Warm up
Evaluate the following

1. \( \arccos \left( \sin\left(\frac{4\pi}{3}\right) \right) \)
2. \( \sin \left( \arctan(0) \right) \)
3. \( \arccos \left( \tan\left(\frac{-\pi}{4}\right) \right) \)
4. \( \tan \left( \arccos\left(-\frac{1}{2}\right) \right) \)
5. \( \cos \left( \arcsin\left(\frac{\sqrt{3}}{2}\right) \right) \)
6. \( \arcsin \left( \sin\left(\frac{5\pi}{4}\right) \right) \)
Solve application problems with right triangles.

1. A surveyor stands 100 feet from a building and sights the top of the building at a $55^\circ$ angle of elevation. Find the height of the building.

\[
\tan 55^\circ = \frac{h}{100}
\]

\[100 \times \tan 55^\circ = h\]

\[h = 142.8\]
2. A geologist measured an angle of elevation to the top of a mountain to be 40° when he was 20 km away. How tall is the mountain?
3. A wheel chair ramp needs to be placed 15 feet away from a building with an elevation of 12°, how long should the ramp be?
5. The angle of depression from the top of a light house to a boat at sea is 27.5° and the lighthouse is 25 feet tall. How far is the boat from the lighthouse?

\[ \tan(27.5°) = \frac{25}{x} \]

The angle of depression to a second boat is 15.4°, how far apart are the boats?
To find the arc length of a circle the central angle $\theta$ which must be in radians. $s = r\theta$

Examples

1. Find the arc length that has an angle of $85^\circ$ and a diameter of 8.

\[
\begin{array}{c}
\theta = 85^\circ \\
\frac{85\pi}{180} \\
\text{radius} = 4 \\
\text{arc length} = \frac{5.93\pi \text{ radians}}{4} \\
\text{arc length} = 27.42
\end{array}
\]

2. Find the perimeter of a $60^\circ$ slice of pizza that has a diameter of 18 inches?

\[
\begin{array}{c}
\theta = 60^\circ \\
\frac{60\pi}{180} \\
\text{radius} = 9 \\
\text{arc length} = \frac{3\pi \text{ radians}}{9} \\
\text{arc length} = \pi
\end{array}
\]
Find the length of each arc. Round your answers to the nearest tenth.

1) \[ \frac{315 \cdot \pi}{180} \times 11 \text{ ft} = 60.5 \text{ ft} \]

3) \[ \frac{3\pi}{2} \text{ ft} \]

2) \[ \frac{270 \cdot \pi}{180} \times 13 \text{ ft} \]

4) \[ \frac{\pi}{6} \times 13 \text{ in} \]
Linear Speed $v = \frac{s}{t}$  
How fast an object moves through an arc. Measured in units like miles per hour.
Examples
The roller, with a radius of 10 in., travels 58.2 revolutions per minute. Find its linear speed in mph

\[
\frac{58.2 \text{ rev}}{1 \text{ min}} \cdot \frac{10 \text{ in.}}{1 \text{ rad}} \cdot \frac{2\pi \text{ rad}}{1 \text{ rev}} = \frac{3656.8 \text{ in}}{1 \text{ min}}
\]

\[
\frac{3656.8 \text{ in}}{1 \text{ min}} \cdot \frac{1 \text{ ft}}{12 \text{ in}} \cdot \frac{1 \text{ mile}}{5280 \text{ ft}} \cdot \frac{60 \text{ min}}{1 \text{ hr}} = 7.46 \text{ mph}
\]
44. **Automobile Design** Table 4.1 shows the size specifications for the tires that come as standard equipment on three different American vehicles.

<table>
<thead>
<tr>
<th>Vehicle</th>
<th>Tire Type</th>
<th>Tire Diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ford Taurus</td>
<td>215/60–16</td>
<td>26.16 inches</td>
</tr>
<tr>
<td>Dodge Charger RT</td>
<td>225/60–18</td>
<td>28.63 inches</td>
</tr>
<tr>
<td>Mercury Mariner</td>
<td>235/70–16</td>
<td>28.95 inches</td>
</tr>
</tbody>
</table>

(a) Find the speed of each vehicle in mph when the wheels are turning at 800 revolutions per minute.