Unit 4 – Pre-Algebra Concepts

4–1 Order of Operations

4–2 One Step Equations

4–3 Inequalities

4–4 Unit Rates

4–5 Proportions

4–6 Solving Formulas

4–7 Two Step Equations/Inequalities

4–8 Writing Equations

4–9 Coordinate System
SWBAT set a goal for the week

“If you don’t know where you are going, any road will get you there”

Guidelines to Setting and Achieving Goals
Read the following story with the students. Have them answer the questions that follow. Lead a discussion on the importance of setting and achieving goals.

The Story of the Beaver
Throughout the years, a lot of us are simply trying to survive. This is not to say that the beaver doesn't try to survive, but it does more than this. Take for example when it decides to tackle a maple tree down by the stream. And, this isn't just a little tree either; in fact, it measured well over four feet in diameter.

The beaver needs to survive just like we do. It needs to eat and have a home. So, what makes it able to pass on a vital lesson to humans? Do you think it might be that this beaver wasn't afraid to tackle a tree this size. It simply could have picked a smaller one near by; maybe not as juicy; maybe not as big; and certainly one that wouldn't have provided all the necessary limbs and branches to help it make its house.

I was surprised I must admit at the tenacity of this animal. Periodically, over the course of six months, I would go back and check on its progress. Each time I checked, the beaver had managed to chew more and more of the tree. And, even though I thought it had given up, it came back time after time and kept at it; I really wondered if it would ever succeed.

For me, this behavior taught me several lessons. First of all, we all have to survive, eat and have a home. But, what was really said through this process was that while it could have taken the easy path to gain something, the gain would not be as great compared to the ultimate goal of chewing and conquering the big tree.

It also showed me a lot about tenacity and perseverance. Sure the tree was big and couldn't be taken down in a few short days. But, did that stop our little friend from coming back day after day until the mission or goal was accomplished? The answer is no. Not only did this particular tenacity win in the long run but this consistent action succeeded in capturing a big prize that would serve its' needs for some time to come.

In order for the beaver to accomplish his ultimate goal, he had to set smaller goals. Basically, break down the tree into smaller chunks. We need to do the same thing with our goals. Today, we will be setting a small goal. This goal can be accomplished in a week. For example, I will have my homework everyday for the next week.
Remember some of our tips on setting goals:

1. Write down your goals. Writing down your goals creates the roadmap to your success. Although just the act of writing them down can set the process in motion, it is also extremely important to review your goals frequently. Remember, the more focused you are on your goals the more likely you are to accomplish them. Sometimes we realize we have to change a goal. If you need to change a goal do not consider it a failure, consider it a victory as you had the insight to realize something needed changed.

2. Make sure the goal you are working for is something you really want, not just something that sounds good. Do you really want to be an engineer or do your parents want you to be one?

3. Write your goal out in complete detail. Instead of writing "I want a nice house," write "I want a 4,000 square foot house with 4 bedrooms and 3 baths and a view of the mountain on 20 acres of land.

4. Make sure your goal is high enough. Shoot for the moon; if you miss you'll still be in the stars. Does passing this class with a ‘C’ seem like a high enough goal?

Questions:

1. Name one goal that you would like to accomplish this school week. Keep in mind the things that we just talked about.

2. List a few things that you are going to have to do in order to accomplish this goal.

3. Name one obstacle that could stop you from accomplishing your goal. Then explain what you can do to overcome this obstacle.

4. Don't you think your attitude and behavior is like the beavers”? Why or Why not?
**Review Question**
What is the difference between experimental and theoretical probability?

**Discussion**
Why does the order in which we do $3(6 + 4)^2 - 9$ matter?
Think about getting ready in the morning. Notice there is a particular order in which you get ready. You must shower before you put your clothes on. You must put your socks on before your shoes.

How do you know the order in which to do these things? There is a particular order in which we must do math problems. I want you to know this order as well as you know the order of putting your clothes on.

The order in math is as follows: parentheses, exponents, multiplication or division, then addition or subtraction. The following saying will help you remember.

$P$lease \hspace{1cm} $E$xcuse \hspace{1cm} $M$y \hspace{1cm} $D$ear \hspace{1cm} $A$unt Sally

Notice how the words are grouped. Multiplication and division are the same and addition and subtraction are the same. Technically, addition and subtraction are the same operation. Similarly, multiplication and division are the same operation. To break these ties go left to right.

**SWBAT** simplify an expression using the order of operations

**Definition**

**Numeric Expression** - problem that only involves numbers that doesn’t have an equal sign

**Example 1:** $7 - 2 + 1$

**Example 2:** $5(3 + 2) - 7 \cdot 2$

**Example 3:** $4^2 - 3 \cdot 2 + 1$

**Example 4:** $5^2 - 3(12 - 8)$

**You Try!**
1. $14 \div 2 \cdot 4 + 1$
2. $18 - 3 \div 3 + 1$
3. $10[18 - 4 \cdot 3]$
4. $15 - 4 \cdot 3 + 5$
5. $(16 + 8)/(15 - 13)$
6. $13 - (1 + 2)^2 + 2$

**What did we learn today?**
*Notice that the answers to the homework problems will start to appear in your books during this unit. This was done intentionally. This was done so you will check your answers and try to make corrections before class. Also, you will know which problems are giving you difficulty. This will allow you to ask pertinent questions about your assignment.

1. Give an example of a problem where you would do subtraction first.

2. Why is there a “tie” between multiplication and division?

List the operations you would perform in the order in which you would perform them.

3. 8 · 9 – 3 + 5
4. 7 – 4 ÷ 2 · 3 + 1

Simplify.

5. 22 – 5 + 2
6. 18 – 1 · 3²

7. 12 ÷ 3 + 21
8. 12 – 3 + 21 ÷ 3

9. 9 + 18 ÷ 3
10. 8 + 5(6) – 2²

11. 3² – 2 · 2 + 3
12. 12 – 24 ÷ 12 + 5

13. 17 + 2 – 12 ÷ 4 ÷ 16
14. 45 ÷ 5 – 3 · 2

15. 14 + 8 ÷ 2 + 4 · 2
16. 6 · 3 ÷ 9 · 3 – 1

17. (6 + 4)² – 12 ÷ 3
18. 13 – (45 + 21) ÷ 11

19. 8 · 5 – 25 ÷ 5 · 2³
20. 10 + (32 ÷ 4) ÷ 2
Review Question
How do we break ties between addition and subtraction?

Discussion
Today we are going to continue our discussion using order of operations. We are going to “spiral back” to Unit 2 by including integers, decimals, and fractions. The order in math is as follows: parentheses, exponents, multiplication and division, then addition and subtraction. The following saying will help you remember.

Please Excuse My Dear Aunt Sally

To break ties go left to right.

SWBAT simplify an expression using the order of operations including integers, decimals, and fractions

Definition
Numeric Expression – problem that only involves numbers that doesn’t have an equal sign

Example 1: $4.2 + 2.6 \cdot 1.8$
Reinforce the skills associated with adding, subtracting, and multiplying decimals including the line up the decimals.

Example 2: $\frac{1}{4} \div \frac{1}{6} + \frac{1}{3}$
Reinforce the skills associated with adding, subtracting, and dividing fractions including common denominators.

Example 3: $-10 \div 2 + 5 \cdot 2$
Reinforce the skills associated with dividing integers.

You Try!
1. $6 + 16 \div 2 - 2^2$
2. $11.8 - 2.3(1.2)$
3. $2(3 - 6) + 2^3$
4. $-20 \div 4 + 4 \cdot 5$
5. $-6 + (10 + 4 \cdot 2)$
6. $(1/2 + 1/5) \cdot 1/3$

What did we learn today?
### Section 4–1 Homework (Day 2)

**Simplify.**

1. \(8 + 9 - 3 + 5\) \[19\]
2. \(7.2 \cdot 5.1 + 2.4\) \[39.12\]
3. \(8 + 3 \cdot 2^3\) \[32\]
4. \((-9 + 4)(18 - 7)\) \[-55\]
5. \((-10 + 5) + (5 + 12)\) \[12\]
6. \(9.84 \div 2.4 - 2.2\) \[1.9\]
7. \(-3 \cdot 4 \div 2\) \[-6\]
8. \(18 - (1 + 3)^2\) \[2\]
9. \(6^2 + 5 \cdot 2 + 3\) \[49\]
10. \(\frac{1}{2} + 2 \cdot \frac{1}{3} \cdot \frac{1}{4}\) \[\frac{13}{12}\]
11. \(7 + 4 - 2 \cdot 4 \div 2\) \[7\]
12. \(\frac{1}{2} + \frac{1}{3} \div \frac{1}{4}\) \[\frac{11}{6}\]
13. \(4 + 8 \div 2 + 4 \cdot 2\) \[16\]
14. \(6 \cdot 3 \div 9 \cdot 2 + 1\) \[5\]
15. \((-15 + 21) \div 3\) \[2\]
16. \(-2(-1 - 3) \div 4\) \[2\]
17. \(5 \cdot 6 - 25 \div 5 - 2^3\) \[17\]
18. \((-40 \div 4) \div 5 + 10\) \[8\]
Review Question
What is a numeric expression?

Discussion
What do you think makes Pre-Algebra different from all of the other math topics that you have learned so far?

SWBAT simplify an expression using the order of operations including variables

Definition
Variable – letter used to represent an unknown

* use a variable that makes sense (For example: m for money)

Algebraic Expression – variables, operations, and numbers but no equal sign

*all of the order of operation problems that we have been solving are examples of numeric expressions

Use for examples one and two: x = 4, y = 7, z = 2

Example 1: 6x – 2z

* notice when two numbers are written next to each other it represents multiplication
* the order of operations still applies to expressions with variables in them

Please Excuse My Dear Aunt Sally

Notice how the words are grouped. Multiplication and division are the same and addition and subtraction are the same. To break these ties go left to right.

Example 2: \( \frac{yz}{2} + 2x \)

* notice when two variables are written next to each other it represents multiplication

You Try!

x = 1, y = 2, z = 3
1. 7x – 2z
2. 2x + (z + 3y)
3. \( \frac{3z}{3x} - 4x \)
4. (3x – y) + 2z^2
5. 2.14 + \( \frac{8.2}{y} \)
6. \( \frac{1}{3} y = \frac{2}{5} \)
What did we learn today?

Evaluate each algebraic expression if \( x = 1, y = 2, \) and \( z = 4. \)

1. \( 5x - y^2 \) \hspace{1cm} 1  
2. \( 6(x + y) - 2z \) \hspace{1cm} 10  
3. \( \frac{yz}{2} + 2 \) \hspace{1cm} 6  
4. \( 2z^2 + y \) \hspace{1cm} 34  
5. \( 10 - (z - y)^2 \) \hspace{1cm} 6  
6. \( 2.4(x + y) \) \hspace{1cm} 7.2  
7. \( (2y + x) + 5 \) \hspace{1cm} 10  
8. \( y^3 + 2z - 4 \) \hspace{1cm} 12  
9. \( \frac{10(z - x)}{z} \) \hspace{1cm} 30 \hspace{1cm} 4  
10. \( \frac{xy}{y} + z \) \hspace{1cm} 5  
11. \( \frac{1}{3}y + \frac{1}{2} \) \hspace{1cm} 7 \hspace{1cm} 6  
12. \( x - y + z \) \hspace{1cm} 3  

13. Explain the difference between the two expressions \((3y)^2\) and \(3y^2\). Use numerical values for \( y \) to illustrate your explanation.
**Review Question**
What is an algebraic expression?
What does it mean when two variables are next to each other?

**Discussion**
In your foreign language class, you translate sentences from English into a foreign language. In class today, we will be translating sentences from English into Algebraic expressions. You need to think of Algebra as a foreign language.

**SWBAT** translate a sentence in English into an Algebraic expression

**Example 1:** A number divided by six \( \rightarrow \frac{n}{6} \)
* notice we chose ‘n’ for our variable because we are talking about a *Number
* notice we are translating one sentence into a simple expression
* eventually we will translate an entire paragraph into a complicated equation:
I am thinking of three consecutive odd integers. Their sum is 321. What are the consecutive odd integers?

**Example 2:** Twice an integer \( \rightarrow 2i \)
* What is an integer?
* notice we chose ‘i’ for our variable because we are talking about an *Integer

**Example 3:** Eight more than a number \( \rightarrow n + 8 \text{ or } 8 + n \)
* notice you can write the expression either way because addition is commutative
* Commutative – order in which number are added doesn’t affect the result
* addition is an example of a combination – order doesn’t matter

**Example 4:** Eight less than a number \( \rightarrow n – 8 \)
* notice we chose ‘n’ for our variable because we are talking about a *Number
* students will struggle with this one
* notice 8 – n is incorrect because subtraction is not commutative

**You Try!**
You are going to translate like you do in your foreign language class. That is, by listening. The teacher will read the sentence in English then they will give the translation verbally.

1. John’s salary plus a $200 bonus.
2. Three more than the number of brownies needed. (notice the order doesn’t matter)
3. Three feet shorter than the ceiling. (notice the variable is first)
4. Three minutes faster than Jimmy’s time. (notice faster is subtracting)
5. Twice the amount of money plus four dollars.

**What did we learn today?**
Translating from English to Algebra

<table>
<thead>
<tr>
<th>Addition</th>
<th>Subtraction</th>
<th>Multiplication</th>
<th>Division</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Evaluate each expression if \( x = 3, y = 4, \) and \( z = 5. \)

<table>
<thead>
<tr>
<th>Expression</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ( 6x - 3y )</td>
<td>6</td>
</tr>
<tr>
<td>2. ( -6(x + y) )</td>
<td>-42</td>
</tr>
<tr>
<td>3. ( x^2 + 4z )</td>
<td>29</td>
</tr>
<tr>
<td>4. ( y^2 - 3z + y )</td>
<td>5</td>
</tr>
<tr>
<td>5. ( 8x - (2y + z) )</td>
<td>11</td>
</tr>
<tr>
<td>6. ( 2.36(z - x) )</td>
<td>4.72</td>
</tr>
<tr>
<td>7. ( 4z - (2y + x) )</td>
<td>9</td>
</tr>
<tr>
<td>8. ( x + (x^3 + z) )</td>
<td>35</td>
</tr>
<tr>
<td>9. ( x \left( \frac{1}{2} - \frac{1}{3} \right) )</td>
<td>3/6</td>
</tr>
<tr>
<td>10. ( \frac{xy}{12 - 10} )</td>
<td>6</td>
</tr>
<tr>
<td>11. ( x - z + y )</td>
<td>2</td>
</tr>
<tr>
<td>12. ( \frac{y(z + x + y)}{y} )</td>
<td>12</td>
</tr>
</tbody>
</table>

Translate each phrase into an algebraic expression.

13. six minutes less than Bobby’s time

14. four points more than the Pirates scored

15. Joanie’s temperature increased by two degrees

16. the cost decreased by ten dollars

17. seven times a number

18. twice a number decreased by four

19. twice the sum of two and \( y \)

20. the quotient of \( x \) and 2
**Review Question**
What is an expression?
What is an equation?

**Discussion**
What is the difference between an equation and expression?
For an equation to be solved the variable must be by itself. Look at two students sitting next to each other. Are they sitting by themselves? How do you get them to sit by themselves?
The same concept applies to equations.
Is the equation \( x + 7 = 9 \) solved?
What is with the variable?
How do you get rid of plus 7?

**SWBAT** solve one-step addition and subtraction equations

**Definition**
**Expression** – no equal sign (simplify)
**Equation** – equal sign (solve)

What does solve mean?
In the equation \( x + 3 = 5 \), does \( x + 3 \) equal 5?

**Example 1**: \( x + 3 = 9 \)
Is it an equation?
Is it solved?
What is with the variable?
How do you get rid of plus three?
Notice to keep the two sides of the equation equal to each other you must subtract 3 from the other side.

Why do we have to use algebra when we clearly can solve this in our heads?
Learning a basic algorithm for solving equations will help us to solve more complicated problems in the future. In “real life”, nobody will ask you to solve “\( x + 3 = 9 \)”, but it’s likely that you will solve everyday problems.

**Example 2**: \( y - 5 = 9 \)
Is it an equation?
Is it solved?
What is with the variable?
How do you get rid of minus five?
Notice to keep the two sides of the equation equal to each other you must add five to the other side as well.
Example 3: \( b + 4 = -8 \)
Is it an equation?
Is it solved?
What is with the variable?
How do you get rid of plus four?
Notice to keep the two sides of the equation equal to each other you must subtract 4 from the other side as well.

Example 4: \( k - 2.5 = 5.6 \)
Is it an equation?
Is it solved?
What is with the variable?
How do you get rid of minus two point five?
Notice to keep the two sides of the equation equal to each other you must add two point five to the other side as well.

You Try!
1. \( x + 5 = 11 \)
2. \( y - 12 = 8 \)
3. \( m + 2.8 = 4.4 \)
4. \( t - 7 = -12 \)
5. \( h + 5 = -6 \)
6. \( x + \frac{1}{2} = 2 \frac{1}{3} \)

What did we learn today?

Section 4–2 Homework (Day 1)

Simplify.
1. \( 22 - 8 + 4 \div 2 \) 16
2. \( 2(12 - 3 \cdot 2) + 3 \) 15
3. \( 2^2 \cdot (6 - 5 + 7) \cdot 2 \) 64
4. \( 22 - 5 + 8 \div 2 \cdot 4 \) 33

Solve each equation. Check your solution.
5. \( x + 8 = 12 \)
6. \( y - 2 = 12 \)
7. \( z + 5 = 9 \)
8. \( x - 5 = -6 \)
9. \( y - 6 = -3 \)
10. \( z + 2 = -6 \)
11. \( x + 4 = 8 \)
12. \( y - 6.4 = 2.2 \)
13. \( x - \frac{1}{3} = 1 \frac{1}{2} \)
14. \( x - 6 = 10 \)
15. \( y + 7.4 = 12.7 \)
16. \( x + \frac{1}{3} = \frac{1}{2} \)

17. Explain how you know if an equation is solved or not.
18. Explain the difference between an algebraic expression and an equation.
**Review Question**
How do you know when an equation is solved?

**Discussion**
In order for an equation to be solved the variable must be by itself.
To get a variable by itself, you must perform opposite operations.
What is the opposite of Addition? Subtraction? Multiplication? Division?

<table>
<thead>
<tr>
<th>Solved?</th>
<th>What operation is being done?</th>
<th>What is the inverse operation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>No</td>
<td>Addition</td>
<td>Subtraction</td>
</tr>
<tr>
<td>No</td>
<td>Multiplication</td>
<td>Division</td>
</tr>
<tr>
<td>No</td>
<td>Division</td>
<td>Multiplication</td>
</tr>
</tbody>
</table>

**SWBAT** solve one-step multiplying and dividing equations

**Example 1:** $4x = 24$
Is it an equation?
Is it solved?
What is with the variable?
How do you get rid of multiplying by 4?
Notice to keep the two sides of the equation equal to each other you must divide by 4 on both sides.

**Example 2:** $\frac{x}{3} = 5$
Is it an equation?
Is it solved?
What is with the variable?
How do you get rid of dividing by 3?
Notice to keep the two sides of the equation equal to each other you must multiply by 3 on both sides.

**Example 3:** $-4x = 20$
Is it an equation?
Is it solved?
What is with the variable?
How do you get rid of multiplying by -4?
Notice to keep the two sides of the equation equal to each other you must divide by -4 on both sides.

**Example 4:** $\frac{x}{-2} = 5$
Is it an equation?
Is it solved?
What is with the variable?
How do you get rid of dividing by -2?
Notice to keep the two sides of the equation equal to each other you must multiply by -2 on both sides.
You Try!

1. \(4x = 16\)  
2. \(\frac{x}{4} = 3\)  
3. \(m + 8 = 18\)  
4. \(t - 7.2 = 12.1\)  
5. \(\frac{x}{-2} = 7\)  
6. \(-3x = -15\)

What did we learn today?

Solve each equation. Check your solution.

1. \(3x = 12\)  
2. \(\frac{x}{4} = 5\)  
3. \(-5z = 20\)  
4. \(\frac{x}{-3} = 4\)  
5. \(y - 6 = 7\)  
6. \(z + 1 = 8\)

7. \(x + 4 = -3\)  
8. \(-5y = -25\)  
9. \(\frac{x}{-2} = -4\)

10. \(x - 3.3 = 4.6\)  
11. \(y + 7 = -11\)  
12. \(6z = -18\)

13. \(x + \frac{1}{3} = \frac{7}{8}\)  
14. \(7y = 21\)  
15. \(\frac{x}{7} = 4\)

16. Why do we do the inverse operation to solve an equation?

17. Answer the following question using the four step method. Four friends won $1000 on the lottery.

a. How much did each person win?

b. Can you write an equation to model this?
Review Question
How do you know when an equation is solved?

Discussion
What does an equation consist of?
How do you spot a word that would represent an operation in a sentence?
How do you spot a number in a sentence?
How do spot a variable in a sentence?
How do you spot an equal sign in a sentence?

SWBAT write a one step equation when given a sentence

Definition
To write an equation:
1. Define variable
2. Find key words (math words)
3. Look for is

Write an equation. Then solve.

Example 1: The sum of x and 8 is 15. (x + 8 = 15; x = 7)

Example 2: 17 less than an integer is 10. (i – 17 = 10; 27)

Example 3: The product of a number and 2 is 12. (2n = 12; n = 6)

Example 4: The quotient of y and 3 is 5. (y/3 = 5; y = 15)

You Try!
1. x increased by 5 is 12

2. 7 less than a number is 12

3. Twice an integer is 18

4. The quotient of x and –4.2 is 2.1

5. Timmy has $45 left after spending $24 at the mall. How much money did he start with?

What did we learn today?
For each of the following problems, write an equation and solve.

1. six less than $x$ is 12
   $$x = 18$$

2. four more than an integer is 8
   $$i = 4$$

3. a temperature increased by two is 72.5
   $$x = 70.5$$

4. 1.2 times a number is 3.36
   $$n = 2.8$$

5. the quotient of $x$ and 3 is 12
   $$x = 36$$

6. $m$ divided by 2.4 is 4.5
   $$m = 10.8$$

7. a number decreased by 6.2 is 10.9
   $$n = 17.1$$

8. 2 more than a number is 14
   $$n = 12$$

9. $x$ minus 5 is −15
   $$x = -10$$

10. twice a number is −12
    $$n = -6$$

11. $y$ multiplied by 2 is 8
    $$y = 4$$

12. $5$ times your hours is $45$
    $$h = 9$$

13. Answer the following question using the four step method. Jimmy has been preparing for the PSSA for some time now. He does 20 PSSA practice problems per day. He has done 160 problems already. For how many days has he been reviewing? $d = 8$ days
Review Question
How do you know when an equation is solved?
How do you get a variable by itself?

Discussion
What makes an equation, an equation?
What makes an inequality, an inequality?

SWBAT graph an inequality
SWBAT write an inequality given a number line

Definition
> - greater than
≥ - greater than or equal to
< - less than
≤ - less than or equal to

Example 1: Graph $x \geq 5$
Why is the dot on ‘5’ colored in?

Example 2: Graph $x < –3$
Why isn’t the dot on ‘–3’ colored in?

Example 3: Graph $x > 3.2$
Why isn’t the dot on ‘3.2’ colored in?
How do know where to put ‘3.2’?
Example 4: Graph $x \leq -\frac{4}{3}$

Why is the dot on $\frac{4}{3}$ colored in?

How do know where to put $\frac{4}{3}$?

Example 5: Write an inequality for the following graph.

(x > 7)

Example 6: Write an inequality for the following graph.

(x ≤ –4)

You Try!

1. Graph: $x \geq -5$
2. Graph: $x < 2$
3. Graph: $x \leq -3$
4. Graph: $x > -4.2$
5. Write an inequality for the following graph.

What did we learn today?
For problems 1-4, write an inequality for the graph.

1. \[ x \geq 9 \]

2. \[ x < -1 \]

3. \[ x > 5.8 \]

4. \[ x \leq -\frac{7}{2} \]

5. Graph: \[ x \geq 9 \]

6. Graph: \[ x < -1 \]

7. Graph: \[ x > 5.8 \]

8. Graph: \[ x \leq -\frac{7}{2} \]
Review Question
What four things make up an equation?

Discussion
What makes an equation, an equation?
What makes an inequality, an inequality?

Remember:
> - greater than
\(\geq\) - greater than or equal to
< - less than
\(\leq\) - less than or equal to

What is the answer to \(x + 4 = 9\)? There is one solution. It is 5. Look at the solution on a number line. What is the answer to \(x + 4 > 9\)? Anything bigger than 5. There is an infinite amount of solutions. Look at the solution on a number line. As far as we know, an equation has one solution. An inequality has an infinite number of solutions.

SWBAT solve one-step inequalities

In order for an inequality to be solved the variable must be by itself. To get a variable by itself, you must perform inverse operations. You must do the same operation to both sides of the equation as well.

Example 1: \(x + 4 > 9\)
Is it solved?
What is with the variable?
How do you get rid of plus four?
Notice to keep the two sides of the inequality equal to each other you must subtract by 4 on both sides.
Graph.
Why isn’t the ‘5’ colored in?

Example 2: \(x - 8 \leq 3\)
Is it solved?
What is with the variable?
How do you get rid of minus 8?
Notice to keep the two sides of the inequality equal to each other you must add 8 on both sides.
Graph.
Why is the ‘11’ colored in?
Example 3: \(4x > 12\)
Is it solved?
What is with the variable?
How do you get rid of times 4?
Notice to keep the two sides of the inequality equal to each other you must divide by 4 on both sides.
Graph.
Why isn’t the ‘3’ colored in?

Example 4: \(\frac{x}{2} \leq -6\)
Is it solved?
What is with the variable?
How do you get rid of divided by 2?
Notice to keep the two sides of the inequality equal to each other you must multiply by 2 on both sides.
Graph.
Why isn’t the ‘-12’ colored in?

You Try!
1. \(x - 6 \leq 8\)
2. \(x + 4.2 > 12.8\)
3. \(4x > 16\)
4. \(\frac{x}{2.4} \geq 5.1\)
5. \(2x > -12\)

What did we learn today?

<table>
<thead>
<tr>
<th>Section 4–3 Homework (Day 2)</th>
</tr>
</thead>
</table>

Solve each inequality. Then graph your solution.

1. \(3x > 12\)  
2. \(\frac{x}{3} > 5\)  
3. \(x + 9 \leq 14\)
4. \(\frac{x}{4} > -6\)  
5. \(y - 12 \geq 8\)  
6. \(z + 9 > 8\)
7. \(x + 5 \leq -5\)  
8. \(1.2y > 6.6\)  
9. \(\frac{x}{1.3} > 2.4\)
10. \(x - 2.9 \geq 0.6\)  
11. \(y - 5 \leq -10\)  
12. \(\frac{x}{3} > \frac{1}{4}\)
13. \(x + \frac{1}{2} > \frac{3}{4}\)  
14. \(2x > 16\)  
15. \(\frac{x}{4.2} > 2.3\)

16. Explain why inequalities have an infinite amount of solutions.
Review Question
How many solutions are there to an equation?
How many solutions are there to an inequality?

Discussion
Can someone give me an example of where you compare two things?
In math, we compare things that have different units. For example, 60 miles per 1 hour.
This is called a rate. That is what we will be talking about today.

SWBAT translate a sentence into a fraction
SWBAT write a ratio as a unit rate

Definition
Ratio – comparison of two numbers

Example: \( \frac{2}{3} \), 2:3 (this could represent the ratio of boys to girls in your class)

Rate – ratio of two measurements with different units

Example: 100 words
2 minutes

Unit Rate – rate where the denominator is 1

Example: 55 miles
1 hour

Notice that we use unit rates all of the time. We do not say we were going 150 miles per 3 hours. We say 50 miles per 1 hour.

Why are unit rates easier?
Can you give me another example of a unit rate? \{\$2.99/1 lb (lunch meat); \$2.25/1 gallon (gas)\}

Example 1: The school sold 150 tickets in 5 days for the play. Write this as a unit rate.
\[
\frac{150 \text{ tickets}}{5 \text{ days}} \div 5 = \frac{30 \text{ tickets}}{1 \text{ day}}
\]

Example 2: The car drove 228 feet in 24 seconds. Write as a unit rate.
\[
\frac{228 \text{ feet}}{24 \text{ seconds}} \div 24 = \frac{9.5 \text{ feet}}{1 \text{ second}}
\]
You Try!
Write as a rate then as a unit rate.
1. 36 brownies, 2 cups of sugar
2. $60 in 5 hours
3. 220 miles on 8 gallons
4. $96 for 3 pair of jeans

What did we learn today?

Express each rate as a fraction then as a unit rate.
1. $3.00 for 3 pounds
2. $75 for 5 Cd’s
3. 100 people in 4 rows
4. $900 for 5 days
5. 385 miles in 7 hours
6. $47 for 4 shirts
7. 2.5 pounds for $7.50
8. 2,500 tickets in five days
9. $3.24 for 3 pounds
10. 12 ounces for 3 cups

11. Answer the following question using the four step method. Johnny paid $1,200 for the carpet in his living room. The room has an area of 250 square feet. What is the unit cost of carpet in dollars per square foot?
**Review Question**
What is a ratio?
What is a rate?
What is a unit rate?

**Discussion**
How can we use unit rates?
Why is it easier to use unit rates?

**SWBAT** use unit rates to determine a “better deal”

**Example 1:** A Honda accord drove 400 miles on 20 gallons of gas. A Honda civic drove 600 miles on 25 gallons of gas. Which car gets better gas mileage?

\[
\begin{align*}
\frac{400 \text{ miles}}{20 \text{ gallons}} & = \frac{20 \text{ miles}}{1 \text{ gallon}} \\
\frac{600 \text{ miles}}{25 \text{ gallons}} & = \frac{24 \text{ miles}}{1 \text{ gallon}}
\end{align*}
\]

The Honda civic gets better gas mileage. Notice how much easier it is to compare the values when they are written as unit rates.

**Example 2:** At Sam’s Club, there are three different sizes of peanut butter. Their sizes and prices are summarized in the table below. Which one is the best buy?

<table>
<thead>
<tr>
<th>Size of Jar</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 ounces</td>
<td>$2.49</td>
</tr>
<tr>
<td>40 ounces</td>
<td>$5.30</td>
</tr>
<tr>
<td>80 ounces</td>
<td>$11.25</td>
</tr>
</tbody>
</table>

\[
\begin{align*}
\frac{$2.49}{12 \text{ ounces}} & = \frac{$.21}{1 \text{ ounce}} \\
\frac{$5.30}{40 \text{ ounces}} & = \frac{$.13}{1 \text{ ounce}} \\
\frac{$11.25}{80 \text{ ounces}} & = \frac{$.14}{1 \text{ ounce}}
\end{align*}
\]

The 40 ounce jar of peanut butter is the best buy. Notice how much easier it is to compare the values when they are written as unit rates.
You Try!
Choose which one is a better deal.
1. $12 for 4 pounds of lunchmeat or $8 for 2 pounds of lunchmeat
2. 2 liters of Pepsi for $1.29 or 3 liters of Pepsi for $1.99
3. 550 miles on 15 gallons of gas or 280 miles on 5 gallons of gas
4. Ritchie made $12,000 for the entire year at his after school job. Johnny made $3600 in 3 months.

What did we learn today?

Evaluate each algebraic expression if \( x = 2, y = 3, \) and \( z = 4. \)

1. \( 4x - 2y \quad 2 \)
2. \( -3(x + y) \quad -15 \)
3. \( \frac{1}{3}y \quad 1 \)
4. \( y^2 + 3z \quad 21 \)
5. \( 24 - (2y + z) \quad 14 \)
6. \( 4.3(z - x) \quad 8.6 \)
7. \( 4z - 2y + x \quad 12 \)
8. \( x^3 + z \quad 12 \)
9. \( x + \left( \frac{1}{2} - \frac{1}{3} \right) \quad \frac{19}{6} \)

Solve each equation.

10. \( \frac{y}{5} = 4 \)
11. \( \frac{x}{-4} = 4 \)
12. \( y - 12 = 8 \)
13. \( y + 10 = -5 \)
14. \( -3y = -24 \)
15. \( x + 4.2 = 8.6 \)
16. \( y - 6 = -3 \)
17. \( x + 8 = 9 \)
18. \( 3x = -21 \)

Choose the best unit price.

19. $12 for 3 pounds of nuts or $25 for 5 pounds of nuts
20. 32 ounce bottle of apple juice for $2.56 or a 48 ounce bottle for $2.88
21. 400 miles on 10 gallons of gas or 240 miles on 8 gallons of gas
22. Johnny made $5025 for the entire year at his after school job. Ritchie made $480 in 4 weeks.
23. 16 ounce of Gatorade costs $1.44 or 12 ounces cost $.96
**Review Question**
What is a ratio?
What is a rate?
What is a unit rate?

**Discussion**
We use comparisons in English class all of the time. For example, umbrella is to rain as boots are to ____. In math, a comparison like this is called a proportion. For example: 1 is to 4 as 3 is to 12.

\[ \frac{2}{4} = \frac{?}{12} \]

What should we replace the ? to make the ratios equal? Why?
Notice that we multiply the bottom by 3. The correct answer should be 6. There is a shortcut to tell is two proportions are equal. You can tell if two ratios are equal by cross multiplying. In our example \(24 = 24\), therefore the two ratios are equal.

**SWBAT**
- identify equivalent proportions
- solve a proportion

**Definition**
**Proportion** – equation that shows two equal ratios

**Example 1: Are the two ratios equal?**
\[ \frac{2}{8} = \frac{3}{12} \]
The two ratios are equal because their cross products are 24.

**Example 2: Are the two ratios equal?**
\[ \frac{8}{9} = \frac{4}{5} \]
The two ratios are not equal because their cross products are 40 and 36, respectively.

**Example 3:** Consider the following proportion.
What should replace the ‘x’ to make the ratios equal? Why?
Notice that we can not multiply the bottom by any whole number. Why can’t we add 6 to the top then add six to the top? Notice this would not work in the previous examples. We can tell if ratios are equal by cross multiplying. We can use this idea to solve for ‘x’. If we cross multiply, we get the following:

\[ 9x = 45 \]
Notice we have been solving equations like this for the past few days. By dividing both sides of the equation by 9 we get:
\[ x = 5 \]
We can check our answer by plugging this value back into the proportion and checking the cross product.
Example 4: Find ‘x’.
\[
\frac{2}{7} = \frac{x}{5}
\]
\[
7x = 10
\]
\[
x = \frac{10}{7}
\]
It is OK for our answer to be a fraction!

**You Try!**

1. \( \frac{n}{7} = \frac{4}{2} \)
2. \( \frac{10}{18} = \frac{5}{x} \)
3. \( \frac{10}{15} = \frac{15}{x} \)
4. \( \frac{3}{7} = \frac{5}{x} \)

**What did we learn today?**

**Section 4–5 Homework (Day 1)**

**Are these ratios equal?**

1. \( \frac{8}{10} = \frac{4}{5} \)
2. \( \frac{9}{4} = \frac{11}{6} \)
3. \( \frac{6}{8} = \frac{3}{4} \)

4. \( \frac{1}{8} = \frac{4}{10} \)
5. \( \frac{3}{9} = \frac{5}{15} \)
6. \( \frac{5}{8} = \frac{10}{15} \)

**Solve each proportion.**

7. \( \frac{y}{7} = \frac{4}{2} \)
8. \( \frac{5}{15} = \frac{10}{w} \)
9. \( \frac{2}{b} = \frac{5}{10} \)

10. \( \frac{5}{2} = \frac{m}{10} \)
11. \( \frac{4}{13} = \frac{a}{6} \)
12. \( \frac{18}{x} = \frac{3}{10} \)

13. \( \frac{3}{u} = \frac{5}{15} \)
14. \( \frac{4.5}{1.3} = \frac{z}{1.8} \)
15. \( \frac{10}{4} = \frac{20}{q} \)
Review Question
What is a proportion?
How can we compare two proportions?
How can we solve proportions?

Discussion
A proportion is a statement where one ratio is equal to another. We use proportions when we are trying to compare two things. Remember our example from yesterday: umbrella is to rain as boots are to _____.
In our math problem we would say: 12 is to 2 as what is to 5. The order in which we write the proportion is important. It is easy to have the correct order if we use units.

SWBAT solve a word problem involving proportions

Example 1: An average American eats 12 pounds of pasta every 2 years. How many pounds of pasta will they eat over five years?

\[
\frac{12 \text{ pounds}}{2 \text{ years}} = \frac{x \text{ pounds}}{5 \text{ years}}
\]

Notice how the units match up. (pounds on top; years on bottom)

\[
\frac{2x}{2} = \frac{60}{2}
\]

\[x = 30\]

The problem would still work if you put years on top and pounds on the bottom. But you must keep the units consistent with both ratios.

\[
\frac{2 \text{ years}}{12 \text{ pounds}} = \frac{5 \text{ years}}{x \text{ pounds}}
\]

\[
\frac{2x}{2} = \frac{60}{2}
\]

\[x = 30\]

Example 2: Jimmy scored a seven out of ten on his math quiz. His teacher told him that he needs to do just as good on his 80 point test next week. What score does he need to get?

\[
\frac{7}{10} = \frac{x}{80}
\]

Notice how the “units” match up. (number correct on top; total on the bottom)

\[
\frac{10x}{10} = \frac{560}{10}
\]

\[x = 56\]
What did we learn today?

Are the ratios equal?
1. \( \frac{1}{10} = \frac{4}{40} \)
2. \( \frac{5}{8} = \frac{3}{6} \)
3. \( \frac{6}{9} = \frac{2}{3} \)

Solve each equation.
4. \( \frac{y}{8} = \frac{4}{2} \)
5. \( \frac{x}{3} = 4 \)
6. \( y - 6 = 7 \)
7. \( \frac{6}{4} = \frac{m}{8} \)
8. \( -5y = -25 \)
9. \( x + 5 = 12 \)
10. \( \frac{2}{5} = \frac{a}{6} \)
11. \( x + 5 = -3 \)
12. \( \frac{6}{x} = \frac{3}{10} \)
13. \( 9x = 81 \)
14. \( \frac{4}{9} = \frac{z}{18} \)
15. \( x - 2.5 = 8.7 \)

16. Tommy scored 18 out of 20 points on his quiz. He was trying to figure out what he would have got out of 100 points. He set up the following proportion. What is wrong with his setup? Why?

\[
\frac{18}{20} = \frac{100}{s}
\]

For the following problems, write a proportion that includes labels. Then solve.
17. Jimmy scored an eight out of ten on his math quiz. His teacher told him that he needs to do just as good on his 50 point test next week. What score does he need to get?

18. Jazmyn can type 120 words every 2 minutes. How many words can she type in 5 minutes?

19. Five quarts of paint can cover 500 square feet. How many cans of paint would you need to cover 2000 square feet?

20. Tommy’s mom is making lasagna for the big party Sunday. Her recipe makes enough lasagna for 8 people and requires 6 cups of ricotta cheese. If she is making lasagna for 50 people, how much cheese does she need?

21. 8 is to 3 as x is to 6.
**Section 4-5: Proportions (Day 3)**

**Review Question**
What is a proportion?
How can we solve proportions?

**Discussion**
Today’s activity involves solving proportions. Leonardo DaVinci determined that in a perfectly proportional human body, certain body parts must be proportional to one another. In this experiment, you will make measurements to determine if your body resembles the idealized perfect body. For example, he suggests that your wingspan should be the same as your height. Try to have fun with it. Nobody is perfect. So if your wingspan is a little bit big, it is OK.

**SWBAT** apply proportions to check the proportionality of their body parts

**What did we learn today?**

**Section 4-5 Activity (Day 3)**

**Directions:**

**ALL MEASUREMENTS ARE TO BE DONE IN INCHES AND SHOULD BE AS ACCURATE AS POSSIBLE.**

1. Measure your height.
2. Substitute your height into the equations.
3. Solve the proportions and fill in the corresponding “theoretical” blanks in the table. (DO THE FIRST TWO PROPORTIONS WITH THE TEACHER)
4. Measure that body part and fill in the corresponding “actual” blanks in the table.
5. Find the difference between the theoretical and actual measurements to see how your body compares to the “perfect” body.

**Description of Measurements**

1. **wingspan** – the distance from fingertip to fingertip of your outstretched arms
2. **head** – the distance from the top of your head to the bottom of your chin
3. **face** – the distance from your hairline to the bottom of your chin
4. **shoulders** – the distance from one shoulder to the other when your back is flat against a wall
5. **elbow to fingertip** – the distance from your elbow to your fingertip (not the forearm)
6. **hand** – the distance from your wrist to your fingertip
Measurements

<table>
<thead>
<tr>
<th></th>
<th>wingspan, $w$</th>
<th>head, $h$</th>
<th>face, $f$</th>
<th>shoulders, $s$</th>
<th>elbow to fingertip, $e$</th>
<th>hand, $n$</th>
</tr>
</thead>
<tbody>
<tr>
<td>theoretical</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>actual</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>difference</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Your height: ___________ inches

1. **Wingspan**
   
   \[
   \frac{\text{wingspan}}{\text{height}} = \frac{w}{h} = \frac{1}{1}
   \]

2. **Head**: $\frac{1}{8}$

3. **Face**: $\frac{1}{10}$

4. **Shoulders**: $\frac{1}{4}$

5. **Elbow to Fingertips**: $\frac{1}{5}$

6. **Hand**: $\frac{1}{10}$

**Answer the following questions after you do all of your calculations.**

1. Do you agree with DaVinci that your body parts should be proportional? Why or Why not?

2. How do you think that DaVinci came up with these proportions?

3. Which body parts are the closest to being proportional?

4. If the number in the difference row is positive, what does that mean?

5. If the number in the difference row is negative, what does that mean?


**Review Question**
What is a proportion?
How can we solve proportions?
What are some uses of proportions?

**Discussion**
We are going to talk about another use of proportions today. Proportions are also used to read maps and blueprints.

**SWBAT** use proportions to read maps and blueprints

**Definition**

**Scale drawing** – drawing of something that is too large or small to actually draw

Examples: maps, blueprints (houses, buildings)

**Example 1:** On a map 1 inch equals 50 miles. You measure the distance from Pittsburgh to New York City as 6 inches. How far is it from Pittsburgh to New York City?

\[
\frac{1 \text{ inch}}{50 \text{ miles}} = \frac{6 \text{ inches}}{x \text{ miles}}
\]

\[x = 300 \text{ miles}\]

**Example 2:** On a blueprint 2 inches equals 100 feet. What would 5 inches represent?

\[
\frac{2 \text{ inches}}{100 \text{ feet}} = \frac{5 \text{ inches}}{x \text{ feet}}
\]

\[2x = \frac{500}{2}\]

\[x = 250 \text{ feet}\]

**What did we learn today?**
Evaluate each expression if $x = 1$, $y = 2$, and $z = 3$.

1. $6x - 2y = 2$
2. $-6(x + y) = -18$
3. $\frac{1}{3}y - \frac{2}{3}$

4. $y^2 + 3z = 13$
5. $13 - (2y + z) = 6$
6. $2.3(z - x) = 4.6$

7. $4z - 2y + x = 9$
8. $y^3 + z = 11$
9. $x + \left(\frac{1}{2} - \frac{1}{3}\right) = \frac{7}{6}$

Solve each equation.

10. $\frac{y}{3} = \frac{4}{2}$
11. $\frac{x}{5} = 4$
12. $y - 8 = 6$

13. $\frac{6}{4} = \frac{m}{8}$
14. $-2y = -18$
15. $x + 5.2 = 12.6$

16. $\frac{2}{5} = \frac{a}{10}$
17. $x + 8 = -5$
18. $\frac{6}{x} = \frac{3}{10}$

Find the actual distance between each pair of cities. For the following problems, write a proportion that includes labels. Then solve.

<table>
<thead>
<tr>
<th>Cities</th>
<th>Distance on the Map</th>
<th>Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>19. Pittsburgh to Ocean City</td>
<td>3 inches</td>
<td>1 in = 120 miles</td>
</tr>
<tr>
<td>20. New York City to Los Angeles</td>
<td>15 cm</td>
<td>1 cm = 200 miles</td>
</tr>
<tr>
<td>21. Chicago to Houston</td>
<td>5 inches</td>
<td>2 inches = 400 miles</td>
</tr>
<tr>
<td>22. Miami to Seattle</td>
<td>12 inches</td>
<td>3 inches = 800 miles</td>
</tr>
</tbody>
</table>
Review Question
Solve: 24 = 4t

Discussion
Today we will be talking about a formula that involves distance, rate, and time. In order to understand the formula, we must understand distance, rate, and time. Given the following three values, which one stands for distance, rate, and time?

40 mph
4 hours
400 miles

SWBAT use their knowledge of one step equations to solve the distance equation

Definition
D = R ∙ T → D = distance, R = rate, T = time

Example 1: Johnny ran 10 mph for 3 hours. How far did he run?
1. Write an appropriate equation → D = rt
2. Substitute appropriate values → D = (10 mph)(3 hrs)
3. Solve for the remaining variable → D = 30 miles

Example 2: Johnny drove 495 miles at a rate of 45 mph. How long did he drive?
1. Write an appropriate equation → D = rt
2. Substitute appropriate values → 495 miles = (45 mph)(t)
3. Solve for the remaining variable → 11 hrs = t
*Notice that we are using our solving equation skills to get the variable by itself.

You Try!
1. You travel 45 mph for 5 hrs. How far did you travel?
2. You traveled 600 miles for 15 hours. How fast were you traveling?
3. You traveled 500 miles at 50 mph. How long were you driving?
4. You traveled 273 miles for 6 hours. How fast were you traveling?

What did we learn today?
For each of the following problems:

a) Write an appropriate equation.

b) Substitute appropriate values for variables.

c) Solve for the remaining variable.

1. You travel 60 mph for 7 hours. How far did you travel?

2. You traveled 675 miles for 15 hours. How fast were you traveling?

3. You traveled 200 miles at 40 mph. For how long were you driving?

4. You traveled 325 miles for 6.5 hours. How fast were you traveling?

5. Bobby traveled 400 miles at 50 mph. For how long did he travel?

6. It is about 600 miles to Myrtle Beach. If you drive 60 mph, how long will it take to get there?

7. a. It takes about 5 hours to drive to Philadelphia. About how far is it?

   b. What factors could cause the trip to take more or less time?
Review Question
What is the equation for distance?
What does each variable stand represent?

Discussion
Yesterday we discussed the distance equation. Today, we are going to discuss two other equations. The point of today’s lesson is to prove to you that you can solve many equations with your current algebra skills. You may not be familiar with these two equations but it will not matter. You will be able to solve them anyway.

SWBAT use their knowledge of one step equations to solve other “rate” equations

Definition
The two new equations deal with area and force. Here they are:

Area of a rectangle:  \( A = B \times H \)  (\( A \) – area, \( B \) – base of rectangle, \( H \) – height of rectangle)
Force on an object:  \( F = M \times A \)  (\( F \) – force, \( M \) – mass, \( A \) – acceleration)

How are these two equations similar to the \( D = R \times T \) equation?
*The units are left out intentionally. They will be discussed further in Unit 5.

Example 1:  The base of a rectangle is 5. The height of the rectangle is 8. Find the area.

1. Write an appropriate equation \( \rightarrow A = B \times H \)
2. Substitute appropriate values \( \rightarrow A = 5 \times 8 \)
3. Solve for the remaining variable \( \rightarrow A = 40 \)

Example 2:  The area of a rectangle is 120. The height of the rectangle is 12. Find the base.

1. Write an appropriate equation \( \rightarrow A = B \times H \)
2. Substitute appropriate values \( \rightarrow 120 = B \times 12 \)
3. Solve for the remaining variable \( \rightarrow 10 = B \)

*Notice that we are using our solving equation skills to get the variable by itself

Example 3:  A rock with a mass of 45 hit the ground with a force of 135. How fast was it accelerating when it hit the ground?

1. Write an appropriate equation \( \rightarrow F = M \times A \)
2. Substitute appropriate values \( \rightarrow 135 = (45) \times A \)
3. Solve for the remaining variable \( \rightarrow 3 = A \)

*Notice that we are using our solving equation skills to get the variable by itself.
You Try!
Write an equation. Then solve.
1. What is the height of a rectangle whose area is 60 and base is 6?
2. You travel 50 mph for 3 hours. How far did you travel?
3. There is a force of 400 acting on a falling object. Its mass is 50. What is its acceleration?

What did we learn today?

For each of the following problems:
 a) Write an appropriate equation.
b) Substitute appropriate values for variables.
c) Solve for the remaining variable.

1. You travel 40 mph for 5 hours. How far did you travel?
2. What is the height of a rectangle whose area is 56 and whose base is 7?
3. You traveled 300 miles for 12 hours. How fast were you traveling?
4. There is a force of 325 acting on a falling object. Its mass is 65. What is its acceleration?
5. You traveled 253 miles at 46 mph. For how long were you driving?
6. A base of a rectangle is 5. Its area is 35. What is its height?
Review Question
Put the complete, correct answers to problems 1, 2, and 4 from yesterday’s homework on the board. These problems represent each one of the three formulas that we have been working on. Explain your solutions.

Discussion
What are the three formulas that we were using?
What does each of the variables represent?

SWBAT make up their own word problem including solutions for the formulas.

Activity
Give each student or group of students a piece of paper. You will make up their own problems. The breakdown is as follows:

1. One problem solving for distance.
2. One problem solving for rate.
3. One problem solving for time.
4. One problem solving for area.
5. One problem solving for base.
6. One problem solving for force.
7. One problem solving for mass.

The problems must include the following:
1. Paragraph – explains the problem; includes all pertinent information
2. Equation – write down the appropriate equation
3. Substitution – replace the variables with numbers
4. Solution – solve the equation for the appropriate variable

Example: Johnny drove 240 miles at 60 mph. How long did he drive?

\[
D = R \times T
\]
\[
\frac{240 \text{ miles}}{60 \text{ mph}} = (60\text{mph})(T)
\]
\[
60 \text{ mph} \quad 60 \text{ mph}
\]

4 hours = T

* Notice that this problem works out evenly. You can do the same in your examples by picking number that divide evenly into each other.

* Be creative with your problems. You can include yourself. “Play” with your numbers in the problems so your solutions make sense. For example, you should not have a car traveling at 250 mph as your answer to your rate problem.

What did we learn today?
Review Question
How do you solve a distance problem if you are trying to find the time?

Discussion
For an equation to be solved the variable must be by itself. Use the example of three kids sitting next to each other. Are they sitting by themselves? Why not? How do you get them by themselves? You must remove two of the students. How do you know what student to remove first? The same concept applies to equations:
2x + 7 = 9
Is the ‘x’ by itself?
What is with the variable?
How do you know what to get rid of first?

SWBAT solve a two step equation

Example 1: 2x + 7 = 9
Is it solved?
What is with the variable?
What do we get rid of first? Why?
How do we get rid of plus 7?
How do we get rid of times 2?
Notice to keep the two sides of the equation equal to each other you must perform the same operation to both sides of the equation.
Plug the value back in to check the solution.

Example 2: 4y – 2 = 10
Is it solved?
What is with the variable?
What do we get rid of first? Why?
How do we get rid of minus 2?
How do we get rid of times -4?
Notice to keep the two sides of the equation equal to each other you must perform the same operation to both sides of the equation.
Plug the value back in to check the solution.

Example 3: \( \frac{x}{-2} + 4 = 7 \)
Is it solved?
What is with the variable?
What do we get rid of first? Why?
How do we get rid of plus 4?
How do we get rid of divided by -2?
Notice to keep the two sides of the equation equal to each other you must perform the same operation to both sides of the equation.
Plug the value back in to check the solution.
You Try!

1. $3x + 8 = 14$
2. $\frac{y}{2} - 5 = 2$
3. $-6m - 8 = 10$
4. $\frac{t}{-3} + 2 = 5$
5. $2h + 5 = -5$
6. $\frac{x}{-1} - 4 = -6$
7. $4x + 5 = 21$
8. $3x - 6 = 12$

What did we learn today?

Solve the following equations.

1. $2u + 5 = 15$
2. $2z - 8 = 12$
3. $3x + 8 = 17$
4. $\frac{x}{3} + 2 = 4$
5. $-3g - 3 = 15$
6. $\frac{x}{4} - 3 = 5$
7. $4w - 6 = 14$
8. $\frac{y}{2} + 5 = 4$
9. $3k + 5 = -7$
10. $5m - 3 = -18$
11. $-9t - 5 = 13$
12. $-4q - 3 = -11$
13. $2a - 6 = 12$
14. $\frac{x}{2} + 5 = -3$
15. $-8d + 2 = -14$
16. $\frac{x}{6} + 1 = 3$
17. $-4y + 3 = 11$
18. $\frac{x}{-2} + 4 = 9$
19. $4x + 4 = 8$
20. $-4x + 6 = 10$
Review Question
How do we solve an equation?
How do we know what operation to get rid of first?
How can we check our answers?

Discussion
Today’s emphasis is to show the connections between different topics. Specifically, we are going to incorporate some decimals into solving two step equations

SWBAT solve a two step equation

Example 1: \(3x + 7 = 22\)
Is it solved?
What is with the variable?
What do we get rid of first? Why?
How do we get rid of plus 7?
How do we get rid of times 2?
Notice to keep the two sides of the equation equal to each other you must perform the same operation to both sides of the equation.
Plug the value back in to check the solution.

Example 2: \(2.2x + 3.5 = 7.9\)
Is it solved?
What is with the variable?
What do we get rid of first? Why?
How do we get rid of plus 3.5?
How do we get rid of times 2.2?
Notice to keep the two sides of the equation equal to each other you must perform the same operation to both sides of the equation.
Plug the value back in to check the solution.

Example 3: \(6 - 3x = 17\)
Is it solved?
What is with the variable?
What do we get rid of first? Why?
How do we get rid of plus 6?
How do we get rid of times \(-3\)?
Notice to keep the two sides of the equation equal to each other you must perform the same operation to both sides of the equation.
Plug the value back in to check the solution.
### You Try!

1. $4x + 8 = 20$
2. $\frac{x}{-2} - 5 = 3$
3. $6m + 8 = -10$
4. $-3x + 6 = 18$
5. $4.2h + 8 = 16.4$
6. $8 - 4x = 12$
7. $4x + 4 = -8$
8. $-4 + 2x = 8$

### What did we learn today?

<table>
<thead>
<tr>
<th>Section 4–7 Homework (Day 2)</th>
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</thead>
</table>

Solve the following equations. Show all of your work!!

1. $2u + 10 = 18$
2. $-2z - 4 = 12$
3. $-3x + 4 = 25$
4. $\frac{x}{3} + 2 = 4$
5. $3.2g + 6.8 = 13.2$
6. $\frac{x}{-3} + 2 = 4$
7. $5.2w - 8.3 = 2.1$
8. $\frac{x}{-3} + 5 = 8$
9. $2.8k + 8 = 16.4$
10. $-4m - 1 = 19$
11. $9t - 5 = -14$
12. $6q - 3 = 15$
13. $-4 + 2a = 12$
14. $\frac{x}{-3} + 5 = 10$
15. $2 - 8d = 18$
16. $\frac{x}{6} + 2 = -3$
17. $2y + 5 = 13$
18. $\frac{x}{2} + 4 = -3$
19. $4 - 4x = 8$
20. $-6 + 4x = 10$
Review Question
How do we solve an equation?
How do we know what operation to get rid of first?
How can we check our answers?

Discussion
Today is going to be a day of practice. You will work on the problems in class. We will put the correct answers on the board.

SWBAT complete order of operations and two step equation problems

What did we learn today?

Section 4–7 In-Class Assignment (Day 3)

Simplify.
1. \(18 + 9 - 13 + 5\) \hspace{1cm} 2. \(7.4 \cdot 5.6 + 2.4\)
3. \(18 - 6 \cdot 2^3\) \hspace{1cm} 4. \((-9 + 6)^2(18 - 7) + 4\)
5. \((-10 + 5^2) + (-5 + 12)\) \hspace{1cm} 6. \(9.84 \div 2.4 - 1.8\)
7. \(\frac{1}{4} + \frac{1}{2} \cdot \frac{1}{3}\) \hspace{1cm} 8. \(18 - (2 + 1)^2 + 4\)

Solve the following equations. Show all of your work!!
9. \(2u + 10 = 22\) \hspace{1cm} 10. \(-2z + 8 = 12\) \hspace{1cm} 11. \(-3x + 5 = 17\) \hspace{1cm} 12. \(\frac{x}{3} + 5 = 14\)
13. \(3g + 6 = -24\) \hspace{1cm} 14. \(\frac{x}{-1} + 4 = 7\) \hspace{1cm} 15. \(2.2w - .8 = 3.6\) \hspace{1cm} 16. \(\frac{x}{-2} + 4 = 8\)
17. \(-6 + 2a = 18\) \hspace{1cm} 18. \(\frac{x}{2} + 1 = -3\) \hspace{1cm} 19. \(4 - 8d = 20\) \hspace{1cm} 20. \(-5.1y - 2.8 = 17.6\)
Review Question
How do we solve an equation?
How do we know what operation to get rid of first?
How can we check our answers?

Discussion
Today’s assignment is a great time to work on skills such as working together, time management, neatness, and organization.

SWBAT complete order of operations and two step equation problems

You Try!
1. 4x + 5 = -15
2. -2x + 4 = 10
3. x/-2 + 3 = 4
4. 2 + 3x = 11

What did we learn today?
**Activity**

You will work in groups of two. Give each group an answer sheet. Give each group one set of problems (one set = 2 problems). Give each group about 3 minutes to complete the two problems. Then rotate the problems around the class giving the groups 3 minutes with each set of problems.

<table>
<thead>
<tr>
<th>1.  $2x + 5 = 15$</th>
<th>2.  $2x - 8 = 12$</th>
<th>3.  $3x + 10 = 13$</th>
<th>4.  $\frac{x}{2} + 5 = 10$</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.  $-4x - 5 = 15$</td>
<td>6.  $\frac{x}{2} - 1 = 8$</td>
<td>7.  $6x - 6 = 18$</td>
<td>8.  $\frac{x}{2} + 6 = 4$</td>
</tr>
<tr>
<td>9.  $3x + 8 = -7$</td>
<td>10.  $5x - 8 = 5$</td>
<td>11.  $-8x - 8 = 16$</td>
<td>12.  $-4x - 7 = 13$</td>
</tr>
<tr>
<td>13.  $-8 + 2x = 12$</td>
<td>14.  $\frac{x}{2} + 5 = -3$</td>
<td>15.  $4 - 8x = -12$</td>
<td>16.  $\frac{x}{6} + 3 = 3$</td>
</tr>
<tr>
<td>17.  $2.4x + 7.1 = 11.9$</td>
<td>18.  $1.5x - 0.6 = 2.4$</td>
<td>19.  $2 + 3x = 23$</td>
<td>20.  $4x + 3 = 11$</td>
</tr>
<tr>
<td>21.  $8 + 9 - 3 + 5$</td>
<td>22.  $18 - (9 + 3) + 2^2$</td>
<td>23.  $18 - 2 \cdot 5 + 2$</td>
<td>24.  $38 - 3 \cdot 2^3 + 5$</td>
</tr>
<tr>
<td>Name</td>
<td>1.</td>
<td>2.</td>
<td>3.</td>
</tr>
</tbody>
</table>
Review Question
How do we solve an equation?
How do we know what operation to get rid of first?
How can we check our answers?

Discussion
What is the answer to $2x + 4 = 10$?
There is one solution. It is 3. Look at the solution on a number line.

What is the answer to $2x + 4 > 10$?
Anything bigger than 3. There is an infinite amount of solutions. Look at the solution on a number line.

As far as we know, an equation has one solution. An inequality has an infinite number of solutions.

We solve inequalities the same way that we solve equations: get the variable by itself by removing operations in reverse order.

**SWBAT** solve a two step inequality

Definition
- > greater than
- ≥ greater than or equal to
- < less than
- ≤ less than or equal to

Example 1: $2x + 5 \geq 9$
Is it solved?
What is with the variable?
What do we get rid of first? Why?
How do we get rid of plus 5?
How do we get rid of times 2?
The final solution is $x \geq 2$
What does that mean?

Example 2: $\frac{x}{3} + 2 < 4$
Is it solved?
What is with the variable?
What do we get rid of first? Why?
How do we get rid of plus 2?
How do we get rid of divided by 3?
The final solution is $x \leq 6$
What does that mean?
Example 3:  \(4y - 8 > 8\)
Is it solved?
What is with the variable?
What do we get rid of first? Why?
How do we get rid of minus 8?
How do we get rid of times 4?
The final solution is \(x < 4\).
What does that mean?

You Try!
1. \(4x + 9 \leq 29\)  
2. \(\frac{x}{5} - 3 > 1\)  
3. \(6x + 9 \geq 33\)
4. \(\frac{x}{3} - 5 < -8\)  
5. \(8 + 4x \geq 20\)  
6. \(4x + 5 < -11\)

What did we learn today?

| Section 4–7 Homework (Day 5) |

Simplify.
1. \(5^2 \div (12 - 8 + 1)\)  
2. \(25 + 4 \cdot 8 \div 2\)  
3.

Evaluate each expression if \(x = 2\), \(y = 3\), and \(z = 4\).
3. \(6x - 2y\)  
4. \(-6(x + y)\)  
5. \(\frac{1}{3}y\)
6. \(y^2 + 3z\)  
7. \(13 - (2y + z)\)  
8. \(2.3(z - x)\)

Solve each equation.
9. \(\frac{y}{3} = \frac{4}{2}\)  
10. \(\frac{x}{5} = 4\)  
11. \(2y - 8 = 6\)
12. \(\frac{6}{4} = \frac{m}{8}\)  
13. \(-2y + 4 = -18\)  
14. \(x + 5.2 = 12.6\)

Solve. Then graph the solution.
15. \(3x + 5 > 17\)  
16. \(2z - 7 < 11\)  
17. \(3x + 8 \geq 23\)
18. \(\frac{x}{3} + 3 \leq 4\)  
19. \(8 + 3g > -13\)  
20. \(\frac{x}{2} - 4 \geq 2\)
21. \(4w - 10 \geq -14\)  
22. \(3.2k + 2.4 < 12\)
**Review Question**
What do we need to have an equation?

**Discussion**
We already wrote expressions and simple equations:
Four more than a number: \( n + 4 \) (expression)
Four more than a number is eight: \( n + 4 = 8 \) (simple equation)
Four more than twice a number is eight: \( 2n + 4 = 8 \) (complicated equation)

Do you remember the steps to writing an equation?
1. Define a variable
2. Look for keywords
   - Add – increase, more than, etc
   - Subtract – decrease, less than, etc
   - Multiply – times, of, etc
   - Divide – quotient, half, etc
3. Look for IS

**SWBAT** write a two step equation given a sentence

**Write an equation. Then solve.**
**Example 1:** Seven times a number plus four is twenty five.

**Example 2:** Twice a number minus five is eleven.

**Example 3:** Twenty less than twice an integer is ten.

**Example 4:** The quotient of \( x \) and four increased by two is five.

**You Try!**
**Write an equation. Then solve.**
1. Four times a number increased by six is eighteen.
2. The difference between twice an integer and eight is ten.
3. The quotient of \( x \) and four increased by two is five.
4. \( 2x \) plus nine is negative nine.

**What did we learn today?**
Translate each sentence into an equation. Then solve.

1. Three times a number increased by five is 20. \( 5 \)
2. Twice a number decreased by four is 10. \( 7 \)
3. Four less than three times a number is 20. \( 8 \)
4. Seven more than twice a number is 17. \( 5 \)
5. The difference between 4x and 5 is 15. \( 5 \)
6. Eight less than ten times a number is 82. \( 9 \)
7. The quotient of a number and 4, less 8, is 2. \( 40 \)
8. If 5 is increased by 3 times a number, the result is 11. \( 2 \)
9. The difference between twice a number and 9 is 7. \( 8 \)
10. If 17 is increased by twice a number, the result is 5. \( -6 \)
**Review Question**
What are the steps to writing an equation?

**Discussion**
The writing of equations is used in computer software programs. For example, an equation must be written in order to calculate the total cost at a cash register. The register at McDonalds adds up all of the items you purchased. Then it calculates the tax. Finally, it adds the total cost of the food and the tax together.

**SWBAT** write a two step equation given a short paragraph

**Example 1:** A gym is $50 to join plus $30 per month. If you have $230, how many months can you join?

What is the variable?
What are the key words?
What do we start with?

\[ 50 + 30m = 230 \]

\[
\begin{align*}
50 + 30m &= 230 \\
-50 &\quad - 50 \\
30m &= 180 \\
30 &\quad 30 \\
m &= 6 \text{ months}
\end{align*}
\]

**Example 2:** Jimmy bought a dog cage for $18 plus three bags of dog food. Each bag of dog food cost the same amount. If he spent $45, how much did each bag cost?

What is the variable?
What are the key words?
What do we start with?

\[ 18 + 3b = 45 \]

\[
\begin{align*}
18 + 3b &= 45 \\
-18 &\quad - 18 \\
3b &= 27 \\
3 &\quad 3 \\
b &= \$9
\end{align*}
\]
You Try!
1. Jenny is trying to save money to buy a $100 pair of shoes. She already saved $55. She plans to save $15/week. How many weeks until she has enough money?

2. Montana is losing weight for wrestling. He weighs 155 lbs. He has four weeks to get down to 139 lbs. How much does he have to lose each week?

3. In one season, Barry Bonds hit 73 homeruns. This was 5 more than twice the amount the leader on the Pirates had. How many homeruns did the leader on the Pirates have?

What did we learn today?

For each problem: define a variable, circle key words, write the equation, and solve.

1. Seven more than twice a number is 17.

2. Twenty more than three times a number is 4.

3. Four less than three times a number is 20.

4. Ten more than the quotient of a number and 2 is three.

5. The difference between twice a number and 9 is 17.

6. If 5 is decreased by 3 times a number, the result is 4.

7. The temperature outside is 32º. It is expected to fall 5º each hour for the next several hours. In how many hours will the temperature be 17º?

8. You saved $50 for an ipod. You plan to save $20 every week. If the ipod costs $150, how many weeks will you have to save?
Section 4-9: Coordinate System (Day 1)

Review Question
What way do we move on the number line for a negative number?

Discussion
What unit are we on?
What topics are considered to be Pre Algebra?

In Pre-Algebra you start to study lines. Lines are made up of points. In order to eventually understand lines, we need to understand points. So we are going to start our discussion with points because they are what make up lines.

SWBAT plot points on a coordinate plane
SWBAT state the location given a point on a graph

Definition
Coordinate System – “the graph thing”
X-axis – horizontal line
Y-axis – vertical line
Origin – point where the two lines meet – (0, 0)
Quadrants – four sections of the graph

Draw and label picture of above definitions.

Every point has two parts: the x-coordinate and the y-coordinate. The x tells you how far to go left and right. The y tells you how far to go up and down.

A little hint to help remember: Run then Jump.
Example 1: Graph the following points.

(2, 3) (-3,1) (5,0) (0,-3) (-2,-3) (4,-2) (3.1, -4.8)

Example 2: Draw picture of coordinate plane with points in each quadrant and on each axis. State the location of each point.

What did we learn today?
State the quadrant. Then graph and label each point.

1. A (4, –3)  
2. B (5, 4) 
3. C (–1, 7)  
4. D (2, 8) 
5. E (–6, –6)  
6. F (–5, 3) 
7. G (2.2, –7.4)  
8. H (1/2, 3 3/4) 

Write the ordered pair for each point graphed on the coordinate plane. Then state the quadrant.

9. J ________ 
10. K ________ 
11. L ________ 
12. M ________ 
13. N ________ 
14. P ________ 
15. O ________
Graph each of the points below. Connect the points in order as you graph them.

1. (1, -1)  
2. (1, -3)  
3. (3, -3)  
4. (3, -1)  
5. (5, 0)  
6. (8, 0)  
7. (7, 1)  
8. (9, 0)  
9. (8, 2)  
10. (5, 1)  
11. (4, 3)  
12. (3, 4)  
13. (2, 3)  
14. (1, 4)  
15. (0, 3)  
16. (-1, 4)  
17. (-2, 3)  
18. (-3, 4)  
19. (-4, 3)  
20. (-5, 1)  
21. (-8, 2)  
22. (-5, 0)  
23. (-3, -1)  
24. (-3, -3)  
25. (-1, -3)  
26. (-1, -1)  
27. (0, -1)
Review Question
How would you plot the point (-4, -8)?
What quadrant would that be located?

Discussion
What does the coordinate system allow us to do?
Notice that they use a similar system to calculate your location and directions on a GPS system.
How do you think that your GPS calculates your location?

SWBAT plot points on a coordinate plane
SWBAT state the location given a point on a graph

Activity
You will draw your own picture on piece of graph paper. It must contain at least 30 points. The picture must be in all four quadrants. Label each one of the points with a number. On a separate sheet of paper, list the corresponding coordinates to each one of the points.

What did we learn today?
**Review Question**
How would you plot the point (-3, 6)?
What quadrant would that be located?

**Discussion**
What would be difficult about plotting the points (1, 2) and (-65, 125) on the same plot?
We can plot these points on our calculators easily.

**SWBAT** plot points on a graphing calculator or graph paper
**SWBAT** create an appropriate window or scale based on a data set

**Activity**
1. Plot (-2, 5) using the graphing calculator
   a. Turn stat plot on
   b. Stat – edit – enter data in L_1 and L_2
   c. Graph

2. Plot (13, -35) (18, -3) (-50, 20), repeat steps b and c.
   How many points should you see?
   Why can’t we see all of the points?

Discuss how to choose appropriate window and scale in order to get all of the points to fit.
   a. Window
   b. Change xmin, xmax, xscl, ymin, ymax, and yscl

3. Plot the following points. Create appropriate window or scale.
   (-11, 1) (-11, 3) (-11, 5) (-11, 7) (-11, 9)
   (-8, 5) (-5, 5)
   (-2, 1) (-2, 3) (-2, 5) (-2, 7) (-2, 9)
   (2, 1) (2, 3) (2, 5) (2, 7) (2, 9)

4. Try to get the word “IT” in quadrants one and two with an appropriate window.

**What did we learn today?**
1. Given the following points, fill in reasonable values for an appropriate window.
   (10, 25) (-12, 36) (1, -10) (5, 4)
   XMin = XMax = XScale =
   YMin = YMax = YScale =

2. Given the following points, fill in reasonable values for an appropriate window.
   (-24, 5) (-10, 6) (0, -22) (15, 4)
   XMin = XMax = XScale =
   YMin = YMax = YScale =

3. Given the following points, fill in reasonable values for an appropriate window.
   (100, 250) (-125, 50) (10, -100) (50, 75)
   XMin = XMax = XScale =
   YMin = YMax = YScale =

4. Given the following points, fill in reasonable values for an appropriate window.
   (-15, -45) (-12, -36) (-28, -24) (-5, -4)
   XMin = XMax = XScale =
   YMin = YMax = YScale =

5. Given the following points, fill in reasonable values for an appropriate window.
   (55, 35) (25, 45) (75, 40) (5, 5)
   XMin = XMax = XScale =
   YMin = YMax = YScale =
Review Question
How would you plot the point (4, -3)?
What quadrant would that be located?

SWBAT study for the Unit 4 test

Discussion
We have a unit test tomorrow.
How do we study for a test?
How should you study for a test?
What topics are on the test?
How could you study these topics?

What did we learn today?

Practice Problems
1. \(4 + 8 \cdot 2 - 5\) 15
2. \(25 + 4 \cdot 8 \div 2\) 41
3. \(\frac{y}{3} = \frac{4}{2}\) \(y = 6\)
4. \(\frac{x}{5} = 4\) \(x = 20\)
5. \(-2y - 8 = 6\) \(y = -7\)
6. \(3x + 5 > 17\) \(x > 4\)
7. \(2z - 7 < 11\) \(z < 9\)
8. \(3x + 8 \geq 20\) \(x \geq 4\)

9. Which is a better price? $12 for 3 pounds of nuts or $25 for 5 pounds of nuts
10. You traveled 200 miles. It took 4 hours. How fast were you traveling?
11. Write an equation and solve: Twenty more than three times a number is 29.
12. Plot the point (-3, 5)
Things to Remember:
2. Reinforce the importance of retaining information from previous units.
3. Reinforce connections being made among units.

1. What value satisfies the equation: 4x + 2 = 18?
   a. 2  b. 3  c. 4  d. 5

2. What is the distance between Pittsburgh and Cleveland?
   a. -50 miles  b. 20 miles  c. 100 cm  d. 120 miles

3. Who is the best college basketball team?

4. What is the largest two digit number that adds up to 6?
   a. 42  b. 105  c. 53  d. 99

5. What is the largest integer?
   a. -8  b. -4  c. $\frac{19}{4}$  d. 5.5

6. Which number isn’t rational?
   a. $\sqrt{5}$  b. 6  c. 2.4  d. $\frac{3}{4}$

7. What is the next term: 1, 8, 15, 22, ___?
   a. 16  b. 17  c. 25  d. 29

8. What is the next term: 2, 3, 5, 8, 12, ___?
   a. 15  b. 17  c. 18  d. 28

9. What is the next term: 1, 4, 16, ___?
   a. 20  b. 37  c. 64  d. 71

10. What is the next term: 3, 7, 6, 10, 9, ___?
    a. 13  b. 15  c. 17  d. 19

11. Evan had $95. He spent $4.75 at Wendy’s and $18.99 on a t-shirt. About how much money does he have left?
    a. $90  b. $80  c. $70  d. $60

12. Lance bought a car for $20,000. He plans to pay it off in 1 year. About how much does he have to pay each month?
    a. $200  b. $500  c. $1000  d. $2000
13. Johnny makes $7.25/hour. He works 20 hours/week. How many weeks will it take for him to save $435?
   a. 2  b. 3  c. 4  d. 5

14. Shirley has 4 quarts of oil. Sammy has 2 gallons of oil. How many gallons of oil do they have together?
   a. 2  b. 3  c. 4  d. 5

15. Tammy drove 20 km. Timmy drove 2000 m. How far did they drive total?
   a. 22 km  b. 2020 km  c. 2222 km  d. 1000 km

16. \(-8 + 14 = \)
   a. 22  b. 6  c. -6  d. 20

17. \(-5 – 9 = \)
   a. 14  b. 4  c. -14  d. -10

18. \((45)(31) = \)
   a. 1395  b. 1102  c. 1202  d. 86

19. \(9.66 ÷ 2.3 = \)
   a. 4.5  b. 4.8  c. 4.2  d. 7.4

20. \(13.8 – 4.22 = \)
   a. 9.62  b. 9.58  c. 9.28  d. 9.18

21. \(\frac{2}{6} + \left(\frac{4}{5}\right) = \)
   a. 14/30  b. 17/15  c. 14/15  d. 40/30

22. \((4.2)(2.53) = \)
   a. 13.152  b. 10.626  c. 11.626  d. 10.891

23. \(
\left(\frac{4}{5}\right) ÷ \left(\frac{12}{7}\right) = \)
   a. 12/20  b. 7/15  c. 8/10  d. 10/40

24. Which of the following is equal to 10/40?
   a. 25  b. 10%  c. 25%  d. 40%

25. Which of the following is equal to 82%?
   a. .82  b. 820%  c. 8200  d. .82%

26. Which of the following is equal to 4/20?
   a. .1  b. .2  c. .3  d. .4

27. Which of the following is equal to 6²?
   a. 6  b. 12  c. 18  d. 36
28. Which of the following is equal to $\sqrt{324}$?
   a. 12  
   b. 18  
   c. 28  
   d. 31

Use the following data set to answer questions 29-30.

12, 8, 10, 22, 40, 16

29. What is the mean?
   a. 18  
   b. 22  
   c. 24  
   d. 70

30. What is the median?
   a. 12  
   b. 14  
   c. 20  
   d. 70

31. There are 4 red marbles, 6 blue marbles, 8 green marbles, and 1 yellow marble in a bag. What is the probability of picking a green marble?
   a. 4/19  
   b. 6/20  
   c. 6/19  
   d. 8/19

32. $18 - (9 + 3) + 22$
   a. 10  
   b. 28  
   c. 32  
   d. 2

33. $18 - 24 \div 12 + 3$
   a. 15  
   b. 16  
   c. 19  
   d. 20

34. Tommy ran 12 mph for 2 hours. How far did he run?
   a. 6  
   b. 24  
   c. 36  
   d. 60

35. $2x + 8 = 14$
   a. 3  
   b. -3  
   c. -11  
   d. 11

36. $x \div 8 > -12$
   a. $x < -8$  
   b. $x > -8$  
   c. $x < 10$  
   d. $x < -10$
UNIT 4 HAND-IN PROBLEMS

This problem set is intended to challenge the students and encourage students to apply a deep understanding of problem-solving skills.

1. \[2 - (3 - 8)^2 \cdot 4 \div 2 + 5 - 2 \cdot 3\]
2. \[123x + 456 = 789\]
3. \[2.6x - 4.22 = 10.236\]
4. \[-\frac{1}{3}y + \frac{2}{5} = 1\frac{3}{5}\]
5. \[-20x + 40 = -120\]
6. \[\frac{3y}{2} + 8 \leq 4\]
7. Write an equation. Then solve. Ten more than the quotient of a number and \(-2\) is three.
8. Explain how you could estimate the distance to a place if you knew how long it took to drive there.
9. Write an equation. Then solve. Tommy makes $7.50 per hour at his job. He is saving to buy a $3,000 car. He already has $500. How many hours must he work until he has enough money?
10. Explain how you would plot the point \((-3.4, 5.6)\) accurately.
Scale Drawing Activity: For this activity the students will use Map Quest to estimate the distance between the two places given. Each student will need access to http://www.mapquest.com/

Example: (Complete the example together as a class.) Estimate the distance between your school and Heinz Field.

1. Go to http://www.mapquest.com

2. Click on Directions

3. In the space for Starting Address type the address of your school.
   
   Aliquippa School District  
   100 Harding Avenue  
   Aliquippa, PA 15001

4. In the space for Ending Address type the address for Heinz Field.
   
   Heinz Field  
   100 Art Rooney Avenue  
   Pittsburgh, PA 15212

5. Look at the map. Use the tool bar on the left hand side to zoom out one time. Now, both locations should be visible on the map. The school is labeled with an A and the stadium with a B. Use the scale in the upper left hand corner to estimate how many miles apart your school is from the stadium. Measure directly from A to B.

   Estimated Distance (Miles): 15 miles

6. Scroll down to the directions given by Map Quest. What does Map Quest give for the distance between these locations?

   Estimated Distance (Miles): __________

   6. Scroll down to the directions given by Map Quest. What does Map Quest give for the distance between these locations? 30.25 miles

7. The estimated distance and the actual distance traveled are very different. The real distance is double the estimated distance! Why aren’t these distances the same?

   The main reason that the distances are different is because the estimated distance was found by measuring directly from A to B. The actual distance listed by Map Quest was found by measuring the roads you would drive on to get from your school to Heinz Field. Notice by looking at the map that when driving you do not take the most direct path to get to the stadium. Also, we need to account for human error when measuring and estimating.

8. We estimated that your school is 15 miles away from Heinz Field. How many feet apart are the two locations?

   Estimated Distance (Feet) = \( \frac{15 \text{ miles}}{1} \cdot \frac{5,280 \text{ feet}}{1 \text{ mile}} \) = 79,200 feet

   Unit 4 Project
Directions: It is your turn to use Map Quest to estimate the distance between the locations given below. Refer to the example on the previous page for help. Remember when measuring the estimated distance please measure directly between points A and B. Also, you may need to zoom out to get both points in view or to get the scale in miles.

1. Estimate the distance in miles between your school and the Pittsburgh Zoo.

The Pittsburgh Zoo
One Wild Place
Pittsburgh, PA 15206

Estimated Distance (Miles):______________________________

Estimated Distance (Feet):______________________________

Actual Distance on the Roadways (Miles):______________________

Explain why the distances are similar or different.

2. Estimate the distance in miles between your school and Kennywood Park.

Kennywood Park
4800 Kennywood Blvd.
West Mifflin, PA 15122

Estimated Distance (Miles):______________________________

Estimated Distance (Feet):______________________________

Actual Distance on the Roadways (Miles):______________________

Explain why the distances are similar or different.

3. Estimate the distance in miles between your school and your house. (Be careful here. If you live close to the school the scale may be in feet. You will have to convert your answer to miles.)

Estimated Distance (Miles):______________________________

Estimated Distance (Feet):______________________________

Actual Distance on the Roadways (Miles):______________________

Explain why the distances are similar or different.
Unit 5 – Geometry

5-1 Angles
5-2 Polygons
5-3 Triangles
5-4 Congruent and Similar Figures
5-5 Quadrilaterals
5-6 Area and Perimeter
5-7 Surface Area and Volume
5-8 Circles
5-9 Three Dimensional Figures
SWBAT check on their goal for the year

“If you don’t know where you are going, any road will get you there”

Guidelines to Setting and Achieving Goals
Read the following story with the students. Have them answer the questions that follow. Lead a discussion on the importance of setting and achieving goals.

Wouldn’t it be nice if you could write yourself out a check and then receive that amount of money in real life? That’s what one movie star did and inspired thousands of others to follow in his footsteps...

Jim Carey who has stared in many popular comedy films wrote himself a check, dated it for Thanksgiving in 1995, carried it about with him and then just before Thanksgiving he received the news!

"I wrote myself a check for ten million dollars for acting services rendered and dated it Thanksgiving 1995. I put it in my wallet and it deteriorated. And then, just before Thanksgiving 1995, I found out I was going to make ten million dollars for Dumb & Dumber. I put that check in the casket with my father because it was our dream together."

-Jim Carrey,

10 million dollars was within Jim’s range of achievement as he had already earned several million prior to this event. Would it be beneficial for you to write a 10 million dollar check and carry it around with you? If that amount of money is reachable, attainable and seems possible to you – then yes!

Decide on a definite date by which you will achieve this amount of money and then complete and sign your check, dating it for that specific date. Carry your check around with you and pull out your check when you are reminded to do so by opening your wallet.

Over the course of the year, we have talked about setting goals. In this story, there are a couple of things that we touched upon this year. First, is the simple act of a setting a definitive goal. Next, making sure that the goal is attainable and high enough. Finally, the fact that the Jim Carey’s check was a visual representation of what he wanted to accomplish.

Questions
1. Name one goal that you set at the beginning of the school year.
2. List a few things that tried to do in order to accomplish that goal this year.
3. Do you think that your goal was reasonable?
4. Do you think that your goal was high enough?
5. Was the timetable reasonable?
6. Did you place your goal in a place where you would see it everyday?
7. Did you accomplish your goal?
Section 5–1: Angles (Day 1)

Review Question
How do you graph the point (-5, 4)?
What quadrant is that point located?

Discussion
What do you think about when I say the word Geometry?

SWBAT define basic geometry terms
SWBAT estimate an angle measure
SWBAT draw an angle given a measure

Definition
Notice how things build in nature: Atoms → Cells → Organs → Body
Notice how things build in Algebra: Variable → Combining → Solving → Lines → Graphs
How do things build in Geometry?
What is the building block that starts Geometry?

Points → Segments → Rays → Lines → Plane

Point - location (no shape or size)  •A  ex) here
Line segment – collection of points with defined length  A→B  ex) wood beam
Ray – segment that extends infinitely in 1 direction  A→B  ex) laser
Line – segment that extends infinitely in both directions  A↔B  ex) #’s, space

Parallel – two lines that do not intersect

Angle – two rays (say angle BAC or CAB)

Vertex – meeting point of two rays (point A)
**Type of Angles**

**Straight** – 180°

**Right** – 90°

**Perpendicular** – two lines that intersect at right angles

**Obtuse** – angles > 90°

**Acute** – angles < 90°

If a line is 180°, what would the angle measure of each of the dotted lines be?

Example 1: Estimate the angle measure.

Example 2: Estimate the angle measure.
You Try!
1. Draw an acute angle, label it BAD – estimate measure
2. Draw an obtuse angle, label it NIC – estimate measure
3. Draw a 20° angle, label it EMO (estimate)
4. Draw a 100° angle, label it JEN (estimate)

What did we learn today?

Label each angle as acute, obtuse, right or straight. Then estimate each angle measure.

[Diagrams of angles labeled 1-9]

Draw an angle for each of the following. Label the angle MNO.

10. 50°  11. 120°  12. 15°
13. 145°  14. 82°  15. 65°

Draw an angle for each of the following. Label the angle CAB.

16. acute angle  17. obtuse angle  18. right angle

19. Draw a pair of lines that have the following characteristics.
   a. Parallel       b. Perpendicular       c. neither

20. Answer the following problem using the four step method. When the clock reads 8:50 the hands form an acute angle. At what time will the clock form a right angle?
**Review Question**
What is the measure of a right angle?
What are parallel lines?

**Discussion**
When you go to the doctor after spraining your ankle, the doctor might use a tool similar to a protractor. The doctor will take the device and measure the angle in which you can stretch your toes forward on your good ankle. Then the doctor will take the same angle measurement on your injured foot. Then the doctor will compare the two measurements.

**SWBAT**
- measure an angle using a protractor
- draw a specific angle given a protractor

**Example 1:** Have the students draw an acute angle and label it $\angle BAC$. Then have the students estimate the angle measure. Remind them of the drawing from yesterday. (the poster should be hanging up) Then use a protractor to measure the angle. Compare.

![Acute Angle Diagram]

Notice that the protractor has two sets of numbers. How do we know which number to use? How do you know that the angle is $70^\circ$ not $110^\circ$?

**Example 2:** Have the students draw an obtuse angle and label it $\angle BAC$. Then have the students estimate the angle measure. Remind them of the drawing from yesterday. (the poster should be hanging up) Then use a protractor to measure the angle. Compare.

![Obtuse Angle Diagram]

How do you know that the angle is $120^\circ$ not $60^\circ$?

**Example 3:** Have the students draw a $50^\circ$ angle using estimation. Then have them get the exact measure using a protractor. Then have them construct one with the protractor. Start with a horizontal ray. Then place the protractor above the ray. Then put a mark above the $50^\circ$ mark on the outside of the protractor. Finally, connect the starting point of the ray with the mark you just made. Notice that the protractor has two sets of numbers. How do we know which number to use? How do you know that the angle is $50^\circ$ not $130^\circ$?
Example 4: Have the students draw a 160° angle using estimation. Then have them get the exact measure using a protractor. Then have them construct one with the protractor. Start with a horizontal ray. Then place the protractor above the ray. Then put a mark above the 160° mark on the outside of the protractor. Finally, connect the starting point of the ray with the mark you just made. Notice that the protractor has two sets of numbers. How do we know which number to use? How do you know that the angle is 160° not 20°?

You Try!
1. Draw an acute angle. Get its exact measurements.
3. Draw a 15° angle using a protractor.
4. Draw a 122° angle using a protractor.

What did we learn today?

Section 5-1 In-Class Assignment (Day 2)

Estimate each angle measure. Circle your estimation. Then find each angle measure using a protractor. Compare the two values.

1.  

2.  

3.  

4.  

Draw each angle by estimating. Then use a protractor to draw each angle. Label the angle BAC. Then compare the two angles.

7. 50°  
8. 115°  
9. 145°  
10. 68°  
11. 42°  
12. 90°  

13. Explain why there are two scales on the protractor. Explain how to use each scale.

14. What angle has the same measure on both scales?
**Review Question**
Why does a protractor have two different sets of scales on it?

**Discussion**
What is a polygon?
Is a circle a shape?
Is a circle a polygon?
What characteristics does a polygon need?

**SWBAT**
- name polygons with sides 3 through 8
- distinguish between regular and irregular polygons

**Definition**

**Polygon** – closed figure formed by three or more line segments

The classroom is an example of a three dimension polygon when the door is closed. The classroom is not a polygon when the door is open. Is it a polygon if you open one of the closet doors?

Give reasons as to why the shapes may or may not be polygons.

YES  YES  NO  NO  NO

**Naming Polygons**

Triangle  Quadrilateral  Pentagon  Hexagon  Heptagon  Octagon
Regular Polygons – all angles and sides are congruent
Congruent – equal: $\cong$

Explain why each of the polygons above are not regular. Then draw a regular polygon under each of the polygons:

![Regular Polygons](image)

What did we learn today?
On line 1 write the name of the polygon.
If it isn’t a polygon, explain why not on line 2.
On line 3 write regular or irregular.
If it is irregular, explain on line 4.

1. ______________
2. ______________
3. ______________
4. ______________

5. ______________
6. ______________
7. ______________
8. ______________

9. ______________

Section 5-2 Homework (Day 1)
Estimate each angle.

10.  

11.  

12.  

13.  

14.  

15.  

Draw each of the given angles. (estimate)

16.  28°  
17.  95°  
18.  155°
Review Question
What is the difference between a regular and irregular polygon?

Discussion
What do we need in order to have a triangle?
Can anyone write a sentence putting all of these ideas together?

SWBAT name a triangle by its angles and sides
SWBAT draw a triangle given its name

Definition
Triangle – 3 sided polygon whose angles add up to 180°

Activity
Draw a picture of a triangle. Then cut out each angle from the triangle. Then tape all three angles together. What does it form?
What is the angle measure of a line?
What does a triangle have to add up to?

Each student will need three rulers.

Triangles have two names like people. They have a first name and last name. Their first name describes its angles and its last name describes its sides.

Types of triangles – by angles
Form the particular triangle on your desk with the rulers. Then draw them next to their definition.

1. Acute – 3 acute angles
2. Obtuse – 1 obtuse angle
3. Right – 1 right angle

Why can you only have one obtuse angle in a triangle?
Why can you only have one right angle in a triangle?
**Types of triangles** – by sides
Form the particular triangle on your desk with the rulers. Then draw them next to their definition.

1. **Equilateral** – 3 congruent sides

2. **Isosceles** – 2 congruent sides

3. **Scalene** – 0 congruent sides

**Example 1:** Name the triangle.

![Right Scalene Triangle](image)

What does ‘x’ have to be?

**Example 2:** Name the triangle.

![Acute Equilateral Triangle](image)

**Example 3:** Name the triangle

![Obtuse Isosceles Triangle](image)

**You Try!**
Make each of the triangles on your desk with the rulers.
1. Right Isosceles
2. Acute Scalene
3. Obtuse Equilateral
4. Acute Isosceles
5. Obtuse Scalene
6. Right Equilateral
What did we learn today?

Find the missing measure in each triangle. Then classify the triangle as acute, right, or obtuse.

1. 

2. 

3. 

Classify each triangle by its angles and its sides.

4. 

5. 

6. 

7. 

8. 

9. 

Find each angle.

10. 

11. 

(\(x^\circ\)) 

\(3x^\circ\) 

\(2x^\circ\) 

(\((x+10)^\circ\))
Review Question
What do the angles in a triangle add up to?
What two things are used to classify triangles?

Discussion
What made problem #11 on the homework so difficult?
Does anyone know how to do this problem?
If you don’t know how to do a problem, what should you do?
What are some of our problem solving skills that we learned in Unit 1?
So let’s try to solve this problem using guess and check.
Can someone give me a good first guess?

SWBAT solve problems from the first three sections of the chapter

Today is going to be a day of practice.

What did we learn today?

Section 5–3 In–Class Assignment (Day 2)

Label each angle as acute, obtuse, right or straight. Then estimate each angle measure. Place your estimation inside the angle. Then get the exact measurement using a protractor.

1.  
2.  
3.  

4.  
5.  
6.  

211
Draw each angle by estimating. Then use a protractor to draw each angle. Label each angle BAC. Then compare the two angles.

7. 65°
8. 125°
9. 94°
10. 18°

State whether each figure is a polygon. If so, name it then label it as regular or irregular.

11.

12.

13.

14. Draw a regular and irregular pentagon.

Find the missing measure in each triangle. Then classify the triangle as acute, right, or obtuse.

15.

16.

17.

Classify each triangle by its angles and its sides.

18.

19.

20.

21. Draw a right isosceles triangle

22. Draw an obtuse equilateral triangle
**Review Question**
What two things are used to classify triangles?
Name the two types of triangles that are not possible.

**Discussion**
What does identical mean?
What do you know about identical twins?
Today we are going to talk about identical figures. However, in math we use the term congruent instead of identical. Draw two triangles that would be comparable to identical twins.
How do you think their angles are related?
How do you think their sides are related?

**SWBAT** find angles and sides of congruent triangles

**Definition**
**Congruent Figures** – equal to each other
- same shape, same size
- same angles, same sides

Congruent triangles are like **identical twins**.

\[ \Delta ABC \cong \Delta DEF \]

The order in which the triangles are named matters!

\[ \angle A \cong \angle D \quad \overline{AB} \cong \overline{DE} \]
\[ \angle B \cong \angle E \quad \overline{BC} \cong \overline{EF} \]
\[ \angle C \cong \angle F \quad \overline{AC} \cong \overline{DF} \]

**Example 1:** \( \Delta ABC \cong \Delta DEF \). (Draw a picture.)
Given: \( \angle A = 70^\circ; \ \angle B = 50^\circ; \ \overline{AC} = 5; \ \overline{AB} = 8; \ \overline{EF} = 10 \)
Label the values of all missing angles and sides in both triangles.

Notice that the longest side is opposite the largest angle.
You Try!
1. Draw two congruent acute isosceles triangles. Label the triangles $\triangle ABC$ and $\triangle DEF$.
   - Given: $\angle B = 50^\circ$, $\angle C = 80^\circ$, $AB = 6$, $BC = 4$, $DF = 4$
   - Label the values of all missing angles and sides in both triangles.

   Question: What is causing two of the sides of the triangles to be congruent?

2. Draw an obtuse scalene triangle. Make up your own values for the angles and sides of the triangle. Make sure the biggest side is across from the biggest angle and the smallest side is across from the smallest angle. Draw another obtuse scalene triangle that is congruent to the first triangle.

3. Draw a right isosceles triangle. Make up your own values for the angles and sides of the triangle. Make sure the biggest side is across from the biggest angle and the smallest side is across from the smallest angle. Draw another right isosceles triangle that is congruent to the first triangle.

What did we learn today?

Section 5-4 Homework (Day 1)

Given $\triangle ABC \cong \triangle DEF$, draw each triangle and find all of the missing angles and sides.
1. $\angle B = 40^\circ$, $\angle C = 60^\circ$, $AB = 6$, $BC = 8$, $DF = 4$

For #2-3, given $\triangle ABC \cong \triangle DEF$, find all of the missing angles and sides.

2.

3.
4. Draw a pair of acute isosceles triangles that are congruent to each other. Make up your own values for the angles and sides of the triangles.

5. Draw a pair of right scalene triangles that are congruent to each other. Make up your own values for the angles and sides of the triangles.

6. What is wrong with the following picture?

![Diagram of a triangle with sides 6, 8, and 10]

7. Explain why the longest side of a triangle must be across from the largest angle. (include pictures)

8. Name the two types of triangles that can not be formed. Then explain why they are impossible. (include pictures)
Review Question
What does congruent mean?
What do congruent figures have in common?

Discussion
Yesterday, we talked about congruent figures. We said they were like identical twins. Today, we are going to talk about similar figures. Similar figures are like brothers. Draw two triangles that would be comparable to a big brother and little brother.
How do you think their angles are related?
How do you think their sides are related?

SWBAT find angles and sides of similar triangles

Definition
If similar was a vocabulary word in English class, how would you define it?

Similar – alike
- same shape, different size
- same angles, proportional sides

Similar triangles are like brothers.

\( \triangle ABC \sim \triangle DEF \)

The order in which the triangles are named matters!

\( \angle A \cong \angle D \quad AB \propto DE \)

\( \angle B \cong \angle E \quad BC \propto EF \)

\( \angle C \cong \angle F \quad AC \propto DF \)
Example 1: \( \triangle ABC \sim \triangle DEF \).  

\[
\begin{align*}
\frac{4}{10} &= \frac{x}{25} \\
10x &= 100 \\
10 &= \frac{10}{10} \\
x &= 10
\end{align*}
\]

The bases go from 10 to 25. That is an increase of 15. Why can’t we just increase the 4 (height) by 15 to get the answer to the other height?

Example 2: \( \triangle ABC \sim \triangle DEF \)

\[
\begin{align*}
\frac{2}{8} &= \frac{x}{12} \\
8 &= \frac{12}{x} \\
8x &= 24 \\
\frac{8}{8} &= \frac{12x}{12} \\
x &= 3 \\
x &= 6
\end{align*}
\]

You Try!

1. Draw two similar right scalene triangles. Label them triangles \( ABC \) and \( DEF \).  
The longest side of the larger triangle is 10. The longest side of the smaller triangle is 4. The base of the shorter triangle is 2. Find the length of the base of the larger triangle.
2. The two triangles are similar. Find the two missing sides and all of the missing angles.

```
2 80° 3
8
```
```
5
20° ?
```

3. Draw two congruent acute isosceles triangles. Label the triangles ABC and DEF.
Given: \( \angle A = 70^\circ; \ \angle B = 55^\circ; \ AB = 12; \ BC = 14; \ DF = 12 \)
Label the values of all missing angles and sides in both triangles.

**What did we learn today?**

**Section 5-4 Homework (Day 2)**

The two figures in each example are similar to each other. Find the missing side.

```
1. 3
  4

2. 6
   x

3. 7
   3
   x
   9
```
```
3. 12
   14

4. 20
   x
   24
   30
```
Given $\triangle ABC \cong \triangle DEF$, draw the two triangles. Then find all of the missing sides and angles.

7. $\angle B = 60^\circ$, $\angle C = 80^\circ$, $AB = 8$, $BC = 4$, $DF = 6$

8. Given $\triangle ABC \cong \triangle DEF$, find the missing sides and angles.

Determine whether each pair of figures is similar by using proportions.

9

10
**Review Question**
What does congruent mean?
What do congruent figures have in common?
What does similar mean?
What do similar figures have in common?

**Discussion**
Back in Unit 4, we talked about proportions. What is a proportion?
When do we use proportions?
How do you solve a proportion?

**SWBAT**
- solve application problems using similar triangles
- solve application problems using proportions
- determine when it is appropriate to use a proportion to solve a problem

**Example 1**: In ancient times, people used the sun to make measurements and calculate heights of objects. We can do the same thing today. A six foot man casts a 10 foot shadow. A building casts a 120 foot shadow. Find the height of the building.

Demonstrate the problem by acting it out. Assume the clock in the room is the sun. Then have one student be the man and another taller student act as the building. Finally, draw a picture of the problem on the board, labeling all of the known parts.
6 = 10
x  120

10x = 720
x = 72 feet

How many inches is that?

Example 2: Joe rides his bike 30 miles in 4 hours. How far can he ride in 7 hours?

30 miles  =  x  miles
4  hours  7 hours

4x = 210
x = 52.5 miles

How many feet is that?

Example 3: Which is the better deal on ice cream?

2 gallons for $2.80 or 5 gallons for $7.50

$2.80
2
or
$7.50
5

$1.40 or $1.50

When is it appropriate to use a proportion to solve a problem?

What did we learn today?

Section 5–4 In-Class Assignment (Day 3)

Given ΔABC ≅ ΔDEF, draw a picture of each triangle correctly labeled. Then find all of the missing angles and sides.

1. ∠B = 65°, ∠C = 85°, AB = 10, BC = 4, DF = 7

The following two figures are similar. Find the missing sides and angles.

2.
For problems 3-6:
1. Read the problem.
2. Draw a picture (#3 and #4)
3. Write a proportion.
4. Solve.

3. On a small scale map, the length from Boston to New York City is 15 centimeters, and from New York City to Washington, D.C. the length is 18 centimeters. On a larger map, the length from Boston to New York City is 25 centimeters. Find the length from New York City to Washington, D.C. on the larger map. (draw a picture)

4. If a tree 6 feet tall casts a shadow 4 feet long, how high is a flagpole that casts a shadow 18 feet long at the same time of day? (draw a picture)

5. Jimmy earns $152 in 4 days. At that rate, how many days will it take him to earn $532?

6. A research study shows that three out of every twenty pet owners got their pet from a breeder. Of the 100 animals cared for by a veterinarian, how many would you expect to have been brought from a breeder?
Review Question
When is it appropriate to use a proportion to solve a problem?

SWBAT solve application problems using similar triangles
SWBAT solve application problems using proportions
SWBAT determine when it is appropriate to use a proportion to solve a problem

Today will be a day of practice.

What did we learn today?

For problems 1-5, setup a proportion and solve.
1. If 5 quarts of iced tea costs $6.25, how much would 7 quarts cost?
2. In a recipe, 2 cups of sugar makes 25 cookies. How many cups of sugar will you need to make 85 cookies?
3. An 8 x 10 picture is enlarged so that the width of the new photo is 12 inches. What is the height of the new photo in inches and feet? (include a picture)
4. Little Johnny has to do 500 practice problems before the PSSA test. He did 125 in 5 days. How many total days will it take him to get done with all 500?
5. A flagpole casts a 42 foot shadow. A 6 foot man casts an 8 foot shadow. How tall is the flagpole in feet and inches? (include a picture)

Estimate each angle.
6. 
7. 
8. 
Classify each triangle by its *angles* and its *sides*.

9. 

10. 

11. 

Find each angle.

12. 

13. 

14. In your own words, define what congruent means. Then draw a picture of two congruent triangles. Make sure the triangles’ angles and sides are labeled.

15. In your own words, define what similar means. Then draw a picture of two similar triangles. Make sure the triangles’ angles and sides are labeled.
**Review Question**
What do the angles of a triangle have to add up to?

**Discussion**
What is needed to form a quadrilateral?
What do the angles have to add up to?
Can anyone make up a definition using these ideas?

**Definition**
**Quadrilateral** - 4-sided polygon whose angles add up to 360°

In order to classify the different types of quadrilaterals, we will use a flowchart.
Where have you seen flowcharts?
Where are they used?

**FLOWCHART EXAMPLE:**

```
President
/   \\  
Vice President  Vice President
    /       /     \\/       \\/
  Marketing   Accounting  Payroll   Computers
    /\         /\                     /\
Advertising Advertising        Advertising
```

**Activity**
Another common example of a flow chart would be your family tree. Make up a flow chart of your family. You will need to include grandparents, parents, siblings, aunts, uncles, cousins, and any others you feel appropriate.
* Notice a square can be called a rectangle, parallelogram, or quadrilateral. A comparison can be made when you are addressing a student. You can call him kid, young man, or by his name. Using his first name would probably be best just like calling a square a square would be best.

**SWBAT** identify different types of quadrilaterals and their characteristics

**SWBAT** find missing angle measures in quadrilaterals

**True or False?**

**Example 1:** All rectangles are parallelograms.

**Example 2:** All rectangles are squares.

**Example 3:** All trapezoids are squares.
Example 4: Find the missing angle in the trapezoid.

![Diagram of trapezoid with angles labeled]

\[ x = 120° \]

You Try!
1. Find the missing angle in the trapezoid.

![Diagram of trapezoid with angles labeled]

2. Name the shape.
   a. 
   ![Rectangle]
   b. 
   ![Trapezoid without bases]
   c. 
   ![Parallelogram]

What did we learn today?
Classify each quadrilateral using the name that best describes it.

1.  
2.  
3.  
4.  

Tell whether each statement is true or false.

5. A parallelogram is a trapezoid.
6. A square is a quadrilateral.
7. A rhombus is a rectangle.
8. A quadrilateral is a rectangle.
9. A square is a rhombus.
10. A parallelogram is a rectangle.
11. A rectangle is a square.
12. A parallelogram is a quadrilateral.

Find the value of x. Then name the quadrilateral.

13.  
14.  
15.  
### Review Question
What do the angles of a quadrilateral have to add up to? Why?

### Discussion
If you wanted to put a fence around your backyard, what measurement would you need? How would you get that measurement? If you wanted to carpet your living room floor, what measurement would you need? How would you get that measurement?

**SWBAT** calculate the area of a rectangle or square
**SWBAT** calculate the perimeter of a quadrilateral

### Definition
**Perimeter** – distance around an object
How do we find perimeter?

![Perimeter Diagram](image)

**Area** – stuff inside a shape

![Area Diagram](image)

Each of the blocks below is 1 x 1. Therefore, the rectangle is 3 x 2. How do we find out how much stuff is inside? Notice that there are six blocks. Therefore, the area (stuff inside) is six.

![Area Blocks](image)

How did we get the answer of ‘6’?
What is the formula for finding area of a rectangle or square?

\[ A = B \times H \]
Example 1: Find the area and perimeter of the rectangle.

\[ \begin{array}{c}
3 \\
8 \\
\end{array} \]

We will worry about units in a few days. Our focus is on understanding/calculating area and perimeter.

\[ P = 3 + 3 + 8 + 8 = 22 \]
\[ A = 3 \times 8 = 24 \]

Example 2: Find the area and perimeter of the square.

\[ \begin{array}{c}
8 \\
\end{array} \]

\[ P = 8 + 8 + 8 + 8 = 32 \quad \text{or} \quad P = 8(4) = 32 \]
\[ A = 8 \times 8 = 64 \]

You Try!

1. Draw a rectangle with B = 4 and H = 7. Find the perimeter and area.
2. Draw a square with sides equal to 5. Find the perimeter and area.
3. Draw a rectangle with B = 2.1 and H = 8.6. Find the perimeter and area.
4. Draw a square with sides equal to \( \frac{1}{3} \). Find the perimeter and area.
5. Draw two different rectangles that have an area of 40.

What did we learn today?

Section 5–6 Homework (Day 1)

Find the area and perimeter of each polygon.

1. \[ \begin{array}{c}
5 \\
10 \\
\end{array} \]

2. \[ \begin{array}{c}
6 \\
2 \\
\end{array} \]

3. \[ \begin{array}{c}
4 \\
\end{array} \]
10. Draw two rectangles that have an area of 24.

11. Draw a square with an area of 100.
Review Question
What is perimeter?
How do you find the perimeter of an object?
What is area?
How do you find the area of a rectangle?

Discussion
A parallelogram is just a rectangle. If you could imagine cutting off the dotted triangle and placing it on the left side of the parallelogram then you would have a rectangle. Since the area of a rectangle is B x H, then the area of a parallelogram must be B x H. We just need to be careful about the height of a parallelogram.

SWBAT calculate the area of a quadrilateral and triangle
SWBAT calculate the perimeter of a quadrilateral and triangle

Example 1: Find the area and perimeter of the parallelogram.
P = 8 + 8 + 10 + 10 = 36
A = 8 x 7 = 56

The height is 7, not 10. You can demonstrate this by leaning to the side. Your height now is not the length of your body rather the distance from the top of your head to the ground. We will worry about units in a few days. Our focus is on understanding/calculating area and perimeter.

So we know the area of some quadrilaterals is base times height. If that is the case, what must be the formula to find the area of a triangle?

Every quadrilateral is made of two triangles. Therefore, the area of a triangle must be half of the area of a quadrilateral.

Area of a triangle = \( \frac{BH}{2} \)
Example 2: Find the area and perimeter.  (be careful with the height)

\[ P = 4 + 5 + 8 = 17 \]
\[ A = \frac{4 \times 4}{2} = 8 \]

You Try!
1. Draw a rectangle with B = 4 and H = 7. Find the perimeter and area.
2. Draw a right triangle with a base of 3 and a height of 4. Label the longest side 5. Find the perimeter and area.
3. Draw a parallelogram with sides 3 and 8 and a height of 7. Find the perimeter and area.
4. Draw a square with sides 1.2. Find the area and perimeter.
5. Draw an obtuse scalene triangle with sides 3, 8, 12. Find the perimeter and area. (Notice you can not find the area because you can not find the height.)

What did we learn today?

Section 5–6 Homework (Day 2)

Name the polygon. Then find the area and perimeter of each polygon.

1. 

2. 

3. 

4. 

5. 

6. \[ \frac{1}{4} \]
10. Draw a picture of a trapezoid. Explain how you could find its area.

11. Find the area of the triangle below.
**Review Question**
What is different about finding the area of a parallelogram?
What is different about finding the area of a triangle? Why?

**Discussion**
What is the answer to the following problem?
8 in + 3 in + 8 in + 3 in =
Notice that adding units together does not affect them. When you add 8 inches onto 3 inches, you simply get 11 inches.

(3)(3) = 3²
(5)(5) = 5²
(x)(x) = ?
(Joe)(Joe) = ?

What is the answer to the following problem: (2 in)(5 in) = ?
First, we multiply 2 times 5 to get 10. Then we must multiply the units as well.

**SWBAT** use the correct units when calculating the area of a quadrilateral and triangle

**Example 1:** Find the area and perimeter of the parallelogram.

![Parallelogram Diagram]

P = 8 in + 4 in + 8 in + 4 in = 24 in (Notice that adding units together does not affect them. When you add 8 inches onto 4 inches, you simply get 12 inches.)

A = (4 in)(6 in) = 24 in²

First, we multiply 4 times 6 to get 24. Then we must multiply the units as well. The area and perimeter are both 24 in this problem. The units are what distinguish the difference in their value.

**Example 2:** Find the area and perimeter of the triangle.

![Triangle Diagram]

P = 8 cm + 6 cm + 6 cm = 20 cm (Notice the 4 cm has nothing to do with perimeter)
A = (8 cm)(4 cm)/2 = 16 cm²
You Try!
1. Draw a rectangle with $B = 3$ ft and $H = 6$ ft. Find the perimeter and area.
2. Draw an obtuse triangle with sides 4 m, 6 m, and 8 m and a height of 5 m. Find the perimeter and area.
3. Draw a right triangle with sides 6 in, 8 in, and 10 in. Find the perimeter and area.
4. Draw a parallelogram with sides 2 and 4 feet, respectively and a height of 3 feet. Find the perimeter and area.

What did we learn today?

Name the polygon. Find the area and perimeter. (Please use correct units)

1. 

2. 

3. 

4. 

5. 

6. 

7. 

8.
Review Question
What are the units when you are finding the perimeter?
What are the units when you are finding the area? Why?

Discussion
How do you find the area and perimeter of a rectangle?
How do you find the area and perimeter of a square?
How do you find the area and perimeter of a parallelogram?
How do you find the area and perimeter of a triangle?

SWBAT calculate the area and perimeter of polygons in the classroom by measuring the base and height of the polygons.
SWBAT label the area and perimeter with correct units.

Activity
For each of the following polygons find the AREA and PERIMETER by doing the following steps.

1. Draw and label a picture with correct units.
2. Write an appropriate equation.
3. Solve the equation for the area and perimeter labeled with correct units.

Find the AREA and PERIMETER of each of the following polygons in INCHES.
1. Shape 1 (Triangle)  
2. Shape 2 (Triangle)  
3. Shape 3 (Parallelogram)  
4. Shape 4 (Rectangle)  
5. Shape 5 (Parallelogram)

Find the AREA and PERIMETER of each of the following polygons in CENTIMETERS.
1. Desktop  
2. Dry erase board  
3. One floor tile  
4. Chalkboard  
5. Math book cover

What did we learn today?
Review Question
What are the units when you are finding the perimeter?
What are the units when you are finding the area?

Discussion
If you wanted to put a fence around your backyard, what measurement would you need?
How would you get that measurement?
If you wanted to carpet your living room floor, what measurement would you need?
How would you get that measurement?
If you wanted to fill up a swimming pool with water, what measurement would you need?
How would you get that measurement?

SWBAT identify what surface area and volume are
SWBAT identify when to use perimeter, area, surface area, and volume

Definition
3-Dimensional Figures

Surface Area – sum of the area of each “face” of a 3D object
How would you calculate the surface area of the two 3D shapes above?
What do you think the units should be? Why?

Uses: Painting a room
Can someone give me another place where surface area would be used?

Volume – stuff inside a 3D object
How would you calculate the volume of the two previous 3D shapes? (hint: think of how you calculated the stuff inside a 2D shape)
What do you think the units should be?

Uses: Building a water tower
Can someone give me another place where volume would be used?
Examples: **Perimeter, Area, Surface Area, Volume?**

1. How many feet of fencing do you need to surround a yard?
2. How big of a box do you need to fit a present in?
3. How much wrapping paper do you need to wrap the gift in problem #2?
4. How many square feet of carpet do you need to carpet a living room?

**What did we learn today?**

Explain whether each situation requires perimeter, area, surface area, or volume.

1. Filling a gas tank
2. Painting a car
3. Length of wood needed to make a picture frame
4. Amount of siding on a house
5. Box size needed to package a product
6. Amount of sand in a sandbox
7. Amount of paint needed to paint one wall
8. Amount of juice in a glass
9. Amount of tape needed to mark off basketball court
10. Amount of fabric needed to make a tablecloth

Find the area and perimeter of each polygon. Please use correct units.

11.  

   \[
   \text{6 in.} \quad \text{3 in.}
   \]

12.  

   \[
   \begin{array}{c}
   \text{5 m} \\
   \text{4 m} \\
   \text{5 m}
   \end{array}
   \]

13.  

   \[
   \begin{array}{c}
   \text{4 ft} \\
   \text{6 ft} \\
   \text{5 ft}
   \end{array}
   \]
Review Question
What is surface area?
How would you find the surface area of an object?
What is volume?
How would you find the volume of an object?

Discussion
Where is surface area used?
How many pieces of siding would it take to cover 4 faces of a house? Why?
Where is volume used?
How many gallons of water would it take to fill up a swimming pool? Why?

SWBAT estimate the surface area or volume of a 3D object

Definition
Surface Area – painting a room, wrapping a present
Volume – water tower, size of boxes

Surface Area
How many cans of paint would it take to paint the classroom?
Do you think 25 cans or 5 cans is a better estimate?
Do you think 5 cans or 3 cans is a better estimate?
How could we get a good estimate?
How could we find the exact value?

Volume
How many 1 x 1 x 1 boxes would it take to fill up the classroom?
Do you think 500 or 5000 is a better estimate?
Do you think 4000 or 5000 is a better guess?
How could we get a good estimate?
How could we find the exact value?

So you already have some idea about surface area and volume and how to estimate it. Today, we are just going to practice estimating these values.

What did we learn today?
Explain whether each situation requires surface area or volume.

1. Stuffing a Thanksgiving Day turkey.
2. Figuring how much stuff you can fit in a 16 wheel truck.
3. Calculating if all of you stuff will fit in a storage unit.
4. Calculating how much paint you will need for the exterior of your house.

Which is a better guess?
5. Amount of storage on a 16 wheel truck: 200 ft\(^3\) or 4000 ft\(^3\). (Remember our class was about 5000 ft\(^3\))

6. Amount of paint cans needed to paint the hallway: 10 cans or 20 cans. (Remember it took about 3 cans of paint to paint our classroom)

Give an estimate for each example.
7. Amount of wrapping paper needed to wrap a shirt.
8. Amount of storage in a portable pod.
**Review Question**
What is surface area?
What is volume?

**Discussion**
How would you find the surface area of a rectangular prism?
What would the units be? Why?
How would you find the surface area of a cube?
What would the units be? Why?

**SWBAT** calculate the surface area of a rectangular prism and cube

**Definition**
Surface Area – sum of the area of each “face” of a 3D object

How would you find the surface area of the object below? Find the area of each of the 6 sides or
Find the area of the front, bottom, and side then multiply by 2.
What would the units be? Why?

**Example 1:**

![Rectangular Prism Diagram]

3 in.  
4 in.  
2 in.

\[ SA = (\text{area of bottom} + \text{area of front} + \text{area of side}) \times 2 \]
\[ = (8 \text{ in}^2 + 12 \text{ in}^2 + 6 \text{ in}^2) \times 2 \]
\[ = 26 \text{ in}^2 \times 2 \]
\[ = 52 \text{ in}^2 \]

**Example 2:** How would you find the surface of a cube? Area of front times 6

![Cube Diagram]

6 cm.

\[ SA = (\text{area of front}) \times 6 \]
\[ = (36 \text{ cm}^2) \times 6 \]
\[ = 216 \text{ cm}^2 \]
You Try!
1. Draw a rectangular prism with $B = 10$ ft, $W = 6$ ft and $H = 3$ ft. Find the surface area.
2. Draw a cube with a side equal to 5 cm. Find the surface area.
3. Draw a rectangular prism with $B = 2$ m, $W = 4$ m, and $H = 6$ m. Find the surface area.
4. Draw a parallelogram with sides 4 in and 6 in and a height of 5 in. Find the area and perimeter.

What did we learn today?

Find the area and perimeter of each polygon. Please use correct units.

1. 
   \[
   \text{Rectangle: } 7 \text{ in.} \times 4 \text{ in.}
   \]

2. 
   \[
   \text{Isosceles Triangle: } 10 \text{ m} \times 10 \text{ m} \times 6 \text{ m}
   \]

3. 
   \[
   \text{Parallelogram: } 4 \text{ ft} \times 8 \text{ ft} \times 5 \text{ ft}
   \]

4. Find the surface area of a rectangular prism with the following dimensions: $H = 3$ in, $W = 5$ in, and $B = 6$ in. (draw a picture)

5. Find the surface area of a cube whose sides are 8 cm. (draw a picture)

6. Find the surface area of the rectangular prism.

7. 
   \[
   \text{Rectangular Prism: } 5 \text{ in} \times 10 \text{ in} \times 2 \text{ in.}
   \]

8. Find the surface area of the cube.

9. Find the surface area of a rectangular prism with the following dimensions: $H = 4$ ft, $W = 8$ ft, and $B = 12$ ft. (draw a picture)

10. Find the surface area of a cube whose sides are 2.3 cm. (draw a picture)
**Review Question**
What is surface area?
How do you find surface area of a rectangular prism?
How do you find surface area of a cube?

**Discussion**
What is volume?
How would you find the volume of a rectangular prism?
What would the units be? Why?
How would you find the volume of a cube?
What would the units be? Why?

**SWBAT** calculate the volume of a rectangular prism and cube

**Definition**
**Volume** – space inside a 3D object

How did we find the area of a 2D object?
It is the number of squares that fit inside.

```
2

4 x 2 = 8
```

How do you think that we can find the volume of a 3D rectangular prism?

```
H

B

W
```

**Volume = Base x Height x Width**

This represents the number of one by one by one unit cubes that fit inside the rectangular prism.

With this in mind, how would you find the volume of a cube?
How would this affect the formula?

What do you think the units will be? Why?
Uses of Volume:
1. Building a water tower. You have to build it big enough to hold enough VOLUME of water to supply all of the necessary communities.
2. Pouring cement to create a sidewalk or driveway. You have to calculate the amount of cement to order. A sidewalk is a rectangular prism.

Example 1: Find the Surface Area and Volume.

\[
\text{SA} = (\text{area of bottom} + \text{area of front} + \text{area of side}) \times 2 \\
= (16 \text{ in}^2 + 32 \text{ in}^2 + 8 \text{ in}^2) \times 2 \\
= 56 \text{ in}^2 \times 2 \\
= 112 \text{ in}^2 \\
\]

\[
V = 8 \text{ in} \times 4 \text{ in} \times 2 \text{ in} \\
= 64 \text{ in}^3 \\
\]

Why are the units cubed?

Example 2: Find the Surface Area and Volume.

\[
\text{SA} = (\text{area of front}) \times 6 \\
= (9 \text{ cm}^2) \times 6 \\
= 54 \text{ cm}^2 \\
\]

\[
V = 3 \text{ cm} \times 3 \text{ cm} \times 3 \text{ cm} \\
= 27 \text{ cm}^3 \\
\]

You Try!
1. Draw a rectangular prism with B = 4 ft, W = 6 ft, and H = 10 ft. Find the surface area and volume.
2. Draw a cube with a side equal to 7 in. Find the surface area and volume.
3. Draw a rectangular prism with B = 2 in, H = 6 in, and W = 8 in. Find the surface area and volume.
4. Draw an obtuse triangle with sides that are 4 cm, 8 cm and 14 cm, respectively and has a height of 7 cm. Find the perimeter and area.
What did we learn today?

Find the area and perimeter of each polygon. Please use correct units.

1. 

2. 

3. 

4. Find the surface area and volume of a rectangular prism with the following dimensions: H = 2 in, W = 3 in, and B = 10 in. (draw a picture)

5. Find the surface area and volume of a cube whose sides are 10 cm. (draw a picture)

6. Find the surface area and volume of the rectangular prism.

7. Find the surface area and volume of the cube.

8. Find the surface area and volume of a rectangular prism with the following dimensions: H = 10 ft, W = 4 ft, and B = 5 ft. (draw a picture)

9. Find the surface area and volume of a cube whose sides are 1.5 cm. (draw a picture)
**Section 5-7: Surface Area and Volume (Day 5)**

**Review Question**
What is surface area?
How do you find surface area of a rectangular prism?
How do you find surface area of a cube?
What would the units be? Why?
What is volume?
How would you find the volume of a rectangular prism?
How do you find volume of a cube?
What would the units be? Why?

**SWBAT** calculate the volume of a rectangular prism and cube
**SWBAT** calculate the area and perimeter of triangles and quadrilaterals

**Example 1:** Find the Surface Area and Volume.

![Rectangular Prism Diagram]

\[
SA = (\text{area of bottom} + \text{area of front} + \text{area of side}) \times 2 \\
= (15 \text{ in}^2 + 10 \text{ in}^2 + 6 \text{ in}^2) \times 2 \\
= 31 \text{ in}^2 \times 2 \\
= 62 \text{ in}^2
\]

\[
V = 5 \text{ in} \times 2 \text{ in} \times 3 \text{ in} \\
= 30 \text{ in}^3
\]

Why are the units cubed?

**Example 2:** Find the Surface Area and Volume.

![Cube Diagram]

\[
SA = (\text{area of front}) \times 6 \\
= (4 \text{ cm}^2) \times 6 \\
= 24 \text{ cm}^2
\]

\[
V = 2 \text{ cm} \times 2 \text{ cm} \times 2\text{cm} \\
= 8 \text{ cm}^3
\]
What did we learn today?

Find the area and perimeter of each polygon. Please use correct units.

1. 

2. 

3. 

4. Find the surface area and volume of a rectangular prism with the following dimensions: h = 3 in, w = 4 in, and b = 5 in. (draw a picture)

5. Find the surface area and volume of a cube whose sides are 8 cm. (draw a picture)

6. Find the surface area and volume of the rectangular prism.

7. Find the surface area and volume of the cube.

8. Find the surface area and volume of a rectangular prism with the following dimensions: h = 8 ft, w = 4 ft, and b = 6 ft.

9. Find the surface area and volume of a cube whose sides are 2.5 cm.
For problems 10 - 17, draw a picture then solve.

10. Draw a rectangle with a perimeter of 24 m.

11. Draw a rectangle with an area of 40 ft²?

12. Draw a rectangle with a perimeter of 22 ft and an area of 24 ft². (use guess and check)

13. Draw a square with a perimeter of 28 m and an area of 49 m²? (use guess and check)

14. Describe the difference between area and surface area.

15. Describe the difference between area and volume.

16. What is the length of each side of a cube with a volume of 27 m³?

17. If you double the base of a triangle, what happens to its area? (show the results)
**Review Question**
What does perimeter mean?  
How do we calculate it?  
What does area mean?  
How do we calculate it?  
What does surface area mean?  
How do we calculate it?  
What does volume mean?  
How do we calculate it?

**SWBAT** calculate the area and perimeter of polygons in the classroom by measuring the base and height of the polygons.  
**SWBAT** calculate the surface area and volume of cubes and rectangular prisms in the classroom by measuring their dimensions.

**Activity**
For each object, draw a picture (labeled), write an equation, and solve.

Find the **AREA** and **PERIMETER** of each of the following polygons in **INCHES**.  
1. Shape 1 (Triangle)  
2. Shape 2 (Rectangle)  
3. Shape 3 (Square)  
4. Shape 4 (Parallelogram)  

Find the **SURFACE AREA** and **VOLUME** of each of the following polygons in **INCHES**.  
1. Smaller Cube  
2. Cube  
3. Book  
4. Box without top  
   (be careful with surface area)

What did we learn today?
**Section 5-8: Circles (Day 1)**

**Review Question**  
What does perimeter mean?  
What does area mean?  
What does surface area mean?  
What does volume mean?  

**Discussion**  
What is a circle?  
Is it a polygon?  
What causes it to be round?  
Think of tie a dog to a tree. If the dog walked around the tree, what shape would it make?  

**SWBAT** calculate the circumference of a circle  

**Definition**  
- **Circle** - set of points same distance from a point  
- **Center** – middle of circle  
- **Radius** – distance from center to any point  
- **Diameter** – distance across circle through center  
- **Chord** – segment from edge to edge not through the center  
- **Circumference** – distance around (perimeter)  

Draw a picture labeling all of the parts of a circle.

How did we find the distance around (perimeter) objects before?  
How can we find the find distance around a circle?  
What problems arise with trying to find the circumference of a circle?  

Circumference of a circle is:  
\[ C = \pi \times D \quad (\pi = 3.14) \]
Example 1: Find the circumference of a circle with a diameter of 8 inches.
\[ C = \pi \times D \]
\[ C = 3.14 \times 8 \]
\[ C = 25.12 \text{ in} \]

Example 2: Find the circumference of a circle with a radius of 10 cm.
\[ C = 3.14 \times 20 \]
\[ C = 62.8 \text{ cm} \]

You Try!
1. Draw a circle with a radius of 9 cm. Then find the circumference.
2. Draw a circle with a diameter of 2 inches. Then find the circumference.
3. Draw a rectangle with B = 3 ft and H = 6 ft. Find the perimeter and area.
4. Draw a parallelogram with sides 3 in and 8 in and a height of 7 in. Find the perimeter and area.

What did we learn today?

Find the circumference of each circle. Find the area and perimeter of each polygon. Please use correct units.

1. Circle with diameter = 4 inches
2. Circle with radius = 6 cm

3. [Diagram of a circle with a radius of 10 m]
4. [Diagram of a circle with a diameter of 8 yd]

5. [Diagram of a rectangle with sides 4 ft and 2 ft]
6. [Diagram of a triangle with sides 6 in, 10 in, and 8 in]

7. [Diagram of a parallelogram with sides 12 m and 4 m, and a height of 10 m]
8. [Diagram of a rectangle with sides 3.4 cm]
For problems 9-10, find the perimeter of the shape.

9. \[ \text{Perimeter} = 10 \text{ yd} \]

10. \[ \text{Perimeter} = 5 \text{ ft} \]

11. Find the surface area and volume of the rectangular prism.

\[ \text{Volume} = 4 \text{ in.} \times 8 \text{ in.} \times 1 \text{ in.} = 32 \text{ in.}^3 \]

12. Find the surface area and volume of the cube.

\[ \text{Volume} = 3 \text{ m}^3 \]
Section 5–8: Circles (Day 2)

Review Question
How do you find the circumference of a circle?

Discussion
What would be difficult about finding the area of a circle?
Could we draw a square around a circle to estimate the area?
What would be wrong with our estimation?

SWBAT calculate the area and circumference of a circle

Example 1: Find the circumference and area of a circle with a radius of 10 cm.
\[ C = \pi \times D \]
\[ A = \pi \times r^2 \]
\[ C = 3.14 \times 20 \]
\[ A = 3.14 \times 10^2 \]
\[ C = 62.8 \text{ cm} \]
\[ A = 314 \text{ cm}^2 \]
*Notice the different units

Example 2: Find the circumference and area of a circle with a diameter of 8 inches.
\[ C = \pi \times D \]
\[ A = \pi \times r^2 \]
\[ C = 3.14 \times 8 \]
\[ A = 3.14 \times 4^2 \]
\[ C = 25.12 \text{ in} \]
\[ A = 50.24 \text{ in}^2 \]
*Notice the different units

A circle is a 2D object just like a square is a 2D object. We can find the area and perimeter of 2D objects. What are the equivalent 3D calculations? What is the 3D equivalent of a circle? (Sphere) Think of tie a dog to the center of the earth. If the dog walked around the earth, what shape would it make?

You Try!
1. Draw a circle with a radius of 9 cm. Then find the circumference and area.
2. Draw a circle with a diameter of 2 inches. Then find the circumference and area.
3. Draw a square with sides 5 ft. Find the perimeter and area.
4. Draw a right triangle with sides 5, 12, and 13 centimeters. Find the perimeter and area.

What did we learn today?
Find the area and perimeter/circumference of each shape. Write the proper equation. Show all of your work. Please use correct units.

1. Circle with diameter = 2 inches

2. Circle with radius = 11 cm

3. \[
\begin{array}{c}
  \text{5 m} \\
\end{array}
\]

4. \[
\begin{array}{c}
  \text{2.8 yd} \\
\end{array}
\]

5. \[
\begin{array}{c}
  \text{2.8 ft} \\
  \text{1.1 ft} \\
\end{array}
\]

6. \[
\begin{array}{c}
  \text{3 in} \\
  \text{4 in} \\
  \text{5 in} \\
\end{array}
\]

7. \[
\begin{array}{c}
  \text{3 m} \\
  \text{5 m} \\
  \text{12 m} \\
\end{array}
\]

8. \[
\begin{array}{c}
  \text{1/2 cm} \\
  \text{1/2 cm} \\
\end{array}
\]
9. Circle with diameter = 4 inches

10. Circle with radius = 12 cm

11. 

12. 

13. Find the surface area and volume of the rectangular prism.

14. Find the surface area and volume of the cube.
Review Question
How do you find the circumference of a circle?
How do you find the area of a circle?

SWBAT calculate the circumference and area of a circle with a string and a ruler

Discussion
Put the solutions to problems 1, 2, 5, 6, 7, and 8 on the board. Explain your solutions.

Activity
You will work together in groups in order to get accurate measurements. You must work together in order to be successful. You must manage their time in order to complete the activity.

What did we learn today?
1. Find the circumference using a string.
2. Find the circumference by finding the diameter (ruler). Then use the formula.
3. Calculate the area.

<table>
<thead>
<tr>
<th>Object</th>
<th>Circumference (string)</th>
<th>Circumference (formula)</th>
<th>$A = \pi r^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>My Circle</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pumpkin</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quarter</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cup</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bowl</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frisbee</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Your Head</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Why are the answers in the two circumference columns different?

2. What column of circumference answers is more accurate? Why?
Review Question
What is perimeter?
How do you find the perimeter of an object?
What is area?
How do you find the area of a rectangle?
What is surface area?
How do you find surface area of a rectangular prism?
How do you find surface area of a cube?
What would the units be? Why?
What is volume?
How would you find the volume of a rectangular prism?
How do you find volume of a cube?
What would the units be? Why?
How do you find the circumference of a circle?
How do you find the area of a circle?

SWBAT use their knowledge of the first eight sections of the unit to solve all of the problems on the review

Today will be a day of practice.

What did we learn today?

Section 5–8 In-Class Assignment (Day 4)

1. Draw a straight, right, acute, and obtuse angle. Estimate each angle measure.

2. Draw a regular and irregular hexagon.

3. Find the missing measure in each triangle. Then classify the triangle as acute, right, or obtuse.

a.  

b. 

c.
4. Classify each triangle by its *angles* and its *sides*.

a.  

b.  

c.  

5. Given \( \triangle ABC \cong \triangle DEF \), draw each triangle. Label all of the missing angles and sides.

\[ \angle B = 40^\circ, \angle C = 80^\circ, AB = 8, BC = 4, DF = 6 \]

6. Draw a pair of acute isosceles triangles that are similar to each other. Then explain why they are similar.

Find the area and perimeter of each shape. Please use correct units.

7.  

8.  

9.  

8 ft

5 ft

10.  

60 in

100 in

80 in

11.  

4 m

8 m

5 m

12.  

2.8 cm
13. Find the surface area and volume of the rectangular prism.

14. Find the surface area and volume of the cube.

15. Using sentences, explain the difference between area and surface area.

16. Using sentences, explain how to calculate the surface area of a cube.
**Review Question**
How do you find the circumference of a circle?
How do you find the area of a circle?

**Discussion**
Why are they called 3D figures?

**SWBAT** identify a three dimensional object from its net
**SWBAT** build a net for four different three dimensional shapes

**Definition**

<table>
<thead>
<tr>
<th>CUBE</th>
<th>RECTANGULAR PRISM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ice cube</td>
<td>Drawer</td>
</tr>
<tr>
<td>Dice</td>
<td>Brick</td>
</tr>
<tr>
<td>Box</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SQUARE PYRAMID</th>
<th>CYLINDER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Egyptian Pyramid</td>
<td>Pop can</td>
</tr>
<tr>
<td>Roof top</td>
<td>Toilet paper</td>
</tr>
<tr>
<td>Tent</td>
<td></td>
</tr>
</tbody>
</table>
If you were to take a 3D cube and unfold it what would it look like on a 2D piece of paper? Try to draw it. Notice it is not a big square with 6 little squares. It would look like this:

![Cube](image)

Try a rectangular prism next. Try a cylinder next and finally a square pyramid. This will help you visualize what the shapes are comprised of.

![Rectangular Prism](image)
![Cylinder](image)
![Square Pyramid](image)

**Activity**
1. Draw the net for a cube on a piece of paper. Make sure all of the squares are equal.
2. Cut out the net.
3. Tape pieces together to form a cube.
4. Try to make the other three shapes.

**What did we learn today?**
Review Question
What does a net of a cube consist of?
What does a net of a rectangular prism consist of?
What does a net of a cylinder consist of?
What does a net of a square pyramid consist of?

Discussion
Notice that we can calculate the area of each of the shapes that make up the 3D figures. Therefore, we can calculate the surface area of them and practice finding the area of 2D shapes.

SWBAT calculate the surface area and volume of a three dimensional figure based on a net

Definition
Cube – 6 squares
Rectangular Prism – 6 rectangles (3 pairs)
Square Pyramid – one square and four triangles
Cylinder – one rectangle and two circles

Notice that we can calculate the area of each of the shapes that make up the 3D figures. Therefore, we can calculate the surface area of them.

Example 1: What 3D figure can be formed by the net below?

What is the surface area of the cube? Find the area of one square then multiply by 6. Make sure to use correct units. \( 5 \times 5 = 25 \times 6 = 150 \text{ in}^2 \)

What is the volume of the cube? \( 5 \times 5 \times 5 = 125 \text{ in}^3 \)

Example 2: What 3D figure can be formed by the net below?

What is the surface area of the cylinder? Find the area of one circle then multiply by 2. Then find the area of the rectangle. Finally, add up your results.
**You Try!**

1. Draw a net for a square pyramid with the following dimensions: base of square = 3 in, height of triangle = 2 in. Find the surface area.
2. Draw a net for a rectangular prism with the following dimensions: base = 6 ft, width = 3 ft, and height = 2 ft. Find the surface area and volume.

**What did we learn today?**

Name each 3-dimensional figure and calculate the surface area.

1. 

2. 

radius of circles = 3 yd
length of rectangle = 10 yd
width of rectangle = 2 yd

3. 

6 mm

4. 

height of triangles = 8 m
base of square = 11 m

5. 

2 in.

6. 

14 ft

7 ft

3 ft
7. Draw a net and find the surface area.

radius of circles = 4 cm
length of rectangle = 13 cm
width of rectangle = 6 cm

8. height of triangles = 25 yd
base of square = 32 yd

9. 10. 11. 11. Circle a pair of lines that are parallel.
Circle a pair of lines that are perpendicular.
Review Question
Name the different 3-D figures that we have talked about?

SWBAT study for the Unit 5 test

Discussion
We have a unit test tomorrow.
How do we study for a test?
How should you study for a test?
What topics are on the test?
How could you study these topics?

Activity
You will make up one problem with the correct solution for each one of the nine topics.

What did we learn today?
Unit 5 Cumulative Review

Things to Remember:
2. Reinforce the importance of retaining information from previous units.
3. Reinforce connections being made among units.

1. What value satisfies the equation: $3x + 2 = 14$?
   a. 2  b. 3  c. 4  d. 5

2. How tall is the Empire State Building?
   a. -50 feet  b. 50 feet  c. 100 feet  d. 1250 feet

3. Where did Bill Cowher go to high school?

4. What is the largest two digit number that adds up to 9?
   a. 42  b. 108  c. 54  d. 99

5. What is the largest integer?
   a. -8  b. -4  c. 19/4  d. 5.5

6. Which number isn’t rational?
   a. $\sqrt{5}$  b. 6  c. 2.4  d. 3/4

7. What is the next term: 1, 2, 6, 24, ___?
   a. 120  b. 60  c. 100  d. 30

8. What is the next term: 2, 3, 5, 8, 12, ___?
   a. 15  b. 17  c. 18  d. 28

9. What is the next term: 1, 4, 16, ___?
   a. 20  b. 37  c. 64  d. 71

10. What is the next term: 3, 7, 6, 10, 9, ___?
    a. 13  b. 15  c. 17  d. 19

11. Tori yelled at her teacher 4 times this week. About how many times would that be in a school year?
    a. 75  b. 150  c. 300  d. 500

12. Corey bought a car for $10,000. He plans to pay it off in 1 year. About how much does he have to pay each month?
    a. $200  b. $500  c. $1000  d. $2000

13. Johnny makes $8.50/hour. He works 20 hours/week. How many weeks will it take for him to save $340?
    a. 2  b. 3  c. 4  d. 5
14. Shirley has 8 quarts of oil. Sammy has 2 gallons of oil. How many gallons of oil do they have together?
   a. 2  b. 3  c. 4  d. 5

15. Tammy drove 30 km. Timmy drove 3000 m. How far did they drive total?
   a. 33 km  b. 3330 km  c. 3333 km  d. 1000 km

16. -8 + 16 =
   a. -8  b. 8  c. 24  d. 20

17. -5 – 9 =
   a. 14  b. 4  c. -14  d. -10

18. (25)(31) =
   a. 395  b. 775  c. 795  d. 860

19. 9.66 ÷ 2.3 =
   a. 4.5  b. 4.8  c. 4.2  d. 7.4

20. 12.8 – 4.22 =
   a. 8.62  b. 8.58  c. 8.28  d. 8.18

21. \( \frac{2}{6} + \left( \frac{4}{5} \right) = \)
   a. 14/15  b. 17/15  c. 38/30  d. 40/30

22. (4.2)(6.2) =
   a. 13.2  b. 20.626  c. 21.624  d. 26.04

23. \( \frac{4}{5} \div \frac{12}{7} = \)
   a. 12/20  b. 7/15  c. 8/10  d. 10/40

24. Which of the following is equal to 5/15?
   a. 33%  b. 10%  c. 33%  d. 40%

25. Which of the following is equal to 94%?
   a. .94  b. 940%  c. 9400  d. .094%

26. Which of the following is equal to 4/20?
   a. 1  b. 2  c. 3  d. 4

27. Which of the following is equal to \( 7^2 \)?
   a. 7  b. 14  c. 18  d. 49

28. Which of the following is equal to \( \sqrt{784} \)?
   a. 22  b. 18  c. 28  d. 31
Use the following data set to answer questions 29-30.
12, 8, 10, 22, 40, 16

29. What is the mean?
   a. 18        b. 22        c. 24        d. 70

30. What is the median?
   a. 12        b. 14        c. 20        d. 70

31. There are 4 red marbles, 6 blue marbles, 8 green marbles, and 1 yellow marbles in a bag. What is the probability of picking a blue marble?
   a. 4/19      b. 6/20      c. 6/19      d. 8/19

32. 18 - 24 ÷ 4 + 3
   a. 15        b. 16        c. 19        d. 20

33. Tommy ran 8 mph for 2 hours. How far did he run?
   a. 10        b. 16        c. 36        d. 60

34. 5x + 8 = 18
   a. 2         b. -2        c. -10       d. 11

35. \( \frac{x}{2} - 8 > 4 \)
   a. x > 24     b. x > -24    c. x < 8     d. x < -8

36. A triangle’s three angles are 40°, 80°, and 60° respectively. What type of triangle is it?
   a. Obtuse      b. Acute      c. Right    d. Isosceles

37. What is the area of a rectangle with base 14 and height 12?
   a. 168        b. 186       c. 28        d. 82

38. What is the circumference of a circle with radius 10 in?
   a. 31.4       b. 62.8      c. 93.6      d. 129.1

39. What is the surface area of a rectangular prism with length 6 cm, width 4 cm, and height 5 cm?
   a. 15 cm\(^2\)  b. 120 cm\(^2\)  c. 74 cm\(^2\)  d. 148 cm\(^2\)

40. What 3-dimensional figure is comprised of four triangles and a square?
   a. rectangular prism      b. square pyramid      c. cylinder      d. sphere
UNIT 5 Hand-In Problems

This problem set is intended to challenge the students and encourage students to apply a deep understanding of problem-solving skills.

Include a picture for each problem.

1. Each angle in a triangle is ten more than the previous one. What is the measure of each angle?

2. The area of a rectangle is 32 ft². The perimeter is 24 ft. What are the dimensions of the rectangle?

3. The area of a parallelogram is 18 cm². The perimeter is 20 cm. What are the dimensions?

4. The area and perimeter of a square are the same. What is the measure of each side?

5. The perimeter of a rectangle is 40 feet. One side of the rectangle is 5 more than twice the other side. Find the area of the rectangle.

6. What is the base of a rectangle whose height is 15 meters and whose area is 285 m²?

7. What is the area of a square with a perimeter of 24 inches?

8. What happens to the area of a triangle if you double the base and the height? Why?

9. A cube has a volume of 27 cm³. If the length of a side must be a whole number, what is the volume of the next larger cube?

10. Draw a net for a cone.
Mr. Jones wants to update his classroom. The dimensions of his room are 24’ x 36’. He decides to carpet half of the room. The carpet he wants costs $1.25 per square foot. He wants to put ceramic tile down on the other half of the classroom. The ceramic tile costs $2.25 per square foot. How much will it cost to buy the tile and carpet?

Your solution must include the following:
1. Diagram (label all measurements)
2. Equations (show all work)
3. Correct units
4. Paragraph explaining how you got your answer
Unit 6 – Rational Operations

6-1 Decimal Operations
6-2 Fraction Operations
6-3 Integer Operations
Adding/Subtracting Decimals

**Review Question**
What is a rational number?

**Discussion**

11.25
+12.7

Why do we line up the decimal points?
4 → 4 means 4
42 → 4 means 40
425 → 4 means 400

*If you put a number in a different place you are changing the value of the number significantly*

* Rewrite each problem vertically. It will help later on when we are solving equations.
* The students can do the problems on graph paper if they are having a difficult time lining up the decimals.

**SWBAT** model the adding of decimals using a number line
**SWBAT** add two decimals together

**Example 1:** 4.8 + 2.45 = ?
Line up the decimals.
Add.
Draw a number line to model the problem and answer

**Example 2:** 13.53 – 8.5 = ?
Line up the decimals.
Subtract.
Draw a number line to model the problem and answer
Example 3:  $8.5 - 4.26 = ?$
Line up the decimals.  
Subtract.  
Draw a number line to model the problem and answer.

![Number line diagram]

Fill in the adding/subtracting decimals block in your table.

**You Try!**
Find the answer and draw a number line to model the problem.
1. $13.2 + 2.95$
2. $8.4 - 7.1$
3. $12.6 - 11.51$
4. $8.47 - 3.8$
5. $4.3 + 12.83$
6. $5 + 8.2$

**What did we learn today?**

<table>
<thead>
<tr>
<th>Section 6-1 Homework (Day 1)</th>
</tr>
</thead>
</table>

Rewrite each problem vertically. Then solve and draw a number line to confirm your answer.
1. $8.6 + 11.2$
2. $13.5 - 4.8$
3. $8.9 + 2.4$
4. $12.16 + 10.4$
5. $11.5 - 4.52$
6. $7.2 + 11.5$
7. $4.8 + 9.23$
8. $6 + 12.4$
9. $5.5 + 5.5$
10. $13.66 - 8.2$
11. $8 - 6.4$
12. $13.43 + 5.22$
13. $14.2 + 5.6$
14. $2.7 + 2$
15. $2.3 - 1.6$

16. Answer the following question using the four step method. Kimmy had $21.25. She made $17.50 babysitting. She spent $12.25 at the movies. How much money does she have now?
<table>
<thead>
<tr>
<th></th>
<th>Decimals</th>
<th>Fractions</th>
<th>Integers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Add</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subtract</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multiply</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Divide</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Multiplying Decimals

**Review Question**
How do we add/subtract decimals? Why?

**Discussion**
We use ( ),  ·  *,  x to denote multiplication

When we multiply 5.8 by 2.6 what happens to the 5.8?
Why?

When we multiply 5.8 by .3 what happens to the 5.8?
Why?

We can use these ideas to help us estimate

**SWBAT** estimate the answer to a multiplying problem involving decimals
**SWBAT** generate rules for proper placement of decimals by using estimating

**Example 1:** (8.2)(5.8)  =  Our estimation should be 8(6) = 48

**Example 2:** .4 ∙ (14.1)  =  Our estimation should be .5(14) = 7

**You Try!**
Give an estimate of each multiplication problem.
1. 3.6 ∙ 2.1 =
2. 8.7 ∙ 2.8 =
3. (16.1)(.3) =
4. 22.8 ∙ 4.3 =
5. (7.4)(.7) =
6. 98.5 ∙ 4.7 =

We can also use this idea of estimating (number sense) to place the decimal in the correct position when we multiply.

**Example 3:** (9.2)(5.8)  = 5336
Place the decimal in the correct position. Based on our estimate (9 ∙ 6 = 54), there is only one place where the decimal could go. It has to go between the two 3’s.

**Example 4:** (.2)(.8)  = 16
Place the decimal in the correct position. The .2 has to be getting smaller because we are multiplying by a number less than one. There is only one place where the decimals could go. It has to go before the one.
You Try!
Use your number sense to place the decimal point in the correct place.
1.  (4.2)(6.4) = 2 6 8 8
2.  5.1 · 6.52 = 3 3 2 2
3.  (24.2)(4.1) = 9 9 2 2
4.  101.2 · 3.8 = 3 8 4 5 6
5.  (.4)(12.2) = 4 8 8
6.  (.2)(.6) = 1 2

We can also use this idea of estimating (number sense) to check our answers or uncover a mistake in our multiplication.

Example 5:  (6.1)(8.8) = 78.58
How do we know that this answer is wrong?

You Try!
Circle the answers that have to be wrong.
(5.8)(6.1) = 35.38
(9.8)(4.8) = 28.34
(2.1)(11.1) = 23.31
(1.92)(8.1) = 32.12

What did we learn today?

Give an estimate of each multiplication problem.
1.  4.1 · 5.6 =
2.  11.1 · 3.2 =
3.  6.2 · .4 =
4.  14.5 · 2.3 =
5.  6.2 · .9 =
6.  20.4 · .11 =

Use your number sense to place the decimal point in the correct place.
7.  (3.2)(8.7) = 2784
8.  8.1 · 9.6 = 7776
9.  (22.2)(.8) = 1776
10.  97.6 · 2.7 = 26352
11.  (8.9)(.15) = 1335
12.  (.45)(.7) = 315

Circle the answers that have to be wrong.
13.  (7.7)(6.1) = 25.77
14.  (6.89)(2.8) = 19.292
15.  (7.15)(10.1) = 53.31
16.  (9.9)(.5) = 12.15

17.  Give an example in your life where you would estimate using multiplication.
Multiplying Decimals

Review Question
How do we know that this answer is wrong?
(7.8)(8.1) = 86.58

Discussion
Show the correct multiplication of 3.9(8.2) = 3198. Use your number sense to place the decimal in the correct position. Notice that our estimation should be 4(8) = 32. There is only one place where the decimal could go. It has to go between the ‘1’ and ‘9’.

This method helps to uncover any mistakes that you make during multiplication. For example, if your final answer was 6192, then you know that you made a mistake. Notice there is no place where you could put the decimal that would make the answer close to our estimate.

If you want a rule: count the number of decimal places in each of the two factors, then place that many decimal places in the answer.

SWBAT multiply two decimals together

Example 1: (11.2)(5.8) = 64.96
Estimate. Notice that our estimation should be 11(6) = 66.
Do you expect the actual answer to be bigger or smaller than the estimate? Why?
Do the problem. The answer is 6496.
There is only one sensible place for the decimal.
Give a real life example of the problem. (I have to pay workers $11.20/hr for 5.8 hours)

Example 2: 2.8 \cdot (3.45) = 9.66
Estimate. Notice that our estimation should be 3(3) = 9.
Do you expect the actual answer to be bigger or smaller than the estimate? Why?
Do the problem. The answer is 966.
There is only one sensible place for the decimal.
When you have “uneven” decimals you can handle it two ways. You can line up the decimals by adding zeroes. Secondly, you can “push” both numbers to the right.

\[
\begin{align*}
2.80 & \quad \text{OR} \quad 2.8 \\
\times & \quad 3.45 \\
\end{align*}
\]

Fill in the multiplying decimals block in your table.
You Try!
For each example estimate the answer. Then find the actual answer.

1. \((3.8)(4.2)\)  
2. \((4.9)(5.11)\)  
3. \(1.2 + 5.8\)  
4. \(17.1 - 3.75\)  
5. \((16.3)(4)\)  
6. \(13.24 + 11\)  
7. \(1.2345 \times 6.789\)

What did we learn today?

Use your number sense to place the decimal in the correct position. Then write a sentence explaining why you placed it there.

1. \((4.2)(6.4) = 2688\)  
2. \(195.1 \cdot 2.9 = 56579\)  
3. \((8.9)(.53) = 4717\)

Find the product.

4. \((9.1)(3) = \)  
5. \(3.4 \cdot 9.8 = \)  
6. \((25.1)(41.6) = \)

Find the answer.

7. \((2.5)(5.4) = \)  
8. \(11.2 + 10.5 = \)  
9. \(12.3 - 2.8 = \)

10. \(11.2 \cdot 2.13 = \)  
11. \((11.2)(3.8) = \)  
12. \(5.65 - 5.1 = \)

13. \(19.54 + 11 = \)  
14. \(6.63 \cdot 6 = \)  
15. \(8.2 - 2.58 = \)

16. Answer the following problem using the four step method. Jimmy gets paid $6.25 per hour. He works 12.5 hours per week. How much money does he make, if he gets paid every two weeks?
Dividing Decimals

**Review Question**
How do we know where to place the decimal when we multiply?

**Discussion**
We use / or ÷ to denote division.

We used estimation to check/find mistakes in our multiplication problems. We can also estimate to place the decimal point in the correct place when we divide.

**SWBAT** estimate the quotient of a division problem
**SWBAT** place the decimal in the correct position in a division problem by estimating

Let’s start out with some easy ones:

**Example 1:** \(24.48 \div 5.1 = 5\) - Our estimation should be \(25 \div 5 = 5\)

Why did we choose ‘25’ instead of ‘24’?

**Example 2:** \(17.105 \div 2.9 = 6\) - Our estimation should be \(18 \div 3 = 6\)

Why did we choose ‘18’ instead of ‘17’?

**You Try!**
Give an estimate of each division problem.

1. \(14.48 \div 1.7 = \)
2. \(34.8 \div 5.2 = \)
3. \(24.27 \div 5.1 = \)
4. \(15.2 \div 4.75 = \)
5. \(19.4 \div 5.6 = \)
6. \(26.5 \div 8.6 = \)

We can also use this idea of estimating (number sense) to place the decimal in the correct position when we divide.

**Example 3:** \(21.76 \div 6.8 = 32\)

Place the decimal in the correct position. Based on our estimate \((21 \div 7 = 3)\), there is only one place where the decimal could go. It has to go between the ‘3’ and the ‘2’. This also helps with finding mistakes we made during division.

**Example 4:** \(31.32 \div 9.2 = 34\)

Place the decimal in the correct position. Based on our estimate \((30 \div 10 = 3)\), there is only one place where the decimal could go. It has to go between the ‘3’ and the ‘4’. This also helps with finding mistakes we made during division.
You Try!
Use your number sense to place the decimal point in the correct place.
1. 10.88 ÷ 1.7 = 64
2. 28.35 ÷ 4.5 = 63
3. 96.48 ÷ 4.8 = 201
4. 8.772 ÷ 3.4 = 258
5. 65.12 ÷ 8.8 = 74
6. 15.9858 ÷ 7.47 = 214

We can also use this idea of estimating (number sense) to check our answers or uncover a mistake in our division.

Example 5: 70.2 ÷ 9.8 = 4.6
How do we know that this answer is wrong?

You Try!
Circle the answers that have to be wrong.
1. 24.96 ÷ 4.8 = 5.2
2. 10.2 ÷ 1.9 = 8.7
3. 59.6 ÷ 9.8 = 9.6
4. 18.29 ÷ 3.1 = 5.9

What did we learn today?

Give an estimate of each division problem.

1. 18.4 ÷ 1.7 =
2. 24.8 ÷ 5.8 =
3. 26.27 ÷ 3.1 =
4. 19.2 ÷ 4.75 =
5. 11.4 ÷ 5.6 =
6. 36.5 ÷ 8.6 =

Use your number sense to place the decimal point in the correct place.

7. 13.44 ÷ 2.4 = 56
8. 38.688 ÷ 5.2 = 744
9. 115.64 ÷ 9.8 = 118
10. 15.2 ÷ 4.75 = 32
11. 117.3 ÷ 11.5 = 102
12. 45.966 ÷ 4.7 = 978

Circle the answers that have to be wrong.

13. 4.68 ÷ 1.2 = 3.9
14. 19.8 ÷ 1.9 = 5.7
15. 48.19 ÷ 6.1 = 7.9
16. 28.29 ÷ 4.1 = 2.9

17. Give an example in your life where you would estimate using division.
Dividing Decimals

Review Question
How do we know that this answer is wrong?

17.8/8.9 = 6.5

Discussion
You can figure out where the decimal needs to go in division problems by estimating. We used the same technique when we multiplied decimals together.

This method of placing the decimal point helps to uncover any mistakes that you make during multiplication. Notice in the previous problem, there is no place where you could put the decimal that would make the answer close to our estimate.

The rule: move the decimal the same on the “inside” as the “outside”.

Why does this work?
You are moving the decimal the same amount of places on the “inside” and “outside”. You are just multiplying each decimal by 10, 100, etc. depending on how many places you move the decimal. Therefore, you are not changing the problem.

**SWBAT** divide two decimals

Example 1: 36.105 ÷ 2.9 = 12.45 (notice it’s about 30 ÷ 3 = 10)

* Reinforce to estimate to figure out which number to put on top of the division bar. For example, they should estimate 29 → 30. Then they should do the following in their head:

30 x 1 = 30  
30 x 2 = 60  
30 x 3 = 90

Example 2: 24.48 ÷ 5.1 = 4.8 (notice it’s about 25 ÷ 5 = 5)

* Reinforce to estimate to figure out which number to put on top of the division bar. For example, they should estimate 51 → 50. Then they should do the following in their head:

50 x 1 = 50  
50 x 2 = 100  
50 x 3 = 150  
50 x 4 = 200  
50 x 5 = 250

Example 3: 20.5 ÷ 8.2 = 2.5 (notice it’s about 20 ÷ 10 = 2)

* Reinforce to estimate to figure out which number to put on top of the division bar. For example, they should estimate 82 → 80. Then they should do the following in their head:

80 x 1 = 80  
80 x 2 = 160  
80 x 3 = 240  
80 x 4 = 320  
80 x 5 = 400

Fill in the dividing decimals block in your table.
You Try!
1. \( 11.48 \div 2.8 = 4.1 \)  
2. \( 10.8 \div 1.5 = 7.2 \)  
3. \( 1.8 + 5 = 6.8 \)

4. \( (3.4)(1.9) = 6.46 \)
5. \( 16.4 - 4.82 = 11.58 \)
6. \( 13.44 \div 3.2 = 4.2 \)

What did we learn today?

Use your number sense to place the decimal in the correct position. Then write a sentence explaining why you placed it there.

1. \( 10.8 \div 2.4 = 45 \)  
2. \( 18.24 \div 1.6 = 114 \)  
3. \( 57.33 \div 9.1 = 63 \)

Find the quotient.
4. \( 17.98 \div 3.1 = \)  
5. \( 33.5 \div 5 = \)  
6. \( 31.62 \div 3.1 = \)

Find the answer.
7. \( 46.08 \div 9.6 = \)  
8. \( 1.2 + 8.9 = \)  
9. \( 16.2 - 2.8 = \)
10. \( 36.72 \div 5.1 = \)  
11. \( (8.6)(3.1) = \)  
12. \( 9.2 - 5.16 = \)
13. \( 13.14 + 10.5 = \)  
14. \( 17.28 \div 9.6 = \)  
15. \( 8.2 \cdot 4.31 = \)

16. **Answer the following problem using the four step method.** You get paid $168.75 per week. You work 22.5 hours per week. How much money do you make per hour?
All Four Operations

Review Question
How do we know where to put the decimal when we divide?

Discussion
Remember back in Unit 1, we solved word problems using the four step method. What are the four steps? Today we are going to do some word problems involving decimals operations.

SWBAT solve word problems using the four step method that require decimal operations

Example 1: Solve using the four step method. When Timmy’s gas light comes on he can drive for 45 more miles. After the light came on, Timmy drove 6.2 miles to the mall. Then he drove 4.3 miles to his friend’s house. How much further can he drive until he runs out of gas?

1. Explore: 6.2 miles to the mall; 4.3 miles to his friends; 45 total miles
2. Plan: First, I will add the two distances together. Then subtract that value from 45.
3. Solve: 6.2 + 4.3 = 10.5 miles; 45 –10.5 = 34.5 miles.
4. Explain: Timmy can drive 34.5 more miles.

You Try!
1. Johnny bought a shirt for $24.50 and a pair of shoes for $49.99. If he had $100, how much money does he have left?

2. Shirley makes $7.50 per hour. She worked 15.5 hours. How much money did she make?

What did we learn today?

Solve each of the following problems using the four step method.

1. The two batting leaders on the Pirates had averages of .312 and .298. What is the difference between their two averages?

2. Lance spent $17.50 on two movie tickets, $4.75 on popcorn, and $5.50 on drinks. How much did he spend at the movies?

3. Ritchie’s credit card has an annual percentage rate (APR) of 1.6%. The rate increases by .4% each time he is late making a payment. What will his rate be after 3 late payments?

4. 550 people were asked who they are going to vote for. 320 said Barrack Obama. 230 said John McCain. How many percentage points is Obama ahead?
All Four Operations

Review Question
What are the four steps in the four step method?

Discussion
Put the correct solutions to the four word problems from yesterday’s homework on the board. Discuss the positive and negative aspects of each solution. You can refer to these solutions as you work on review problems. Today’s class will be a day of practice. The skills we are practicing will be on the quiz tomorrow.

SWBAT solve word problems using the four step method that require decimal operations

1. $17.680 \div 5.2 =
2. (4.6)(2.1) =
3. $8.2 - 6.88 =
4. $11.18 + 8.5 =

Answer each one of the following problems using the four step method.
5. Katie makes $5.60 per hour. If she works 16.75 hours in a week, how much will she earn for the week?
6. Bob’s car wash collected $825. He charges $7.50 for each car. How many cars did he wash?
7. Jimmy’s first paycheck was $143.25. His second paycheck was $123.50. How much total money did he make?
8. Joey had $20.75. He spent $4.55 at McDonalds and $12 at the barber shop. How much money does he have left over?

What did we learn today?
Adding and Subtracting Fractions

Review Question

What is a denominator in a fraction?

Discussion

Who did better on an assignment: Jimmy: 8/14 or Johnny: 9/14?
Who did better on an assignment: Tommy: 8/11 or Timmy: 14/18?
Why is the second problem more difficult?

What is $\frac{1}{5} + \frac{2}{5}$?

What is $\frac{1}{3} + \frac{2}{5}$?

Why is the second problem harder?

Why can’t we add $\frac{1}{3}$ and $\frac{2}{5}$?

Why do the denominators have to be the same?

How do we find common denominators?

SWBAT to find a common denominator between two fractions

Example 1: What is the common denominator between $\frac{1}{3}$ and $\frac{2}{5}$? (15; 3 x 5)

Example 2: What is the common denominator between $\frac{1}{4}$ and $\frac{2}{6}$? (24; 4 x 6)

Is ’24’ the best denominator to use?
Notice that ‘12’ is a better choice but ‘24’ will work.

What did we learn today?
Find a common denominator between the two fractions.

1. \( \frac{1}{3} \) and \( \frac{2}{5} \)  
2. \( \frac{1}{8} \) and \( \frac{3}{7} \)  
3. \( \frac{1}{5} \) and \( \frac{2}{6} \)  
4. \( \frac{3}{8} \) and \( \frac{2}{3} \)

Find the least common denominator between the two fractions.

5. \( \frac{1}{4} \) and \( \frac{2}{8} \)  
6. \( \frac{1}{8} \) and \( \frac{3}{6} \)  
7. \( \frac{1}{12} \) and \( \frac{2}{8} \)  
8. \( \frac{3}{8} \) and \( \frac{2}{10} \)

9. Why is a common denominator good enough when you are adding/subtracting two fractions?

10. How would you find a common denominator between three fractions?

Find the least common denominator between the two fractions.

1. \( \frac{1}{2} \) and \( \frac{2}{5} \)  
2. \( \frac{1}{5} \) and \( \frac{3}{6} \)  
3. \( \frac{1}{4} \) and \( \frac{2}{10} \)  
4. \( \frac{3}{12} \) and \( \frac{2}{16} \)

5. \( \frac{1}{8} \) and \( \frac{2}{14} \)  
6. \( \frac{1}{11} \) and \( \frac{3}{10} \)  
7. \( \frac{1}{12} \) and \( \frac{2}{10} \)  
8. \( \frac{3}{15} \) and \( \frac{2}{18} \)

9. \( \frac{1}{2} \) and \( \frac{2}{4} \) and \( \frac{3}{6} \)  
10. \( \frac{1}{2} \) and \( \frac{3}{5} \) and \( \frac{1}{8} \)  
11. \( \frac{1}{3} \) and \( \frac{2}{4} \) and \( \frac{3}{5} \)  
12. \( \frac{3}{4} \) and \( \frac{2}{6} \) and \( \frac{1}{8} \)

13. Why do we need to find a common denominator in order to add fractions?
Adding and Subtracting Fractions

Review Question
How do we find a common denominator between two fractions?

Discussion
What is 2 apples plus 3 oranges?
What is 2 pieces of fruit plus 3 pieces of fruit?
Notice the difference in these two problems. In order to add two items together, they must be the same item. The same is true for fractions.

Why can’t we add \( \frac{1}{3} \) and \( \frac{1}{2} \) together?

How do we find a common denominator?

SWBAT add/subtract two fractions together

Tips:
* Write the fractions vertically.
* The bottoms must be the same!

Example 1: \( \frac{2}{3} - \frac{1}{5} = ? \)
Are the denominators the same?
Subtract the numerators.

\[
\begin{array}{c}
\frac{2}{3} - \frac{1}{5} = \\
\frac{10}{15} - \frac{3}{15} = \\
\frac{7}{15}
\end{array}
\]

Example 2: \( \frac{3}{4} + \frac{1}{6} = ? \)
Are the denominators the same?
Add the numerators.

\[
\begin{array}{c}
\frac{3}{4} + \frac{1}{6} = \\
\frac{9}{12} + \frac{2}{12} = \\
\frac{11}{12}
\end{array}
\]
Example 3: \( \frac{2}{3} + \frac{1}{2} = ? \)

\[
\begin{align*}
\frac{2}{3} &= \frac{11}{6} = \frac{22}{12} \\
+ \frac{1}{2} &= \frac{3}{6} = \frac{9}{18} \\
\hline
\frac{31}{6}
\end{align*}
\]

Fill in the adding/subtracting fractions block in your table.

**You Try!**

1. \( \frac{1}{6} + \frac{3}{8} = \)
2. \( \frac{7}{15} - \frac{3}{10} = \)
3. \( 12.8 - 4.25 = \)
4. \( 3.2(4.24) = \)
5. \( 9.45 ÷ 2.1 = \)
6. \( \frac{3}{4} + \frac{1}{2} = \)

**What did we learn today?**
For each addition or subtraction problem, rewrite the problem vertically and then solve.

1. \[ \frac{8}{5} - \frac{3}{5} = \]
2. \[ \frac{2}{3} + \frac{4}{5} = \]
3. \[ \frac{5}{6} - \frac{1}{4} = \]

Rewrite each problem vertically, then solve.

4. \[ 1.24 + 12.6 = \]
5. \[ 4.2 - 2.8 = \]
6. \[ \frac{3}{4} - \frac{2}{10} = \]
7. \[ \frac{2}{4} + \frac{1}{6} = \]
8. \[ 4.8(6.7) = \]
9. \[ 9.84 ÷ 1.2 = \]
10. \[ \frac{5}{8} - \frac{1}{3} = \]
11. \[ 6.88 + 13 = \]
12. \[ \frac{1}{6} + \frac{2}{8} = \]
13. \[ 2.55 \cdot 1.5 = \]
14. \[ \frac{1}{4} - \frac{2}{10} = \]
15. \[ \frac{5}{6} + \frac{1}{3} = \]

16. **Answer the following problem using the four step method.** You need \( 2 \frac{1}{4} \) cups of milk in order to make cookies. If you already added \( \frac{1}{2} \) of a cup, how much more milk do you need?
Multiplying Fractions

**Review Question**
What do we have to do when we are adding and subtracting fractions?

**Discussion**
What would make multiplying the following problem difficult?

\[
\frac{123}{243} \times \frac{25}{123}
\]

What could we do to make the problem easier?
You can simplify fractions up/down or diagonally.

**SWBAT** multiply two fractions

Example 1: \( \frac{1}{3} \times \frac{2}{5} = \)

Example 2: \( \frac{2}{6} \times \frac{1}{5} = \)

Example 3: \( \frac{4}{9} \times \frac{1}{2} = \)

* It is easier to simplify first: \( \frac{22}{34} \times \frac{17}{44} = \)

Example 4: \( \frac{1}{9} \times \frac{2}{7} = \)

Example 5: \( \frac{6}{8} \times 12 = \)

Fill in the multiplying fractions block in your table.
You Try!

1. $\frac{1}{4} \left( \frac{1}{3} \right)$
2. $\frac{3}{7} \left( \frac{14}{4} \right)$
3. $8.2 + 5.32$
4. $2.4(1.22)$
5. $7.42 \div 1.4$
6. $1\frac{6}{8} - \frac{2}{6}$
7. $3\frac{2}{3}\left( \frac{2}{3} \right)$
8. $\frac{3}{5}\left( \frac{15}{21} \right)$

What did we learn today?

Find the product.

1. $\left( \frac{2}{3} \right) \left( \frac{1}{8} \right)$
2. $\left( \frac{4}{5} \right) \left( \frac{7}{12} \right)$
3. $\left( \frac{2}{5} \right) \left( \frac{15}{20} \right)$

Find the answer.

4. $\left( \frac{2}{4} \right) \left( \frac{1}{5} \right)$
5. $\left( 1\frac{2}{3} \right) \left( \frac{3}{9} \right)$
6. $2.6(2.8)$
7. $9.8 \div 3.5$
8. $\frac{1}{4} + \frac{2}{3}$
9. $\frac{6}{8} \left( \frac{15}{21} \right)$
10. $\frac{4}{5} - \frac{4}{10}$
11. $\frac{3}{5}(20)$
12. $10.4 - 8.17$
13. $\left( 2\frac{1}{2} \right) \left( \frac{1}{10} \right)$
14. $7.56 \div 1.8$
15. $\frac{2}{5} \left( \frac{15}{22} \right)$

16. **Answer the following question using the four step method.** Timmy made $85 last week. One-fifth of his money goes to taxes. How much money did he pay in taxes?
Dividing Fractions

**Review Question**
What do we have to do when we are multiplying fractions?

**Discussion**
Notice that these two problems are the same:
\[ 10 \div 2 = 5 \]
\[ 10 \cdot \frac{1}{2} = 5 \]
Notice that dividing by 2 is the same as multiplying by 1/2.
The only difference is that we “flipped” the 2/1 to 1/2.
To change division into multiplication change ÷ to ∙. Then “flip” the second number. The correct word for “flipping” is reciprocal. We call this process Leave, Change, Flip. Then use all of the multiplication rules.

“Flipping”:
\[ \frac{2}{3} \rightarrow \frac{3}{2} \]
\[ 4 \rightarrow \frac{1}{4} \]
\[ 1 \frac{1}{2} = \frac{3}{2} \rightarrow \frac{2}{3} \]

**SWBAT** divide two fractions

**Example 1:**
\[ \frac{1}{3} \div \frac{4}{7} \rightarrow \frac{1}{3} \times \frac{7}{4} \]

**Example 2:**
\[ \frac{4}{3} \div \frac{6}{9} \rightarrow \frac{4}{3} \times \frac{6}{9} \]

**Example 3:**
\[ \frac{8}{12} \div 4 \rightarrow \frac{8}{12} \cdot \frac{1}{4} \]

**Example 4:**
\[ \frac{2}{3} \div \frac{1}{6} = \frac{8}{3} \div \frac{7}{6} \rightarrow \frac{8}{3} \div \frac{6}{7} \]

Fill in the dividing fractions block in your table.
You Try!
1. \( \frac{4}{6} \div \frac{5}{7} = \)
2. \( \frac{3}{5} \div 6 = \)
3. \( \frac{1}{5} \cdot \frac{2}{6} = \)
4. \( 4.4(2.9) = \)
5. \( 12.6 - 5.82 = \)
6. \( \frac{5}{6} + \frac{2}{4} = \)

What did we learn today?

Find the quotient.
1. \( \left( \frac{2}{3} \right) \div \left( \frac{1}{8} \right) = \)
2. \( \left( \frac{4}{5} \right) \div \left( \frac{8}{12} \right) = \)
3. \( \left( \frac{2}{5} \right) \div \left( \frac{15}{20} \right) = \)

Find the answer.
4. \( \left( \frac{2}{4} \right) \div \left( \frac{8}{5} \right) = \)
5. \( \left( \frac{2}{3} \right) \div \left( \frac{1}{9} \right) = \)
6. \( 14.2 + 6.5 = \)
7. \( 2 \frac{1}{2} \div 6 = \)
8. \( 2.7(10.4) = \)
9. \( \left( \frac{5}{9} \right) \cdot \left( \frac{12}{5} \right) = \)

10. \( 18.4 - 10.11 = \)
11. \( 12.48 \div 2.6 = \)
12. \( 10.35 \div 2.3 = \)
13. \( 1 \frac{1}{4} - \frac{5}{6} = \)
14. \( \frac{1}{2} + \frac{5}{6} = \)
15. \( \left( \frac{1}{4} \right) \div \left( \frac{2}{10} \right) = \)

16. Answer the following question using the four step method. Ritchie wants to shorten a threshold by \( 1 \frac{3}{8} \) inches. He wants to take off the same amount from each side. How much should he cut from each side?
All Four Operations

Review Question
What are the four steps in the four step method?

Discussion
Today’s class will be a day of practice. The skills we are practicing will be on the quiz tomorrow. You can work alone or with partners. Today’s assignment is a great time to emphasize skills such as working together, time management, neatness, and organization

SWBAT solve word problems using the four step method that require decimal and fraction operations.

What did we learn today?

Section 6–2 In–Class Assignment (Day 5)

1. \( \frac{1}{2} + \frac{2}{8} = \)
2. \( \frac{1}{4} - \frac{2}{6} = \)
3. \( \left( \frac{3}{8} \right) \cdot \left( \frac{1}{7} \right) = \)
4. \( \frac{1}{6} + \frac{2}{10} = \)

5. \( 12.8 + 4.7 = \)
6. \( 14.2 - 5.23 = \)
7. \( (4.2)(5.3) = \)
8. \( 5.46 \div 2.1 = \)

Answer each one of the following problems using the four step method.

9. Jimmy has to swim \( \frac{1}{2} \) of a mile for swim class. He already swam \( \frac{1}{8} \) of a mile. How much further does he have to swim?

10. Stephanie makes $7.50 per hour. If she works 15.75 hours in a week, how much will she earn for the week?

11. Jimmy had $42.75. He spent $5.55 at Wendy’s and $4.50 at Dairy Queen. How much money does he have left over?

12. Johnny ran \( \frac{1}{4} \) miles on Monday and \( \frac{1}{2} \) miles on Tuesday. How many total miles did he run?
Adding Integers

Review Question
What is different about the way we solve adding and multiplying problems with fractions?

Discussion
What is a rational number?
What is an integer?

SWBAT model the addition of integers using a number line
SWBAT demonstrate an understanding of what takes place during integer addition
SWBAT model a real life example of integer addition

Example 1: \(4 + 2 = ?\)
Is the 4 being increased or decreased? Why?
Is the answer positive or negative? Why?
Draw a number line to model the problem and answer.

Example 2: \(-3 + 5 = ?\)
Is the \(-3\) being increased or decreased? Why?
Is the answer positive or negative? Why?
Draw a number line to model the problem and answer.

Example 3: \(2 + (-5) = ?\)
Is the 2 being increased or decreased? Why?
Is the answer positive or negative? Why?
Draw a number line to model the problem and answer.
Example 4: \(-5 + (-4) = ?\)
Is the \(-5\) being increased or decreased? Why?
Is the answer positive or negative? Why?
Draw a number line to model the problem and answer.

\[
\begin{array}{cccccccc}
\bullet & -1 & \bullet & -2 & \bullet & -3 & \bullet & -4 & \bullet & -5 & \bullet & -6 & \bullet & -7 & \bullet & -8 & \bullet & -9 & \bullet & -10 & \bullet
\end{array}
\]

Make up a real life example for each of the four examples above.
(money, temperature, and digging a ditch are good examples for negative numbers)

Example 1: Four apples plus two apples is six apples.
Example 2: You owe your friend $3. Then you found $5. Now you have $2.
Example 3: It was 2°. Then the temperature went down 5°. Now it is -3°.
Example 4: You dug a 5 foot ditch. Then you dug down 4 more feet. Now you have a 9 foot hole.

You Try!
For each example do each of the following:
1. Decide if the number is being increased or decreased.
2. Decide if the answer is positive or negative.
3. Draw a number line to model the problem and answer.

1. \(3 + 4 = \)  
2. \(-4 + (-3) = \)  
3. \((-5) + 4 = \)
4. \(4 + (-1) = \)  
5. \(6 + (-3) = \)  
6. \(-5 + 8 = \)

What did we learn today?
For each problem do the following:
1. Decide if the number is being increased or decreased.
2. Decide if the answer is positive or negative.
3. Draw a number line to model the problem and answer.

1. \(4 + 2 =\)
2. \(-3 + 6 =\)
3. \(-4 + (-3) =\)
4. \(-7 + 2 =\)
5. \(3 + 5 =\)
6. \(-2 + 6 =\)
7. \(-4 + (-3) =\)
8. \(-1 + 5 =\)
9. \(4 + (-5) =\)
10. \(2 + 5 =\)
11. \(-2 + (-4) =\)
12. \(-7 + 3 =\)

Write a sentence giving a real life example to demonstrate the problem.

13. \(4 + 7 = 11\)
14. \(-5 + (-4) = -9\)
15. \(-5 + 8 = 3\)

16. Answer the following problem using the four step method. Make sure to include explanations and a number line. Kenny has $32 in his checking account. He writes a check for $45. How much money does he have in his account?
Adding Integers

**Review Question**
When we add a positive and negative together how do we know if the answer is positive or negative?

**Discussion**
In an addition problem, the signs of the two numbers can be the same or different. There are no other options. So let’s look at yesterday’s homework problems to try to figure out a pattern to get the correct answer.

Let’s summarize the first four homework problems:
#1: The signs are the same. We add to get the answer.
#2: The signs are different. We subtract to get the answer.
#3: The signs are the same. We add to get the answer.
#4: The signs are different. We subtract to get the answer.
In problem #1 and #3, how do we know what the sign should be?
In problem #2 and #4, how do we know what the sign should be?

<table>
<thead>
<tr>
<th>Same Signs</th>
<th>Different Signs</th>
</tr>
</thead>
<tbody>
<tr>
<td>– Add</td>
<td>– Subtract</td>
</tr>
<tr>
<td>– Keep Sign</td>
<td>– Keep sign of bigger #</td>
</tr>
</tbody>
</table>

**SWBAT** discover the rules for adding integers
**SWBAT** add two integers

*It is important to explain what “bigger number” means. We are going to ignore the sign when determining which number is “bigger.”*

*Rewrite each problem “up and down.” Instead of writing the problems horizontally, write them vertically. It will help later on when we are solving equations.*

**Example 1:** $4 + 3 = ?$
Are the signs the same or different?
What do we do?
Draw a number line to model the problem and answer.
Example 2: \(-3 + 6 = ?\)
Are the signs the same or different?
What do we do?
Why do we keep the sign of the bigger number?
Draw a number line to model the problem and answer.

Example 3: \(4 + (-7) = ?\)
Are the signs the same or different?
What do we do?
Why do we keep the sign of the bigger number?
Draw a number line to model the problem and answer.

Example 4: \(-5 + (-4) = ?\)
Are the signs the same or different?
What do we do?
Draw a number line to model the problem and answer.

Fill in the adding integers block in your table.

You Try!
Find the answer and draw a number line to model the problem.

1. \(2 + 8 = \)
2. \(-1 + (-6) = \)
3. \((-7) + 2 = \)
4. \(5 + (-4) = \)
5. \(8 + (-3) = \)
6. \(-4 + 7 = \)

What did we learn today?
For each problem do the following:
1. Find the correct answer using your rules.
2. Draw a number line to model the problem and answer.

1. \(7 + 2 =\)  
2. \(\text{–}4 + 5 =\)  
3. \(\text{–}8 + (\text{–}3) =\)

4. \(\text{–}7 + 3 =\)  
5. \(1 + 5 =\)  
6. \(\text{–}9 + 6 =\)

7. \(\text{–}11 + (\text{–}3) =\)  
8. \(\text{–}4 + 9 =\)  
9. \(4 + (\text{–}10) =\)

10. \(2 + 9 =\)  
11. \(\text{–}8 + (\text{–}8) =\)  
12. \(\text{–}12 + 3 =\)

13. \(4 + 7 =\)  
14. \(\text{–}15 + (\text{–}7) =\)  
15. \(\text{–}5 + 13 =\)

16. **Answer the following problem using the four step method. Make sure to include explanations and a number line.** It was \(\text{–}15^\circ\) F outside when you caught your bus. The temperature rose \(22^\circ\) during the school day. What was the temperature when you got on your bus to leave at the end of the day?
Subtracting Integers

Review Question
What are the rules for adding integers?

Discussion
We are going to change every subtraction problem into an addition problem. We are going to use a process known as LEAVE, CHANGE, OPPOSITE. You leave the first number alone. Then change the subtraction into addition. Finally, take the opposite of the last number. This process is technically called “add the opposite”.

SWBAT model the subtracting of integers using a number line
SWBAT subtract two integers

Example 1: $4 - 2 = ?$
After we do leave, change, opposite we end up with $→ 4 + (-2)$
Now just use our addition rules.
Are the signs the same or different?
What do we do?

Example 2: $2 - 7 = ?$
After we do leave, change, opposite we end up with $→ 2 + (-7)$
Are the signs the same or different?
What do we do?
Why do we keep the sign of the bigger number?
Draw a number line to model the problem and answer.
Example 3: \(-2 - 8 = ?\)
After we do leave, change, opposite we end up with \(\rightarrow -2 + (-8)\)
Are the signs the same or different?
What do we do?
Draw a number line to model the problem and answer.

Example 4: \(3 - (-8) = ?\)
After we do leave, change, opposite we end up with \(\rightarrow 3 + 8\)
Are the signs the same or different?
What do we do?
Draw a number line to model the problem and answer.

Make up a real life example for each of the four examples above.
(money, temperature, and digging a ditch are good examples for negative numbers)

Example 1: Four apples minus two apples is two apples.
Example 2: It was 2°. Then the temperature went down 7°. Now it is -5°.
Example 3: It was -2°. Then the temperature went down 8°. Now it is -10°.
Example 4: You have $3. You don’t owe your friend $8. You “have” $11.

**Fill in the adding integers block in your table.**

**You Try!**
For each example find the answer. Then draw a number line to model the problem and answer.

1. \(3 - 8\)  
2. \(-8 - 5\)  
3. \(-4 - (-3)\)  
4. \(-8 + 2\)  
5. \(8 - (-2)\)  
6. \(2 + (-10)\)  
7. \(-5 - (-6)\)  
8. \(-7 + (-4)\)

**What did we learn today?**
For each problem do the following:
1. Find the correct answer using your rules.
2. Draw a number line to model the problem and answer.

1. $7 - 2 = \hfill 2. \ -4 + 8 = \hfill 3. \ -8 - (-3) =$
2. $-8 - 3 = \hfill 5. \ 2 + 8 = \hfill 6. \ -8 - 2 =$
3. $-10 + (-7) = \hfill 8. \ -4 - 7 = \hfill 9. \ -4 + (-10) =$
4. $-2 + 11 = \hfill 11. \ -7 - (-1) = \hfill 12. \ -9 + 3 =$
5. $2 + 6 = \hfill 14. \ -8 + (-5) = \hfill 15. \ -2 - 13 =$

16. Answer the following problem using the four step method. Make sure to include explanations and a number line. It was $-4^\circ$ F outside when you caught your bus. The temperature dropped $14^\circ$ during the school day. What was the temperature when you got on your bus to leave at the end of the day?
Multiplying Integers

Review Question
What are the rules for subtracting integers?

Discussion
The following is a pattern for a positive times a negative.
\[
4 \cdot 3 = 12 \\
4 \cdot 2 = 8 \\
4 \cdot 1 = 4 \\
4 \cdot 0 = 0 \\
4 \cdot (-1) = -4
\]
The pattern suggests that a positive times a negative is negative.
Let’s try to understand what multiplying really means.
\[
4 \cdot 5 = 20 \quad \text{(work 4 hours at $5/hour)} \\
4 \cdot (-5) = -20 \quad \text{(owe 4 people $5)}
\]

The following is a pattern for a negative times a negative.
\[
4 \cdot (-1) = -4 \\
3 \cdot (-1) = -3 \\
2 \cdot (-1) = -2 \\
1 \cdot (-1) = -1 \\
0 \cdot (-1) = 0 \\
-1 \cdot (-1) = 1
\]
The pattern suggests that a negative times a negative is positive.
Let’s try to understand what multiplying really means
\[
-4 \cdot (-5) = 20 \quad \text{(don’t owe 4 people $5)}
\]

In summary:
Positive \cdot Positive = Positive
Positive \cdot Negative = Negative
Negative \cdot Negative = Positive

Notice it doesn’t have anything to do with keeping the sign of the bigger number. That is the addition rule.

SWBAT generate rules for multiplying integers
SWBAT multiply two integers together

Remember… integer (… −3, −2, −1, 0, 1, 2, 3, ..)

* We use ( ), ∙, * to denote multiplication
* You can also use temperature and digging a ditch
Example 1: $4 \cdot (-2) = ?$
The answer is $-8$.
Give a real life example of the problem.
*Notice we did not keep the sign of the bigger number. That is the subtraction rule.

Example 2: $-14 \cdot (-23) = ?$
Give a real life example of the problem.

Fill in the adding integers block in your table.

**You Try!**
For each example find the answer. Then write a sentence giving a real life example to model the problem.

<table>
<thead>
<tr>
<th>Example</th>
<th>Equation</th>
<th>Real Life Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>$3(-4)$</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>$(-4)(-5)$</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>$(-15)(19)$</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>$4 + (-14)$</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>$-3 - 10$</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>$-4(26)$</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>$5 - 13$</td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>$-5 + (-5)$</td>
<td></td>
</tr>
</tbody>
</table>

What did we learn today?

1. Explain why a positive multiplied by a negative is a negative. (use a pattern or a real life example)

Find the product.

<table>
<thead>
<tr>
<th>Equation</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. $(-2)(4)$</td>
<td>$-8$</td>
</tr>
<tr>
<td>3. $(-12 \cdot 0(-3))$</td>
<td>$0$</td>
</tr>
<tr>
<td>4. $2 \cdot (-3)$</td>
<td>$-6$</td>
</tr>
<tr>
<td>5. $(6)(-6)$</td>
<td>$-36$</td>
</tr>
<tr>
<td>6. $4 \cdot 12$</td>
<td>$48$</td>
</tr>
<tr>
<td>7. $(72)(-9)$</td>
<td>$-648$</td>
</tr>
</tbody>
</table>

Find the answer.

<table>
<thead>
<tr>
<th>Equation</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>8. $-2(2)$</td>
<td>$-4$</td>
</tr>
<tr>
<td>9. $-8(3)$</td>
<td>$-24$</td>
</tr>
<tr>
<td>10. $-4 - 10$</td>
<td>$-14$</td>
</tr>
<tr>
<td>11. $-2 + 8$</td>
<td>$6$</td>
</tr>
<tr>
<td>12. $(48)(-4)$</td>
<td>$-192$</td>
</tr>
<tr>
<td>13. $-4 + (-8)$</td>
<td>$-12$</td>
</tr>
<tr>
<td>14. $-6 - 12$</td>
<td>$-18$</td>
</tr>
<tr>
<td>15. $8 - (-2)$</td>
<td>$10$</td>
</tr>
<tr>
<td>16. $-15 \cdot 3$</td>
<td>$-45$</td>
</tr>
<tr>
<td>17. $-8(-5)$</td>
<td>$40$</td>
</tr>
<tr>
<td>18. $8 - 4$</td>
<td>$4$</td>
</tr>
<tr>
<td>19. $12 + (-6)$</td>
<td>$6$</td>
</tr>
</tbody>
</table>

20. Answer the following question using the four step method. It is $8^\circ$ outside. The temperature decreases $2^\circ$ per hour. What will the temperature be after six hours?

Section 6–3 Homework (Day 4)
Dividing Integers

Review Question
What are the rules for multiplying integers?

Discussion
We know that dividing is the same as multiplying by the reciprocal (flipping) from our lesson on dividing fractions.

Notice that these two problems are the same:
10 ÷ 2 = 5
10 ÷ ½ = 5

So the rules for multiplying are the same as dividing.

We know that 2 x (-8) = -16.
Therefore, -16 ÷ 2 = -8.
We know that -2 x (-8) = -16.
Therefore, -16 ÷ (-2) = 8.

In summary:
Positive ÷ Positive = Positive
Positive ÷ Negative = Negative
Negative ÷ Negative = Positive

Notice it doesn’t have anything to do with keeping the sign of the bigger number. That is the addition rule.

SWBAT divide two integers

Remember… integer (… -3, -2, -1, 0, 1, 2, 3, ..)

Example 1: -16 ÷ 2 = -8

Example 2: -12 ÷ (-6) = 2

Example 3: 602 ÷ 14 = 43

Fill in the division block in your table
You Try!
1. \(-20 \div 4 = -5\)  
2. \(-21 \div (-7) = 3\)  
3. \(8 + (-5) = 3\)  
4. \(34(-19) = -646\)  
5. \(-6 - 8 = -14\)  
6. \(-54 \div 9 = -6\)  
7. \(-12 + 5 = -7\)  
8. \(-248 \div 8 = -31\)

What did we learn today?

1. Explain why a positive divided by a negative is a negative. (use a pattern or a real life example)

Find the quotient.
2. \(-32 \div 4 = \) 
3. \(-18 \div (-3) = \) 
4. \(24 \div (-3) = \) 
5. \(-36 \div (-6) = \) 
6. \(234 \div 13 = \) 
7. \(12 \div (-5) = \) 

Find the answer.
8. \(-24 \div 2 = \) 
9. \(-8 + 13 = \) 
10. \(4 - 11 = \) 
11. \((-2)(8) = \) 
12. \(-48 \div (-4) = \) 
13. \(-64 \div (-8) = \) 
14. \(-6 + (-12) = \) 
15. \(11 - (-2) = \) 
16. \(-15 \div 3 = \) 
17. \(-5(-5) = \) 
18. \(-8 - 4 = \) 
19. \(12 \div (-4) = \)

20. Answer the following question using the four step method. Timmy and four of his friends broke the neighbor’s window while playing baseball. It cost $250 to get it fixed. If they all pitch in to get it fixed, how much do each of them have to pay?
All Four Operations

Review Question
How do the rules for multiplying and dividing compare? Why?

Discussion
Today’s assignment is a great time to emphasize skills such as working together, time management, neatness, and organization.

SWBAT add, subtract, multiply, and divide integers, decimals, and fractions.

Rules:
Add – Same Signs: add, keep sign
Different Signs: subtract, keep bigger sign

Subtract – Leave, Change, Opposite
   Then use addition rules

Multiply/Divide – Positive/Positive = Positive
   Positive/Negative = Negative
   Negative/Negative = Positive

Activity
Put the students into groups. Give each group an answer sheet. Then give each group a question sheet. A questions sheet consists of 2 problems. Give each group about 3 minutes to complete the two problems. Then rotate the problems around the class giving the groups 3 minutes with each set of problems. This activity is another great opportunity to discuss ideas such as teamwork and time management.

What did we learn today?
<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 4.8 + 5.85 =</td>
<td>2. (2.8)(4.9) =</td>
<td>3. ( \frac{3}{4} - \frac{2}{6} = )</td>
<td>4. ( \frac{1}{4} \div \frac{5}{7} = )</td>
</tr>
<tr>
<td>5. ( \frac{5}{8} \div \frac{3}{2} = )</td>
<td>6. (-8 + 2 = )</td>
<td>7. 14.8 – 12.21 =</td>
<td>8. ( \frac{1}{2} + \frac{2}{5} = )</td>
</tr>
<tr>
<td>9. 5 – 12 =</td>
<td>10. 18.76 ÷ 2.8 =</td>
<td>11. ( \left( \frac{1}{3} \right) \cdot \frac{5}{15} = )</td>
<td>12. (-18 \div 3 = )</td>
</tr>
<tr>
<td>13. (4.1)(2.31) =</td>
<td>14. (-3 – 8 = )</td>
<td>15. ( \left( \frac{2}{3} \right) \cdot \frac{9}{10} = )</td>
<td>16. (-400 \div (-16) = )</td>
</tr>
<tr>
<td>17. 32.25 ÷ 2.5 =</td>
<td>18. 24 + 7.81 =</td>
<td>19. (-5 + (-6) = )</td>
<td>20. ((-22)(-13) = )</td>
</tr>
<tr>
<td>21. ( \left( \frac{11}{2} \right) + \left( \frac{1}{4} \right) = )</td>
<td>22. 14 – 8.6 =</td>
<td>23. ( \left( \frac{1}{6} \right) - \left( \frac{2}{3} \right) = )</td>
<td>24. ((-5)(4) = )</td>
</tr>
</tbody>
</table>
Name: _______________________________________

1. __________________    13. __________________

2. __________________    14. __________________

3. __________________    15. __________________

4. __________________    16. __________________

5. __________________    17. __________________

6. __________________    18. __________________

7. __________________    19. __________________

8. __________________    20. __________________

9. __________________    21. __________________

10. ___________________ 22. ___________________

11. ___________________ 23. ___________________

12. ___________________ 24. ___________________
All Four Operations

Review Question
What are the four steps in the four step method?

Discussion
Today’s class will be a day of practice.

SWBAT solve word problems using the four step method that require decimal, fraction, and integer operations.

What did we learn today?

1. \(-18 \div 6 = \)
2. \((-14)(-21) = \)
3. \(-8 - 12 = \)
4. \(-11 + 8 = \)

Answer the following word problems using the four step method.

5. The temperature was 15° F at the beginning of the day. The temperature dropped 23° F during the course of the day. What was the temperature at the end of the day?

6. The Dead Sea’s deepest part is 799 meters below sea level. A plateau to the east of the Dead Sea rises to about 1,340 meters above sea level. What is the difference between the deepest part of the Dead Sea and the top of the plateau?

7. Eleven students bought a lunch that cost $2.35 each. Eight students bought a lunch that cost $1.75 each. How much did it cost for the nineteen students to buy lunch?

8. In order to hang a shelf Johnny needs a nail that is \(1 \frac{1}{4}\) inches long. He has a nail that is \(\frac{5}{8}\) of an inch long. How many inches short is Johnny’s nail?

9. The Steelers were penalized 11 times for a total of 165 yards. Each penalty was for the same amount of yards. How many yards did they lose for each penalty?

10. The temperature was –8° F. The temperature rose 3° F for 5 straight hours. What is the temperature now?
Unit 6 Cumulative Review

Remember:
2. Reinforce the importance of retaining information from previous units.
3. Reinforce connections being made among units.

1. What value satisfies the equation: \(4x + 2 = 18\)?
   a. 2  
   b. 3  
   c. 4  
   d. 5

2. What year did the movie Finding Nemo come out?
   a. 1980  
   b. 1985  
   c. 1990  
   d. 2003

3. Who was the 3rd president of the United States?
   a. George Washington  
   b. Thomas Jefferson  
   c. George Bush  
   d. Barrack Obama

4. What is the largest two digit number that adds up to 8?
   a. 44  
   b. 107  
   c. 53  
   d. 99

5. What is the largest integer?
   a. -8  
   b. -2  
   c. 19/4  
   d. 7.5

6. Which number isn’t rational?
   a. \(\sqrt{3}\)  
   b. 6  
   c. 2.8  
   d. 2/3

7. What is the next term: 1, 2, 6, 24, ___?
   a. 120  
   b. 60  
   c. 100  
   d. 30

8. What is the next term: 2, 3, 5, 8, 12, ___?
   a. 15  
   b. 17  
   c. 18  
   d. 28

9. What is the next term: 1, 4, 16, ___?
   a. 20  
   b. 37  
   c. 64  
   d. 71

10. What is the next term: 3, 7, 6, 10, 9, ___?
    a. 13  
    b. 15  
    c. 17  
    d. 19

11. Tori yelled at her teacher 5 times this week. **About** how many times would that be in a school year?
    a. 75  
    b. 180  
    c. 300  
    d. 500

12. Corey bought a car for $10,000. He plans to pay it off in 1 year. **About** how much does he have to pay each month?
    a. $200  
    b. $500  
    c. $1000  
    d. $2000

13. Johnny makes $8.50/hour. He works 20 hours/week. How many weeks will it take for him to save $340?
    a. 2  
    b. 3  
    c. 4  
    d. 5
14. Shirley has 8 quarts of oil. Sammy has 2 gallons of oil. How many gallons of oil do they have together?
   a. 2  b. 3  c. 4  d. 5

15. Tammy drove 30 km. Timmy drove 3000 m. How far did they drive total?
   a. 33 km  b. 3330 km  c. 3333 km  d. 1000 km

16. Which of the following is equal to 5/20?
   a. 33  b. 10%  c. 25%  d. 40%

17. Which of the following is equal to 94%?
   a. .94  b. 940%  c. 9400  d. .094%

18. Which of the following is equal to 2/20?
   a. .01  b. .1  c. .3  d. .4

19. Which of the following is equal to \(3^2\)?
   a. 3  b. 4  c. 6  d. 9

20. Which of the following is equal to \(\sqrt{784}\)?
   a. 22  b. 18  c. 28  d. 31

Use the following data set to answer questions 21-22.
12, 8, 10, 22, 40, 16

21. What is the mean?
   a. 18  b. 22  c. 24  d. 70

22. What is the median?
   a. 12  b. 14  c. 20  d. 70

23. There are 4 red marbles, 6 blue marbles, 8 green marbles, and 1 yellow marbles in a bag. What is the probability of picking a blue marble?
   a. 4/19  b. 6/20  c. 6/19  d. 8/19

24. \(18 - 24 \div 4 + 3\)
   a. 15  b. 16  c. 19  d. 20

25. Tommy ran 6 mph for 2 hours. How far did he run?
   a. 8  b. 12  c. 36  d. 60

26. \(5x + 8 = 18\)
   a. 2  b. -2  c. -10  d. 11

27. \(\frac{x}{2} - 8 > 4\)
   a. \(x > 24\)  b. \(x > -24\)  c. \(x < 8\)  d. \(x < -8\)
28. A triangle’s three angles are 40°, 80°, and 60° respectively. What type of triangle is it?
   a. Obtuse  b. Acute  c. Right  d. Isosceles

29. What is the area of a rectangle with base 6 and height 8?
   a. 48  b. 14  c. 28  d. 82

30. What is the circumference of a circle with radius 10 in?
   a. 31.4  b. 62.8  c. 93.6  d. 129.1

31. What is the surface area of a rectangular prism with length 6 cm, width 4 cm, and height 5 cm?
   a. 15 cm²  b. 120 cm²  c. 74 cm²  d. 148 cm²

32. What 3-dimensional figure is comprised of four triangles and a square?
   a. rectangular prism  b. square pyramid  c. cylinder  d. sphere

33. \(-8 + 13 =
   a. -5  b. 5  c. 21  d. 20

34. \(-5 - 7 =
   a. 12  b. 2  c. -12  d. -10

35. \((25)(31) =
   a. 395  b. 775  c. 795  d. 860

36. \(9.66 ÷ 2.3 =
   a. 4.5  b. 4.8  c. 4.2  d. 7.4

37. \(12.8 - 4.22 =
   a. 8.62  b. 8.58  c. 8.28  d. 8.18

38. \(\frac{2}{6} + \left( \frac{4}{5} \right) =
   a. \frac{14}{15}  b. \frac{17}{15}  c. \frac{38}{30}  d. \frac{40}{30}

39. \((4.2)(6.2) =
   a. 13.2  b. 20.626  c. 21.624  d. 26.04

40. \(\left( \frac{4}{5} \right) ÷ \left( \frac{12}{7} \right) =
   a. \frac{12}{20}  b. \frac{7}{15}  c. \frac{8}{10}  d. \frac{10}{40}
UNIT 6 HAND-IN PROBLEMS

This problem set is intended to challenge the students and encourage students to apply a deep understanding of problem-solving skills.

1. Using a pattern, prove that $6 + (-2) = 4$.
2. Using a pattern, prove that $(-5)(-2) = -10$
3. $-11.2 + (-57.932) =$
4. $5 \frac{3}{12} - \left(-3 \frac{2}{16}\right) =$
5. $-9.276982 \div 3.586 =$
6. $-145 - (-286) =$
7. $(-14.82)(362.6) =$
8. $12 \frac{1}{2} ÷ 7 \frac{1}{8} =$
9. The following is a list of the transactions that occurred on a particular bank account during a one month period. There was a $154 deposit, $945 deposit, $150 withdrawal, and a $225 check to the gas company. The balance of the account was $1234 at the end of the month. What was the balance at the beginning of the month?
10. Explain the difference between $\frac{2}{3}$ and $\frac{2}{5}$. Use diagrams to help explain.
Eratosthenes Project

DAY 1

1. Learn the divisibility rules for the following numbers: 2, 3, 4, 5, 6, 9, and 10.

2. In-Class Assignment.

DAY 2

1. Make your own Sieve of Eratosthenes! Use the divisibility rules for the numbers 2, 3, and 5, and test 7 to find all of the prime numbers from 2 and 100.

2. You should use a different color to cross off the numbers divisible by 2, 3, 5, and 7 (four colors in all).
   a. Blue for numbers divisible by 2
   b. Green for numbers divisible by 3
   c. Orange for numbers divisible by 5
   d. Purple for numbers divisible by 7
   e. Circle prime numbers in yellow

DAY 3

1. Answer questions about the Greek mathematician Eratosthenes.

   Websites
   - [http://www-history.mcs.st-andrews.ac.uk/Biographies/Eratosthenes.html](http://www-history.mcs.st-andrews.ac.uk/Biographies/Eratosthenes.html)
   - [http://space.about.com/cs/astronomerbios/a/Eratosthenesbio.htm](http://space.about.com/cs/astronomerbios/a/Eratosthenesbio.htm)
   - [http://www.biographybase.com/biography/Eratosthenes.html](http://www.biographybase.com/biography/Eratosthenes.html)

2. Answer the questions about the Sieve of Eratosthenes and prime numbers. The answers should be in your notes from class.
• Where and when was Eratosthenes born?

• What was Eratosthenes’s nickname and how did he earn it?

• List 3 things Eratosthenes is famous for besides his method for finding prime numbers.

• List 2 things named after Eratosthenes?

• At which library was he the head librarian?

• Where and when did Eratosthenes die?

• How did Eratosthenes die?
Answer the following questions about the Sieve of Eratosthenes and prime numbers. The answers should be in your notes from class.

1.) What is a prime number?

2.) List the divisibility rules for the numbers 2, 3, 4, 5, 6, 9, and 10.

   2 –
   3 –
   4 –
   5 –
   6 –
   9 –
   10 –

3.) How many prime numbers are there between 2 and 100?
### Sieve of Eratoshenes

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