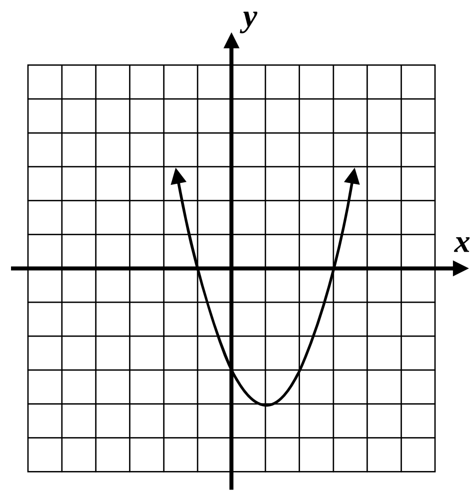
Name: ____________________________________ Date: __________________

THE ZEROES OF A QUADRATIC
COMMON CORE ALGEBRA I

The x-locations on any function where the output (the y-coordinate) is equal to zero are known, not surprisingly, as the **zeroes of the function**. These are amazingly important in applied settings. When they are **rational numbers** then they can be found using a factoring technique. We'll develop the idea in the first exercise.

***Exercise* #1:** Consider the quadratic function $y = x^2 - 2x - 3$. It's graph is shown below.



(a) What are the zeroes of the function? Write their x-values and circle them on the graph.

(b) Verify that the positive zero is correct by showing that $y = 0$.

(c) Factor the expression $x^2 - 2x - 3$. How do these factors compare to the zeroes?

(d) Based on (c), determine where the zeroes of $y = x^2 + 3x - 10$ are algebraically. Verify using a table.

What is really going on here is perhaps the **second most important equation solving technique**, known as the **Zero Product Law**.

THE ZERO PRODUCT LAW

If two or more quantities have a product of **zero** then at least one of them must be equal to **zero**. In symbolic form:

If $a \cdot b = 0$ then either $a = 0$ or $b = 0$ (or both are zero)

***Exercise* #2:** Use the Zero Product Law to find all solutions to each of the following equations.

(a) $(x+7)(x-2) = 0$

(b) $(2x-1)(3x+4) = 0$

The **Zero Product Law** is remarkable because it allows us to solve equations with an x^2 or higher level term in it, as long as the expression set equal to zero can be **factored**.

***Exercise* #3:** Find the **roots** (solutions) to each of the following equations by using the **Zero Product Law**. Sometimes you will be instructed to **solve by factoring**.

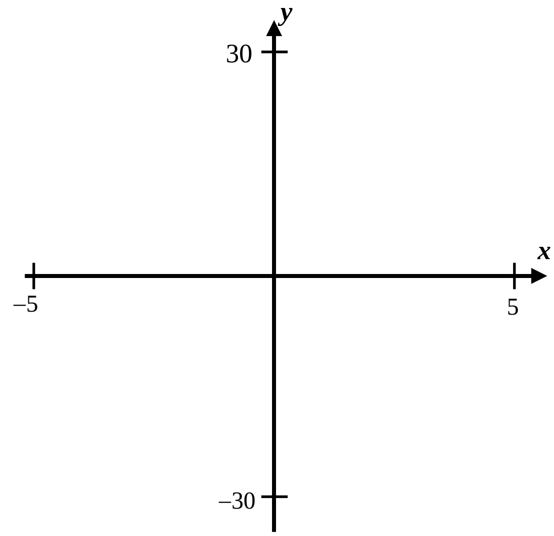
(a) $x^2+4x-12=0$

(b) $2x^2-14x=0$

(c) $x^2-25=0$

(d) $2x^2+5x-12=0$

***Exercise* #4:** Find the zeroes of the quadratic function $y=3x^2-6x-24$ algebraically. Then verify your answer by using your calculator to sketch a graph of the parabola using the window indicated on the axes below. Clearly mark the zeroes on the graph.



Name: ______________________________________ Date: ___________________

THE ZEROES OF A QUADRATIC
COMMON CORE ALGEBRA I HOMEWORK

FLUENCY

1. The roots of $x^2 - 6x - 16 = 0$ can be found by factoring as

   (1) $\{-16, 6\}$ (3) $\{-2, 8\}$

   (2) $\{-8, 2\}$ (4) $\{6, 16\}$

2. The equation $(2x-3)(x+7)=0$ has a solution set of

   (1) $\{-7, 1\frac{1}{2}\}$ (3) $\{-7, 3\}$

   (2) $\{3, 7\}$ (4) $\{\frac{1}{2}, -3\}$

3. Find the roots of each of the following equations by factoring:

   (a) $x^2 - 36 = 0$

   (b) $x^2 + 12x + 27 = 0$

   (c) $3x^2 + 5x - 2 = 0$

   (d) $20x^2 - 10x = 0$

   (e) $10x^2 + x - 21 = 0$

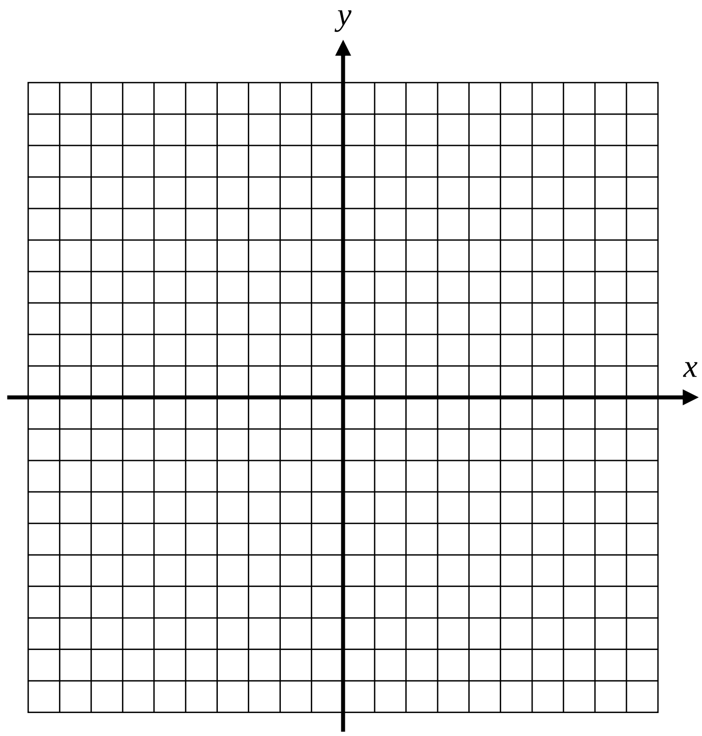
   (f) $4x^2 - 16x - 84 = 0$

4. Consider the quadratic function $y = x^2 - 4x - 5$.

(a) Using your calculator, graph the function on the grid provided.

(b) State the zeroes of the function by inspecting the graph. Circle their locations.

(c) Find the zeroes algebraically by factoring. Verify that your answers match (b).



APPLICATIONS

5. A baking soda rocket is fired upwards with an initial speed of 80 feet per second. Its height, *h*, above the ground in feet can be modeled using the equation:

$$h(t) = -16t^2 + 80t \qquad \text{where } t \text{ is the time since launch in seconds}$$

At what time, $t > 0$, does the rocket hit the ground? Find algebraically using factoring.

REASONING

6. The two quadratic equations below have the same solutions. Can you determine why? Completely factor both to see what they have in common.

$x^2 - 7x + 12 = 0$ $\qquad$ $3x^2 - 21x + 36 = 0$