Welcome MYP 9 Mathematics!

	Assignment Effort Grade (Circle One)	Comments (What was interesting or challenging?)
Monday Date: 3/19 - Quiz Friday, no homework Topic:	0 1 2	
Tuesday Date: 3/20 Topic: 18BC: Solving Quadratics	0 1 2	
Wednesday Date: 3/21 Topic: 18BC: Modeling a dive into a pool.	0 1 2	
Thursday Date: ______ Topic: ____________	0 1 2	
Friday Date: ______ Topic: ____________	0 1 2	

Class Plan

1. Warm-up - Compare yesterday's work to the key.

2. Partner Practice: Model a toy rocket!

3. Practice: Verify accuracy or inconsistencies, and defend realism, (*or not realistic)*.

From the MYP RUBRIC:

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. • Verify your critical points using equation

Analysis of the modeling of Platform Diving

From the MYP RUBRIC:

"Verify the degree of accuracy of the solution"

Warm-up:

2) Discuss how accuracy could be affected by inconsistencies between the model and real-life?

From the MYP RUBRIC: "Verify the degree of accuracy of the solution"

Warm-up:

2) Discuss how accuracy could be affected by inconsistencies between the model and real-life?

It would be very difficult to create a model that fits the swimmer's dive exactly. There is technology to measure time, speed, and other factors, but each diver is different and it would be hard to build a model that fits **every diver**.

From the MYP RUBRIC:

"**justify** whether the solution makes sense in the context of the authentic real-life situation"

Further evidence:

- One inconsistency is that the maximum height should occur after the diver has jumped from the platform. When a swimmer dives into a pool, they jump up and then perform their dive. The model shows the max height is at -1 seconds, but impossible for negative time.
- The height of the platform also seems inaccurate being that the olympic platforms are 10 meters. 10 meters is about 393.7 inches, but the platform is stated as 384 inches.

Toy Rockets ..... "in the air" :)

https://www.youtube.com/watch?v=MAWcASi8U7M

Model the flight of a toy rocket!

Do: **Independent work:** Show Work!

1) Find critical points (intercepts and vertex)
2) Interpret the critical points.
3) Answer questions.
4) Graph critical points.

Done? Self assess with solutions and rubric

Part a) Find height of the rocket launcher.

Toy rocket A toy rocket is launched upward from ground level. Its height is in feet and the time is in seconds, and the equation below models the path of the rocket after it is launched into the air.

$$h(t) = -16t^2 + 128t$$

Finding Critical Points

a) At what height was the rocket launched from? How can you show this height using the equation? What is this point called on the graph?

$h(0) = -16(0)^2 + 128(0)$

$h(0) = 0$ feet

y-intercept (0,0)

time = 0sec

x-int

Part b) Find the time when the rocket hits the ground.

Toy rocket A toy rocket is launched upward from ground level. Its height is in feet and the time is in seconds, and the equation below models the path of the rocket after it is launched into the air.

$$h(t) = -16t^2 + 128t$$

Finding Critical Points

b) How long will it take for the rocket to return to the ground? How can this be found using the equation and factored form? How is this shown on the graph?

$$\frac{0}{-16} = \frac{-16t^2}{-16} \frac{+128t}{-16}$$

$$0 = t^2 - 8t + 0$$

$$0 = (t-8)(t+0)$$

$t-8=0$ | $t=0$ start

Landed $t=8$ sec

Part c) Find the time when the rocket is at their heighest distance in the air.

Toy rocket A toy rocket is launched upward from ground level. Its height is in feet and the time is in seconds, and the equation below models the path of the rocket after it is launched into the air.

$$h(t) = -16t^2 + 128t$$

Finding Critical Points

c) How long will it take the rocket to hit its maximum height? What line goes through this point on the graph? How can we use the x-intercepts (*roots*) to show this time?

Part d) Find the maximum height of the rocket.

Toy rocket A toy rocket is launched upward from ground level. Its height is in feet and the time is in seconds, and the equation below models the path of the rocket after it is launched into the air.

$$h(t) = -16t^2 + 128t$$

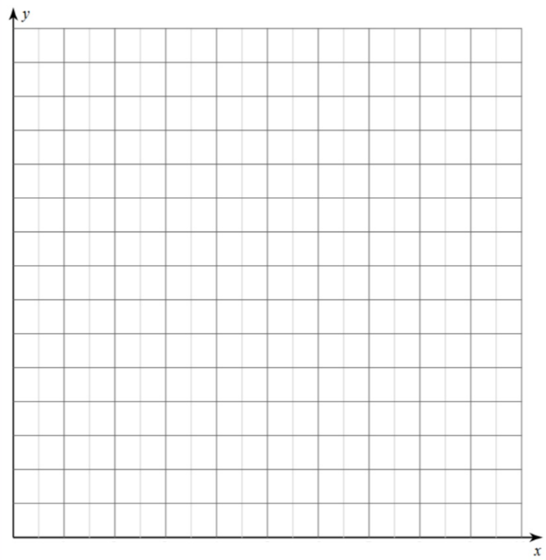
Finding Critical Points

d) What is the maximum height of the rocket? What do we call this point when the maximum height and the time from d) are put in an ordered pair? How can we use the equation to show this height?

$$h(t) = -16t^2 + 128t$$

e) Enter the equation in your graphing calculator. Then record the table to draw the path of the rocket in the graph below.

Time (seconds)							
Height (feet)							



Analyzing Critical Points Record and respond on a separate sheet of paper:

1) Which critical point(s) seem realistic? Why or why not?

2) What inconsistencies did you find between the model and real-life?

Solution to Toy Rocket Model

Toy rocket A toy rocket is launched upward from ground level. Its height is in feet and the time is in seconds, and the equation below models the path of the rocket after it is launched into the air.

$$h(t) = -16t^2 + 128t$$

Finding Critical Points

a) At what height was the rocket launched from? How can you show this height using the equation? What is this point called on the graph?

• The rocket was launched when time was 0. $t=0$

$h(0) = -16(0)^2 + 128(0)$

$h(0) = 0$

• The rocket was launched zero feet from the ground.

• This point $(0,0)$ is the y-intercept or starting height.

$(t, h(t))$

Solution to Toy Rocket Model

b) How long will it take for the rocket to return to the ground? How can this be found using the equation and factored form? How is this shown on the graph?

$$h(t) = -16t^2 + 128t$$

$$0 = -16t^2 + 128t$$

$$0 = -16t(t - 8)$$

$$\frac{0}{-16} = \frac{-16t}{-16} \qquad 0 = t - 8 \quad (+8 \quad +8)$$

$$0 = t \qquad 8 = t \text{ seconds}$$

- The graph will have roots or x-intercepts at (0,0) and (8,0).
- This means the rocket will have a height of zero or will be touching the ground at 0 seconds and 8 seconds.
- The rocket will take 8 seconds to return to the ground.

Solution to Toy Rocket Model

c) How long will it take the rocket to hit its maximum height? What line goes through this point on the graph? How can we use the equation to show this time?

The rocket will reach its maximum height at the vertex. We can find the vertex by using the line of symmetry. The line of symmetry and vertex are in the middle of our x-intercepts (0,0) and (8,0). This would be at $x=4$, since $\frac{8}{2}=4$

$t=4$

$8-0=8$

$0+4=4$
$8-4=4$

Line of Symmetry $t=4$

d) What is the maximum height of the rocket? What do we call this point when the maximum height and the time from ~~d)~~ c) are put in an ordered pair? How can we use the equation to show this height?

- The rocket reaches its maximum height at $t=4$ seconds

$h(4)=-16(4)^2+128(4)$

$h(4)=256$

(4,256) vertex (maximum)

- The rockets [redacted] will reach a maximum height of 256 feet

Solution to Toy Rocket Model

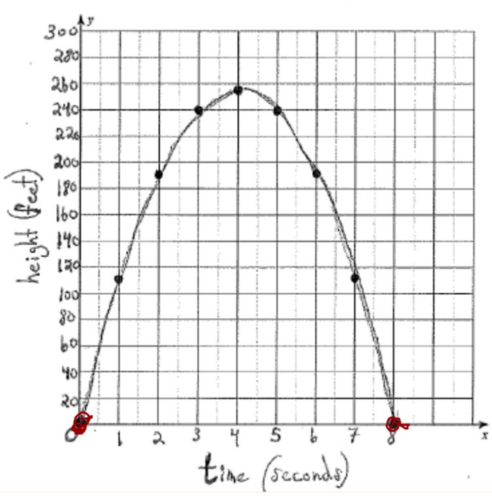
$h(t) = -16t^2 + 128t$

Graphing Critical Points

Enter the equation in your graphing calculator. Then record the table to draw the path of the rocket in the graph below.

Time (seconds)	0	1	2	3	4	5	6	7	8
Height (feet)	0	112	192	240	256	240	192	112	0

Height of a Toy Rocket



Analysis of the Toy Rocket Model

Analyzing Critical Points:

1.) • The x-intercepts (roots) of (0,0) and (8,0) seem realistic, since we launched a toy rocket. A toy rocket won't travel as high as a NASA rocket and should return with 5-20 seconds.

• The vertex (maximum) of (4, 256) seems realistic since the rocket should reach the max half way through its trip. The height of 256 feet seems realistic for a toy rocket to reach the height of a tall building or distant of a football field.

• The Y-intercept or starting height of zero feet above the ground (0,0) seems realistic. Most rockets are launched from the ground.

Analysis of the Toy Rocket Model

2) Discuss how accuracy could be affected by inconsistencies between the model and real-life?

- One inconsistency is that there are many external factors that affect when and where a rocket may fly or land. Gravity, wind, and whether the launch actually happens can affect the accuracy of the rocket's flight. It would be challenging to create a model that fits ***all toy rockets***.