

Date: \_\_\_\_\_

## 4.1 Solving Simple Equations

### Bell Work



- 1) Isabelle paid for lunch for herself and three friends. The food price included tax, and each person had the same meal. She gave the server a \$4 tip and paid \$24 in total.
  - a) What is our unknown quantity in this situation?
  - b) Explain in words how you would determine the value of the unknown quantity (no algebra, just explain!).
  - c) Write your words as an algebraic equation.
- 2) What is the difference between an algebraic expression and an algebraic equation?
- 3) If 248 students attended the academic banquet last night, and each table holds ten people, how many tables do we need to have? Follow the steps from question 1 to solve this problem, even if you can do it quickly.

### Solving Simple Equations

An **equation** is a mathematical statement that says that two expressions are equivalent (the same). For example:

The **solution** to an equation is the value for the variable that makes the statement true. For example, state the solution to the equation below by examining the statement.

$$x + 1 = 3$$



The method that we just used to solve the equation is called '[inspection](#)' in your text book. Why can't we rely on inspection to solve all equations?

Most of you also were taught to solve using a guess and check or trial and error strategy somewhere along your math journey. Solve  $3x - 5 = 10$  using a guess and check strategy and explain your thinking (why did you guess what you guessed?).

Why can't we rely on this method to solve all equations?

### New Method to Solve Two-Step Equations

#### Balance Method/Opposite Operations

To use this method, we do the same operations on both sides of the equals sign. To maintain the truth of an equation, we have to carry out the same changes on both sides. As long as you do the same thing to both sides, you can do whatever you would like. However, some things make sense to bring us closer to the answer!



Example: Solve the following equations using the balance method. (This is another opportunity for coloured pens!!)

$$x + 5 = 9$$



$$2x + 8 = 12$$

Continue to solve using the balance method, or the idea that whatever you do to one side you must do to the other. Keep in mind that your mission is ALWAYS to isolate the variable.

1)  $2x - 5 = -9$

2)  $-3x + 7 = 4$

3)  $-5x + 1 = -11$

What can you do to check your answer? Check your answers for the three equations above.

### Summary

- To solve any equation, you need to apply the same operation to both sides in each step.
- To "undo" an operation, you must do the opposite operation. Subtraction "undoes" addition, multiplication "undoes" division, etc.
- To isolate our variable, we must "undo" everything that has been done to it.
- To check our solution, we can substitute it back in to the ORIGINAL equation to make sure that the statement is still true (left side = right side).

### More Practice:

Solve each of the following equations using the balance method. Check your solution.

1)  $\frac{x}{3} + 5 = 3$

2)  $-5x + 11 = -5$

3)  $3x - 14 = -2$

