(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?		
CONTEXT of this LESSON:	Where we've been In Lesson 3, you investigated the main features of the graphs of parabolas and how to find these features using a graph or graphing calculator	Where we are How can we use the equation & algebra to help find the special features of the graphs of quadratic relations – so is there a graph & algebra connection	Where we are heading How can I use graphs of quadratic relations to make predictions from quadratic data sets & quadratic models and quadratic equations

(A) Lesson Objectives

a. Determine how to calculate the key features of a parabola from its equation in factored form
b. Determine the equation of a parabola (in factored form) when given a graph
c. Present real world applications involving zeroes or parabola

(B) Fast Five

a. Ex 1 ➔ For the quadratic relation $y = (x + 3)(x – 4)$, determine:
   i. The direction of opening.
   ii. The zeroes
   iii. The optimal point.
   iv. The y-intercept.
   v. Sketch the parabola.

b. Ex 2 ➔ The zeroes of a parabola are -3 and 5. The graph crosses the y-axis at -75. Determine:
   i. if the relation have a maximum or minimum value?
   ii. the equation of the quadratic relation.
   iii. the co-ordinates of the vertex.
   iv. Sketch the parabola.

(D)Consolidation of Investigations ➔ Key Points

a. Equations in the form of y = ***a***(x – ***s***)(x – ***t***) are_____, provided that _____.

b. The equation written the form y = ***a***(x – ***s***)(x – ***t***) is said to be in _____.

c. If a > 0, the parabola opens _____and has _____.

d. If a < 0, the parabola opens _____and has _____.

e. The zeroes of the quadratic can be determined by setting _____and solving_____.

The zeroes are then located _____.

f. If the zeroes are known, then the axis of symmetry can be found ➔_____.

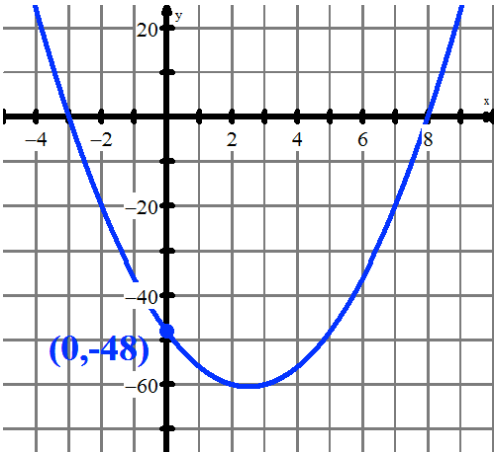
g. Once the axis of symmetry is known, the optimal value can be found ➔_____.

h. The value of ***a*** can be determined IF_____. All known values are substituted into y = ***a***(x – ***s***)(x – ***t***) and then solve for ***a***.

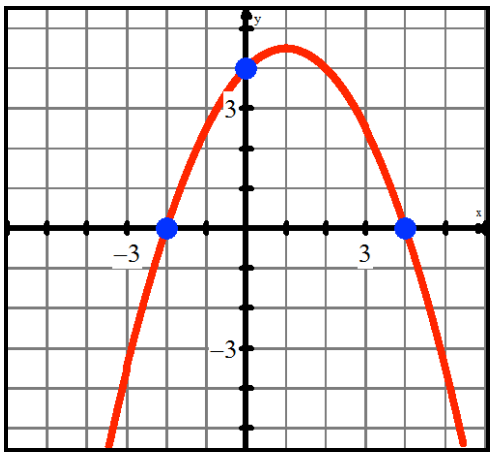
(E) Determining Equations from Graphs

Determine the equations of the following graphs (or listed information), recalling that the equation of a quadratic function in factored form is $f(x) = a(x - R)(x - S)$

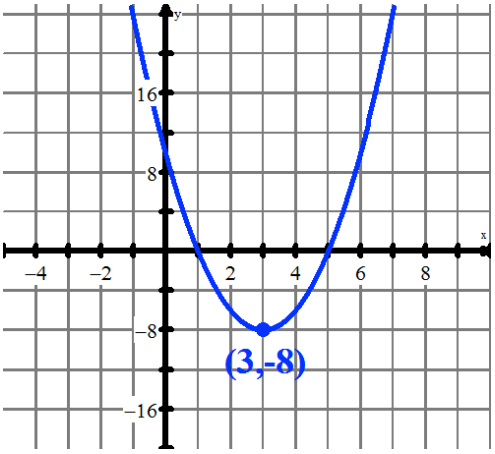
(a)



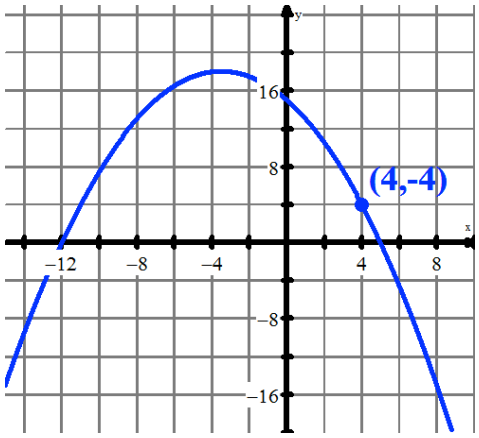
(b)



(c)



(d)



(e) the zeroes are at x = 7 and x = -3, and the y-intercept is at -63

(f) the x-intercepts are (5,0) and (-2,0) and the minimum value is -24.5

(g) one zero is at 4 and the vertex is at (1,-45)

(g) one zero is at -6 and two points are at (-4,-24) and at (2,-24)

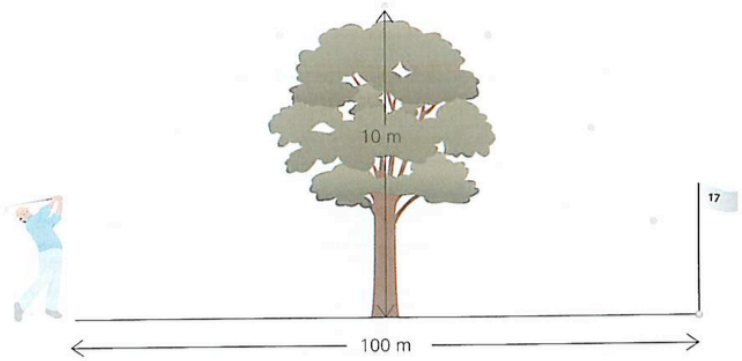
(F) Application/Context Problems

a. Ex 1 ➔ Mr. S throws a ball upward from the roof of the building that is 25m tall. The ball reaches a height of 45m above the ground after 2s and hits the ground 5s after being thrown.

i. Draw an accurate graph of the height of ball and the time in flight.
ii. What are the zeroes of the relation?
iii. What are the co-ordinates of the vertex?
iv. Determine an equation that models this situation.
v. What is the meaning of each zero?

b. Ex 2

Application: Angus is playing golf. The diagram (not to scale) shows him making a perfect shot to the pin. Determine the height of the ball when it is 15 m from the hole by using the information in the diagram to determine a quadratic relation for height vs. distance travelled.



c. Ex 3

17. This table gives the height of a golf ball at different times during its flight.
(a) Create a scatter plot and draw a graph of best fit.
(b) Use the graph to approximate the zeros of the relation.
(c) Find an algebraic expression that models the flight of the ball.
(d) Use the expression to determine the maximum height of the ball.

Time (s)	Height (m)
0.0	0.000
0.5	10.175
1.0	17.900
1.5	23.175
2.0	26.000
2.5	26.375
3.0	24.300
3.5	19.775
4.0	12.800
4.5	3.375

d. Ex 4 ➔ a company called SAMSOONG introduces a new cellphone and its PROFITS are modelled by the equation $P(m) = -5m^2 + 80m - 100$ where m is time in months and P(m) is the profit in millions of dollars. The cellphone is sold for a period of 2 years.

i. Graph the profit function on your TI-84.

ii. Calculate the zeroes of the quadratic and interpret what they mean.

iii. Write the equation in factored form, given your work in (ii).

iv. Calculate the co-ordinates of the vertex and interpret.

v. Evaluate P(5) and interpret.

vi. Solve P(m) = -25 and interpret

vii. Solve P(m) < 0 and interpret

viii. For what values of m are the profits DECREASING? Explain how you determined your answer.

(G)EXIT TICKET

Given the following sets of 10 graphs, 10 equations and 10 data tables, match the corresponding graphs to data tables to equations