Example

Refer to Figure 8. Suppose we have a circle of radius 10cm and an arc of length 15cm. Suppose we want to find (a) the angle θ, (b) the area of the sector OAB, (c) the area of the minor segment (shaded).

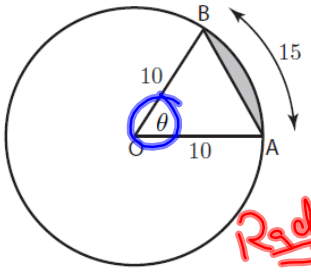

Figure 8. The shaded area is called the minor segment.

Area of a Triangle

$A = \frac{1}{2}bh$

OR

$A = \frac{1}{2}ab\sin\theta$

Area of Sector

$A = \left(\frac{\theta}{360°}\right)\pi r^2$

Radians OR $A = \frac{\theta}{2\pi}(\pi r^2)$

Radians $\rightarrow A = \frac{\theta r^2}{2}$

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

$\theta = \frac{15cm}{10cm} = 1.5 Rad$

$A_{segment} = A_{sector} - A_{Triangle}$

$= \frac{1.5(10)^2}{2} - \frac{1}{2}(10)(10)\sin 1.5$

Mode

DRG

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1.5(10²)/2-1/2(1
00)sin(1.5)
     25.12525067
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cm^2

Practice Problems...

Pages 175 - 178
#3, 4, 5, 6, 7, 9, 11, 12, 13

Check-Up...

Arrange the following angles in descending order:

$340°$ $\quad 4.28rad$ $\quad \frac{9\pi}{5}$ $\quad (10\pi)°$

$4.28 \text{ Rad} \times \frac{180°}{\pi \text{ Rad}} = 245°$

$\frac{9\pi}{5} = \frac{9(180°)}{5} = 324°$

$(10 \times 3.14)° = 31.4°$

$340°, \frac{9\pi}{5}, 4.28, 10\pi°$

Determine a negative angle co-terminal with each of the following:

(i) $\frac{5881\pi}{3}$

$\frac{5880\pi}{3} + \frac{\pi}{3}$

$1960\pi + \frac{\pi}{3}$

$\frac{-2\pi}{1} + \frac{\pi}{3}$

$= \frac{-5\pi}{3}$

$\frac{5883\pi}{3} - \frac{2\pi}{3}$

$1961\pi - \frac{2\pi}{3}$

$-\pi - \frac{2\pi}{3}$

$= \frac{-5\pi}{3}$

(ii) $\frac{29784\pi}{5}$

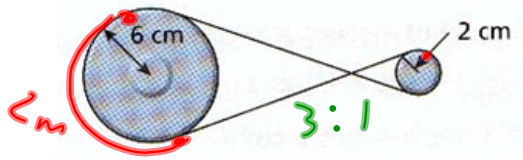
$\frac{29785\pi}{5} - \frac{\pi}{5}$

$5957\pi - \frac{\pi}{5}$

$-\pi - \frac{\pi}{5}$

$= \frac{-6\pi}{5}$

Two flywheels are connected by a belt, as shown in the diagram below. The larger one has a radius of 6 cm and the smaller one has a radius of 2 cm.



(a) If the small wheel rotates –300°, then through how many radians does the large wheel rotate?

(b) If the large wheel rotates $\frac{7\pi}{6}$ radians, what distance would a point on the circumference of the small wheel rotate?

a) $\frac{-300^\circ}{3} = -100^\circ \Rightarrow$ Must Be $100^\circ = \frac{100\pi}{180} = \frac{5\pi}{9}$ (app. direction)

b) $\theta = \frac{a}{r} \Rightarrow \frac{7\pi}{6} = \frac{a}{6\,cm}$

$a = 7\pi\,cm$

Other wheel

$\theta = \frac{7\pi}{6} \times 3 = \frac{21\pi}{6}$

$\frac{21\pi}{6} = \frac{a}{2}$

$\frac{42\pi}{6} = \frac{6a}{6}$

$a = 7\pi\,cm$

Angular Velocity

Angular velocity - amount of rotation around a central point per unit of time

$V = \frac{d}{t}$

$$v_a = \frac{\theta}{t} \qquad \theta = \frac{a}{r}$$

θ = angle (radians)

v_a = angular velocity

a = arc length

t = time

r = radius

Ex. The roller on a computer printer makes 2200 rpm (revolution per minute). Find the roller's angular velocity. (Rad/sec)

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

$2200 \frac{Rev}{min} \times \frac{2\pi\ Rad}{1\ Rev} = 4400\pi \frac{Rad}{min}$

$V_A = \frac{4400\pi\ Rad}{60\ sec}$

$V_A = 230.38\ Rad/sec \times \frac{180^\circ}{\pi\ Rad} = 13200^\circ/sec$

Ex. (a) If wheel 1 rotates 40 radians, how far has the belt traveled?

(b) Given the 40 rad rotation of wheel 1, what was the angle of rotation for wheel 2?