Course: MFM2P Gr. 10 Applied **Lesson: 7 - 3**

Unit: Representing Quadratic Relations **Topic: Factoring Quadratic Relations with a>1**

- ***homework check:*** **Lesson 7 - 2**

- ***note:*** **Factoring Quadratic Relations with a>1**

Sometimes quadratics may have an ***a*** value greater than one. In this case, we must common factor the value of ***a*** first before factoring the rest of the trinomial. For example,

a) $2x^2 + 4x - 48 =$ The value of a > 1.

Divide each term of the trinomial by 2.

$= 2\left(x^2 + 2x - 24\right)$

Now we can factor the trinomial.

$c = -24$

$b = 2$

$= 2(x+6)(x-4)$

b) $-3x^2 + 9x + 84 =$ The value of a > 1.

Divide each term by -3.

$= -3\left(x^2 - 3x - 28\right)$

Now we can factor the trinomial.

$c = -28$

$b = -3$

$= -3(x-7)(x+4)$

c) Jake fires a gun from his tree stand at a deer standing several metres away. The path of the bullet can be modeled by the equation $h = -0.35t^2 + 2.8t + 3.15$ where t is the time in seconds and h is the height of the bullet in metres.

i) How long is the bullet in the air?

ii) How high is the tree stand that Jake is sitting on?

iii) What is the maximum height of the bullet?

i) To find how long the bullet is in the air,
we need the x intercepts. Therefore we must factor.

$h = -0.35t^2 + 2.8t + 3.15$

$h = -0.35\left(t^2 - 8t - 9\right)$

$h = -0.35(t+1)(t-9)$

$t = -1, \quad t = 9$

Since time cannot be negative, the bullet is in the air for 9 seconds.

ii) To find the height of the tree stand,
we need to find the y intercept. Therefore, set t = 0.

$h = -0.35t^2 + 2.8t + 2.15$

$h = -0.35(0)^2 + 2.8(0) + 3.15$

$h = 3.15$

The tree stand is 3.15 *m* in the air.

iii) To find the max height of the bullet,
we need to find the vertex time and height.
Since we know the intercepts, $t = -1$ *and* $t = 9$,
we find the middle.

$\frac{-1+9}{2} =$

$= \frac{8}{2}$

$= 4$

$h = -0.35(4)^2 + 2.8(4) + 3.15$

$h = 8.75$

The maximum height of the bullet is 8.75*m.*

homework assignment: **<u>Lesson 7 - 3</u>**

Lesson 7 – 3: Factoring Quadratic Relations with A>1

1. The minimum cost of maintaining an overhead crane depends on the number of hours the crane is in operation. The cost is given by the relation $C = 6t^2 - 36t + 154$, where C represents the cost in hundreds of dollars and t represents the time in hours tha the crane has been operated.

a) Write the equation in factored form.

b) What are the zeroes of the relation?

c) All measures are in metres. What is the horizontal distance between the ends of the cable?

2. A circuit board company earns a profit that can be represented by the relation $P = -3x^2 + 42x - 135$, where P represents the profit in tens of thousands of dollars and x represents the number of circuit boards in thousands manufactured per day.

a) Find the maximum profit the company makes each day.

b) How many circuit boards should the company manufacture each day to earn this maximum profit?

3. 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) What is the horizontal distance between the cables?

4. The shape of a skateboard ramp can be modelled by the relation $d = 0.08t^2 - 0.8t$, where d represents the depth in metres and t represents the horizontal distance in metres.

a) Find the maximum depth of the ramp.

b) From the start of the ramp, what is the horizontal distance to the point with mazimum depth?

c) What is the total horizontal distance across the tamp?

5. The path of a soccer ball can be represented by the relation $h = -0.05x^2 + 1.5x$, where h is the height of the soccer ball in yards, and x is the horizontal distance the ball travels in yards.

a) What is the maximum height of the ball?

b) What is the horizontal distance the ball is from the kicker when the maximum occurs?

c) What is the horizontal distance the ball travels before hitting the ground?

6. Determine the zeroes and the maximum or minimum value of the relation $y = -2x^2 + 12x - 10$.