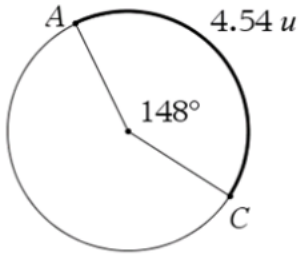
Problem 1



Determine the radius of the circle

$s = \theta r$

We know s= 4.54 units

we know angle in degrees is 148°

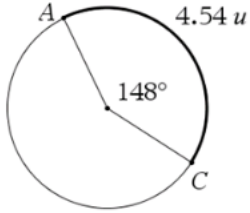
Step 1) Find θ

$\theta = 148° \cdot \frac{\pi \text{ radians}}{180°}$

$= \frac{148}{180}\pi \text{ radians} = \frac{37}{45}\pi \text{ radians}$

Step 2) Solve for r

$4.54 = \left(\frac{148}{180}\pi\right) r$



Determine the radius of the circle

$s = \theta r$

s= 4.54 units

angle in degrees is 148°

$\theta = \frac{37}{45}\pi \text{ radians}$

Use $s = \theta r$ replace s and θ and solve for r

Step 2) Solve for r

$4.54 = \left(\frac{148}{180}\pi\right) r$

$\frac{4.54}{1} = \frac{148\pi r}{180}$

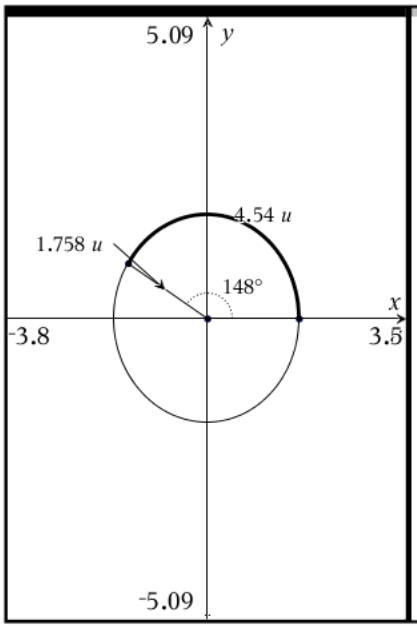
$4.54 \cdot 180 = 148\pi r$

$817.2 = 148\pi r$

$\frac{817.2}{148\pi} = \frac{148\pi r}{148\pi}$

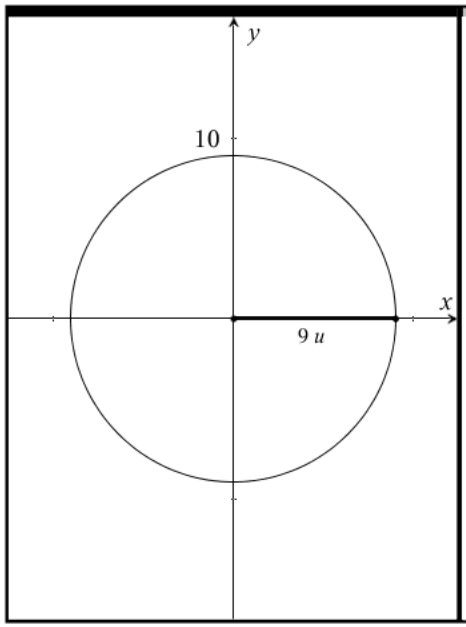
$r = \frac{817.2}{148\pi} = \frac{8172}{1480\pi} = \frac{2043}{370 \cdot \pi}$

$r \approx 1.758$ units



This drawing was created with a computer and it checks that the radius is $1.75759 \approx 1.758$

Problem 2



Drum with a diameter of 18 meters is making 5.6 revolutions per minute

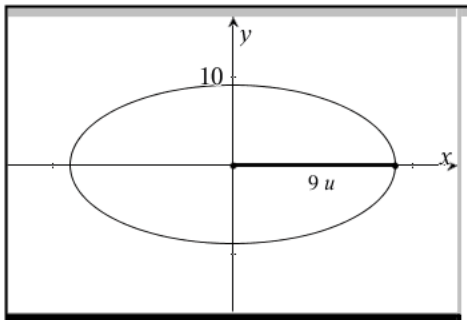
5.6 revolutions per min

$$\text{Angular speed} = \frac{5.6\ rev.}{\text{min.}} \cdot \frac{360°}{rev} = \frac{2016°}{\text{min}}$$

$$\text{Angular speed} = \frac{5.6\ rev.}{\text{min.}} \cdot \frac{2\pi}{rev} = \frac{11.2\pi\ radians}{\text{min}}$$

Note Linear Speed = (Angular speed)(radius)

$$= \frac{11.2\pi\ radians}{\text{min}} \cdot \frac{9m.}{radian} = \frac{100.8\pi\ m}{\text{min}}$$



$$\text{Angular speed} = \frac{5.6\ rev.}{\text{min.}} \cdot \frac{2\pi}{rev} = \frac{11.2\pi\ radians}{\text{min}}$$

$\theta = 11.2 \cdot \pi\ radians$ $\quad r = \frac{18}{2} = 9$ meters

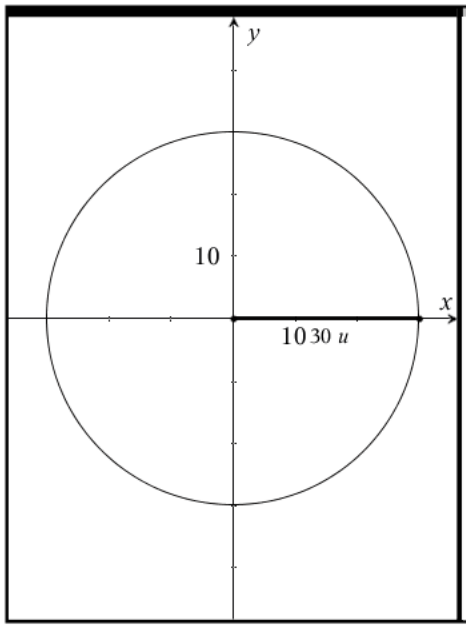
Drum with a diameter of 18 meters is making 5.6 revolutions per minute

$$\text{Linear Speed} = \frac{\theta r}{t} = \frac{11.2 \cdot \pi \cdot 9\ m.}{1\ \text{min.}} = \frac{100.8 \cdot \pi\ m.}{1\ \text{min}} \approx 316.673\ \frac{m.}{\text{min.}}$$

Now convert meters/min to meters/sec

$$\text{Linear Speed} = \frac{100.8 \cdot \pi\ m.}{1\ \text{min}} \cdot \frac{1\text{min}}{60\ \text{sec}} = \frac{100.8\pi\ m.}{60\ \text{sec}} = \frac{1.68\pi\ m.}{\text{sec}} = \frac{42\pi}{25}\ \frac{m.}{\text{sec.}} \approx 5.278\ \frac{m}{\text{sec}}$$

Problem 3



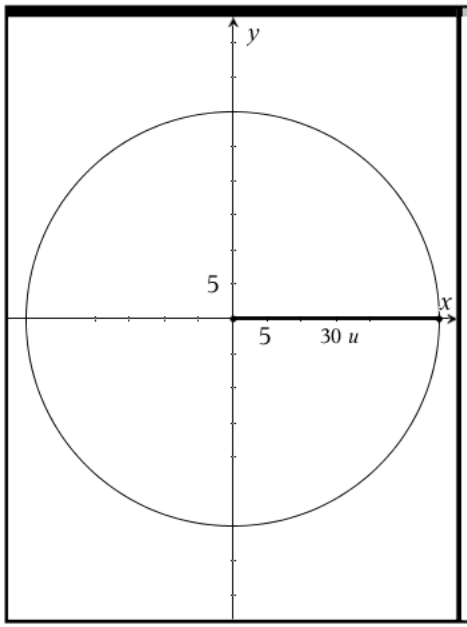
tire with a radius of 30 meters is making 3.5 revolutions per 25 seconds

3.5 revolutions per 25 seconds

$\frac{3.5}{25} = 0.14$ revolution per second

$$\text{Angular speed} = \frac{0.14\ rev.}{\text{sec.}} \cdot \frac{360°}{rev} = \frac{50.4°}{\text{sec}}$$

$$\text{Angular speed} = \frac{0.14\ rev.}{\text{sec.}} \cdot \frac{2\pi}{rev} = \frac{0.28\pi\ radians}{\text{sec}}$$



tire with a radius of 30 inches is making 3.5 revolutions per 25 seconds

$$\text{Angular speed} = \frac{0.14\ rev.}{\text{sec.}} \cdot \frac{2\pi}{rev} = \frac{0.28\pi\ radians}{\text{sec}} \approx 0.88\ \frac{radians}{\text{sec}}$$

Now convert radians/sec to radians/min

$$\text{Angular Speed} = \frac{0.28 \cdot \pi\ radians.}{1\ \text{sec}} \cdot \frac{60\ \text{sec}}{1\ \text{min}} = \frac{16.8\pi\ radians}{1\text{min}}\ \ 0.28 \cdot 60 \blacktriangleright 16.8 \approx 52.779\ \frac{radians}{\text{min}}$$