

Do Now: From the Exercises section of yesterday's packet #s 21, 24, 26 and 28

	30°	45°	60°
sin θ	1/2	√2/2	√3/2
cos θ	√3/2	√2/2	1/2
tan θ	1/√3	1	√3

21 The expression $\cos 290^\circ$ is equivalent to

- (1) $\cos 70^\circ$
- (2) $\cos 20^\circ$
- (3) $-\cos 20^\circ$
- (4) $-\cos 70^\circ$

Q IV
 R $360^\circ - 290^\circ = 70^\circ$
 S +

24 Which expression is not equal to $\sin 210^\circ$?

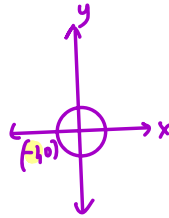
- (1) $-\sin 30^\circ$
- (2) $\sin (-30^\circ)$
- (3) $\sin 30^\circ + \frac{1}{2}$
- (4) $-\cos 60^\circ$

Q III
 R $210^\circ - 180^\circ = 30^\circ$
 S -
 T none
 $-\sin 30^\circ$
 $-\frac{1}{2}$

26 Find the exact value of $(\tan 120^\circ)^2 - \cos 180^\circ$.

- (1) $\sqrt{3} + 1$
- (2) 2
- (3) 3
- (4) 4

Q II
 R $180^\circ - 120^\circ = 60^\circ$
 S -
 T



$-\tan 60^\circ$

$$(-\sqrt{3})^2 - (-1)$$

$$3 + 1 = 4$$

28 What is the reference angle for -132° ?

- (1) 42°
- (2) 48°
- (3) 138°
- (4) 228°

$$-132^\circ + 360^\circ = 228^\circ$$

Q III

$$228^\circ - 180^\circ = 48^\circ$$

Name: _____
 PC: Solving First Degree Trig Equations

Date: _____
 Ms. Loughran

Examples:

1. Solve for θ , to the nearest degree in the interval $0^\circ \leq \theta \leq 360^\circ$.
 $3 \tan \theta - 4 = 5 \tan \theta - 1$

2. Solve for θ in the interval $0 \leq \theta \leq 2\pi$. *← in radians*

$$2 \cos \theta + 3\sqrt{2} = 2\sqrt{2}$$

$$\text{let } x = \cos \theta$$

$$\frac{2x + 3\sqrt{2} = 2\sqrt{2}}{-3\sqrt{2} \quad -3\sqrt{2}}$$

$$2x = -\sqrt{2}$$

$$x = -\frac{\sqrt{2}}{2}$$

$$\cos \theta = -\frac{\sqrt{2}}{2}$$

ref θ : think what θ has a cosine of $\frac{\sqrt{2}}{2}$

$$\text{QII: } 180^\circ - 45^\circ = 135^\circ \cdot \frac{\pi}{180^\circ} = \frac{3\pi}{4}$$

$$\text{QIII: } 180^\circ + 45^\circ = 225^\circ \cdot \frac{\pi}{180^\circ} = \frac{5\pi}{4}$$

$180^\circ - \text{ref } \theta$	S	A
$180^\circ + \text{ref } \theta$	S	A
	$\frac{3\pi}{4}$	$\frac{5\pi}{4}$

3. Solve for θ in the interval $0^\circ \leq \theta \leq 360^\circ$

$$8 \sec \theta - 2 = 10 + 2 \sec \theta$$

$$\text{let } x = \sec \theta$$

$$8x - 2 = 10 + 2x$$

$$6x = 12$$

$$x = 2$$

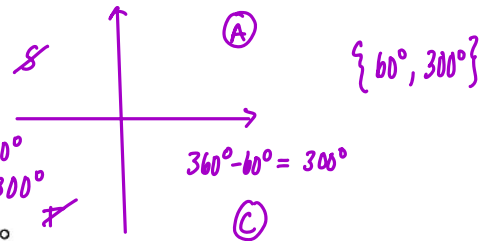
$$\sec \theta = 2$$

$$\cos \theta = \frac{1}{2}$$

ref θ : 60°

$$\text{QI } \theta = 60^\circ$$

$$\text{QIV } \theta = 300^\circ$$



4. Solve for θ to the nearest degree in the interval $0^\circ \leq \theta \leq 360^\circ$

$$3(\sin \theta - 1) = -4$$

↙ in radians

5. Solve for θ in the interval $0 \leq \theta \leq 2\pi$.

$$2\sin\theta - 1 = 0$$

$$\text{let } x = \sin\theta$$

$$2x - 1 = 0$$

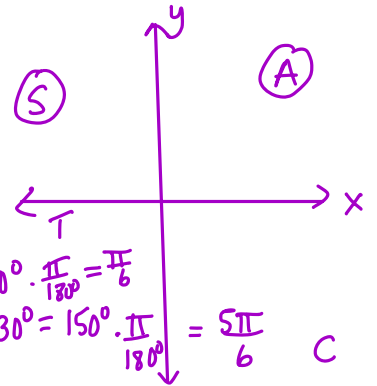
$$2x = 1$$

$$x = \frac{1}{2}$$

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

$$\text{ref } \angle: 30^\circ$$

$$\left\{ \frac{\pi}{6}, \frac{5\pi}{6} \right\}$$



6. Solve for θ to the nearest degree in the interval $0^\circ \leq \theta \leq 360^\circ$

$$4\cos\theta = \cos\theta + 2$$

↙ radians

Q.I and Q.II

7. For $0 \leq \theta \leq \pi$, solve:

↕ 180°

$$\tan\theta \cos\theta - \tan\theta = 0$$

$$\text{let } x = \tan\theta$$

$$\text{let } y = \cos\theta$$

$$xy - x = 0$$

$$x(y-1) = 0$$

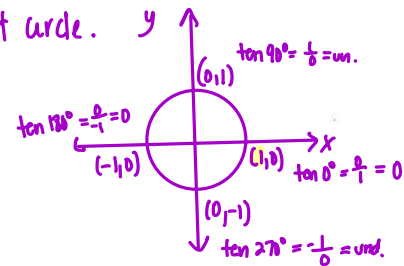
$x = 0$	$y - 1 = 0$
$\tan\theta = 0$	$y = 1$
$0^\circ, 180^\circ, 360^\circ \dots$	$\cos\theta = 1$

$$0^\circ, 180^\circ$$

$$\{0, \pi\}$$

* If $\sin\theta$ or $\cos\theta = \pm 1$ or 0

or if $\tan\theta = 0$, you are dealing with quadrantal \angle s, so go to the unit circle.



8. For $0^\circ \leq \theta \leq 360^\circ$, solve: $|2\cos\theta - 3| = 5$

$$0^\circ, 360^\circ, 720^\circ \dots$$

Use the table to help you obtain your answer after you find the reference angle.

To Find an Angle θ in Quadrant	Given Reference Angle R in Degrees	Given Reference Angle R in Radians
I	$\theta = R$	$\theta = R$
II	$\theta = 180^\circ - R$	$\theta = \pi - R$
III	$\theta = 180^\circ + R$	$\theta = \pi + R$
IV	$\theta = 360^\circ - R$	$\theta = 2\pi - R$

Exercises

Exercises 1–6: Solve for exact values of θ in the interval $0^\circ \leq \theta \leq 360^\circ$.

1 $2\tan \theta - 3 = -5$

2 $4(\csc \theta + 2) = \csc \theta + 14$

3 $2\sin \theta + 3 = 3(\sin \theta + 1)$

4 $2\cos \theta + 5\sqrt{3} = 4\sqrt{3}$

5 $6\left(\cot \theta - \frac{\sqrt{3}}{2}\right) = 5\cot \theta - 2\sqrt{3}$

6 $3\sin \theta - 1 = 2$

Exercises 7–12: Solve for exact values of θ in the interval $0 \leq \theta \leq 2\pi$.

7 $3\tan \theta - 4 = 4\tan \theta - 5$

8 $3\sec \theta = \frac{2}{3}(3\sec \theta - 3)$

9 $2(\sin \theta + \sqrt{2}) = \sqrt{2}$

10 $6\cos \theta + \sqrt{3} = -4(\cos \theta + \sqrt{3})$

11 $4\csc \theta + 5 = 3\csc \theta + 4$

12 $4\cos \theta + 3 = 3$

Exercises 13–17: Solve for β , to the nearest tenth of a degree, in the interval $0^\circ \leq \beta \leq 360^\circ$.

13 $9\sin \beta - 2 = 4\sin \beta - 1$

14 $-2(\tan \beta - 4) = 3(4 - \tan \beta)$

15 $3\sec \beta + 12 = \frac{3}{4}(8\sec \beta - 4)$

16 $\frac{1}{2}\csc \beta + 1 = \frac{1}{4}(\csc \beta + 8)$

17 $2\tan \beta - \sqrt{3} = 2\sqrt{3} - \tan \beta$

18 Find $m\angle B$ in the interval $180^\circ \leq B \leq 270^\circ$ that satisfies the equation $2\tan B - 3 = 3\tan B - 4$.

19 In the interval $90^\circ \leq x \leq 180^\circ$, find the value of x that satisfies the equation $3(\sin x - 2) = \sin x - 6$.

20 If $\frac{3\pi}{2} \leq \theta \leq 2\pi$, solve for θ : $5\cos \theta = 3\cos \theta + \sqrt{2}$

21 Find all values of x , to the nearest tenth of a degree, in the interval $0^\circ \leq x < 360^\circ$: $|3\cos \theta + 1| = 2$

22 Solve for all values of θ in the interval $0^\circ \leq \theta < 360^\circ$: $\sqrt{2}\sin x + 7 + 1 = 4$

Exercises 23–30: Select the numeral preceding the choice that best completes the statement or answers the question.

23 If θ is a positive acute angle, and $2\tan \theta = 7$, what is the value of θ to the nearest degree?

(1) $\frac{7}{2}$

(2) 16°

(3) 27°

(4) 74°

Homework 03-19

Exercises

1 Copy and complete the table.

θ	0°	30°	45°	60°	90°	180°	270°	360°
$\sec \theta$								
$\csc \theta$								
$\cot \theta$								

3 Determine the quadrant in which x lies if

- a $\sin x > 0$ and $\cot x < 0$ II
- b $\csc x < 0$ and $\cot x < 0$ IV
- c $\sec x > 0$ and $\sin x < 0$ IV
- d $\cot x < 0$ and $\sec x < 0$ II
- e $\cos x > 0$ and $\csc x > 0$ I

Exercises 4-10: Find the exact value of each expression.

4 $\sec 300^\circ$ 2

Q II
 $\frac{R}{S} = \frac{360^\circ - 300^\circ = 60^\circ}{+}$
 $\frac{1}{\cos 60^\circ} = \frac{1}{\frac{1}{2}} = 2$

6 $\cot 270^\circ$ 0

Q IV
 $\frac{R}{S} = \frac{360^\circ - 270^\circ = 90^\circ}{+}$
 $\frac{0}{\tan 90^\circ} = \frac{0}{\text{undefined}} = 0$

8 $\csc(-210^\circ)$ 2

$-210^\circ + 360^\circ = 150^\circ$
Q II
 $\frac{R}{S} = \frac{180^\circ - 150^\circ = 30^\circ}{+}$
 $\frac{1}{\sin 30^\circ} = \frac{1}{\frac{1}{2}} = 2$

10 $(\tan 300^\circ)(\cot 300^\circ)$ 1

$\frac{\tan 300^\circ}{\tan 300^\circ} = 1$

Exercises 11-15: Use a calculator and approximate each value to the nearest thousandth.

- 11 $\csc 238^\circ$
- 12 $\sec 410^\circ$
- 13 $\cot(-35^\circ)$
- 14 $\cot 125^\circ$
- 15 $\csc 325^\circ$

Exercises 16-20: Select the numeral preceding the choice that best completes the statement or answers the question.

16 $(\sec \theta)(\cos \theta) =$

- (1) 1
- (2) 0
- (3) undefined
- (4) varies depending upon the value of θ

$\frac{1}{\cos \theta} \cdot \cos \theta = 1$
 unless $\cos \theta = 0$
 b/c then would be undefined

2 In the interval $0 \leq \theta \leq 360^\circ$, identify all values at which the function is undefined:

- a $\sec \theta$
- b $\csc \theta$
- c $\cot \theta$

17 Which expression is equivalent to $\csc 45^\circ$?

- (1) $\frac{1}{\sin 45^\circ}$
- (2) $\frac{1}{\sec 45^\circ}$
- (3) $\frac{1}{\tan 45^\circ}$
- (4) $\sin(-45^\circ)$

18 If $f(x) = 2 \sec x$, find $f(30^\circ)$.

- (1) $\frac{2\sqrt{3}}{3}$
- (2) 2
- (3) $\sqrt{3}$
- (4) $\frac{4\sqrt{3}}{3}$

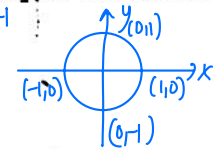
$\cos 30^\circ = \frac{\sqrt{3}}{2}$
 $f(30^\circ) = 2 \sec 30^\circ$
 $2 \cdot \frac{2}{\sqrt{3}} = \frac{4}{\sqrt{3}}$
 with rational denominator

19 If $g(x) = \sin x + \csc x$, find $g(90^\circ)$.

- (1) 1
- (2) 2
- (3) 0
- (4) -2

20 Which expression is equal in value to $\sec 180^\circ$?

- (1) $\csc 180^\circ$ undefined
- (2) $\tan 180^\circ = 0$
- (3) $\cot 135^\circ$
- (4) $\cos 225^\circ$



$\sec 180^\circ = -1$ $\cos 180^\circ = -1$

$\frac{1}{\cos 180^\circ} = \frac{1}{-1} = -1$

$\frac{1}{\cos 225^\circ} = \frac{1}{-\frac{\sqrt{2}}{2}} = -\frac{2}{\sqrt{2}} = -\sqrt{2}$

$\cot 135^\circ = \frac{\cos 135^\circ}{\sin 135^\circ} = \frac{-\frac{\sqrt{2}}{2}}{\frac{\sqrt{2}}{2}} = -1$

21 The expression $\cos 290^\circ$ is equivalent to

- (1) $\cos 70^\circ$
- (2) $\cos 20^\circ$
- (3) $-\cos 20^\circ$
- (4) $-\cos 70^\circ$

22 What single transformation moves a fourth-quadrant angle to its equivalent first-quadrant reference angle?

- (1) reflection in the y -axis
- (2) reflection in the origin
- (3) reflection in the x -axis
- (4) reflection in the line $y = x$

23 Which expression has the greatest value?

- (1) $\sin 120^\circ$
- (2) $\sin 150^\circ$
- (3) $\tan 240^\circ$
- (4) $\cos 315^\circ$

24 Which expression is *not* equal to $\sin 210^\circ$?

- (1) $-\sin 30^\circ$
- (2) $\sin (-30^\circ)$
- (3) $\sin 30^\circ$
- (4) $-\cos 60^\circ$

25 Evaluate:

$$(\cos 315^\circ)^2(\sin 30^\circ) + (\tan 135^\circ)(\cos 180^\circ)$$

- (1) $-\frac{3}{4}$
- (2) $\frac{1}{2}$
- (3) $\frac{3}{4}$
- (4) $\frac{5}{4}$

26 Find the exact value of $(\tan 120^\circ)^2 - \cos 180^\circ$.

- (1) $\sqrt{3} + 1$
- (2) 2
- (3) 3
- (4) 4

27 The value of $\tan 315^\circ$ is the same as the value of

- (1) $\cos 0^\circ$
- (2) $\sin 90^\circ$
- (3) $\tan 135^\circ$
- (4) $\sin 180^\circ$

28 What is the reference angle for -132° ?

- (1) 42°
- (2) 48°
- (3) 138°
- (4) 228°

29 If the coordinates of point A are $(1, 0)$ and the coordinates of B are $(-\frac{\sqrt{3}}{2}, \frac{1}{2})$, what is the measure of $\angle AOB$?

- (1) 120°
- (2) 135°
- (3) 150°
- (4) 330°

30 The expression $\sin(360^\circ - x)$ is equivalent to

- (1) $\sin x$
- (2) $-\sin x$
- (3) $\cos x$
- (4) $-\cos x$

31 The expression $\tan 180^\circ$ has the same value as

- (1) $\tan 90^\circ$
- (2) $\cos 180^\circ$
- (3) $\sin 270^\circ$
- (4) $\sin 180^\circ$

32 Which is a *false* statement?

- (1) $\tan \theta$ is undefined whenever $\cos \theta$ equals zero.
- (2) If $\sin \theta = \frac{\sqrt{3}}{2}$, $|\cos \theta| = \frac{1}{2}$.
- (3) If $\cos \theta = 0$, then $|\sin \theta| = 1$.
- (4) $\sin \theta = \cos \theta$ only in Quadrant I.