

**(A) Lesson Context**

BIG PICTURE of this UNIT:	<ul style="list-style-type: none"> <li>• How do we analyze and then work with a data set that shows both increase and decrease</li> <li>• What is a parabola and what key features do they have that makes them useful in modeling applications</li> <li>• How do I use graphs, data tables and algebra to analyze quadratic equations?</li> </ul>
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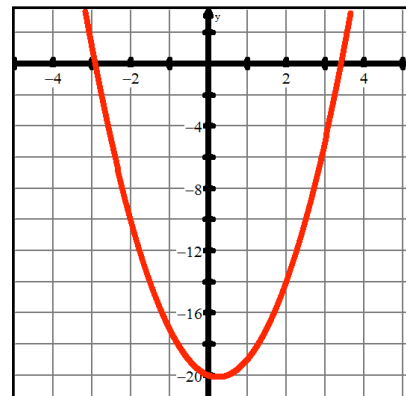
**(B) Lesson Objectives:**

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

**(C) Review of Skills: Practice – Graphing & Word Problem Context**

a. (CA) Given the function  $f(x) = 2x^2 - x - 20$  (pictured below), write the equation in factored form.

b. (CI) The monthly profits of a company in its first 13 months of operations are modelled by the quadratic function  $P(m) = -\frac{1}{4}m^2 + 3m - 5$  where  $m$  is the number of months (and  $m = 1$  represents January) and  $P(m)$  is measured in billions of pesos.



- 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 ..... ?
- For what values of  $m$  are the profits DECREASING? Explain how you determined your answer.
- Solve  $P(m) = -12$  and interpret

c. (CI) Complete the following chart

Analyze & sketch	Evaluate f(2)	Axis of Symmetry	Max/min point	Zeroes
$f(x) = (x + 1)(x + 3)$				
$f(x) = -3(x + 5)(x - 1)$				
$f(x) = 2x^2 + 6x - 20$				
$f(x) = -x^2 + 3x + 18$				

- d. (CA) 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.
- Determine an equation that can you used to model Mr. S.'s expected revenues.
  - What price should he charge to maximize his revenues?
  - What is his maximum revenue?

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

1. Expand and simplify.

- $(x + 1)(x + 2) - 3(x - 2)$
- $(7x - 6)^2 + (x + 2)^2$
- $(3x - 7)(x + 7) - (x - 4)(5x + 4)$
- $(x - 5)(2x + 3) + 2(x - 1)^2$
- $3(x - 9)^2 - 2(4x - 3)(x + 6)$

**(E) Practice – Factoring Quadratic Trinomials where  $a \neq 1$**

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

9. The area of a rectangle is given by each of the following trinomials.

**K** Determine expressions for the length and width of the rectangle.

- a)  $A = 6x^2 + 17x - 3$     b)  $A = 8x^2 - 26x + 15$

10. Identify possible integers,  $k$ , that allow each quadratic trinomial

**T** to be factored.

- a)  $kx^2 + 5x + 2$     b)  $9x^2 + kx - 5$     c)  $12x^2 - 20x + k$

14. A computer software company models the profit on its latest video

**A** game using the relation  $P = -4x^2 + 20x - 9$ , where  $x$  is the number of games produced in hundred thousands and  $P$  is the profit in millions of dollars.

- What are the break-even points for the company?
- What is the maximum profit that the company can earn?
- How many games must the company produce to earn the maximum profit?