

FEBRUARY 8, 2016

**UNIT 5: LINEAR EQUATIONS AND
INEQUALITIES**

**SECTION 6.1:
SOLVING EQUATIONS BY
USING INVERSE
OPERATIONS**

M. MALTBY INGERSOLL
MATH 9



WHAT'S THE POINT OF TODAY'S LESSON?

We will begin working on the Math 9 Specific Curriculum Outcome (SCO) "Patterns and Relations 3" OR "PR3" which states:

"Model and solve problems using linear equations in a variety of forms ($ax = b$; $ax + b = c$; $ax + b = cx + d$; $a(bx + c) = d (ex + f)$ etc.) concretely, pictorially and symbolically where a, b, c, d, e and f are rational numbers."



What does THAT mean???

SCO PR3 means ALGEBRA!!!





What's the difference between an expression and an equation?

**EXPRESSION: $5x + 2$
(Polynomial / Binomial)**

**EQUATION $5x + 2 = -8$
(Algebra)**

Please turn to page 264 in
Math Makes Sense 9 (MMS9).

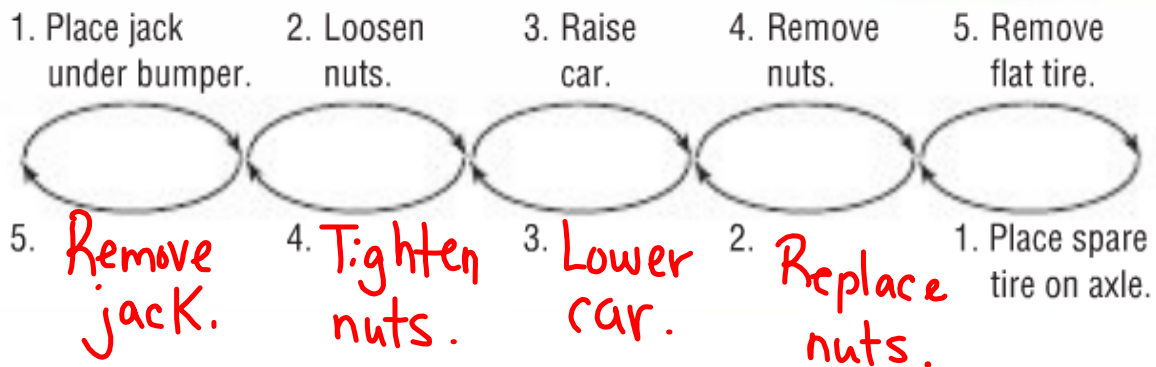
"What You'll Learn"

"Why It's Important"

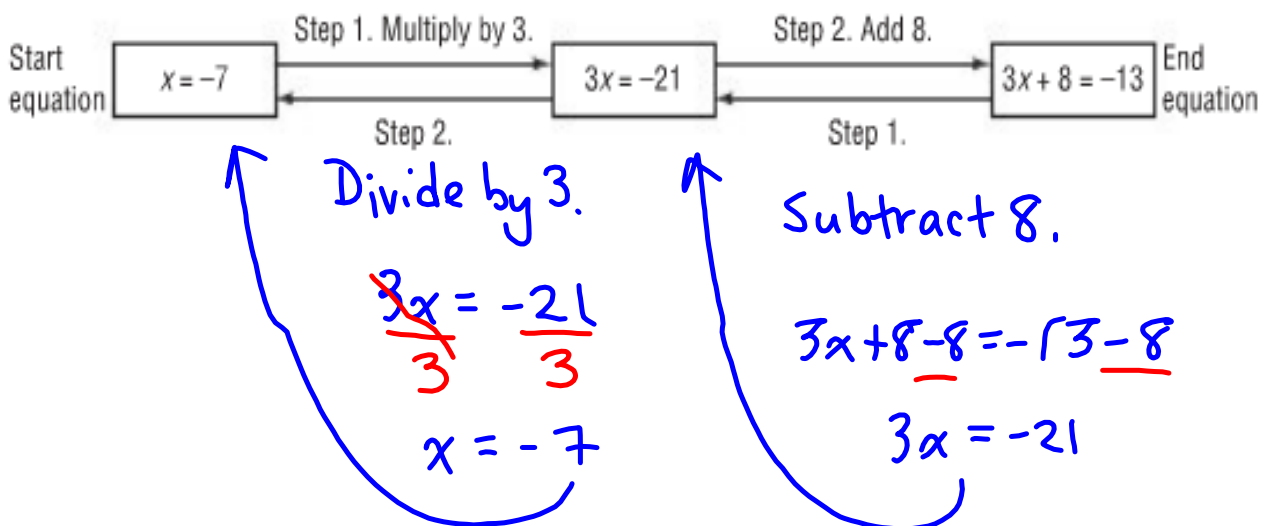
And now for the nuts and bolts of it all..



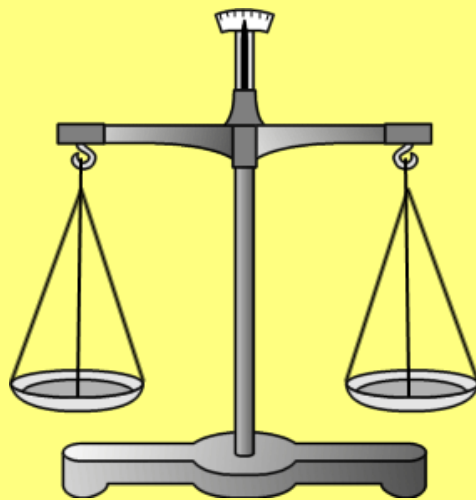
The top row of the arrow diagram below shows the steps to remove a flat tire on a car. What steps are needed to put on a new tire?



The arrow diagram used in the previous example is very much like algebra. The top row of the arrow diagram below shows the operations applied to the equation $x = -7$. What steps are needed to return to the original equation?



ALGEBRA IS A "BALANCING ACT"...



INVERSE PROPERTY:

This property occurs when a mathematical operation is "**undone**". For example, subtraction "**undoes**" addition and division "**undoes**" multiplication. Algebra is based on this property. We sometimes say that we use the "method of inverse operations" to solve algebraic equations.

EX.: $x + 4 = 10$

We need to isolate the "**x**" here to solve this equation, so we have to "**undo**" the addition next to the "**x**" by doing the opposite or **inverse** - a subtraction. **Remember - what we do to one side of an equation, we MUST do to the other side as well!!!**

$$x + 4 - 4 = 10 - 4$$

$$x = 6$$

EX.: $3x = 12$

We need to isolate the "**x**" here to solve this equation, so we have to "**undo**" the multiplication next to the "**x**" by doing the opposite or **inverse** - a division.

$$\frac{3x}{3} = \frac{12}{3}$$

$$x = 4$$

EX. 1: Three times a number is -3.6.

Let n represent the number. Then, 3 times n is -3.6 .

The equation is: $3n = -3.6$

$$\frac{\cancel{3}n}{\cancel{3}} = \frac{-3.6}{3}$$

$$n = -1.2$$

EX. 1: Verify the solution ($n = -1.2$):

LS	RS
$3n$	-3.6
$3(-1.2)$	
-3.6	

LS = RS $\therefore n = -1.2$.

EX. 2: A number divided by 4 is 1.5.

Let m represent the number. Then, m divided by 4 is 1.5.

The equation is: $\frac{m}{4} = 1.5$

$$\frac{m}{4} = 1.5$$
$$\cancel{4} \left(\frac{m}{\cancel{4}} \right) = 4 (1.5)$$
$$m = 6$$

EX. 2: Verify the solution ($m = 6$):

LS	RS
$\frac{m}{4}$	1.5
$\frac{6}{4}$	
1.5	

LS = RS $\therefore m = 6$.

**What trick can we use to remember
how to "undo" 2 or more
mathematical operations???**

SAMDEB!!!

(BEDMAS backwards.)

EX. 3: Let's solve this equation algebraically together using **SAMDEB**:

$$4.5d - 3.2 = -18.5$$

$$4.5d - 3.2 + 3.2 = -18.5 + 3.2$$

$$\frac{4.5d}{4.5} = \frac{-15.3}{4.5}$$

$$d = -3.4$$

EX. 3: Verify the solution ($d = -3.4$):

LS	RS
$4.5d - 3.2$	-18.5
$4.5(-3.4) - 3.2$	
$-15.3 - 3.2$	
-18.5	

$$\text{LS} = \text{RS} \therefore d = -3.4.$$

EX. 4: Let's solve this equation algebraically together using **SAMDEB**:

$$\frac{r}{4} + 3 = 7.2$$

$$\frac{r}{4} + 3 - 3 = 7.2 - 3$$

$$\frac{r}{4} = 4.2$$

$$\cancel{4} \left(\frac{r}{\cancel{4}} \right) = 4(4.2)$$

$$r = 16.8$$

EX. 4: Verify the solution ($r = 16.8$):

LS	RS
$\frac{r + 3}{4}$	7.2
$\frac{16.8 + 3}{4}$	
4.2 + 3	
7.2	

LS = RS $\therefore r = 16.8$.

"Books Never Written" Sheet

Feb. 8/16

$$\textcircled{0} \quad 4y - 9 = 15$$

$$4y - 9 + 9 = 15 + 9$$

$$\frac{4y}{4} = \frac{24}{4}$$

$$y = 6$$

LS	RS
$4y - 9$	15
$4(6) - 9$	
$24 - 9$	
15	

$$LS = RS \therefore y = 6.$$

CONCEPT REINFORCEMENT:

**Worksheet: "Books Never Written"
(with 5 verifications)**

HEADS UP - QUIZ SOON!!! There will be a short quiz on Section 6.1 once we have completed it, probably around Feb. 11. This will involve one-step and two-step equations, the distributive property, equations with one denominator and two denominators and verifications.