

Lesson 9

Translating Sentences to Algebraic Equations

Objective

- Translate a sentence into an algebraic equation, solve for an unknown, and check using substitution



You are still very excited after winning bikes on the radio. You decide to tune in each day so that you have a chance to win more cool stuff. Today, you turn the radio on just in time to hear this: “Hey, it’s Ian the Shark here on KPPX-FM Rebel Radio, and you’ve tuned in for ‘Tuesday’s Tubular Test!!!’ Here are the official rules: we’re going to ask one question. The first caller with the correct answer is going to win an all-expense-paid trip to see the hottest band around, *The Lone Rangers*, in lovely Hawaii! Okay, here is the question... **Five times a number is one hundred plus the number. What number is it?**”

In Lesson 4, we saw how certain words gave us clues toward creating algebraic expressions. Now, we will use many of the same words to create equations.

**Problem
Solving
Tip** 

Turn back to Lesson 4 now, and re-read the charts on pages 31 and 34. Make sure you still remember what all the key words are and how they translate algebraically.

You are thinking to yourself:

“five times a number is one hundred plus the number.”

Let’s circle key words and underline our variable first.

“five [•]times a number is one hundred ⁺plus the number.”

The word “is” means “=.” We will put a box around that word, with an equal sign above it.

“five [•]times a number ⁼is one-hundred ⁺plus the number.”

Then, we will write our let statement.

Let n be a number.

Next, we will translate the sentence into an algebraic equation.

$$5 \cdot n = 100 + n$$

Finally, we can solve this equation using what we learned in the previous two lessons.

$$\begin{array}{r|l}
 5n & = 100 + n \\
 -n & \\
 \hline
 4n & = 100 \\
 \hline
 4 & \\
 n & = 25
 \end{array}$$

Divide by 4 on both sides.

We have the variable on both sides of the equal sign. We will subtract n from both sides.

Check your answer by using the original sentence.

Check: $n = 25$

Five times a number is one-hundred plus the number.

$$\begin{array}{r}
 5 \cdot (25) = 100 + (25) \\
 125 = 125 \quad \checkmark
 \end{array}$$

You call up KPPX-FM. The call goes through. A man picks up this time, with a wacky voice. “Ian the Shark here, you’re on the radio. No one has answered correctly yet, so this is your lucky chance. What is the number?” You clear your throat, and say proudly, “The number is twenty-five.” Ian hits every sound effect button in the radio station. Bells, sirens, whistles, and cheers go off at once. Ian then screams, “Pack your bags, you’re going to Hawaii!!”



Algorithm

To translate an equation:

- 1) Put a box around words that mean equal.
Circle words that stand for operations (+, -, •, ÷), and underline words that will be a variable.
- 2) Create a variable using a let-statement.
- 3) Write the equation, and solve for the variable you created in Step 2.
- 4) Check your answer using substitution.

Example 1

Write an equation, solve for the unknown, and check:

Twelve less than a number is twenty-nine.

Solution

Step 1:

-
=
 Twelve less than a number is twenty-nine.

Step 2:

Let n be a number.

Step 3:

$$\begin{array}{r|l}
 n - 12 & = \\
 + 12 & \\
 \hline
 n & = 41
 \end{array}
 \qquad
 \begin{array}{r|l}
 & = \\
 & \\
 & + 12 \\
 \hline
 & = 29
 \end{array}$$

Step 4: Check: $n = 41$

Twelve less than a number is twenty-nine.

$$\begin{aligned}
 (41) - 12 & \stackrel{?}{=} 29 \\
 29 & = 29 \quad \checkmark
 \end{aligned}$$

Example 2

Write an equation, solve for the unknown, and check:

Three times a number, minus six, is fifteen.

Solution

Step 1:

Three [•]times a number, ⁻minus six, ⁼is fifteen.

Step 2:

Let n be a number.

Step 3:

$$\begin{array}{r|l}
 3n - 6 & = & 15 \\
 + 6 & & + 6 \\
 \hline
 3n & = & 21 \\
 \hline
 3 & & 3 \\
 n & = & 7
 \end{array}$$

Step 4:

Check: $n = 7$

Three times a number, minus six, is fifteen.

$$\begin{array}{r}
 3 \cdot (7) - 6 \stackrel{?}{=} 15 \\
 21 - 6 \stackrel{?}{=} 15 \\
 15 = 15 \quad \checkmark
 \end{array}$$



Write an equation, solve for the unknown, and check your answer for each of the following sentences.

5) Two times a number, minus five, is seventeen.

6) Triple a number is that number increased by eight.

7) Seven subtracted from twice a number is nineteen.

8) One more than the quotient of a number and nine is negative seven.

 **Review**

Before you go on, be sure you understand these concepts:

1. When translating a sentence into an equation, the word “is” means equals.
2. When checking an answer based on a word problem, you can substitute your answer directly into the sentence.

Write one question you would like to ask your mentor, or one new thing you learned in this lesson.



Practice Problems

Unit 1 Lesson 9

Directions: Write your answers in your math journal. Label this exercise
Unit 1 – Lesson 9, Set A and Set B.

Set A

Write an equation, solve for the unknown, and check your answer for each of the following sentences.

- 1) A number minus three is one.
- 2) Three more than a number is twenty.
- 3) Eight times a number is sixty-four.
- 4) The difference of a number and 13 is negative two.
- 5) A number divided by ten is nine.

Questions 6 – 10 will need more than one step to solve.

- 6) Twice a number minus fifteen is five.
- 7) Six less than the quotient of a number and two is three.
- 8) Ten plus the difference of a number and three is ten.
- 9) A number added to twice that number is six.
- 10) Triple a number minus four is eight.

Set B

This time, we will give you the algebraic equation. You need to write its English translation with words.

- 1) $x + 4 = 9$
- 2) $2x - 1 = 10$
- 3) $y + 2y - 7 = 4y + 3$

Write the following equation's English translation in two different ways:

- 4) $z - 5 = 2$



Not all steps are shown. Provided are the setups for each equation and the correct answers. Choices for unknowns will vary. Your work should be much more detailed.

1) Let a be a number.

$$3 + a = 7$$

$$a = 4$$

5) Let n be a number.

$$2n - 5 = 17$$

$$n = 11$$

2) Let y be a number.

$$y - 6 = 14$$

$$y = 20$$

6) Let x be a number.

$$3x = x + 8$$

$$x = 4$$

3) Let h be a number.

$$h - 18 = 37$$

$$h = 55$$

7) Let a be a number.

$$2a - 7 = 19$$

$$a = 13$$

4) Let z be a number.

$$4z = 28$$

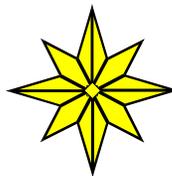
$$z = 7$$

8) Let c be a number.

$$1 + \frac{c}{9} = -7$$

$$c = -72$$

NOTES



End of Lesson 9