

## Daylight

You have probably noticed that the sun rises and sets at different times throughout the year. Some days are really long while others are really short.



In this activity, you will use data about sunrise and sunset times to create a function that models the number of minutes of daylight on a given day of the year.

### Create a function

Below is a table containing the number of minutes of daylight on the 1st and 15th of each month in Paris, France during 2021.

Date	Day of Year	Daylight (minutes)
January 1	1	501
January 15	15	523
February 1	32	558
February 15	46	613
March 1	60	662
March 15	74	712
April 1	91	774
April 15	105	823
May 1	121	876
May 15	135	917
June 1	152	954
June 15	166	969

Date	Day of Year	Daylight (minutes)
July 1	182	966
July 15	196	946
August 1	213	905
August 15	227	862
September 1	244	805
September 15	258	756
October 1	274	699
October 15	288	650
November 1	305	592
November 15	319	550
December 1	335	514
December 15	349	497

1. Make a scatterplot of the relationship between the day of the year and the amount of daylight.
2. Describe what the scatterplot reveals about the relationship between the day of the year and the amount of daylight.
3. Based on the scatterplot, what type of function do you think would best model the data?
4. Plot a regression model on your scatterplot. What is its equation?

## Analyze the function

In the previous section, you may have selected a sinusoidal function to model your data. If you chose another type of function, go back and apply a trigonometric regression and compare the models.

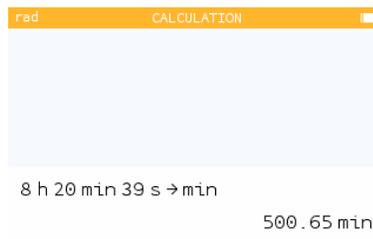
Use a trigonometric regression model to answer the following questions. To connect dates with their corresponding day of the year, here is a helpful resource.

1. Identify the amplitude of the regression model. Interpret its value in context.
2. Identify the period of the regression model. Explain what it means in the context of this problem.
3. Determine the maximum value of the function. Explain what this means in the context of the problem.
4. September 10, 2021 (Day 253) is not a data point in the table. Use the regression model to predict the amount of daylight on this day.
5. On which date(s) in 2021 is it predicted that there will be 700 minutes of daylight?

## Extension

Navigate to [www.timeanddate.com/sum](http://www.timeanddate.com/sum). Search for a different city around the world and view its "Sunrise and Sunset" times. Scroll down on the page to see the amount of daylight each day in a given month.

The amount of daylight will be given in hours, minutes, and seconds. You can convert to minutes using the NumWorks calculator.



Record the number of minutes of daylight on the 1st and 15th of each month for 2021.

1. Create a scatterplot for your data and apply a trigonometric regression. What is the equation of your model?
2. Determine the amplitude and period.
3. Determine the minimum value of the function. Explain what this means in the context of the problem.
4. Use your model to predict the amount of daylight for September 10, 2021 (Day 253).
5. On which date(s) in 2021 is it predicted that there will be 700 minutes of daylight?

6. How do the values found above compare to those found from Paris, France? Why might these values be different?