Grade 11 U/C Summative Assessment Unit

Activity: **Investigation - S.A.D.** **Day: 6**

Purpose of Activity: Assessment Activity

Overall Expectations Addressed:

TFV.04

· solve problems involving models of sinusoidal functions drawn from a variety of applications..

OCV.03

· communicate mathematical reasoning with precision and clarity throughout the course.

Activity Description:

Students examine data relating to hours of daylight over a period of time. They determine a model for applying light therapy that would ensure total hours of daylight to be constant over a period of time.

Management Suggestions*:*

Students need access to graphing calculators.
Have students work in small groups to brainstorm for 10 minutes.
Students work independently to complete task.

Assessment:

See rubric included.

Guidelines for Solution: See solution attached.

S.A.D.

The table below shows the length of day every 30 days for Toronto, ON from 12/31/99 to 3/26/01.

Date	12/31	1/30	3/1	3/31	4/30	5/30	6/29	7/29
Day #	0	30	60	90	120	150	180	210
Length (h)	9.1	9.9	11.2	12.7	14.0	15.0	15.3	14.6

Date	8/28	9/27	10/27	11/26	12/26	1/25	2/24	3/26
Day #	240	270	300	330	360	390	420	450
Length (h)	13.3	11.9	10.6	9.5	9.1	9.7	11.0	12.4

Rosita, who lives in Toronto, suffers from SAD (seasonal affective disorder). During the winter, she gets very depressed, but by the first day of spring, March 21st, she feels wonderful. She has been advised to use light therapy during the winter. One hour of light therapy replaces one hour of natural daylight.

Rosita will use light therapy during the fall and winter of 00/01 (Sept. 21st, 2000 – March 21st, 2001).

Use the data in the table to determine a minimum amount of light that Rosita requires in total each day to be happy. Explain your thinking.

Create a model to show Rosita how much light therapy she needs from Sept. 21st, 2000 – March 21st, 2001 to reach her minimum total hours of light.
Be sure to include a graph of this model over the interval corresponding to the days when she will use this model. Explain your thinking.

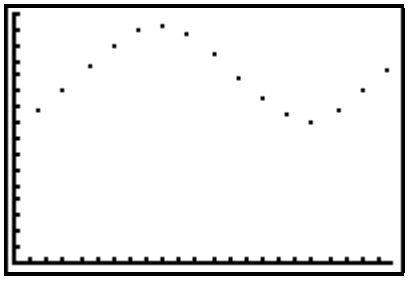
Use your model to determine how long Rosita should apply light therapy on Jan. 15th, 2001.

Extension:

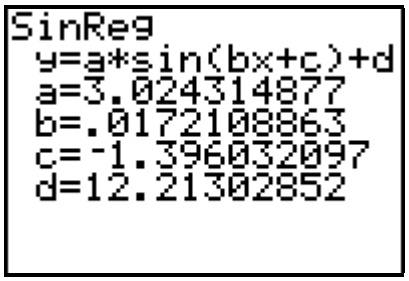
Like Rosita, Sander lives in Toronto and also suffers from SAD. However, his depression is triggered at times when the length of daylight is changing most rapidly. At what times of the year will he be most likely to suffer from depression? Explain how you know?

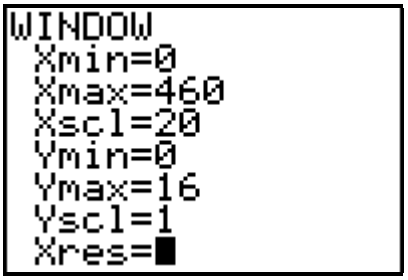
S.A.D. SOLUTION

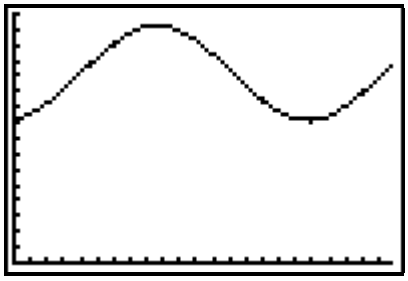
Make a scatter plot of the given data.



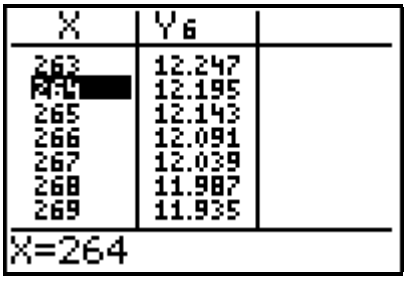
The data appears to be periodic. Fit a sinusoidal regression to the data.



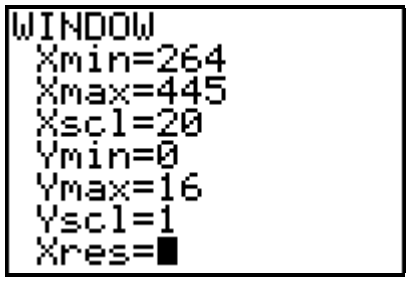


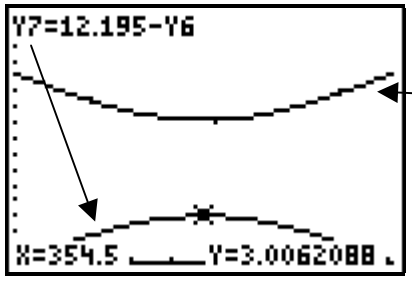


September 21st, 2000 is day #264 of this data set. From the table of values, it is determined that the amount of sunlight on that day was 12.195 hours.

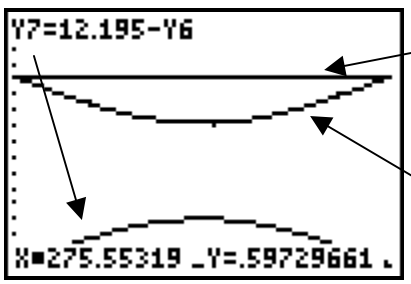


To determine the amount of light therapy that Rosita should receive each day to give her a total amount equal to that of September 21st, graph the function $y_7=12.195 - y_6$ over the interval September 21st 2000 to March 21st 2001.



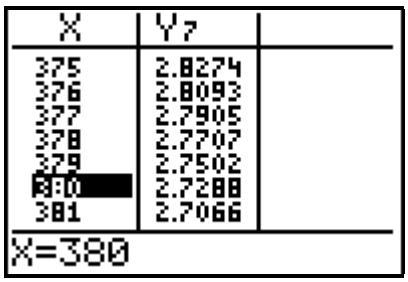


y_6 (total amount of daylight)



$y_6 + y_7 = 12.195$

y_6 (total amount of daylight)



X	Y7
375	2.8274
376	2.8093
377	2.7905
378	2.7707
379	2.7502
380	2.7288
381	2.7066

X=380

January 15th 2001 is day #380 of this data set. On that day, Rosita will need 2.7288 hours of light therapy in order to have an equivalent amount of daylight from September 21st 2000 until March 21st 2001.

Assessment Task - SAD

Rubric

Category	Level 1	Level 2	Level 3	Level 4
Application	• Model selected is only partially appropriate to the data • Selected model is used with some inaccuracies	• Model selected is generally appropriate to the data • Selected model is used but may contain minor errors	• Model selected is appropriate and relates to the data • Selected model is used correctly	• Model selected is appropriate and efficient and relates to the data • Selected model is used correctly and is verified or supported
Thinking, Inquiry, and Problem Solving	• Data, and models (graphical, algebraic, numeric) are weakly connected and address few aspects of the situation • Reasoning is evident but inconsistent	• Data, and models (graphical, algebraic, numeric) make some connections and address some aspects of the situation • Reasoning is evident and logical in parts of the problem	• Data, and models (graphical, algebraic, numeric) are well-connected and address most aspects of the situation • Reasoning is logical and consistent within context	• Data, and models (graphical, algebraic, numeric) are well-connected and integrate all aspects of the situation • Reasoning is logical and consistent and relates to broader context
Communication	• Explanations and justifications lack clarity • Either mathematical or narrative form is present, but not both	• Explanations and justifications are understandable but lack clarity • Both mathematical and narrative forms are present, but the forms are not integrated	• Explanations and justifications are clear • Mathematical and narrative forms are present and integrated	• Explanations and justifications are clear and thorough • A variety of mathematical forms and narrative are present, integrated and well chosen