Use the following information to answer numerical-response question 44.

The height of a pendulum, h, in inches, above a table top t seconds after the pendulum is released can be modelled by the sinusoidal regression function

$$h = 2\sin(3.14t - 1) + 5$$

Numerical Response

44. The height of the pendulum at the moment of release, to the nearest tenth of an inch, is __________ in.

Possible Solution:
The h-intercept represents the starting moment, so let $t = 0$.
$h = 2\sin(3.14(0) - 1) + 5$
$h = 3.317 \ldots$

The height of the pendulum at the moment of release is approximately 3.3 in above the table.

Use the following information to answer question 45 and numerical-response question 46.

The height above the ground of a rider on a Ferris wheel can be modelled by the sinusoidal function

$$h = 6 \sin(1.05t - 1.57) + 8$$

where h is the height of the rider above the ground, in metres, and t is the time, in minutes, after the ride starts.

45. According to the sinusoidal function, the maximum height of the rider above the ground is

A. 2 m
B. 6 m
C. 8 m
***D.** 14 m

Numerical Response

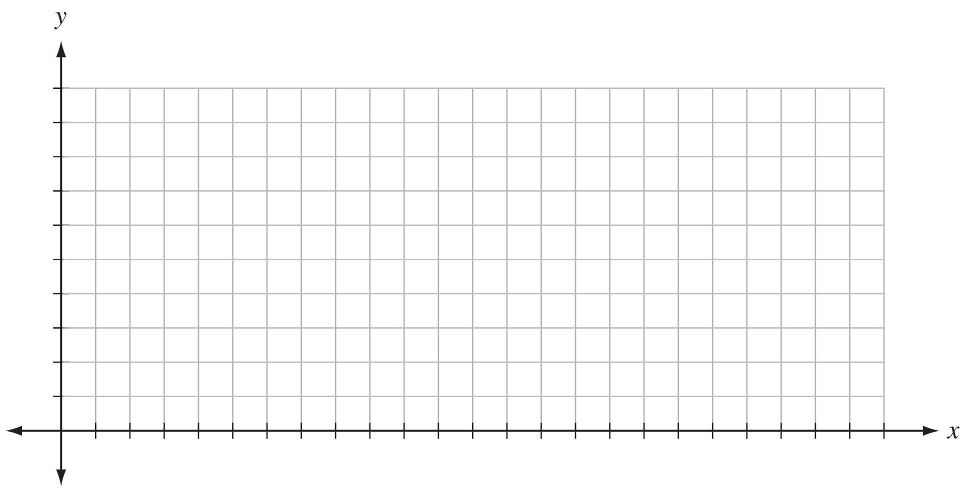
46. When the rider is at least 11.5 m above the ground, she can see the rodeo grounds. During each rotation of the Ferris wheel, the length of time that the rider can see the rodeo grounds, to the nearest tenth of a minute, is __________ min.

Possible Solution:
By sketching $y_1 = 11.5$ and $y_2 = 6 \sin(1.05x - 1.57) + 8$ using a window of x:[0, 7, 1], y:[0, 15, 1] and finding the intersection points of the graphs, it can be determined that the rider can see the rodeo grounds between approximately 2.09 min and 3.89 min on the first rotation. This means the rider sees the rodeo grounds for approximately 1.8 min on each rotation.

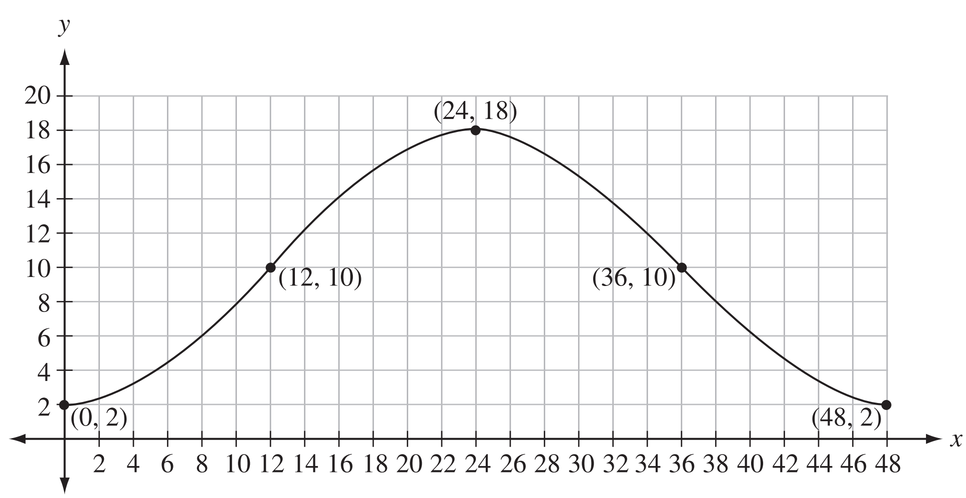
Use the following information to answer question 47.

A Ferris wheel has a radius of 8 m and its centre is 10 m above the ground. A rider gets on a chair of the Ferris wheel at its lowest point and completes one full revolution in 48 s.

47. a. Sketch a graph on the grid below to show the height of the rider above the ground, y, over time, x, for the first 48 s. Label key points on the graph.



Possible Solution:



b. State the amplitude, period, and equation of the midline for the function sketched in part a, on the previous page.

Possible Solution:
The amplitude represents the radius of the Ferris wheel, which is 8 m, and the period is 48 s. The midline represents the height of the centre of the Ferris wheel above the ground. The equation of the midline is $y = 10$.

c. Determine a function of the form $y = a \bullet \sin(bx - 1.57) + d$, where y represents the height of a rider above the ground and x represents the time after the ride has started, that could be used to model the height above the ground of a rider on the Ferris wheel described above.

Possible Solution:
The value of b can be determined by the formula $\frac{2\pi}{b} = \text{period}$. $\frac{2\pi}{b} = 48$, so $b \approx 0.13$.

The function that models the height of a rider on this Ferris wheel is

$y = 8\sin(0.13x - 1.57) + 10$.

Use the following information to answer question 48.

The average daily high temperature of Montreal, in °F, for each month of the year is shown in the table below. (January = 1, February = 2, etc.).

Month	Average Daily High Temperature in °F
1	22
2	25
3	36
4	52
5	66
6	75

Month	Average Daily High Temperature in °F
7	80
8	77
9	67
10	51
11	41
12	28

48. a. Write a sinusoidal regression function of the form $y = a \bullet \sin(bx + c) + d$, where x is the month number and y is the average daily high temperature, that could be used to model these data. Round the values of a, b, c, and d to the nearest hundredth.

Possible Solution:
$y = 29.08 \sin(0.51x - 2.02) + 50.77$

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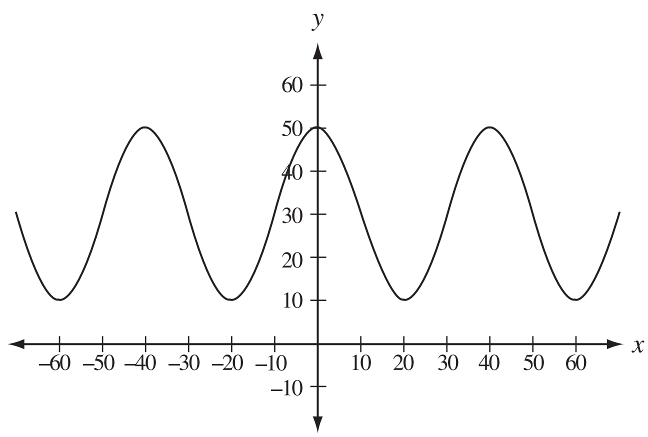
b. If scientists predict that the average daily high temperature in °F will increase by 1.2 °F each month, what characteristics of the graph of the sinusoidal regression function would change?

Possible Solution:
If the y-coordinate of every point on the graph of the sinusoidal function was increased by 1.2 °F, then there would be no change in the amplitude, period, and phase shift of the function. The median value would increase by 1.2 units, as would the maximum and minimum values of the graph. The domain would remain the same.

Use the following information to answer question 49.

The graph of a sinusoidal function is shown below.



Possible values for the amplitude and median of the sinusoidal function are 10, 20, 30, 40, and 50.

49. Record the values of the amplitude and the median of the sinusoidal function in the blanks.

Value:	________	________
Characteristic:	**Amplitude**	**Median**

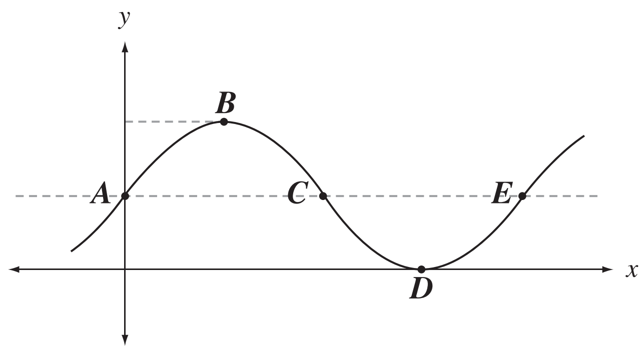
Solution:

Value:	20	30
Characteristic:	**Amplitude**	**Median**

Note: This question could be adapted for use on a digital test.

Use the following information to answer question 50.

The graph of a sinusoidal function is shown below. The points ***A***, ***B***, ***C***, ***D***, and ***E*** are labelled. Points ***A***, ***C***, and ***E*** lie on the midline of the function.



50. a. Mary says that in order to find the period of the function, she would need to know the coordinates of points *A* and *E*. Bill says that he could find the period using the coordinates of *B* and *D*. Both Mary and Bill are correct. Explain why.

Possible Solution:
Mary is correct because the horizontal distance between *A* and *E* would be the period, as it is the length of time it takes the function to complete one cycle. Bill is also correct, as the horizontal distance between *B* and *D* represents half the period. He would need to remember to double this result to determine the period.

b. Select all points that represent the *x*-intercepts of the function.

Solution:
D is the only *x*-intercept visible on the graph above.

c. Select all points that represent the minimum value of the function.

Solution:
D is the only minimum point visible on the graph above.

d. Select two points that could be used to determine the amplitude of the function. Describe a process that could be used to determine the amplitude using the two selected points.

Possible Solution:
One possible solution would be to select *B* and *C* and find the vertical distance between them. This distance would represent the amplitude.

Note: This question could be adapted for use on a digital test.