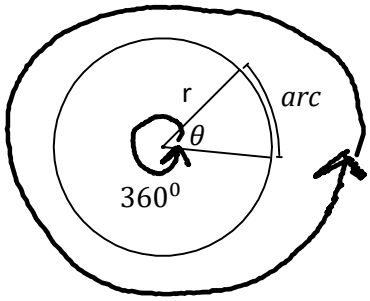
C12 - 4.9 - Arc Length, Sector Area Notes

θ *in radians*



Circumference

$$\frac{arc\ length}{Circumference} = \frac{\theta}{360^o}$$ Grade 8-11

$$\frac{arc\ length}{Circumference} = \frac{\theta}{2\pi}$$

$$\frac{a}{2\pi r} = \frac{\theta}{2\pi}$$

$$\cancel{2\pi} \times \frac{a}{\cancel{2\pi} r} = \frac{\theta}{\cancel{2\pi}} \times \cancel{2\pi}$$

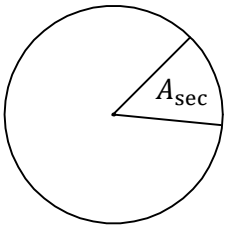
$$\frac{a}{r} = \theta$$

$$r \times \frac{a}{\cancel{r}} = \theta \times r$$

$$\boxed{a = \theta r}$$

$$\boxed{a = \theta r}$$ θ *must be in radians*

Sector Area



$$\frac{Area_{sector}}{Area_{Total}} = \frac{arc\ length}{Circumference}$$

$$\frac{A_{\sec}}{\pi r^2} = \frac{a}{2\pi r}$$

$$\boxed{A_{sec} = \frac{ar}{2}}$$

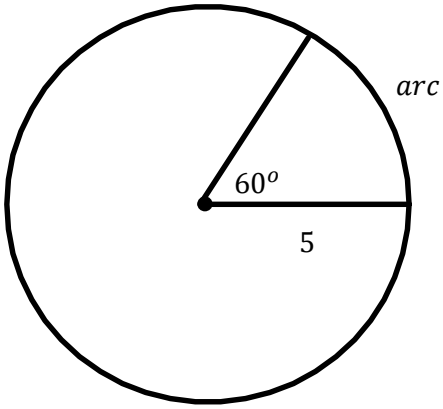
$$\boxed{A = \frac{\theta r^2}{2}}$$

$$\boxed{A = \frac{ar}{2}}$$

$$\boxed{\frac{A_{\sec}}{\pi r^2} = \frac{a}{2\pi r} = \frac{\theta}{360^o} = \frac{\theta}{2\pi}}$$ They are all equal to each other.

C12 - 4.9 - Arc Length Notes

Find the arc length

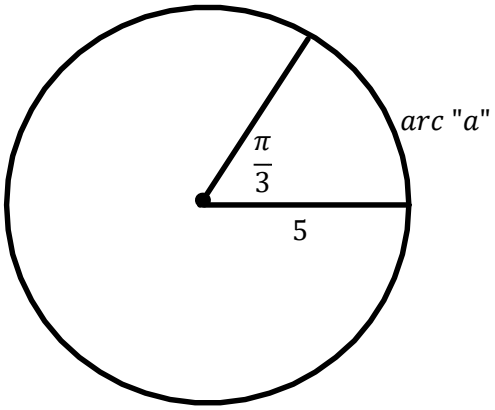


$$\frac{a}{C} = \frac{\theta}{360}$$
$$\frac{a}{2\pi r} = \frac{60}{360}$$
$$a = \frac{\pi(5)}{3}$$
$$a = 5.24$$

$C = 2\pi r$
$C = 2\pi \times 5$
$C = 31.4$

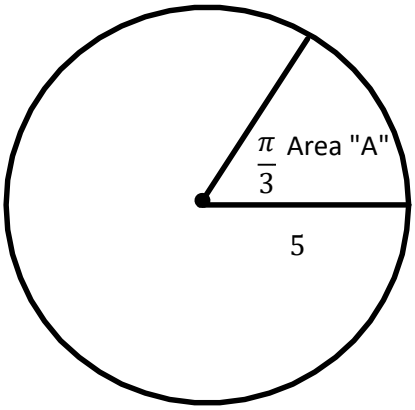
$\frac{60^o}{360^o} = \frac{1}{6}$ *of circle*

$\frac{1}{6} \times 31.4 = 5.2$



$$a = \theta r$$
$$a = \frac{\pi}{3} \times 5$$
$$a = 5.24$$

Find the Area pf the Sector



$$\frac{Area_{sector}}{Area_{Total}} = \frac{\theta}{2\pi}$$
$$\frac{A_{\text{sec}}}{\pi r^2} = \frac{\theta}{2\pi}$$
$$A_{sec} = \frac{\theta r^2}{2}$$
$$A_{sec} = \frac{\left(\frac{\pi}{3} \times 5^2\right)}{2}$$
$$A_{sec} = 13.09$$

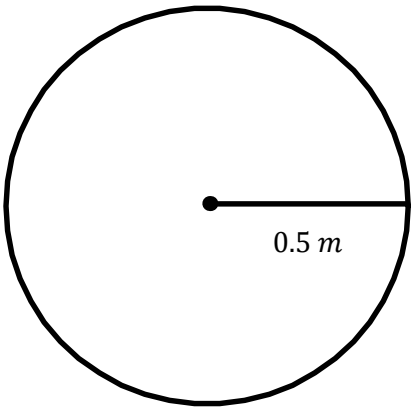
$A = \pi r^2$
$A = \pi(5)^2$

$A = 78.54$

$\frac{1}{6} \times 78.54 = 13.09$

C12 - 4.9 - Angular Velocity Notes

Find the angular velocity of a wheel travelling 25 meters per second if the radius 0.5 meters. Find the arc in 0.1 seconds.



$w = \frac{\theta}{t}$ *Angular Velocity* "w"

$C = 2\pi r$
$C = 2\pi(0.5)$
$C = 3.14\ m$

$1\ Rev = 2\pi$

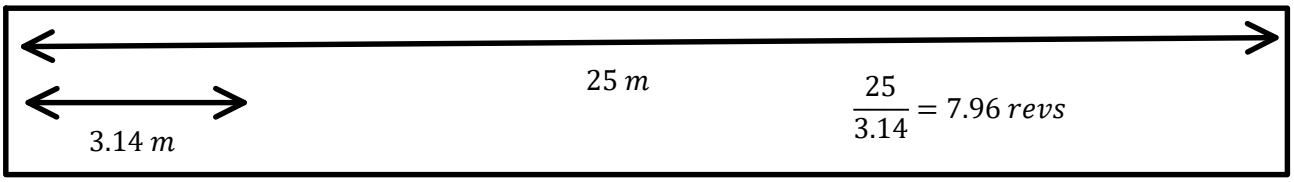
$w = \frac{v}{C} \times 2\pi$

$w = \frac{v}{r}$

$\frac{25m}{s} \times \frac{1\ revolution}{3.14m} = 7.96\frac{Rev}{s}$

$7.96 \times \frac{2\pi}{s} = 15.92\frac{Rad}{s}$

$w = 15.92\pi\frac{Rad}{s}$



$\frac{25}{3.14} = 7.96\ revs$

$25\frac{m}{s} \Rightarrow 0.04\frac{s}{m}$

$\frac{25}{1} \Rightarrow \frac{1}{25} = 0.04$

$15.92\pi\frac{Rad}{s} \times 0.1\ s = 5\ Rad$

$w = \frac{\theta}{t}$

$a = \theta r$
$a = 5(0.5)$

$a = 2.5\ m$

$\frac{25m}{s} \times \frac{1\ revolution}{3.14m} = 7.96\frac{Rev}{s}$

$1\ Rev = 360^0$

$7.96 \times \frac{360^0}{s} = 2865.6\frac{o}{s}$

$w = 2865.6\frac{o}{s}$

$w = \frac{v}{C} \times 360^0$

$25\frac{m}{s} \times 0.1\ s = 2.5\ m$

$d = vt$