Applications of Sinusoidal Functions

These notes are intended as a companion of section 6.7 (p. 542 – 547) in your workbook. You should also read the section for more complete explanations and additional examples.

Example (not in workbook)

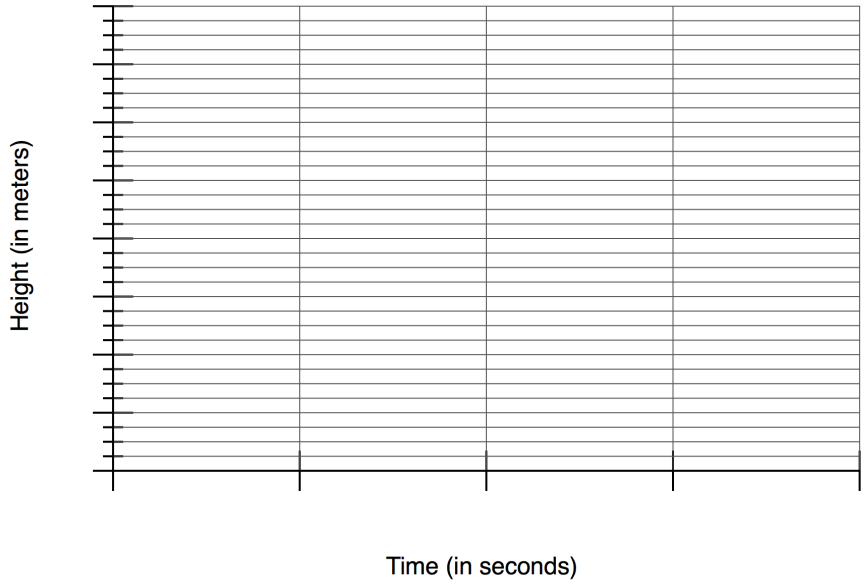
The depth of water in a harbor is given by the equation $d(t) = -4.5\cos(0.16\pi t) + 13.5$, where $d(t)$ is the depth (in meters) and t is the time (in hours) after low tide.

a) Sketch the graph.

b) A bulk carrier needs at least 14.5 m of water to dock safely. For how many hours per cycle can the bulk carrier dock safely?

Example (not in workbook)
A Ferris wheel has a radius of 15 m. It rotates once every 20 seconds. Passengers start at the bottom of the Ferris wheel, which is 1 m above the ground.

a) Graph the function and find its equation (height above the ground as a function of time).



b) Estimate the height above the ground after 22 seconds.

c) Estimate at what time you will be 20 m above the ground.

Example 1 (sidebar p. 544)
A piston moves vertically in a cylinder starting from its minimum height. Every 20 s, the piston repeats its cycle from a minimum height of 15 cm to a maximum height of 35 cm back to a minimum height of 15 cm.

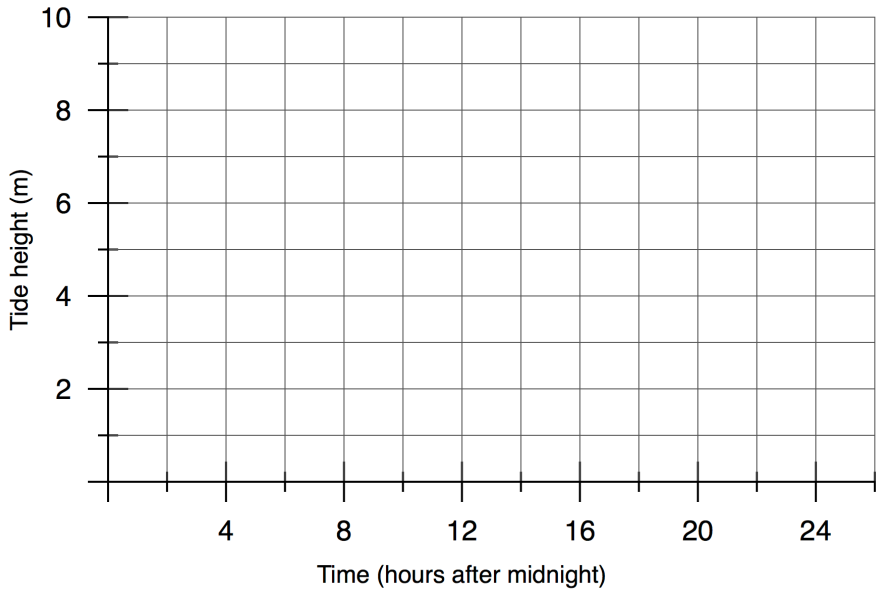
a) Determine a sinusoidal function that models the height, h centimeters, of the piston at time t seconds after it begins moving.

b) Use technology to graph the function, then estimate the height of the piston 26 s after it begins moving. Give the answer to the nearest centimeter.

Example 2 (sidebar p. 546)
The following data show the predicted tide heights every 2 h, starting at midnight, for St. Andrews, PEI, on March 9, 2011:

Time (hours after midnight)	00	02	04	06	08	10	12	14	16	18	20	22
Height (m)	4.6	6.5	5.7	3.5	1.4	1.7	4.0	6.1	5.8	3.9	1.8	1.7

a) Graph the data, then write an equation of a sinusoidal function that models the data.



b) Use technology to graph the function in part a. Estimate the tide height at 17:00. Give the answer to the nearest tenth of a meter.

Homework: #3 – 9 in the exercises (p. 548 – 556). Answers on p. 556.