

Chapter 8 – Solving Linear Equations and Inequalities to Make Predictions
Section 4 – Solving Formulas

Objectives

1. Find a quantity by substituting values for all but one variable in a formula and then solving for the remaining variable.
2. Find a quantity by using a formula with summation notation.
3. Solve a formula for one of its variables.
4. Solve a formula with a square root.
5. Graph a linear equation in two variables by solving for y .

Lesson/Activity

OBJECTIVE 1 – Find a quantity by substituting values for all but one variable in a formula and then solving for the remaining variable.

Recall that a **formula** is an equation that contains two or more variables (Section 4.1).

1. At Apple, 7% of employees are African American and 18% of employees are African American OR Hispanic (Source: Apple). Find the probability of randomly selecting an Apple employee who is Hispanic. Use the following formula from section 5.2: If E and F are disjoint events, then $P(E \text{ OR } F) = P(E) + P(F)$.

To find a single value of a variable in a formula, we often substitute numbers for all the other variables and then solve for the remaining variable.

2. Recall that the scores on the Wechsler IQ test are normally distributed with mean 100 points and standard deviation 15 points. Actress Sharon Stone is reported to have an IQ of 154 points (Source: Chicago Tribune). Use the formula $x = \bar{x} + zs$ to find the z-score for an IQ of 154 points.

OBJECTIVE 2 – Find a quantity by using a formula with summation notation.

3. Substitute the following values in the $\mu = \sum x_i P(x_i)$ and solve for the remaining variable:

$$x_1 = 0, x_2 = 1, x_3 = 2, x_4 = 3, x_5 = 4,$$

$$P(x_1) = 0.0625, P(x_2) = 0.25, P(x_3) = 0.375, P(x_4) = 0.25, P(x_5) = 0.0625$$

4. Substitute the following values in the formula $MSE = \frac{\sum[(n_i - 1)s_i^2]}{n - k}$ and solve for the remaining variable:

$$n_1 = 22, n_2 = 28, n_3 = 21, s_1 = 2, s_2 = 5, s_3 = 4, n = 71, \text{ and } k = 3$$

Round the result to the first decimal place.

OBJECTIVE 3 – Solve a formula for one of its variables.

5. a. Solve the formula $P(A \text{ OR } H) = P(A) + P(H)$ for $P(H)$.
b. Substitute 0.18 for $P(A \text{ OR } H)$ and 0.07 for $P(A)$ in the formula found in Problem 1.

Solving for a variable in a formula will not change the association between the variables in the formula.

6. a. Solve the formula $x = \bar{x} + zs$ for z .
- b. For students who graduated from high school in 2013, their SAT math scores were approximately normally distributed with a mean of 514 points and a standard deviation of 118 points (Source: College Board). Use the formula $x = \bar{x} + zs$ or the formula you found in Part (a) to find the z -scores for the following students' SAT scores (all in points): 621, 457, 555, 748, 242, and 562.
- c. Which of the students' scores given in Part (b) is most unusual? Explain.

To find several values of a variable in a formula, we usually solve the formula for that variable before we make any substitutions.

7. Let **F** be the Fahrenheit reading corresponding to a Celsius reading of **C** degrees. A formula that describes the association between **F** and **C** is $C = 5/9(F - 32)$.
 - a. Solve the Fahrenheit-Celsius formula for **F**.
 - b. Convert 10°C to the equivalent Fahrenheit temperature.
 - c. Use technology to convert 10°C , 15°C , 20°C , 25°C , and 30°C to the equivalent Fahrenheit temperatures.
8. Solve $u_r = \frac{2n_1n_2}{n}$ for n_1 .

OBJECTIVE 4 – Solve a formula with a square root.

Squaring a Principal Square Root

If x is nonnegative, then $(\sqrt{x})^2 = x$.

9. In introductory statistics, you will learn about a **margin of error formula** $E = z \cdot \frac{s}{\sqrt{n}}$, where E has to do with the error in making a certain type of estimate. Solve the formula for **n**, which is the number of individuals in a random sample.

OBJECTIVE 5 – Graph a linear equation in two variables by solving for y .

Determine the slope and the **y**-intercept. Use the slope and the **y**-intercept to graph the equation by hand.

10. $3x + 5y = 10$

11. $2(x - 2y) + 1 = 9$

12. $5 - 2(3x - y) = 1 - 3(x - 2y)$

Homework/Assessment

1, 3, 5, 13, 23, 29, 41, 43, 47, 61, 63, 65, 75, 87, 95, 101