

## Absolute value equations and inequalities Assignment

Solve the following equations.

1)  $|x + 9| = 24$ .

2)  $|2x - 1| = 5$

3)  $2 \times |3x - 1| = 16$

4)  $\frac{|x-9|}{4} + 2 = 4$

## Absolute value equations and inequalities Assignment

5)  $\left| \frac{1}{2}x + 8 \right| = 9$

6)  $3 \times |2x + 8| = 36$

7)  $3 \times \left| \frac{x-3}{2} \right| = 4$

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# Absolute value equations and inequalities Assignment

Solve the following inequalities

1)  $|3x - 1| < 5$

2)  $|3x - 1| \geq 5$

3)  $-3|2x| \leq 12$

4)  $\frac{3|x-3|}{2} \leq 5$

5)  $\left| \frac{1}{2}x + 7 \right| \geq 5$

# Absolute value equations and inequalities Assignment

Solve the following word problems

- 1) A machine fills Quaker Oatmeal containers with 32 ounces of oatmeal. After the containers are filled, another machine weighs them. If the container's weight differs from the desired 32 ounce weight by more than 0.5 ounces, the container is rejected. Write an equation that can be used to find the heaviest and lightest acceptable weights for the Quaker Oatmeal container. Solve the equation.
  
- 2) On the starship Enterprise, Captain Picard continually asks the food replicator to brew him a cup of Earl Grey tea. The proper brewing temperature for Earl Grey tea is  $210^{\circ}$  F plus or minus 5 degrees. Write and solve an absolute value equation representing the maximum and minimum brewing temperatures for Earl Grey tea.
  
- 3) At the Brooks Company, the average starting salary for a new employee is \$37,600, but the actual salary could differ from the average by as much \$2590.
  - Write an absolute value inequality to describe this situation.
  - Solve the inequality to find the range of the starting salaries.
  
- 4) Forensic scientists use the equation
$$h = 2.6f + 47.2$$
to estimate the height,  $h$ , of a woman given the length in centimeters,  $f$ , of her femur bone. Suppose the equation has a margin of error of  $\pm 4$  centimeters and the length of a female skeleton's femur is 48 centimeters. Write and solve an absolute value inequality that describes the woman's height in centimeters.

# Absolute value equations and inequalities Assignment

Solve the following equations.

1)  $|x + 9| = 24$ .

<p>Case 1</p> $x + 9 = 24$ $x = 15$	<p>Case 2</p> $x + 9 = -24$ $x = -33$
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Check the two values in the original equation.

Both solutions are true.

2)  $|2x - 1| = 5$

<p>Case 1</p> $2x - 1 = 5$ $2x = 6$ $x = 3$	<p>Case 2</p> $2x - 1 = -5$ $2x = -6$ $x = -3$
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Check the two values in the original equation.

Both solutions are true.

3)  $2 \times |3x - 1| = 16$

$|3x - 1| = 8$

<p>Case 1</p> $3x - 1 = 8$ $3x = 9$ $x = 3$	<p>Case 2</p> $3x - 1 = -8$ $3x = -7$ $x = -\frac{7}{3}$
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Check the two values in the original equation.

Both solutions are true.

4)  $\frac{|x-9|}{4} + 2 = 4$

$\frac{|x - 9|}{4} = 2$

$|x - 9| = 8$

# Absolute value equations and inequalities Assignment

<p>Case 1</p> $x - 9 = 8$ $x = 17$	<p>Case 2</p> $x - 9 = -8$ $x = 1$
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Check the two values in the original equation.

Only 17 is a true solution of the original equation.

5)  $\left| \frac{1}{2}x + 8 \right| = 9$

<p>Case 1</p> $\frac{1}{2}x + 8 = 9$ $\frac{1}{2}x = 1$ $x = 2$	<p>Case 2</p> $\frac{1}{2}x + 8 = -9$ $\frac{1}{2}x = -17$ $x = -34$
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Check the two values in the original equation.

Both solutions are true.

6)  $3 \times |2x + 8| = -36$

It has NO solution since the result of an absolute expression is not negative. The answer is the empty set  $\emptyset$

7)  $2 \times \left| \frac{x-3}{2} \right| = 4$

$$\left| \frac{x-3}{2} \right| = 2$$

<p>Case 1</p> $\frac{x-3}{2} = 2$ $x-3 = 4$ $x = 7$	<p>Case 2</p> $\frac{x-3}{2} = -2$ $x-3 = -4$ $x = -1$
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Check the two values in the original equation.

Both solutions are true.

**Absolute value equations and inequalities** Assignment

Solve the following inequalities

1)  $|3x - 1| < 5$

$$-(3x - 1) < 5 \quad \text{and} \quad 3x - 1 < 5$$

$$3x - 1 > -5 \quad \text{and} \quad 3x < 6$$

$$3x > -4 \quad \text{and} \quad x < 2$$

$$x > -4/3 \quad \text{and} \quad x < 2$$

$$-4/3 < x < 2$$

2)  $|3x - 1| \geq 5$

$$-(3x - 1) \geq 5 \quad \text{or} \quad 3x - 1 \geq 5$$

$$3x - 1 \leq -5 \quad \text{or} \quad 3x \geq 6$$

$$3x \leq -4 \quad \text{or} \quad x \geq 2$$

$$x \leq -4/3 \quad \text{or} \quad x \geq 2$$

$$x \leq -4/3 \quad \text{or} \quad x \geq 2$$

3)  $-3|2x| \leq 12$

$$|2x| \geq -4$$

$$2x \geq -4 \quad \text{and} \quad 2x \leq 4$$

$$x \geq -2 \quad \text{and} \quad x \leq 2$$

$$-2 \leq x \leq 2$$

4)  $\frac{3|x-3|}{2} \leq 5$

$$3|x - 3| \leq 10$$

$$|x - 3| \leq \frac{10}{3}$$

$$x - 3 \leq \frac{10}{3} \quad \text{and} \quad x - 3 \geq -\frac{10}{3}$$

$$x \leq \frac{19}{3} \quad \text{and} \quad x \geq -\frac{1}{3}$$

# Absolute value equations and inequalities Assignment

$$5) \left| \frac{1}{2}x + 7 \right| \geq 5$$

$\frac{1}{2}x + 7 \geq 5$	or	$\frac{1}{2}x + 7 \leq -5$
$\frac{1}{2}x \geq -2$	or	$\frac{1}{2}x \leq -12$
$x \geq -4$	or	$x \leq -24$

Solve the following word problems

- 1) A machine fills Quaker Oatmeal containers with 32 ounces of oatmeal. After the containers are filled, another machine weighs them. If the container's weight differs from the desired 32 ounce weight by more than 0.5 ounces, the container is rejected. Write an equation that can be used to find the heaviest and lightest acceptable weights for the Quaker Oatmeal container. Solve the equation.

Let  $x$  = the weight of the container.

$$|x - 32| = 0.5$$

Case 1

$$x - 32 = 0.5$$

$$x = 32.5$$

Case 2

$$x - 32 = -0.5$$

$$x = 31.5$$

$$x = 31.5 \text{ ounces (lightest)}$$

$$x = 32.5 \text{ ounces (heaviest)}$$

- 2) On the starship Enterprise, Captain Picard continually asks the food replicator to brew him a cup of Earl Grey tea. The proper brewing temperature for Earl Grey tea is 210° F plus or minus 5 degrees. Write and solve an absolute value equation representing the maximum and minimum brewing temperatures for Earl Grey tea.

Let  $x$  = the brewing temperature..

$$|x - 210| = 5$$

Case 1

$$x - 210 = 5$$

$$x = 215$$

Case 2

$$x - 210 = -5$$

$$x = 205$$

$$x = 205 \text{ (minimum temperature)}$$

$$x = 215 \text{ (maximum temperature)}$$



**Absolute value equations and inequalities** Assignment

- 3) At the Brooks Company, the average starting salary for a new employee is \$37,600, but the actual salary could differ from the average by as much \$2590.

- Write an absolute value inequality to describe this situation.
- Solve the inequality to find the range of the starting salaries.

$$|x - 37600| \leq 2590$$

Case 1 $x - 37600 \leq 25900$ $x \leq 40190$	Case 2 $x - 37600 \geq -25900$ $x \geq 35010$
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So

$$\$35,010 \leq x \leq \$40,190$$

- 4) Forensic scientists use the equation

$$h = 2.6f + 47.2$$

to estimate the height,  $h$ , of a woman given the length in centimeters,  $f$ , of her femur bone. Suppose the equation has a margin of error of  $\pm 4$  centimeters and the length of a female skeleton's femur is 48 centimeters. Write and solve an absolute value inequality that describes the woman's height in centimeters.

$$h = 2.6f + 47.2$$

If the femur is 48 centimeters, the height is

$$h = 2.6(48) + 47.2 = 172 \text{ centimeters}$$

The woman's height,  $h$ , in centimeters can be represented by

$$|h - 172| \leq 4$$

Case 1 $h - 172 \leq 4$ $h \leq 176$	Case 2 $h - 172 \geq -4$ $h \geq 168$
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$$168 \text{ centimeters} \leq h \leq 176 \text{ centimeters}$$