

(A) WEEKLY OBJECTIVES

- a. Review fundamental algebra skills → expansion, factoring
- b. Establish connection of algebra skills to graphing & key graph concepts from last week
- c. Emphasis on real world applications when reviewing algebra & graphing

(B) Lesson 22 Objectives

- a. Introduce the factored form of the equation of a quadratic relation by means of investigations
- b. Determine how to calculate the key features of a parabola from its equation in factored form
- c. Present real world applications involving zeroes or parabola

(C) Investigation – Investigating the Graphs of Quadratic Functions & Factored Form

All of the quadratics you will graph are presented in the form of $y = a(x - s)(x - t)$. How do the values of a, s, t affect the graph?

1. Use a graphing calculator (or use www.desmos.com) to graph $y = a(x - 2)(x + 3)$ when $a = 3$. Describe what happens to the graph as you change the value of a to 2, 1, $\frac{1}{2}$, $\frac{1}{4}$, 0, -1, -2, -3. Include sketches.

2. Graph $y = 2(x - s)(x + 5)$ when $s = 3$. Describe what happens to the graph as you change the value of s to 2, 1, 0, -1, -2, -3. Include sketches.

(C) Investigation – Investigating the Graphs of Quadratic Functions & Factored Form

All of the quadratics you will graph are presented in the form of $y = a(x - s)(x - t)$. How do the values of a, s, t affect the graph?

3. Graph $y = 1.275(x - 2.41)(x - t)$ when $t = 3.3$. Describe what happens to the graph as you change the value of t to 2.75, 1.875, 0, -1.15, -2.6, -3.025. Include sketches. (Is this really any different than Q2???)
4. Which of the quantities $a, s,$ or t affects whether the graph has a maximum or a minimum value? How can you PREDICT where a parabola has a maximum or minimum?
5. Which of the quantities $a, s,$ or t affects where the graph has a zeroes? How can you PREDICT where a parabola has its zeroes?

(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) Algebra Skills – REVIEW**a. Expanding →**

<http://www.kutasoftware.com/FreeWorksheets/Alg1Worksheets/Multiplying%20Polynomials.pdf>

b. Factoring →

<http://www.kutasoftware.com/FreeWorksheets/Alg1Worksheets/Factoring%201.pdf>

(F) Examples

- a.** Ex 1 → For the quadratic relation $y = (x + 3)(x - 4)$, determine:
- The direction of opening.
 - The zeroes
 - The optimal point.
 - The y-intercept.
 - Sketch the parabola.
- b.** Ex 2 → The zeroes of a parabola are -3 and 5. The graph crosses the y-axis at -75. Determine:
- if the relation have a maximum or minimum value?
 - the equation of the quadratic relation.
 - the co-ordinates of the vertex.
 - Sketch the parabola.
- c.** Ex 3 → 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.
- Draw an accurate graph of the height of ball and the time in flight.
 - What are the zeroes of the relation?
 - What are the co-ordinates of the vertex?
 - Determine an equation that models this situation.
 - What is the meaning of each zero?
- 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.
- Graph the profit function on your TI-84.
 - Calculate the zeroes of the quadratic and interpret what they mean.
 - Write the equation in factored form, given your work in (ii).
 - Calculate the co-ordinates of the vertex and interpret.
 - Evaluate $P(5)$ and interpret.
 - Solve $P(m) = -25$ and interpret
 - Solve $P(m) < 0$ and interpret
 - For what values of m are the profits DECREASING? Explain how you determined your answer.

(G) Homework

From the Nelson 10 textbook, Sec 3.4, p280, Q1adf, 2adf, 3, 4cd, 5dfh, 7efg, 13