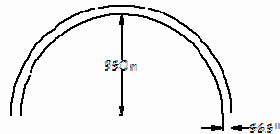




JETS Challenge 108
Chugging through Altoona.

The famous *Horseshoe Curve* in Altoona, PA has trains make a 180° turn around to climb out of the valley. The traditional distance between standard American rails is 56.5 inches.

The Challenge: If the radius of the turn for the inside track is 950m, how much further does the wheel on the outside track travel compared to the wheel on the inside track?



$$\begin{aligned} \text{in} &= \text{distance of inside track} = \frac{1}{2} (2\pi r_1) = \pi r_1 \\ \text{out} &= \text{distance of outside track} = \frac{1}{2} (2\pi r_2) = \pi r_2 \end{aligned}$$

$$\begin{aligned} \text{where } r_1 &= 950\text{m} \\ \text{and } r_2 &= 950\text{m} + 56.5'' \\ &= 950\text{m} + (56.5\text{m})(0.0254\text{m}''^{-1}) \\ &= 950\text{m} + 1.4351\text{m} \\ &= 951.4351\text{m} \end{aligned}$$

$$\begin{aligned} \text{So the difference} &= \text{out} - \text{in} = \pi r_2 - \pi r_1 \\ &= \pi(951.4351\text{m}) - \pi(950\text{m}) \\ &= \pi 1.4351\text{m} \\ &= 4.51 \text{ m} \end{aligned}$$

ANSWER:

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JETS Challenge problems are generously provided by Dave Meredith, Associate Professor, Penn State University-Fayette