MATH110 1.1 Linear Equations

https://www.youtube.com/watch?v=PexiTeH-bZs&index=1&list=PL9dj44OpeMZe9WwXL9LGFPnEkF799M43c

Recall: An ______________ is a statement of equality that sets one expression “equal to” another one.

Question: What do we call the value(s) of a variable that make the statement of equality true (in other words, the value(s) of the variable that satisfy the equation)?

In this section, we are going to review how to solve some equations, including linear equations in one variable. They appear as:

\[ ax + b = 0 \]
where \( a, b \in \mathbb{R}, a \neq 0, \) and \( x \) is the variable

Linear equations are also called first degree equations. Why?

To solve a linear equation, we want to get the variable all by itself on one side so that:

\[ x = \text{number(expression)} \quad \text{or} \quad \text{number(expression)} = x \]  
(either way, they are the same)

Remember: What you do to one side of the equation, you MUST do to the other!!!

Solving Equations in 1 Variable (first degree equations or reducible to first degree)

GOAL: Isolate the variable (get it by itself on one side)!

1. Take note of the domain of the variable. Any values that make any of the expressions in the equation undefined cannot be solutions.
2. Use properties of equality to produce simpler _______________ (equations that have exactly the same set of solutions), working towards isolating the variable.
   - Use the distributive property and/or other operations (FOIL, etc.) to remove any parentheses and simplify.
   - Clear any fractions by multiplying both sides of the equations by the LCD.
   - If the equation involves a single fraction set equal to a single fraction, you can solve by taking the cross product (cross multiply).
   - Use addition/subtraction to get all terms containing a variable on one side and all constants on the other. Simplify.
   - Use multiplication/division to isolate the variable.
3. Check the solution in the original equation.

Example 1: Solve the following equations for \( x \).

a) \(-2x = 36\)

b) \(5x = 4x\)
c) \[4(x - 3) + 2x = 6(x - 2)\]

d) \[\frac{3x + 4}{3} = x + 1\]

e) \[\frac{1}{3}x = 2 - \frac{2}{3}x\]

f) \[\frac{-4}{x + 4} = \frac{-3}{x + 6}\]

g) \[\frac{x}{x^2 - 9} + \frac{4}{x + 3} = \frac{3}{x^2 - 9}\]

h) \[\frac{a}{x} + \frac{b}{x} = c\]
Example 2: Solve $A = P(1 + rt)$ for $r$.

**Strategy for Application Problems:**

1. **READ, READ, READ**
   - Read carefully so that you understand what is being asked. **Underline it.**
   - Write down what you have and what you are looking for.
   - Determine if you’ll need a formula.
   - Draw a diagram if applicable.
2. Choose a variable to represent the unknown(s) (in other words, what you are being asked to find).
3. Translate from English to Algebra.
4. Solve any equations.
5. Check your solution. Does the solution seem reasonable?
6. Interpret the results.
   - Use your solution to answer the question the problem asks.
   - Be sure to use the appropriate units!

**Application**

*Example 3:* Going into the final exam, which counts as 2/3 of the course grade, Pacey has test scores of 86, 80, 84, and 90. The average of the test scores counts for 1/3 of his course grade. What score does he need on the final to get a B in the course, which requires an 80% overall?