Quiz Four Solutions

1 (a) $\sin(30°) = 1/2$

(b) $\cos(\pi/3) = 1/2$

2 Let $|BD|$ be the length of the segment from B to D. By looking at the right triangle with corners at B, C, and D, we have $\sin(40°) = \frac{15}{|BD|}$. Solving, we get $|BD| = \frac{15}{\sin(40°)}$.

3 Using the same notation as in the previous problem, we're looking for $|AB| = |AC| - |BC|$. We can use the same triangle as in problem 2 to see that $\tan(40°) = \frac{15}{|BC|}$, or $|BC| = \frac{15}{\tan(40°)}$. Similarly, looking at the triangle with corners at A, C, and D, we have $\tan(32°) = \frac{15}{|AC|}$, or $|AC| = \frac{15}{\tan(32°)}$. Thus $|AB| = |AC| - |BC| = \frac{15}{\tan(32°)} - \frac{15}{\tan(40°)}$.

4 The angular speed is $\omega = \frac{1 \text{ revolution}}{2 \text{ minutes}}$. Converting to radians per minute by multiplying by $1 = \frac{2\pi \text{ radians}}{1 \text{ revolution}}$, we get $\omega = \pi$ radians per minute.

5 The general form of the position of the TAs is

$$(x, y) = (r\cos(\omega t + \theta_0), r\sin(\omega t + \theta_0)),$$

where $r = 75$ feet is the radius, $\omega = \pi$ radians per minute is the angular speed (and $\omega > 0$ because we're moving counter-clockwise), t is the time in minutes, and $\theta_0 = 3\pi/2$ is the initial angle. Thus the TAs have coordinates

$$(x, y) = (75\cos(\pi t + 3\pi/2), 75\sin(\pi t + 3\pi/2))$$

at time t minutes.