

Analyzing Periodic Data

Let's examine the 1998-2000 surface water temperature record for Jack Bay on the lower Patuxent River. These data are from the Maryland Department of Natural Resources.

Date	Time in months	Temp. °C	Date	Time in months	Temp. °C	Date	Time in months	Temp. °C
1/98	1	5.90	1/99	13	5.30	1/00	25	1.00
2/98	2	6.10	2/99	14	6.90	2/00	26	1.40
3/98	3	6.95	3/99	15	6.25	3/00	27	8.85
4/98	4	15.00	4/99	16	13.45	4/00	28	14.00
5/98	5	19.90	5/99	17	19.20	5/00	29	19.15
6/98	6	23.70	6/99	18	23.70	6/00	30	24.70
7/98	7	27.45	7/99	19	26.25	7/00	31	27.20
8/98	8	28.05	8/99	20	28.00	8/00	32	25.90
9/98	9	25.95	9/99	21	23.60	9/00	33	22.80
10/98	10	19.10	10/99	22	17.00	10/00	34	17.15
11/98	11	11.70	11/99	23	12.90	11/00	35	11.80
12/98	12	12.90	12/99	24	8.30	12/00	36	6.00

From: http://www.dnr.state.md.us/bay/conditions/jack_wt.html

- Complete a scatter plot for 1999 and 2000 (by hand & on GDC)
- Determine equation that models the temperature as a function of the month. Let $t = 1$ represent January, as shown in the data table.
- Use the equation to determine the temperature of water on the 23 of April. Verify your answer using the graph.
- When the water temperature is over 20°C , swimmers will start to use the bay. Specifically, when is the "swimming season"?

(B) Sunsets are later in the summer than in the winter. For planning a sunset dinner cruise, the cruise planners may find the time, t , in hours (on a 24 hour clock) of the sunset on the n th day of the year using the equation $t = 1.75\sin(0.986n - 79.37)^\circ + 18.43$

- a. Sketch the graph of $t = 1.75\sin(0.986n - 79.37)^\circ + 18.43$
- b. What is the period of the function? What does the period represent?
- c. What is the equilibrium axis? Explain the equilibrium axis in the context of the problem.
- d. What is the amplitude? Explain the amplitude in the context of the problem
- e. Determine the time of the sunset on Shera's birthday of July 26, (the 207th day of the year).
- f. On what day(s) of the year does the sun set the latest? What time is the sunset?
- g. On what day(s) of the year does the sun set the earliest? What time is the sunset?
- h. Determine the day(s) of the year when the sunset time is at 6:00 pm (18:00 hours).