

Indicator 22 Class Notes by Mrs. Joshi
Substitution to Solve Equations and
Inequalities-(AL Standard 18)

I can use substitution to determine if a given value is a solution to an equation or inequality.

A **solution** of an equation is a value that makes the equation true.

Value of x	$x + 3 = 7$	Are both sides equal?
3	$3 + 3 \stackrel{?}{=} 7$ $6 \neq 7$ ✗	no
4	$4 + 3 \stackrel{?}{=} 7$ $7 = 7$ ✓	yes
5	$5 + 3 \stackrel{?}{=} 7$ $8 \neq 7$ ✗	no

So, the value $x = 4$ is a solution of the equation $x + 3 = 7$.

EXAMPLE 1 Checking Solutions

Tell whether the given value is a solution of the equation.

a. $p + 10 = 38$; $p = 18$

$$18 + 10 \stackrel{?}{=} 38$$

Substitute 18 for p .

$$28 \neq 38$$
 ✗

Sides are *not* equal.



∴ So, $p = 18$ is not a solution.

b. $4y = 56$; $y = 14$

$$4(14) \stackrel{?}{=} 56$$

Substitute 14 for y .

$$56 = 56$$
 ✓

Sides are equal.



∴ So, $y = 14$ is a solution.

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An **inequality** is a mathematical sentence that compares expressions. It contains the symbols $<$, $>$, \leq , or \geq . To write an inequality, look for the following phrases to determine where to place the inequality symbol.

Inequality Symbols				
Symbol	$<$	$>$	\leq	\geq
Key Phrases	<ul style="list-style-type: none"> • is less than • is fewer than 	<ul style="list-style-type: none"> • is greater than • is more than 	<ul style="list-style-type: none"> • is less than or equal to • is at most • is no more than 	<ul style="list-style-type: none"> • is greater than or equal to • is at least • is no less than

EXAMPLE 1 Writing Inequalities

Write the word sentence as an inequality.

- a. A number c is less than 4.

A number c is less than 4.

c $<$ 4

∴ An inequality is $c < 4$.

- b. A number k plus 5 is greater than or equal to 8.

A number k plus 5 is greater than or equal to 8.

$k + 5$ \geq 8

∴ An inequality is $k + 5 \geq 8$.

- c. Four times a number q is at most 16.

Four times a number q is at most 16.

$4q$ \leq 16

∴ An inequality is $4q \leq 16$.

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A **solution of an inequality** is a value that makes the inequality true. An inequality can have more than one solution. The set of all solutions of an inequality is called the **solution set**.

Value of x	$x + 3 \leq 7$	Is the inequality true?
3	$3 + 3 \stackrel{?}{\leq} 7$ $6 \leq 7$ ✓	yes
4	$4 + 3 \stackrel{?}{\leq} 7$ $7 \leq 7$ ✓	yes
5	$5 + 3 \stackrel{?}{\leq} 7$ $8 \not\leq 7$ ✗	no

EXAMPLE 2 Checking Solutions

Tell whether the given value is a solution of the inequality.

a. $x + 1 > 7$; $x = 8$

$$x + 1 > 7$$

Write the inequality.

$$8 + 1 \stackrel{?}{>} 7$$

Substitute 8 for x .

$$9 > 7$$
 ✓

Add. 9 is greater than 7.

∴ So, 8 is a solution of the inequality.

b. $7y < 27$; $y = 4$

$$7y < 27$$

Write the inequality.

$$7(4) \stackrel{?}{<} 27$$

Substitute 4 for y .

$$28 \not< 27$$
 ✗

Multiply. 28 is *not* less than 27.

∴ So, 4 is *not* a solution of the inequality.

c. $\frac{z}{3} \geq 5$; $z = 15$

$$\frac{z}{3} \geq 5$$

Write the inequality.

$$\frac{15}{3} \stackrel{?}{\geq} 5$$

Substitute 15 for z .

$$5 \geq 5$$
 ✓

Divide. 5 is greater than or equal to 5.

∴ So, 15 is a solution of the inequality.

