## Answer on Question \#44665-Physics-Mechanics-Kinematics-Dynamics

The original Ferris wheel, built by George Ferris for the Columbian Exposition of 1893, was much larger and slower than its modern counterparts: it had a diameter of 250 feet and contained 36 cars, each of which held 40 people. It made one revolution every 10 minutes. Suppose that the Ferris wheel revolves counterclockwise in the $x-y$ plane with its center at the origin. Car D in the figure had a coordinates $(125,0)$ at time $t=0$. Find the rule of a function that gives the $y$-coordinate of car $D$ at time $t$.


## Solution

The most general form of the equation that describes any object undergoing SHM (simple harmonic motion) is given by:

$$
y=A \sin (2 \pi f t+\varphi)+B
$$

In our case

$$
\begin{gathered}
B=0 \\
f=\frac{1}{10} \mathrm{rpm}=\frac{1}{10} \cdot \frac{1}{60} \mathrm{~Hz}=\frac{1}{600} \mathrm{~Hz}
\end{gathered}
$$

$y=0$ at time $\mathrm{t}=0$ :

$$
\begin{gathered}
0=A \sin (\varphi) \rightarrow \varphi=0 \\
A=\frac{250}{2}=125
\end{gathered}
$$

The rule of a function that gives the $y$-coordinate of car $D$ at time $t$

$$
y=125 \sin \left(2 \pi \frac{1}{600} t\right)=125 \sin \left(\frac{\pi t}{300}\right)
$$

Answer: $125 \sin \left(\frac{\pi t}{300}\right)$.

