A. Lesson Context

BIG PICTURE of this UNIT:	• How & why do we build NEW knowledge in Mathematics? • What NEW IDEAS & NEW CONCEPTS can we now explore with specific references to QUADRATIC FUNCTIONS? • How can we extend our knowledge of FUNCTIONS, given our BASIC understanding of Functions?		
CONTEXT of this LESSON:	Where we've been In Unit 2, you worked with quadratic MODELS **focusing on the vertex** in QE the form of $y = \boldsymbol{a}(x - \boldsymbol{h})^2 + \boldsymbol{k}$	Where we are NOW we will focus on the ROOTS of quadratic equations & how these solutions relate to word problems and can be extended to develop new function concepts?	Where we are heading How do we extend our knowledge & skills of the algebra of quadratic functions, and build in new ideas & concepts involving functions.

B. Lesson Objectives

a. Understand various factoring strategies that can be applied to solving quadratic equations in standard form.
b. Apply these strategies to quadratic models in variety of contexts as well as to graphs of quadratic functions.

C. Fast Five (Skills Review Focus)

1. $3x^2 - 15x + 18$
2. $x^3 + 11x^2 + 10x$
3. $8x^3 - 18x$
4. $5x^3 - 40x^2 + 60x$
5. $4x^2 + 8x - 60$
6. $2x^3 - 20x^2 - 48x$
7. $4m^2 - 18m + 14$
8. $15m^3 + 24m^2 + 9m$
9. $15m^2 - 10m - 25$
10. $50m^3 - 2m$
11. $3m^2 - 10m + 8$
12. $60m^3 + 54m^2 - 6m$

1. $4x^2 - 25$
2. $3x^2 - 12x$
3. $2x^2 - 8$
4. $3x^2 + 7x - 6$
5. $x^2 - 3x - 28$
6. $x^2 - 12x + 36$
7. $8x^2 + 7x - 1$
8. $4x^2 - 4x + 1$
9. $10x^2 - 3x - 4$
10. $x^2 - 9x + 20$

D. Algebraic Strategies & Skills: Factoring ➔ Contextual Problem

Example 1:

Andy & Susie have a custom T-shirt design business. Their profits from this business can be modeled by the quadratic function $P(x) = -x^2 + 120x - 2000$, where P represents their expected profit and x is the number of T-shirts they sell.

(a) Andy wants to know how many T-shirts need to be sold to make a profit of $1200. Create an equation to model this question and use factoring as your algebraic strategy to answer the question.

(b) Susie wants to know how T-shirts need to be sold to break even. Create an equation to model this question and use factoring as your algebraic strategy to answer the question.

Example 2:

A model rocket's height can be determined using the quadratic function, $h(t) = 40t - 5t^2$, where *h* is height above the ground in meters and *t* is time in seconds. When will this rocket reach a height of

(a) 60 meters

(b) 90 meters

Example 3:

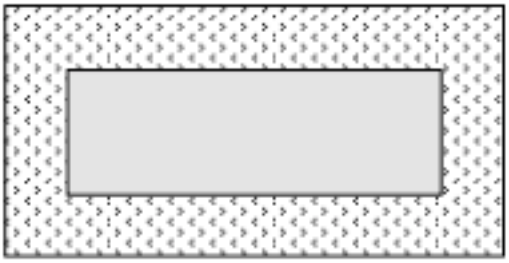
The length of a rectangle is 4 less than twice the width. The area of the rectangle is 70. Find the dimensions of the rectangle.

Example 4:

The length of a rectangle is 7 units more than its width. If the width is doubled and the length is increased by 2, the area is increased by 42 square units. Find the dimensions of the original rectangle.

Example 5:

A rectangular lawn measuring 8 m by 4 m is surrounded by a flower bed of uniform width. The combined area of the lawn and the flower bed is 165 m^2. What is the width of the flower bed?



Example 6:

A sheet of cardboard 10 inches by 12 inches will be made into a box by cutting equal-sized squares from each corner and folding up the four edges. If the area of the base is to be 80 square inches, then what size square should be cut from each corner?