

Course: MFM2P Gr. 10 AppliedLesson: 7 - 2Unit: Representing Quadratic RelationsTopic: Interpreting Quadratic Relations

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✚ **homework check: Lesson 7 - 1**✚ **note: Interpreting Quadratic Relations**

Quadratic relations can be represented by equations or graphs. Our experience with quadratic relations is mainly based on the standard form  $y = ax^2 + bx + c$ ,  $a \neq 0$ . The value of  $c$  from standard form is the value of the y intercept. The value of  $a$  is necessary when we are asked to determine a maximum or minimum value. When  $a$  is positive, the parabola opens up and has a minimum. When  $a$  is negative, the parabola opens down and has a maximum

When quadratics are factored, they have the form  $y = a(x - r)(x - s)$ . The value of  $r$  and  $s$  from factored form are the ***x intercepts or zeroes***. To find the value of the x intercepts, we set  $y = 0$  and solve. For example, find the value of the x intercepts for each of the following.

a)  $y = x^2 + 3x - 10$  must factor to find the zeroes

$$y = (x + 5)(x - 2)$$

Set each factor to zero and solve to find the x intercepts.

$$x + 5 = 0 \qquad x - 2 = 0$$

$$x = -5 \qquad x = 2$$

b)  $y = x^2 - 5x + 6$  must factor to find the zeroes

$$y = (x - 2)(x - 3)$$

Set each factor to zero and solve to find the x intercepts.

$$x - 2 = 0 \qquad x - 3 = 0$$

$$x = 2 \qquad x = 3$$

What do you notice about the signs of the factors and the signs of the zeroes or x intercepts?

We should notice that ***the signs of the factors and zeroes or intercepts are opposite*** of one another. Keeping this in mind, find the x intercepts of each of the following.

c)  $y = x^2 + 8x + 7$  must factor to find the zeroes

$$y = (x + 7)(x + 1)$$

The x intercepts are:

$$x = -7, x = -1$$

d)  $y = x^2 - 7x - 8$  must factor to find the zeroes

$$y = (x - 8)(x + 1)$$

The x intercepts are:

$$x = 8, x = -1$$

Once we know the x intercepts, we can find the value of x when the maximum or minimum occurs. The value of x can be substituted into the original to find the value of y. This max or min point is known as the vertex of the parabola. For example, find the vertex of the parabola in parts a and b.

From a) we have  $x = -5$  and  $x = 2$

$$\begin{aligned} \frac{-5 + 2}{2} &= \\ &= \frac{-3}{2} \end{aligned}$$

$x = -1.5$  substitute back into original

$$y = x^2 + 3x - 10$$

$$y = (-1.5)^2 - 3(-1.5) - 10$$

$$y = -3.25$$

vertex is  $(-1.5, -3.25)$

From b) the zeroes are

$$x = 2 \text{ and } x = 3$$

$$\begin{aligned} \frac{2 + 3}{2} &= \\ &= \frac{5}{2} \end{aligned}$$

$= 2.5$  which we substitute back into the original

$$y = x^2 - 5x + 6$$

$$y = (2.5)^2 - 5(2.5) + 6$$

$$y = -0.25$$

vertex is  $(2.5, -0.25)$

**✚ homework assignment: Lesson 7 - 2**

**Lesson 7 – 2: Interpreting Quadratic Relations****1. Find the zeroes of each quadratic relation by factoring first, then solving.**

a)  $y = x^2 + 5x + 6$

b)  $y = x^2 + 7x - 18$

c)  $y = x^2 - 10x + 24$

d)  $y = x^2 + 2x - 3$

**2. Given the quadratic relation  $y = x^2 + 3x - 4$** 

a) Does the relation have a maximum or minimum value?

b) What is the y-intercept?

c) What are the zeroes of the relation?

**3. Find the maximum or minimum value of each quadratic relation.**

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

b)  $y = -x^2 - 2x$

c)  $y = -3x^2 - 21x - 18$

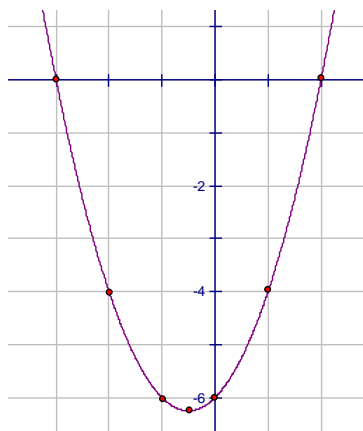
d)  $y = 4x^2 - 64$

**4. Which of these equations represents the parabola shown?**

a)  $y = (x + 2)(x - 3)$

b)  $y = (x - 2)(x + 3)$

c)  $y = x^2 + x - 6$



**5. Find the maximum area, in square meters, of a rectangle whose area can be represented by  $A = 15x - x^2$ .**

**6. The curve formed by a cable on a suspension bridge can be modelled by the equation  $y = x^2 - 10x + 16$ .**

**a) Write the equation in factored form.**

**b) What are the zeroes of this relation?**

**c) Where is the distance between the ends of the cables?**

**d) What is the maximum or minimum value?**