Trigonometric Identity Formulas

Pythagorean Identities

$$\sin^2\theta + \cos^2\theta = 1$$

$$1 + \cot^2\theta = \csc^2\theta$$

$$\tan^2\theta + 1 = \sec^2\theta$$

Reciprocal Identities

$$sin\theta = \frac{1}{csc\theta} \qquad csc\theta = \frac{1}{sin\theta}$$

$$cos\theta = \frac{1}{sec\theta} \qquad sec\theta = \frac{1}{cos\theta}$$

$$tan\theta = \frac{1}{cot\theta} \qquad cot\theta = \frac{1}{tan\theta}$$

Quotient Identities

$$tan\theta = \frac{sin\theta}{cos\theta} \qquad cot\theta = \frac{cos\theta}{sin\theta}$$

Sum and Difference Identities

$$\sin(\alpha \pm \beta) = sin\alpha cos\beta \pm cos\alpha sin\beta$$

$$\cos(\alpha \pm \beta) = cos\alpha cos\beta \mp sin\alpha sin\beta$$

$$tan(\alpha \pm \beta) = \frac{tan\alpha \pm tan\beta}{1 \mp tan\alpha tan\beta}$$

Double and Half Angle Formulas

$$sin2\theta = 2sin\theta cos\theta$$

$$cos2\theta = \cos^2\theta - \sin^2\theta$$

$$cos2\theta = 2\cos^2\theta - 1$$

$$cos2\theta = 1 - 2\sin^2\theta$$

$$tan2\theta = \frac{2tan\theta}{1 - \tan^2\theta}$$

$$sin\frac{\theta}{2} = \pm\sqrt{\frac{1 - cos\theta}{2}}$$

$$cos\frac{\theta}{2} = \pm\sqrt{\frac{1 + cos\theta}{2}}$$

$$tan\frac{\theta}{2} = \pm\sqrt{\frac{1 - cos\theta}{1 + cos\theta}}$$

Trigonometric Ratios

$$sin\theta = \frac{opposite}{hypotenuse} \qquad csc\theta = \frac{hypotenuse}{opposite}$$

$$cos\theta = \frac{adjacent}{hypotenuse} \qquad sec\theta = \frac{hypotenuse}{adjacent}$$

$$tan\theta = \frac{opposite}{adjacent} \qquad cot\theta = \frac{adjacent}{opposite}$$

Law of Cosines

$$a^2 = b^2 + c^2 - 2bc \cdot cosA$$

$$A = \cos^{-1}\left(\frac{a^2 - b^2 - c^2}{-2bc}\right)$$

Law of Sines

$$\frac{a}{sinA} = \frac{b}{sinB} = \frac{c}{sinC}$$

Area of a scalene Triangle

$$A = \sqrt{s(s-a)(s-b)(s-c)}$$

Where $s = \frac{a+b+c}{2}$

Degrees to Radians

$$degrees = radians\frac{\pi}{180^o}$$

Radians to Degrees

$$radians = degrees\frac{180^o}{\pi}$$

Magnitude

$$magnitude = \sqrt{x^2 + y^2}$$

Direction

$$\theta = \tan^{-1}\frac{y}{x}$$

Precalculus Final Review Name: Key Block: ___

1. $\begin{bmatrix}-2\\5\end{bmatrix}+\begin{bmatrix}-4\\-5\end{bmatrix}=$

$\begin{bmatrix}-6\\0\end{bmatrix}$

2. $\begin{bmatrix}2 & 1\\0 & 4\end{bmatrix}\cdot\begin{bmatrix}1 & -2\\2 & 4\end{bmatrix}=$

$\begin{bmatrix}4 & -4\\8 & 16\end{bmatrix}$

3. Find $\begin{vmatrix}3 & 2\\-4 & 1\end{vmatrix}$

11

4. $\begin{bmatrix}2 & 1\\3 & 0\end{bmatrix}^{-1}=$

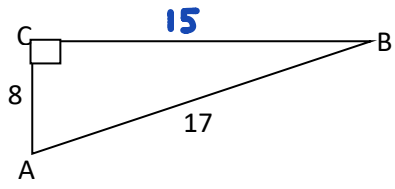
$\begin{bmatrix}0 & \frac{1}{3}\\1 & -\frac{2}{3}\end{bmatrix}$

5. Solve the system of equations using matrices.

$x - 3y - 2z = 0$
$2x + 3y + 2z = 3$
$-x + y - z = 6$

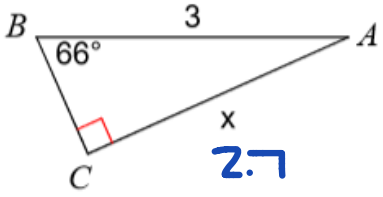
$\begin{bmatrix}1\\3\\-4\end{bmatrix}$

6. Find the value of the 6 trigonometric ratios for triangle ABC.



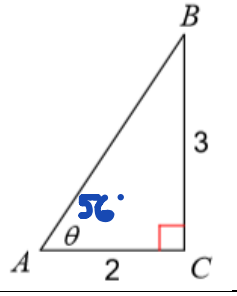
$\sin B = \frac{8}{17}$
$\cos B = \frac{15}{17}$
$\tan B = \frac{8}{15}$
$\csc B = \frac{17}{8}$
$\sec B = \frac{17}{15}$
$\cot B = \frac{15}{8}$

7. Find the value of x.

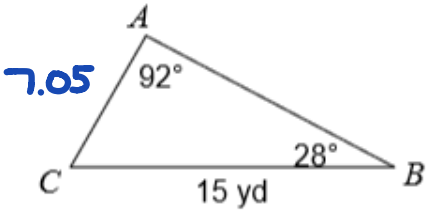


2.7

8. Find the value of θ.

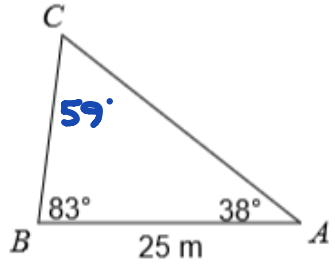


9. Find the length of $\overline{AC}$.

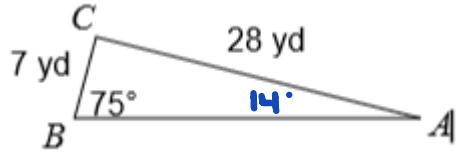


7.05

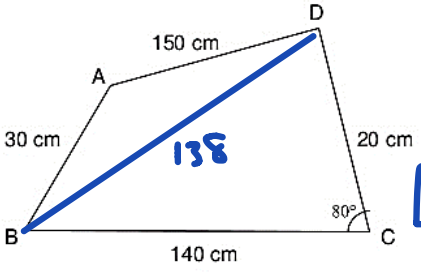
10. Find $m\angle C$.



11. Find $m\angle A$.



12. Find the area of quadrilateral ABCD.



A = 1969
A = 1379
A = 3348

13. Find the function value, rounded to the tenths. $cos\ 177^o$

-1.0

14. Find θ, rounded to the nearest tenths. $sin\,\theta = .602$

37°

15. State the reference angle and the quadrant the given angle terminates. $-\frac{4\pi}{3}$

$\frac{\pi}{3}$ Q II

16. State the reference angle and the quadrant the given angle terminates. $\frac{7\pi}{12}$

$\frac{5\pi}{12}$ Q II

17. Convert $\frac{2\pi}{5}$ radians to degrees.

72°

18. Convert 50^o to radians.

$\frac{5\pi}{18}$

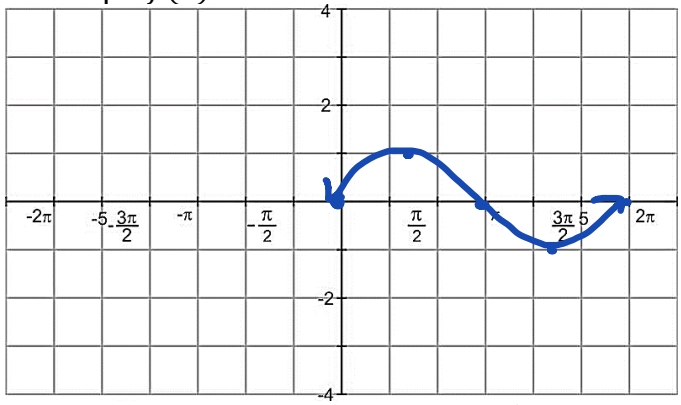
19. Write one positive and negative coterminal angle to $-\frac{\pi}{4}$

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

20. Write one positive and negative coterminal angle to 390^o.

30° -330°

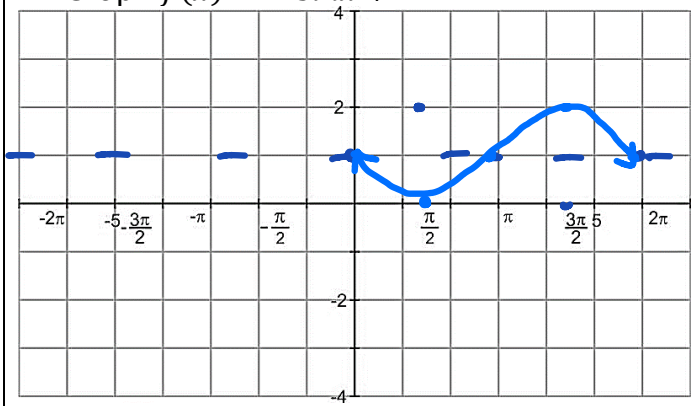
21. Graph $f(x) = sinx$



Amplitude: 1 Period: 2π

Vertical Shift: 0 Phase Shift: 0

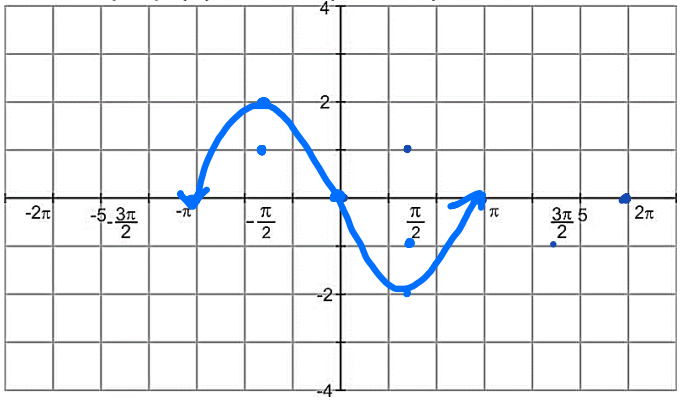
22 Graph $f(x) = -sinx + 1$



Amplitude: 1 Period: 2π

Vertical Shift: ↑1 Phase Shift: 0

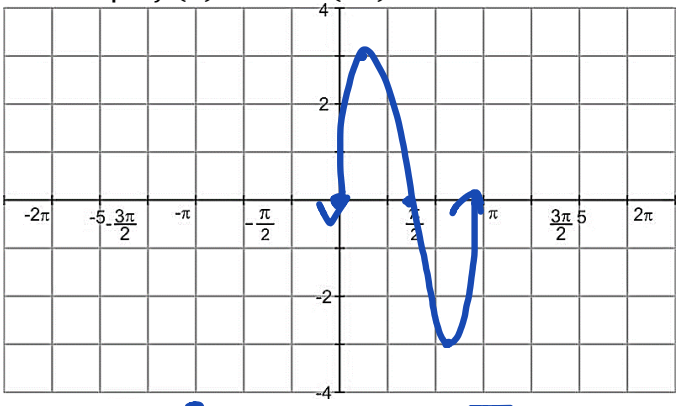
23. Graph $f(x) = 2sin(x + \pi)$



Amplitude: 2 Period: 2π

Vertical Shift: 0 Phase Shift: $\leftarrow\pi$

24. Graph $f(x) = 3sin(2x)$



Amplitude: 3 Period: π

Vertical Shift: 0 Phase Shift: 0

25. Find the exact value of $\sin\theta$ if the terminal side of θ in standard position contains the point (4, -3).

$-\frac{3}{5}$

26. Solve the equation for $0 \leq \theta < 2\pi$. Write your answer as a multiple of π.

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

$\frac{2\pi}{3}$ $\frac{4\pi}{3}$

27. Solve for θ.

$$2\sin\theta\cos\theta + \cos\theta = 0$$

$\frac{\pi}{2}, \frac{3\pi}{2}, \frac{7\pi}{6}, \frac{11\pi}{6}$

28. Simplify the expression

$$\frac{\sin^2\theta}{1-\cos\theta}$$

$\cos\theta + 1$

29. Rewrite the identity. $\sin^2 x + \cos^2 x = 1$

$\cos^2 x = 1 - \sin^2 x$

$\sin^2 x = 1 - \cos^2 x$

30. In which quadrants is the statement true,

$\sin\theta < 0$? Q_3 Q_4

$\cos\theta < 0$? Q_2 Q_3

$\tan\theta < 0$? Q_2 Q_4

31. Find the exact value of $\cos\left(\frac{\pi}{4}\right)$ $\frac{\sqrt{2}}{2}$

32. Find the exact value of $\sin\left(-\frac{\pi}{6}\right)$ $-\frac{1}{2}$

33. Find the exact value of $\tan\left(\frac{\pi}{2}\right)$ undefined

34. Find the exact value of $\cot\left(\frac{\pi}{3}\right)$ $\frac{\sqrt{3}}{3}$

35. Find the exact value of $\cos\left(\frac{-\pi}{6}\right)$. $\frac{\sqrt{3}}{2}$

36. Find the exact value of $\tan(4\pi)$. 0

37. Find the exact value of $\sec\left(\frac{\pi}{4}\right)$. $\sqrt{2}$

38. Evaluate $\cos^{-1}\left(\frac{1}{2}\right)$ $60°$ or $\frac{\pi}{3}$

39. Evaluate $\sin\left(\tan^{-1}\left(\frac{\sqrt{3}}{3}\right)\right)$ $\frac{1}{2}$

40. Evaluate $\sin^{-1}\left(-\frac{1}{2}\right)$ $\frac{11\pi}{6}$ or $330°$

41. Evaluate $\cos\left(Sec^{-1}(2)\right)$

$\frac{1}{2}$

42. An airplane travels at 445 mph at a $N25^{\circ}E$ and the wind blows at 40 mph at a bearing of $\mathrm{N}10^{\circ}E$. Find the magnitude of the true flight path of the plane.

483

43. Given that P = (5, 4), Q = (7, 3), R = (3, 6), and S = (-2, 1), find the component form and magnitude of the vector $PQ + 3RS$.

<-13, -16>

44. Determine whether the vectors u and v are parallel, orthogonal, or neither.

$u =< -6, -5 >, v =< 3, 2 >$

-28

45. Determine if u and v are equal. R = (8, -2), S = (11, -6), O = (-3, -9), and P = (0, -13)

equal

46. Find $|v|$ $v =< -2, -5 >$

$\sqrt{29}$

47. The numbers 1 – 10 are placed in a hat, and a number is selected. What is the probability that the number is 4 given that it is known to be an even number?

$\frac{1}{5}$

48. The payoff for a lottery game has the following probability distribution. What is the expected value of x?

Pay off (x)	P(x)
$ 0	0.95
$ 5	0.05

0.25

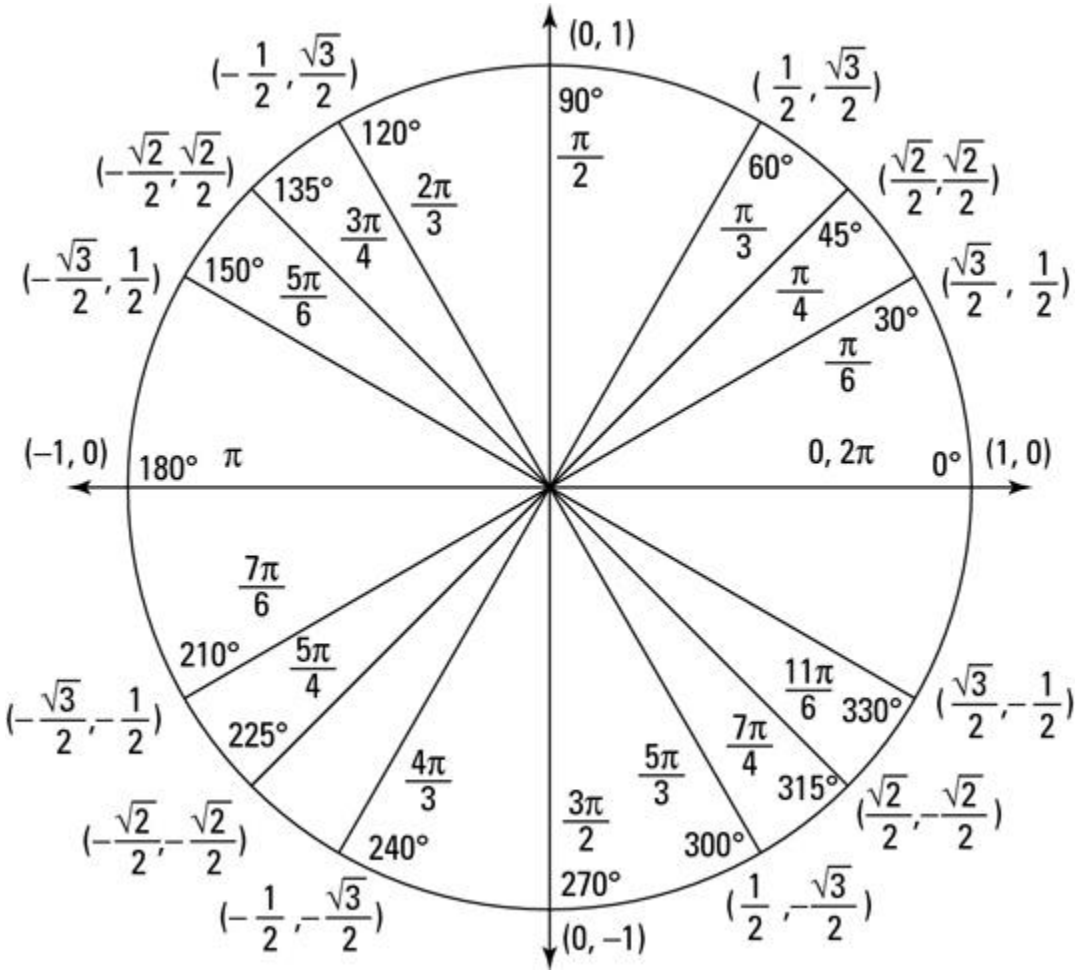
49. There are 20 people participating in a raffle. Three $50 gift cards, from the same store, are to be awarded. How many ways can the three gift cards be awarded?

1140

50. A casino game costs $5 to play. You draw 1 card. If it is a heart, you win $10; If it is a Queen of hearts, you win $50. What is the expected value? Is this a fair game?

-1.73

not fair


(0, 1)
90°
$\frac{\pi}{2}$
$(\frac{1}{2}, \frac{\sqrt{3}}{2})$
60°
$\frac{\pi}{3}$
$(\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2})$
45°
$\frac{\pi}{4}$
$(\frac{\sqrt{3}}{2}, \frac{1}{2})$
30°
$\frac{\pi}{6}$
(1, 0)
0°
0, 2π
(−1, 0)
180°
π
$(-\frac{\sqrt{3}}{2}, \frac{1}{2})$
150°
$\frac{5\pi}{6}$
$(-\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2})$
135°
$\frac{3\pi}{4}$
$(-\frac{1}{2}, \frac{\sqrt{3}}{2})$
120°
$\frac{2\pi}{3}$
$(\frac{\sqrt{3}}{2}, -\frac{1}{2})$
330°
$\frac{11\pi}{6}$
$(\frac{\sqrt{2}}{2}, -\frac{\sqrt{2}}{2})$
315°
$\frac{7\pi}{4}$
$(\frac{1}{2}, -\frac{\sqrt{3}}{2})$
300°
$\frac{5\pi}{3}$
(0, −1)
270°
$\frac{3\pi}{2}$
$(-\frac{1}{2}, -\frac{\sqrt{3}}{2})$
240°
$\frac{4\pi}{3}$
$(-\frac{\sqrt{2}}{2}, -\frac{\sqrt{2}}{2})$
225°
$\frac{5\pi}{4}$
$(-\frac{\sqrt{3}}{2}, -\frac{1}{2})$
210°
$\frac{7\pi}{6}$