EXAMPLE 1 – Integer Sum and Products
Identify and label any and all variables. Write and solve a Quadratic Equation. No Credit granted for guess and check.

a. Two numbers differ by 5 and have a product of 84. Find the numbers.

\[
\begin{align*}
X &= a \quad x - 5 = \text{ the smaller } \\
X(x - 5) &= 84 \\
x^2 - 5x - 84 &= 0 \\
(x + 7)(x - 12) &= 0 \\
x &= -7, 12
\end{align*}
\]

b. The sum of the squares of two consecutive even numbers is 100. Find the numbers.

\[
\begin{align*}
X &= a \quad x + 2 = \text{ next} \quad \text{consec. even} \\
x^2 + (x + 2)^2 &= 100
\end{align*}
\]

c. The product of three consecutive integers is 21 more than the cube of the smallest integer. Find the integers.

\[
\begin{align*}
x &= \text{ first} \quad x + 1 = \text{ second} \quad x + 2 = \text{ third} \\
x(x + 1)(x + 2) &= x^3 + 21 \\
x(x^2 + 3x + 2) &= x^3 + 21
\end{align*}
\]

EXAMPLE 2 – Area and Perimeter
Identify and label any and all variables. Write and solve a Quadratic Equation. No Credit granted for guess and check.

a. The length of a rectangle is 1 m less than twice the width. If the area is 55 m², find the perimeter.

b. The shorter leg of a right triangle is 17 cm less than the longer leg. If the hypotenuse is 25 cm long, find the perimeter of the triangle.
Example 3 – Height vs. Velocity

Identify and label any and all variables. Write and solve a Quadratic Equation. No Credit granted for guess and check.

a. Luis wanted to throw an apple to Kim, who was on a balcony 40 ft above him, so he tossed it upward with an initial speed of 56 ft/s. Kim missed it on the way up, but then caught it on the way down. How long was the apple in the air?

\[ h = v_0 t - 16t^2 \]
\[ 40 = 56t - 16t^2 \]
\[ 16t^2 - 56t + 40 = 0 \]
\[ 2t^2 - 7t + 5 = 0 \]

\[ t = \frac{3}{2} \]

Example 4 – Property Dimensions

Identify and label any and all variables. Write and solve a Quadratic Equation. No Credit granted for guess and check.

a. Ali paints with watercolors on a sheet of paper 20 in. wide by 15 in. high. He then places this sheet on a mat so that a uniformly wide strip of the mat shows all around the picture. The perimeter of the mat is 102 in. How wide is the strip of the mat around the picture?

\[ 2(15+2x) + 2(20+2x) = 102 \]
\[ x = 4 \text{ in} \]

b. A parcel of land is 6 ft longer than it is wide. Each diagonal from one corner to the opposite corner is 174 ft long. What are the dimensions of the parcel?

c. A rectangular parcel of land is 50 ft wide. The length of a diagonal between opposite corners is 10 ft more than the length of the parcel. What is the length of the parcel?