Warmup question

3.2 (p 111)

33)

$$\boxed{S = r\,\theta}$$

S = arc length
r = radius
θ = angle (radians).
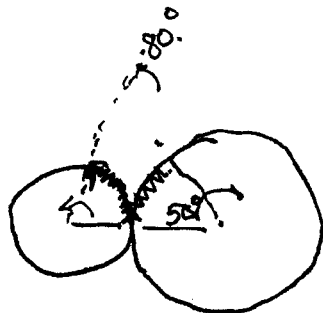
Smaller wheel
radius = 11.7 cm

larger wheel
radius = r

When the small wheel rotates 80.0 degrees,
the large wheel rotates 50.0 degrees.
What is the radius of the larger wheel.

Note: 50.0 degrees $\cdot \dfrac{\pi \text{ radian}}{180 \text{ degrees}} = \dfrac{50\pi}{180}$ radians (large)

80.0 degrees $\cdot \dfrac{\pi \text{ radian}}{180 \text{ degrees}} = \dfrac{80\pi}{180}$ radians (small)

Also note: $S_{large} = S_{small}$ so

$$r \cdot \frac{50\pi}{180} = (11.7 \text{ cm}) \cdot \frac{80\pi}{180}$$

multiply both
sides by $\frac{180}{\pi}$

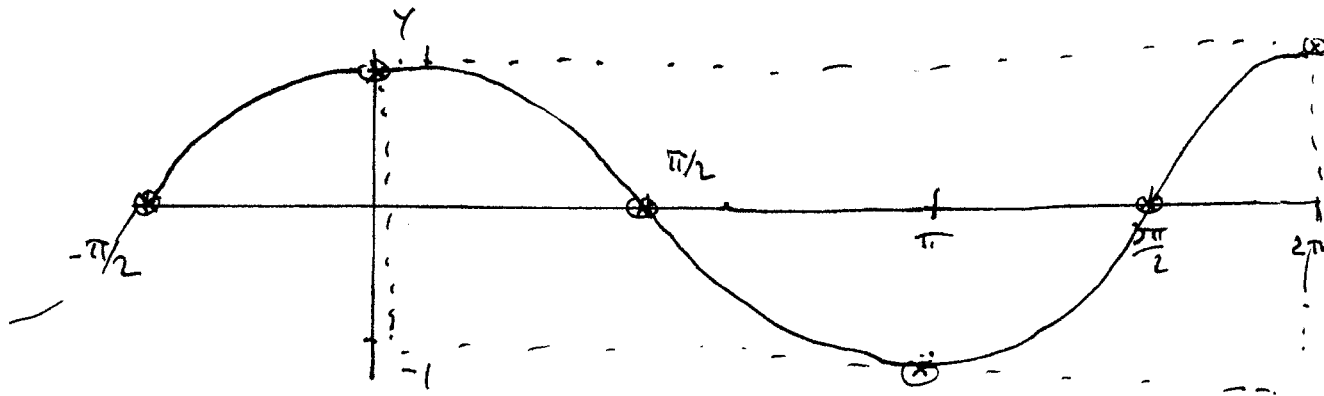$$50\,r = (11.7 \text{ cm}) \cdot 80$$

$$r = \frac{(11.7 \text{ cm}) \cdot 80}{50} = (11.7 \text{ cm})\,1.60$$

$$= 18.72 \text{ cm}$$

$$\approx 18.7 \text{ cm}$$

4.1   Graph of the cosine function

X	cos X
0	1
$\frac{\pi}{2}$	0
π	-1
$\frac{3\pi}{2}$	0
2π	1

Domain $= (-\infty, \infty)$

Range $= [-1, 1]$

period $= 2\pi$

cosine is an <u>even</u> function, that is,

$$\cos(-x) = \cos x$$

(the graph is symmetric across the y-axis)

amplitude $= 1$

ex $y = \sin 2x$ Period?
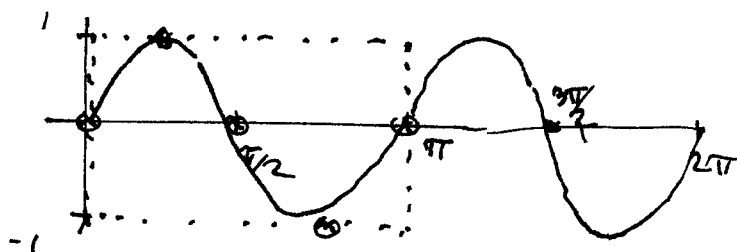
Sine goes through one cycle as the "argument" goes from 0 to 2π.

one cycle for this function $0 \le 2x \le 2\pi$

So $\dfrac{0}{2} \le \dfrac{2x}{2} \le \dfrac{2\pi}{2}$

So $0 \le x \le \pi$

That is the period of the new function is $\pi = \dfrac{2\pi}{2}$.

x	Sin 2x
0	$\sin 2(0) = 0$
$\pi/4$	$\sin 2\left(\pi/4\right) = 1$
$\pi/2$	$\sin 2\left(\pi/2\right) = 0$
$3\pi/4$	$\sin 2\left(3\pi/4\right) = -1$
π	$\sin 2(\pi) = 0$

More generally : $y = \sin bx$

The $\boxed{\text{period} = \dfrac{2\pi}{b}}$ so $b = \dfrac{2\pi}{\text{period}}$

ex: Design a sine function whose period is 1.

Let $b = \dfrac{2\pi}{1} = 2\pi$

$y = \sin(2\pi x)$.