Check-Up...

π Rad $= 180°$ $\quad$ $\frac{\pi}{\pi}$ $\quad$ 1 Rad $= \frac{180°}{\pi}$

Arrange the following angles in descending order:

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

340° (1) $\quad$ 4.28 Rad $\times \frac{180°}{\pi \text{ Rad}} = 245°$ (3) $\quad$ $\frac{9(180°)}{5} = 324°$ (2) $\quad$ $(10 \times 3.14)° = 31.4°$ (4)

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

(i) $\frac{5881\pi}{3} \div 2\pi$

$\frac{5881\pi}{3} \times \frac{1}{2\pi}$

$\frac{5881}{6} =$

5881/6
980.1666667

$\frac{5881}{6} = 980\frac{1}{6}$

$= \frac{1}{6}$ of 2π

$= \frac{2\pi}{6} = \frac{\pi}{3}$ Principal Angle

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

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

(ii) $\frac{29784\pi}{5} \div 2\pi$

$\frac{29784\pi}{5} \times \frac{1}{2\pi}$

$\frac{29784}{10} = 2978.4$ full turns

$\frac{4}{10}$ or $\frac{2}{5}$ of $\frac{2\pi}{1}$

0.4 of a full turn

P.A. $= \frac{4\pi}{5} - \frac{2\pi}{1}$

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

Coterminal Angles in General Form

$70° \pm 360°n, n \in N$

Any given angle has an infinite number of angles coterminal with it, since each time you make one full rotation from the terminal arm, you arrive back at the same terminal arm. Angles coterminal with any angle θ can be described using the expression

$\theta \pm (360°)n$ or $\theta \pm 2\pi n$,

where n is a natural number. This way of expressing an answer is called the **general form**.

$\theta + 360n, n \in I$ ($\mathbb{Z}$)

general form

- an expression containing parameters that can be given specific values to generate any answer that satisfies the given information or situation
- represents all possible cases

Let's use the following two angles...

$\theta = 70°$

$\theta = 70° \pm 360°n, n \in N$

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

$= \frac{5\pi}{6} \pm 2\pi n, n \in N$

What if we are given a restricted domain?

$\theta = 70°$, $-720° \le \theta \le 1080°$

Co-terminal Angles

$= 430°, 790°$

$-290°, -650°$

70-360
Ans-360
Ans-360

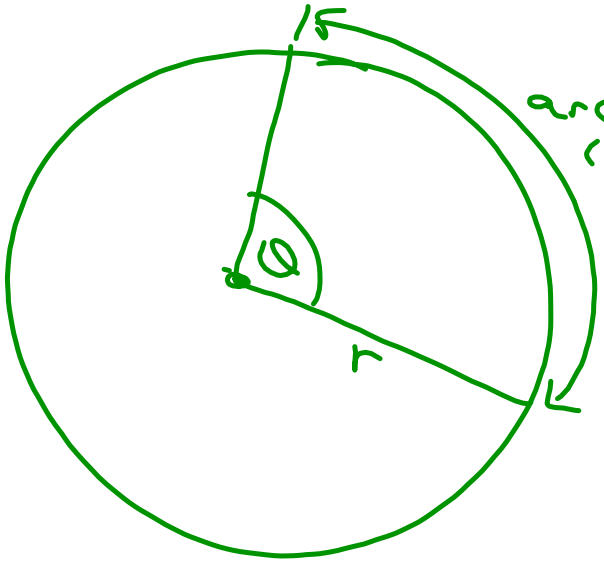
-290
-650
~~-1010~~

$-\frac{12\pi}{6} \longleftrightarrow \frac{48\pi}{6}$

$\pm\frac{12\pi}{6}$ $\theta = \frac{5\pi}{6}$, $-2\pi \le \theta \le 8\pi$

$\theta = \frac{17\pi}{6}, \frac{29\pi}{6}, \frac{41\pi}{6}$

$-\frac{7\pi}{6}$



arc (a) *

Must be Radians !!!

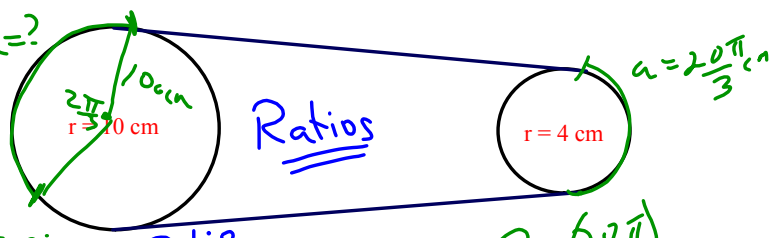
$\frac{a}{r} = \theta$

Applying our knowledge of rotations and radians...

Ex. (a) If the large wheel rotates $2\pi/3$ radians, how many radians does the smaller wheel rotate?

(b) If the large wheel completes three revolutions, how much does the small wheel rotate in radians?

(c) If the small wheel rotates $-15\pi/4$ radians, how many radians does the larger wheel rotate?



Ratios

Ratio $\frac{10}{4} = 2.5$ or $\frac{5}{2}$

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

$(10)\frac{2\pi}{3} = \frac{a}{10}(10)$

$\frac{20\pi}{3}$ cm = arc

$\theta = \left(\frac{20\pi}{3}\right)$ cm / 4 cm

$\theta = \frac{20\pi}{3} \times \frac{1}{4} = \frac{5\pi}{3}$

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

Larger Pulley → Smaller Pulley (2.5)

$\theta = \frac{2\pi}{3} \times \frac{5}{2}$

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

(b) Large ⇒ 3 Rev

$3 \times 2\pi$

$= 6\pi$ Radians ⇒

Smaller

$6\pi \times 2.5$

$= 15\pi$ Rad

(c) Smaller $\frac{-15\pi}{4}$ ⇒ Larger

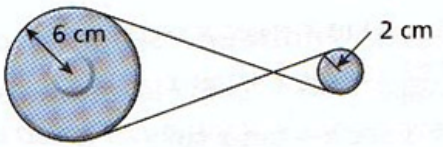
$-\frac{15\pi}{4} \div \frac{5}{2}$

$-\frac{15\pi}{4} \times \frac{2}{5}$

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

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.

Ratio: 1 : 3



(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?

Small

(a) $\frac{-300^\circ}{3} = -100^\circ$ $\frac{100\pi}{180} = \frac{5\pi}{9}$

(b) $\theta = \frac{a}{r}$ $\frac{7\pi}{6} \times 3 = \frac{7\pi}{2}$

$\frac{7\pi}{2} = \frac{a}{2\text{cm}}(2)$

arc $= 7\pi$ cm

Practice Problems...

Pages 175 - 178
#11, 12, 13, 14, 16, 17