Big Al’s Ice Cream shop is making a large sign out of wood to go in front of the shop. The sign is in the shape of an ice cream cone.

1. Calculate the area of the cone-part of the sign.

\[ A = \frac{1}{2} bh \]

\[ h = 36'' \]

\[ \frac{1/2 b}{h} = \tan\left(\frac{25.06^\circ}{2}\right) \]

\[ b = 16'' \]

\[ A = \frac{1}{2} (16'')(36''), \quad A = 288in^2 \]
2. Calculate the total height of the sign, \( h \). The ice cream-part of the sign is circular.

\[
h = 36'' + a + 10''
\]

\[
10^2 = 8^2 + a^2, \quad a = 6''
\]

\[
h = 36'' + 6'' + 10'', \quad h = 52''
\]
3. Calculate the area of the ice cream-part of the sign.

\[ A = A_{\text{sect}} + A_{\text{tri}} \]

\[
A_{\text{sect}} = \frac{\phi}{360^\circ} \pi r^2
\]
\[
r = 10''
\]
\[
\phi = 360^\circ - 2\theta
\]
\[
\sin \theta = \frac{8}{10}, \quad \theta = 53.13^\circ
\]
\[
\phi = 360^\circ - 2(53.13^\circ) = 253.7^\circ
\]
\[
A_{\text{sect}} = \frac{253.7^\circ}{360^\circ} \pi (10'')^2 = 221.4\text{in}^2
\]

\[
A_{\text{tri}} = \frac{1}{2} b h = \frac{1}{2} (16')(6'') = 48\text{in}^2
\]

\[
A = 221.4\text{in}^2 + 48\text{in}^2, \quad A = 269\text{in}^2
\]
4. Rhoda is making a rocking chair for her 51-year-old husband. She wants it to survive her 3-year-old son so she is making the frame out of steel. The rockers will have a circular shape (shown below). How long must the piece of steel be before it is bent?

\[ S = r \theta \]

\[ r^2 = (2')^2 + (r - 1/2')^2 \]

\[ r^2 = 4 + r^2 - 2\left(\frac{1}{2}r\right) + \frac{1}{4} \]

\[ r = 4 + \frac{1}{4}, \quad r = 4.25' \]

\[ \sin \frac{\theta}{2} = \frac{2'}{4.25'}, \quad \theta = 56.14^\circ \]

\[ \theta^{\text{rad}} = 56.14^\circ \cdot \frac{\pi^{\text{rad}}}{180^\circ} = 0.980^{\text{rad}} \]

\[ S = (4.25')(0.980^{\text{rad}}), \quad S = 4.16' \]