

SOLVING EQUATIONS: HOW SWEET IT IS!

GRADES 8–10

LORINDA DEVAIES

OVERVIEW:

In this lesson, students will have the opportunity to solve linear equations with variables on both sides using a hands-on approach. By modeling equations with candy and gum, students will find that they can have fun solving equations.

ITV SERIES:

The Power Of Algebra #1: Inverse Operations

LEARNING OBJECTIVES:

The students will be able to:

- Realize the usefulness of equations and algebra in solving everyday problems
- Use the addition, subtraction, multiplication, and division properties of equality to solve equations
- Use inverse operations to solve equations
- Solve linear equations with variables on both sides of the equation
- See the advantage of getting variables together first and keeping the variable positive
- Set up models of equations and solve them through a hands-on experience

VOCABULARY:

- Equation
- Opposite
- Inverse operation
- Variable
- Solution

MATERIALS:

FOR THE TEACHER:

- overhead projector
- Cutouts for the overhead that look like candy canes, peppermints and bubble gum



peppermint candy cane = x



flavored candy cane = $-x$



peppermint = 1



bubble gum = -1

Naturally, bubble gum will be negative for the classroom!

You may use algebra tiles instead. You need two different colors to represent positive and negative, and two sizes of each color to represent $x/-x$ and $1/-1$.

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FOR EACH GROUP OF 2-3 STUDENTS:

- 30 peppermint candy canes
- 30 flavored candy canes
- 30 peppermints
- 30 pieces of bubble gum
- balance bar worksheet
- worksheet with problems

PRE-VIEWING ACTIVITIES:

Solve a few simple equations that involve only one operation with the class. Ask your students how many of them have a little brother or sister. Ask what would happen if mom came home tonight and gave their little brother \$10. Ask what they would say (“Where’s my \$10?”) Equations are just like us - they want to be fair. Remember, whatever we do to one side of an equation we must do to the other side to keep it even. I call this the little brother-sister property. Review the idea that we inverse operations to “undo” the problem and solve it. Review the property of opposites by asking what would happen if mom gave them \$10 one day and then charged \$10 for the meals they ate that day. (They’d be back to zero.) This is just like the property of opposites - any number added to its opposite is zero.

FOCUS FOR VIEWING:

To give students a specific responsibility while viewing, tell them that they are about to see how algebra is used to solve problems. Tell them be sure to look for how Holmes uses variables and equations to solve his problem.

VIEWING ACTIVITIES:

Start the video after the credits. (We use this video to catch the interest of the students. The cartoon will make algebra seem more “fun” and less boring.) **Pause** after Holmes says “Algebra, my dear Watson, Algebra.” **Fast Forward** to the teeter-totter (right after

reduction-comparison). **Resume** viewing the video. **Pause** after “so we subtract 150 from both sides of the equation.”

CLASS DISCUSSION:

Ask if anyone has ever been on a teeter-totter or seesaw. Ask them what happens if an extra person gets on one side. What happens if one person suddenly jumps off? (It messes up the balance and may send someone flying or crashing.) That is why it is necessary to do the same thing to both sides of the equation. What would happen if you only did something to one side? (It will change the balance - no longer equal.)

In this problem they are subtracting 150 from both sides. Ask what are some other ways of saying this. (We can **take away 150** from both sides, or we could **add -150** to both sides and still get the same result.)

Resume viewing the video. **Pause** after “no matter how complicated the equation, you can always solve it by getting that variable alone on one side of the equation.”

Fast forward over people and numbers and the New Orleans docks. While fast forwarding, ask the class if they really think Algebra can help solve problems like Holmes said. Tell them to look closely at this next part of the video and see.

Resume viewing the video when the man is at the bridge and the screen shows:

$$X - 150 = 180$$

When they start working the problem

$$4X = X + 12$$

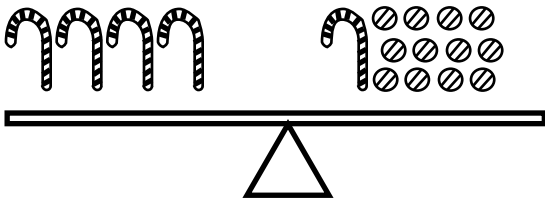
pause when he says “so $X = 4$.”

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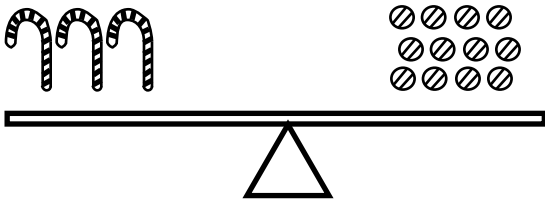
Set up this equation on the overhead to model for the students as they set it up in their groups.

First, agree that peppermint is positive.
 peppermint candy cane = X
 flavored candy cane = $-X$
 peppermint = 1
 bubble gum = -1

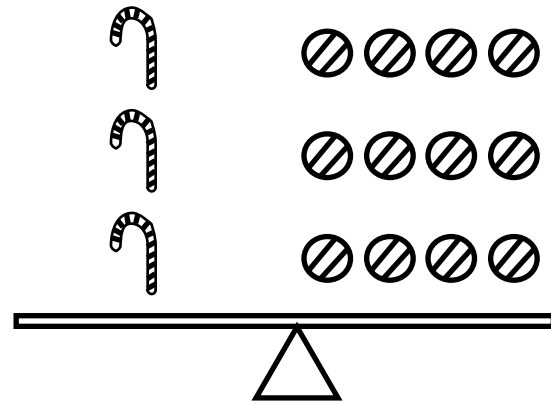
1. $4X = X + 12$



2. Take away from each side (subtract X):



3. Now we are trying to find out what one candy cane is (we want to find X), so divide it up:



From this we can see that:

=

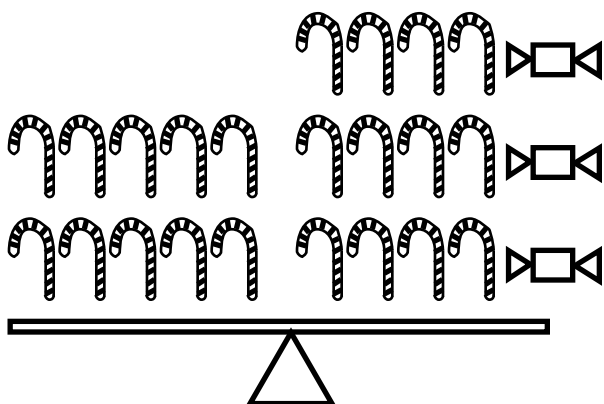
so, $X=4$.

Resume viewing the video. **Pause** when he simplifies the equation to $10X = 12X - 3$ and says “so then 10 times X equals 12 times X minus 3.”

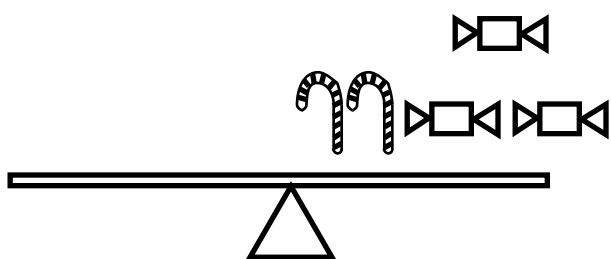
SOLVING EQUATIONS: HOW SWEET IT IS!

Model the equation for the students as they set up the equation with their group.

1. $10X = 12X - 3$

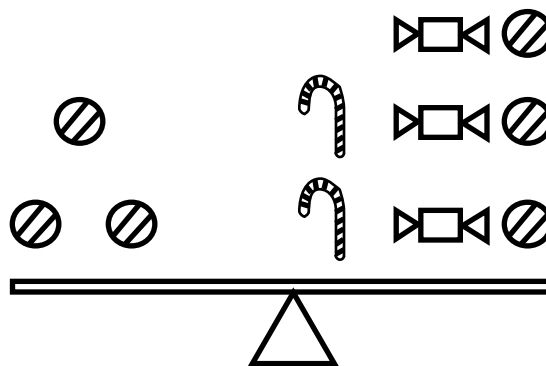


2. Take away 10 candy canes from each side:

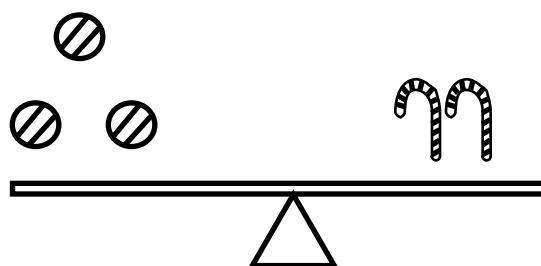


3. We want our candy canes to stay peppermint because we are looking for X , not $-X$. So we add 3 peppermints to each side to get rid of the bubble gum.

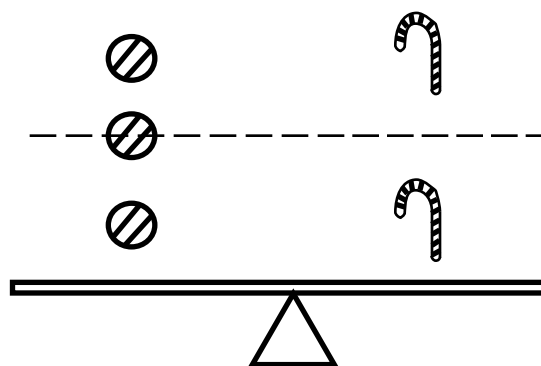
(Remember that $\text{peppermint} + \text{bubble gum} = 0$.)



4. This gives us:



5. When we divide it up we must split the third mint:



So $X = 1 \frac{1}{2}$.

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Resume viewing the video. **Stop** at the end when Watson says “Jump, Holmes!”

POST-VIEWING ACTIVITIES:

Tell the students that they will solve some problems now using their goodie bags. Review the idea that

$$\text{🍬} + \text{🍭} = 0.$$

When we add a peppermint and a bubble gum we get zero and take it off of our problem. We also get zero when we add a peppermint candy cane to a flavored

candy cane. $\text{🍭} + \text{🍬} = 0.$

Remind the students that we want to find out what X is - i.e., we want to get the peppermint candy cane alone - so we need to keep the candy canes peppermint (positive).

Give each group a worksheet of equations to model

and solve with their goodie bag. I usually let my students have a “treat” while they work as long as they don’t eat up all of their numbers and variables!

ACTION PLAN:

- Invite a guest speaker who uses equations in his or her work to come and talk to the class.
- Have each student interview 10 adults and ask them if they ever use equations in their work.

EXTENSIONS:

MORE MATH:

Give the students practical problems to set up an equation and then solve it.

SCIENCE:

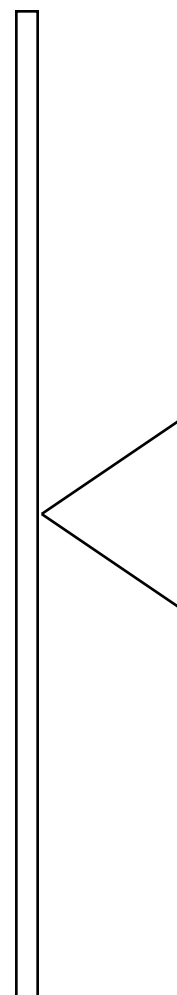
Find out how chemists balance equations by having a chemistry teacher or chemist talk to the class.

STUDENT WORKSHEET

Name: _____

Date: _____

KEEP IT BALANCED!



STUDENT WORKSHEET

Name: _____

Date: _____

SOLVE THESE EQUATIONS:

1. $3X + 4 = 10$

2. $9 = 2a - 1$

3. $5x - 2 = 3x + 4$

4. $7 - 2y = 2 + 3y$

5. $12x = 6x - 6$

6. $6 - 3y = y - 2$

7. $-3a = 4a + 7$

8. $3 + 4y = 3y - 1$

9. $2x + 4 - x = 3x - 6$

10. $2(3 + 2a) = 6 - a + 5$
