

(A) Lesson Context

BIG PICTURE of this UNIT:	<ul style="list-style-type: none"> • 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:	<p>Where we've been</p> <p>In Lesson 5, you looked at the three forms of quadratic equations and how the equation communicates key features of the parabolas</p>	<p>Where we are</p> <p>We can easily switch between forms using simple algebra → today we will expand and factor</p>	<p>Where we are heading</p> <p>How can I use graphs and equations to make predictions from quadratic data sets & quadratic models and quadratic equations</p>

(B) Lesson Objectives:

- a. Review & practice the algebraic skills of expanding and factoring
- b. Understand the graphic & function connection of the algebra
- c. Use the skills of factoring and expanding in application problems

(C) Changing from Factored Form to Standard Form – Expanding

Expand:

$$f(x) = (x + 1)(x + 3)$$

$$f(x) = -3(x + 5)(3 - x)$$

$$f(x) = 2(x + 4)(x - 4)$$

$$f(x) = (2x + 5)^2$$

Evaluate $f(2)$

Axis of Symmetry

Max/min point

(C) Practice with Expanding

1. Expand and simplify.

a) $(x + 7)(x - 1)$

b) $(x + 3)(x + 4)$

c) $(2x - 1)(x + 3)$

d) $(4x + 5)(6x + 2)$

e) $(3x - 2)(3x + 1)$

2. Expand and simplify.

a) $(x - 11)(x + 11)$

b) $(x - 6)(x + 6)$

c) $(3 - 8x)(3 + 8x)$

d) $(4x + 9)(4x - 9)$

e) $(7x + 2)(7x - 2)$

2. Expand and simplify.

a) $4(x - 5)(x + 5)$

b) $7(x + 1)(x - 6)$

c) $3(2x - 1)(3x + 4)$

d) $2(x + 4)(x + 2)$

e) $5(x - 9)(x - 5)$

4. Expand and simplify

a) $(x - 8)^2$

b) $(5x - 3)^2$

c) $(9x + 2)^2$

d) $(6x + 12)^2$

e) $(x + 7)^2$

3. Expand and simplify.

a) $(x + 1)(x + 2) + 3(x - 2)$

b) $(x - 6)^2 + (x + 2)^2$

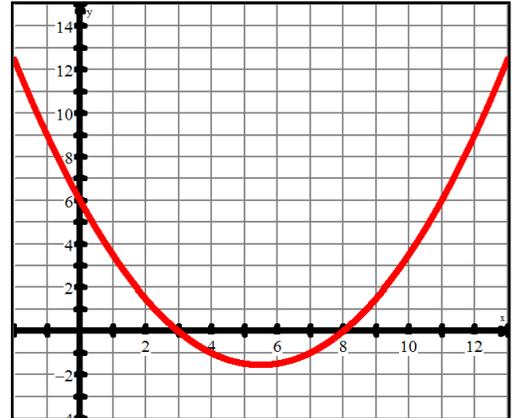
c) $(x - 7)(x + 7) - (x - 4)(x + 4)$

d) $(x + 5)(x + 3) + 2(x - 1)^2$

e) $3(x - 9)^2 - 2(x - 3)(x + 6)$

(D) Changing from Factored Form to Standard Form – Expanding

Connect to the Graph → Determine the equation of the parabola graphed. Write its equation, first in factored form and then in standard form



Apply to Problems → Mr. S. can sell 500 apples per week when he charges 50 cents per apple. Through market research, his wife (being smarter than Mr. S of course) knows that for every price increase of 2 cents per apple, he will sell 10 less apples.

- i. Determine an equation that can you used to model Mr. S.'s expected revenues.

- ii. What price should he charge to maximize his revenues?

- iii. What is his maximum revenue?

(E) Standard Form to Factored Form – Factoring

Practice the Algebra → Determine the zeroes of the following parabolas.

$$y = x^2 - x - 6$$

$$y = x^2 - 4x - 32$$

$$y = x^2 + x - 12$$

$$y = x^2 - 10x + 25$$

$$y = x^2 + 5x + 4$$

$$y = x^2 + 8x + 15$$

$$y = 2x^2 - 2x - 12$$

$$y = x^2 - 6x$$

$$y = 3x^2 + 24x + 45$$

$$y = x^2 - 25$$

$$y = 2x^2 - x - 6$$

$$y = 9x^2 - 6x + 1$$

(F) Practice – Factoring Quadratic TrinomialsPart A

Directions: USE A SEPARATE SHEET OF PAPER. Please factor the following expressions. If any of the following expressions cannot be factored, please indicate so by stating "prime".

1. x^2+5x+4

2. $x^2+12x+32$

3. $x^2+15x+50$

4. $a^2-5a-24$

5. $a^2+5a-24$

6. $r^2+2r-48$

7. $x^2+6x-72$

8. $d^2+2d+80$

9. $2x^2-12x+18$

10. $3m^2+45m+162$

11. $x^2-33x+32$

12. $-3x^2+36x-60$

13. b^2+b-72

14. $d^2-25d+156$

15. $5b^2-50b+120$

16. $-2f^2+22f+52$

Part B

Directions: USE A SEPARATE SHEET OF PAPER. Please factor the following expressions. If any of the following expressions cannot be factored, please indicate so by stating "prime".

1. $6x^2-13x-5$

2. $3x^2+10x-25$

3. $10x^2+17x+3$

4. $6x^2-7x-3$

5. $12x^2-28x-5$

6. $3x^2-32x+45$

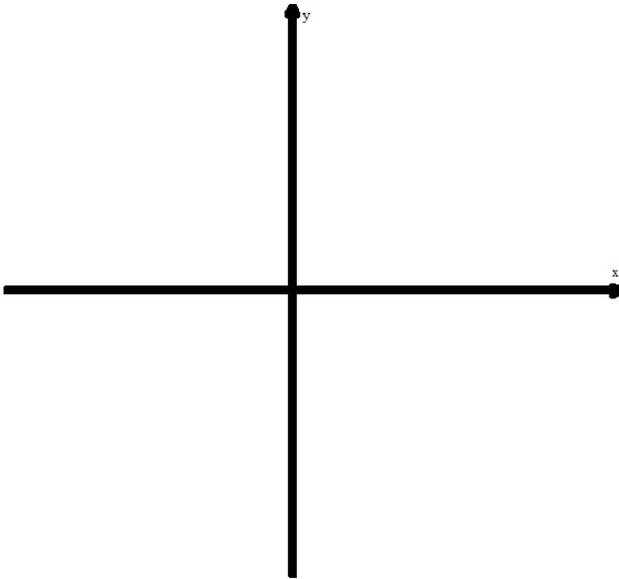
7. $14x^2-9x+1$

8. $12x^2-8x-15$

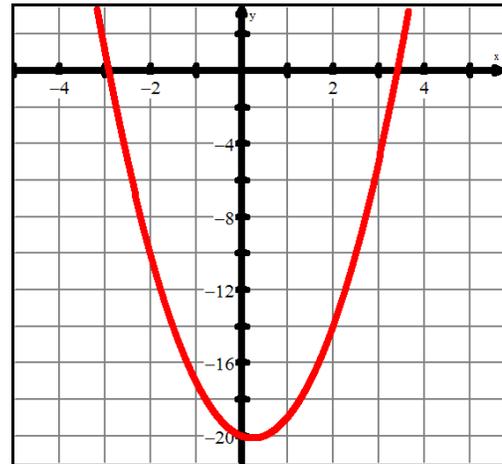
9. $11x^2+35x+6$

(G)Practice – Graphing & Word Problem Context

Given the quadratic function $f(x) = -x^2 + 3x + 18$, determine the zeroes, y-intercept & vertex & sketch the parabola



Given the quadratic function $f(x) = 2x^2 - x - 20$ (pictured below), use the TI-84 somehow..... and write the equation of $f(x) = 2x^2 - x - 20$ in factored form. **(T)**



Apply to Problems → The profits of a company in its first 13 months of operations are modelled by the quadratic function $P(m) = -0.25m^2 + 3m - 5$ where m is the number of months (and $m = 1$ represents January) and $P(m)$ is measured in billions of pesos. (CALC INACTIVE)

- Determine when the company “breaks even”.
- Determine in which month the company maximizes its profits.
- What are the company’s maximum profits?
- Solve and interpret $P(m) < 0$ given that the domain is $D: \{m \in \mathbb{Z} \mid 0 \leq m \leq 13\}$
- For what values of m are the profits DECREASING? Explain how you determined your answer.
- Solve $P(m) = -12$ and interpret