Precalculus WS Angles and their Measures

multiply by $\frac{\pi}{180^\circ}$

1. Express each angle in exact radian measure.

0°	? oops	1128°	$\frac{94\pi}{15}$	2.5°	$\frac{\pi}{72}$
315°	$\frac{7\pi}{4}$	206°	$\frac{103\pi}{90}$	-550°	$\frac{55\pi}{18}$
-14°	$-\frac{7\pi}{90}$	-302°	$-\frac{151\pi}{90}$	17°	$\frac{17\pi}{180}$

2. Express each angle in degree measure multiply by $\frac{180^\circ}{\pi}$

$\frac{3\pi}{2}$	270°	$\frac{7\pi}{6}$	210°	$\frac{34\pi}{15}$	408°
$-\frac{7\pi}{12}$	-105°	$\frac{\pi}{9}$	20°	$1.5 \times \frac{180^\circ}{(2\pi)}$	43.0°
$\frac{14\pi}{3}$	840°	$-\frac{11\pi}{30}$	-66°	$-4 \times \frac{180^\circ}{(2\pi)}$	-114.6°

these are unitless measures

Be careful!

3. Determine two coterminal angles (one positive and one negative) for each angle. Add/Subtract multiples of 360°

θ = 59°	-301°, 419°	θ = -36.8°	-396.8°, 323.2°
θ = 125.6°	-234.4°, 485.6°	θ = -420°	-60°, 300°
θ = 1740°	300°, -60°	θ = -520.1°	-160.1°, 199.9°

Add/Subtract multiples of 2π

4. Determine two coterminal angles (one positive and one negative) for each angle. Give answer in radians.

$\theta = \frac{\pi}{6}$	$-\frac{11\pi}{6}$, $\frac{13\pi}{6}$	$\theta = \frac{4\pi}{3}$	$-\frac{2\pi}{3}$, $\frac{10\pi}{3}$
$2\pi = \frac{12\pi}{6}$		$2\pi = \frac{6\pi}{3}$	
$\theta = \frac{2\pi}{11}$	$-\frac{20\pi}{11}$, $\frac{24\pi}{11}$	$\theta = -\frac{12\pi}{5}$	$-\frac{2\pi}{5}$, $\frac{8\pi}{5}$
$2\pi = \frac{22\pi}{11}$		$2\pi = \frac{10\pi}{5}$	
$\theta = \frac{3\pi}{8}$	$-\frac{13\pi}{8}$, $\frac{19\pi}{8}$	$\theta = -\frac{39\pi}{14}$	$-\frac{11\pi}{14}$, $\frac{17\pi}{14}$
$2\pi = \frac{16\pi}{8}$		$2\pi = \frac{28\pi}{14}$	

5. Determine the quadrant in which angle lies.

130° II

8.3° I

-132°50′ III

-260° II

285° IV

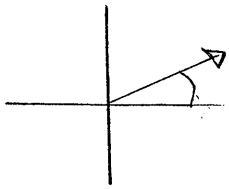
257°30 III

-336° I

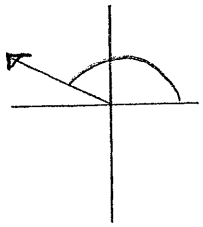
-3.4° IV

6. Sketch each angle in standard position.

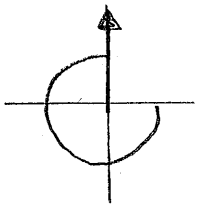
34°



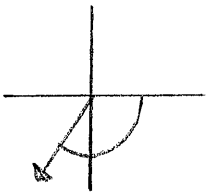
150°



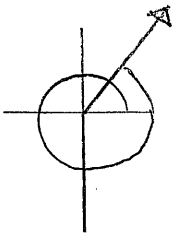
-270°



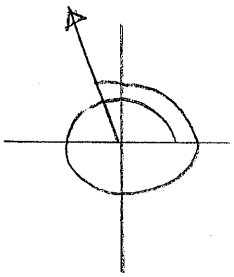
-128°



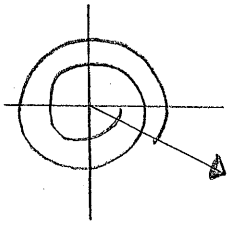
405°



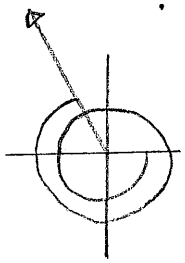
480°



-750°



-600°



7. Determine the quadrant in which the angle lies.

$\frac{\pi}{5}$ I

$\frac{7\pi}{5}$ III

$\frac{11\pi}{8}$ III

$\frac{9\pi}{8}$ III

$-\frac{\pi}{12}$ IV

$-\frac{11\pi}{9}$ II

-1 IV

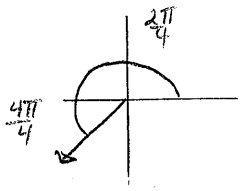
$-1 \times \frac{180^\circ}{\pi} \approx -57.3^\circ$

-2 III

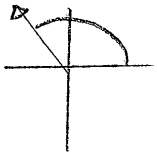
$-2 \times \frac{180^\circ}{\pi} = -114.6^\circ$

8. Sketch each angle in standard position.

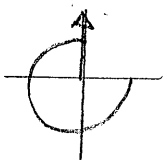
$\frac{5\pi}{4}$



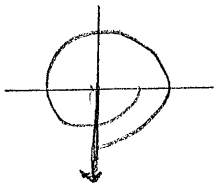
$\frac{2\pi}{3}$



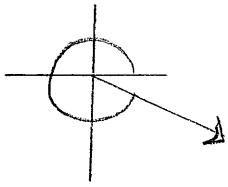
$-\frac{7\pi}{4}$



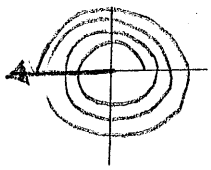
$-\frac{5\pi}{2}$



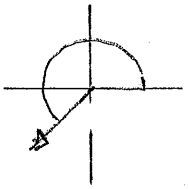
$\frac{11\pi}{6}$



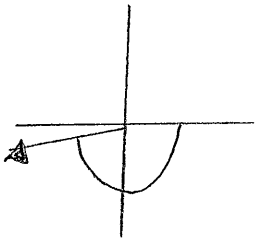
7π



$4 \times \frac{180^\circ}{\pi} \approx 229.2^\circ$

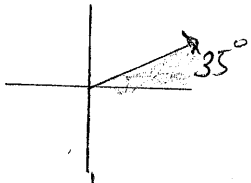


$-3 \times \frac{180^\circ}{\pi} \approx -171.9^\circ$

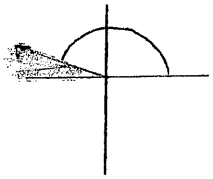


9. Find the reference angle.

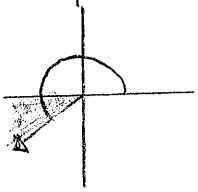
35° 35°



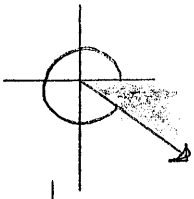
165° 15°



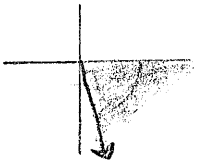
197° 17°



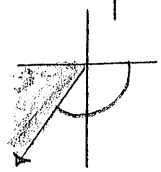
335° 25°



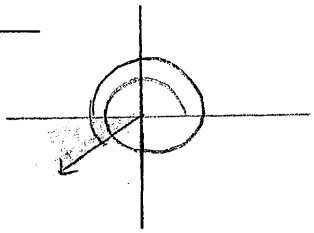
-83° 83°



-135° 45°

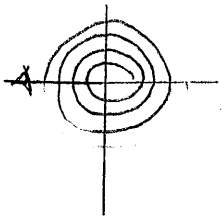


574° 34°

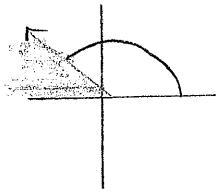


1260° NA

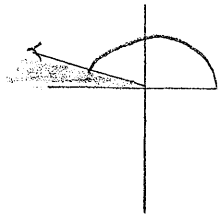
this is a "quadrantal" angle



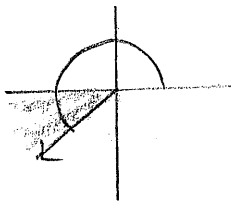
$\frac{2\pi}{3}$ $\frac{\pi}{3}$



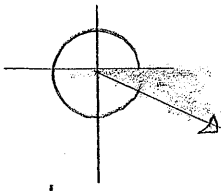
$\frac{8\pi}{9}$ $\frac{\pi}{9}$



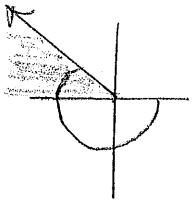
$\frac{11\pi}{9}$ $\frac{2\pi}{9}$



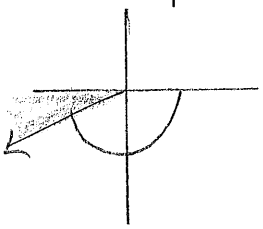
$\frac{11\pi}{6}$ $\frac{\pi}{6}$



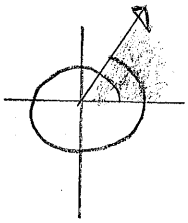
$-\frac{6\pi}{5}$ $\frac{\pi}{5}$



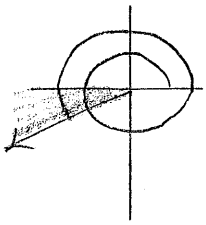
$-\frac{13\pi}{15}$ $\frac{2\pi}{15}$



$\frac{7\pi}{3}$ $\frac{\pi}{3}$



$\frac{16\pi}{5}$ $\frac{\pi}{5}$



10. Find the complement and the supplement, if applicable.

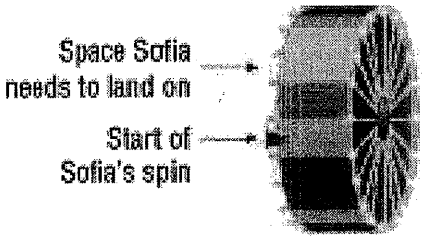
18 ° C: 72°, S: 162°

117° C: NA, S: 63°

$\frac{3\pi}{8}$ C: $\frac{5\pi}{8}$, S: $\frac{13\pi}{8}$

$\frac{4\pi}{3}$ C: NA, S: $\frac{2\pi}{3}$

11. Sofia is spinning a wheel on a game show. There are 20 values in equal-sized spaces around the circumference of the wheel. The value that Sofia needs to win is two spaces above the space where she starts her spin, and the wheel must make at least one full rotation for the spin to count. Describe a spin rotation in degrees that will give Sofia a winning result.



each sector of the wheel is $\frac{360^\circ}{20} = 18^\circ$

She must spin the wheel so that it lands $360^\circ + 18^\circ = 378^\circ$ or some angle coterminal to it.