Applying Algebraic Thinking
Solutions

1. Solve for \( x \):
   \[
   5(6 - 3x) = 75
   \]
   \[
   30 - 15x = 75
   \]
   \[
   x = -3
   \]

2. Solve for \( x \):
   \[
   8 - 12x \geq 32 - 4x
   \]
   \[
   -8x \geq 24
   \]
   \[
   x \leq -3
   \]

3. Solve the following system of equations:
   \[
   x = \underline{2}, \quad y = \underline{5}
   \]
   \[
   4x + 6y = 38 \quad \rightarrow \quad 4(4x + 6y = 38) \quad \rightarrow \quad 16x + 24y = 152
   \]
   \[
   10x + 8y = 60 \quad \rightarrow \quad -3(10x + 8y = 60) \quad \rightarrow \quad -30x - 24y = -180
   \]
   \[
   -14x = -28
   \]
   \[
   x = 2
   \]
   \[
   4(2) + 6y = 38
   \]
   \[
   8 + 6y = 38
   \]
   \[
   y = 5
   \]
   so, \( x = 2 \) and \( y = 5 \)

Highlights of Education in Wisconsin

4. In the 2004-2005 school year, 136,792 elementary and secondary students were enrolled in private schools. This is 13.6% of the total enrollment for all elementary and secondary schools, both private and public. What is the total enrollment for all elementary and secondary schools?
   Let \( x \) = the total enrollment
   \[
   0.136x = 136,792
   \]
   \[
   x = 1,005,824
   \]

5. In the 2003-04 school year, 42,182 teachers taught in elementary grades. This number is 4,430 more than twice the number of teachers who taught in secondary grades. How many teachers taught in secondary grades?
   Let \( x \) = the number of teachers who taught in secondary grades
   \[
   42,182 = 2x + 4430
   \]
   \[
   x = 18,876
   \]

6. The retention rate for grades 9-12 can be calculated from the formula
   \[
   R = \frac{N}{T} \cdot 100
   \]
   where \( R \) stands for the retention rate or percent
   \( N \) stands for the number of students who finish school
Applying Algebraic Thinking

Solutions

T stands for the total number of students enrolled

a) Use the formula to determine the retention percent when the total number of students enrolled is 657 and the number of students who finish is 643.

\[ R = \frac{643}{657} \times 100 = 97.9\% \]

b) Solve the retention rate formula for T. In other words, rearrange the formula to express T, the total number of students enrolled, in terms of the other variables.

\[ R = \frac{N}{T} \times 100 \]
\[ R \cdot T = \frac{N}{T} \cdot 100 \]
\[ RT = N \cdot 100 \]
\[ \frac{RT}{R} = \frac{100N}{R} \]
\[ T = \frac{100N}{R} \]

7. In 1992-93, the reported enrollment for home-schooled students was 8,690. Since then, the reported enrollment has increased at a rate of 1,234 students per year. At this rate, in how many years will the home-schooled enrollment exceed 13,500 students?

Let \( x \) = the number of years

\[ 8,690 + 1,234x > 13,500 \]
\[ x > 3.9 \text{ or } 4 \text{ years} \]

8. The top two UW System Schools, based on enrollment, are UW at Madison and UW at Milwaukee. The undergraduate enrollment of UW-Milwaukee is 7,474 students less than the undergraduate enrollment at UW-Madison. If the two schools have a combined undergraduate enrollment of 48,960, what is the undergraduate enrollment of each University?

Let \( x \) = the undergraduate enrollment at UW-Madison

Then \( x - 7,474 \) = the undergraduate enrollment at UW-Milwaukee

Milwaukee + Madison = 48,960
\[ x - 7,474 + x = 48,960 \]
\[ x = 28,217 \text{ (UW-Madison)}, \quad 8,217 - 7,474 = 20,743 \text{ (UW=Milw)} \]
9. One of the skills of algebra is to observe and form comparisons between numbers. Exploring the 2004-05 enrollment numbers for Alverno College, Mount Mary, Marquette University, and Cardinal Stitch University, the following observations were made:
Let A = the enrollment for Alverno College
Let M = the enrollment for Mount Mary College

\[ 4A + 2M = 11,840 \]  \hspace{1cm} (This number is just over the undergraduate enrollment for Marquette University.)
\[ 6A - 4M = 6,560 \]  \hspace{1cm} (This number is just under the undergraduate enrollment for Cardinal Stritch University.)

Solve this system for A and M.

\[
\begin{align*}
2(4A + 2M = 11,840) & \rightarrow 8A + 4M = 23,680 \\
6A - 4M = 6,560 & \rightarrow 6A - 4M = 6,560 \\
\hline
14A = 30,240 & \\
A = 2,160 & \text{Alverno} \\
\end{align*}
\]

then, \[ 4(2,160) + 2M = 11,840 \]
\[ M = 1,600 \quad \text{Mount Mary} \]