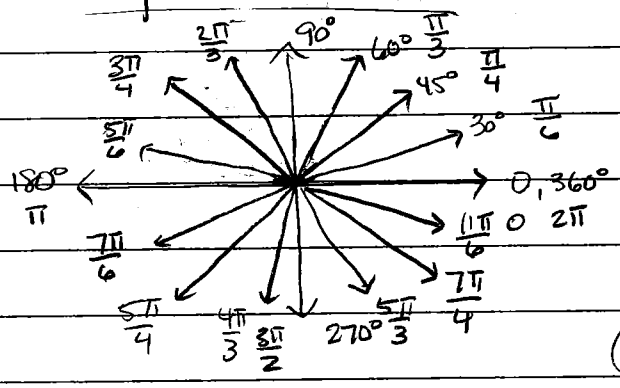
Pg. 453 45-59 odd, 85-99 odd

6.1 Angles and Their Measure

Degrees / Radians



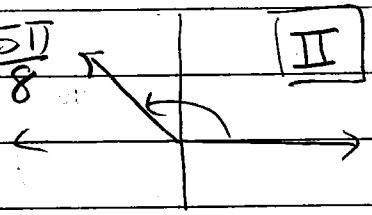
(2 min) How would you learn, not memorize, this?

$\frac{\pi}{4} = 45°$ $\frac{\pi}{6} = 30°$ $\frac{\pi}{3} = 60°$

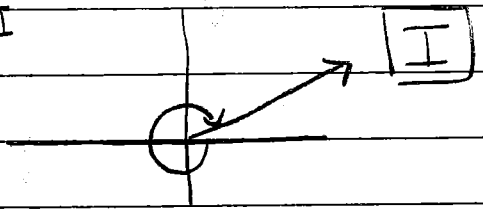
(2 min) Share

Example 1 Sketch the angle in standard position. Determine the quadrant of the terminal side.

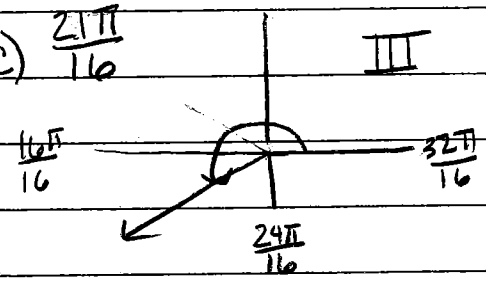
a) $\frac{5\pi}{8}$ — II



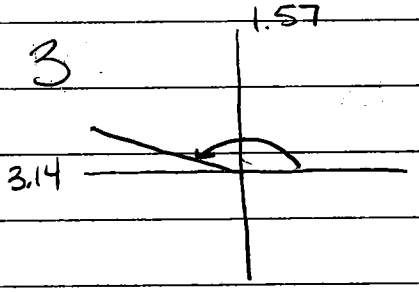
b) $-\frac{11\pi}{6}$ — I



c) $\frac{21\pi}{16}$ — III

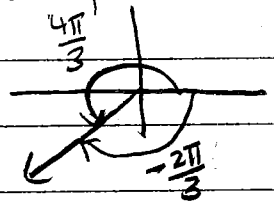


d) 3 — II



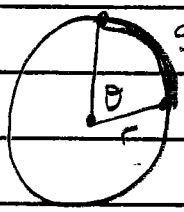
Example 2 Find two coterminal angles, one positive and one negative

$\frac{4\pi}{3}$



$\frac{4\pi}{3} + 2\pi = \boxed{\frac{10\pi}{3}}$ $\frac{4\pi}{3} - 2\pi = \boxed{-\frac{2\pi}{3}}$

Arc length

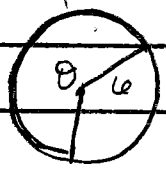


r = radius
θ = central angle
s = intercepted arc

$$\boxed{s = r\theta}$$ * θ in radians

Example 2 Solve for θ, s or r

(A) 19



$19 = 6\theta$

$$\boxed{\frac{19}{6} = \theta}$$

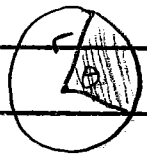
(B) radius = 3cm

$\theta = 135°$

$= \frac{3\pi}{4}$ radians

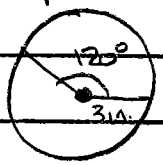
$s = 3 \cdot \frac{3\pi}{4} = \boxed{\frac{9\pi}{4}}$

Area of a sector



$$\boxed{A = \frac{1}{2}r^2\theta}$$ * θ in radians

Example 3 Find the area



$A = \frac{1}{2}r^2\theta$ $\theta \Rightarrow$ radians

$120° \cdot \frac{\pi}{180} = \frac{2\pi}{3}$ radians

$A = \frac{1}{2}(3)^2\left(\frac{2\pi}{3}\right)$

$= \frac{18\pi}{6}$

$= \boxed{3\pi} \approx \boxed{9.42\ in^2}$

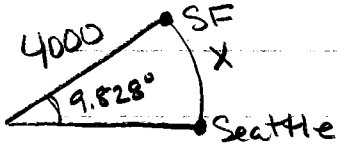
6.1 Angles and Their Measure

two hints: (109) d = 7.25"
(113) r = 15

Applications

(102) **Example 4** Assuming the radius of the Earth is 4000 miles, find the distance between San Francisco 37°47'36" N and Seattle 47°37'18" N

Actual radius ≈ 3,959 mi



$\theta = 47°37'18" - 37°47'36"$
$= 9.828°$
$9.828 \cdot \frac{\pi}{180} = .172$ radians

$s = r\theta$
$= 4000(.172)$
$= 688$ miles

Linear Speed (v) $v = \frac{s}{t}$ s = arc length, t = time

Angular Speed (w) $w = \frac{\theta}{t}$ θ = angle in radians, t = time

* $s = r\theta$ $\quad \frac{s}{t} = \frac{r\theta}{t}$ $\quad \boxed{v = rw}$

linear speed = (radius) x angular speed

Examples Convert to radians/min (angular speed)

① $100 \text{ rev/min} = 100 \frac{\text{rev}}{\text{min}} \cdot \frac{2\pi \text{ rad}}{1 \text{ rev}}$

angular speed → $= \boxed{200\pi \frac{\text{rad}}{\text{min}}}$

② $6 \text{ rev/min} = \frac{6 \text{ rev}}{\text{min}} \cdot \frac{2\pi \text{ rad}}{1 \text{ rev}}$

$= \boxed{12\pi \frac{\text{rad}}{\text{min}}}$

Example A ferris wheel with a 62' diameter travels at 6.5 revolutions per minute.

a) find the angular speed in radians/min

$6.5 \frac{\text{rev}}{\text{min}} \cdot \frac{2\pi \text{ rad}}{1 \text{ rev}} = \boxed{13\pi \frac{\text{rad}}{\text{min}}}$

b) find the linear speed in mph

$v = rw$

$= 31(13\pi) \frac{\text{ft}}{\text{min}}$

$= 403\pi \frac{\text{ft}}{\text{min}}$

convert to mph: $403\pi \frac{\text{ft}}{\text{min}} \cdot \frac{1 \text{ mi}}{5280 \text{ ft}} \cdot \frac{60 \text{ min}}{1 \text{ hr}} = \boxed{14.387 \text{ mph}}$