SINUSOIDAL FUNCTION PRACTICE EXAM
Math 30-2

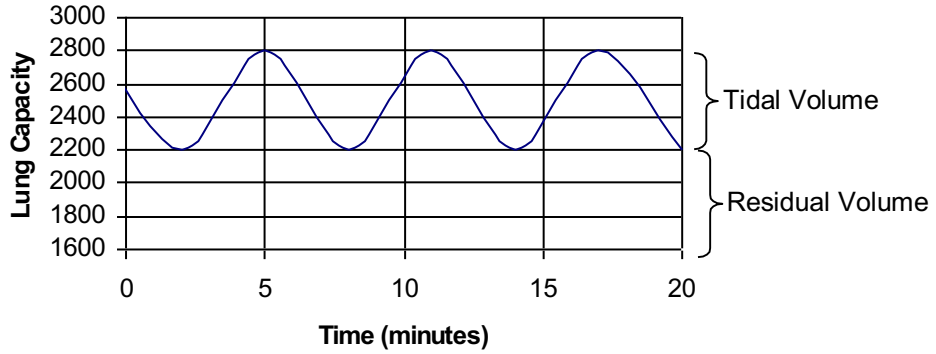
Name: _____

Multiple Choice & Numeric Response:

Record your answers in the space provided on the front page of the exam. Each correct response is worth one mark.

Use the following information to answer the next question.

The graph below represents the volume of air in the lungs of a person at rest.



The volume of air in the lungs can be expressed as a function in the form, $y = a\sin(bx + c) + d$.

When running, the breathing rate increases but the volume does not change

1. How is the equation, $y = a\sin(bx + c) + d$, affected when a person runs?
   a. The parameters *a* and *b* increase.
   b. The parameter *a* and *b* decrease.
   c. The parameter *b* increases.
   d. The parameter *b* decreases.

Use the following information for the next question.

Valerie collected the following data during a math experiment:

(1, 15)
(7, 31)
(13, 59)
(19, 122)
(25, 241)
(31, 478)

2. This data could most appropriately be modelled using
   a. Linear regression
   b. Quadratic regression
   c. Sinusoidal regression
   d. Exponential regression

Use the following information to answer the next question.

The data in the table shows the tide levels at the Annapolis Tidal Generating Station for a given day.

Time of Day (h)	00:00	05:00	10:00	15:00	20:00
Tide Level (m)	3.046	7.904	2.187	6.714	5.000

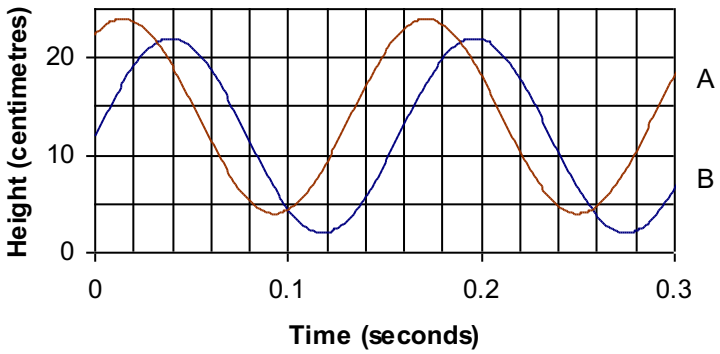
The first maximum tide level occurs at about 5 am.

Numeric Response 1

The time of day (on the 24 hour clock) that the 2nd maximum tide level occurs, to the nearest whole minute, is __ __ : __ __. (Record each digit of your answer in its own column in the space provided on the answer sheet)

Use the following information to answer the next question.

The graph shows the height and time for the pistons in two different six-cylinder engines.



Numeric Response 2

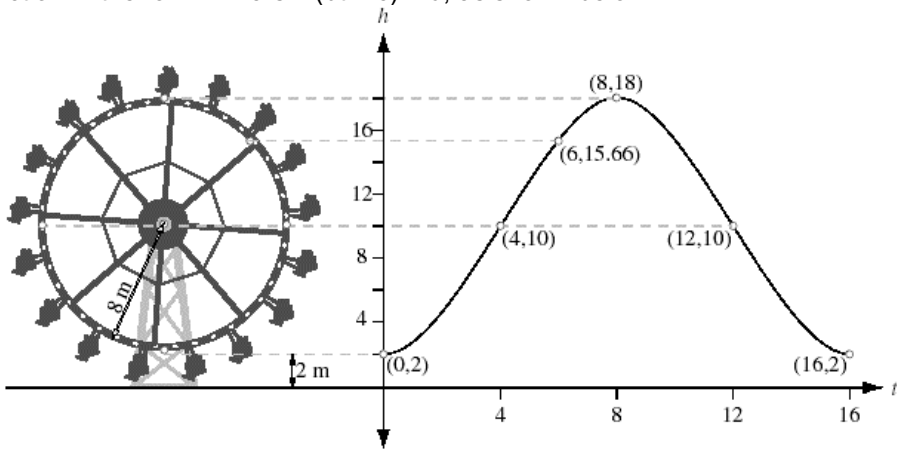
To obtain the graph of B, some of the parameters must change. Use 1 to indicate if a parameter will change and 0 to indicate if the parameter will not change.

a = _____ (record this value in the first column)
b = _____ (record this value in the second column)
c = _____ (record this value in the third column)
d = _____ (record this value in the fourth column)

Record your answer in the space provided on the answer sheet

Use the following information to answer the next question.

The height, h, in metres, of a point on a Ferris wheel at time, t, in seconds, can be represented by a sinusoidal function in the form h = a sin (bt + c) + d, as shown below.



3. The function that best describes the height of the point on the Ferris wheel is
   a. h = 8 sin (0.39t + 1.57) + 10
   b. h = 8 sin (0.39t – 1.57) + 10
   c. h = 8 sin (t + 4.02) + 10
   d. h = 8 sin (t – 4.02) + 10

Use the following information to answer the next three questions.

The function y = 17.14 sin (0.48 x – 1.75) + 7.11, where x represents the number of the month, models the average monthly temperature, in degrees Celsius, for Edmonton.

4. The amplitude of this function is
   a. 0.48°C
   b. 1.75°C
   c. 7.11°C
   d. 17.14°C

5. The maximum average temperature in Edmonton can be found by adding 17.14°C and
   a. 7.11°C
   b. 0.48°C
   c. 1.75°C
   d. –1.75°C

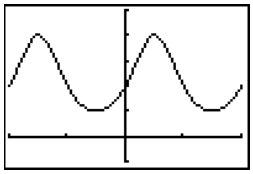
Numeric Response 3

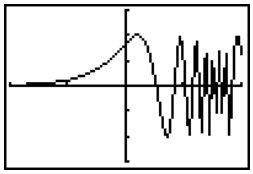
A tourist is able to determine that the average monthly temperature in Edmonton for month 9 (September), to the nearest tenth, is _____ °C.

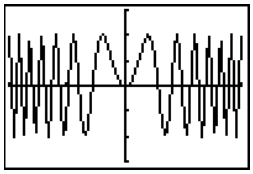
Record your answer in the space provided on the answer sheet.

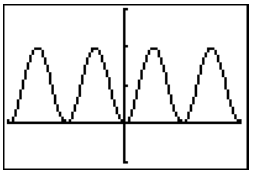
Use the following information to answer the next question.

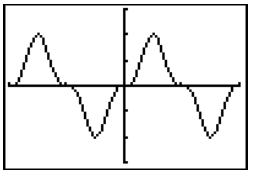
Jasmine graphed the following functions on her graphing calculator.

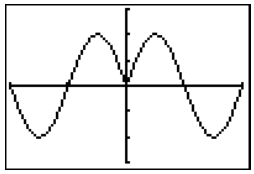
1. 

2. 

3. 

4. 

5. 

6. 

Numeric Response 4

The graphs of the periodic functions are ____, ____, _____.

Record your answer in the space provided on the answer sheet

Use the following information to answer the next question

Mark is using his calculator to graph a sinusoidal function. He knows the following information about the function:

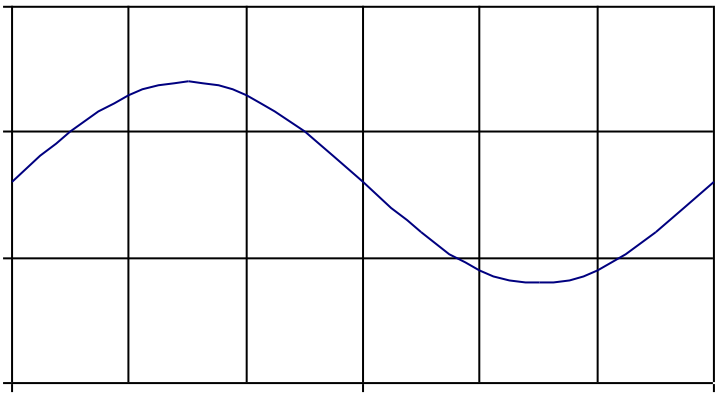
Amplitude = 3
Median = -2
Period length = 2π

6. The most appropriate window settings for this function are
   a. x:[-2π, 2π, π] y:[-2, 3, 1]
   b. x:[-2π, 2π, π] y:[-6, 2, 1]
   c. x:[-2, 3, 1] y:[-2π, 2π, π]
   d. x:[-6, 2, 1] y:[-2π, 2π, π]

7. The height of a chair on a Ferris wheel follows the equation $y = 5.7\sin(0.31x) + 7.9$, where y is the height (in metres) and x is the time (in seconds). A student wants to determine when the chair will be at a height of 15m. The student could graph the given sine function and look for
   a. X-intercepts
   b. Y-intercepts
   c. Points where y = 15
   d. Points where x = 15

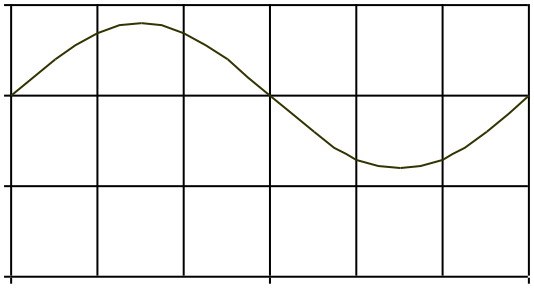
Use the following information to answer the next question

The graph shown below has the form $y = a \sin x + d$

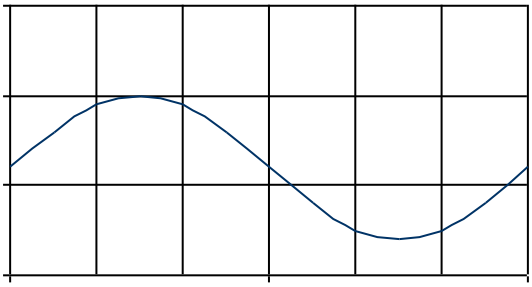


8. The if the d value was increased by 2 the new graph for this function would be

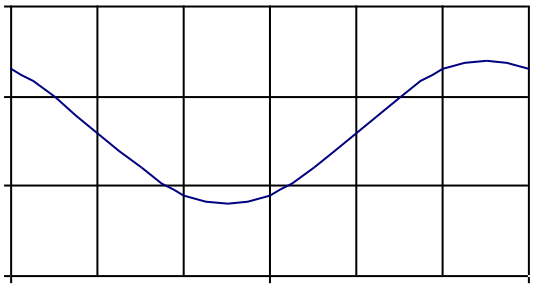
a.



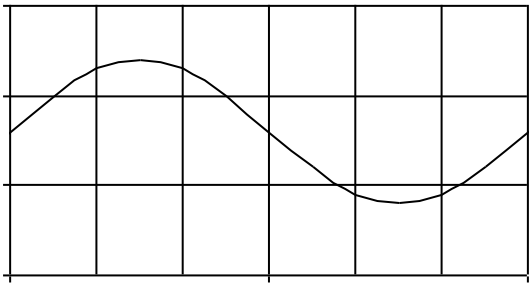
b.



c.



d.

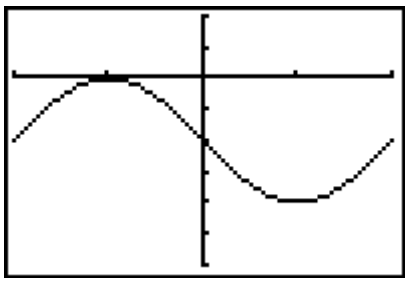


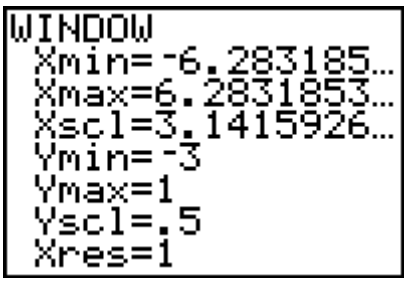
9. On a typical day at an ocean port, the water has a maximum depth of 20 m at 8:00 am. The minimum depth of 8 m occurs 6.2 hours later. Assume that the relation between time and water depth is a sinusoidal function. Which of the following would be the most appropriate window setting for *x* for one period of the function?

   a. x: [0, 24, 2]
   b. x: [0, 6.2, 1]
   c. x: [-2π, 2π, π]
   d. x: [8, 21, 1]

Use the following information to answer the next question

Neil graphed a sinusoidal function in the form $y = a\sin(bx) + d$ with his calculator and recorded the window settings as shown below.

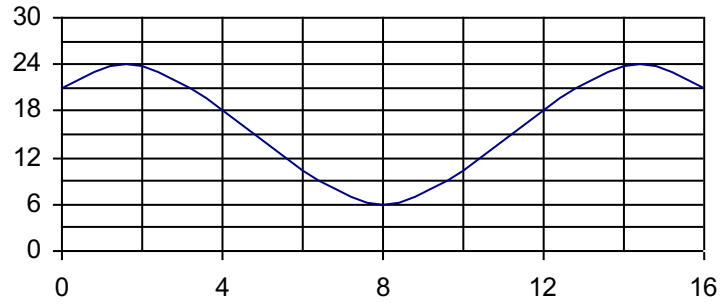




10. By looking at the window settings you can determine the b value of the function to be
    a. 0.5
    b. 1
    c. 2
    d. 2π

Use the following information to answer the next question

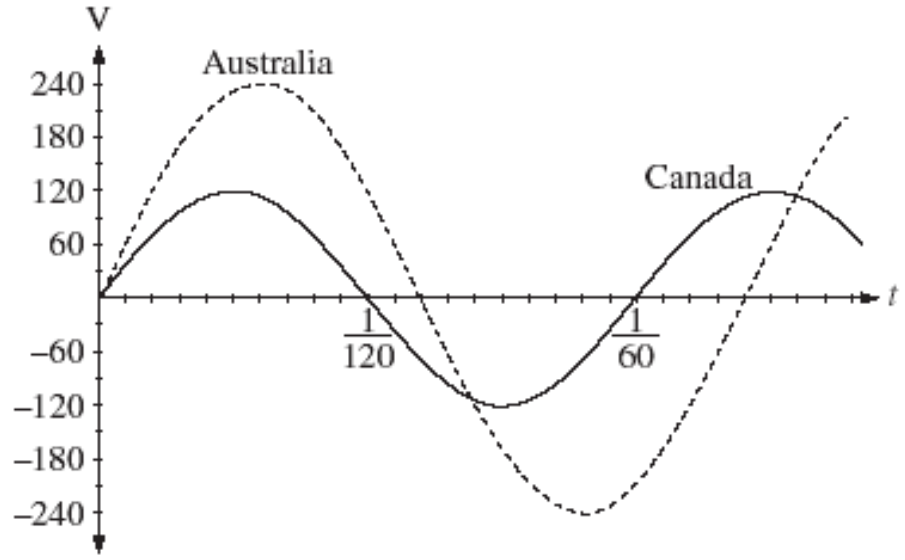
The graph shown below is a sinusoidal function in the form $y = a\sin x + d$.



11. The a and d values for this function, respectively, are
    a. 9, 15
    b. 24, 15
    c. 15, 9
    d. 15, 24

Use the following information to answer the next question.

The sinusoidal function that represents electrical current in Australia and the sinusoidal function that represents electrical current in Canada are graphed below.



12. The sinusoidal function representing electrical current in Australia differs from the sinusoidal function representing electrical current in Canada in
    a. Amplitude and period.
    b. Period and horizontal shift
    c. Amplitude and vertical shift
    d. Horizontal shift and vertical shift

Use the following information to answer the next question.

Mary needed to analyze the equation $y = \sin(3x) + 4$ in order to solve a problem.

Numeric Response 5

The values of a, b, c, and d in the equation are

a = _____ (record this value in the first column)
b = _____ (record this value in the second column)
c = _____ (record this value in the third column)
d = _____ (record this value in the fourth column)

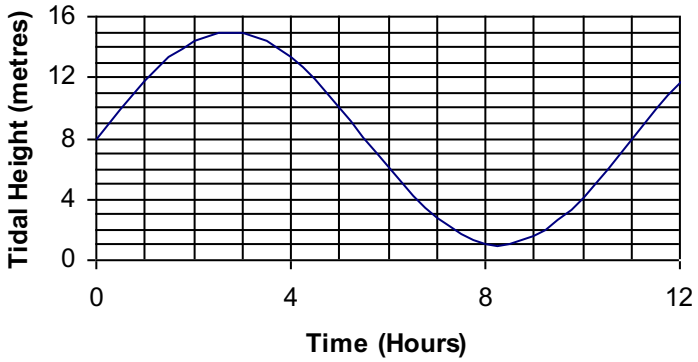
Record your answer in the space provided on the answer sheet

Written Response:

Record your answers in the space provided.

Use the following information to answer the next question

The highest tides on Earth occur in the Minas Basin in the Bay of Fundy, Nova Scotia, where tides can reach a maximum height of 15 m. The tidal heights for the morning of July 3, 2202 are graphed below.



This graph can be represented by the sinusoidal function, $y = a\sin(0.57x) + d$.

- On the graph above, label the amplitude, period, maximum, minimum and median.

- Use the graph to determine the values of *a* and *d* in the equation.

  a = _____ *d* = _____

  y = _____

- Using the sinusoidal function, calculate the height of the tide, to the nearest tenth, at 4.3 hours

- You can only dig clams when the tide is below 2 m. Between what times can you dig clams on the morning of July 3? Express your time in hours and minutes.

Solutions

1. C
2. D
3. B
4. D
5. A
6. B
7. C
8. A
9. D
10. A
11. A
12. A

NUMERICAL RESPONSE

1. 1654
2. 0011
3. 16.4
4. 145
5. 1304

WRITTEN RESPONSE

- a = 7, d = 8, y=7sin(0.57x)+8
- 12.5 m
- 7:19 am and 9:13 am