

Lesson Plan and Related Unit Activities

Grade 8 – Patterns and Relations (Variables and Equations)

Topic 2: Solving and Verifying One-Step Equations

Elizabeth Lavery

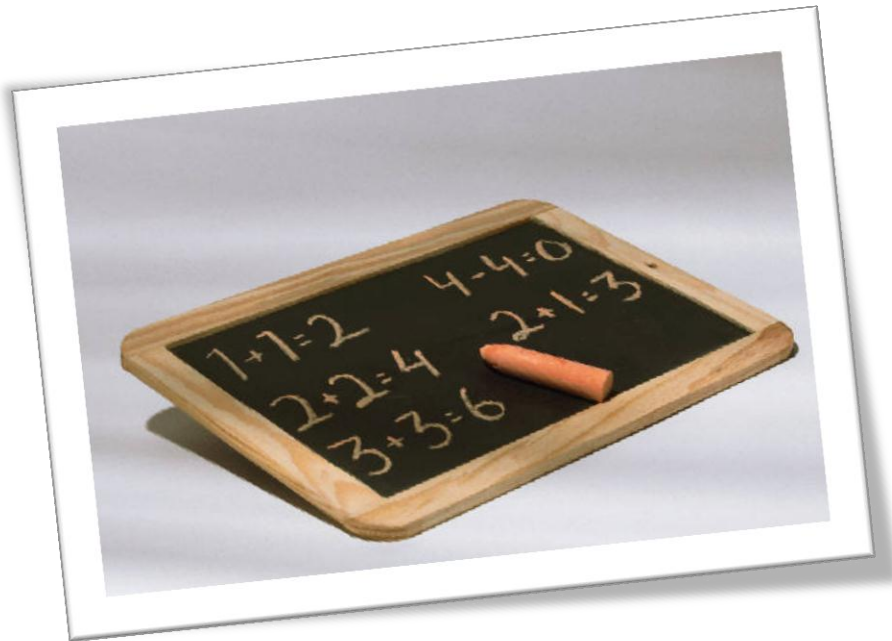


Table of Contents

General Information	First Section Green
Day 1 Lesson Anticipatory Set Algebra Tiles Student notes	Second Section Blue
Day 2 Lesson Anticipatory Set Student Notes Exit Cards	Third Section Purple
Day 3 Lesson Anticipatory Set Equation Stations	Fourth Section Pink
Unit Project Information Assignment Rubric Exemplar	Fifth Section Red
Unit Review Game/Activity Information Solutions	Sixth Section Orange
Glossary	Seventh Section Bright Yellow
Bibliography	Eighth Section Dark Yellow

Topic 2: Solving and Verifying One-Step Equations

General Outcome: Represent algebraic expressions in multiple ways

Specific Outcome: Model and solve problems, concretely, pictorially, and symbolically, using linear equations in the form:

$$ax = b$$

$$x/a = b, a \neq 0$$

[C, CN, PS, V]

Achievement Indicators:

- Model a given problem with a linear equation; and solve the equation, using concrete models, e.g., counters, integer tiles
- Verify the solution to a given linear equation, using a variety of methods including concrete materials, diagrams and subtraction
- Draw a visual representation of the steps used to solve a given linear equation, and record each step symbolically
- Solve a given linear equation symbolically
- Identify and correct an error in a given incorrect solution of a linear equation

Timeline: 3 55-minute classes

Day 1: One-Step Linear Equations – Concretely and Pictorially

Day 2: Apply the opposite operation

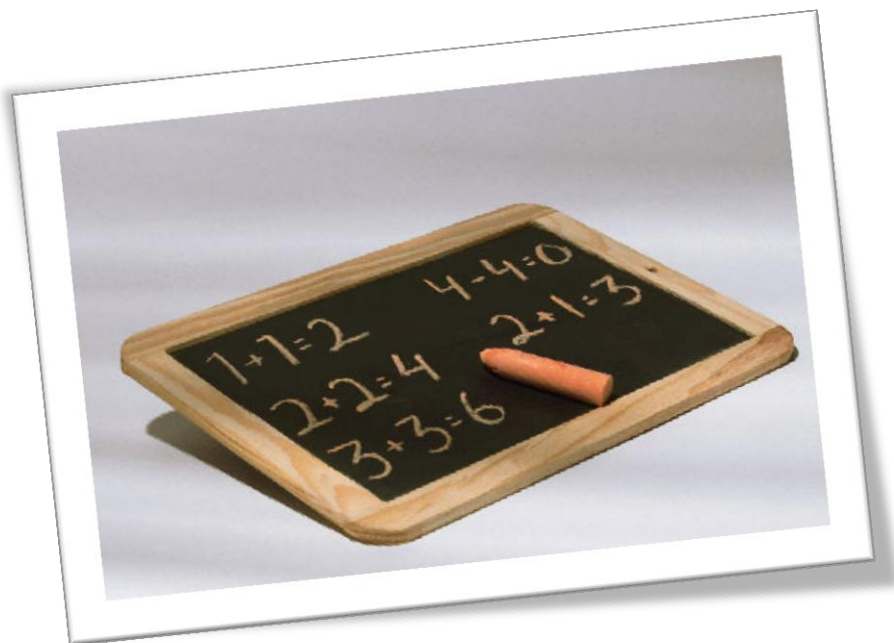
Day 3: Identify and Correct errors in incorrect equations, and practice working with one-step equations.

Objective: By the end of this lesson of 3 days, students will be able to solve one-step linear equations using a variety of methods and show how they worked out the answer.

Required Materials:

Candies, Plastic Easter Eggs
 Algebra Tiles
 Online Algebra Tiles
 Square paper
 Computers with internet access
 Photocopied Materials:
 Anticipatory Sets, Notes Sheets, Assignments
 Answer Key to assignments
 Additional Assignment (if needed)

DAY 1



Lesson

Anticipatory Set

Algebra Tiles

Student Notes

Anticipatory Set: Peter Cotton Tail's Linear Equation

See attachment

The purpose of this activity is to relate the concept of **variables** to actual numerical values (in this case the value is the amount of candies per egg). Students work in groups of 2 to decipher Peter Cotton Tail's Linear Equation by finding the value of x . Students can verify their answer by counting the candies in each plastic egg.

Main Lesson Day 1: One-Step Linear Equations – Concretely and Pictorially

- Objective:** To solve one-step linear equations concretely and pictorially, using algebra tiles and diagrams. Students will also solve a linear equation, showing all work and providing step by step instructions.
- Materials:** For students: Peter Cotton Tail Sheet, Eggs and Candy (in groups of 2) algebra tiles, notes sheet, assignment.
For Teacher: Smartboard algebra tiles:
http://my.hrw.com/math06_07/nsmedia/tools/Algebra_Tiles/Algebra_Tiles.html
- Procedure:** Pass out the Anticipatory Set packages to each student. The plastic eggs and candies are to be shared in groups of 2. Pass out individual algebra tile packages to each student. Allow the students a moment to play with and sort their tiles. Remind the students that when the lesson starts they must focus on the lesson and use the tiles for solving the equation, rather than playing with them.

During the discussion allow time for students to make their own notes on their notes sheets provided (see attachment)

Invite the students to share their definitions of **Equations**. What was Peter Cotton Tail's equation?

Have the students recall the definition of a **variable**. What was the variable in the Peter Cotton Tail activity?

Ask the students how they come to their answers. Most students likely did it by **Inspection Method**. They likely asked themselves what number multiplied by 3 equals 18.

Next, ask the students to recall the definition of **Linear Equations**, in their own words, from last class. Challenge the students to write out the linear equation from the Peter Cotton Tail Activity. Walk around the room to check for correct equation. Remind the students that there must be an **equal sign** with values on either side. Encourage the students to **set up their problem** with the eggs and candies again. Ask the students how we can represent the candies in each egg without

Equation

A mathematical statement with two expressions that have the same value. The two expressions are separated by an equal sign.

Variable

A letter that represents an unknown number

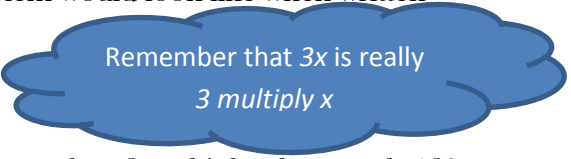
Linear Equation

An equation that when graphed, results in points that lie along a straight line

giving away the answer? Could we give it a symbol? What do we call that symbol? (A **variable**)

Show the students on the white board what the Peter cotton Tail Problem would look like when written out as a linear equation:

$$3x = 18$$



Remember that $3x$ is really
3 multiply x

Inspection Method: we can figure out what the value of x is by asking ourselves 3 multiply what equals 18? To do the inspection method we just look at the equation and ask ourselves what the value of x would have to be to make it correct.

Write a new problem on the white board for the students to solve by inspection (Instruct students to do this question on their notes sheet, encourage the students to fill in the “Things to remember” section in their own words for future reference):

$$5x = 15$$

Solution: 5 times what equals 15? 3, $x=3$

Show the students that we can **verify** (check) our answers by “**plugging it in**”. We just substitute our answer (3) for the x and then get the correct solution (15)

Give the students a new question to solve by inspection. This question can also be put on their notes sheet.

$$x/2 = 6$$

Solution: What divided by 2 equals 6? Or 6 times 2 equal what? 12, $x=12$

Show the students that we can **verify** (check) our answers by “**plugging it in**”. We just substitute our answer (12) for the x and then get the correct solution (6)

Before moving on to the next method, ask the students if they like this method? Do they think there is an easier one? Would this method always be possible? What if the numbers were too big to do in our head?

Have the students complete the **Inspection Method** section on their student notes sheet.

Algebra Tiles (Models and diagrams Method): have the students clear their work space and bring out their algebra tiles. Share the legend with the students.

Long red tiles: positive variable
Long blue tiles: negative variable
Black square: (+1)
White Square: (-1)

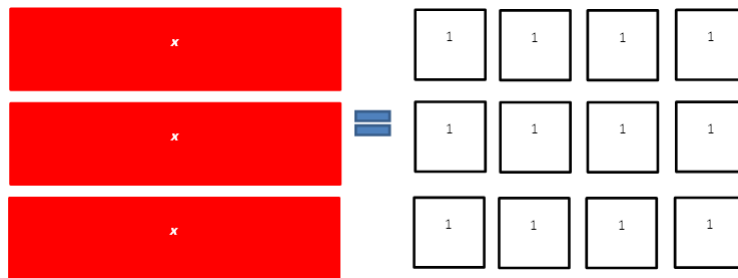
Before using the algebra tiles, have the class recall the rules for multiplying and dividing integers, if students wish to, they can quickly write the rules on their notes sheet:

$$\begin{aligned} (+) \times (+) &= (+) \\ (-) \times (-) &= (+) \\ (+) \times (-) &= (-) \\ (-) \times (+) &= (-) \end{aligned}$$

Give the students a problem on the whiteboard and ask them to represent the equation with their integer tiles:

$$3x = -12$$

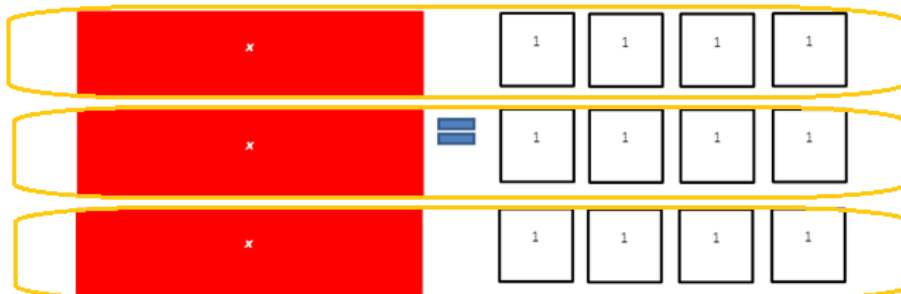
The equation should look like this:



The 3 long red bars (positive variable tiles) represent $3x$. The 12 white tiles (negative) represent -12 . We know that the three variable tiles must have the same value as the 12 negative tiles (because of the equal sign). Each variable tile must have a value of 4 negative tiles.

$$x = -4$$

Show the students your reasoning by making three groups of negative 4



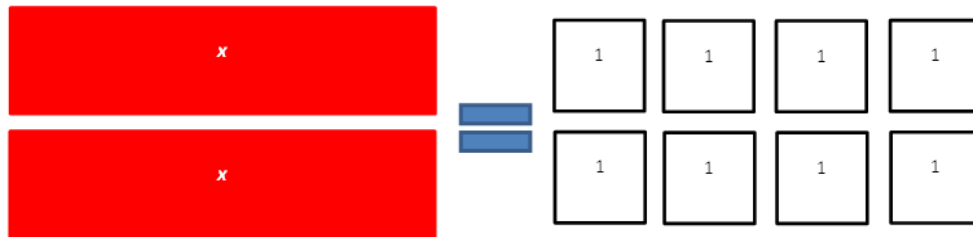
We can also check our answers by “**plugging it in**”. Show the students that when you take our answer of (-4) and substitute it in for the x , we get the correct answer (-12).

Instruct the class to sketch this into their student notes sheets in the “**Algebra Tiles**” section.

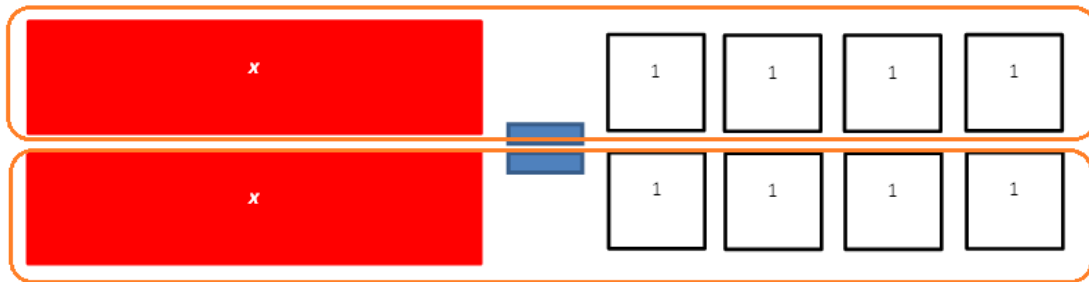
Put up another question on the whiteboard for the students to practice with the algebra tiles:

$$2x = -8$$

Solution: Their tiles should look like this:



The students should be able to make 2 groups of negative 4, like this:

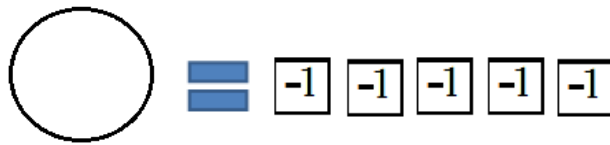


Ask the students if they like this method? Would it work for every type of question? What if we were working with really big numbers? Encourage the students to fill in the “Things to remember” section of their algebra tiles notes.

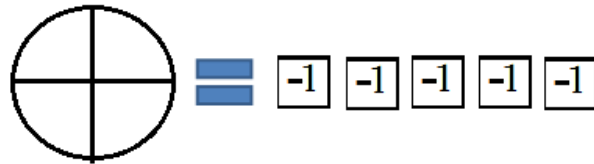
Diagram (Models and Diagrams Method): Tell the students you have another method for them to try before we move on. The Diagram method can be used in place of the algebra tiles, and is better for representing division equations. Provide the students with the equation:

$$\frac{-x}{4} = -5$$

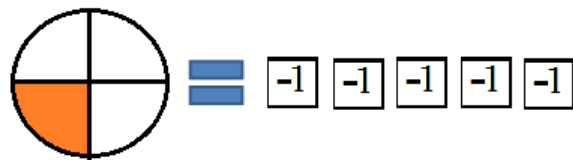
Solution: we start out by drawing one circle to represent $(-x)$



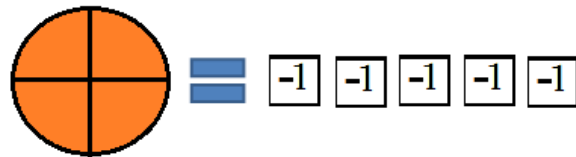
Since $-x$ is divided by 4, we need to divide the circle by 4:



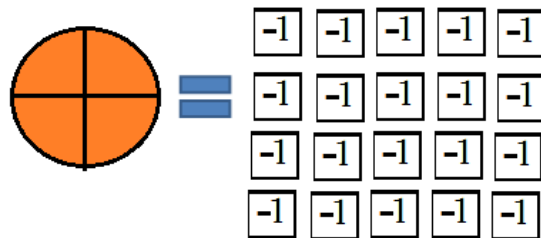
We then shade in only one section of the circle, since it is divided by 4, so we colour one of the 4ths



Since we want to find the value of $(-x)$ we need to fill in the rest of the circle. We must multiply that one section of the circle by 4...



Since we multiply one side by 4, we must do the same to the other side of the equation

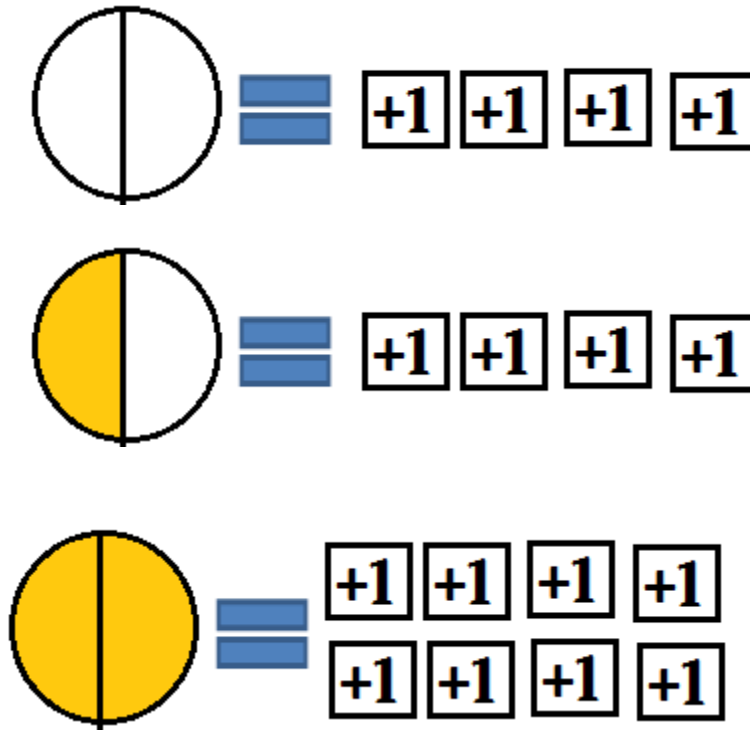


We now know that $-x = -20$. How do we get rid of those negative signs? Since they both have negative signs in front of them then we can multiply both sides by positive 1. The answer is 20, $x = 20$

Give the students time to copy this into their note sheet in the “Diagram” section. Give the students a new question to solve for by drawing their own diagrams:

$$\frac{r}{2} = 4$$

Solution: the finished diagram may look like this:



$$r = 8$$

Wrap-up: invite the students to ask question now if they have them. When all concerns have been addressed, hand out the exit cards to each student.

Exit cards: challenge the students to solve the one-step linear equation but using which ever method they prefer. However, they must write out their steps as they solve the problem. Tell the students that they are to be as descriptive as possible, as if they were writing out instructions for someone who didn't know how to solve one-step equations. (See Attachment)

Day 1: Anticipatory Set

Peter Cotton Tail's Linear Equation

Peter Cotton Tail has gotten a little creative this Easter, and has made a challenge for you! He has left you **3 plastic eggs**. Inside each egg is an unknown amount of candies. Each egg has the same amount of candies. Mr. Cotton Tail has also given you **18 candies that are not in eggs**.



Arrange your eggs and individual candies on this diagram to figure out how many candies are in each egg.

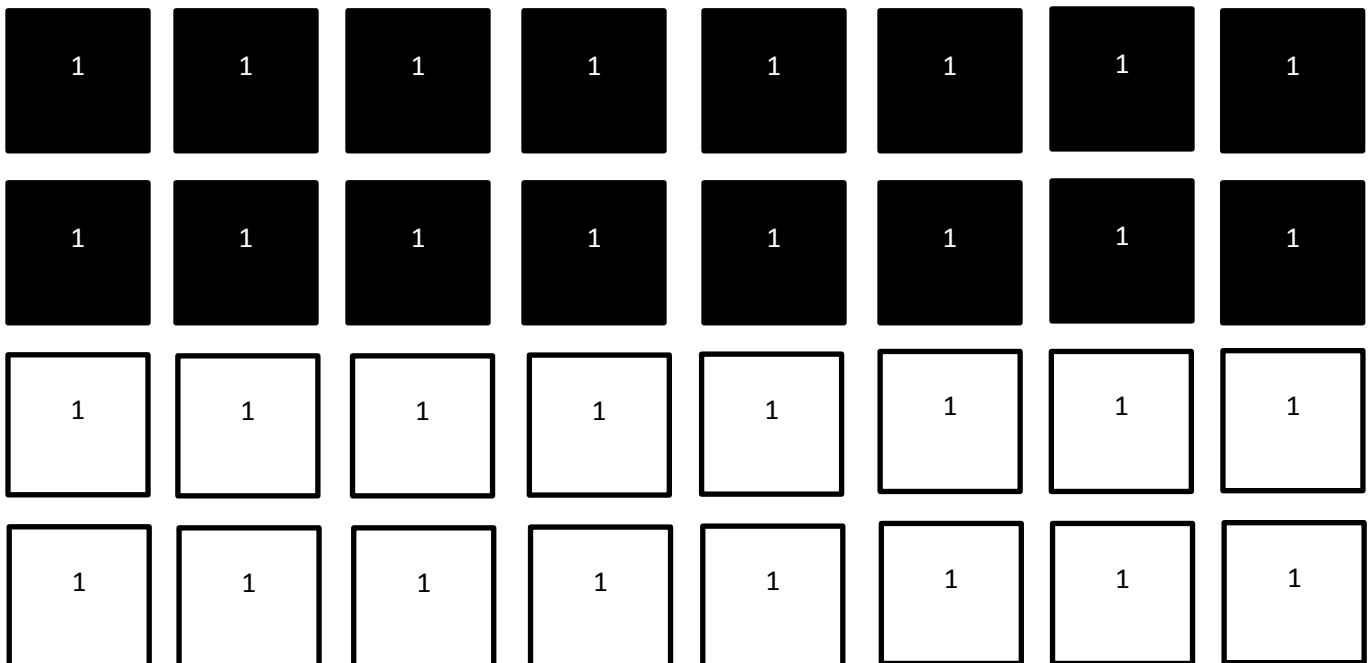
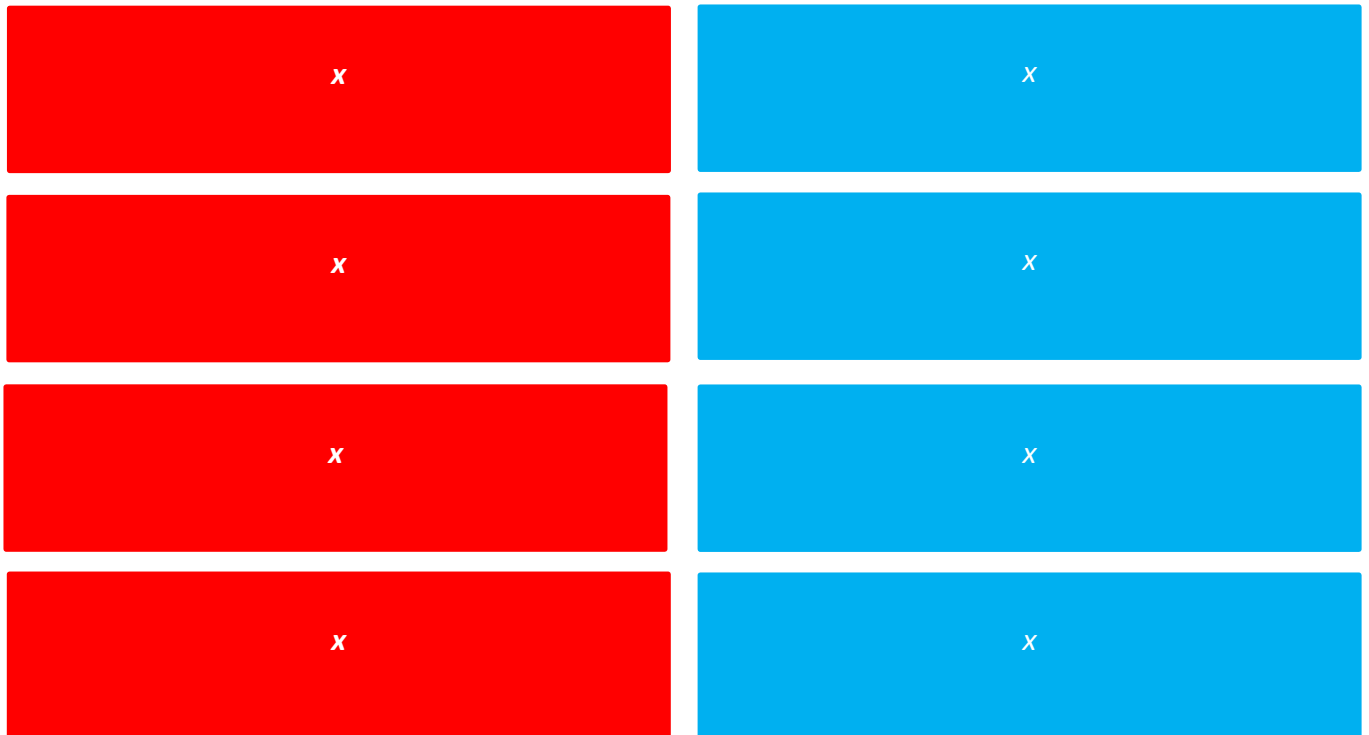
Place Plastic Eggs Here



Place Individual
Candies Here

Please use this space to describe how you figured out how many candies were in each egg.

Day 1: Printable Algebra Tiles



Long Red Bar represents a positive variable

Long Blue Bar represents a negative variable

Black Square represents +1

White Square represents -1

Day 1: Student Notes Sheet

Definitions

Equation:

Variable:

Linear Equation:

Solving One-Step Linear Equations

Inspection Method

Example:

Example:

Things to remember:

Algebra Tiles

Example:

Things to remember:

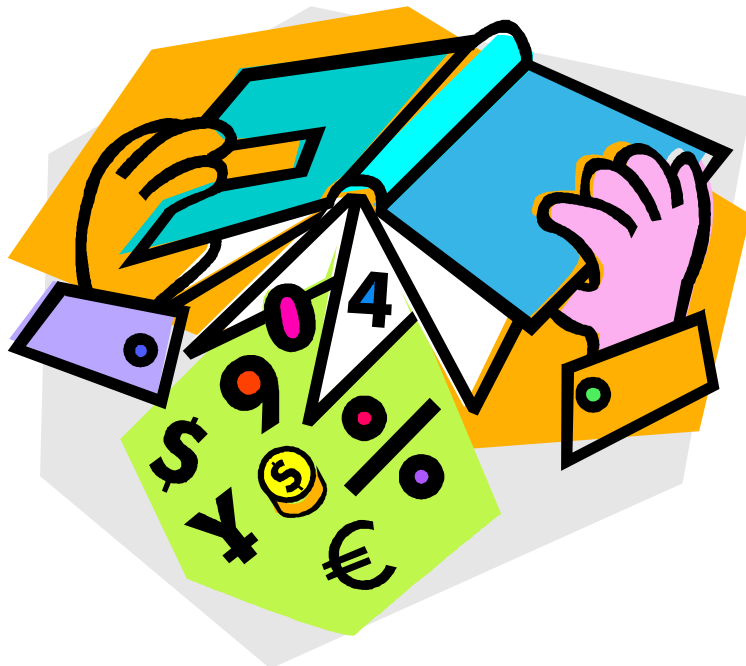
Day 1: Student Notes Sheet (continued)

Example:

Diagram

Example:

Things to remember:



Day 1: Exit Cards

Solve for x , and provide detailed steps/instructions...

$$-3 = x/4$$

Name: _____

Date: _____

Solve for x , and provide detailed steps/instructions...

$$-3 = x/4$$

Name: _____

Date: _____

DAY 2



Lesson

Anticipatory Set

Student Notes

Anticipatory Set: Chatty Cathy

Chatty Cathy has been chatting up a storm! She has Bieber Fever and has been calling a VERY expensive Justine Bieber hotline. The students are given the details of the fees and are challenged to figure out how many minutes she spent on the hotline by creating their own linear equation for the problem.

The purpose of this anticipatory set is to challenge the students to create their own linear equation for a given word problem. Students are allowed to work in pairs. There is also a hint provided for students to use a guide for when creating their linear equation. After the students have completed their challenge briefly go over it as a class and discuss strategies that students used to solve the problem.

***Optional:** Have a Justin Bieber song (clean version) playing in the background. When the song is over, the students' time is up to work on the assignment.

Main Lesson Day 2: Apply the opposite operation (One-Step Linear Equations)

Objective: To be able to solve a given one-step linear equation symbolically and verify the answer.

Materials: **Photocopied Materials for each student:** Chatty Cathy Sheet (Anticipatory Set), Day 2 Student Notes Sheet, in class practice assignment.

Teacher: Answer key to anticipatory set, lesson examples and in class assignment

Optional: Justin Bieber song:

<http://www.youtube.com/watch?v=kffacxfA7G4&feature=artistob&playnext=1&list=TLqjiNSBzKtM> (4 minutes long)

Procedure: Start by handing out the anticipatory set assignment to the students. When everyone has settled get them to try the Chatty Cathy Challenge. Remind the students that they only have the duration of the song (or timer) to complete the challenge. Afterwards, briefly go over the solution with the students.

During the main section of the lesson, have the students follow along in their student notes sheets and fill in the missing information

Before beginning the main lesson of the day, have the students recall what they learned last class.

Ask the students:

- What is an **equation**?
 - It is a mathematical statement with two expressions that have the same value. The two expressions are separated by an equal sign
- What is a **linear equation**?
 - It is an equation that, when graphed, results in points that lie along a straight line
- What is a **variable**?
 - It is a letter that represents an unknown number
- What are the **three methods** that we learned last class?

- Inspection Method
- Algebra Tiles
- Diagrams
- Have the students **describe** each method/model
 - **Inspection Method:** you solve the equation by looking at it and asking yourself what the variable would have to be to make the expression true.
 - **Algebra tiles:** The long tiles represent the unknown variables, one colour is negative, the other is positive, the small squares each have a value of 1, the black ones are positive, and the white ones are negative
 - **Diagrams:** Draw a circle to represent the variable being divided, we then shade in a section to represent what it is being divided by. Then we multiply both sides to make the variable whole.

Tell the students that you have two more ways to solve one-step equations. The good news is they are both very easy to remember. With this new method when we get a one-step equation we just need to remember to “**apply the opposite operation**” (have students repeat that quote aloud together).

Before we do this though, we need to figure out what “opposite operation” means. First off, ask the students what “opposite” means

- The inverse of something

What does operation mean in math?

- A mathematical calculation (Multiplication, division, subtraction, addition...)

Therefore an **opposite operation** is a mathematical operation that undoes another operation, Subtraction and addition are opposite operations; multiplication and division are opposite operations. Also called inverse operation

Have the students copy the definition for opposite operations in their own words on their student notes sheets.

Inform the students that there is an image of two hearts on their notes. These are there to remind them that “opposites attract”. Ask the students to put a multiplication sign in one heart, and a division sign in the other. This is in their notes to remind them to apply the opposite operation. So if they see multiplication in their expression to be solved, then they will automatically remember to apply the opposite operation (which would be dividing).

Show the students an example of **dividing to apply the opposite operation:**

$$36 = 4d$$

Solution: tell the students the very first step we do is isolate the variable. Ask the students if anyone know what that could mean. Prod the students by asking them what the variable is (d). Then ask them what the word “isolate” means (to be alone). Therefore, we know that “**Isolate the variable**” means to get the unknown amount by itself, with no other values on that side of the equal sign with it.

Have students copy down their own definition of “**isolate the variable**”: to get the variable by itself on one side of the equation

$$36 = 4d$$

Isolate the variable: we want to get the d by itself, so we have to get rid of the 4. Ask the students to identify what the 4 is doing to the d. The 4 is multiplying the d. Therefore the operation that we are looking at is multiplication. To get the 4 away from the d we must “apply the opposite operation” (get the students to repeat that quote aloud as a class to reinforce it) Ask the students what the opposite operation will be in this situation (divide).

Therefore we know that we need to divide “4d” by 4 to get the d by itself. However, before we do that we must remember that **what we do to one side we MUST to the other**. Therefore, we know that we also have to divide 36 by 4

$$\frac{36}{4} = \frac{4d}{4}$$

Now we just divide 36 by 4, (9) and 4d by 4, (d). Show the students how you cross out both fours on the right side because you are really dividing 4 by 4, which would result in 1, so when we see the d by itself, it could have a 1 in front of it, however it is not necessary.

$$9 = d$$

We know have our answer, $d = 9$. The value of the variable is 9.

Congratulate the class for solving the equation. Now remind them that they are not quite done, we must always verify our work. To do this we can just use substitution. We need to go back to the original equation and insert 9 into the spot where we see the variable “d”.

$$36 = 4 \times 9$$

$$36 = 36$$

Left Side = Right Side

Therefore we are correct!

Provide the students with a practice question to do in their notes:

$$6f = -12$$

When all students have completed the question, invite a student to share their answer on the board, and explain the steps they used.

Solution: first we must isolate the variable (f). We ask ourselves what 6 is doing to the f (multiplying). Therefore, we know we need to “apply the opposite operation” (have the students recite the quote together as a class. The opposite operation is dividing, but “what we do to one side we **MUST** do to the other” (have the students say that quote out loud together to reinforce it). So, we will divide 6f by 6 and -12 by 6.

$$\frac{6f}{6} = \frac{-12}{6}$$

$$f = -2$$

We now have our solution, $f = -2$. Remember though, that we must verify our answer by going back to the original question and replacing the variable with the value of -2.

$$6 \times -2 = -12$$

$$-12 = -12$$

Right Side = Left Side

We are correct!

The second part of the “**apply the opposite operation method**” is **multiplying** when the equation has division in it. Provide the students with an example to work with:

$$\frac{b}{-5} = 6$$

Ask the students what we need to do? (Isolate the variable)

So we need to get that -5 away from the b. Since we see division, what do we know we have to do to get rid of it? (Apply the opposite operation - Have the students repeat this out loud together)

What is the opposite operation of division? (Multiplication)

Therefore, to get rid of the -5 on the left side, we can just multiply it by -5. Ask the students to complete the phrase: What we do to one side we must? _____ (do to the other). So, since we multiplied the left side by -5, we must do the same on the right side.

$$-5 \times \frac{b}{-5} = 6 \times -5$$

$$b = -30$$

We now have our answer: $= -30$. But, as always, we must verify our answers. To verify our answers, we just substitute our answer in for the variable in the original question.

$$\frac{-30}{-5} = 6$$

$$6 = 6$$

Left Side = Right Side

We are correct!

Provide the students with another practice problem to solve and add to their notes:

$$-7 = \frac{x}{-5}$$

Solution: first we must isolate the variable. The variable (x) is being divided by -5. We have to get that -5 out of there, so the opposite of division is multiply. Therefore, we must multiply $\frac{x}{-5}$ by -5. Remember, what we do to one side, we must also do to the other side. So, we must also multiply -7 by -5.

$$-5 \times -7 = \frac{x}{-5} \times -5$$

$$35 = x$$

We have solved for x, now we must verify our answer. Substitute our value for the x in the original question

$$-7 = \frac{35}{-5}$$

$$-7 = -7$$

Left Side = Right Side

We are correct!

Ask the students if they have any more questions before we start the in class assignment. Hand out the assignment (see attached). The students have the remainder of the class time to complete the assignment. If students do not finish in time it is to be assigned as homework.

Day 2: Anticipatory Set

Chatty Cathy

Cathy has been talking way TOO much on her cell phone! She has racked up a huge bill, and her parents aren't impressed! She has been calling a Justin Bieber hotline, which gives her all the latest news on the Biebs! Chatty Cathy thinks it's great, but the hotline charges \$3.00 for every minute she is on the line! The bill for the Bieber hotline came to \$330.00!

How many minutes did Chatty Cathy stay on the Justin Bieber hotline for?

Hint: use a one-step linear equation to figure it out...

It may look like: $ax = b$ or $\frac{x}{a} = b$

Use the space below to figure out your equation and solution...



A large, empty rectangular box with rounded corners and a black border, intended for the student to write their equation and solution.

Day 2: Student Notes

Definitions

**Opposite
Operation:**

**Isolate the
variable:**

Divide to Apply the Opposite Operation**Example:****Things to Remember:****Hints:**

- Apply the opposite operation!
- What you do to one side you **MUST** do to the other!

Day 2: Student Notes (Continued)



Multiply to Apply the Opposite Operation

Example:

Things to Remember:

REMEMBER!

We must verify (check) our answers after solving an equation.

To do this, go back to the original question and just substitute (replace) your answer in for the variable.

Example:



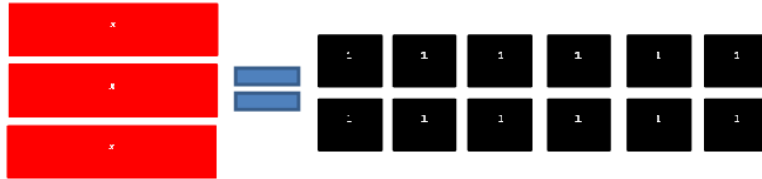
Day 2: In Class Assignment

Total: /10

Name: _____

Please complete this assignment in class.

- 1) Write the equation modelled by the diagram, and solve for x:



Equation: _____

x = _____

/2

- 2) Draw a diagram for this equation, and solve for x:

$$\frac{x}{-2} = -8$$

/2

- 3) Use the Opposite Operation to solve these equations:

a) $\frac{y}{5} = -4$

/2

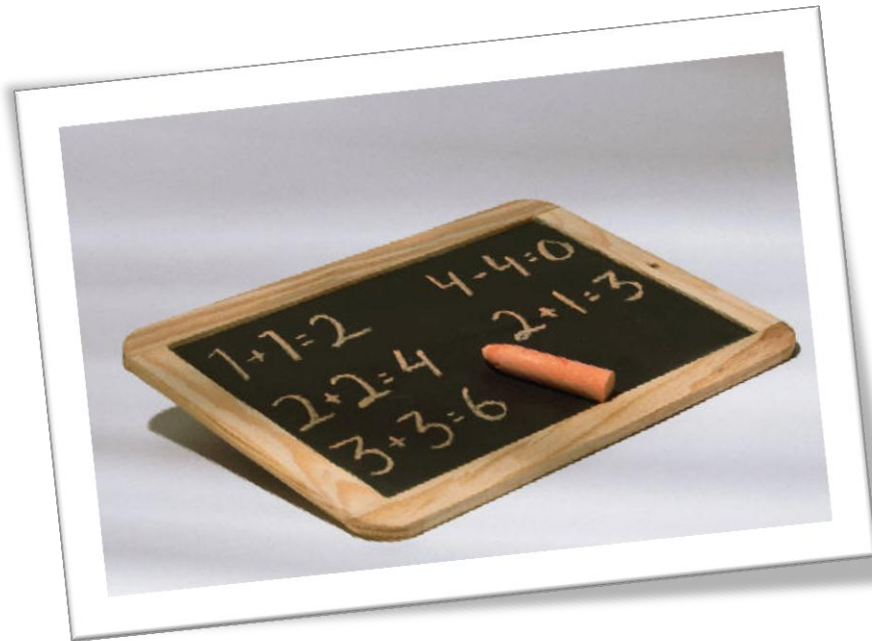
c) $12 = \frac{x}{-10}$

/2

b) $-1 = \frac{b}{10}$

/2

DAY 3



Lesson

Anticipatory Set

Station Instructions

Anticipatory Set: Encrypted Message (See Attached)

The students are given a riddle and challenged to find the answer. By solving the linear equations and then placing the variables (letters) above their correct value the message will be revealed!

The purpose of this activity is to provide the students with more practice with solving one-step linear equations.

Main Lesson Day 3: Identify and Correct errors in incorrect equations, and practice working with one-step equations.

Objective: For students to strengthen their skills in solving one-step linear equations and to identify and correct an error in an incorrect equation.

Materials: Photocopied material for students: anticipatory set,
Premade list of student groups for Equation Stations (3 groups)
Online timer: <http://www.online-stopwatch.com/>

Procedure: Begin the class by handing out the anticipatory set sheets to each student. Put a timer on the Smartboard to let students know how much time they have to complete the assignment.
As students are working on the anticipatory set, set up the stations that will be used for the second part of class. The stations are:

- On-line games
- Creating a foldable
- Work Sheet

After Students complete the anticipatory activity, begin the main lesson on identifying and correcting errors in work.
After the main lesson is done

Congratulate the students for solving the secret riddle. Inform the students that you have another challenge for them. We will be detectives looking for errors in the incorrect work done on one-step linear equations.

Identifying Errors

Begin by showing the students a sample of incorrect work on the smart board:

$$\frac{n}{9} = -4$$

$$\frac{n}{9} \times (-9) = -4 \times (-9)$$

$$n = 36$$

Ask the students what the first step is?

- Apply the opposite operation

What is the opposite operation?

- Multiply

So we know we need to multiply by 9, was this done correctly?

- No, they multiplied by (-9) rather than (+9)

Since they multiplied by negative 9, we are left with an incorrect answer. What should the answer really be?

- Negative 36

That's right; we know that a positive multiplied by a negative will result in a negative answer!

We have to verify our answer. We must substitute our answer in the original question for the unknown variable.

$$\frac{-36}{9} = -4$$

$$-4 = -4$$

Left Side = Right Side

We are Correct!

Provide the students with another example of incorrect work. Have them identify and correct the problem individually in their note books.

$$3b = -15$$

$$3 \times 3b = -15 \times 3$$

$$b = -45$$

After the students have corrected and completed the question, invite a student to show their solution on the board.

Solution: The person doing the question didn't apply the opposite operation. Instead they tried to perform the same operation. We need to divide both sides by 3, rather than multiplying.

$$3b = -15$$

$$\frac{3b}{3} = -15 \div 3$$

$$b = -5$$

We have to check that our answer is right by verifying. We substitute our answer in for the variable in the original question

$$3 \times (-5) = -15$$

$$-15 = -15$$

Left Side = Right Side

We are correct!

Equation Stations

Explain to the students that the rest of the class will be spent doing stations to improve and test our equation skills. The class will be divided into three groups and will only have 10 minutes at each station. Explain each station to the whole class before dividing them into their groups. Each station should also have printed instructions in case the students are unclear on some points. **(See Attached)**

Station 1: On-Line Games

For the games station there will be a bank of 10 computers with access to the internet. Provide a list of approved games that can be played at this station. Firmly remind the students that computers are to be ONLY used for the approved games.

Station 2: Foldable

At this station each student needs one square sheet of paper, to create their own study guide. There is an example one at the station for referencing. Use the text book and your own student notes to add the content.

Station 3: Worksheet

The purpose of this station is to see how well you understand the material. This assignment must be done individually. When the time is up put it in the envelope on the center of the table.

Watch the time to be sure that all students have time to visit each station. Use the worksheets as a form **of summative assessment** to gauge how well each student understand the concept.

Conclude the lesson by asking the students to clean up the materials at their stations. Congratulate the students on a job well done in one-step equations. Inform the students that next class we will be learning how to do two-step equations.



Day 3: Anticipatory Set

What did the 0 say to the 8?

Secret Encrypted Message



Linear equations can be used to encrypt secret messages. Solve the questions below, and write each variable overtop of their correct value on the blanks below to solve the secret question...

Question: what did the 0 say to the 8?

$$3l = 18$$

$$8t = 40$$

$$6i = 54$$

$$4c = 28$$

$$\frac{n}{10} = 4$$

$$\frac{e}{9} = 7$$

$$\frac{b}{6} = 7$$

40

9

7

63

42

63

6

5

Day 3: Equation Stations**Station 1: On-Line Games**

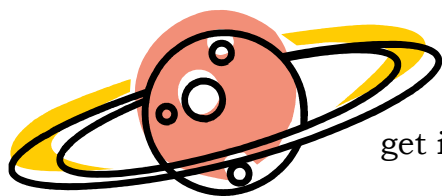
At this station you have the opportunity to check out all of the games on this list, or just one. It is your choice.

Remember: the computers are to be only used for the playing the games on this list. If someone chooses not to play one of the games and do something else on the computer they will be removed from station time and required to sit at their desk and complete an assignment individually.

Approved Games to try out:

Basket Ball Game: When you correctly solve the linear equation take a shot and see if you can score!

<http://www.math-play.com/One-Step-Equation-Game.html>

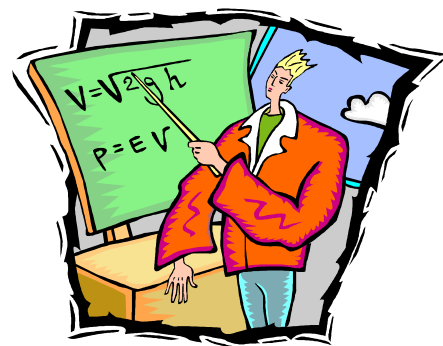


Planet Blaster: Solve the one-step linear equations, if you get it right then you get to blast a planet!

<http://www.aplusmath.com/Games/PlanetBlast/index.html>

Equation Match: Solve the equations to play this matching game. Very cool!

<http://www.bbc.co.uk/education/mathsfile/shockwave/games>



Post Man Phil: Help Post Man Phil by solving the equations on the door of each homeowner using the value they show you in the window.

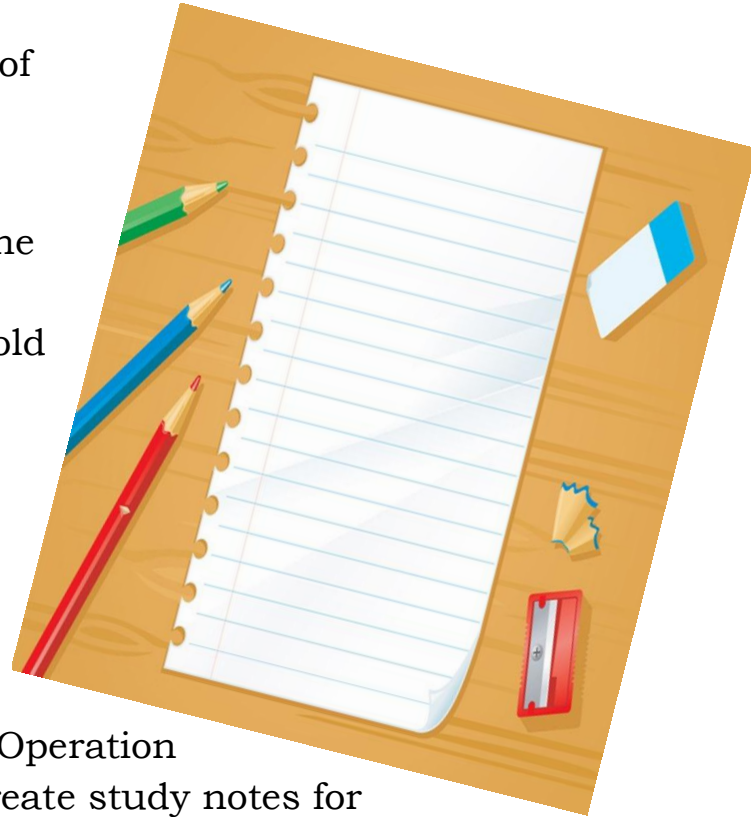
<http://www.bbc.co.uk/education/mathsfile/shockwave>

Day 3: Equation Stations

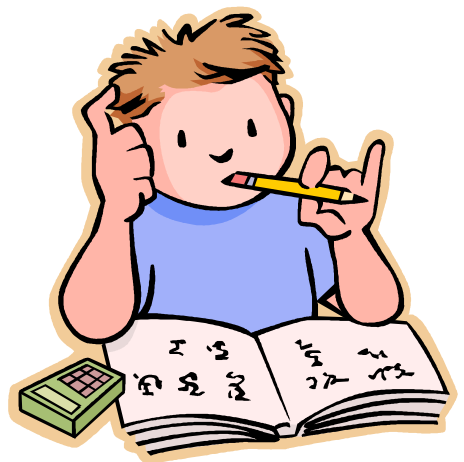
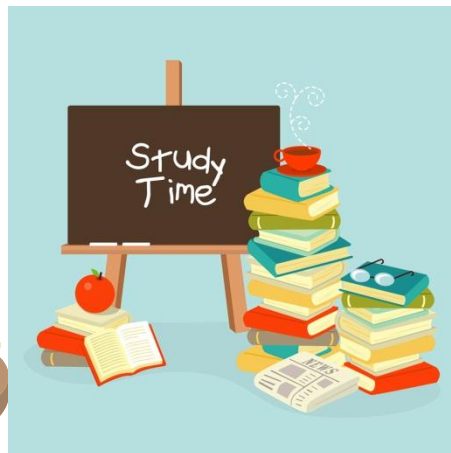
Foldable Study Guide

At this station you each need one piece of square paper

1. Fold the paper in half diagonally
2. Open, and fold in half diagonally the other way
3. Open, now lay the paper flat and fold the corners into the center
4. Now you have four flaps
5. Label your four flaps like this:
 - a. Model
 - b. Diagram
 - c. Multiply to Apply the Opposite Operation
 - d. Divide to Apply the Opposite Operation
6. Use you text books and notes to create study notes for each of the four topics. Your information should go under each flap in the appropriate spot



***** If you have any problems please see the example at the station!!**



Day 3: Equation stations

Worksheet: please do this worksheet to the best of your ability. The teacher will be using it to check up on how well you understand the concept.

Please solve for the unknown variable:

1) $72 = -9t$

8) $\frac{y}{5} = -7$

15) $\frac{w}{-2} = -6$

2) $-48 = -4c$

9) $16 = \frac{x}{3}$

16) $-6 = \frac{p}{7}$

3) $8f = -56$

10) $2 = \frac{w}{24}$

17) $4 = \frac{r}{7}$

4) $-6 = \frac{n}{21}$

11) $\frac{y}{-6} = -2$

18) $32 = 8x$

5) $\frac{t}{3} = -12$

12) $-5x = 25$

19) $\frac{t}{9} = 6$

6) $13 = \frac{g}{6}$

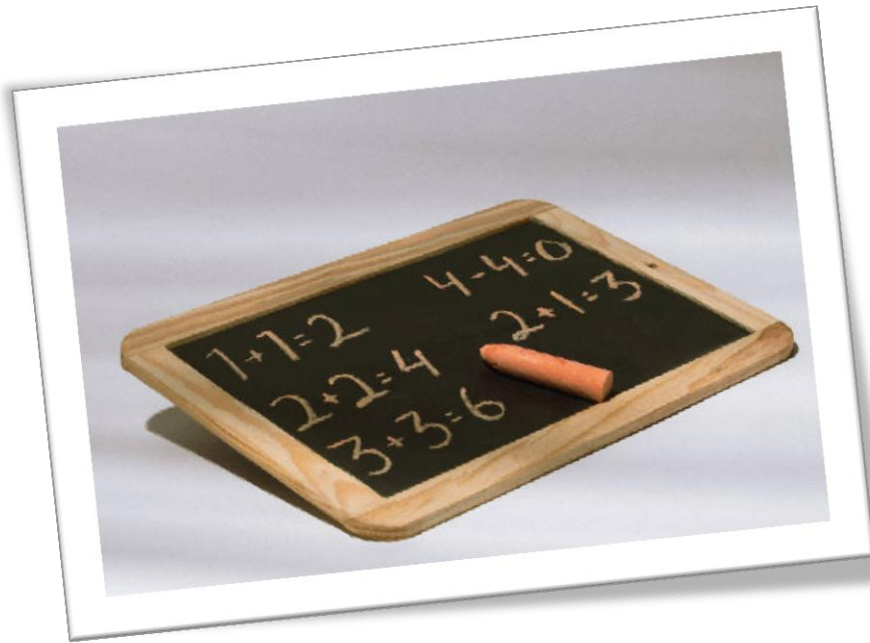
13) $36 = 18c$

20) $49 = 7y$

7) $12 = \frac{h}{-10}$

14) $\frac{n}{3} = -7$

Unit Project



Assignment

Rubric

Exemplar

Unit Project

FUN and Games

With One-Step Linear Equations

Grade 8 students; you have been challenged by **Wild Wendy's Fun and Games** (a new local game company) to create a game that tests its players' skills for **solving linear equations**. You need to create a game for grade 8 students to play as a **review tool** for their **linear equation unit**. Here is what Wild Wendy wants each game to have:

- An interesting **title** that makes students want to play
- A full set a **rules and instructions** for game play
- At least **15 questions that cover AT LEAST TWO** of the topics in our unit:
 - Evaluating Algebraic Expressions
 - Solving and Verifying One-step Equations
 - Solving and Verifying Two-Step Equations
 - The Distributive Property
 - Word Problems
- Correct answers for each question of your game

The Vitals:

Due: Friday April 1st

You will have **2 periods** of class time to work on your game

Your game can be in any form, as long as it is testing the students about linear equations. Think of your favourite games and add a fun math twist! Here are some examples to help you get the ball rolling:

- Jeopardy
- Bingo
- An on-line game, check this link
<http://www.sploder.com/>
- Candy Land
- Battle Ships
- Cranium
- The game of life
- Trivial pursuit
- Who wants to be a millionaire

Remember:

It doesn't have to be a board game, it could be any type!

Check the rubric on the next page to make sure that you get the top possible marks!

Unit Project

Wild Wendy's Fun and Game's Rubric

	Excellent! (4)	Proficient (3)	Adequate (2)	Developing (1)
Details: title, presentation, spelling and grammar	Interesting title The game is visually appealing and well decorated Less than 5 spelling and grammar mistakes	Appropriate title The game has some decorations Less than 7 spelling and grammar mistakes	Title included The game decorations look unfinished Over 7 spelling and grammar mistakes	No Title The game is not decorated Many spelling and grammar mistakes
Rules and Instruction for game play	Rules and instructions are complete and easy to understand	Rules and instructions are complete	Rules and instructions are hard to understand or not complete	Rules and instructions are not included or not complete
Linear Questions with answers (x3)	15 good questions from at least 2 of the topics are included with correct answers	15 questions are included with some incorrect answers	Less than 15 questions are included with answers	Less than 10 questions are included with no answers or incorrect answers



Unit Project Exemplar



Unit Project Exemplar

Kenny's Crazy Bingo Game!

You'll have so much fun learning about linear equations during this game that you're going to want to yell, "BINGO!!!!!!!"



RULES and INSTRUCTIONS

Each player is given a blank Bingo card. Before the game starts the players fill their card with the numbers provided in any order that they wish. If a number appears more than once in the list, they can use it that many times if they chose. However, if an equation is called during the game, and the player has the correct answer twice on their bingo card, they **only get to mark off one!**

After all plays have filled in their bingo cards, they caller will then pull the first question. The caller shows the players the question. The players then have to solve for the unknown variable. If they have that value on their bingo card then the get to mark it off. **PLAYERS MUST WRITE THE EQUATION IN THE BOX THAT HAS THE ANSWER** to prove that that number was called.

The first player with a full line (horizontal, vertical or diagonal) marked off is the winner. That person then becomes the caller and then a new game begins.

GOOD LUCK!



Number List:

This is the selection of numbers that you have to choose from. If a number appears more than once then you can use it that many times on your bingo card if you wish. Numbers that appear once can only be used once



2	-3	-3	4	3	-4
-5	5	10	8	-60	81
99	20	-75	48	30	-24
35	-10	4	2	-5	12
10	3	12	12	4	-2

B	I	N	G	O
		FREE SPACE		

Bingo Caller Questions:

$-22 = -11x$	2
$6r = -18$	-3
$-5t = 15$	-3
$-8 = 2x$	4
$7x = 21$	3

$$-12 = 3r$$

$$-4$$

$$5n = -25$$

$$-5$$

$$45 = x9$$

$$5$$

$$-3x = -33$$

$$10$$

$$56 = 7r$$

$$8$$

$$\frac{t}{2} = -30$$

-60

$$\frac{x}{-9} = -9$$

81

$$\frac{r}{11} = 9$$

99

$$\frac{x}{5} = 4$$

20

$$\frac{m}{3} = -25$$

-75

$$-6 = \frac{r}{-8}$$

48

$$15 = \frac{r}{2}$$

30

$$-12 = \frac{r}{2}$$

-24

$$-7 = \frac{w}{-5}$$

35

$$-1 = \frac{b}{10}$$

-10

$4r - 2 = 14$	4
$6r + 6 = 18$	2
$4x + 6 = -14$	-5
$3x + 9 = 45$	12
$3x + 9 = -21$	10

$$5 + 5x = 20$$

$$3$$

$$2x + 5 = 29$$

$$12$$

$$-3x + 4 = -32$$

$$12$$

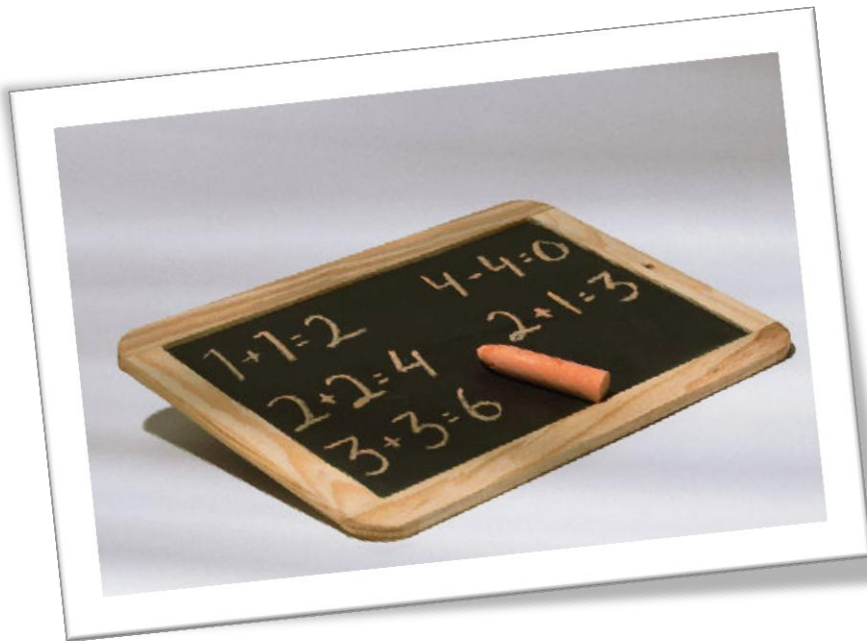
$$39 + 9g = 75$$

$$4$$

$$29 = -14n + 1$$

$$-2$$

Unit Review



Glossary of terms used for One-Step Equations Lesson Plan

Equation: a mathematical statement with two expressions that have that same value. The two expressions are separated by an equal sign. For example: $2x = 3$, $\frac{a}{3} = 5$

Linear Equation: an equation that, when graphed, results in points that lie along a straight line.

Opposite Operation: “undoes” another operation. Examples are subtraction and addition; and multiplication and division. They can also be called inverse operations.

Variable: a letter that represents an unknown number.

Isolate the variable: means to get the variable by itself on one side of the equation

**** Terms from Mathlinks 8 text book****



Annotated Bibliography of Resources

Alberta Education Program of Studies, Mathematics 8

http://education.alberta.ca/media/645598/kto9math_ind.pdf

This website was essential in creating this lesson plans. It is the law that teachers use the program of studies to create their lesson plans to ensure that all students meet the required learning outcomes

Foldables:

<http://newsouthvoices.uncc.edu/files/nsv/institute/Foldables.pdf>

This pdf document is 12 pages with plenty of different types of foldables to use in your classroom.

Interactive **Algebra Tiles** to be used on the smart board:

http://my.hrw.com/math06_07/nsmedia/tools/Algebra_Tiles/Algebra_Tiles.html

This website offers a tool to represent linear equations through algebra tiles. This goes nicely with the physical tiles that students may use individually on their desks.

Math Jokes:

<http://www.math.ualberta.ca/~runde/jokes.html>

This website boasts many jokes and riddles that can capture the attention of your math students. We used this site to find the riddle for the Day 3: Anticipatory set.

One-Step Linear Equation On-Line Games

<http://www.math-play.com/One-Step-Equation-Game.html>

<http://www.bbc.co.uk/education/mathsfile/shockwave/games/postie.html>

<http://www.aplusmath.com/Games/PlanetBlast/index.html>

On-Line Timer/Stop watch

<http://www.online-stopwatch.com/>

This is a great site that features many virtual stopwatches to use in your classroom. The bomb one is particularly fitting for the Day 3: Anticipatory Set. It adds a sense of urgency and may encourage students to get their work done, rather than doing off task activities.

Resource Website

<http://classrooms.tacoma.k12.wa.us/stadium/eschlytter/index.php?section=links> This website boasts a large collection of resources for teaching and learning about linear equations.

Text Book:

MathLinks 8, McGraw-Hill Ryerson. This text book was a valuable resource in creating this lesson plan.

