Name:

Where in the World is Carmen Sinusoidal?

This project will count as a QUIZ grade and will be due at the beginning of class Wednesday, January 22. You will turn in this packet of information, as well as a link to your desmos graph on google classroom.

1. Choose 6 cities from different continents around the globe. Try to vary the cities' locations by choosing different hemispheres, latitudes, longitudes, altitudes, and proximities to things like large bodies of water, deserts, mountain ranges, etc. You may NOT choose Dallas! **Mark the location of each on the map below.**



2. Find the average monthly temperature for each city and record below. Some good sites to search include <u>www.climate-zone.com</u>, or <u>www.weatherbase.com</u>. Make sure all temperatures are in Fahrenheit.

3. Go to www.desmos.com and create a scatterplot (add item, table) for each of your cities in a different color (click the settings wheel to change the color). <u>Include values for a second year</u> to see the sinusoidal pattern more clearly (13 corresponds to January year 2, 14 is February year 2, etc. through 24). You can change your window, axes and mode by clicking the wrench.

4. For your European, North and South American cities, create a *cosine* equation *without using regression*. Include this on your Desmos graph. You can hide your other scatterplots to see one at a time by clicking the color circle.

5. For your African, Asian, and Australian cities, create a *sine* equation <u>using regression</u> on your calculator. Include these on your Desmos graph. You can hide your other graphs and scatter plots by clicking on the color wheel.

6. You should have SIX scatterplots and SIX different equations on your desmos graph.

7. Submit your Desmos graph to google classroom and answer the questions below.

EXAMPLE North America

City: Dallas

Color on Desmos: Blue

| Month | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|-------|-------|-------|-------|---------|-------|--------|--------|-------|--------|-------|-------|-------|
| | (Jan) | (Feb) | (Mar) | (April) | (May) | (June) | (July) | (Aug) | (Sept) | (Oct) | (Nov) | (Dec) |
| Avg | 43.4 | 47.9 | 56.7 | 65.5 | 72.8 | 81.0 | 85.3 | 84.9 | 77.4 | 67.2 | 56.2 | 46.9 |
| Temp | | | | | | | | | | | | |

Example Desmos: https://www.desmos.com/calculator/uogw4brben



Cosine equation (don't use regression):

Sine equation (use regression on your calculator):

Regression Instructions:

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| | u | | IC. | • |

| North Ar | nerica | | City: | | | | | Color on Desmos: | | | | | |
|-------------|------------|------------|------------|--------------|------------|-------------|-------------|------------------|-------------|-------------|-------------|-------------|--|
| Month | 1 (Jan) | 2 (Feb) | 3 (Mar) | 4 (April) | 5 (May) | 6 (June) | 7 (July) | 8 (Aug) | 9 (Sept) | 10 (Oct) | 11 (Nov) | 12 (Dec) | |
| Avg Temp | | | | | | | | | | | | | |

Cosine equation (don't use regression):

| South America City: | | | | | Color on Desmos: | | | | | | | |
|---------------------|------------|------------|------------|--------------|------------------|-------------|-------------|------------|-------------|-------------|-------------|-------------|
| Month | 1 (Jan) | 2 (Feb) | 3 (Mar) | 4 (April) | 5 (May) | 6 (June) | 7 (July) | 8 (Aug) | 9 (Sept) | 10 (Oct) | 11 (Nov) | 12 (Dec) |
| Avg Temp | | | | | | | | | | | | |

Cosine equation (don't use regression):

| Europe | | | City: | | Color on Desmos: | | | | | | | |
|-------------|-------|-------|-------|---------|------------------|--------|--------|-------|--------|-------|-------|-------|
| Month | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| | (Jan) | (Feb) | (Mar) | (April) | (May) | (June) | (July) | (Aug) | (Sept) | (Oct) | (Nov) | (Dec) |
| Avg Temp | | | | | | | | | | | | |

Cosine equation (don't use regression):_____

| Asia | City: | | | | | | | | _ Color on Desmos: | | | | | | |
|-------------|------------|------------|------------|--------------|------------|-------------|-------------|------------|--------------------|-------------|-------------|-------------|--|--|--|
| Month | 1 (Jan) | 2 (Feb) | 3 (Mar) | 4 (April) | 5 (May) | 6 (June) | 7 (July) | 8 (Aug) | 9 (Sept) | 10 (Oct) | 11 (Nov) | 12 (Dec) | | | |
| Avg Temp | | | | | | | | | | | | | | | |

Sine equation (use regression on your calculator):

| Africa | | | City: | | | Color on Desmos: | | | | | | | |
|-------------|------------|------------|------------|--------------|------------|------------------|-------------|------------|-------------|-------------|-------------|-------------|--|
| Month | 1 (Jan) | 2 (Feb) | 3 (Mar) | 4 (April) | 5 (May) | 6 (June) | 7 (July) | 8 (Aug) | 9 (Sept) | 10 (Oct) | 11 (Nov) | 12 (Dec) | |
| Avg Temp | | | | | | | | | | | | | |

Sine equation (use regression on your calculator):

| Australia/Oceania City: | | | | | | | | Color on Desmos: | | | | | |
|-------------------------|-------------------------------------|--|--|--|--|-------------|-------------|------------------|-------------|-------------|-------------|-------------|--|
| Month | 1 2 3 4 (Jan) (Feb) (Mar) (April) | | | | | 6 (June) | 7 (July) | 8 (Aug) | 9 (Sept) | 10 (Oct) | 11 (Nov) | 12 (Dec) | |
| Avg Temp | | | | | | | | | | | | | |

Sine equation (use regression on your calculator):_____

Please answer the following questions below in complete sentences.

1. What are some reasons for the differences in the temperature graphs between each city?

2. What is the actual meaning in this situation for the "c" value in each equation?

3. Which value(s) (a, b, c, and/or d) would change if January was month 0? Why?

4. What are some other real world phenomenon that could be modeled using a periodic (sine or cosine) function? (It's okay if you need to research this question!)