

Happy Friday! Reflect and turn in!

	Assignment Effort Grade (Circle One)	Comments (What was interesting or challenging?)
Monday Date: <u>1 - 8</u> Topic: <u>No homework over break :)</u>	0 1 2	
Tuesday Date: <u>1 - 9</u> Topic: <u>Sin, cos, tan, (& recipricals) Table</u>	0 1 2	
Wednesday Date: <u>1 - 10</u> Topic: <u>Sin, cos, (& tan) Graphs</u>	0 1 2	
Thursday Date: <u>1 - 11</u> Topic: <u>Sin, cos, equations and graphs</u>	0 1 2	
Friday Date: <u>1 - 12</u> Topic: <u>Sin, cos, equations</u>	0 1 2	

Warm-up: What do you notice? Wonder?



Steyn Studio's chapel frames dramatic views of South African countryside below its sinuous roof.

Class Plan:

1. Warm-up: What do you notice?
Wonder?

2. Modeling Real-life Periodic Data

3. Return 4.1 Quizzes

-Exemplars posted on Weebly!

4. Practice

5. Partner Quiz
Assignments



Verify and **justify** our equation model

Verification:

"Demonstrate that (something) is true, accurate...."

- Choose a data pair from given data. Show algebraically how closely the equation predicts the actual data.



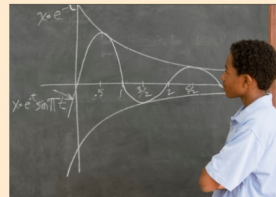
Justification:

"...Prove to be right or reasonable."

- Give evidence from the data table and/or graph that supports the **a**, **b**, **c** in your equation.

Modeling Periodic Data Investigation

1) Examine data and graph.
Find amp, period, mean line.



2) Create equation model.

$$\text{LAUGHTER} = \text{HA} \times 3$$

3) Verify and justify your equation.

What evidence from the graph/data supports the parts of your equation?



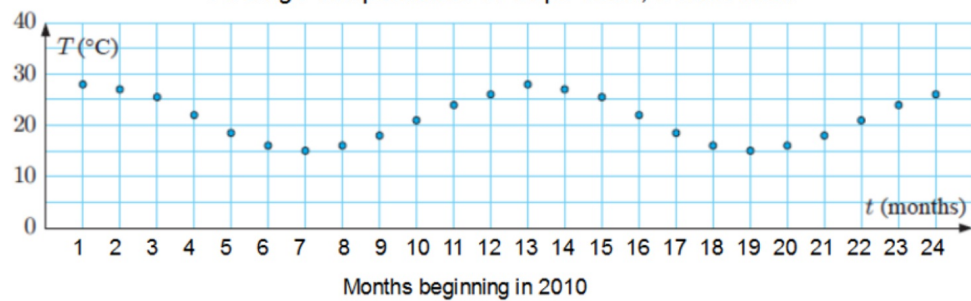
Done: Show teacher, start homework.

Modeling Periodic Data Investigation

1) Find the period, amplitude, and the principal axis of the data below.

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Temp ($^{\circ}\text{C}$)	28	27	$25\frac{1}{2}$	22	$18\frac{1}{2}$	16	15	16	18	$21\frac{1}{2}$	24	26

Average Temperatures of Cape Town, South Africa



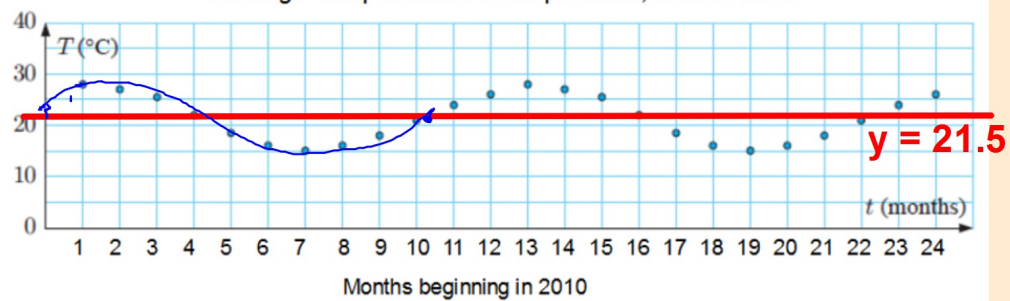
Period _____ Amplitude _____ Principal Axis _____

Modeling Periodic Data Investigation **SOLUTION**

1) Find the period, amplitude, and the principal axis of the data below.

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Temp ($^{\circ}\text{C}$)	28	27	$25\frac{1}{2}$	22	$18\frac{1}{2}$	16	15	16	18	$21\frac{1}{2}$	24	26

Average Temperatures of Cape Town, South Africa



Period **12 months** Amplitude $\frac{(28 - 15)}{2}$ Principal Axis $\frac{(28 + 15)}{2}$
 $a = 6.5^{\circ}$ $c = 21.5$

Modeling Periodic Data Investigation

2) Which trigonometric function does the data and graph above illustrate? _____



Discovering a rule for your data:

3) Use the period, amplitude, and the principal axis to write a trigonometric equation.

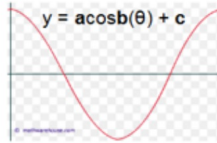
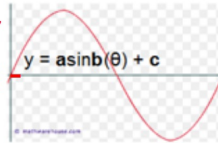
$$Period = \frac{360^\circ}{b}$$

$$b = \frac{360^\circ}{period}$$

Modeling Periodic Data Investigation **SOLUTION**

2) Which trigonometric function does the data and graph above illustrate? **Sine**

The y-int. is near the principal axis not perfect!



Discovering a rule for your data:

3) Use the period, amplitude, and the principal axis to write a trigonometric equation.

$$\text{Period} = \frac{360^\circ}{b}$$

$$b = \frac{360^\circ}{\text{period}}$$

Handwritten calculations on a piece of paper:

- A box containing: $a = 6.5$ and $C = 21.5$
- period = 12
- $\frac{12}{1} = \frac{360}{b}$
- $12b = 360$
- A box containing: $b = 30^\circ$

$$y = 6.5 \sin(30t) + 21.5$$

Modeling Periodic Data Investigation

Verify and justify your equation:

4) Use the data table to verify your equation algebraically.

5) Defend how you found the parts of the equation.
What evidence supports your model?

Modeling Periodic Data Investigation **SOLUTION**

Verify and justify your equation:

4) Use the data table to verify your equation algebraically.

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(month 2, 27°C)

t=2, y=??

$$27.129 \approx 27$$

$$y = 6.5 \sin(30(2)) + 21.5$$

$$y = 6.5 \sin(60) + 21.5$$

$$y = 27.129$$

Equation predicts the temp in February at 27.129°, and the model is an approximate. A change in temperature of .129° is hardly noticed on a Celcius scale. This small margin of error for Celcius shows the equation is an accurate fit for my data.

Modeling Periodic Data Investigation

SOLUTION

5) Defend how you found the parts of the equation.

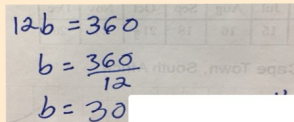
What evidence supports your model? $y = 6.5\sin(30t) + 21.5$

***Sine** - The function's y-intercept is near the principal axis.

- **a=6.5** The data shows the max as 28° and min as 15° . This shows the distance between the **max** and principal axis **and** the distance between the **min** and principal axis is about 6.5° C.

- **b=30** I noticed the data started at the maximum temp of 28° at the first month of January. This max temp was also the temperature at 13 months. This shows the cycle of temperatures begin to repeat themselves after 12 months, so the period is 12 months.

- Period = $360/b$, so $12 = 360/b$.



Handwritten calculations showing the derivation of b from the period:

$$12b = 360$$
$$b = \frac{360}{12}$$
$$b = 30$$

- **c=21.5** The mean between the min/max is 21.5, so the mean line (*principal axis*) is at $y = 21.5$.

Partner Quiz 4.2 Wednesday 1-17

Expectations:

- 1) Both partner names on both quizzes.
- 2) Each pair turns in 2 completed quizzes.
(Each student must contribute and use their own handwriting to complete their quiz.)
- 2) Pairs collaborate **ONLY** within the pair.
- 3) Staple both quizzes, turn in.
- 4) Teacher will roll die to determine which quiz will be assessed.



(No Retakes for Partner quiz)

Partner Quiz 4.2 Wednesday 1-17

Do: Sign up with your partner.
(Both names please!)

<u>Group #</u>	<u>Names</u>
1	
2	
3	
4	
5	
6	
7	

Exercises...Graph Paper Needed!

MYP 9 Modeling Real-life Periodic Data - **Exercise**

Name _____

The table below represents the average monthly temperature, in degrees Fahrenheit, in Southeast Australia. (Remember the seasons are reversed in the Southern Hemisphere, so January is summer in Australia!)

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
°F	64.04	64.22	61.88	57.92	53.60	50.36	49.10	49.82	52.34	55.22	58.10	61.52

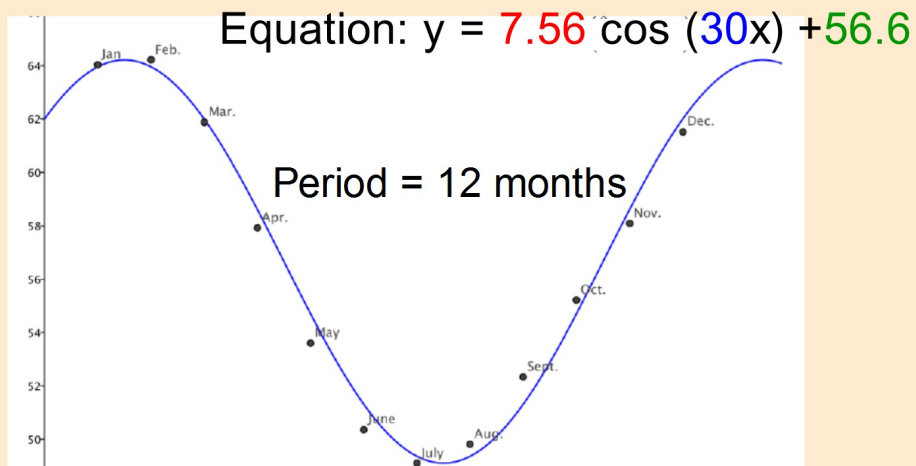
- 1) Scale and graph the data on a titled graph with axes labeled.
- 2) Find and identify the period, amplitude, and the principal axis.
- 3) Use the period, amplitude, and the principal axis to write an equation for your graph and data.
- 4) **Verify** your equation algebraically using data from the table.
- 5) **Justify** your equation by providing evidence of how the parts of the equation are found.

Exercises...Solutions (Maximum = 64.22°, minimum = 49.10°)

Amplitude $\frac{64.22^{\circ}\text{F} - 49.10^{\circ}\text{F}}{2} = 7.56^{\circ}\text{F}.$

Principle Axis

The average of 64.22°F and 49.10°F six months later is 56.66.



Verification

$$\text{Equation: } y = 7.56 \cos(30x) + 56.6$$

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
°F	64.04	64.22	61.88	57.92	53.60	50.36	49.10	49.82	52.34	55.22	58.10	61.52

x : time (months) y : temp (°F)

$$X = 2 \text{ (February)}$$

$$Y = 7.56 \cos(30 \cdot 2) + 56.6$$

$$Y = 7.56 \cos(60) + 56.6$$

$$Y = 7.56 \left(\frac{1}{2}\right) + 56.6$$

$$Y = 3.76 + 56.6$$

$$Y \approx 60.38^\circ \text{ (actual } 64.22^\circ)$$

Equation predicts the temp in February at 60.38° , and the model is an approximate. Even meteorologists struggle to make accurate predictions of temps. 3.84° F is a small margin of error for Fahrenheit, hence the equation is a moderately good fit to my data.

Justification

Equation: $y = 7.56 \cos(30x) + 56.6$

- **a=7.56** The data shows the max as 49.1° and min as 64.22° . This shows the distance between the *max* and principal axis **and** the distance between the *min* and principal axis is about 7.56° C.

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
$^\circ\text{F}$	64.04	64.22	61.88	57.92	53.60	50.36	49.10	49.82	52.34	55.22	58.10	61.52

- **b=30** I noticed the table started near the maximum temp of 64° at the first month. Since the temp started increasing after July, the temperature will reach a near max temp at 12 months. This shows the cycle of temperatures begin to repeat themselves after 12 months, so the period is 12 months. (30 12 month waves complete a full wave of 360°).
- **c=56.6** The mean between the min/max is 56.6, so the mean line (*principal axis*) is at $y = 56.6$.