

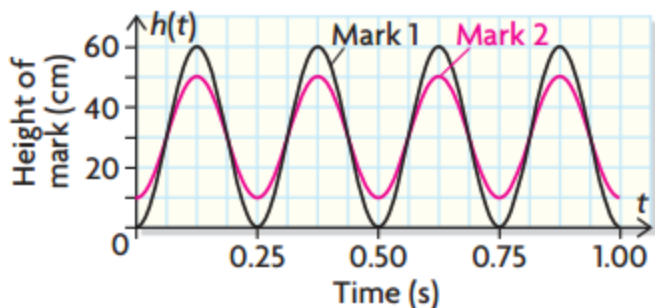
Sinusoidal Functions Assignment

1. The following data show the pressure (in pounds per square inch, psi) in the tank of an air compressor at different times.

Time (s)	0	1	2	3	4	5	6	7	8	9
Pressure (psi)	60	60	80	100	100	90	80	70	60	60

Time (s)	10	11	12	13	14	15	16	17	18	19
Pressure (psi)	80	100	100	90	80	70	60	60	80	100

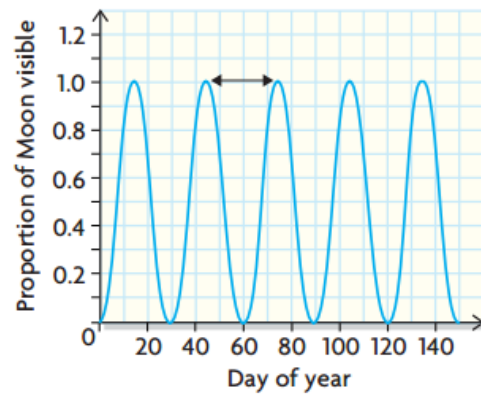
- a) Create a scatter plot of the data and the curve that best models the data.
 - b) How do you know that the graph is periodic?
 - c) Determine the period of the function.
 - d) Determine the equation of the axis.
 - e) Determine the amplitude.
 - f) How fast is the air pressure increasing when the compressor is on?
 - g) How fast is the air pressure decreasing when the equipment is in operation?
 - h) Is the container ever empty? Explain.
2. Two white marks are made on a car tire by a parking meter inspector. One mark is made on the outer edge of the tire; the other mark is made a few centimetres from the edge. The two graphs show the relationship between the heights of the white marks above the ground in terms of time as the car moves forward.



- a) What is the period of each function, and what does it represent in this situation?
 - b) What is the equation of the axis of each function, and what does it represent in this situation?
 - c) What is the amplitude of each function, and what does it represent in this situation?
3. Sketch the graph of $f(x) = 3 \sin(2x - 120^\circ) + 4$
 4. For the function $f(x) = -2 \cos 3(\theta - 90^\circ) - 4$ describe the transformations in words.

5. For the following function state the period, amplitude, equation of the axis, domain and range.

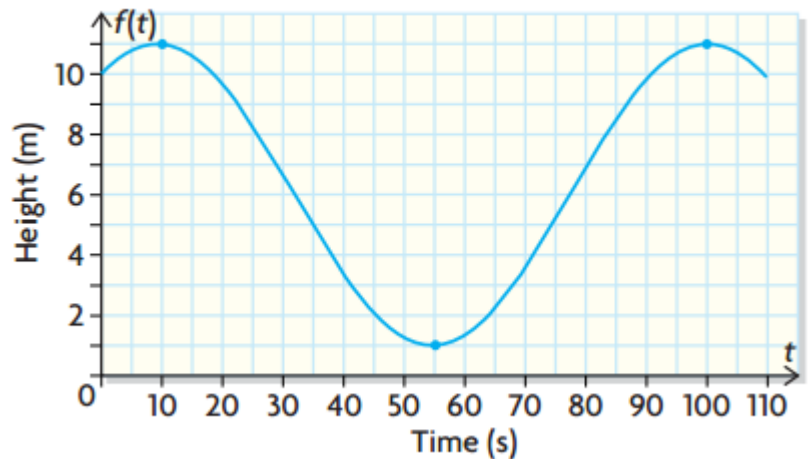
Cycle of the Proportion of the Moon Visible



6. a) Write an equation for the sinusoidal function.

- b) what was John's height after 78 seconds?

John's Height above the Ground



7. Candice is holding onto the end of a spring that is attached to a lead ball. As she moves her hand slightly up and down, the ball moves up and down. With a little concentration, she can repeatedly get the ball to reach a maximum height of 20 cm and a minimum height of 4 cm from the top of a surface. The first maximum height occurs at 0.2 s, and the first minimum height occurs at 0.6 s.

- Determine the equation of the sinusoidal function that represents the height of the lead ball in terms of time.
- Determine the domain and range of the function.
- What is the equation of the axis, and what does it represent in this situation?
- What is the height of the lead ball at 1.3 s?

8. Use transformations to graph each function for $0^\circ \leq x \leq 360^\circ$

- $y = 5 \cos(2x) + 7$
- $y = -0.5 \sin(x - 30^\circ) - 4$

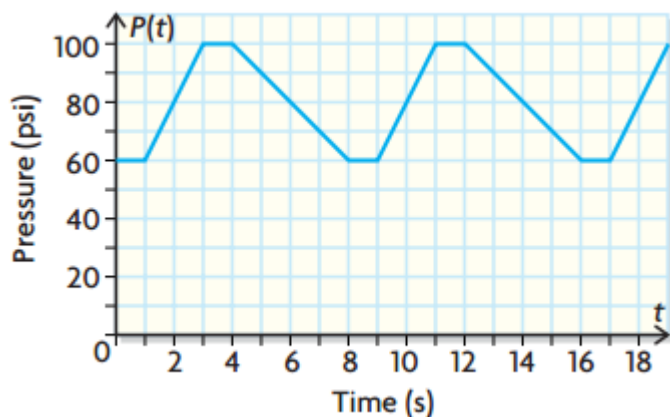
9. Determine the range of each sinusoidal function without graphing.

- $y = -3 \sin(4x) + 2$
- $y = 0.5 \cos(3(x - 40^\circ))$

Sinusoidal Functions Assignment

ANSWERS

1.



b) cycle repeats

e) 20

h) No, because its lowest

c) 8 s

f) 20 psi/s pressure value is 60 psi.

d) P 5 80

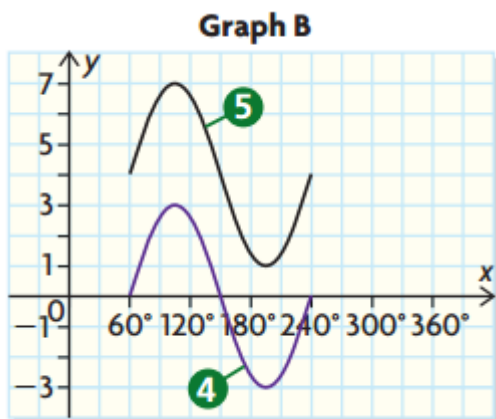
g) 10 psi/s

2. a) Both have a period of 0.25; the time for the tire to complete one revolution.

b) Both have same equation of the axis, h 5 30; the height of the axle.

c) 1: amplitude: 30; 2: amplitude: 20; distance from white mark to the centre of the wheel

3. Graph 5 is the final graph



4. A vertical stretch by a factor of 2, reflection over the x axis, horizontal compression by a factor of $\frac{1}{3}$, phase shift 90° to the right and a vertical translation 4 down.

5. Period: 30 days, Amplitude: 0.5, equation of axis: $y = 0.5$, Domain: $\{x \in R | 0 \leq x \leq 150\}$, Range: $\{y \in R | 0 \leq y \leq 1\}$

6. $y = 5 \cos(4(x - 10)^\circ) + 6$

b) 6.17 m

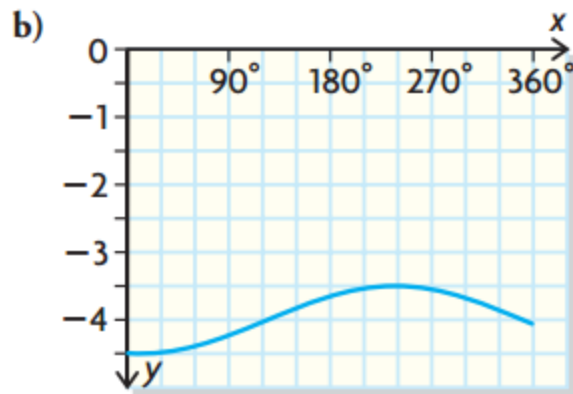
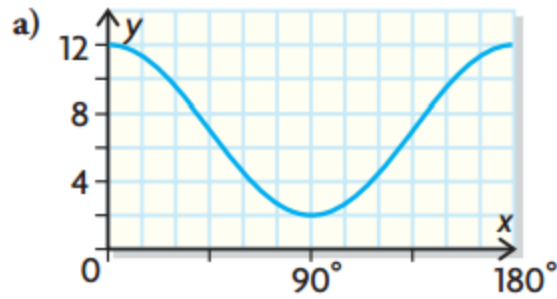
7. a) $h = 8 \cos(450(t - 0.2))^\circ + 12$

b) domain: $\{t \in \mathbb{R}\}$; range: $\{h \in \mathbb{R} \mid 4 \leq h \leq 20\}$

c) $h = 12$ cm, resting position of the spring

d) 6.3 cm

8.



9. a) $\{y \in \mathbb{R} \mid -1 \leq y \leq 5\}$

b) $\{y \in \mathbb{R} \mid -0.5 \leq y \leq 0.5\}$