F.IF.B.4: Graphing Trigonometric Functions 1

- 1 Relative to the graph of $y = 3 \sin x$, what is the shift of the graph of $y = 3 \sin \left(x + \frac{\pi}{3}\right)$? 1) $\frac{\pi}{3}$ right 2) $\frac{\pi}{3}$ left 3) $\frac{\pi}{3}$ up
 - 4) $\frac{\pi}{3}$ down
- 2 Given the parent function $p(x) = \cos x$, which phrase best describes the transformation used to obtain the graph of $g(x) = \cos(x+a) - b$, if *a* and *b* are positive constants?
 - 1) right *a* units, up *b* units
 - 2) right *a* units, down *b* units
 - 3) left *a* units, up *b* units
 - 4) left a units, down b units
- 3 The temperature, in degrees Fahrenheit, in Times Square during a day in August can be predicted by the function $T(x) = 8\sin(0.3x - 3) + 74$, where x is the number of hours after midnight. According to this model, the predicted temperature, to the *nearest degree* Fahrenheit, at 7 P.M. is
 - 1) 68
 - 2) 74
 - 3) 77
 - 4) 81
- 4 The hours of daylight, y, in Utica in days, x, from January 1, 2013 can be modeled by the equation $y = 3.06 \sin(0.017x 1.40) + 12.23$. How many hours of daylight, to the *nearest tenth*, does this model predict for February 14, 2013?
 - 1) 9.4
 - 2) 10.4
 - 3) 12.1
 - 4) 12.2

5 The Ferris wheel at the landmark Navy Pier in Chicago takes 7 minutes to make one full rotation. The height, *H*, in feet, above the ground of one of the six-person cars can be modeled by

$$H(t) = 70 \sin\left(\frac{2\pi}{7} (t - 1.75)\right) + 80$$
, where *t* is time,

in minutes. Using H(t) for one full rotation, this car's minimum height, in feet, is

- 1) 150
- 2) 70
- 3) 10
- 4) 0
- 6 The average monthly temperature, T(m), in degrees Fahrenheit, over a 12 month period, can be

modeled by $T(m) = -23 \cos\left(\frac{\pi}{6}m\right) + 56$, where *m* is

in months. What is the range of temperatures, in degrees Fahrenheit, of this function?

- 1) [-23,23]
- 2) [33,79]
- 3) [-23,56]
- 4) [-79,33]
- 7 As θ increases from $-\frac{\pi}{2}$ to 0 radians, the value of

$\cos\theta$ will

- 1) decrease from 1 to 0
- 2) decrease from 0 to -1
- 3) increase from -1 to 0
- 4) increase from 0 to 1
- 8 A sine function increasing through the origin can be used to model light waves. Violet light has a wavelength of 400 nanometers. Over which interval is the height of the wave *decreasing*, only?
 1) (0,200)
 - $\begin{array}{c} (0,200) \\ (100,300) \end{array}$
 - 3) (200,400)
 - 4) (300,400)

Name:

Regents Exam Questions

F.IF.B.4: Graphing Trigonometric Functions 1 www.jmap.org

9 Given
$$p(\theta) = 3\sin\left(\frac{1}{2}\theta\right)$$
 on the interval

 $-\pi < \theta < \pi$, the function *p*

- 1) decreases, then increases
- 2) increases, then decreases
- 3) decreases throughout the interval
- 4) increases throughout the interval

10 As x increases from 0 to $\frac{\pi}{2}$, the graph of the equation $y = 2\tan x$ will

equation $y = 2 \tan x$ with

- 1) increase from 0 to 2 2) decrease from 0 to -2
- a) accrease from 0 to -2
 a) increase without limit
- 4) decrease without limit
- 4) decrease without limit
- 11 The depth of the water, d(t), in feet, on a given day at Thunder Bay, *t* hours after midnight is modeled

by $d(t) = 5\sin\left(\frac{\pi}{6}(t-5)\right) + 7$. Which statement

about the Thunder Bay tide is false?

- 1) A low tide occurred at 2 a.m.
- 2) The maximum depth of the water was 12 feet.
- 3) The water depth at 9 a.m. was approximately 11 feet.
- 4) The difference in water depth between high tide and low tide is 14 feet.

Name:

12 Based on climate data that have been collected in Bar Harbor, Maine, the average monthly temperature, in degrees F, can be modeled by the equation $B(x) = 23.914 \sin(0.508x - 2.116) + 55.300$. The same governmental agency collected average monthly temperature data for Phoenix, Arizona, and found the temperatures could be modeled by the equation

 $P(x) = 20.238 \sin(0.525x - 2.148) + 86.729$. Which statement can *not* be concluded based on the average monthly temperature models *x* months after starting data collection?

- 1) The average monthly temperature variation is more in Bar Harbor than in Phoenix.
- 2) The midline average monthly temperature for Bar Harbor is lower than the midline temperature for Phoenix.
- The maximum average monthly temperature for Bar Harbor is 79° F, to the nearest degree.
- 4) The minimum average monthly temperature for Phoenix is 20° F, to the nearest degree.
- 13 A person's lung capacity can be modeled by the

function $C(t) = 250 \sin\left(\frac{2\pi}{5}t\right) + 2450$, where C(t)

represents the volume in mL present in the lungs after *t* seconds. State the maximum value of this function over one full cycle, and explain what this value represents.

14 The height, h(t) in cm, of a piston, is given by the equation $h(t) = 12 \cos\left(\frac{\pi}{3}t\right) + 8$, where *t* represents the number of seconds since the measurements began. Determine the average rate of change, in

cm/sec, of the piston's height on the interval $1 \le t \le 2$. At what value(s) of *t*, to the *nearest tenth* of a second, does h(t) = 0 in the interval $1 \le t \le 5$? Justify your answer.

F.IF.B.4: Graphing Trigonometric Functions 1 Answer Section

1 ANS: 2 REF: 011701aii 2 ANS: 4 REF: 061706aii 3 ANS: 3 $T(19) = 8\sin(0.3(19) - 3) + 74 \approx 77$ REF: 061922aii 4 ANS: 2 REF: 011804aii 5 ANS: 3 RAD 🚺 🔀 *Doc 🗢 < 1.1 ▶ (3.5,150) ħ $\sin\left(\frac{2 \cdot \pi}{7} \cdot (x-1.75)\right) + 8$ H(t) is at a minimum at 70(-1) + 80 = 10REF: 061613aii 6 ANS: 2 -23(1) + 56 = 33; -23(-1) + 56 = 79REF: 062305aii 7 ANS: 4 REF: 012016aii 8 ANS: 2 REF: 081610aii 9 ANS: 4 REF: 082220aii 10 ANS: 3 REF: 081705aii 11 ANS: 4 1) $d(2) = 2; 2) d(1) = 12; 3) d(9) \approx 11; 4) d(-1) = 2$ REF: 062220aii 12 ANS: 4

	Bar Harbor	Phoenix	
Minimum	31.386	66.491	
Midline	55.3	86.729	
Maximum	79.214	106.967	
Range	47.828	40.476	

REF: 061715aii

13 ANS:

250(1) + 2450 = 2700 The maximum lung capacity of a person is 2700 mL.

REF: 081928aii

14 ANS: $\frac{h(2) - h(1)}{2 - 1} = -12, h(t) = 0 \text{ at } t \approx 2.2, 3.8, \text{ using a graphing calculator to find where } h(t) = 0.$

REF: 061836aii