2.3 Translating Sentences Into Equations

Mathematical equations are sentences! This fact is not always obvious because punctuation marks like periods are often left off (I do this sometimes), and numbers, variables, parenthesis, and mathematical operators are not capitalized. Nevertheless, equations are sentences with a subject, verb and object. Equations can be read as sentences because every symbol stands for something. The verb in an equation is "=" which means "equals", "is equal to", or "is the same as".

$$Subject = Object$$

To translate a sentence into an equation, look for the key verb which will be turned into "=". Unless specified or useful for clarification, you may use any letter you wish for the variable, yet it is wise to stick to familiar and easily recognized letters like x, y, and z.

Example Translate into an equation, then solve: *Twice a number added to six is seventeen.*

$$\begin{aligned} 2x+6 &= 17 \\ -6 &\quad -6 \\ \hline 2x &= 11 \\ x &= \frac{11}{2} \end{aligned}$$

Example Translate into an equation, then solve: *Half the revenue and fifty is four hundred.*

$$\begin{aligned} \frac{1}{2}R+50 &= 400 \\ -50 &\quad -50 \\ \hline \frac{1}{2}R &= 350 \\ R &= \frac{1}{2}\cdot 350 \\ R &= 175 \end{aligned}$$

Example Translate into an equation, then solve: *What is 6 percent of fifty?*

$$\begin{aligned} x &= .06(50) \\ x &= 3.0 \end{aligned}$$

Example Translate into an equation, then solve: *Thirty percent of what is one hundred twenty?*

$$\begin{aligned} .30x &= 120 \\ \frac{.30x}{.30} &= \frac{120}{.30} \\ x &= 400 \end{aligned}$$

Exercises

Translate each sentence into an equation with a variable for the unknown, then solve for the variable.

1. *What is 5% of eight ?*
2. *Four less than the product of five and a number is sixteen.*
3. 6.5% of what is \$12.44 ?
4. Three times a number added to seven is twenty-two.
5. Seven added to twice a number is eleven.
6. The product of a number and two-thirds is twenty.
7. A number multiplied by thirteen equals 221.
8. The product of a certain number and seventeen is four-hundred three.
9. A number multiplied by 3.7 equals 8.51.

Each of these word problems has a problem sentence followed by a question. Solve these problems using algebra by these steps.
a. Choose a variable to be the answer to the question.
b. Writing the sentence as an equation.
c. Solving the equation for the variable.
d. Answer the question.

10. A farm consisting of 43 acres is offered for sale at \$36,550. What is the average price per acre?
11. The total expense for a picnic with 18 students is \$59.40. How much must each student sontribute?
12. A driver must travel 126 miles in his truck over a logging road in 7 hours. How many miles must the driver average per hour? ($Distance = Rate \cdot Time$, or d = rt.)

13. The fastest train between St. Louis and New York makes the trip in 24 hours, and the cities are 1052.4 miles apart. What is the average train rate per hour? (d = rt.)

14. Three-tenths the cost of a certain car is $2100. What is the cost of the car?

15. Five eighths of a number is 343. What is the number?

16. Two fifths of the area of Lake Michigan is 9200 square miles. What is the area of Lake Michigan?

17. Three eighths of the cost of the Suez Canal was $37,500,000. What was the cost of the canal?