(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 1, you looked for number patterns & graphed in data from a variety of activities & in Lesson 2, you determined regression equations of quadratic data sets	Where we are What are the special features of the graphs of quadratic relations	Where we are heading How can I use graphs of quadratic relations to make predictions from quadratic data sets & quadratic models and quadratic equations

(B) Lesson Objectives:

a. Generate graphs of quadratic relations on the TI-84 from given equations
b. Introduce special features of these graphs – called parabolas
c. Use the graphing calculator to analyse the parabolas and determine these special features
d. Use the special features of the parabolas to answer contextual questions in quadratic modelling questions

(C) KEY REVIEW POINTS ➔ Main Point to Lesson 1

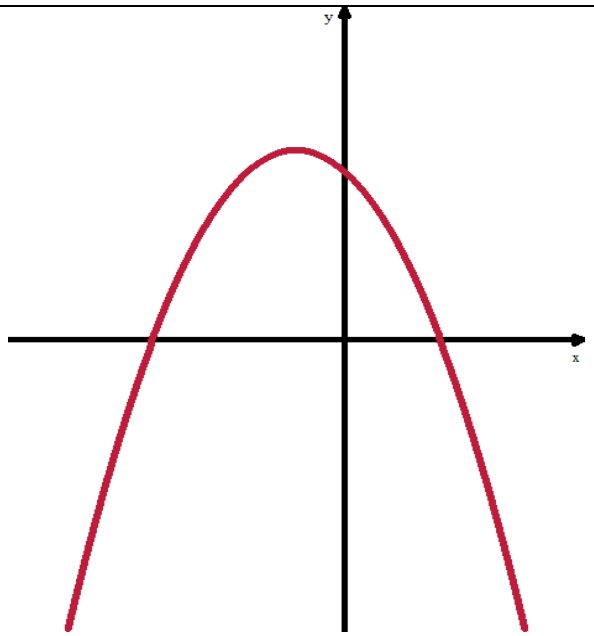
The KEY POINT to Lesson 1 was ➔

(D) KEY REVIEW POINTS ➔ The TWO Main Points to Lesson 2

The FIRST KEY POINT to Lesson 2 was ➔

The SECOND KEY POINT to Lesson 2 was ➔

(E) Special Features of Parabolas



Define/describe/explain the following and label them on the diagram

i) Direction of opening

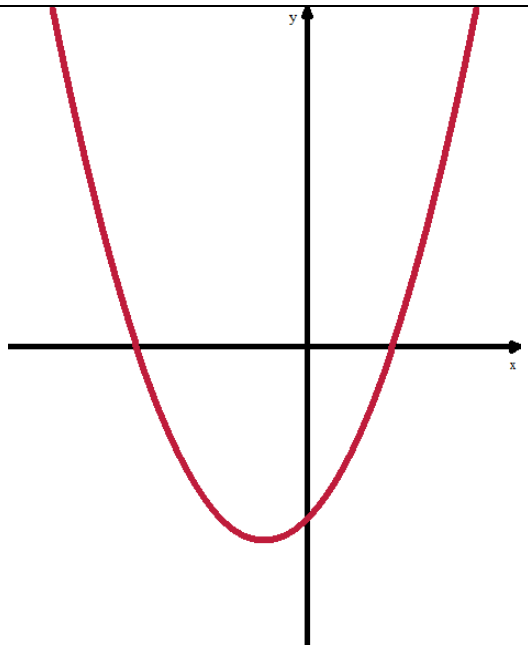
ii) Vertex/optimum point/Max or Min point

iii) Optimal value/max or min value

iv) Zeroes/x-intercepts

v) Y-intercept

vi) Axis of Symmetry



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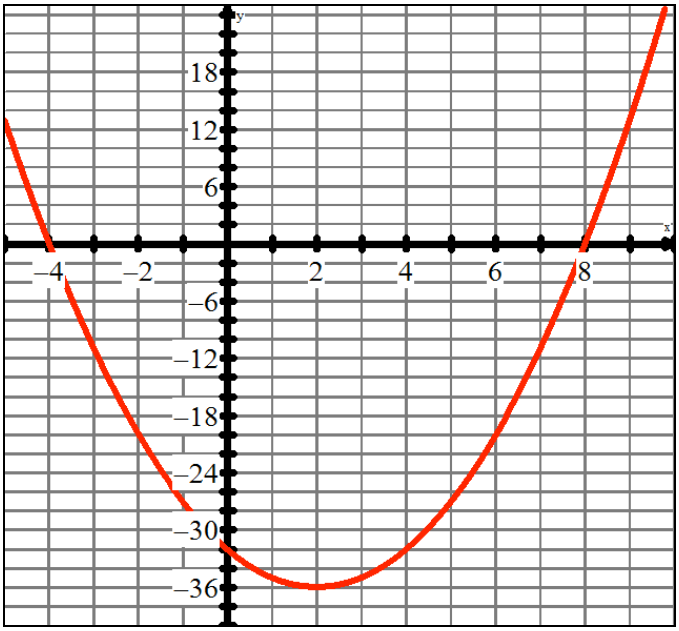
(F) Special Features of Parabolas – From A GRAPH

From the graph of the quadratic relation below, complete the required analysis:



(a) Direction of opening

(b) Vertex/optimum point/Max or Min **POINT**

(c) Optimal value/max or min **VALUE**

(d) Zeroes/x-intercepts

(e) Y-intercept

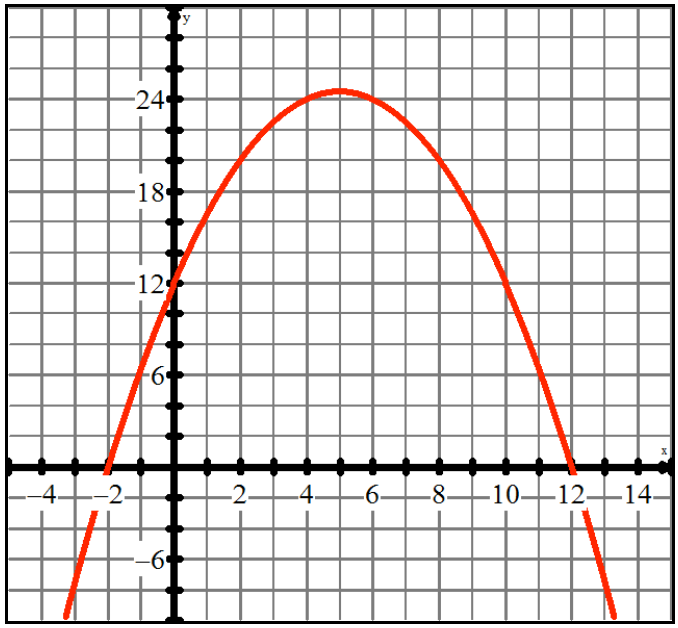
(f) Axis of Symmetry

(g) Determine the value of y when x = 3 (i.e. f(3) = ?)

(h) Determine x when y = -21 (i.e. solve -21 = f(x))

EQUATION is y = (x + 4)(x – 8)

From the graph of the quadratic relation below, complete the required analysis:



(a) Direction of opening

(b) Vertex/optimum point/Max or Min **POINT**

(c) Optimal value/max or min **VALUE**

(d) Zeroes/x-intercepts

(e) Y-intercept

(f) Axis of Symmetry

(g) Determine the value of y when x = 2 (i.e. f(2) = ?)

(h) Determine x when y = 6 (i.e. solve f(x) = 6)

EQUATION is $y = -0.5x^2 + 5x + 12$

(G)Special Features of Parabolas – From an EQUATION & the TI-84

From the equation $f(x) = 2x^2 – 12x – 32$, complete the required analysis using the TI-84:

(a) Direction of opening

(b) Vertex/optimum point/Max or Min **POINT**

(c) Optimal value/max or min **VALUE**

(d) Zeroes/x-intercepts

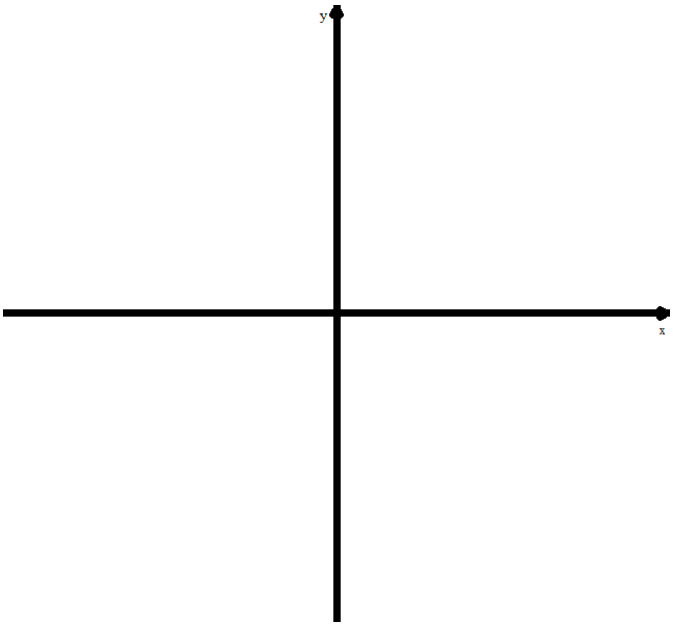
(e) Y-intercept

(f) Axis of Symmetry

(g) Evaluate f(1)

(h) Solve f(x) = -49.5

(i) Show a sketch with the key features labeled



From the equation $g(x) = -0.25(x – 5)^2 + 4$, complete the required analysis using the TI-84:

(a) Direction of opening

(b) Vertex/optimum point/Max or Min **POINT**

(c) Optimal value/max or min **VALUE**

(d) Zeroes/x-intercepts

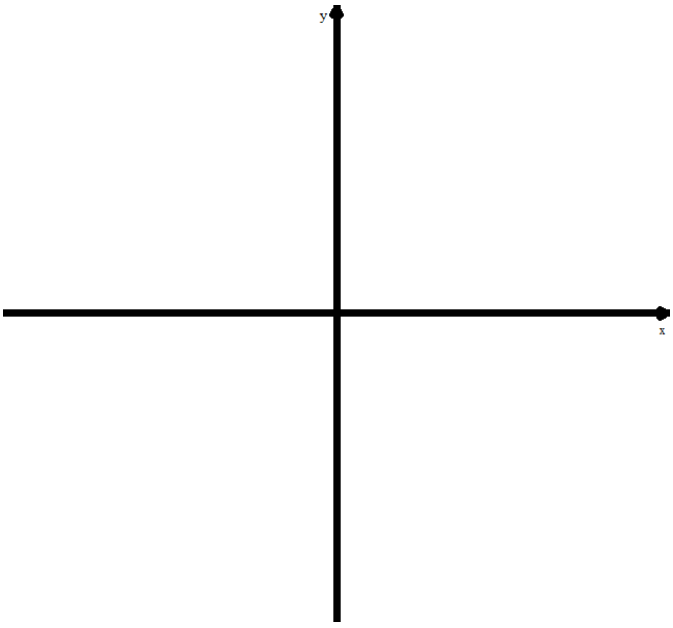
(e) Y-intercept

(f) Axis of Symmetry

(g) Evaluate g(-8)

(h) Solve g(x) = -12

(i) Show a sketch with the key features labeled.



(H)Special Features of Parabolas – From an EQUATION & the TI-84

From the equation h(x) = -2(x + 4)(x – 7) , complete the required analysis using your TI-84:

(a) Direction of opening

(b) Vertex/optimum point/Max or Min **POINT**

(c) Optimal value/max or min **VALUE**

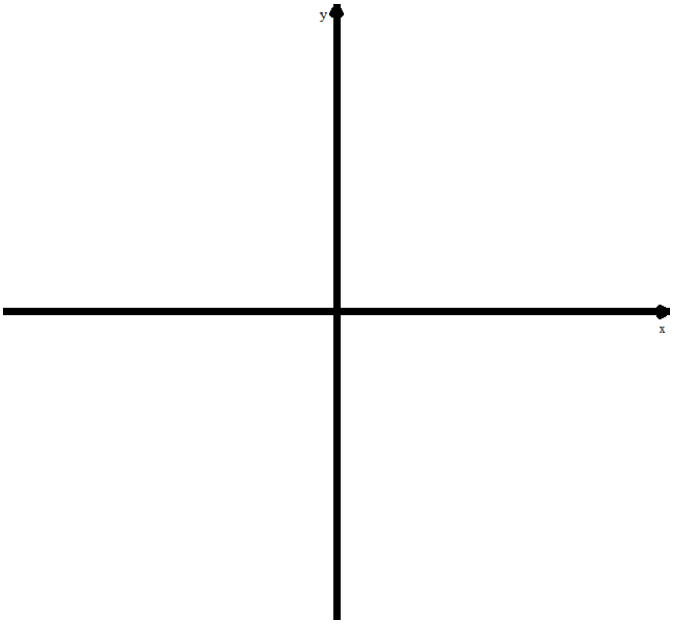
(d) Zeroes/x-intercepts

(e) Y-intercept

(f) Axis of Symmetry

(g) Evaluate h(5.5)

(h) Solve h(x) = 30



From the equation P(t) = $3t^2 + 10t – 5$, complete the required analysis using your TI-84:

(a) Direction of opening

(b) Vertex/optimum point/Max or Min **POINT**

(c) Optimal value/max or min **VALUE**

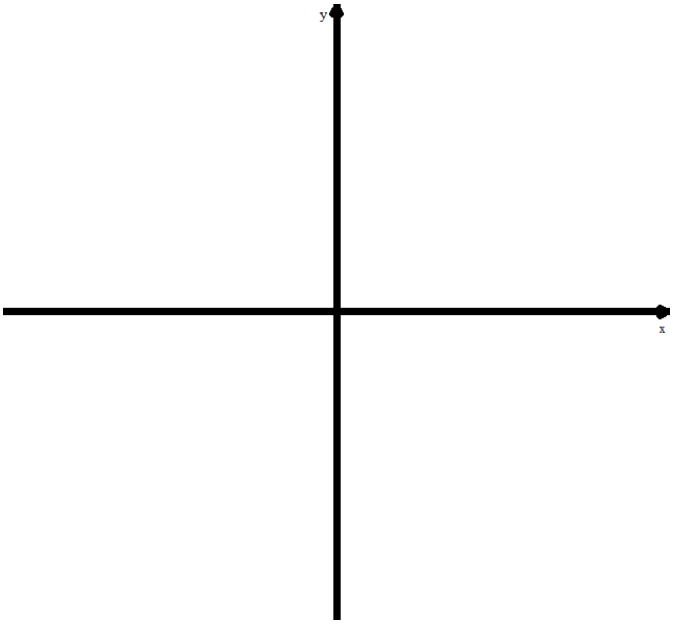
(d) Zeroes/x-intercepts

(e) Y-intercept

(f) Axis of Symmetry

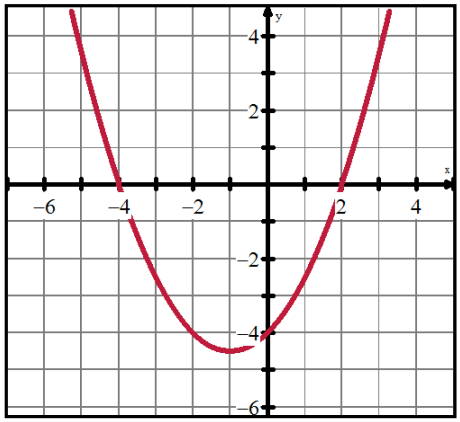
(g) Evaluate p(-8)

(h) Solve p(t) = -12



(I) Modelling with Quadratic Relations

Ex 1 ➔ Examine the graph of the quadratic relation below:



(i) What are the co-ordinates of the vertex?

(ii) What is the optimal value?

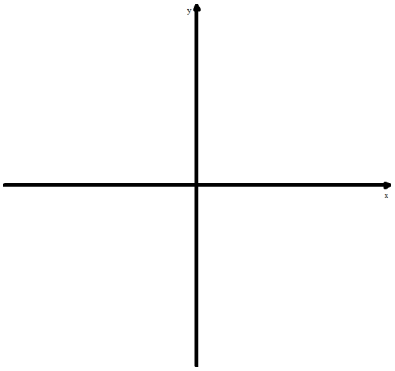
(iii) What is the equation of the axis of symmetry?

(iv) What are the zeroes of the relation?

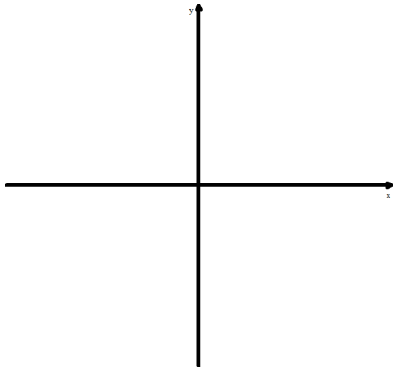
(v) What would be the sign of the second differences?

(vi) CHALLENGE: Determine the equation of this parabola.

b) Ex 2 ➔ Two parabolas each have zeroes of 1 and 11. One has a maximum value of 12, the other has a minimal value of -6. Sketch the 2 parabolas on the same axes.



c) CONNECTION TO ALGREBRA ➔ A relation is defined by the equation $A(L) = 24L - L^2$. For this relation:



i) Determine the zeros.

ii) State the equation of the axis of symmetry.

iii) Graph it on the GDC and determine the optimal value.

iv) Sketch the parabola, labeling the key features

v) ***ALGEBRA CONNECTION***: Write the equation in factored form by removing the GCF.