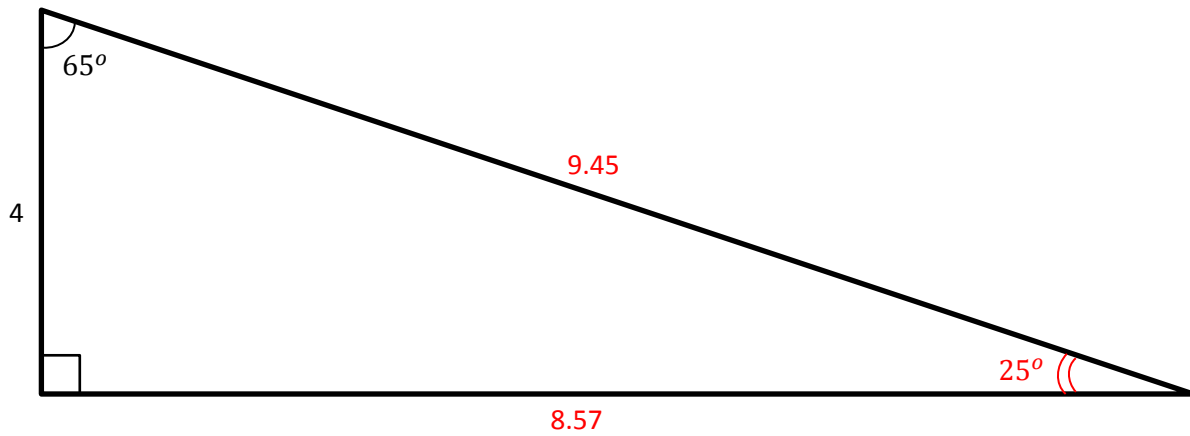


Calculator Portion: You may use a calculator on this page.

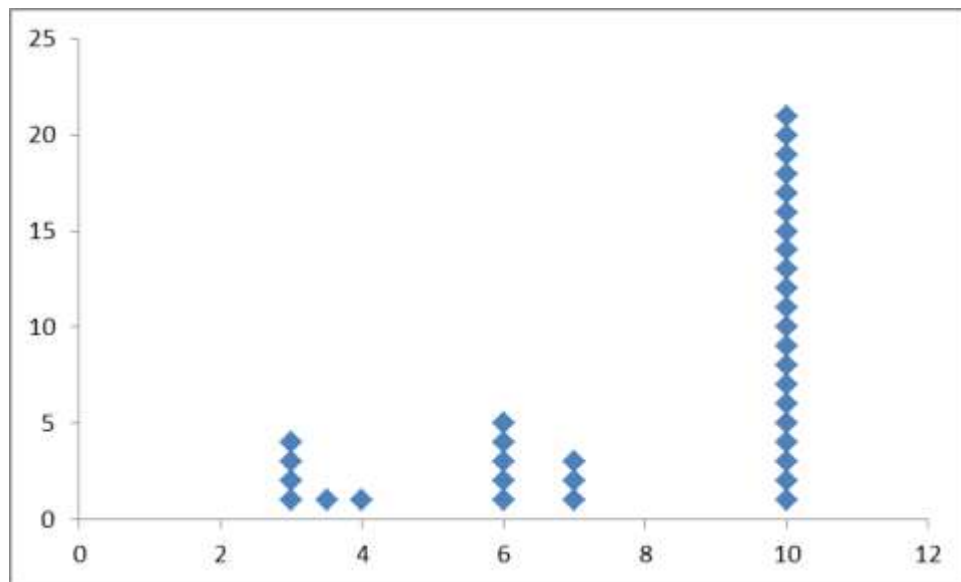
1) Solve the following triangle. (10 points)



$$\tan(65^\circ) = \frac{x}{4} \Rightarrow x = 8.57$$

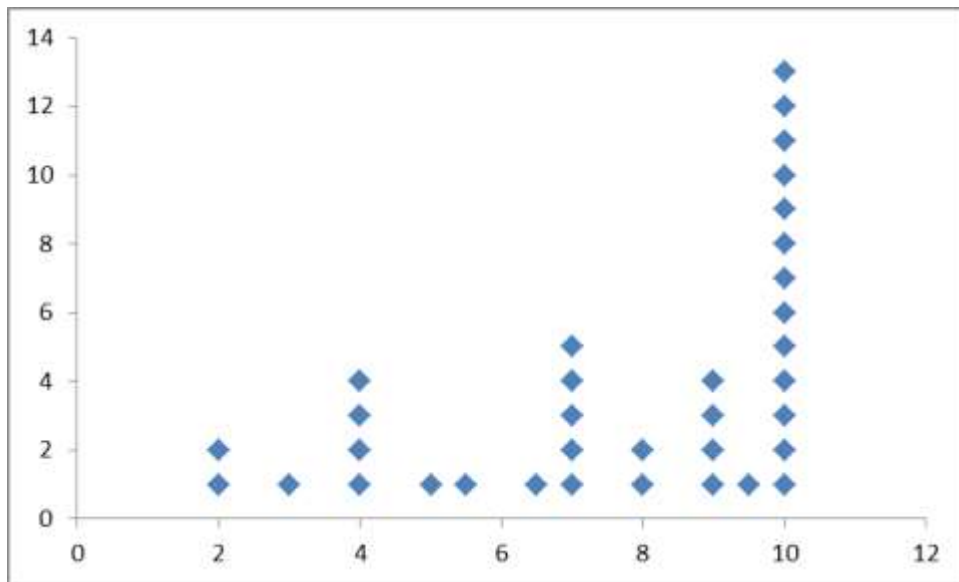
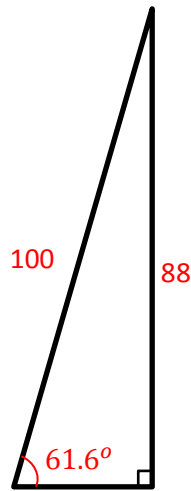
$$4^2 + 8.57^2 = x^2 \Rightarrow x = 9.45$$

Note that there are roughly 12 ways to solve this problem.



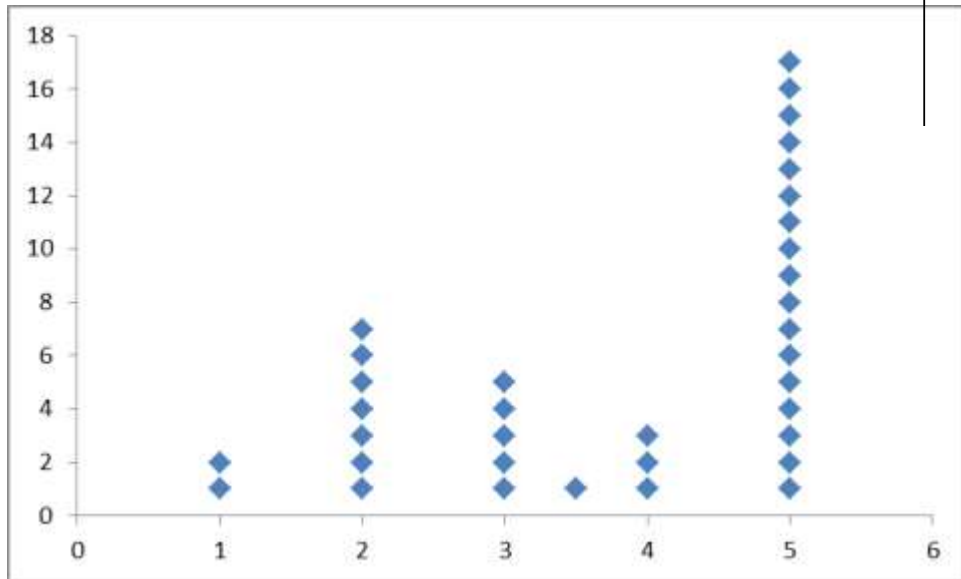
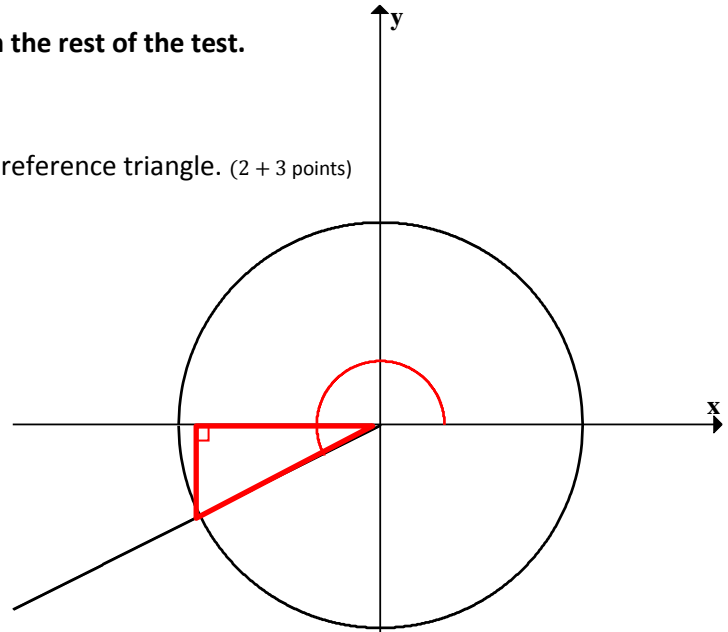
2) A 100-ft guy wire is attached to the top of an 88-ft antenna. What angle does the wire make with the ground? (Picture/diagram: 4 points. Answer: 3 points. Supporting work: 3 points)

$$\sin^{-1}\left(\frac{88}{100}\right) = 61.6^\circ$$



Non-Calculator Portion: You may not use a calculator on the rest of the test.

3) In the figure to the right, draw the standard angle and reference triangle. (2 + 3 points)



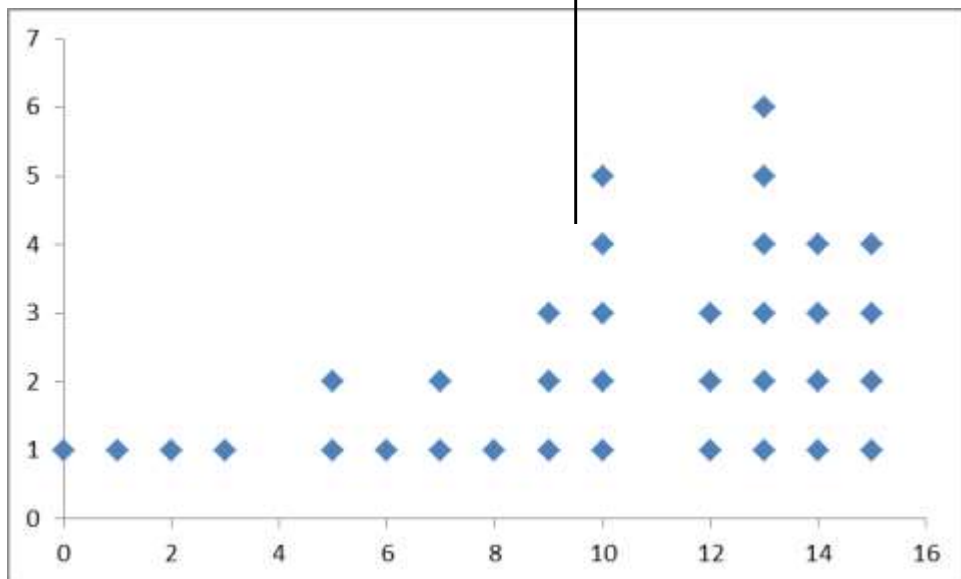
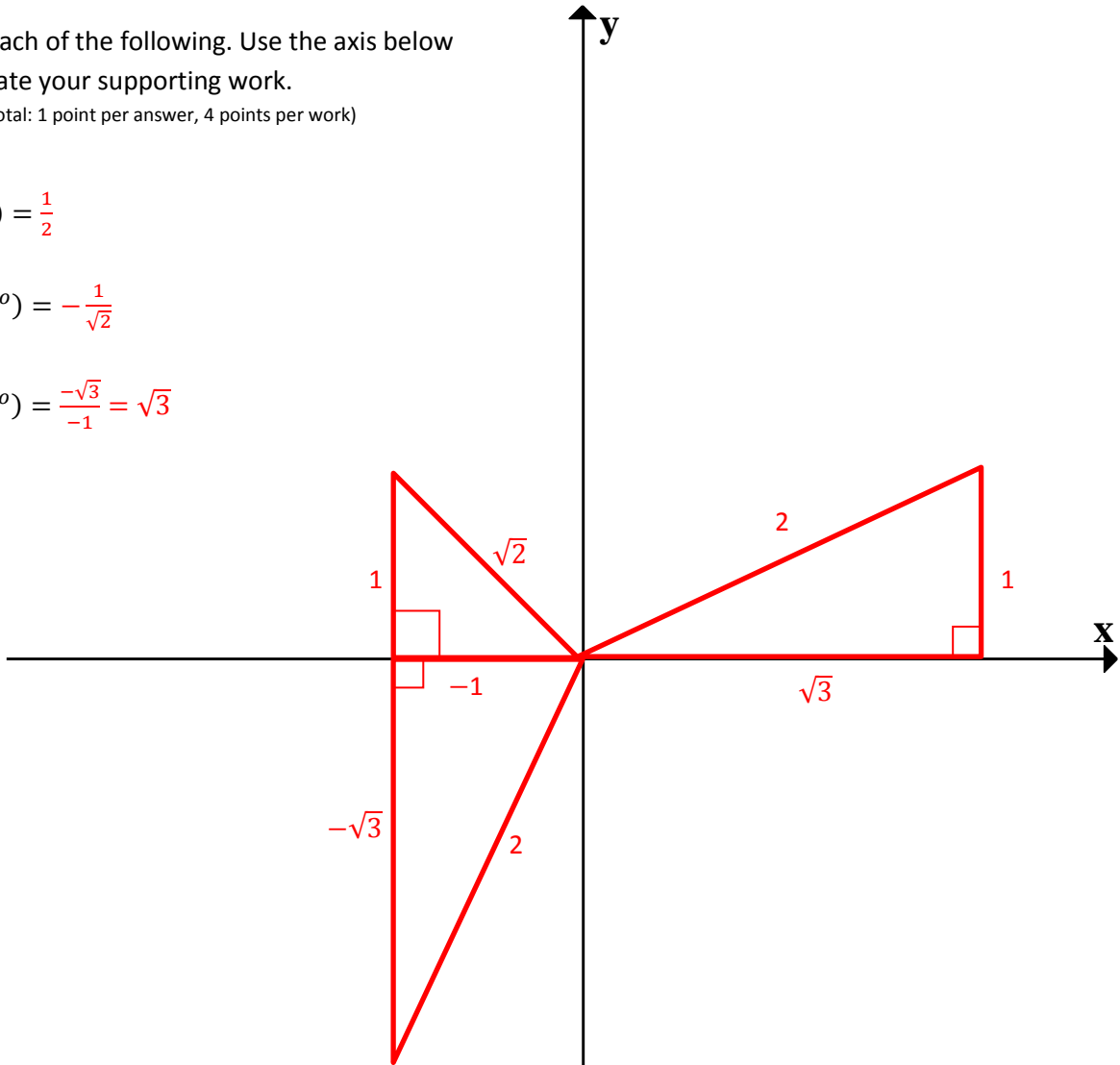
4) Find each of the following. Use the axis below to illustrate your supporting work.

(15 points total: 1 point per answer, 4 points per work)

$$\sin(30^\circ) = \frac{1}{2}$$

$$\cos(135^\circ) = -\frac{1}{\sqrt{2}}$$

$$\tan(240^\circ) = \frac{-\sqrt{3}}{-1} = \sqrt{3}$$



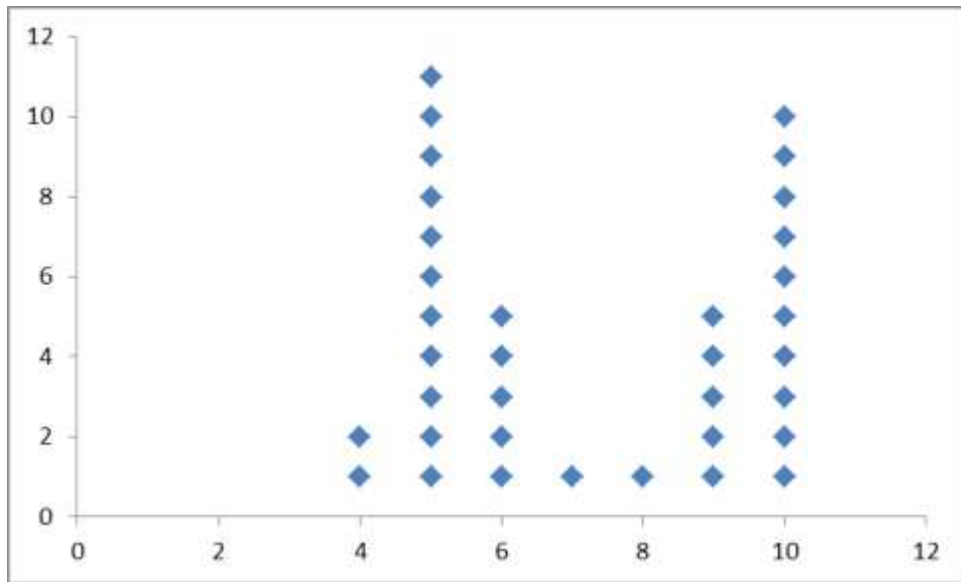
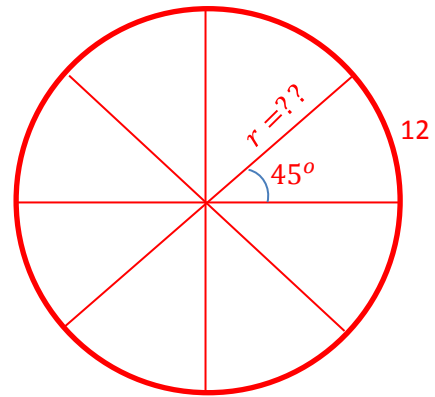
5) A wagon wheel has a 8 spokes. The arc length of the wheel between spokes is 12 inches. Draw a diagram and find the radius of the wheel. (5 points for the diagram, 5 points for the radius)

$$l = \theta r$$

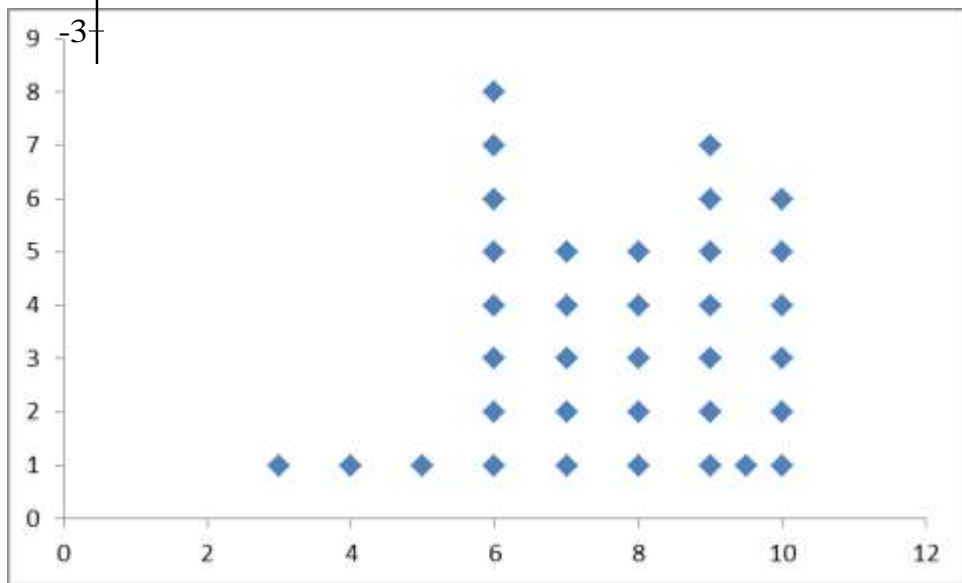
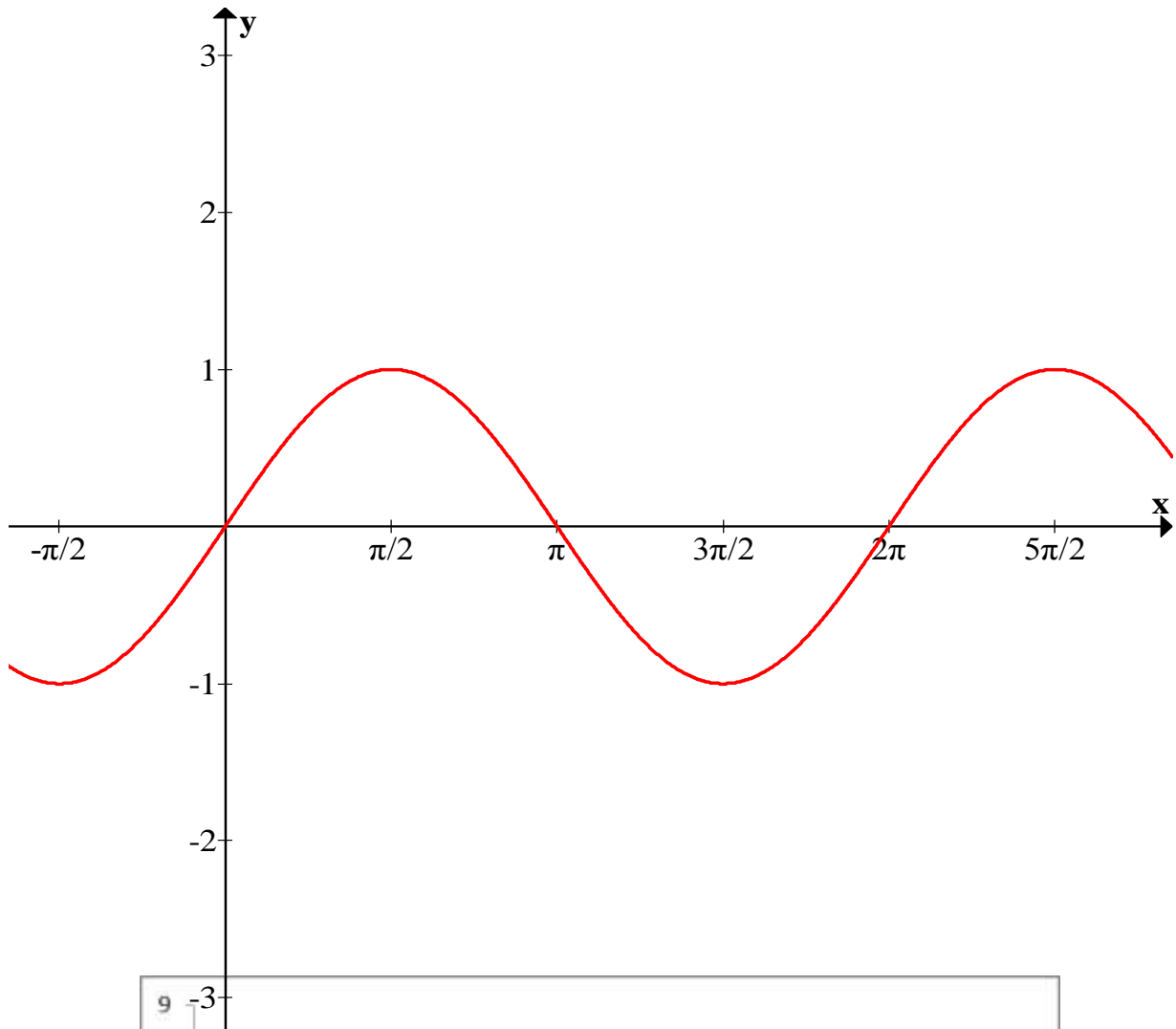
$$12 = \frac{\pi}{4} \cdot r$$

$$48 = \pi r$$

$$\frac{48}{\pi} = r$$



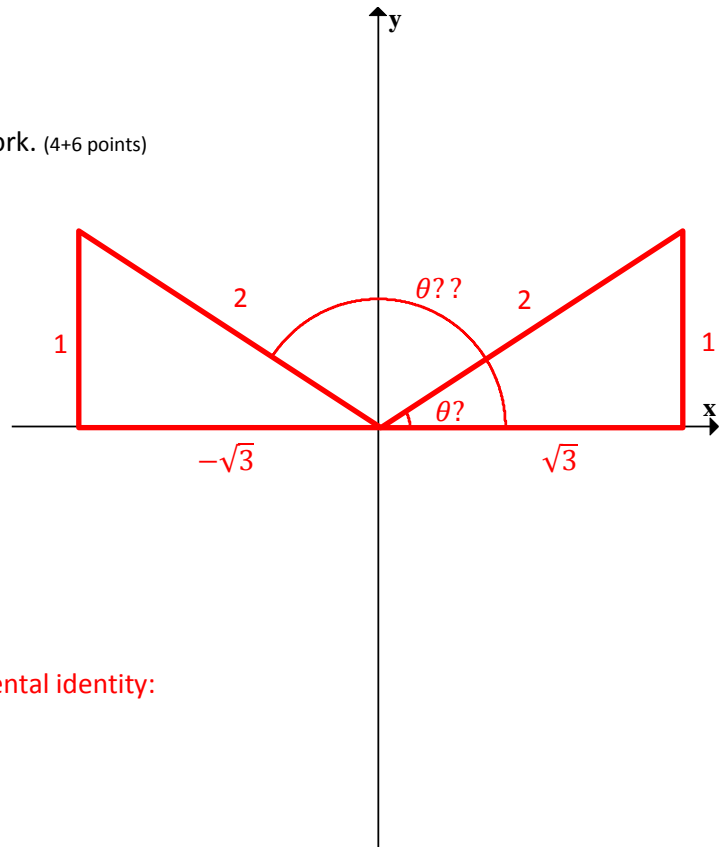
6) On the axis below, graph the function $y = \cos\left(x - \frac{\pi}{2}\right)$. (10 points)



7) It is known that $\sin(\theta) = \frac{1}{2}$. Find $\cos(\theta)$. Show your work. (4+6 points)

$\cos(\theta) = \frac{\sqrt{3}}{2}$ if θ comes from the triangle on the right.

$\cos(\theta) = -\frac{\sqrt{3}}{2}$ if θ comes from the triangle on the left.

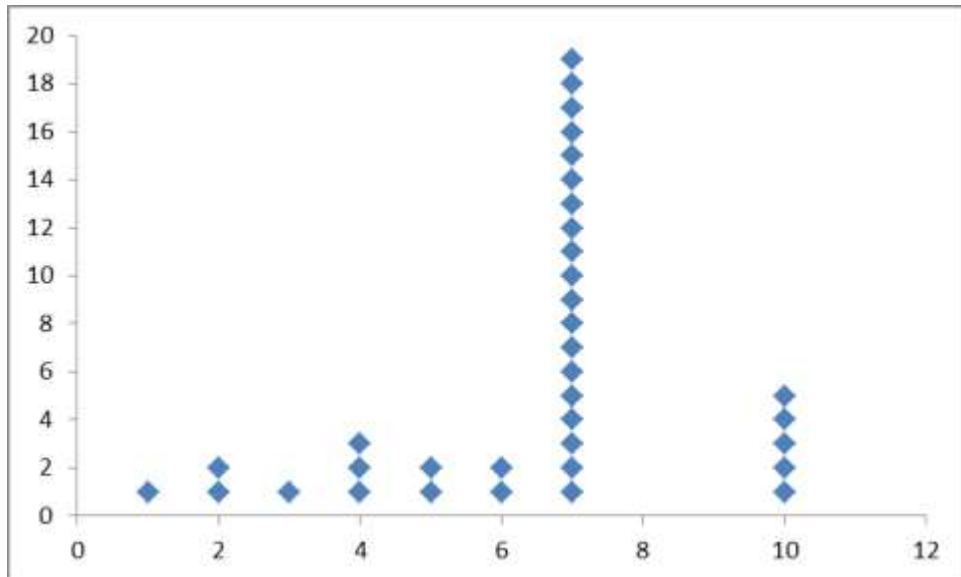


Or another way to solve this would be to use the fundamental identity:

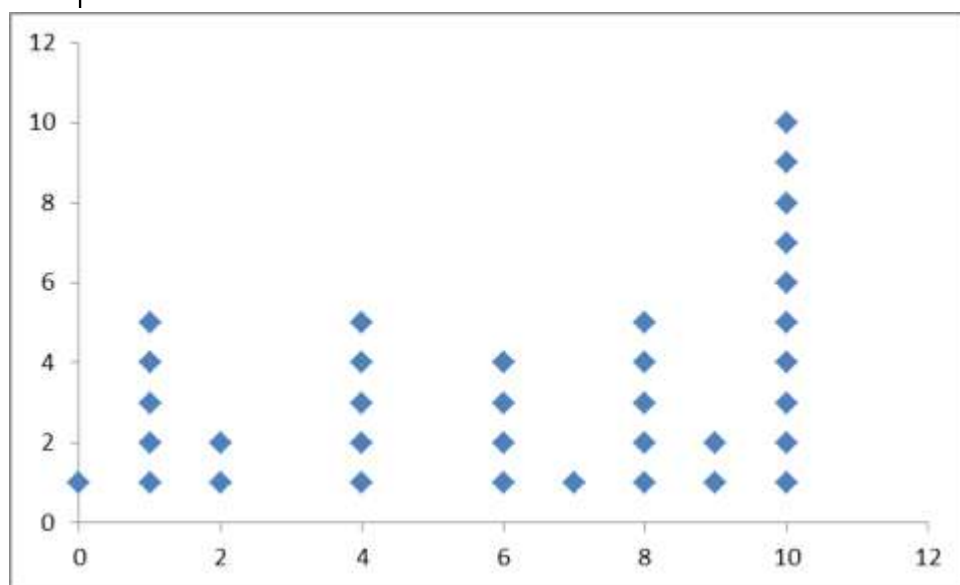
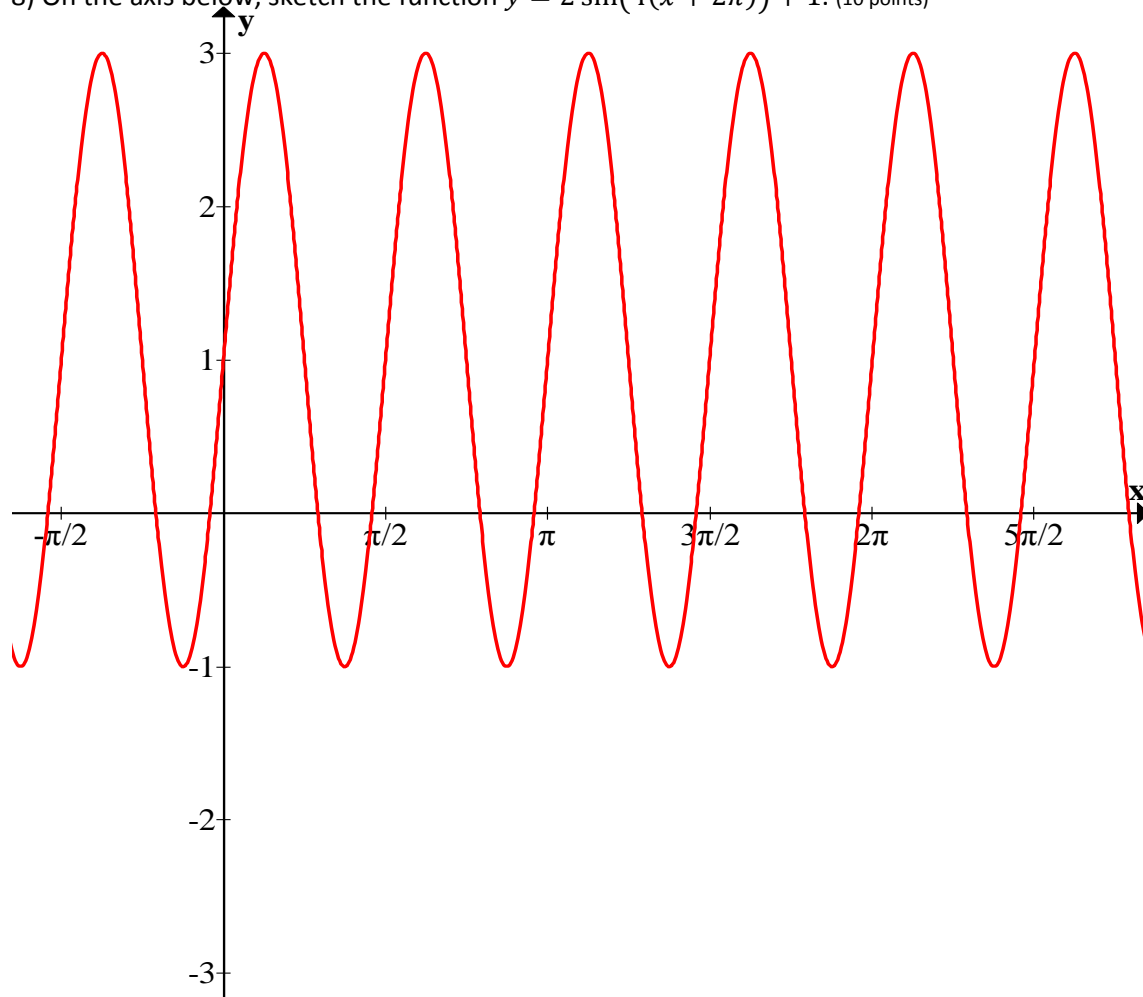
$$\left(\frac{1}{2}\right)^2 + \cos^2(\theta) = 1$$

$$\cos^2(\theta) = 1 - \frac{1}{4} = \frac{3}{4}$$

$$\cos(\theta) = \pm \frac{\sqrt{3}}{2}$$

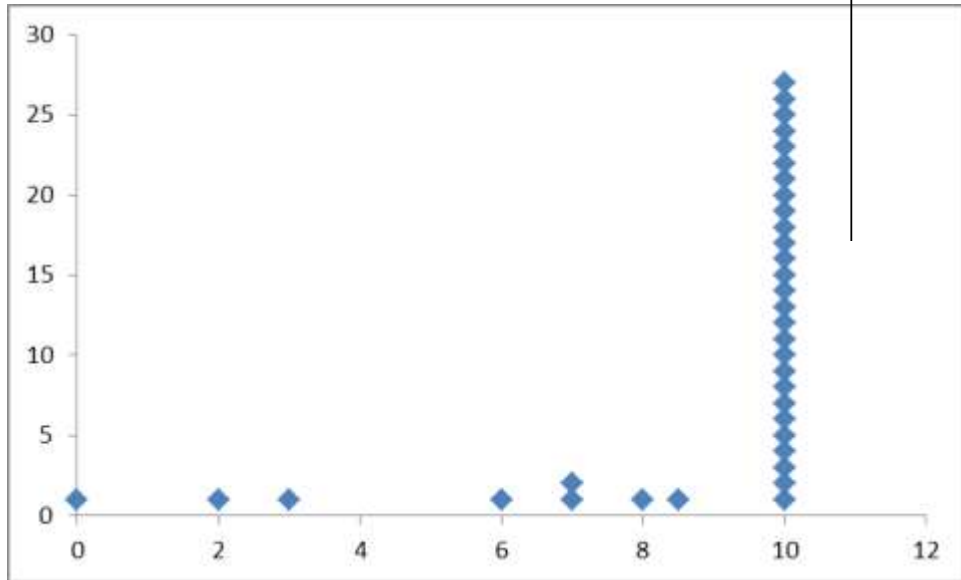
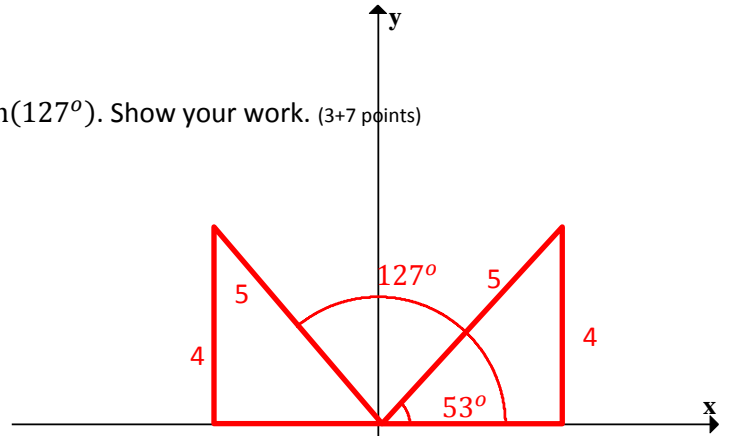


8) On the axis below, sketch the function $y = 2 \sin(4(x + 2\pi)) + 1$. (10 points)



9) Assume $\sin(53^\circ) = \frac{4}{5}$. Find $\sin(127^\circ)$. Show your work. (3+7 points)

$$\sin(127^\circ) = \frac{4}{5}$$



10) Assume $\sin(53^\circ) = \frac{4}{5}$. Find $\sin(143^\circ)$. Show your work. (3+7 points)

$$\sin(143^\circ) = \frac{3}{5}$$

