Welcome Back to MYP Math 9!

	Assignment Effort Grade (Circle One)	Comments (What was interesting or challenging?)
Monday Date: 3/16 Topic: Quiz 6.1 - no homework	0 1 2	
Tuesday Date: _____ Topic: _____	0 1 2	
Wednesday Date: _____ Topic: _____	0 1 2	
Thursday Date: _____ Topic: _____	0 1 2	
Friday Date: _____ Topic: _____	0 1 2	

Warm-up:

How high do fireworks fly into the air?

300 feet

1000 ft

400 ft

401 ft

Abdinasir had the best estimate! :)

Fireworks around the world!

https://www.theguardian.com/global/video/2017/jan/01/dazzling-fireworks-around-world-celebrate-2017-new-year-video

Class Plan:

1. Warm-up
2. Rockets in the air!!
   Real-life quadratic application.
3. Justify!
4. Practice.

Factored form in real - life!

A skyrocket is shot into the air during a 4th of July celebration. The height of the rocket **y** in feet after **t** seconds is modeled by the equation: $y = -16t^2 + 96t + 112$

Step 1: What is the height of the rocket when it hits the ground? 0

a) Divide each side of the equation by -16: $\frac{-16t^2}{-16} + \frac{96t}{-16} + \frac{112}{-16} = \frac{0}{-16}$

$t^2 - 6t - 7 = 0$

b) Factor this equation. $(t - 7)(t + 1) = 0$

-7, 1, -7, -6, +

c) Solve from factored form. When will the rocket hit the ground?

$t - 7 = 0$ | $t + 1 = 0$

$+7 \quad +7$ | $-1 \quad -1$

$t = 7$ sec | $t = -1$ sec

d) Defend ~~whether the answer~~ to c) is realistic, ***or not***. X

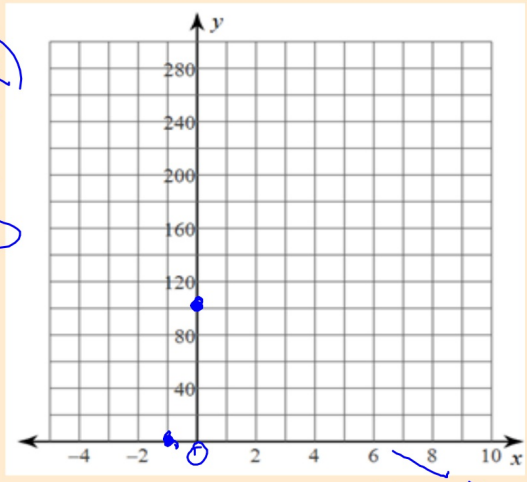
Cannot go back in time -1 sec. 7 sec

Step 2:

Factored form in real - life!

X (time **s**)	-2	-1	0	1	2	3	4	5	6	7	8
Y (height **ft**)	-144	0	112	192	240	256	240	192	112	0	-144

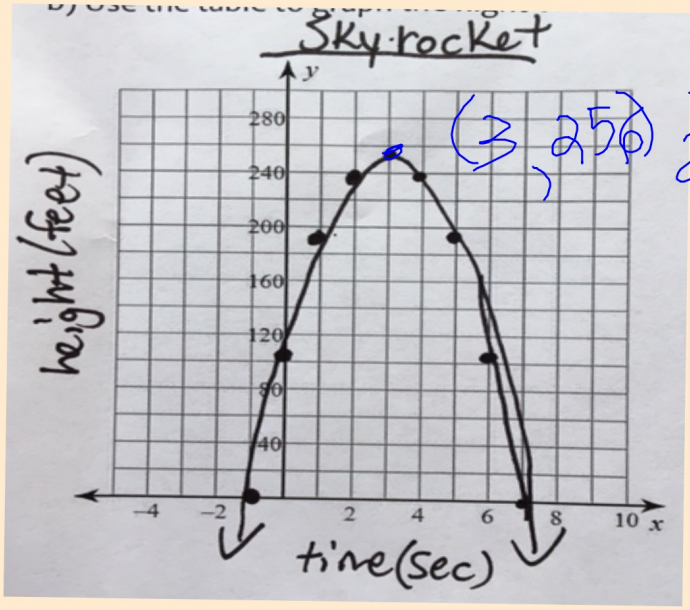
b) Use the table to graph the flight of the fireworks. (Remember to title and label your graph!!)



height (ft)

time (sec)

When and where is the rocket at its highest point?



Factored form in real - life!

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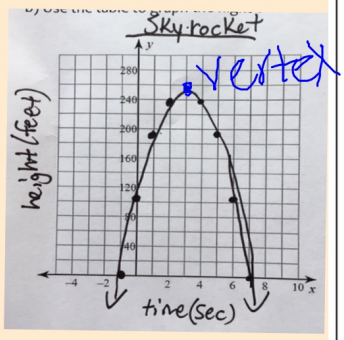


Use the graph to answer questions:

i) How high will the fireworks fly in the air? (Feet)

256 ft

ii) When will the fireworks be the highest in the air? (Seconds)

3 sec

iii) What is the average of the x-intercepts? 7, -1

$\frac{7+-1}{2} = \frac{6}{2} = 3$ secs

Vocabulary: Vertex **is the point where the** graph **changes** direction.

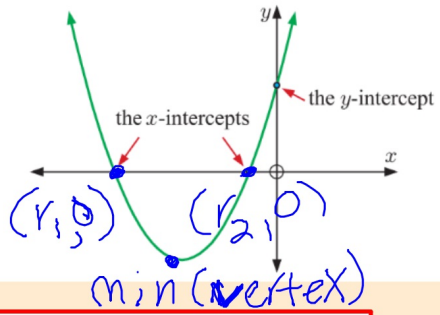
It is also the maximum **or** minimum **point on the graph. Depending on its shape.**

Recall: Intercepts of quadratic graphs

C AXES INTERCEPTS

Suppose we are given a function and its graph.

- An ***x*-intercept** is a value of x where the graph meets the x-axis.
  x-intercepts are found by letting y be 0 in the equation of the function.
- A ***y*-intercept** is a value of y where the graph meets the y-axis.
  y-intercepts are found by letting x be 0 in the equation of the function.



$$y = ax^2 + bx + c$$

General form:

y-intercept = **c**

$$y = a(x - r_1)(x - r_2)$$

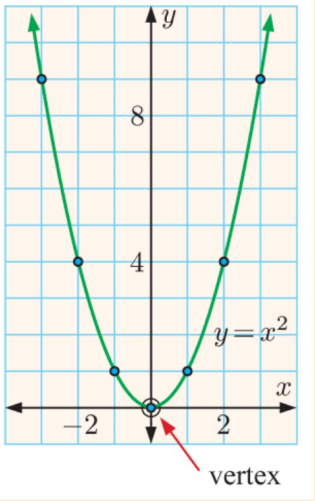
$y = 0$

Factored form:

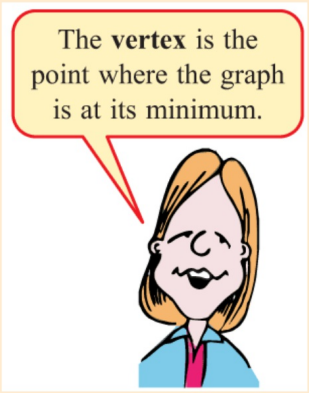
x-intercepts = $\mathbf{r_1}$ & $\mathbf{r_2}$

A Vertex QUADRATIC FUNCTIONS

x	-3	-2	-1	0	1	2	3
y	9	4	1	0	1	4	9



Vertex: If parabola opens downward, the vertex is at the maximum.

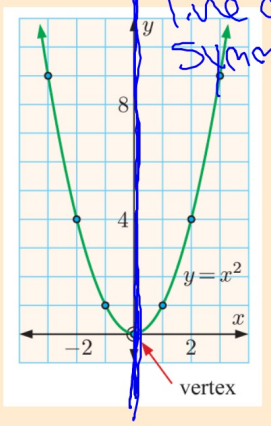


In this graph....Vertex = y-intercept = x-intercept

A QUADRATIC FUNCTIONS

Notice that:

- The curve is a **parabola** and it opens upwards.
- There are no negative y values, since $x^2 \geqslant 0$ for all x. The curve does not go below the x-axis.
- The curve is **symmetrical** about the y-axis.
  For example: when $x = -3$, $y = (-3)^2 = 9$
  when $x = 3$, $y = 3^2 = 9$.
- The curve has a **turning point** or **vertex** at $(0, 0)$.



line of symmetry

x-coordinate of vertex (average of the roots/ x-intercepts)

$$y = a(x - r_1)(x - r_2)$$

$$\frac{r_1 + r_2}{2}$$

KEY Factored form in real - life!

Step 1: What is the height of the rocket when it hits the ground? Zero

a) Divide each side of the equation by -16: $-16t^2 + 96t + 112 = 0$

$$\frac{-16t^2}{-16} + \frac{96t}{-16} + \frac{112}{-16} = \frac{0}{-16} \longrightarrow t^2 - 6t - 7 = 0$$

b) Factor this equation. $(t\ \underline{+1}\ )(t\ \underline{-7}\ ) = 0$

c) Solve from factored form. When will the rocket hit the ground?

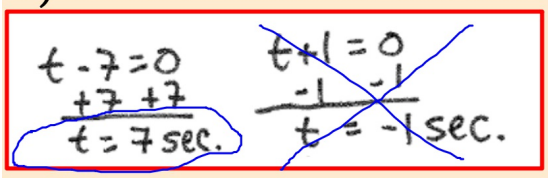
$t - 7 = 0$ $\quad +7\ +7$ $\quad t = 7$ sec.

$t + 1 = 0$ $\quad -1\ -1$ $\quad t = -1$ sec.

The rocket will hit the ground after 7 seconds.

KEY **Factored form in real - life!**

d) Defend whether the answer to c) is realistic, ***or not.***



7 seconds seems like a reasonable time to be in the air and then hit the ground. -1 seconds is impossible since the rocket can't go back in time.

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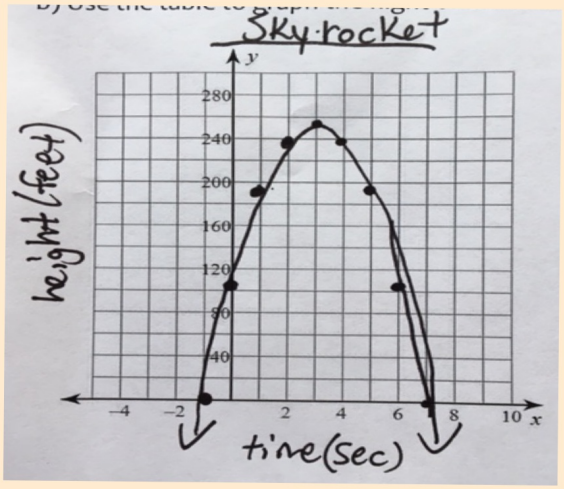

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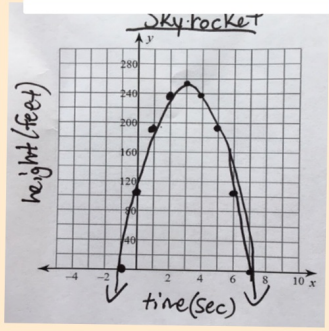

Use the graph to answer questions:

i) How high will the fireworks fly in the air? (Feet)

256 feet

ii) When will the fireworks be the highest in the air? (Seconds)

3 seconds

iii) What is the average of the x-intercepts?

(-1 + 7)/2 = 3

Vocabulary: Vertex **is the point where the** graph **changes** direction.

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Joke Break!

Q: What do you get when you cross a dinosaur with fireworks?

A: DINOMITE!

Just a reminder that fireworks look even more amazing when you're not constantly checking your Phone.

How high do fireworks need to be in the air??

Maximum height of fireworks is 256 feet.

Realistic or not?? Defend your answer!

c) Defend whether the maximum height is realistic, ***or not.***

The height of 256 feet seems realistic because 300 feet is a football field. Also, the MOA is 50 feet high, and fireworks need to be high enough to view over tall buildings.

A look ahead to Friday's partner quiz

As a pair, you will:

1) Solve for and define cricital points
2) Interpret real-life meaning of critical points
3) Defend realism of scenario and answers

7 8	The student is able to: i. **identify** the relevant elements of the authentic real-life situation ii. **select** appropriate mathematical strategies to model the authentic real-life situation iii. **apply** the selected mathematical strategies to reach a correct solution to the authentic real-life situation iv. **Verify** the degree of accuracy of the solution v. **justify** whether the solution makes sense in the context of the authentic real-life situation	• Necessary critical points are found. [X-intercept, y-intercept, vertex] (Found algebraically with ***appropriate*** work shown). • Solutions are interpreted and ***justified*** using the real-life context. • **Discuss** how aspects of the model could affect accuracy.

Exercises:

Real-life Applications choose ***at least*** 1 application.

3) A Bald eagle flies above the cliffs of the Mississippi river. The eagle drops a stick 64 feet above the river's edge and it falls to the ground after **t** seconds. The drop of the stick can be modeled by the equation

$y = -16x^2 + 64$.

a) When will the stick hit the ground? (*In other words, what is the **x-intercept**? What is x when y = 0?*)

SHOW YOUR WORK☺

$\frac{0}{-16} = \frac{-16x^2}{-16} + \frac{64}{-16}$ $0 = x^2 - 4$ $4 = x^2$ $x = -2, 2$

b) How high is the stick in the air after dropping for 1 second? (*In other words, what is y when x=1?*)

SHOW YOUR WORK☺

c) Defend whether your answers are realistic, *or not.*

Exercises:

4) A juggler tosses a ring into the air. The height, in feet, of the ring above the ground can be modeled by the equation $y = -16x^2 + 16x + 6$, where x is the time, in seconds, after the ring is tossed.

a) How high off the ground is the ring before it is thrown?
(*In other words, what is the **y-intercept**? What is y when x=0?*) **SHOW YOUR WORK☺**

b) The ring is at its highest point in the air after 0.5 seconds. How far in the air is the ring before it starts to fall to the ground? (*In other words, what is the **maximum** height? What is y when x=.5?*) **SHOW YOUR WORK☺**

c) Defend whether your answers are realistic, *or not.*

Solutions:

3) a) (0, 6 feet)

b) (0.5, 10 feet)

4) a) (2 seconds, 0 feet)

b) (1 second, 48 feet)

Don't forget to defend your realism or ***nonrealism!***