

Section 3: Solving for “X”

In this section, we are going to learn skills for:

NGSS Standards

- ☀ **MA.912.A.3.1** Solve linear equations in one variable that include simplifying algebraic expressions. (Also assesses MA.912.A.3.2.)
- ☀ **MA.912.A.3.2** Identify and apply the distributive, associative, and commutative properties of real numbers and the properties of equality. (Assessed with MA.912.A.3.1.)
- ☀ **MA.912.A.3.4** Solve and graph simple and compound inequalities in one variable and be able to justify each step in a solution.

CCS Standards

- ☉ **MACC.912.A-REI.2.3** Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

Section 3 – Video 1

Solving Equations for “X”

Your first step is to **WRITE IT DOWN!** Do ***NOT*** try to do these in your head!

$$h - 6 = 5$$

$$3d = 27$$

$$\frac{x}{8} = -5$$

Try it!

$$-9 = y + 2$$

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

Let's try a couple of two-step equations:

$$6w + 12 = -1$$

$$\frac{h}{5} - 6 = 8$$

Try it!

$$-2g - 3 = -8$$

$$-4 = \frac{x}{3} + 7$$

Study Edge Tip

When solving a long equation:

- 1) Distribute.
- 2) Combine like terms on each side of the “ = ” sign.
- 3) Move your variables to one side.
- 4) Move your numbers to the other side.

If you think of the = as “the line,” just remember for addition/subtraction:

“Over the line, Change the sign!”

- 5) Divide if needed to solve for the variable.

$$-3y + 5y - 4 = -7 + 4y$$

$$2(g + 5) = -7 - 4g + g$$

BEAT THE TEST!

1. Given the following equation:

$$2 + 2a + 4(2a + 7) = -3 + 2a$$

What is the correct value of a ?

A. $\frac{8}{33}$

B. $\frac{33}{8}$

C. $-\frac{8}{33}$

D. $-\frac{33}{8}$

2. The older brother Gerardo is three years older than his little brother Danny. Taken together, the sum of their ages is 25. The following equation models the situation where d is Danny's age.

$$d + (d + 3) = 25$$

How old is Gerardo?

A. 3

B. 11

C. 14

D. 25

Section 3 – Video 2

Solving Equations with Fractions

First, let's practice a skill...

$$12 * \frac{3}{4}$$

Try it!

$$10 * \frac{4}{5}$$

$$-21 * \frac{3}{7}$$

$$4 * \frac{3}{4}$$

- See how none of our answers have any fractions?
 - Do the same thing to get rid of fractions in any equation!

- For beast equations like the ones below,
- Just multiply by a number (LCD) that will get rid of the fractions

$$-\frac{4}{3}c - \frac{7}{6} = -\frac{7}{2} - 2c$$

Try it!

$$-\frac{k}{2} - 2 = -\frac{3}{4} - 6k + \frac{3}{2}$$

BEAT THE TEST!

1. Given the following equation:

$$-\frac{d}{3} + \frac{3}{2} = -\frac{1}{6}$$

What is the correct value of d ?

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2. Honor Simpson is the top nuclear scientist in Springfield. She created the following equation to model the relationship between two radioactive isotopes. Unfortunately, due to an equipment malfunction, the plant is going to melt down! The following equation can be used to determine how many **hours**, h , she has to prevent the meltdown:

$$-\frac{h}{6} + \frac{1}{4} = -\frac{3}{4} + \frac{h}{3}$$

How many **minutes** does she have?

- A. 1
- B. 2
- C. 60
- D. 120

Section 3 – Video 3

Solving Equations with Decimals

Study Edge Tip

You can move every decimal point to the right in an equation... as long as you move EVERY ONE the same number of places!

$$-2.3 = 1.5g - 0.9$$

$$1.2 + 2.6g = -0.1$$

$$-0.1 = -9 + k$$

Try it!

$$2 - 0.2j = -0.2$$

Remember for multi-step equation you would start by distributing.

$$-0.4(0.5z + 4) = 3.2$$

BEAT THE TEST!

1. Jerrod is an actuary at the AMCO insurance company and needs to ensure clients are being charged the appropriate rates. The following equation was formulated to record the correct rates.

$$0.3(x - 6) + 0.5x = 0.6(x + 6)$$

What is the correct value for x ?

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2. The height of an object can be ascertained from the following equation:

$$0.02h - 4 = 0.02 + 4h - 8$$

What is the height of the object?

- A. 0.01
- B. 0.1
- C. 1
- D. 10

Section 3 – Video 4

Inequalities

$x > 6$ means “ x is greater than 6”

$x < 6$ means “ x is less than 6”

$6 > x$ means “6 is greater than x ” or “ x is less than 6”

Study Edge Tip

Always read an inequality from the variable (for example, “ x ”).

Divide both sides by 3: $12 > 6$

Divide both sides by -3 : $12 > 6$

Study Edge Tip

If you multiply or divide by a negative, you need to **change the direction of the sign.**

- On the test, you will NOT have to graph by hand, but you will have to find the right answer.
- Look at your choices of graphs:
 - Open circle for $<$ and $>$

 - Closed circle for \leq and \geq

Solve for v .

$$15 + 4v > 8v + 7$$

Try it!

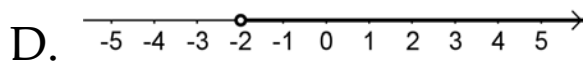
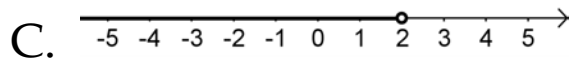
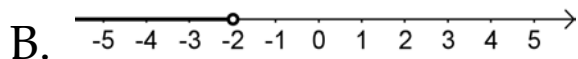
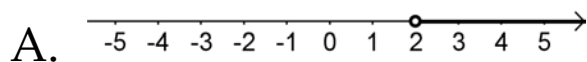
$$-6 + 4b > 2(-8 + 3b)$$

BEAT THE TEST!

1. Esperanza needed to solve the following inequality:

$$-4 + 2h + 12 > 2(-3h - 4)$$

What is the correct answer?



Section 3 – Video 5

Compound Inequalities

A compound inequality has two inequality symbols, but you would still solve it like a regular inequality problem.

If you see the word “or” between two inequalities, solve the two problems and graph on the same number line.

$$9 + x > 8 \text{ or } 5x < -35$$

If you see a problem like this, you can either focus on the middle OR split it up and solve it like two problems.

* Always graph the answer on the same number line!

$$1 < 4x - 3 < 9$$

Try it!

$$6c - 2 > 14 \text{ or } 3c - 3 < -6$$

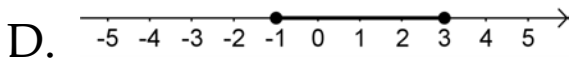
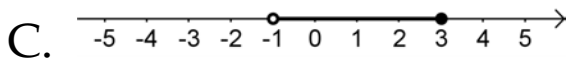
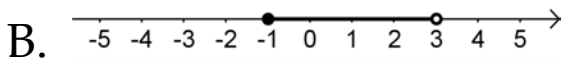
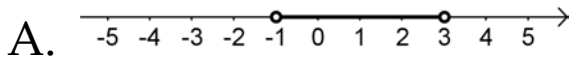
$$1 < -3 - 4n \leq 9$$

BEAT THE TEST!

1. Given the following inequality:

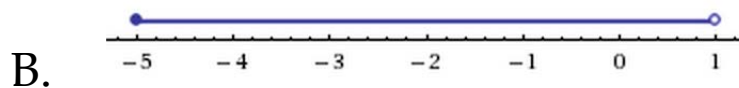
$$-14 \leq -1 - 3w + 2 - 2w < 6$$

What graph correctly represents the compound inequality above?



2. Which of the graphs below correctly expresses the solution to the inequality below?

$$8x + 1 > 9 \text{ or } 3x - 12 \geq 8x + 13$$



Section 3: Solving for "X"

Practice Problems

1. Solve the following equations for x :

a. $-4(x + 10) - 6 = -3(x - 2)$

b. $5 - 2(x + 3) + 3x = 8 - 4x$

2. Solve the following equations for y :

a. $0.253y + 0.857y - 0.200 = 0.001$
Round to the nearest thousandth.

b. $0.06(y + 20) + 0.08(y - 10) = 4.60$
Round to the nearest hundredth.

3. Tarzan and Jane decide to calculate the number of gorillas left in the part of the jungle where they live. To calculate this value, they use the equation given below, where x is the number of gorillas:

$$\frac{3x}{4} + \frac{5}{4} = \frac{15}{3}$$

What is the value of x , the number of gorillas left in their part of the jungle?

4. Maria takes her nephew and niece to a concert over the summer and buys t-shirts and pins for them. Pins cost \$1 each. Maria's niece chose 1 shirt and 7 pins. Maria's nephew wanted 2 shirts and 3 pins. If Maria's total is \$67, what is the cost of one shirt?

5. The temperature, t , of bacteria in a lab can be measured using the equation below.

$$7.2 + 18.4t = 3.21$$

What is the temperature of the bacteria? Round your answer to the hundredth place.

6. Abram wants to take a road trip across Florida. Abram's car, the Ford Fraction, only gives mileage information in fractions. Abram starts with $\frac{27}{2}$ gallons of gasoline in his car. For every mile Abram drives, the amount of gasoline in his car decreases by $\frac{1}{16}$ of a gallon. If G is the amount of gasoline left after driving M miles, write an equation that represents this situation.

If Abram checks his gas tank and realizes he has 5 gallons left, how many miles must he have driven?

7. For a school fundraiser, you earn \$4.25 for every coupon book you sell, \$6.55 for every basket of cookies you sell, and \$19.50 for every bicycle you sell. Assume the total amount of funds you were able to raise was \$105.75. If you sold 8 coupon books and 5 baskets of cookies, how many bicycles did you sell?

8. Solve and graph the compound inequalities that are listed below. Make sure to show your work.

a. $2 - 3x > 14$ *or* $3 + 5x \geq 18$

b. $-4 < -3(x + 5) < 3$

9. Write and solve an inequality that represents this statement:

Five less than twice Z is at least seventeen.

Now, graph that inequality on a number line.

10. Sean is told by his parents that he can spend, at most, \$75 on new shirts and pants for school. Sean already knows he is going to spend \$35 on new shirts. He also knows that pants are \$8 each. Write and solve an inequality that shows how many pairs of pants Sean can buy.