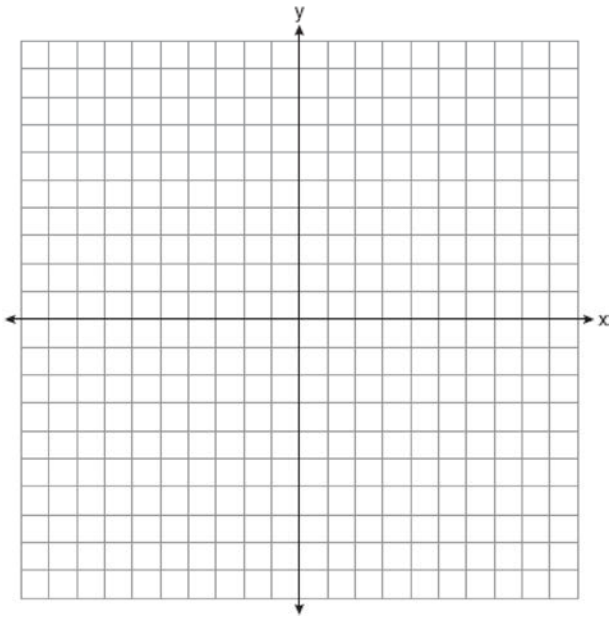
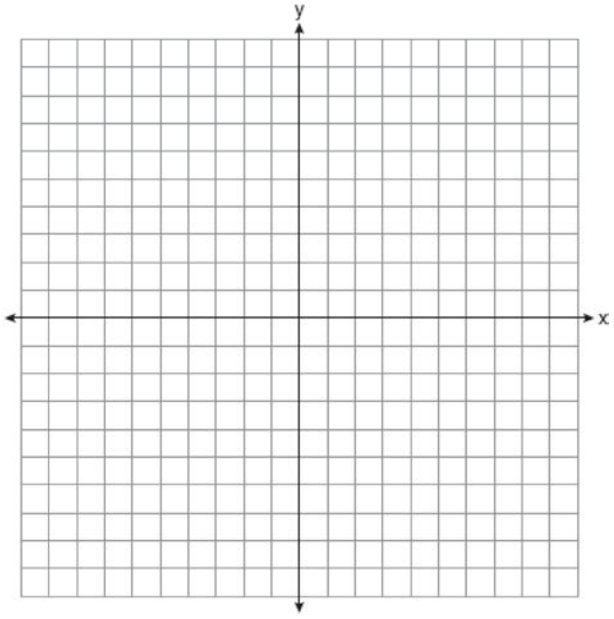
Name: _____

F.IF.C.7: Graphing Trigonometric Functions 6

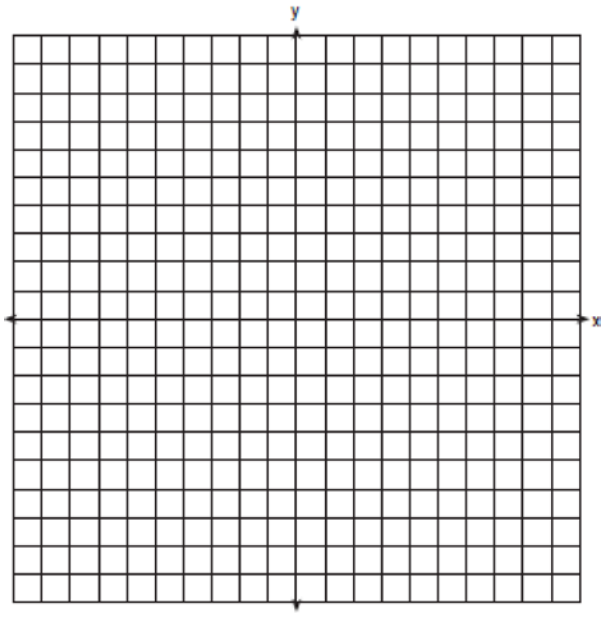
1 Sketch the graph of $y = 3\sin 2x$ in the interval $-\pi \le x \le \pi$.



2 Sketch and label the function $y = 2\sin\frac{1}{2}x$ in the interval $-2\pi \le x \le 2\pi$.



3 On the accompanying set of axes, sketch the graph of the equations $y = 2\cos x$ in the interval $-\pi \le x \le \pi$. On the same set of axes, reflect the graph in the x-axis. Write an equation of the graph drawn. Using this equation, find the value of y when $x = \frac{\pi}{6}$.



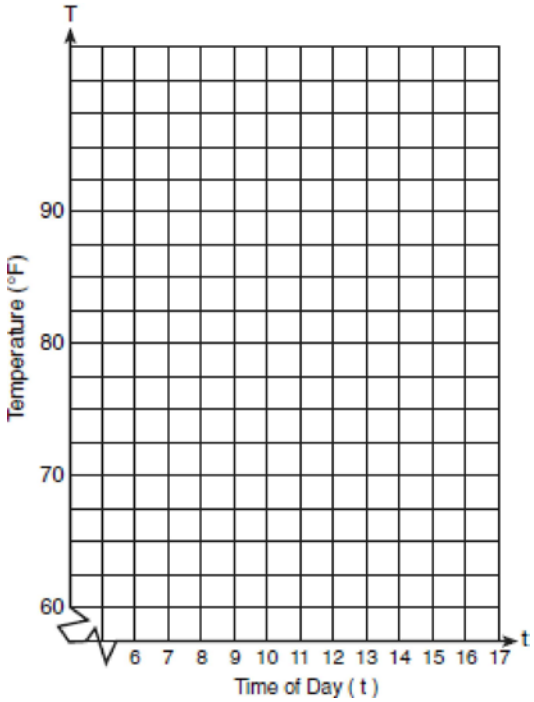
4 In the interval $0 \le x \le 2\pi$, in how many points will the graphs of the equations $y = \sin x$ and $y = \frac{1}{2}$ intersect?
1) 1 2) 2 3) 3 4) 4

Name: _____

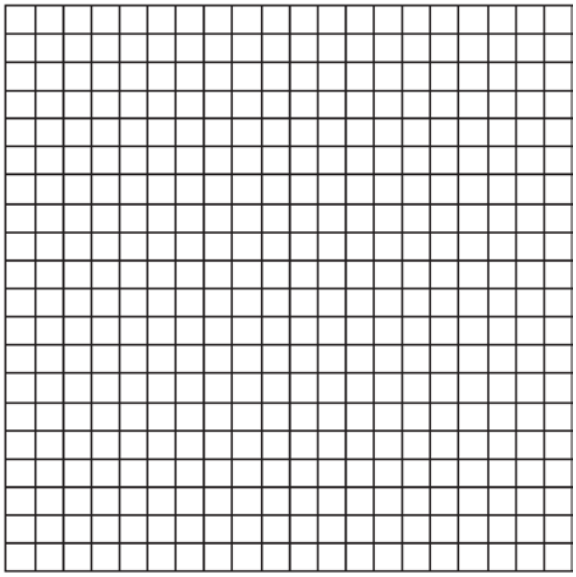
5 A building's temperature, T, varies with time of day, t, during the course of 1 day, as follows:

$$T = 8\cos t + 78$$

The air-conditioning operates when $T \geq 80°F$. Graph this function for $6 \leq t < 17$ and determine, to the *nearest tenth of an hour*, the amount of time in 1 day that the air-conditioning is on in the building.

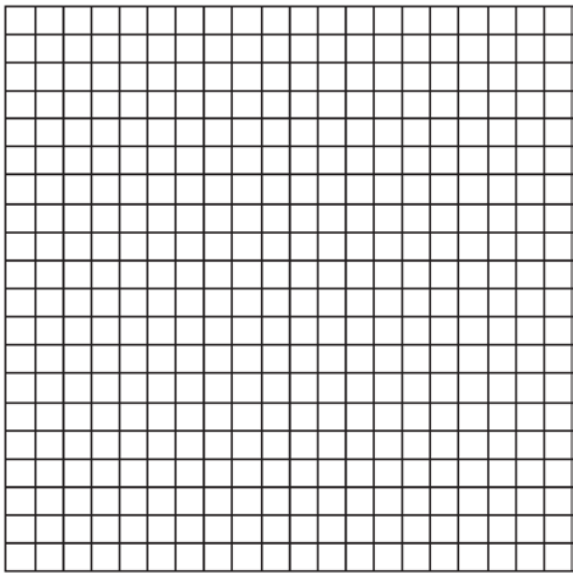


6 The tide at a boat dock can be modeled by the equation $y = -2\cos\left(\frac{\pi}{6}t\right) + 8$, where t is the number of hours past noon and y is the height of the tide, in feet. For how many hours between $t = 0$ and $t = 12$ is the tide at least 7 feet? [The use of the grid is optional.]

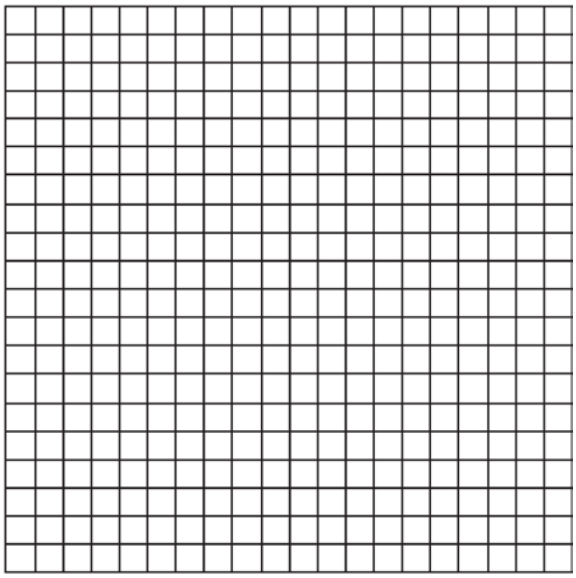


Name: _____

7 The average annual snowfall in a certain region is modeled by the function $S(t) = 20 + 10\cos\left(\frac{\pi}{5}t\right)$, where S represents the annual snowfall, in inches, and t represents the number of years since 1970. What is the minimum annual snowfall, in inches, for this region? In which years between 1970 and 2000 did the minimum amount of snow fall? [The use of the grid is optional.]

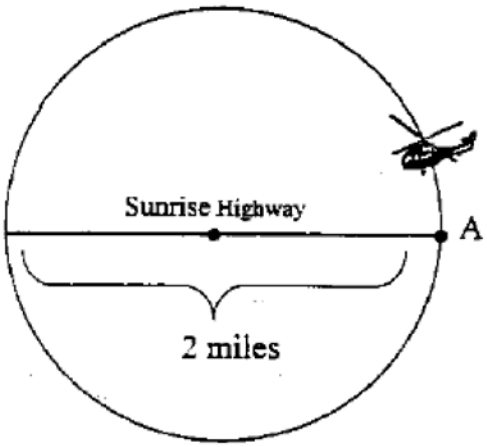


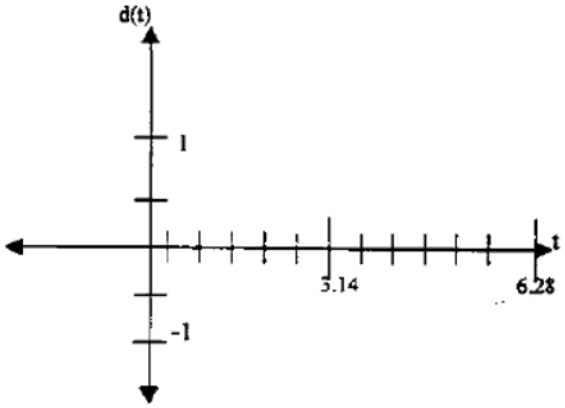
8 A radio wave has an amplitude of 3 and a wavelength (period) of π meters. On the accompanying grid, using the interval 0 to 2π, draw a possible sine curve for this wave that passes through the origin.



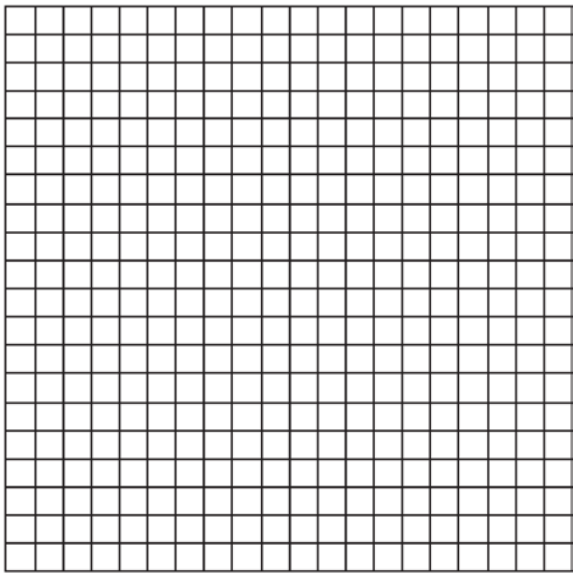
Name: _____

9 A helicopter, starting at point *A* on Sunrise Highway, circles a 2-mile section of the highway in a counterclockwise direction. If the helicopter is traveling at a constant speed and it takes approximately 6.28 minutes to make one complete revolution to return to point *A*, sketch a possible graph of distance (dependent variable) from the helicopter to the highway, versus time (independent variable). If the helicopter is north of the highway, distance (*d*) is positive; if the helicopter is south of the highway, distance (*d*) is negative. (Disregard the height of the helicopter.) State the equation of this graph.

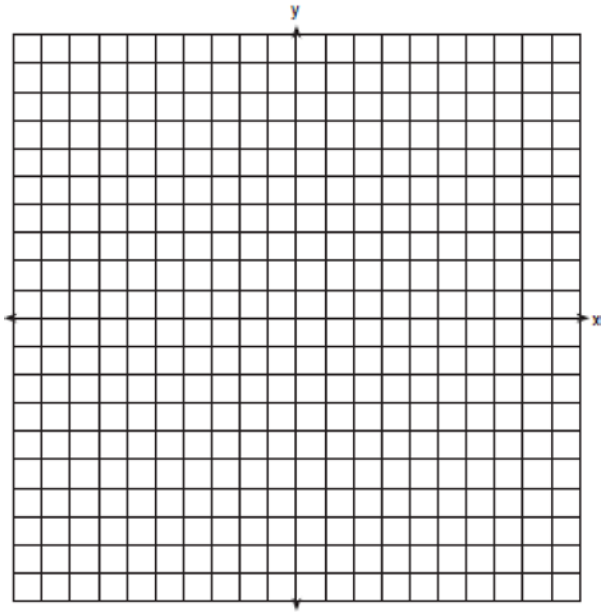




10 On the same set of axes, sketch the graphs of the equations of $y = \cos 2x$ and $y = \tan x$ in the domain $-\pi \le x \le \pi$. What is a line of symmetry of the graph of $y = \cos 2x$ as sketched?

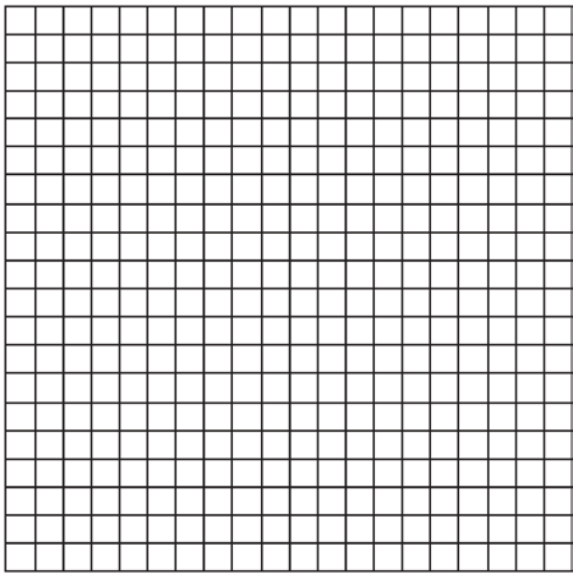


11 On the accompanying set of axes, graph the equations $y = 4\cos x$ and $y = 2$ in the domain $-\pi \le x \le \pi$. Express, in terms of π, the interval for which $4\cos x \ge 2$.

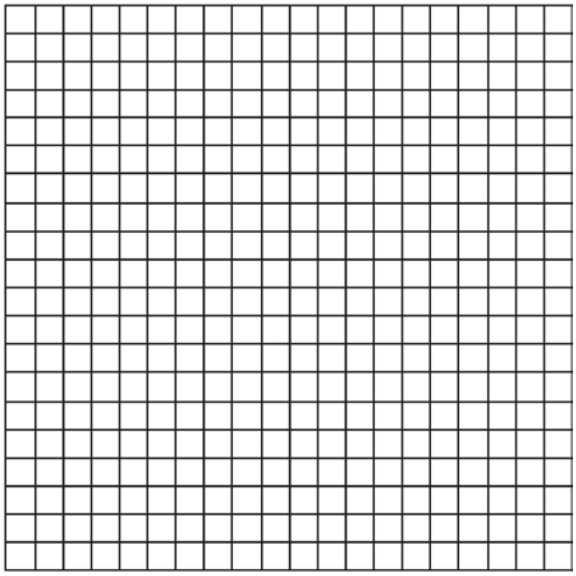


Name: _____

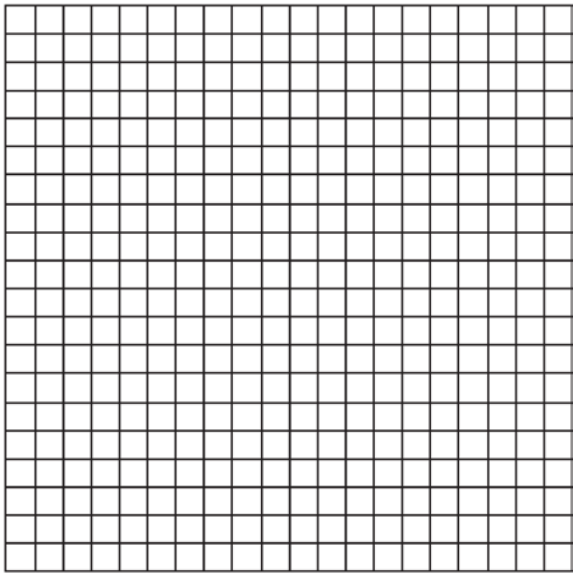
12 On the same set of axes, sketch and label the graphs of $y = 2\cos\frac{1}{2}x$ and $y = -1$ for the values of x in the interval $0 \le x \le 2\pi$. State the number of values of x in the interval $0 \le x \le 2\pi$ that satisfy the equation $2\cos\frac{1}{2}x = -1$.



13 On the same set of axes, sketch and label the graphs of $y = \sin x$ and $y = 2\cos x$ in the interval $-\pi \le x \le \pi$. How many values in the interval $-\pi \le x \le \pi$ does $\sin x = 2\cos x$?

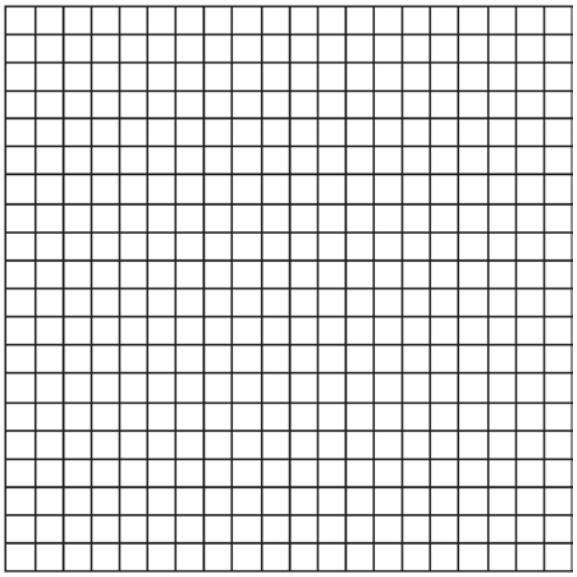


14 On the same set of axes, sketch and label the graphs of $y = 2\sin x$ and $y = \cos 2x$ as x varies from 0 to 2π radians. How many values of x in the interval $0 \le x \le 2\pi$ satisfy the equation $2\sin x = \cos 2x$.

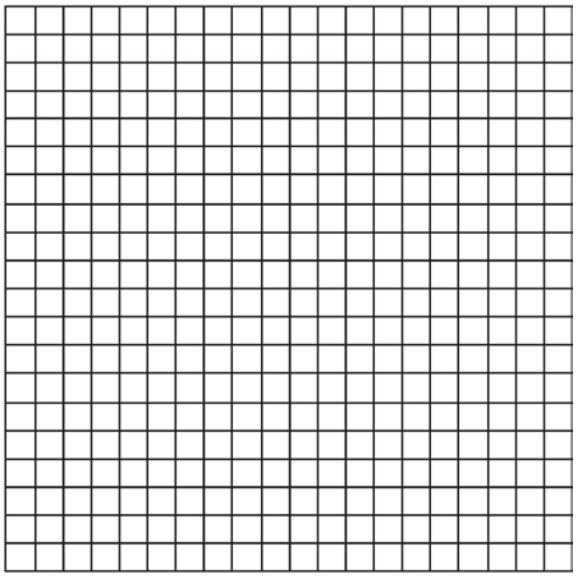


Name: _____

15 On the same set of axes, sketch the graphs of $y = \cos 2x$ and $y = \frac{1}{2}\sin x$ for the values of x in the interval $0 \le x \le 2\pi$. How many values of x in the interval $0 \le x \le 2\pi$ satisfy the equation $\cos 2x = \frac{1}{2}\sin x$?

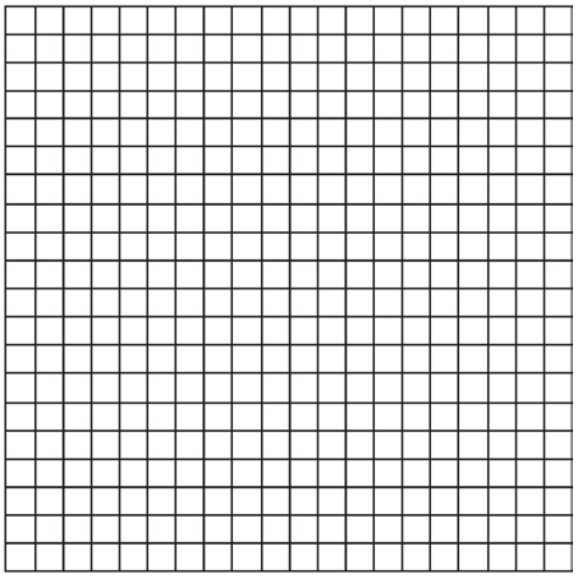


16 On the same set of axes, sketch the graphs of $y = \sin x$ and $y = \frac{1}{2}\cos 2x$ as x varies from 0 to 2π radians. State the number of values of x in the interval $0 \le x \le 2\pi$ that satisfy the equation $\sin x = \frac{1}{2}\cos 2x$.

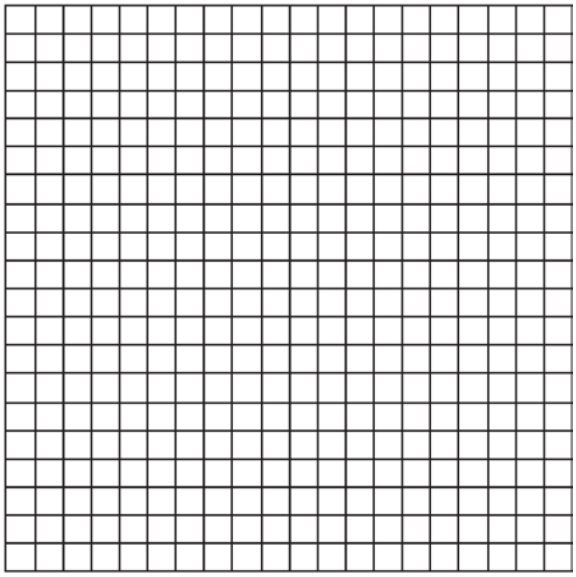


Name: _____

17 On the same set of axes, sketch the graphs of the equations of $y = 2\cos\frac{1}{2}x$ and $y = -\sin x$ in the interval $0 \le x \le 2\pi$. From the graphs drawn, find all values of x that satisfy the equation $y = 2\cos\frac{1}{2}x = -\sin x$.

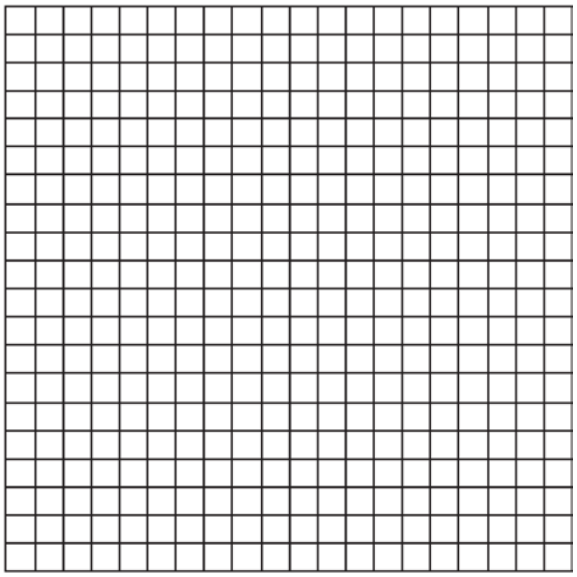


18 On the same set of axes, sketch and label the graphs of $y = 2\sin x$ and $y = \cos 2x$ for the values of x in the interval $-\pi \le x \le \pi$. Based on these graphs, which value of x in the interval $-\pi \le x \le \pi$ satisfies the equation $2\sin x - \cos 2x = 3$?

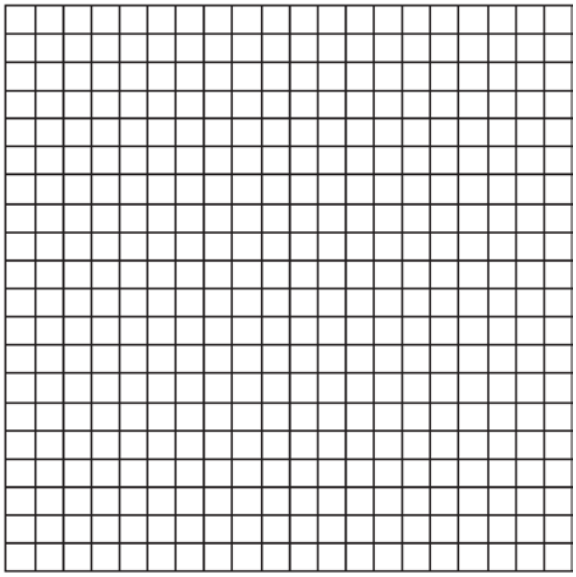


Name: _____

19 On the same set of axes, sketch the graphs of $y = \tan x$ and $y = \frac{1}{2}\cos x$ as x varies from 0 to 2π radians. State the number of values of x in the interval $0 \le x \le 2\pi$ that satisfy the equation $\tan x = \frac{1}{2}\cos x$.

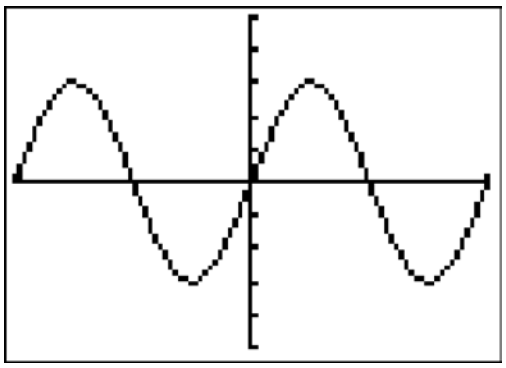


20 On the same set of axes, sketch and label the graphs of $y = \tan x$ and $y = 2\cos x$ for the values of x in the interval $0 \le x \le 2\pi$. State the number of values of x in the interval $0 \le x \le 2\pi$ which satisfy the equation $\tan x = 2\cos x$.



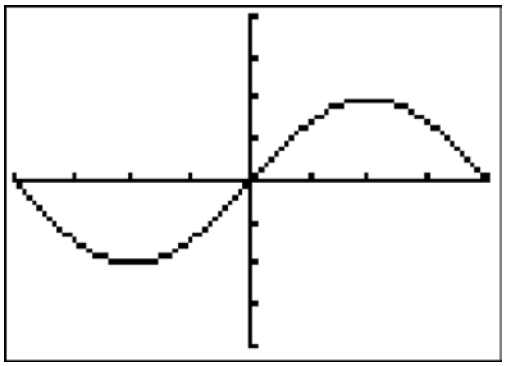
F.IF.C.7: Graphing Trigonometric Functions 6
Answer Section

1 ANS:



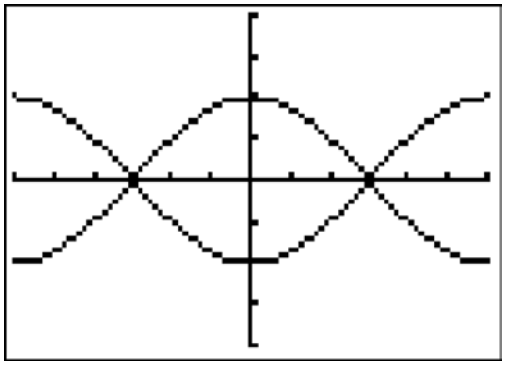
REF: 069040siii

2 ANS:



REF: 019536siii

3 ANS:

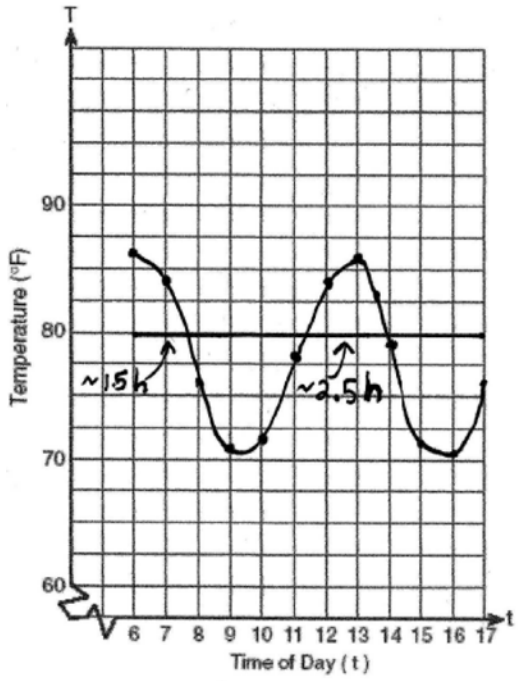


$y = -2\cos x, -\sqrt{3}$

REF: 069637siii

4 ANS: 2 REF: 069522siii

5 ANS:



4.2. $8\cos t + 78 \geq 80$

$8\cos t \geq 2$

$\cos t \geq \frac{2}{8}$

$t \geq \cos^{-1}\frac{1}{4}$

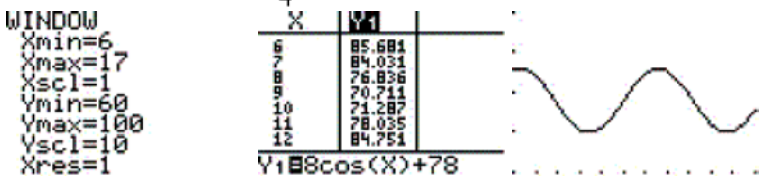
$\cos^{-1}\frac{1}{4} \approx 1.3$

. $1.3 + 2\pi \approx 7.6$. $1.3 + 4\pi \approx 13.9$

$4\pi - 1.3 \approx 11.3$

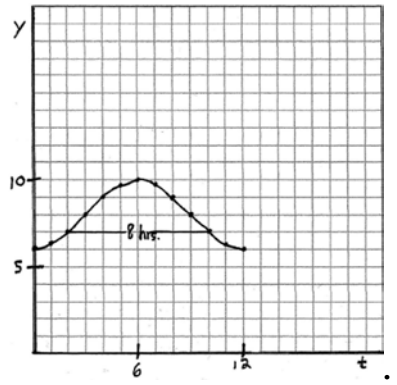
. 7.6-6 = 1.6 hours.

13.9-11.3 = 2.6 hours. 1.6+2.6 = 4.2 hours.



REF: 010329b

6 ANS:

8. 

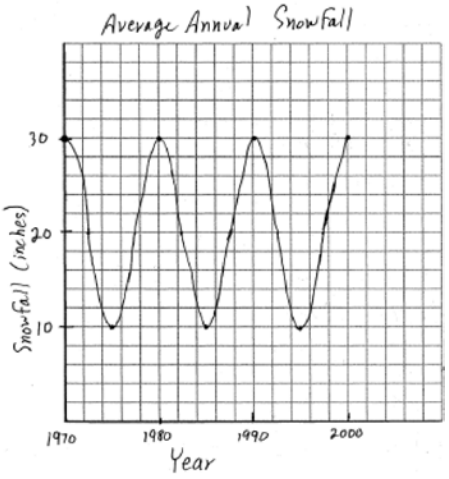
$$-2\cos\left(\frac{\pi}{6}t\right)+8\ge 7$$
$$-2\cos\left(\frac{\pi}{6}t\right)\ge -1$$
$$\cos\left(\frac{\pi}{6}t\right)\le \frac{1}{2}$$
$$\frac{\pi}{6}t\le \cos^{-1}\left(\frac{1}{2}\right)$$
$$\frac{\pi}{3}\le \frac{\pi}{6}t\le \frac{5\pi}{3}$$
$$2\le t\le 10$$

REF: 080433b

7 ANS:

$$20+10\cos\frac{\pi}{5}t=10$$
$$10\cos\frac{\pi}{5}t=-10$$
$$\cos\frac{\pi}{5}t=-1$$
$$\frac{\pi}{5}t=\cos^{-1}-1$$
$$\cos^{-1}-1=\pi,3\pi,5\pi$$

10, 1975, 1985, 1995. The minimum of the cosine function is −1. $20+10(-1)=10$.

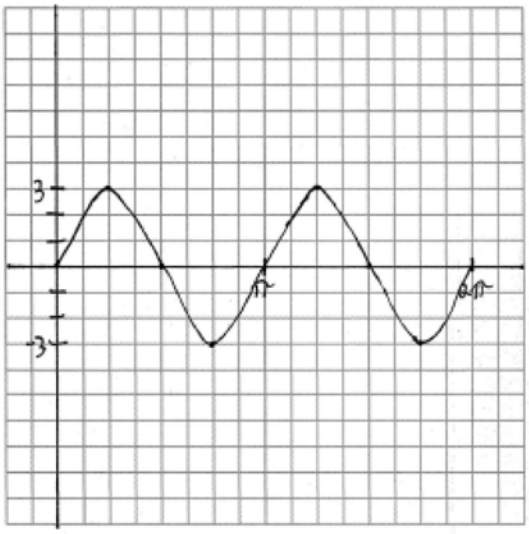


$\frac{\pi}{5}t=\pi$. $\frac{\pi}{5}t=3\pi$. $\frac{\pi}{5}t=5\pi$.

$t=5$ (1975) $t=15$ (1985) $t=25$ (1995)

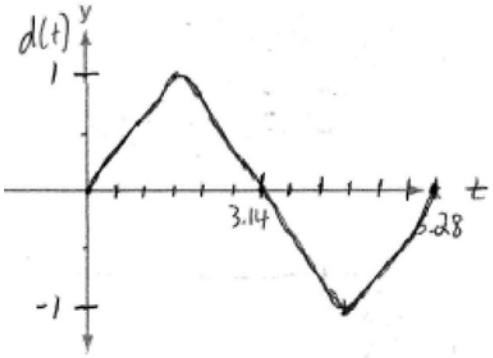
REF: 060731b

8 ANS:



REF: 060832b

9 ANS:



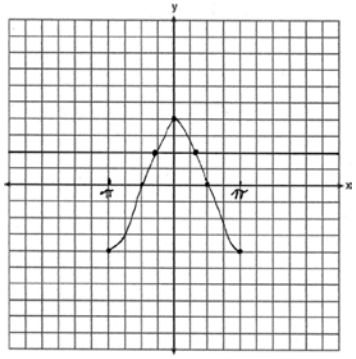
$d(t) = \sin(t)$

REF: fall9931b

10 ANS:
$x = 0$

REF: 089136siii

11 ANS:



$-\frac{\pi}{3} \le x \le \frac{\pi}{3}.$

$$4\cos x \ge 2$$
$$\cos x \ge \frac{2}{4}$$
$$x \ge \cos^{-1}\left(\frac{1}{2}\right)$$
$$-\frac{\pi}{3} \le x \le \frac{\pi}{3}$$

REF: 080532b

12 ANS:
1

REF: 018436siii

13 ANS:
2

REF: 068336siii

14 ANS:
2

REF: 018336siii

15 ANS:
4

REF: 018138siii

16 ANS:
2

REF: 088136siii

17 ANS:
π

REF: 019236siii

18 ANS:
$\frac{\pi}{2}$

REF: 019141siii

19 ANS:
2

REF: 018236siii

20 ANS:
2

REF: 068236siii