n
4n
4(n)

**Evaluate 3x − 14 when x = 5.**

3x − 14 =
3(5) − 14 = Substitute 5 for x.
15 − 14 = 1 Using order of operations, multiply 3 and 5. Subtract 14 from 15

**Evaluate $z^2$ + 8.5 when z = 2.**

$z^2 + 8.5 = (2)^2 + 8.5$ = Substitute 2 for z.
4 + 8.5 = 12.5 Using order of operations, evaluate $2^2$. Add 4 and 8.5.

**Sample Problem**: You are saving for a skateboard. Your aunt gives you $45 to start and you save $3 each week. The expression 45 + 3w gives the amount of money you save after w weeks. How much will you have after 4 weeks, 10 weeks, and 20 weeks? After 20 weeks, can you buy the skateboard? Explain.

| **Number of Weeks, w** | **45 + 3w** | **Amount Saved** |
|---|---|---|
| 4 | 45 + 3(4) | 45 + 12 = $57 |
| 10 | 45 + 3(10) | 45 + 30 = $75 |
| 20 | 45 + 3(20) | 45 + 60 = $105 |

After 20 weeks, you have $105. So, you cannot buy the $125 skateboard.

**Sample Problem**: Meagan spent $56.58 on three pair of jeans. If each pair of jeans costs the same amount, write an algebraic equation that represents this situation and helps you determine how much one pair of jeans cost. 3j = $56.58 (with j representing the cost of one pair of jeans)

**Sample Problem**: Consider the following expression: $x^2$ +5y +3x +6
Students should recognize that X and Y are the variables.
There are 4 terms: $x^2$, 5y, 3x and 6
The coefficients are 1, 5 and 3 and the constant term is 6.

**Sample Problem:** 5(n + 3) – 7n, when n = $^1/_2$
5 x 3 ½ - 7 x ½ = 17 ½ - 3 ½ = 14
**Sample Problem**: The expression c + 0.07c can be used to find the total cost of an item with 7% sales tax, where c is the pre-tax cost of the item. Use the expression to find the total cost of an item that cost $25.
C + 0.07c
$25 + 0.07c
$25 + $1.75 = $26.75

**Sample Problem**: The perimeter of a parallelogram is found using the formula p = 2l + 2w. What is the perimeter of a rectangular picture frame with dimensions of 8.5 inches by 11 inches?
P = 2*l* + 2*w*
P = (2 x 8.5) + (2 x 11)
P = 17 + 22 = 39 sq inches

**Sample Problem**: 1. what is the value of 6y - 3x when x = 0.3 and y = 1.2
(6 x 1.2) – (3 x 0.3)
7.2 – 0.9 = 6.3

# Oct 31st

**[ 6.M.EE.B.05]** I can create and solve an algebraic equation or inequality from a word problem and then justify my answer.

**Big Ideas**

- Students need to be able to isolate the variable when using inverse operations (including 2-step equations). Students need to justify answers by substituting values for variables

**Common Misconceptions**

- Students don't understand that a number next to a variable means multiplication. Ex: 2y = 2 times y

**Symbol Vocabulary:**

| Symbol | Meaning | Example |
|---|---|---|
| > | greater than | 6 is greater than 3 6 >3 |
| < | less than | 2 is less than 5 2 < 5 |
| ≤ | less than or equal to | 6 is less than or equal to 7 6 ≤ 7 |
| ≥ | greater than or equal to | 8 is greater than or equal to 7 8 ≥ 7 |
| = | equal to | two plus one equals three 2+1 = 3<br>three equals 3 3 = 3 |
| ≠ | is not<br>equal to | three plus one is not equal to 5 3 + 1 ≠ 5<br>four is not equal to 4 4 ≠ 5 |

A **variable** is a letter or symbol that represents an unknown number.

An **inequality** has more than one solution

***Information taken from LearnZillion***: **How do you solve inequalities?** By using inverse operations!

**If the value is NOT part of the solution set:**

- greater than
- < less than

**If the value IS part of the solution set:**

- $\geq$ greater than or equal to
- $\leq$ less than or equal to

Beginning experiences in solving equations should require students to understand the meaning of the equation as well as the question being asked. Solving equations using reasoning and prior knowledge should be required of students to allow them to develop effective strategies such as using reasoning, fact families, and inverse operations.

**Sample Problem**: Joey had 26 papers in his desk. His teacher gave him some more and now he has 100. How many papers did his teacher give him?

This situation can be represented by the equation $26 + n = 100$ where n is the number of papers the teacher gives to Joey. This equation can be stated as “some number was added to 26 and the result was 100”. Students ask themselves “What number was added to 26 to get 100?” to help them determine the value of the variable that makes the equation true.

**Students could use several different strategies to find a solution to the problem.**

- **Reasoning**: 26 + 70 is 96. 96 + 4 is 100, so the number added to 26 to get 100 is 74.
- Use knowledge of **fact families** to write related equations: $n + 26 = 100$, $100 - n = 26$, $100 - 26 = n$. Select the equation that helps you find n easily.
- Use knowledge of **inverse operations**: Since subtraction “undoes” addition then subtract 26 from 100 to get the numerical value of n
- **Scale model**: There are 26 blocks on the left side of the scale and 100 blocks on the right side of the scale. All the blocks are the same size. 74 blocks need to be added to the left side of the scale to make the scale balance.
- **Bar Model**: Each bar represents one of the values. Students use this visual representation to demonstrate that 26 and the unknown value together make 100.

| 100 | |
|---|---|
| 26 | + n |

**Sample Problem**: The equation $0.44s = 11$ where s represents the number of stamps in a booklet.
The booklet of stamps costs 11 dollars and each stamp costs 44 cents. How many stamps are in the booklet? Explain the strategies you used to determine your answer. Show that your solution is correct using substitution.
Twelve is less than 3 times another number can be shown by the inequality $12 < 3n$ . What numbers could possibly make this a true statement?

**Sample Problem**: $^{2}/_{3}y$ if $y = 6$

- Substitute the new number for the variable: $^{2}/_{3}y = {}^{2}/_{3} \bullet 6$
- Change the whole number to a fraction: $^{2}/_{3} \bullet {}^{6}/_{1}$
- Cross reduce if possible: $^{2}/_{3} \bullet {}^{6}/_{1}$ = 3 will go into 3 and 6 to make them 1 and 2
- Multiply across and reduce: $^{2}/_{1} \bullet {}^{2}/_{1} = {}^{4}/_{1} = 4$

**Sample Problem**: $21 + 3k = 51$

- Use inverse operations to isolate the variable. First, undo the constant from both sides:

$$\begin{array}{r} 21 + 3k = 51 \\ \underline{-21 \qquad -21} \\ 3k = 30 \end{array}$$

- Then undo the coefficient:

$$\frac{3k}{3} = \frac{30}{3} \qquad \boxed{k = 10}$$

**Solution**: An inequality solution is a number that produces a true statement when it is substituted for the variable in the inequality. Example: 2 is one solution of: x < 5, because 2 < 5. This is a true statement.

**Solving the inequality:** This is similar to solving an equation with a variable. You can add, subtract, multiply, or divide from each side of the inequality to find all possible solutions. This is called inverse operations.

| | |
|---|---|
| **Example**: $x + 2 < 6$ | Write the original inequality. |
| $x + 2 - 2 < 6 – 2$ | Subtract 2 from both sides. (Inverse Operation) |
| $x < 4$ | Solution of the inequality. |
| **Example**: $3x > 12$ | Write the original inequality |
| $^{3x}/_{3} > {}^{12}/_{3}$ | Divide both sides by 3. (Inverse Operation) |
| $x > 4$ | Solution of the inequality. |
| **Example**: $14 \geq x – 2$ | Write the original inequality. |
| $14 + 2 \geq x – 2 + 2$ | Add 2 to each side. (Inverse Operation) |
| $12 \geq x$ | Solution of the inequality. |
| **Example**: $^{x}/_{8} \leq 11$ | Write the original inequality. |
| $8 \text{ x } {}^{x}/_{8} \leq 11 \text{ x } 8$ | Multiply both sides by 8. (Inverse Operation |
| $x \leq 88$ | Solution of the inequality |

# Nov 7th

**[ 6.M.EE.B.07]** I can solve real-world problems using one-step equations.

**Big Ideas**

- Create an algebraic equation from a real world situation.
- Solve a one-step algebraic equation

**Common Misconceptions**

- Students do not correctly identify the operation.

They do not use inverse operations to solve for the variable.

**Sample Problem**: Sally spent $56.58 on three pairs of jeans. If each pair of jeans costs the same amount, write an algebraic equation that represents this situation and solve to determine how much onepair of jeans cost.

| $56.58 | | |
|---|---|---|
| J | J | J |

**Sample Solution:** "I created the bar model to show the cost of the three pairs of jeans. Each bar labeled J is the same size because each pair of jeans costs the same amount of money. The bar model represents the equation 3j = $56.58. To solve the problem, I need to divide the total cost of $56.58 between the three pairs of jeans. I know that it will be more than $10 each because 10 x 3 is only $30 but less than $20 each because 20 x 3 is $60. If I start with $15 each, I am up to $45. I have $11.58 left. I then give each pair of jeans $3. That's $9 more dollars. I only have $2.58 left. I continue until all the money is divided. I ended up giving each pair of jeans another $0.86. Each pair of jeans costs $18.86 (15 + 3 + 0.86). I double check that the jeans cost $18.86 each because $18.86 x 3 is $56.58."

**Sample Problem**: 4 friends found the 6th grade treasure chest. There were 16 candy bars in the treasure chest. If they share the candy bars equally how many will each student receive? Write and equation and solve it.

$\frac{4c}{4} = \frac{16}{4}$

C = 4 candy bars each

## Nov 14th

**[ 6.M.EE.B.08]** I can write and graph an inequality on a number line.

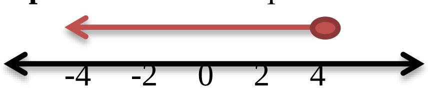
**Big Ideas**

- When graphing inequalities on a number line, closed 'dots' are used when the inequality is ≤ or ≥ .
- Open 'dots' are used when the inequality is < or >.

**Common Misconceptions**

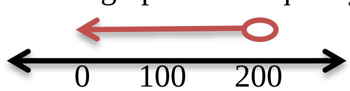
- Students confuse the comparing symbols.
- Students also confuse when to use an 'open circle' on the number line vs. a 'closed circle'

**Sample Problem**: Graph $x \leq 4$.

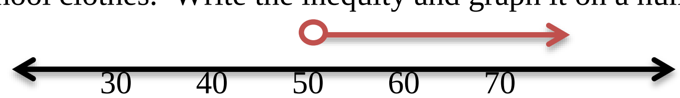



**Sample Problem**: Less than $200.00 was spent by the Flores family on groceries last month. Write an inequality to represent this amount and graph this inequality on a number line.

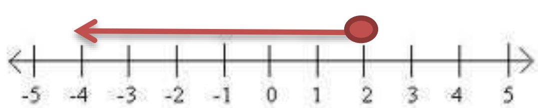
Solution: 200 > x




**Sample Problem**: Connor is working all weekend in the family garden. He is hoping to make more than $50.00 to spend on school clothes. Write the inequity and graph it on a number line.




**Sample Problem**: $X \leq 2$




## Nov 21st

**[ 6.M.NS.C.07]** I can write an inequality to show relationships between rational numbers.

A. Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram. For example, interpret -3 > -7 as a statement that -3 is located to the right of -7 on a number line oriented from left to right.

B. Write, interpret, and explain statements of order for rational numbers in real-world contexts. For example, write -3ºC is warmer and -7º C.

C. Understand the absolute value of a rational number is its distance from 0 on the number line; interpret absolute value as magnitude for a positive or negative quantity in a real-world situation. For example, for an account balance of -30 dollars, write [-30] = 30 to describe the size of debt in dollars.

D. Distinguish comparisons of absolute value from statements about order. For example, recognize that an account balance less than -30 dollars represents a debt greater than 30 dollars

**Big Ideas**

- Absolute Value is the distance from zero on a number line.
- Negative number's value decrease as the digits increase.
- A negative number's value is less the further away it gets from zero.

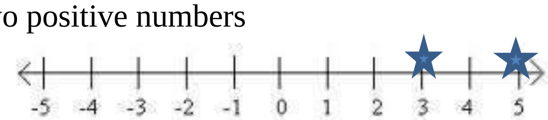
**Common Misconceptions**

- Students will mix up the inequality signs.
- Students will get confused about location of negative numbers.
- Students have a hard time distinguishing absolute value as neither positive nor negative.

Common models to represent and compare integers include number line models, temperature models and the profit-loss model. On a number line model, the number is represented by an arrow drawn from zero to the location of the number on the number line; the absolute value is the length of this arrow. The number line can also be viewed as a thermometer where each point of on the number line is a specific temperature. In the profit-loss model, a positive number corresponds to profit and the negative number corresponds to a loss. Each of these models is useful for examining values but can also be used in later grades when students begin to perform operations on integers.

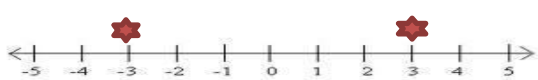
In working with number line models, students internalize the order of the numbers; larger numbers on the right or top of the number line and smaller numbers to the left or bottom of the number line. They use the order to correctly locate integers and other rational numbers on the number line. By placing two numbers on the same number line, they are able to write inequalities and make statements about the relationships between the numbers.

**Case 1**: Two positive numbers



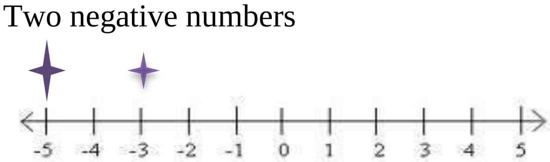

5 > 3
5 is greater than 3

**Case 2**: One positive and one negative number



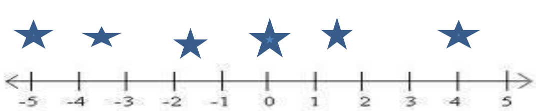

3 > -3
positive 3 is greater than negative 3
negative 3 is less than positive 3

**Case 3**: Two negative numbers



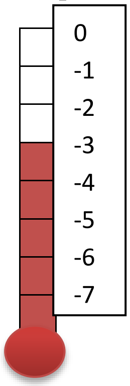

-3 > -5
negative 3 is greater than negative 5
negative 5 is less than negative 3

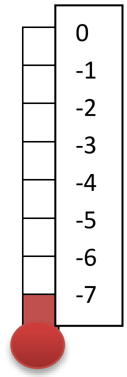
**Sample Problem**: Place these numbers on a number line. Order them from least to greatest.
**Numbers 4, -5, -3 ½ , 0, 1.5, -1.5**




**Sample Problem**: 3 > -6 because 3 is to the right of -6 on the number line.

**Sample Problem**: One of the thermometers shows -3°C and the other shows -7°C. Which thermometer shows which temperature? Which is the colder temperature? How much colder? Write an inequality to show the relationship between the temperatures and explain how the model shows this relationship.




## Nov 28th

**[ 6.M.EE.A.04]** I can show that two expressions are equivalent using properties and by combining like terms.

**Big Ideas**

- Apply properties to simplify a problem and combine like terms. Explain why or why not two different expressions are equivalent.

**Common Misconceptions**

- Students do not combine all terms with the same variable.
- Students do not correctly apply the properties.

**Are the expressions equivalent? How do you know?**

**4m + 8 4(m+2) 3m + 8 + m 2 + 2m + m + 6 + m**

Expression Simplifying the Expression Explanation

| | |
|---|---|
| **4m+8** | 4m + 8 already in simplest form |
| **4(m+2)** | 4(m + 2) = 4m + 8 Distributive Property |
| **3m+8+m** | 3m + 8+m = 3m + m + 8 = (3m + m) + 8 = 4m + 8 Combine like terms |
| **2+2m+m+6+m** | 2+2m + m + 6 + m = 2 + 6 + 2m + m + m = (2 + 6)+(2m + m + m) = 8 + 4m Combine Like Terms |

**Sample Problem**: Select an expression that is equivalent to 7y

A) 5y + 3y + y
B) y + 7
**C) 3y + y + 3y**
D) y + y + y + y + y + y

**Sample Problem**: My yard is three times as long as it is wide. Let w represent the width of the yard. Write two equivalent expressions that represent the area of the yard. Justify your answer. (Note: A = L x W)

**Equation 1**: A = 3W x W
**Justification**: The Length is equal to 3W and the width is W. Therefore, when substituting 3W in for L in the formula for Area (A = L x W) the resulting equation is A = 3W x W

**Equation 2**: $A = 3W^2$
**Justification**: When simplifying equation 1 equation 2 is created. $W \times W = W^2$. The coefficient (3) stays the same resulting in the equation $3W^2$

# Benchmark #2 Test Dec 5th (2 weeks)

## Dec 19th

**[ 6.M.EE.C.09]** I can use a chart, table or a graph to demonstrate relationships between two quantities in words and expressions.

**Big Ideas**

- A chart, table or a graph can be used to show relationships between quantities.
- Patterns can be used to recognize and describe the relationship.
- Understand the difference between a dependent and an independent variable

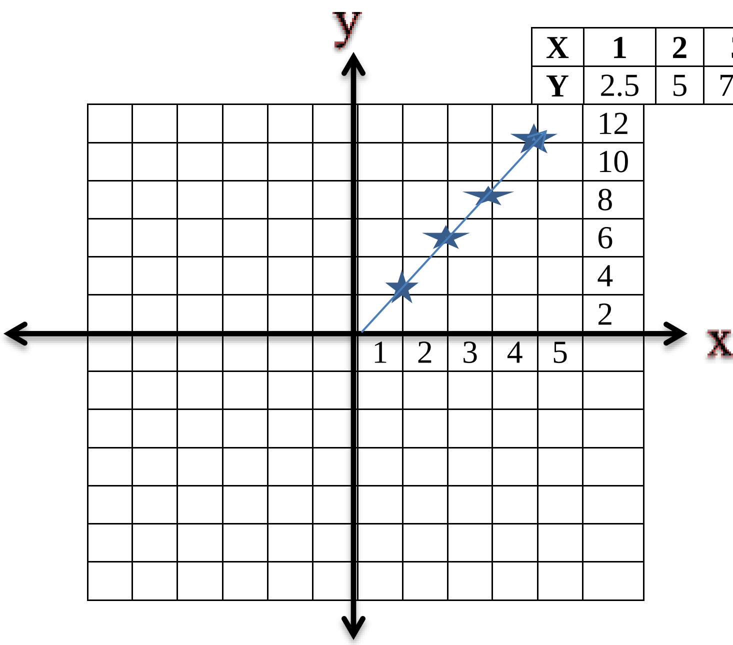
**Common Misconceptions**

- On an input/output chart, students don't know which number to plot first.
- Students have difficulty working from the graph to the chart.
- Students will confuse dependent and independent variables.

Students can use many forms to represent relationships between quantities. Multiple representations include describing the relationship using language, a table, an equation, or a graph. Translating between multiple representations helps students understand that each form represents the same relationship and provides a different perspective on the function.

**Sample Problem**: What is the relationship between the two variables? Write an expression that illustrates the relationship.

| X | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Y | 2.5 | 5 | 7.5 | 10 |

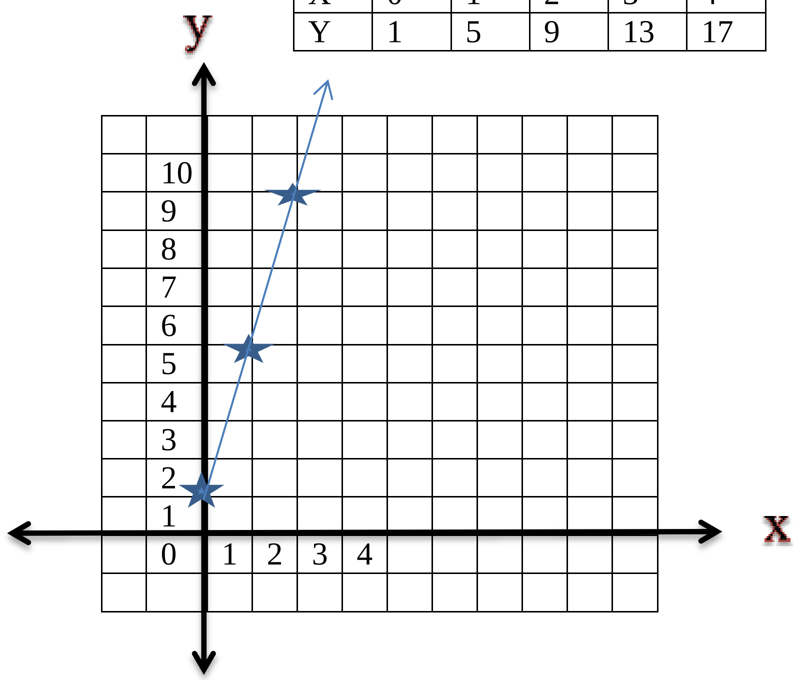



**Sample Problem**: Susan started with $1 in her savings. She plans to add $4 per week to her savings. Use an equation, table and graph to demonstrate the relationship between the number of weeks that pass and the amount in her savings account.

**I know**: Susan has $1 in her savings account. She is going to save $4 each week.

**Equation**: y = 4x + 1

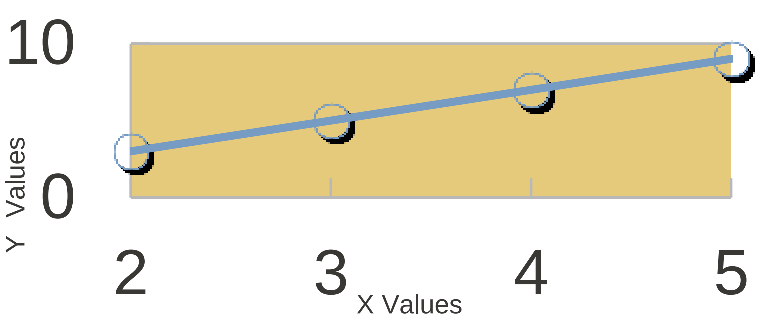
| X | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| Y | 1 | 5 | 9 | 13 | 17 |

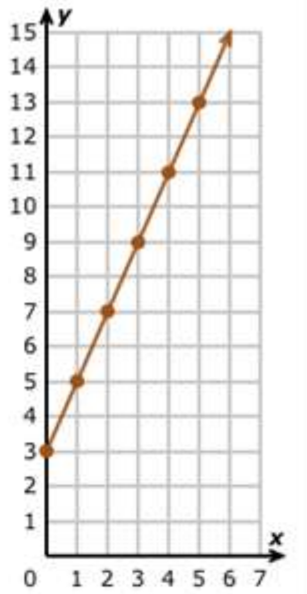



**Sample Problem**: For instance, the following table represents the equation:
**y = 4x – 1** **x is also known as the independent variable**. It changes independently. **y is also known as the dependent variable**. It changes in response to the independent variable.

| x | y |
|---|---|
| 1 | 3 |
| 2 | 7 |
| 3 | 11 |
| 4 | 15 |

**Sample Problem**: We can also show relationships between 2 numbers using graphs…
For instance, the following graph represents the equation:
y = 2x – 1 If x = 2, then y = 3 If x = 3, then y = 5 If x = 4, then y = 7






| x | y |
|---|---|
| 0 | 3 |
| 1 | 5 |
| 2 | 7 |
| 3 | 9 |
| 4 | 11 |

Write an Equation:

# Jan 4th – 8th (2 standards)

**[ 6.M.NS.C.08]** I can solve problems by graphing ordered pairs using absolute value to calculate distances.

**Big Ideas**

- Students should use absolute value to calculate distances between points.
- Students should be able to find missing coordinates of a 2D shape. (square, rectangle, equilateral triangle)
- A coordinate plane is divided into four quadrants by the x and y axes.
- In the first quadrant x is positive y is positive.
- In the second quadrant x is negative y is positive.
- In the third quadrant x is negative y is negative.
- In the fourth quadrant x is positive y is negative.
- The x coordinate is always the first. The y coordinate is the second.

**Common Misconceptions**

- Students don't know the attributes of square, rectangle and an equilateral triangle.
- Students mix up ordered pairs.
- Students have trouble with the concept of absolute value.

**Helpful information**: Please use IXL or Khan Academy to practice this standard

**[ 6.M.G.A.03]** I can plot coordinates and calculate distances between vertices on a coordinate plane

**Big Ideas**

- Students can calculate the distances between vertices on a coordinate plane.
- Students can identify the shapes that are created when ordered pairs are graphed on the coordinate plane.
- Students should see how these skills relate to real-life situations.
- Students will relate absolute value to calculate distances between vertices.

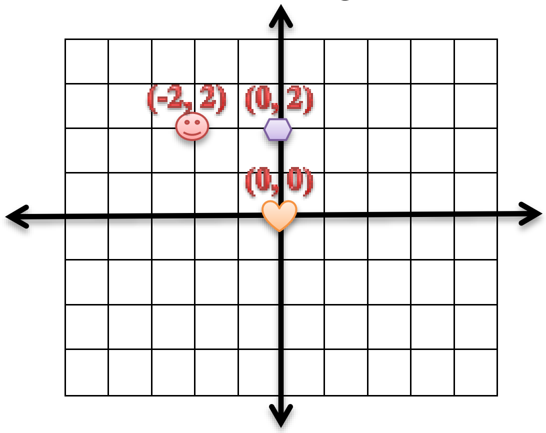
**Common Misconceptions**

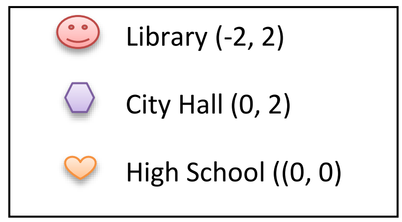
- Students will mix up graphing ordered pairs.

- Students don't grasp the concept of absolute value to calculate distances.

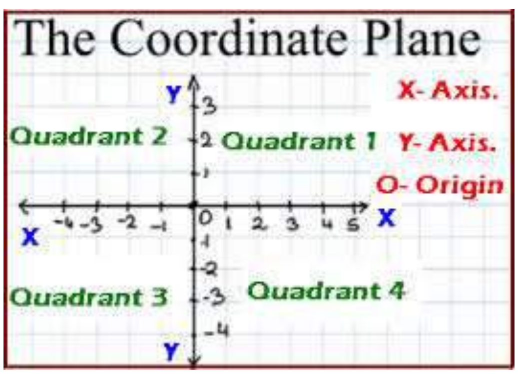
On a map, the library is located at (-2, 2), the city hall building is located at (0,2), and the high school is located at (0,0). Represent the locations as points on a coordinate grid with a unit of 1 mile.

- What is the distance from the library to the city hall building? The distance from the city hall building to the high school? How do you know?
- What shape is formed by connecting the three locations? The city council is planning to place a city park in this area. How large is the area of the planned park?



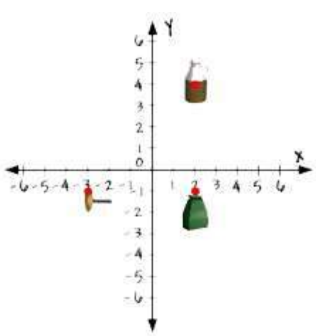

In algebra, you were introduced to the coordinate system, plotting ordered pairs, and graphing lines. These tools are used in geometry as well. Algebra and geometry are used hand-in-hand to solve many real-world math problems.





x-values    y-values

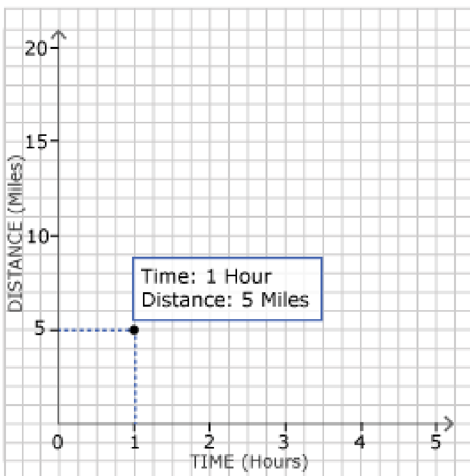
| Students | Pencils | |
|---|---|---|
| 0 | 0 | → (0,0) |
| 1 | 3 | → (1,3) |
| 2 | 6 | → (2,6) |
| 3 | 9 | → (3,9) |
| 4 | 12 | → (4,12) |



This graph shows the location of a medicine bottle, a doorknob, and a pottery jug. Each unit on the grid is equal to 5 meters.

**Vocabulary**:

- **Ordered Pair** - Two numbers (called x-coordinate and y-coordinate) written in a certain order. Written with parentheses.
- **Graph** - Drawings or diagrams that show information, usually about how many things.
- **Quadrant** - In coordinate geometry we use the space between the axis-x and axis-y. We can extend the x-axis and the y-axis so that all four quadrants of the number plane can be seen. They are numbered in a clockwise direction.
- **Coordinate Plane** - The plane containing both the x-axis and y-axis.
- **Length** - How long something is from end to end.
- **Polygon** - A plane shape which has three or more straight sides. Example: triangle, quadrilateral, pentagon or hexagon.
- **Vertex**- A point where two or more adjacent lines meet to form an angle or a corner.




Time - Distance

Graph

A **distance–time graph** has two axes. The vertical axis (going up and down) shows the distance traveled, while the horizontal axis (going side to side) shows the time that has passed.
The two axes meet at a single point called the origin. As you move from the origin up the vertical axis, the distance traveled increases. As you move from the origin along the horizontal axis, the amount of time passed increases. People use distance–time graphs to see how far a person, bike, car, train—really, anything that moves—has traveled over a certain amount of time.
A single point on the graph can show where a moving object is at a certain moment. Look at the point on the graph to the left. It lines up with 1 hour on the horizontal axis and 5 miles on the vertical axis. So if this graph represented a person's trip, that person would have traveled 5 miles in 1 hour.

## Jan 16th

**[ 6.M.NS.C.06bc]** I can reflect ordered pairs across one or more axes.

**Big Ideas**

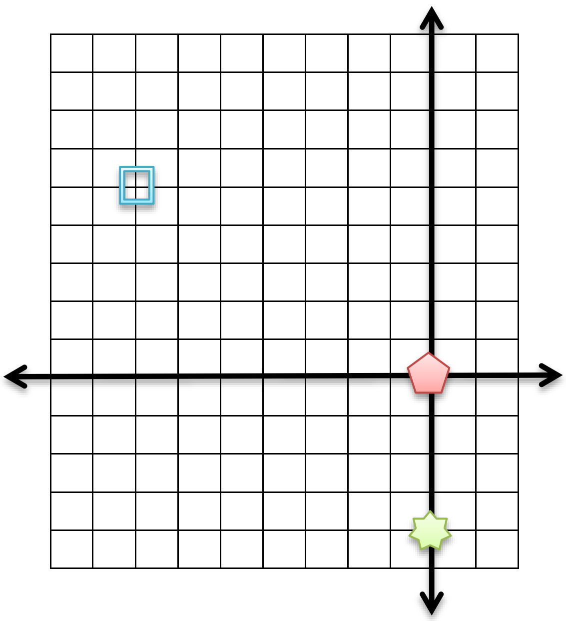
- When an ordered pair is reflected across the x axis, the first number in the ordered pair remains constant.
- When an ordered pair is reflected across the y axis the second number in the ordered pair remains constant.
- Every transformation can be represented with prime notation. For example, the original figure ABC would be labeled A’B’C’ after the first transformation. After the 2nd transformation, it would be labeled A’’B’’C’’ and so on.

**Common Misconceptions**

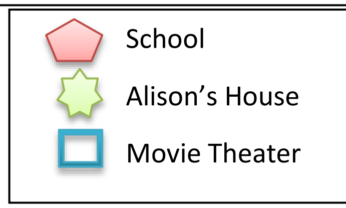
- Students confuse the x and y axes.
- Students don’t know where the point of origin is on a coordinate graph.
- Students mix up the coordinate pairs before plotting on a graph.

Graph the following points in the correct quadrant of the coordinate plane. If you reflected each point across the x-axis, what are the coordinates of the reflected points?
What similarities do you notice between coordinates of the original point and the reflected point?

$(^{1}/_{2}, -3\tfrac{1}{2})$ (- ½, -3) (0.25, -0.75)

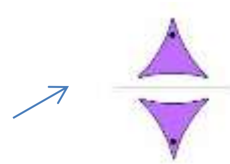


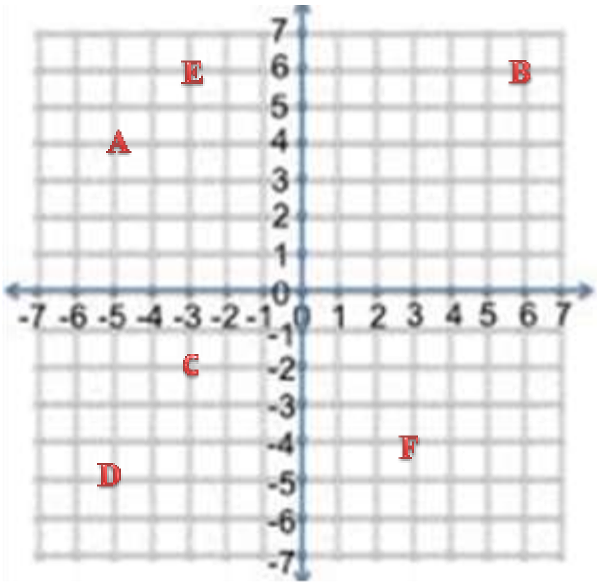
Janet is going to Alison’s house after school. Then they are going to the movie theater. Alison uses a grid to make a map for Janet. School is located at the origin. Each unit is one block. Directions east of the school are positive x-coordinates, north are positive y-coordinates, west are negative x-coordinates, and south are negative y-coordinates. Alison’s house is 4 blocks south of school. The theater is 7 blocks west and 9 blocks north of Alison’s house. What does the map look like?




**Vocabulary**

- **Quadrants** - The space between the axis-x and axis-y on a coordinate plane. There are a total of 4 of these.
- **Ordered Pairs** - Two numbers (called x-coordinate and y-coordinate) written in a certain order. They are written with parentheses.
- **X-Axis** - The line on a graph that runs horizontally (left to right) through zero.
- **Y-Axis** - The line on a graph that runs vertically (up and down) through zero.
- **Reflection** - A transformation in which the figure is the mirror image of the other.






Identify the ordered pair for each point. Remember to put the X value first, followed by the Y value.

A: (    ,    )  D: (    ,    )

B: (    ,    )  E: (    ,    )

C: (    ,    )  F: (    ,    )

Write the new ordered pair when the point has been reflected across the specified axis.

a. X  (–4, 3)  (-4, -3)
b. Y  (-31, -71)  (31, -71)
c. Y  (40, -8)  (-40, -8)
d. Y  (7, -5)  (-7, -5)
e. X  (1, 5)  (1, -5)
f. Y  (-9, 6)  (9, 6)
g. X  (3, -9)  (3, 9)
h. X  (-12, 16)  (-12, -16)
i. Y  (8, 23)  (-8, 23)
j. X  (-5, -7)  (-5, 7)

## Jan $23^{rd}$

**[ 6.M.G.A.01]** I can calculate area of regular and irregular polygons.

**Big Ideas**

- Area is the inside of a polygon.
- Irregular polygons can be broken apart into regular polygons to determine area.
- Every regular polygon has a formula to calculate its area.

**Common Misconceptions**

- Students forget to divide by 2 when calculating area of triangles.
- Students have trouble breaking down irregular polygons into regular polygons.
- They have trouble identifying lengths of missing sides.

Special quadrilaterals include rectangles, squares, parallelograms, trapezoids, rhombi, and kites.
Examples:
• Find the area of a triangle with a base length of three units and a height of four units.
• Find the area of the trapezoid shown below using the formulas for rectangles and triangles.


2(½b x h) + l x w =
2(½ of 3 x 4) + 6 x 4 =
2(1 ½ x 4) + 24 =
2 x 6 + 24 =
12 + 24 = 36 Sq units

**Vocabulary**

**Area** - The amount of surface or the size of a surface. It is measured in square units. Some units of area are: Square foot - ft2, square kilometer - km2, square mile - mi2, square meter - m2.

**Formula** - An equation that uses symbols to represent a statement. Example: Statement - The area of a rectangle is found when its length is multiplied by its width. Equation - A = l x w

**Polygon** - A plane shape which has three or more straight sizes: for example, a triangle, quadrilateral, pentagon or hexagon.

**Regular Polygon** - A polygon with sides that are equal in length and its angles are equal in size. Some common examples: Square - 4 sides, Regular Pentagon - 5 sides, Regular hexagon - six sides.

**Irregular Polygon** - A shape in which not all sides are equal in length, and/or at least one angle is different in size from the other angles.

**Length** - How long something is from end to end.

**Width** - The measurement from side to side.

**Height** - Measurement from top to bottom: the vertical distance.

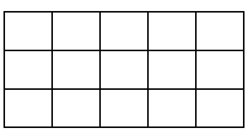
**How do we calculate area?**

We calculate the area by multiplying the shape's length by the shape's width.

To calculate the area of this shape, we would multiply 3 by 5. The area would be 15 feet squared.


**Why do we put "squared" after our answer?**

When we multiplied 3 by 5, we got an answer of 15. That means we could fit 15 1ft by 1ft "squares" inside this shape.



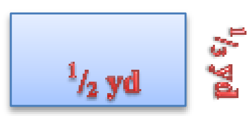
**Area with Decimals**

Multiply them like you would the whole numbers.

8.3 x 5.7 = 47.31 feet squared


**Area with Fractions**

$^1/_2$ x $^1/_3$ = $^1/_6$ yds squared



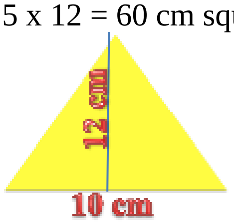

**Area of a Triangle**

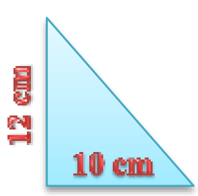
**Formula: $^1/_2$b x h**

To find the size of the space within a triangle (its area), you have to multiply $^1/_2$ the base by the height.

Since the base is 10, we would take half of that (which is 5) and multiply it by the height which is 12.

5 x 12 = 60 cm squared




It doesn't matter what shape the triangle is the formula remains the same.

Formula: 1/2b x h

# Jan 30th

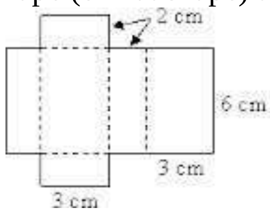
**[ 6.M.G.A.04]** I can calculate the surface area of a 3-D solid by creating a net.

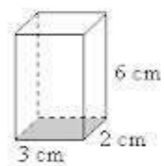
**Big Ideas**
- Nets are two dimensional representations of a three dimensional object.
- The areas of each face on the net can be added to find the surface area of the 3D solid.

**Common Misconceptions**
- Students will forget to divide by 2 for triangle areas.
- Students forget to identify pyramids by their base

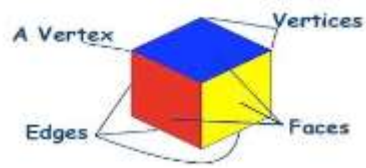
Students construct models and nets of three dimensional figures, describing them by the number of edges, vertices, and faces. Solids include rectangular and triangular prisms. Students are expected to use the net to calculate the surface area.
Students also describe the types of faces needed to create a three-dimensional figure. Students make and test conjectures by determining what is needed to create a specific three-dimensional figure.

**A Net**- A 2D shape (or flat shape) that can be folded to create a 3-D shape.

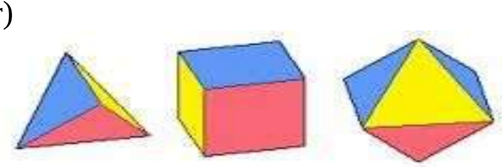


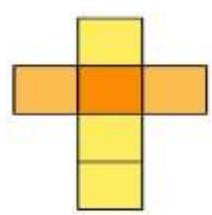

**Vocabulary**
**Vertex** - The corner of a 3D shape.
**Edge** - The line along which two lines meet.
**Face** - One of the surfaces of a 3D shape.



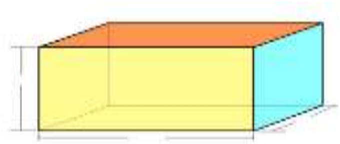

**Surface Area** - The total area on the outside of the shape. (Calculate the area of each face and add them together)

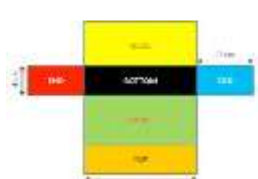


**Cube** - a 3-D shape with six congruent (same size) square faces.

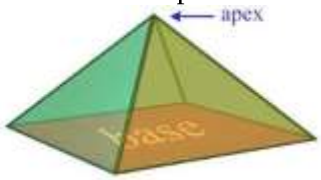


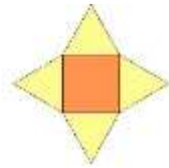
**Cuboid** - A 3-D rectangle



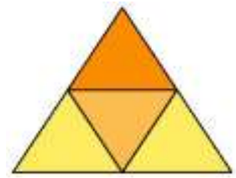


**Pyramid** - A 3-D shape with 4 triangular sides and a square base.



**Tetrahedron** - A 3-D shape with 4 congruent triangular faces.



## Feb 6th

**[ 6.M.G.A.02]** I can calculate the volume of right rectangular and right triangular prisms.

**Big Ideas**

- Students can explore the connection between filling a box with unit cubes and the volume formula.
- Students should draw diagrams with fractional lengths and connect with multiplying fractions.

**Common Misconceptions**

- Students haven't had a lot of exposure to 3D shapes.
- They will get confused on attributes of 3D shapes.

Students need multiple opportunities to measure volume by filling rectangular prisms with blocks and looking at the relationship between the total volume and the area of the base. Through these experiences, students derive the volume formula (volume equals the area of the base times the height).
Students can draw diagrams to represent fractional side lengths, connecting with multiplication of fractions. This process is similar to composing and decomposing two dimensional shapes.

**Examples:**

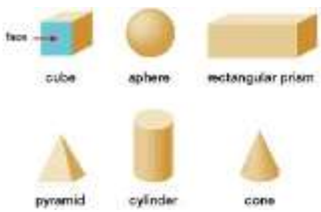
• The model shows a cubic foot filled with cubic inches. The cubic inches can also be labeled as a fractional cubic unit with dimensions of ¼ $in^3$

¼ of ¼ of ¼ = 1/64 $in^3$

**Vocabulary**

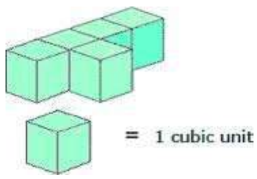
- **Prism** - A solid figure with two faces that are parallel and the same in size and shape.
- **Volume** - The amount of space inside a container, or the actual amount of material in the container.
- **Cube** - A solid, shaped like a box, with twelve equal edges, size equal square faces and eight corners.

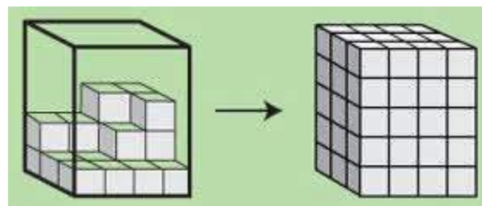
- **Area** - The amount of surface or the size of a surface.
- **Base** - The face on which a shape or solid stands.
- **Height** - Measurement from top to bottom; the vertical distance.
- **Length** - How long something is from end to end.
- **Width** - The measurement from side to side.
- **Fraction** - A number that compares a part of an object or a set with the whole.
- **Measurement** - Finding a number that shows the size or amount of something.




**How are 3-D shapes different than 2-D shapes?**

**Volume**: The number of cubic units needed to fill a space



So... if you multiply the length times the width times the height to find the Volume of a rectangular prism...
V = L x W x H
or V= lwh

## Feb 13th  2 weeks

**[ 6.M.SP.A.01.02.03]** I can understand that a set of data collected to answer a statistical question can be described and summarized by its distribution.

**Big Ideas**

- A statistical question anticipates an answer that varies from one individual to the next.
- Data are the numbers produced in response to a statistical question.
- When using mean, median, mode and range, students are describing data with a single number.
- The center, spread and overall shape can be used to compare the data sets.

**Common Misconceptions**

- Students confuse mean, median and mode.
- Students have trouble extracting information from the dot plots; they don't realize that each 'x' represents an individual number.

**Vocabulary:**

- **Mean** - The average of a set of numbers. It is found by adding all the numbers and then dividing the sum by the number of addends.
- **Median** - In statistics it is the middle number for an odd number of data, when numbers are arranged in order. For an even number of data arranged in order, it is the average of the two middle numbers.
- **Mode** - In statistics, it is the number that occurs most often in a set of data.
- **Range** - The difference between the largest and smallest values.
- **Distribution** - The number of times each possible outcomes occurs in a sample.
- **Clusters** - A group of the same or similar elements gathered or occurring closely together
- **Peaks** - The point of greatest value.

- ➢ **Gaps** - A space between points.
- ➢ **Symmetry** - A shape has this when one half of the shape can fit exactly over the other half.
- ➢ **Minimum** - The smallest or least value.
- ➢ **Maximum** - The greatest or biggest value.
- ➢ **Dot Plot** - a statistical chart consisting of data points plotted on a fairly simple scale, typically using filled in circles.
- ➢ **Graph** - Drawings or diagrams that show information, usually about how many things.
- ➢ **Collect** - To bring together in a group or mass: gather.

**Students Must Be Able to:**

- **6.SP.1** – design good statistical questions
- **6.SP.2** – compare dot plots
- **6.SP.3** – use mean, median, mode, and range to describe how the values vary across the data set

**6.SP.1** Statistics are numerical data relating to an aggregate of individuals; statistics is also the name for the science of collecting, analyzing and interpreting such data. ***A statistical question anticipates an answer that varies from one individual to the next and is written to account for the variability in the data***. Data are the numbers produced in response to a statistical question. Data are frequently collected from surveys or other sources (i.e. documents).
Students might want to know about the fitness of the students at their school. Specifically, they want to know about the exercise habits of the students. So rather than asking "Do you exercise?" they should ask about the amount of exercise the students at their school get per week. ***A statistical question for this study could be: "How many hours per week on average do students at Jefferson Middle School exercise?"***

- ❖ ***A statistical question is a question about a set of data that can vary. To answer a statistical question you need to collect or look at a set of data.***
- ❖ ***A good statistical question has variability in the data collected.***
- ❖ ***A bad statistical question does not have variability in its data. For example, "How many planets in our solar system have you visited?"***

**6.SP.2** The two dot plots show the 6-trait writing scores for a group of students on two different traits, organization and ideas. The center, spread and overall shape can be used to compare the data sets. Students consider the context in which the data were collected and identify clusters, peaks, gaps, and symmetry. Showing the two graphs vertically rather than side by side helps students make comparisons. For example, students would be able to see from the display of the two graphs that the ideas scores are generally higher than the organization scores. One observation students might make is that the scores for organization are clustered around a score of 3 whereas the scores for ideas are clustered around a score of 5.

```
    Scores for Organization                 Scores of Ideas
          x                                          x
          x    x                                     x
          x    x                                x    x
          x    x    x                      x    x    x    x
     x    x    x    x    x            x    x    x    x    x
x    x    x    x    x    x    x  x    x    x    x    x    x    x
l-----l-----l-----l-----l-----l-----l  l-----l-----l-----l-----l-----l-----l
0     1     2     3     4     5     6  0     1     2     3     4     5     6
```

**Steps to Describe Distribution**

- ❖ **Step 1** – **Look for clusters** – There are no groups of data that are separated from the rest, so there are no clusters of data.
- ❖ **Step 2** – **Look for gaps** – There are no intervals that contain no data, so there are no gaps in the data.
- ❖ **Step 3** – **Look for peaks** – There is one peak, at the interval of 3 on the organization dot plot and one at the 5 on the ideas dot plot.

❖ **Step 4 – Look for symmetry** – Imagine folding the graph in half vertically, along the interval of 3. The halves are not identical; they are skewed to the right. The graphs do not have symmetry

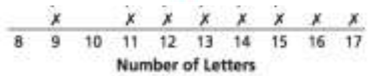
**6.SP.3** When using measures of center (mean, median, and mode) and range, students are describing a data set in a single number. The range provides a single number that describes how the values vary across the data set. The range can also be expressed by stating the minimum and maximum values.

**Example**: Consider the data shown in the dot plot of the six trait scores for organization for a group of students.
How many students are represented in the data set?
What are the mean, median, and mode of the data set? What do these values mean? How do they compare?
What is the range of the data? What does this value mean?

The students in Ms. Jee's class made a **line plot** to display the distribution of their class's data.

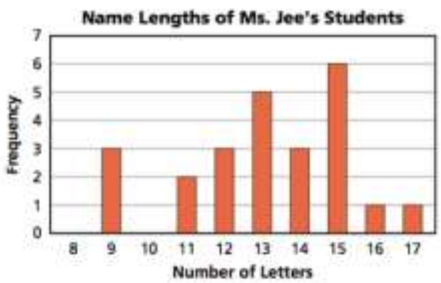
Test scores: 95, 98, 89, 91, 93, 95, 97

$$\frac{95 + 98 + 89 + 91 + 93 + 95 + 97}{7} = 94$$




To describe how the data are distributed, you might look at where the data values cluster, how much they vary and the high and low values

Another group displayed the same data using a **bar graph.**




Fahimeh Ghomizadeh said, "My name has the most letters, but the bar that shows my name is one of the shortest lengths on the graph. Why?

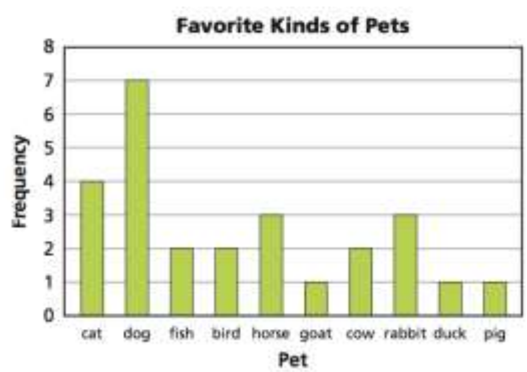
You can use the median and the mode of a set of data to describe what is typical about the distribution. They are sometimes called measures of center.

**Student Name Lengths**

| Name | Number of Letters |
|---|---|
| Thomas Petes | 11 |
| Michelle Hughes | 14 |
| Shoshana White | 13 |
| Deborah Black | 12 |
| Tonya Stewart | 12 |
| Richard Mudd | 11 |
| Tony Tung | 8 |
| Janice Wong | 10 |
| Bobby King | 9 |
| Charlene Greene | 14 |

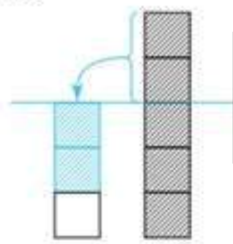
**Favorite Kinds of Pets**

| Pet | Frequency |
|---|---|
| cat | 4 |
| dog | 7 |
| fish | 2 |
| bird | 2 |
| horse | 3 |
| goat | 1 |
| cow | 2 |
| rabbit | 3 |
| duck | 1 |
| pig | 1 |



Finding the Mean:

1, 5



Use the cubes to determine the mean (or, the balance point) for the data set of 1,5.

I moved two cubes from 5 to 1 so both equal 3. The balance point is 3.

**Words Typed per Minute by 6th Graders**

5 | 1 2 2 6 7 8
6 | 2 3 4 4 5 9
7 | 0 2 5
8 | 3 5
9 | 0

The distribution of the data is skewed right. The mean is greater than the median.

The data are listed in a stem-and-leaf plot.

0 | 2 5
1 | 1 1 4 6
2 | 0 2
3 | 4

The mean is $\frac{135}{9}$ or 15.

The median is 14.

The mode is 11.

**How to Construct a Stem and Leaf Plot**

28 13 26 12 20 14 21 16 17 22 17 25 13 30 13 22 15 21 18 18 16 21 18 31 15 19

**Step 1**: Find the least number and the greatest number in the data set.
The greatest number is 31 (3 in the tens place)
The smallest number is 12 (1 in the tens place)

**Step 2**: Draw a vertical line and write the digits in the tens places from 1 to 3 on the left of the line. The tens digit form the stems.

1 |
2 |
3 |

**Step 3**: Write the units digit to the right of the line. The units digits form the leaves.

1 | 3 2 4 6 7 7 3 3 5 8 8 6 8 5 9
2 | 8 6 0 1 2 5 2 1 1
3 | 0 1

**Step 4**: Rewrite the units digits in each row from the least to the greatest.

1 | 2 3 3 3 4 5 5 6 6 7 7 8 8 8 9
2 | 0 1 1 1 2 2 5 6 8
3 | 0 1

**Step 5**: Include an explanation.

2 | 5 means 25

# Benchmark Test #3 Feb 27th

# March 6th

**[ 6.M.RP.A.03]** I can solve real world problems involving rate and ratio using diagrams

**Big Ideas**

- Rates and ratios can be used in real-world situations.
- Using ratio and rate reasoning you can find missing values in a diagram.

**Common Misconceptions**

- Students will set up ratios and problems incorrectly.
- Students will have trouble extracting information from diagrams.

**Sample Problem**: Using the information in the table, find the number of yards in 24 feet.

| Feet | 3 | 6 | 9 | 15 | 24 |
|---|---|---|---|---|---|
| Yards | 1 | 2 | 3 | 5 | ? |

There are several strategies that students could use to determine the solution to this problem.

- Add quantities from the table to total 24 feet (9 feet and 15 feet); therefore the number of yards must be 8 yards (3 yards and 5 yards).
- Use multiplication to find 24 feet: 1) 3 feet x 8 = 24 feet; therefore 1 yard x 8 = 8 yards, or 2) 6 feet x 4 = 24 feet; therefore 2 yards x 4 = 8 yards.

**Sample Problem**: Compare the number of gray to white squares. If the ratio remains the same, how many gray squares will you have if you have 60 white circles?

| Gray | 4 | 40 | 20 | 60 | ? |
|---|---|---|---|---|---|
| White | 3 | 30 | 15 | 45 | 60 |

**Sample Problem**: A credit card company charges 17% interest on any charges not paid at the end of the month. Make a ratio table to show how much the interest would be for several amounts. If your bill totals $450 for this month, how much interest would you have to pay if you let the balance carry to the next month? Show the relationship on a graph and use the graph to predict the interest charges for a $300 balance.

| Charges | $1 | $50 | $100 | $200 | $450 |
|---|---|---|---|---|---|
| Interest | $0.17 | $8.50 | $17.00 | $34.00 | ? |

**Sample Problem**: 8% of 90

$8\% = {}^{8}/_{100}$

${}^{8}/_{100} \times 90 = {}^{720}/_{100} = 7.2$

**Find 8% of 90**
**Step 1** Write the % as a rate per 100
**Step 2** Write the multiplication problem
**Step 3** Multiply
**So** 8% of 90 is 720/100 or 7.2

**Sample Problem**: 0.9% of 30

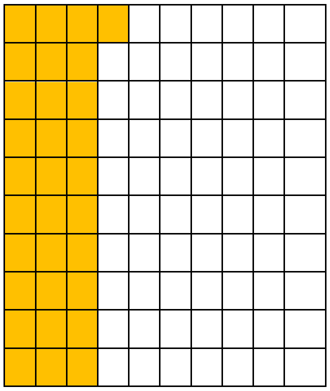
$0.9\% = {}^{0.9}/_{100}$

${}^{0.9}/_{100} \times {}^{10}/_{10} = {}^{9}/_{1000}$

${}^{9}/_{1000} \times 30 = {}^{270}/_{1000} = {}^{27}/_{100} = 0.27$

**Find 0.9% of 30**
**Step 1** Write the $ as a rate per 100
**Step 2** multiply by a fraction equivalent to 1 to get a whole number in the numerator
**Step 3** Write the multiplication problem
**Step 4** Multiply
**So** 0.9% of 30 is 0.27

Model the percent and write it as a ratio: 31%



$^{31}/_{100}$

31 to 100

31:100

# March 20th

**[ 6.M.SP.B.04]** I can collect, record, organize and display data using dot plots, histograms, number lines and box plots

**Big Ideas**

- Each graph has a specific purpose and one might be a better choice than another to display data.
- There are different graphs that display different data in an effective way.
- Dot plots show moderate size data, clusters, gaps and outliers.
- Box plots show degree of spread and skewness of data. Easy to compare data when using box plots side by side.
- Histograms show a large amount of data spread over a wide range.
- Line graphs show data spread over time and show trends.

**Common Misconceptions**

- Students will confuse graphs and choose the easiest one to make.

In order to display numerical data in dot plots, histograms or box plots, students need to make decisions and perform calculations. Students are expected to display data graphically in a format appropriate for that data set as well as reading data from graphs generated by others students or contained in reference materials.

**Dot plots** are simple plots on a number line where each dot represents a piece of data in the data set. Dot plots are suitable for small to moderate size data sets and are useful for highlighting the distribution of the data including clusters, gaps, and outliers.

In most real data sets, there is a large amount of data and many numbers will be unique.
A graph (such as a dot plot) that shows how many ones, how many twos, etc. would not be meaningful; however, a **histogram** can be used. Students organize the data into convenient ranges and use these intervals to generate a frequency table and histogram. **Note** that changing the size of the range changes the appearance of the graph and the conclusions you may draw from it.

**Box plots** are another useful way to display data and are plotted horizontally or vertically on a number line. Box plots are generated from the five number summary of a data set consisting of the minimum, maximum, median, and two quartile values. Students can readily compare two sets of data if they are displayed with side by side box plots on the same scale. Box plots display the degree of spread of the data and the skewness of the data.

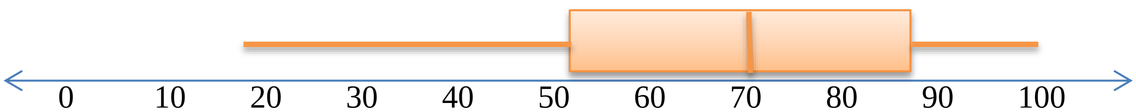
**Vocabulary**

- **Label** - Tells what kind of data is shown.
- **Title** - A few words that explain what the graph is about.

- **Key** - Tells what each symbol or color stands for.
- Number Line - A line in which equally spaced points are marked. The points correspond, in order, to the numbers shown.
- **Dot Plot** - A statistical chart consisting of data points plotted on a fairly simple scale, typically using filled in circles.
- **Histogram** - A bar graph with no spaces between columns.
- Box & Whisker Plot - A convenient way of graphically depicting groups of numerical data through their quartiles.
- **X-Axis** - The line on a graph that runs horizontally (left to right) through zero.
- **Y-Axis** - The line on a graph that runs vertically (up and down) through zero.
- **Mean** - The average of a set of numbers. It is found by adding all the numbers and then dividing the sum by the number of addends.
- **Median** - In statistics it is the middle number for an odd number of data, when number are arranged in order. For an even number of data arranged in order, it is the average of the two middle numbers.
- **Mode** - In statistics, it is the number that occurs most often in a set of data.
- **Range** - The difference between the largest and smallest values.
- **Box & Whisker Plot** (Khan Academy has excellent practice for creating and reading Box and Whisker Plots)

**Sample Problem**: 18 27 34 **52** 54 59 61 **68** 78 82 85 **87** 91 93 100
median of lower quartile = 52 MEDIAN median of upper quartile= 87

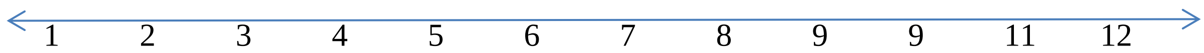
- put numbers in order from least to greatest to find the median of all of the numbers in the set = 68
- find the median of the numbers to the left of 68 (lower quartile) = 52
- find the median of numbers to the right of 68 (upper quartile) = 87
- find the interquartile range (the range between 52 and 87) by subtracting 52 from 87 = 35
- draw a number line. Number accordingly.
- the box above the number line will start with 52 (lower quartile) and end at 87 (upper quartile). The range of the numbers in the box is 35.
- the line connected to the left side of the box starts above lowest number in the set of numbers,(18), and the line on the right side of the box ends with highest number in the set, 100)
- the median for all of the numbers in the set, 68, will be plotted in the box by using a point and a vertical line going through the point. (The plotted median will not always be in the center of the box. Depending on your data, sometimes it will be more to one side than the other.)



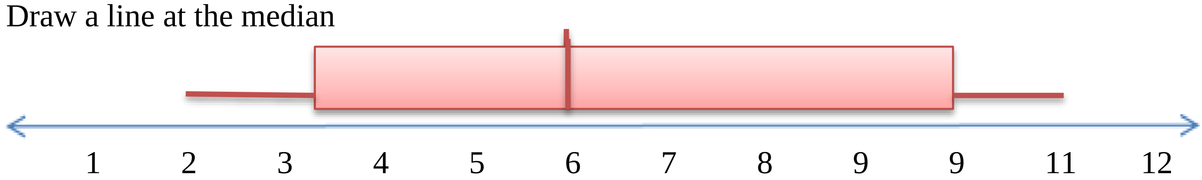
**Sample Problem**: Represent the following data using a box-and-whiskers plot. Exclude the median when computing the quartiles:

6, 5, 3, 11, 2, 10, 6, 6 2, 3, 5, 6, 6, 6, 10, 11

Step 1 – order the numbers from least to greatest
Step 2 – Find the median. The median is 6 because the two middle numbers are 6
Step 3 – find the median of the both sides of the main median. The median of 2, 3, 5 is 3.3 and the median of 6, 10, 11 is 9
Step 4 – Draw a number line




Step 5 – Draw a line at the median

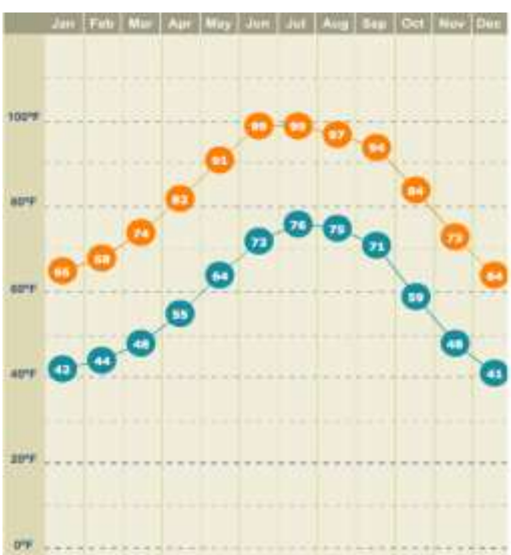



Step 6 – Draw a box between the 2 half medians and add the whiskers

**Sample Problem**: Use this stem & leaf to answer questions

| | | |
|---|---|---|
| 8 2 3 0 | 5 | |
| 7 6 2 | 6 | 6 |
| 4 4 4 3 | 7 | 2 4 |
| 9 6 2 | 8 | 4 6 7 8 8 |
| | 9 | 2 4 5 9 |
| | 10 | 0 2 |

What is the highest pulse rate before exercise? **89**
What is the lowest pulse rate after exercise? **66**
How many people were in the study? **28**
Before exercise: mean: **68.57** mode: **74**
After exercise: median: **88** range: **36**




**Sample Problem**:

To find the median put all the numbers listed in order from least to greatest. It is a good idea to cross off numbers as you list them so that you don't forget any.

To find the mode, you must find the number that occurs the most. You might also remember mode as the Most Often Digit Encountered.

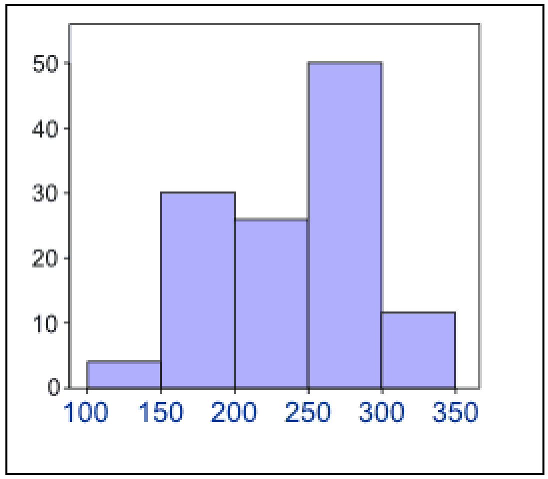
To find the mean, you must add up all the numbers in the data set listed and then divide by how many numbers there are.

Median: __________ Mode: _________ Mean: ____________

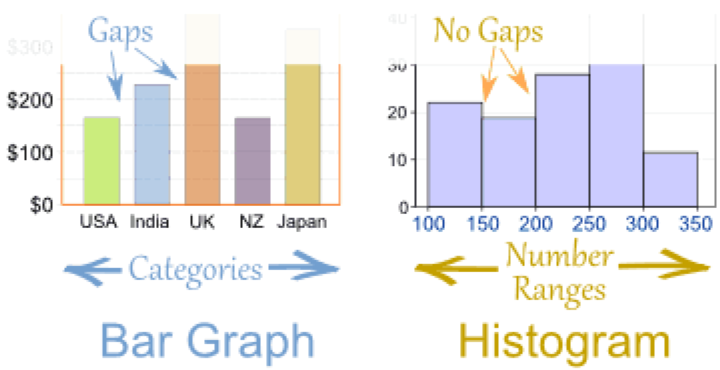
**Histograms**
A Histogram is a graphical display of data using bars of different heights. It is similar to a Bar Chart, but a histogram groups numbers into ranges. And you decide what ranges to use!

**Sample Problem**: Height of Orange Trees

- You measure the height of every tree in the orchard in centimeters
- The heights vary from 100 cm to 340 cm
- You decide to put the results into groups of 50 cm:
- The 100 to just below 150 cm range,
- The 150 to just below 200 cm range,
- etc...
- So a tree that is 260 cm tall is added to the "250-300" range.
- And here is the result: You can see (for example) that
- there are 30 trees from 150 cm to just below 200 cm tall




**Histograms** are a great way to show results of continuous data, such as: weight, height, how much time, etc. But when the data is in categories (such as Country or Favorite Movie), we should use a **Bar Chart**.




## March 27th

**[ 6.M.SP.B.05]** I can calculate and summarize numerical data from a graph.

**Big Ideas**
Students can see that the larger the mean distance, the greater the variability.
To find the mean absolute deviation, students examine each of the data points and its difference from the mean. The absolute deviations are the absolute value of each difference.

**Common Misconceptions**
Vocabulary is important.

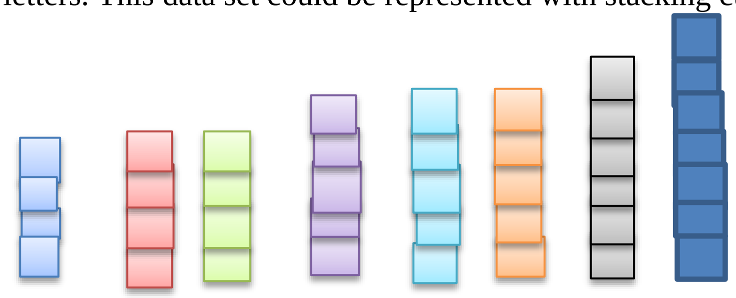
Students summarize numerical data by providing background information about the attribute being measured, methods and unit of measurement, the context of data collection activities, the number of observations, and summary statistics. Summary statistics include quantitative measures of center, spread, and variability including extreme values (minimum and maximum), mean, median, mode, range, quartiles, interquartile ranges, and mean absolute deviation.

The measure of center that a student chooses to describe a data set will depend upon the shape of the data distribution and context of data collection. The mode is the value in the data set that occurs most frequently. The mode is the least frequently used as a measure of center because data sets may not have a mode, may have more than one mode, or the mode may not be descriptive of the data set. The mean is a very common measure of center computed by adding all the numbers in the set and dividing by the number of values. The mean can be affected greatly by a few data points that are very low or very high. In this case, the median or middle value of the data set might be more descriptive. In data sets that are symmetrically distributed, the mean and median will be very close to the same. In data sets that are skewed, the mean and median will be different, with the median frequently providing a better overall description of the data set.

**Understanding the Mean** - The mean measures center in the sense that it is the value that each data point would take on if the total of the data values were redistributed equally, and also in the sense that it is a balance point. Students develop understanding of what the mean represents by redistributing data sets to be level or fair. The leveling process can be connected to and used to develop understanding of the computation of the mean.

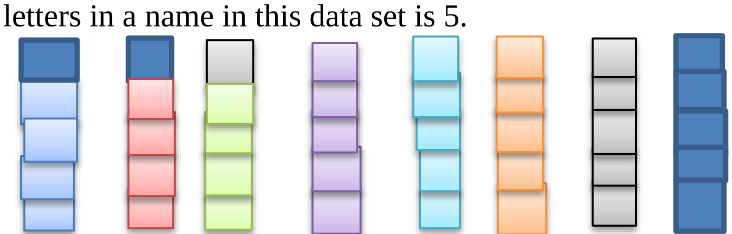
**For example**, students could generate a data set by measuring the number of jumping jacks they can perform in 5 seconds, the length of their feet to the nearest inch, or the number of letters in their names. It is best if the data generated for this activity are 5 to 10 data points which are whole numbers between 1 and 10 that are easy to model with counters or stacking cubes.

Students generate a data set by drawing eight student names at random from the popsicle stick cup. The number of letters in each of the names is used to create the data set. If the names drawn were Carol, Mike, Maria, Luis, Monique, Sierra, John, and Karen there would be 3 names with 4 letters each, 3 names with 5 letters each, 1 name with 6 letters and 1 name with 7 letters. This data set could be represented with stacking cubes.



Students can model the mean by "leveling" the stacks or distributing the blocks so the stacks are "fair". Students are seeking to answer the question "If all of the students had the same number of letters in their name, how many letters would each person have?"

One block from the stack of six and two blocks from the stack of 7 can be moved down to the stacks of 4 and then all the stacks have five blocks. If all students had the same number of letters in their name, they would have five letters. The mean number of letters in a name in this data set is 5.

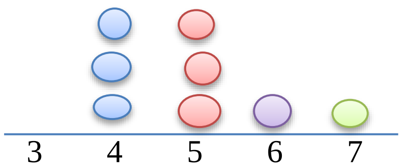


If it was not possible to make the stacks exactly even, students could begin to consider what part of the extra blocks each stack would have.

**Understanding Mean Absolute Deviation**

The use of mean absolute deviation in 6th grade is mainly exploratory. The intent is to build a deeper understanding of variability. Students would understand the mean distance between the pieces of data and the mean of the data set expresses the spread of the data set. Students can see that the larger the mean distance, the greater the variability. Comparisons can be made between different data sets.

In the previous data set, the names drawn were Carol, Mike, Maria, Luis, Monique, Sierra, John, and Karen. There were 3 names with 4 letters each, 3 names with 5 letters each, 1 name with 6 letters and 1 name with 7 letters. This data can be represented on a dot plot. The mean of the data set is 5.




To find the mean absolute deviation, students examine each of the data points and its difference from the mean. This analysis can be represented on the dot plot itself or in a table. Each of the names with 4 letters has one fewer letter than the mean, each of the names with 5 letters has zero difference in letters as compared to the mean, each of the names with 6 letters has one more letter than the mean, and each of the names with 7 letters has two more letters than the mean. The absolute deviations are the absolute value of each difference.

| **Name** | **Number of letters in a name** | **Deviation from the Mean** | **Absolute Deviation from the Mean** |
|---|---|---|---|
| John | 4 | -1 | 1 |
| Luis | 4 | -1 | 1 |
| Mike | 4 | -1 | 1 |
| Carol | 5 | 0 | 0 |
| Maria | 5 | 0 | 0 |
| Karen | 5 | 0 | 0 |
| Sierra | 6 | +1 | 1 |
| Monique | 7 | +2 | 2 |
| **Total** | **40** | **0** | **6** |

The mean of the absolute deviations is found by summing the absolute deviations and dividing by the number of data points. In this case, the mean absolute deviation would be 6 ÷ 8 or ¾ or 0.75. The mean absolute deviation is a small number, indicating that there is little variability in the data set.

Consider a different data set also containing 8 names. If the names were Sue, Joe, Jim, Amy, Sabrina, Monique, Timothy, and Adelita. Summarize the data set and its variability. How does this compare to the first data set?

The mean of this data set is still 5. $\frac{3 + 3 + 3 + 3 + 7 + 7 + 7}{8} = \frac{40}{8} = 5$

| **Name** | **Number of letters in a name** | **Deviation from the Mean** | **Absolute Deviation from the Mean** |
|---|---|---|---|
| Sue | 3 | -2 | 2 |
| Joe | 3 | -2 | 2 |
| Jim | 3 | -2 | 2 |
| Amy | 3 | -2 | 2 |
| Sabrina | 7 | +2 | 2 |
| Timothy | 7 | +2 | 2 |
| Adelita | 7 | +2 | 2 |
| Monique | 7 | +2 | 2 |
| Total | 40 | 0 | 16 |

The mean deviation of this data set is 16 ÷ 8 or 2. Although the mean is the same, there is much more variability in this data set.

**Understanding Medians and Quartiles**
Students can also summarize and describe the center and variability in data sets using the median and a five number summary consisting of the minimum, quartiles, and maximum as seen in the box plot example in 6.SP.4. The median is the middle number of the data set with half the number below the median and half the numbers above the median. The quartiles partition the data set into four parts by dividing each of the halves of the data set into half again. Quartile 1 (Q1 or the lower quartile) is the middle value of the lower half of the data set and quartile 3 (Q3 or the upper quartile) is the middle value of the upper half of the data set. The median can also be referred to as quartile 2 (Q2). The range of the data is the difference between the minimum and maximum values. The interquartile range of the data is the difference between the lower and upper quartiles (Q3 – Q1). The interquartile range is a measure of the dispersion or spread of the data set: a small value indicates values that are clustered near the median whereas a larger value indicates values that are more distributed.

Consider the first data set again. Recall that the names drawn were Carol, Mike, Maria, Luis, Monique, Sierra, John, and Karen. The data set can be represented in a numerical list. To find the median and quartile, the values are placed in order from least to greatest.

**Vocabulary**
- **Tendencies** - Information about the data that helps us determine what's typical. Mean, median, mode, and range are all examples of central tendencies.
- **Data** - A general term used to describe a collection of facts, numbers, measurements or symbols.
- **Quantitative** - being or capable of being measured by quantity.
- **Mean** - The average of a set of numbers. It is found by adding all the numbers and then dividing the sum by the number of addends.
- **Median** - In statistics it is the middle number for an odd number of data, when number are arranged in order. For an even number of data arranged in order, it is the average of the two middle numbers.
- **Mode** - In statistics, it is the number that occurs most often in a set of data.
- **Range** - The difference between the largest and smallest values.
- **Interquartile Range** - The difference between the first quartile and the third quartile of a set of data.
- **Absolute deviation** - The absolute value of a numbers deviation.
- **Deviation** - How far a given value is away from the mean of the data.
- **Distribution** - The number of times each possible outcomes occurs in a sample.
- **Extreme Values** - The minimum and maximum values in a given data set.
- **Quartiles** - The values that divide a list of numbers into quarters.

**Important Information**
When describing data we might say, "The data are concentrated in the middle and "tail off" to both sides or some distributions are concentrated to one side and tail off to the other side. These are called skewed distributions. Being skewed left means being concentrated to the left and tailing off to the right. Being skewed right means being concentrated to the right and tailing off to the left. Dot plots can have other shapes too."

# Prepare for AzMERIT