SOLVING EQUATIONS

UNIT 01 LESSON 03

OBJECTIVES

STUDENTS WILL BE ABLE TO:

- Simplify algebraic expressions.
- Solve equations in one variable.
- Interpret a word problem into an equation.
- Rearrange a formula to highlight a quantity of interest.

KEY VOCABULARY:

- Algebraic Expression
- Equation

An equation says that two things are equal.
It will have an equals sign "=" like this:

$$7 + 2 = 10 - 1$$

That equation says: what is on the left (7 + 2) is equal to what is on the right (10 – 1)

Solving linear equations is just a matter of undoing operations that are being done to the variable.

The task is always to isolate the variable -- >get the variable ALONE on one side of the equal sign.

Always keep in mind the properties of real numbers

1. Commutative and associative properties of addition.
2. Commutative and associative properties of multiplication.
3. The distributive property.

PROPERTIES OF EQUATIONS

Reflexive Property	For all real numbers $x, x = x$ A number equals itself	These three Properties define an equivalence relation
Reflexive Property	For all real numbers $x\ and\ y,$ If $x = \mathrm{y}$, then $\mathrm{y} = x$ Order of equality does not matter	
Transitive Property	For all real numbers $x\ and\ y,$ If $x, \mathrm{y}\ and\ z$ If $x = \mathrm{y}$ and y=z then x=z Two numbers equal to the same number are equal to each other	

PROPERTIES OF EQUATIONS

Addition Property	For all real numbers $x, y\ and\ z$, If $x = \mathrm{y}$, then $x + z = \mathrm{y} + \mathrm{z}$	These properties allow you to balance and solve equations involving real numbers
Subtraction Property	For all real numbers $x, y\ and\ z$, If $x = \mathrm{y}$, then $x - z = \mathrm{y} - \mathrm{z}$	
Multiplication Property	For all real numbers $x, y\ and\ z$, If $x = \mathrm{y}$, then $xz = \mathrm{yz}$	
Division Property	For all real numbers $x, y\ and\ z$, If $x = \mathrm{y}$, and $\mathrm{z} \neq 0$, then $\frac{x}{z} = \frac{y}{z}$	
Substitution Property	For all real numbers $x\ and\ y$, If $x = \mathrm{y}$, then y can be substituted for x in any expression	

PROPERTIES OF EQUATIONS

Distributive Property	For all real numbers x, y and z, $x(y+z) = \mathrm{xy} + \mathrm{xz}$	For more, see the section on the distributive property

PROBLEM 01

Solve $x + 3 = 8$

Solution

Our goal is to isolate x in one side
To get rid of the 3, we can subtract 3 from both sides of the equation.

$x + 3 - 3 = 8 - 3$
$x = 5$

PROBLEM 02

Solve $4(2x - 6) = 3(x - 6)$

Solution

We can apply the distributive property to get rid of the parentheses.

$4 \times 2x + 4 \times (-6) = 3 \times x + 3 \times (-6)$

$8x - 24 = 3x - 18$

Now we need to get all the x's in one side.

To do that, we can subtract 3x from both sides.

$8x - 3x - 24 = -18$

$5x - 24 = -18$

PROBLEM 02

Now add 24 to both sides to get the numbers in one side.

$5x = -18 + 24$

$5x = 6$

Divide both sides by 5.

$x = \frac{6}{5}$

PROBLEM 03

Aaron is 5 years younger than Ron. Four years later, Ron will be twice as old as Aaron. Find their present ages.

Solution

Let Ron's present age be x.

Then Aaron's present age = x – 5

After 4 years Ron's age = x + 4, Aaron's age x – 5 + 4.

PROBLEM 03

According to the question;

Ron will be twice as old as Aaron.

Therefore, $x + 4 = 2(x - 5 + 4)$

$\Rightarrow x + 4 = 2(x - 1)$

$\Rightarrow x + 4 = 2x - 2$

PROBLEM 03

$\Rightarrow x + 4 = 2x - 2$

$\Rightarrow x - 2x = -2 - 4$

$\Rightarrow -x = -6$

$\Rightarrow x = 6$

Therefore, Aaron's present age = $x - 5 = 6 - 5 = 1$

Therefore, present age of Ron = 6 years and present age of Aaron = 1 year.

PROBLEM 04

The cylinder volume equation is $v = \pi . r^2 . h$ Solve for "h"

Solution

We divide both sides by $\pi . r^2$, to get h in one side.

$$\frac{v}{\pi . r^2} = h$$