

# KEY

Name: \_\_\_\_\_ Block: \_\_\_\_\_

## Sheet 651: Radians, right triangles, circular functions, master formula

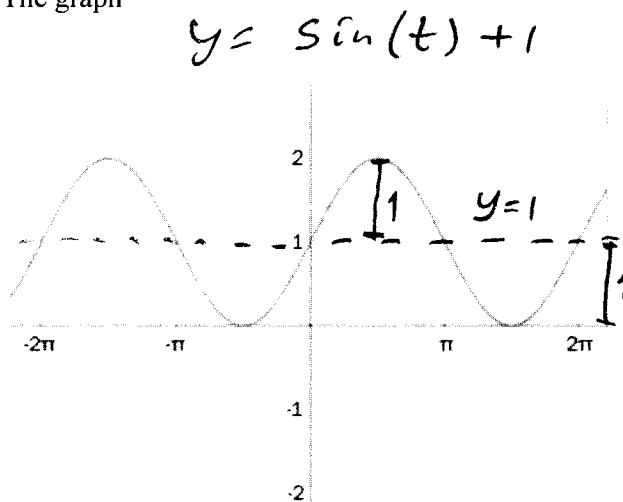
$y = \pm A \sin(B(t-h)) + k$      $\sin \theta = \frac{y}{r}$      $\cos \theta = \frac{x}{r}$      $\tan \theta = \frac{y}{x}$ . Calculator needed.

1. Find the values of each of the three trigonometric functions sine, cosine, and tangent of  $\theta$  for the following coordinates in the  $x$ - $y$  plane.

	$r$	$\sin \theta$	$\cos \theta$	$\tan \theta$
a. (3, 4)	5	$\frac{4}{5}$	$\frac{3}{5}$	$\frac{4}{3}$
b. (3, -4)	5	$-\frac{4}{5}$	$\frac{3}{5}$	$-\frac{4}{3}$
c. (-5, -7)	$\sqrt{25+49} = \sqrt{74}$	$-\frac{7}{\sqrt{74}}$	$-\frac{5}{\sqrt{74}}$	$-\frac{7}{5} = \frac{7}{5}$
d. (-1, 0)	1	0	-1	$\frac{0}{-1} = 0$
e. $(-\frac{\sqrt{3}}{2}, -\frac{1}{2})$	1	$-\frac{1}{2}$	$-\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{3}} = \frac{\sqrt{3}}{3}$

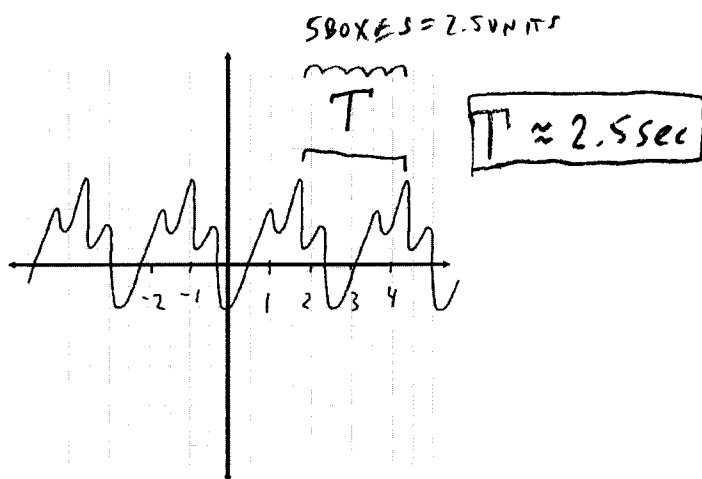
3. Find the amplitude, angular frequency, period, horizontal shift, phase shift, vertical shift, and the equation of the midline using the given information.

- a. The graph



2. Using the given information, find a good approximation of the period.

- a. The graph, assuming that the horizontal axis is time in units of seconds.



$A = \text{AMPLITUDE} = 1$      $V = \text{VERT. SHIFT} = 1$   
 $\omega = \text{ANG. FREQ} = 1$      $M = \text{MIDLINE} = y = 1$   
 $P = \text{PERIOD} = 2\pi$   
 $H = \text{HORIZ. SHIFT} = \text{PHASE SHIFT} = 0$

- b. The formula  $y = \pm A \sin(B(t-h)) + k$

$A = \text{AMPLITUDE}$      $K = \text{VERT. SHIFT}$   
 $B = \text{ANG. FREQ}$      $y = K = \text{MIDLINE}$   
 $T = \text{PERIOD}$   
 $H = \text{HORIZ. SHIFT}$   
 $\phi = \text{PHASE SHIFT}$

- c. The equation  $y = 2 \cos(t)$

$A = 2$      $K = 0$   
 $B = 1$      $y = 0 = \text{MIDLINE}$   
 $T = 2\pi$   
 $H = \phi = 0$

- d. The equation  $y = -5 \sin(4(t-3)) + 7$

$A = 5$      $K = 7$   
 $B = 4$      $y = 7 = \text{MIDLINE}$   
 $T = 2\pi/4 = \pi/2$   
 $H = 3$   
 $\phi = 12$

- e. The equation  $y = \sin(8t - 16) = \sin(8(t-2))$

$A = 1$      $K = 0$   
 $B = 8$      $y = 0 = \text{MIDLINE}$   
 $T = 2\pi/8 = \pi/4$   
 $\phi = 16, \text{ so } H = 2$

- b. The table

$24 - 8 = 16$      $T = 16 \text{ min}$

$t$ (minutes)	0	4	8	12	16	20	24	28	32
$y$ (meters)	3	7	9	7	3	7	9	7	3

- c. The position of Earth as it revolves around the Sun.

$T = 1 \text{ year}$

- f. The height,  $y$ , of the second hand of a clock with

(3f.)

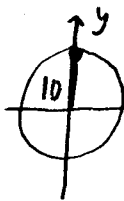
radius of 10 centimeters, starting at the top with  $y = 10$  centimeters when time  $t = 0$  seconds.

HERE ARE TWO FORMULAS.

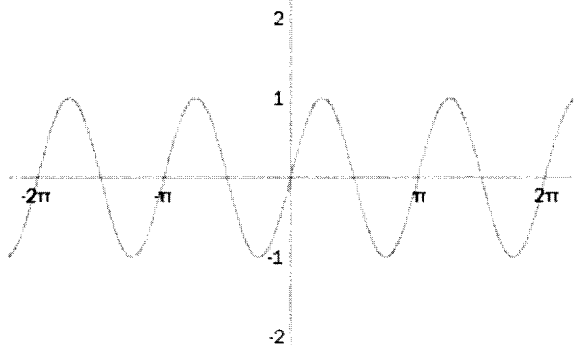
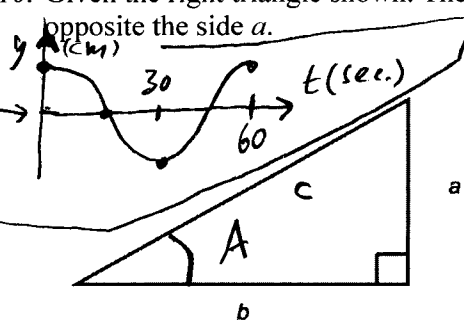
\*SEE BELOW.

g. The graph

$$y = 10 \sin\left(\frac{\pi}{30}(t+15)\right) = 10 \cos\left(\frac{\pi}{30}t\right)$$



10. Given the right triangle shown. The angle  $A$  is the angle opposite the side  $a$ .



$$y = \sin(2t)$$

$A = 1$	$H = 0$
$B = 2$	$BH = 0$
$T = \pi$	$K = 0$
$y = 0$ MIDLINE	

4. Write an equation for a sine function,  $y$  versus  $t$ , with amplitude of 4, period of  $\pi/4$ , and horizontal shift of  $\pi/8$ .

5. Convert to degrees:  $\pi/18 = \frac{180^\circ}{\pi} \left(\frac{\pi}{18}\right) = 10^\circ$

6. Convert to radians:  $260^\circ = \frac{\pi}{180^\circ} (260^\circ) = \frac{13\pi}{9}$

7. State the reference angle:  $260^\circ$

$+80^\circ$

8. State the quadrant given this measure:  $31\pi/18$

**IV**

9. Given a circle, what is the arc length if the radius is 15 meters and the subtended central angle is  $\pi/6$ ?

$$S = r\theta = 15 \text{ m} \cdot \frac{\pi}{6} = 2.5 \text{ m}$$

a) Find  $\sin A$  in terms of the variables given.

$$\sin A = \frac{a}{c}$$

b) If  $c = 8$  and  $b = 3$ , find  $\cos A$ .

$$\cos A = \frac{3}{8}$$

c) If  $c = 8$  and  $b = 3$ , find  $\sin A$  exactly (use integers and square roots as needed but no decimals).

$$a = \sqrt{8^2 - 3^2} = \sqrt{55}, \quad \sin A = \frac{\sqrt{55}}{8}$$

d) If  $c = 7$  and  $a = 2$ , find the measure of the angle  $A$  to one decimal.

$$\sin A = \frac{2}{7}$$

$$A = \sin^{-1}\left(\frac{2}{7}\right) \approx 16.6^\circ$$

$$(\approx 0.290 \text{ radians})$$

\* QUESTION 3f

$A = 10 \text{ cm}$	USING SINE	USING COSINE	$K = 0 \text{ cm}$
$B = \pi/30 \text{ /sec}$	$H = -15 \text{ sec}$	$H = 0 \text{ sec}$	$y = 0 \text{ cm, MIDLINE}$
$T = 60 \text{ sec}$	$BH = \frac{\pi}{2}$	$BH = 0$	