

Name: _____

Period: _____

Date: _____

Background and Purpose

Most of us have heard the story of the Pilgrims' exodus from England to the New World in the year 1620. The Pilgrims anchored the *Mayflower* at the site of Provincetown (Cape Cod), Massachusetts for almost a month before settling at Plymouth Harbor. Imagine that you are the ship's captain of the *Mayflower II* and you need to know the tidal fluctuations at Provincetown in order to keep the ship from running aground while at anchor. You will use the tide chart given to you to estimate/graph the tidal fluctuations for February 2008 arrival at Provincetown. In doing so, you will become familiar with the differences in tidal ranges during each phase of the moon.

Materials

- Tide chart
- Ruler
- Graph Paper on Back
- Pencil

Procedure

1. Using a sheet of graph paper, divide the paper lengthwise into 4 separate sections.
2. Plot time of day on the x-axis and water level in feet on the y-axis for the dates corresponding to the third quarter, new moon, first quarter, and full moon. Be careful to scale your graph correctly and to account for negative tides, which are below mean sea level. The origin for the time axis should be 12:00 A.M. for each graph.
3. Once you have plotted your points, connect the points with a smooth curve. Make sure to label you graphs with a title and units on each axis.
4. Answer the questions that follow concerning your 4 graphs.

Pre Graphing Questions (Refer to pages 541-543 in your text to do these)

1. Draw the orientation of the Earth, Sun, and Moon for **Spring** tides. Also make sure to draw the tidal bulge of the ocean. See page 542.

2. Draw the orientation of the Earth, Sun, and Moon for **Neap** tides. Also make sure to draw the tidal bulge of the ocean. See page 542.

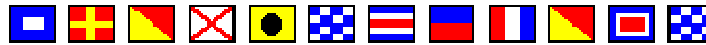
3. How many high tides and how many low tides are there (usually) per day? Why is this? Drawing a diagram of how the Earth rotates underneath the tidal bulge would be helpful.

Massachusetts
Tides

PROVINCETOWN

February
Tide Chart

Cape Cod Tides



Provincetown 42°03'N 070°11'W

2008

DATE	HIGH				LOW						
	AM	hgt	PM	hgt	AM	hgt	PM	hgt	rise	set	qtr
1 Fri	6:39	8.4	7:23	7.2	12:21	2.0	1:11	1.5	6:54	4:55	
2 Sat	7:35	8.5	8:20	7.3	1:16	2.1	2:08	1.3	6:53	4:56	
3 Sun	8:29	8.7	9:12	7.6	2:11	1.9	3:00	1.0	6:52	4:57	
4 Mon	9:18	9.1	9:59	7.9	3:02	1.6	3:46	0.6	6:51	4:59	
5 Tue	10:04	9.4	10:41	8.3	3:49	1.2	4:29	0.2	6:50	5:00	
6 Wed	10:47	9.8	11:21	8.7	4:34	0.8	5:09	-0.2	6:49	5:01	
7 Thu	11:28	10.1	11:59	9.1	5:17	0.4	5:49	-0.5	6:48	5:03	
8 Fri	-	-	12:10	10.2	6:00	0.0	6:29	-0.7	6:46	5:04	
9 Sat	12:38	9.5	12:52	10.2	6:44	-0.3	7:09	-0.8	6:45	5:05	
10 Sun	1:18	9.8	1:36	10.1	7:29	-0.5	7:52	-0.7	6:44	5:07	
11 Mon	2:01	10.0	2:23	9.7	8:17	-0.5	8:37	-0.4	6:43	5:08	
12 Tue	2:46	10.1	3:15	9.3	9:08	-0.4	9:26	0.0	6:42	5:09	
13 Wed	3:37	10.0	4:11	8.8	10:03	-0.2	10:20	0.4	6:40	5:10	
14 Thu	4:32	9.9	5:13	8.3	11:04	0.0	11:19	0.8	6:39	5:12	
15 Fri	5:34	9.7	6:21	8.1	-	-	12:09	0.2	6:38	5:13	
16 Sat	6:40	9.7	7:30	8.1	12:23	1.0	1:17	0.2	6:36	5:14	
17 Sun	7:48	9.7	8:37	8.3	1:29	1.0	2:22	0.0	6:35	5:15	
18 Mon	8:52	9.9	9:37	8.7	2:32	0.7	3:22	-0.3	6:33	5:17	
19 Tue	9:51	10.2	10:30	9.1	3:32	0.4	4:16	-0.5	6:32	5:18	
20 Wed	10:43	10.3	11:17	9.4	4:26	0.1	5:03	-0.7	6:30	5:19	
21 Thu	11:30	10.3	11:59	9.6	5:15	-0.2	5:47	-0.7	6:29	5:20	
22 Fri	-	-	12:14	10.1	6:01	-0.3	6:27	-0.5	6:28	5:22	
23 Sat	12:39	9.7	12:56	9.8	6:45	-0.2	7:07	-0.2	6:26	5:23	
24 Sun	1:18	9.6	1:37	9.4	7:27	-0.1	7:46	0.2	6:25	5:24	
25 Mon	1:56	9.4	2:19	8.9	8:10	0.2	8:26	0.6	6:23	5:25	
26 Tue	2:36	9.2	3:03	8.4	8:54	0.6	9:08	1.1	6:21	5:27	
27 Wed	3:18	8.9	3:50	7.9	9:41	0.9	9:53	1.6	6:20	5:28	
28 Thu	4:05	8.6	4:42	7.5	10:31	1.3	10:43	2.0	6:18	5:29	
29 Fri	4:57	8.4	5:39	7.2	11:27	1.6	11:38	2.2	6:17	5:30	

Eastern Standard Time

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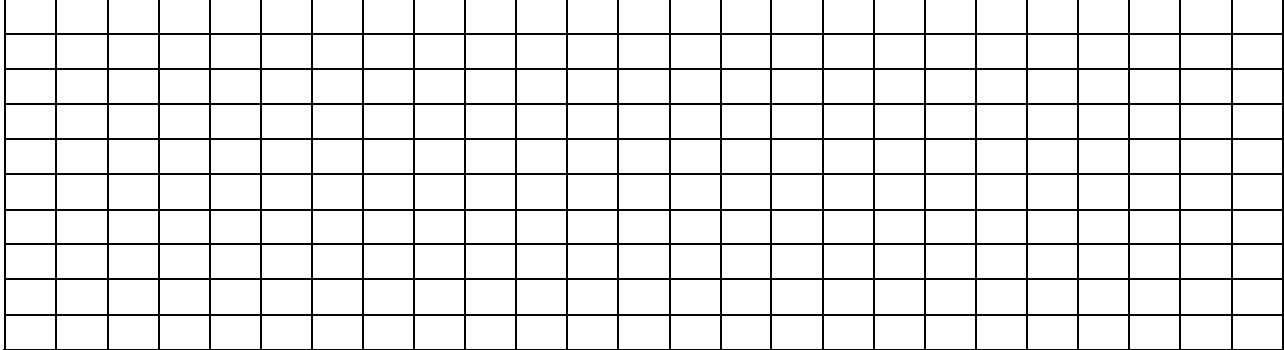
Tides by Maine Harbors

Source for Tide Chart: <http://www.boatma.com/tides/febpro08.html>

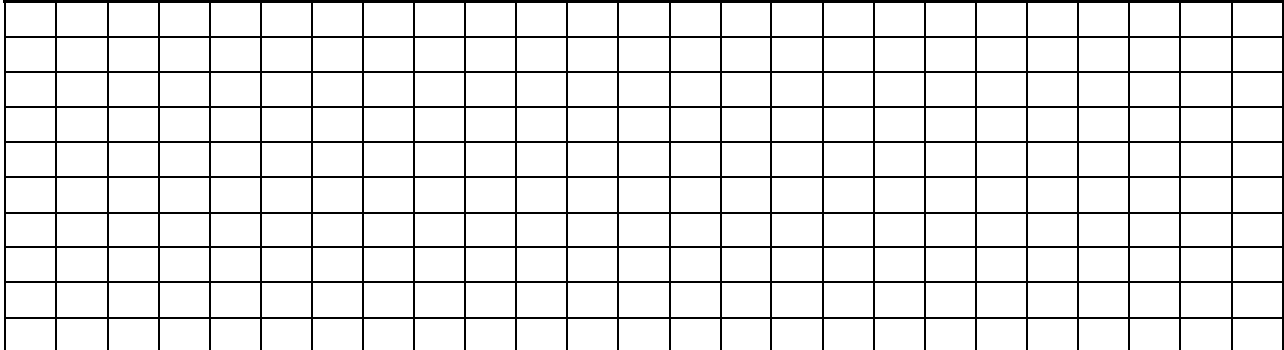
Making Tide Graphs

Use the following graph sheet to plot your tides. Make sure to make 4 separate graphs, one for each phase of the moon. Plot time of day (hours) on x axis and height variation (feet) on y axis.

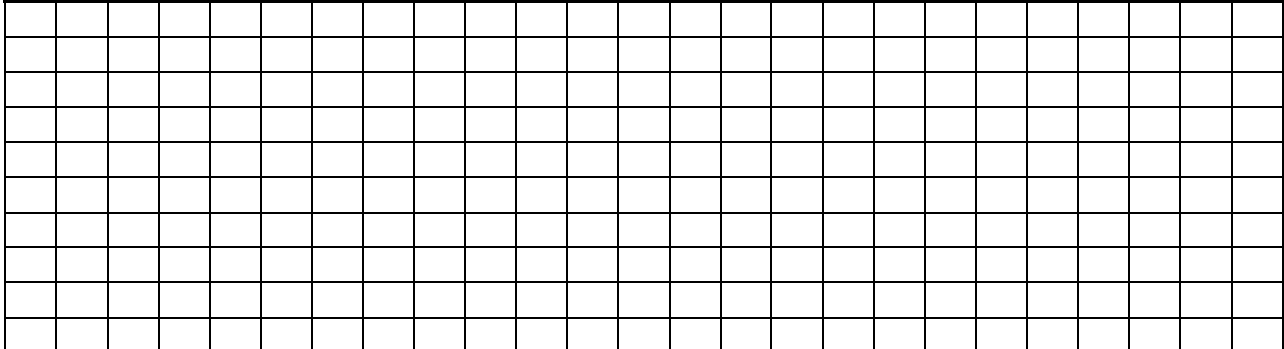
New Moon (Saturday, February 9, 2008)



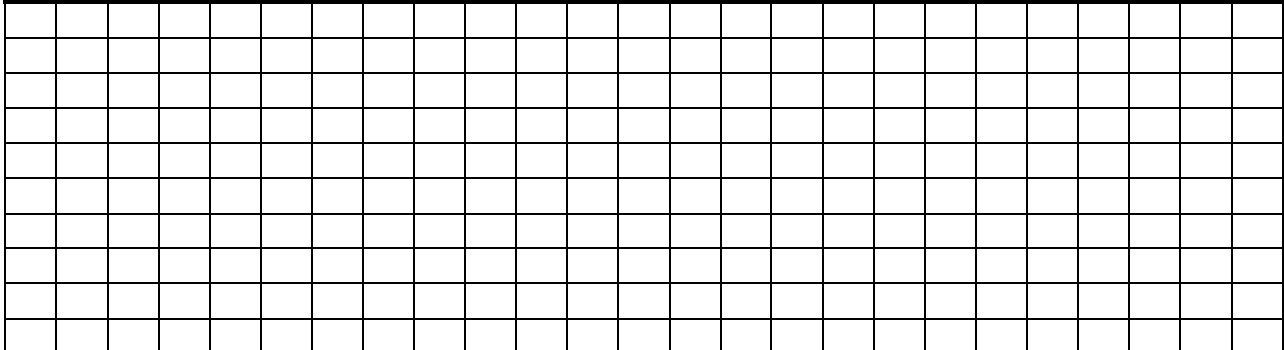
First Quarter (Saturday, February 16, 2008)



Full Moon (Thursday, February 21, 2008)



Third Quarter (Friday, February 29, 2008)



The Pilgrim Tides

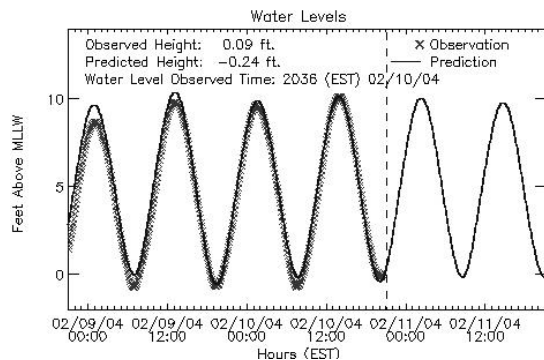
Geology/Earth Science

February 2008

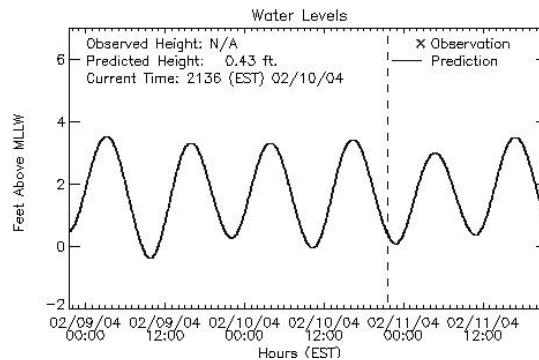
Mr. Traeger

Post Graphing Questions (Refer to pages 541-543 in your text to do these)

1. Which two dates that you plotted have the highest high and lowest low (Spring) tides? Why is this?
2. Which two dates that you plotted have intermediate (Neap) tides? Why is this?
3. Look at the times of the AM high tides for the whole month of February. By how many minutes does the time advance for each successive day? Why is this?
4. Which has the greatest influence on tides, the sun or the moon? Why?
5. Which side of the Earth is more attracted to the moon? The side facing the moon or the side away from the moon? Why?
6. Would spring tides be strongest at perigee or apogee? Why?
7. Look at the following two tide graphs from different locations. Then look at the map on page 708-709 in your book. Explain why the tidal range (size of the tides) is different for each location.



Boston, MA (Atlantic Ocean)



Cedar Key, FL (Gulf of Mexico)

8. Why is it that oceans have tides and lakes do not? Explain.
9. Predict what might happen on the Earth if we did not have the moon to cause our tides.