(A) Lesson Context

BIG PICTURE of this UNIT:	• How do we analyze and then work with a data set that shows both increase and decrease • What is a parabola and what key features do they have that makes them useful in modeling applications • How do I use graphs, data tables and algebra to analyze quadratic equations?

(B) Lesson Objectives:

a. Understand the connection between the standard form of a quadratic equation and the y-intercept of a parabola
b. Understand the connection between the factored form of a quadratic equation and the zeroes of a parabola
c. Understand the connection between the vertex form of a quadratic equation and the maximums/minimums of a parabola
d. Start to see how additional features of a parabola can be determined from an equation (i.e how can an axis of symmetry be predicted from factored form? How can the zeroes be predicted from vertex form?)

(C) Fast Five

Mr. S throws a ball upward from the roof of the building that is 32m tall. The ball reaches a maximum height of 50m above the ground after 3s and hits the ground 8s after being thrown.

a. Draw an accurate graph of the height of ball and the time in flight.
b. What are the zeroes of the relation?
c. What are the co-ordinates of the vertex?
d. Determine an equation that models this situation.
e. What is the meaning of each zero?

(C) FACTORED FORM: (This should be a REVIEW of concepts from previous lessons)

Use DESMOS to complete the observation table below:

EQN	y-int	x-int (zeroes)	vertex	axis of symmetry
$y = (x+3)(x-5)$				
$y = (x-2)(x-6)$				
$y = x(x-7)$				
$y = (x-3)^2$				
$y = (x-4)(x-2)$				
$y = 2(x-4)(x-2)$				
$y = -3(x-4)(x-2)$				
$y = (2x-4)\left(\frac{1}{2}x-2\right)$				
$y = (4-x)(x-2)$				
$y = (3x-2)(3x-4)$				

Which feature is EASIEST TO PREDICT given the form of the equation? How?

How can you PREDICT where the axis of symmetry is FROM THE EQUATION?

(D) STANDARD FORM:

Use DESMOS to complete the observation table below:

EQN	y-int	axis of symmetry	vertex	x-int (zeroes)
$y = x^2 + 4x - 12$				
$y = x^2 - 5x + 6$				
$y = x^2 - 5x$				
$y = x^2 + 12x$				
$y = x^2 + 3x - 8$				
$y = x^2 + 8x + 16$				
$y = x^2 + 2x + 3$				
$y = x^2 + 4x - 12$				
$y = 2x^2 + 4x - 12$				
$y = 4x^2 + 4x - 12$				

Which feature is EASIEST TO PREDICT given the form of the equation?

How can you PREDICT where the ***axis of symmetry*** is FROM THE EQUATION?

(E) <u>VERTEX FORM:</u>

EQN	y-int	x-int (zeroes)	vertex	axis of symmetry
$y=(x-1)^2-4$				
$y=(x+1)^2-9$				
$y=(x+4)^2+6$				
$y=(x-3)^2$				
$y=-(x-4)^2+4$				
$y=-(x+2)^2-1$				
$y=-\left(x-\frac{1}{2}\right)^2+2$				
$y=\frac{1}{2}(x+4)^2-2$				
$y=2(x+5)^2-8$				
$y=(3x-2)^2-9$				

Which feature is EASIEST TO PREDICT given the form of the equation?

How can you PREDICT where the zeroes are FROM THE EQUATION?

(F) <u>SUMMARY OF KEY POINTS OF LESSON 5:</u>

EQUATION FORM	EQUATION	KEY FEATURE	EXTENSION ➔ ADDITIONAL FEATURE:
(1) Standard Form			
(2) Factored Form			
(3) Vertex Form			