WRITING & SOLVING Equations (and Inequalities)

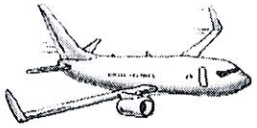
7·3·4 How can I find the unknown?

Writing Algebraic Equations and Inequalities

Today you will use variables to represent specific unknown quantities. Then you will use equations to represent real-life situations that involve unknown quantities. You will also explore how equations and inequalities can be solved to determine the values of the unknown variables.

7-112. FINDING UNKNOWN VARIABLES WITH EQUATIONS

a) An airplane is at full capacity, carrying an unknown number of passengers and 7 crewmembers. What variable could you use to represent the unknown number of passengers? Write an **expression** for the total number of people on the plane.



*An expression does not have an equal sign. For example, $x - 3$ is an expression.

b) The plane was designed to hold 241 people. Write an **equation** that equates the total number of people on the plane to your expression in part (a) above.

*An equation does have an equal sign. For example, $x - 3 = 5$ is an equation.

c) Thinking about the idea of **inverse operations**, determine the value that your **variable** needs to be in order to solve your equation. That is, how many passengers can fly in the plane? Write a complete sentence.

d) Whenever it flies, the airplane is not always at full capacity. Using what you wrote in part (b) as a start, write an **inequality** to relate the total number of people to the capacity of the plane. In the inequality, use the mathematical symbol for "less than or equal to" (≤).

e) What values for p will make the inequality you wrote in part (d) true? That is, what are the solutions to the inequality?

7-113. According to the attendance office, Lakeside Middle School has 57 fewer students than Xavier Middle School. You want to determine the number of students that attend Xavier Middle School.

- When you use a variable to represent an unknown, you will need to **define your variable** using a "let" statement to communicate what your variable represents. For example, in problem 7-112, you could have said, "Let p represent the number of passengers."

a) Write an **algebraic expression** for the number of students at Lakeside Middle School. Make sure you define the variable you choose.

b) The attendance office says there are 403 students at Lakeside Middle School. Use the expression that you wrote in part (a) to write an **equation** for the number of students at Lakeside Middle School.

c) How many students are at Xavier Middle School? Explain how you used **inverses** to find your answer. Write your answer in a complete sentence.

d) Use your equation to show how you know that 550 is **not** the number of students who are at Xavier Middle School. Test two other values that do not make the equation true. How many solutions are there to the equation that you wrote in part (b)?

I used the inverse of subtraction (addition) to "work backwards" and solve.

d) $550 - 57 = 403$ $\quad 100 - 57 = 403$

$493 = 403$ $\quad 43 = 403$

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There is one solution.

7-112 a) You could use the variable P for the unknown number of passengers.

$\boxed{P+7}$

* Let P = number of passengers.

b) $\boxed{P+7=241}$

c) The inverse of addition is subtraction so we can use subtraction to "work backwards" to solve.

$$\begin{array}{r} 2\overset{3}{4}\overset{1}{1}1 \\ -\quad 7 \\ \hline 234 \end{array}$$

$\boxed{P=234}$

d) There can be less than 234 passengers. $\boxed{P+7 \leq 241}$

e) The inequality will be true if the number of passengers is less than or equal to 234

$\boxed{P \leq 234}$

7-113 a) Let X = Xavier Middle School

$\boxed{X-57}$

b) $X-57=403$

$$\begin{array}{r} \overset{1}{4}0\overset{1}{3} \\ +\quad 57 \\ \hline 560 \end{array}$$

c) There are 560 students at Xavier. I used the inverse of subtraction (addition) to "Work Backwards" and solve.

d) $550-57=403$ $\quad 493=403$ ✗ $\qquad 100-57=403$ $\quad 43=403$ ✗ There is one solution.