How many solutions to an equation?

Problem 1

How many solutions for x will solve the equation?
3x + 2 = 10

Answer to Problem 1

One. If we solve for x...

3x + 2 = 10 (subtract 2 from both sides)

3x = 8 (divide both sides by 3)

x = 8/3

You can clearly see that x has just one answer (8/3).

Problem 2

How many solutions for x will solve the equation?

$$3x + 2 = 2x + x$$

Answer to problem 2

None.

3x + 2 = 2x + x (combine like terms)
3x + 2 = 3x (undo the 3x by subtracting 3x from both sides)
2 = 0

Since 2 does not equal 0 that means no value for x will solve the equation.

Problem 3

How many solutions for x will solve the equation?

$$3x + 2x + 4 = 2x + 3x + 2 + 2$$

Answer to problem 3

Infinite number of solutions.

$3x + 2x + 4 = 2x + 3x + 2 + 2$ (combine like terms)
$5x + 4 = 5x + 4$ (subtract four from both sides)
$5x = 5x$ (subtract 5 x's from both sides)
$0 = 0$

Since 0 does equal 0 then there are an infinite number of solution.