

MODELING PROBLEMS ALGEBRAICALLY

3

Name: Key Date: \_\_\_\_\_ Period: \_\_\_\_\_

SECTION 3.2 EQUATIONS

VOCABULARY

DEFINITION	EXAMPLE
Equation: A math sentence using the equal sign to state that 2 expressions represent the same number	$x = 2y - 3$ $3 = m$

**Big Idea:** How do we translate equations into words? How do we translate word problems into equations?

EXPLORING QUESTION

What makes an equation different from an expression?

An expression describes a phrase mathematically.  
An equation describes a sentence comparing two expressions

EXAMPLE 1

Translate the sentence "A number is 3 more than 7" into an equation.

$$N = 7 + 3$$

PROBLEM 1

Translate the sentences below, where  $x$  is a number.

a.  $x$  less than 10 equals 8.

$$10 - x = 8$$

b. 10 less than a number is 8.

$$x - 10 = 8$$

EXAMPLE 2

Translate the following sentence into an equation: What number is twice as large as six?

$$N = 2 \cdot 6$$

**PROBLEM 2**

Translate each number sentence below into an equation using a variable for the unknown number. Determine the value of the variable.

a. The product of 4 and a number is 64.  $4n = 64$      $n = 16$

b. A number times 7 is 49.  $7x = 49$      $x = 7$

**CHARTING THE PROCESS****EXAMPLE 3**

We have seen how we can use numbers and variables to translate problems into equations. Consider the problem, "Jeremy is 9 years old. In how many years will Jeremy be 15 years old?"

How might you begin this problem? Did you define a variable? If so, how did you use this variable?

Here is a step-by-step approach. Do your steps resemble the following?

**Step 1: Define your variable**

$$x = \text{years to reach 15 years old}$$

**Step 2: Translate the problem into an equation**

$$9 + x = 15$$

**Step 3: Solve for the unknown variable**

$$9 + x - 9 = 15 - 9$$

$$0 + x = 6$$

$$x = 6$$

**Step 4: Check your answer**

$$9 + 6 = 15 \quad \checkmark$$

**EXAMPLE 4**

Translate the sentence "A number is 2 less than four times 10" into an equation and solve for the unknown variable. Does your answer make sense?

**SOLUTION**

Step 1:

*n is the number described above.*

Step 2:

$$n = 4 \cdot 10 - 2$$

Step 3:

$$n = 40 - 2$$

$$n = 38$$

Step 4:

*38 is 2 less than 4 times 10.  
38 is 2 less than 40. ✓*

**PROBLEM 3**

Translate and solve each number sentence below.

a. Four greater than 3 times a number is 19.

$$3n + 4 = 19$$

$$3n + 4 - 4 = 19 - 4$$

$$3n = 15$$

$$n = 5$$

check:  $3(5) + 4 =$   
 $15 + 4 = 19 \checkmark$

b. Half of 36 minus 6 is a number.

$$\frac{1}{2}(36) - 6 = n$$

$$18 - 6 = n$$

$$12 = n$$

check:  $\frac{1}{2}(36) - 6 = 12$   
 $18 - 6 = 12$   
 $12 = 12$   
✓

**PROBLEM 4**

Jacob has \$73. How much more does he need if he wants to have \$98?

*m = money he needs to get to \$98*

$$73 + m = 98$$

$$73 - 73 + m = 98 - 73$$

$$0 + m = 98 - 73$$

$$m = \$25$$

check:  $73 + 25 =$   
 $98$   
✓

PRACTICE EXERCISES

Translate each of these into an equation.

1. A number increased by nine is fifteen.

$$n + 9 = 15$$

2. Seven greater than a number is twelve.

$$n + 7 = 12$$

3. Five more than a number is twenty.

$$n + 5 = 20$$

4. The sum of eight and a number is seventeen.

$$8 + x = 17$$

5. Two more than a number is thirteen.

$$y + 2 = 13$$

6. Ten less than a number is eight.

$$z - 10 = 8$$

7. The product of four and a number is sixty-four.

$$4(g) = 64$$

8. A number times eight is forty-eight.

$$c(8) = 48$$

9. Half of thirty-six minus six is a number.

$$36 \div 2 - 6 = n \quad \text{or} \quad \frac{1}{2}(36) - 6 = n$$

10. The difference between two times a number and six is fourteen.

$$2x - 6 = 14$$

11. Six times a number is equal to the product of three and eight.

$$6k = 3 \cdot 8$$

12. A number increased by 7 is 24.

$$R + 7 = 24$$

13. Five greater than a number is 18.

$$P + 5 = 18$$

14. Six more than a number is fourteen.

$$A + 6 = 14$$

15. The sum of three and a number is twenty.

$$3 + Q = 20$$

16. Three more than a number is twenty-one.

$$Q + 3 = 21$$

17. Six less than a number is eight.

$$n - 6 = 8$$

18. The product of six and a number is forty-two.

$$6 \cdot L = 42$$

19. A number times eight is forty-eight.

$$h \cdot 8 = 48$$

20. Four less than two times a number is 10.

$$2n - 4 = 10$$

**SUMMARY (What I learned today)**

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