Lesson Plan

Grade 10 Academic Math **Lesson: 5 - 4**

Unit: Transformations of Quadratic **Topic: Using Vertex Form of a Quadratic**

- ***homework check:*** **Principles of Mathematics 10 p. 269 # 1 – 4, 6, 8, 10, 15**

- ***note:*** **Using Vertex Form of a Quadratic**

We can determine the equation of any quadratic if we know the vertex and one other point on the parabola. By knowing this information, we can solve for the value of 'a' and write the equation in vertex form to graph or write the equation in standard form as required.

a) Brent is jumping over fences with his horse. The fence is 2 m high and he plans on being in the air for a total of 4 seconds. Write an equation that models this quadratic movement.

*Note: If we are writing an equation for this model, we have to assume that Brent's horse leaves the ground at 0 s and 0 m, so in our vertex form, substitute the values we know.

$y = a(x-h)^2 + k$

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

substitute the point $(0,0)$

$0 = a(0-2)^2 + 2$

solve

$-2 = 4a$

$a = \frac{-1}{2}$

$\therefore y = \frac{-1}{2}(x-2)^2 + 2$

b) Tara is diving down to a reef that is 10 m under the ocean and it takes her 5 minutes to get there. If she was 40 metres from shore, write an equation that models this quadratic movement.

*Note: If Tara begins 40m from shore, we get another point (40 , 0) and the vertex for this movement will be (45, -10).

$$y = a(x-45)^2 - 10$$
$$0 = a(40-45)^2 - 10$$
$$10 = 25a$$
$$\frac{2}{5} = a$$
$$y = \frac{2}{5}(x-45)^2 - 10$$

This method can also be applied to a table of values or scatter plot. For example, given the following data, determine the equation of the parabola.

Time (s)	Distance (m)
0	5
10	12
20	14
30	11
40	6

Vertex appears at (20 , 14) and another point we can use is (0 , 5).

$$y = a(x-20)^2 + 14$$
$$5 = a(0-20)^2 + 14$$
$$-9 = 400a$$
$$\frac{-9}{400} = a$$
$$-0.0225$$
$$y = -0.0225(x-20)^2 + 14$$

- ***homework assignment:*** **<u>Principles of Mathematics 10</u> p. 280 #2, 3, 4, 8, 11, 13**