Swept Away

Task Statement 1

You will construct a model of the tides in Boston for July 4–5, 2018, and then use your model to make predictions about future tides. Here are the water levels, recorded hourly, for the two-day period. The water levels are given relative to the mean lower low water.

hours after 00:00, July 4	water level (in feet)
0	4.06
1	5.85
2	7.6
3	9.09
4	9.59
5	8.94
6	7.48
7	5.61
8	3.57
9	1.84
10	0.68
11	1.13
12	2.38
13	4.1
14	5.89
15	7.71

hours after 00:00, July 4	water level (in feet)
16	8.81
17	8.89
18	8.04
19	6.59
20	4.82
21	3.07
22	1.84
23	1.84
24	2.83
25	4.43
26	6.15
27	7.84
28	9.14
29	9.37
30	8.62
31	6.97

hours after 00:00, July 4	water level (in feet)
32	5.19
33	3.08
34	1.62
35	0.87
36	1.64
37	3.01
38	4.77
39	6.58
40	8.29
41	9.07
42	8.96
43	7.9
44	6.33
45	4.49
46	2.69
47	1.7
48	1.97

1. Make a model of the water level on the given dates.
2. When does your model predict the high and low tides? How well does your model fit the data?
3. Ask your teacher for the high and low tide data for July 11, 2018. How accurately does your model predict the tides?
4. Revise your model as needed. How accurately does your final model predict the high and low tides?

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Task Statement 2

The table shows the water level at different times in Boston, on July 4–5, 2018. The water levels are given relative to the mean lower low water (MLLW).

hours after 00:00, July 4	water level (in feet)
0	4.06
1	5.85
2	7.6
3	9.09
4	9.59
5	8.94
6	7.48
7	5.61
8	3.57
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48	1.97

1. How many high tides are there in Boston each day? How many low tides? What is a good estimate for how often the high and low tides occur?
2. Estimate the average water level for July 4–5, 2018.
3. Estimate how much the high and low tides differ from the average water level on July 4–5, 2018.
4. Choose a trigonometric function (sine or cosine) to model the water-level data. What horizontal shift will you need to model the data?
5. Find a model for the water level. How well does the model fit the data for July 4–5?
6. On July 11, the first high tide is a little after 10:00 a.m. What does your model predict for this date? Revise your model as needed and recheck its accuracy for July 4–5.