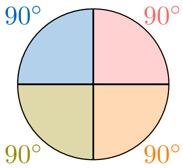
A RADIAN MEASURE

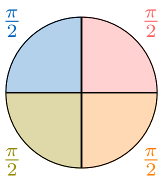
A.1 CONVERTING DEGREES TO RADIANS IN TERMS OF π

Ex 1: Convert to radians in terms of π:

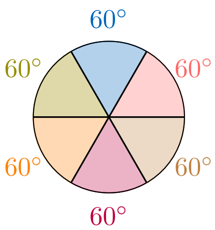


$$90^\circ = \boxed{\frac{\pi}{2}}$$

Answer:

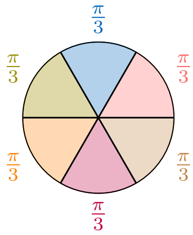
- **Method 1**: $90^\circ = \left(90^\circ \times \frac{\pi}{180^\circ}\right) = \frac{\cancel{90^\circ} \times \pi}{2 \times \cancel{90^\circ}} = \frac{\pi}{2}$
- **Method 2**:
$$\begin{aligned} 180^\circ &= \pi \\ \frac{180^\circ}{2} &= \frac{\pi}{2} \quad \text{(dividing both sides by 2)} \\ 90^\circ &= \frac{\pi}{2} \end{aligned}$$
- 

Ex 2: Convert to radians in terms of π:

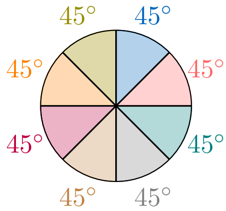


$$60^\circ = \boxed{\frac{\pi}{3}}$$

Answer:

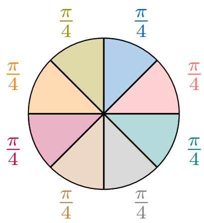
- **Method 1**: $60^\circ = \left(60^\circ \times \frac{\pi}{180^\circ}\right) = \frac{\cancel{60^\circ} \times \pi}{3 \times \cancel{60^\circ}} = \frac{\pi}{3}$
- **Method 2**:
$$\begin{aligned} 180^\circ &= \pi \\ \frac{180^\circ}{3} &= \frac{\pi}{3} \quad \text{(dividing both sides by 3)} \\ 60^\circ &= \frac{\pi}{3} \end{aligned}$$
- 

Ex 3: Convert to radians in terms of π:

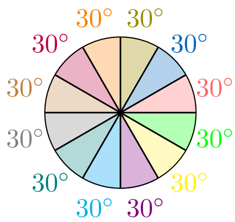


$$45^\circ = \boxed{\frac{\pi}{4}}$$

Answer:

- **Method 1**: $45^\circ = \left(45^\circ \times \frac{\pi}{180^\circ}\right) = \frac{\cancel{45^\circ} \times \pi}{4 \times \cancel{45^\circ}} = \frac{\pi}{4}$
- **Method 2**:
$$\begin{aligned} 180^\circ &= \pi \\ \frac{180^\circ}{4} &= \frac{\pi}{4} \quad \text{(dividing both sides by 4)} \\ 45^\circ &= \frac{\pi}{4} \end{aligned}$$
- 

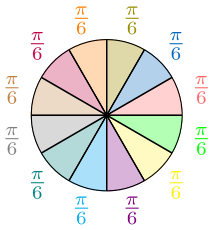
Ex 4: Convert to radians in terms of π:



$$30^\circ = \boxed{\frac{\pi}{6}}$$

Answer:

- **Method 1**: $30^\circ = \left(30^\circ \times \frac{\pi}{180^\circ}\right) = \frac{\cancel{30^\circ} \times \pi}{6 \times \cancel{30^\circ}} = \frac{\pi}{6}$
- **Method 2**:
$$\begin{aligned} 180^\circ &= \pi \\ \frac{180^\circ}{6} &= \frac{\pi}{6} \quad \text{(dividing both sides by 6)} \\ 30^\circ &= \frac{\pi}{6} \end{aligned}$$

- 

A.2 CONVERTING DEGREES TO RADIANS

Ex 5: Convert to radians (round to 2 decimal places).

$$46.5° = \boxed{0.81}$$

Answer:

$$\begin{aligned} 46.5° &= 46.5° \times \frac{\pi}{180°} \\ &\approx 0.8116 \quad \text{(using calculator)} \\ &\approx 0.81 \quad \text{(rounding to 2 decimal places)} \end{aligned}$$

Ex 6: Convert to radians (round to 2 decimal places).

$$110° = \boxed{1.92}$$

Answer:

$$\begin{aligned} 110° &= 110° \times \frac{\pi}{180°} \\ &\approx 1.9199 \quad \text{(using calculator)} \\ &\approx 1.92 \quad \text{(rounded to 2 decimal places)} \end{aligned}$$

Ex 7: Convert to radians (round to 2 decimal places).

$$43° = \boxed{0.75}$$

Answer:

$$\begin{aligned} 43° &= 43° \times \frac{\pi}{180°} \\ &\approx 0.7505 \quad \text{(using calculator)} \\ &\approx 0.75 \quad \text{(rounded to 2 decimal places)} \end{aligned}$$

Ex 8: Convert to radians (round to 2 decimal places).

$$300° = \boxed{5.24}$$

Answer:

$$\begin{aligned} 300° &= 300° \times \frac{\pi}{180°} \\ &\approx 5.2359 \quad \text{(using calculator)} \\ &\approx 5.24 \quad \text{(rounded to 2 decimal places)} \end{aligned}$$

A.3 CONVERTING RADIANS TO DEGREES

Ex 9: Convert to degrees (round to the nearest integer).

$$1.25 = \boxed{72}°$$

Answer:

$$\begin{aligned} 1.25\,\text{rad} &= 1.25 \times \frac{180°}{\pi} \\ &\approx 71.6197 \quad \text{(using calculator)} \\ &\approx 72° \quad \text{(rounded to the nearest integer)} \end{aligned}$$

Ex 10: Convert to degrees (round to the nearest integer).

$$0.7 = \boxed{40}°$$

Answer:

$$\begin{aligned} 0.7\,\text{rad} &= 0.7 \times \frac{180°}{\pi} \\ &\approx 40.1070 \quad \text{(using calculator)} \\ &\approx 40° \quad \text{(rounded to the nearest integer)} \end{aligned}$$

Ex 11: Convert to degrees (round to the nearest integer).

$$4.5 = \boxed{258}°$$

Answer:

$$\begin{aligned} 4.5\,\text{rad} &= 4.5 \times \frac{180°}{\pi} \\ &\approx 257.6106 \quad \text{(using calculator)} \\ &\approx 258° \quad \text{(rounded to the nearest integer)} \end{aligned}$$

Ex 12: Convert to degrees (round to the nearest integer).

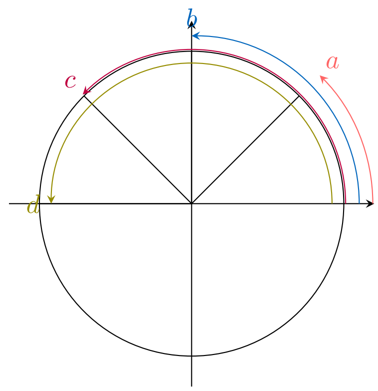
$$2 = \boxed{115}°$$

Answer:

$$\begin{aligned} 2\,\text{rad} &= 2 \times \frac{180°}{\pi} \\ &\approx 114.5920 \quad \text{(using calculator)} \\ &\approx 115° \quad \text{(rounded to the nearest integer)} \end{aligned}$$

A.4 CONVERTING REFERENCE ANGLES TO RADIANS

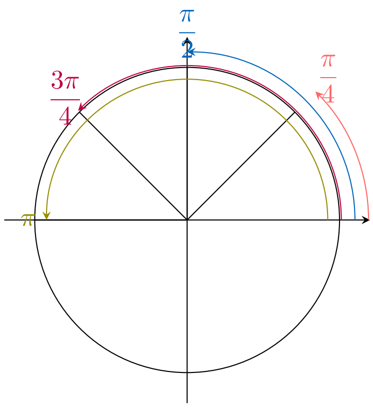
Ex 13: Convert to radians in terms of π:



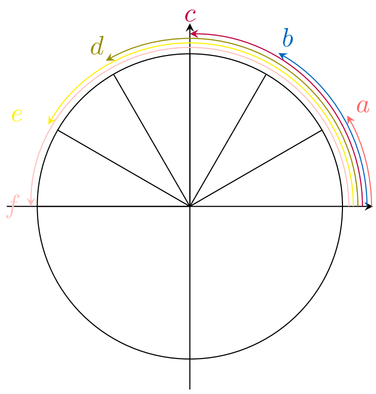
- $a = \boxed{\frac{\pi}{4}}$
- $b = \boxed{\frac{\pi}{2}}$
- $c = \boxed{\frac{3\pi}{4}}$
- $d = \boxed{\pi}$

Answer: All angles are multiples of $\frac{\pi}{4}$:

- $1 \times \frac{\pi}{4} = \frac{\pi}{4}$
- $2 \times \frac{\pi}{4} = \frac{\pi}{2}$
- $3 \times \frac{\pi}{4} = \frac{3\pi}{4}$
- $4 \times \frac{\pi}{4} = \pi$



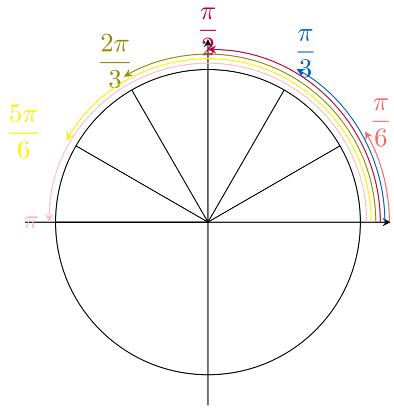
Ex 14: Convert to radians in terms of π:



- $a = \boxed{\frac{\pi}{6}}$
- $b = \boxed{\frac{\pi}{3}}$
- $c = \boxed{\frac{\pi}{2}}$
- $d = \boxed{\frac{2\pi}{3}}$
- $e = \boxed{\frac{5\pi}{6}}$
- $f = \boxed{\pi}$

Answer: All angles are multiples of $\frac{\pi}{6}$:

- 1 time : $\frac{\pi}{6}$
- 2 times : $2 \times \frac{\pi}{6} = \frac{\pi}{3}$
- 3 times : $3 \times \frac{\pi}{6} = \frac{\pi}{2}$
- 4 times : $4 \times \frac{\pi}{6} = \frac{2\pi}{3}$
- 5 times : $5 \times \frac{\pi}{6} = \frac{5\pi}{6}$
- 6 times : $6 \times \frac{\pi}{6} = \pi$



A.5 CALCULATING TRIGONOMETRIC VALUES

Ex 15: Calculate (round to 2 decimal places)

$$\cos\left(\frac{\pi}{4}\right) \approx \boxed{0.71}$$

Answer: To calculate this on your calculator, you can either:

- Set the calculator to radian mode and compute $\cos\left(\frac{\pi}{4}\right) \approx 0.71$
- Or, if in degree mode, first convert the angle to degrees: $\frac{\pi}{4} \times \frac{180°}{\pi} = 45°$, then $\cos(45°) \approx 0.71$

Ex 16: Calculate (round to 2 decimal places)

$$\cos\left(\frac{\pi}{6}\right) \approx \boxed{0.87}$$

Answer: To calculate this on your calculator, you can either:

- Set the calculator to radian mode and compute $\cos\left(\frac{\pi}{6}\right) \approx 0.87$
- Or, if in degree mode, first convert the angle to degrees: $\frac{\pi}{6} \times \frac{180°}{\pi} = 30°$, then $\cos(30°) \approx 0.87$

Ex 17: Calculate (round to 2 decimal places)

$$\sin\left(\frac{5\pi}{6}\right) \approx \boxed{0.5}$$

Answer: To calculate this on your calculator, you can either:

- Set the calculator to radian mode and compute $\sin\left(\frac{5\pi}{6}\right) \approx 0.50$
- Or, if in degree mode, first convert the angle to degrees: $\frac{5\pi}{6} \times \frac{180°}{\pi} = 150°$, then $\sin(150°) = 0.5$

Ex 18: Calculate (round to 2 decimal places)

$$\sin\left(-\frac{\pi}{5}\right) \approx \boxed{-0.59}$$

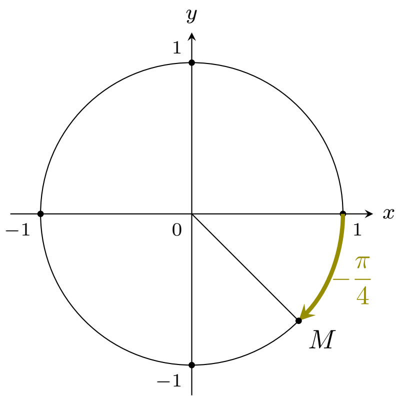
Answer: To calculate this on your calculator, you can either:

- Set the calculator to radian mode and compute $\sin\left(-\frac{\pi}{5}\right) \approx -0.59$
- Or, if in degree mode, first convert the angle to degrees: $-\frac{\pi}{5} \times \frac{180°}{\pi} = -36°$, then $\sin(-36°) \approx -0.59$

B TRIGONOMETRIC RATIOS AND UNIT CIRCLE

B.1 EXPRESSING THE COORDINATES OF A POINT ON THE UNIT CIRCLE

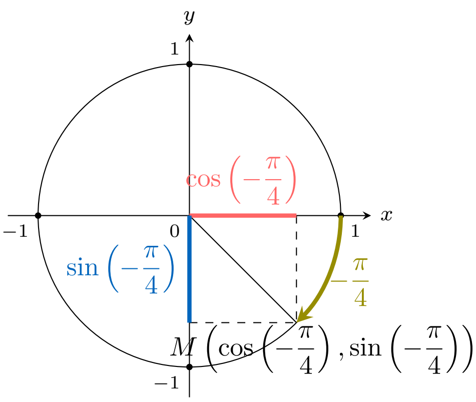
Ex 19:



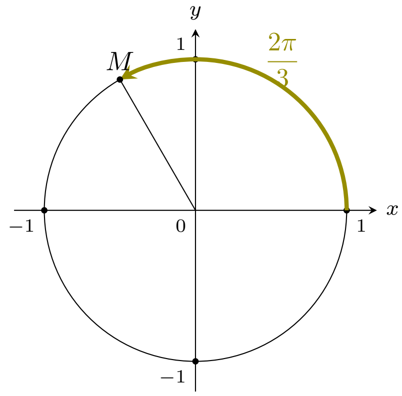
Determine the coordinates of point M in terms of sine and cosine:

$$M\left(\boxed{\cos(-\frac{\pi}{4})}, \boxed{\sin(-\frac{\pi}{4})}\right).$$

Answer:



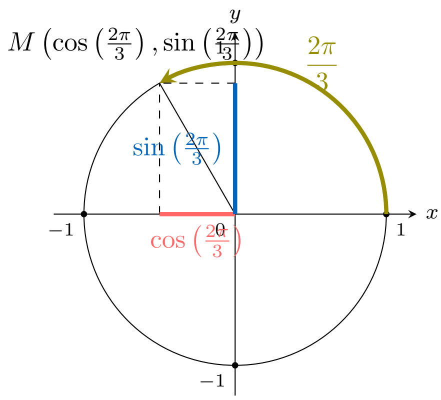
Ex 20:



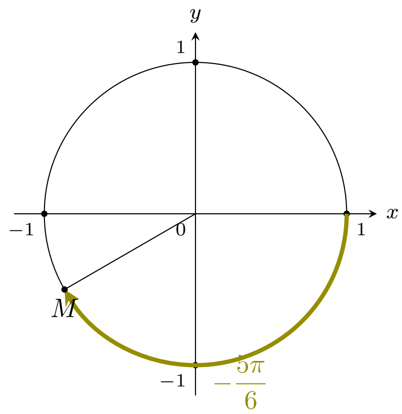
Determine the coordinates of point M in terms of sine and cosine:

$$M\left(\boxed{\cos(\frac{2\pi}{3})}, \boxed{\sin(\frac{2\pi}{3})}\right).$$

Answer:



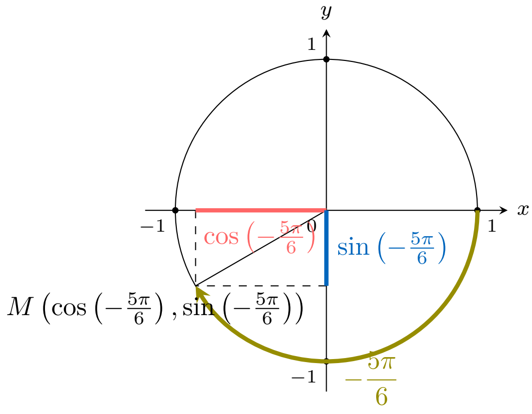
Ex 21:



Determine the coordinates of point M in terms of sine and cosine:

$$M\left(\boxed{\cos(-\frac{5\pi}{6})}, \boxed{\sin(-\frac{5\pi}{6})}\right).$$

Answer:

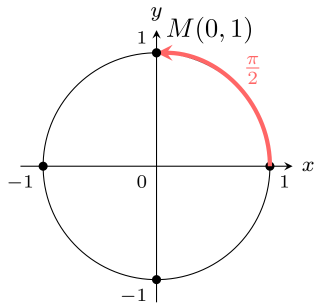


B.2 FINDING SINE AND COSINE VALUES ON THE UNIT CIRCLE

Ex 22: Find the values:

- $\cos\left(\frac{\pi}{2}\right) = \boxed{0}$
- $\sin\left(\frac{\pi}{2}\right) = \boxed{1}$

Answer: On the unit circle, the point corresponding to the angle $\frac{\pi}{2}$ has coordinates (0,1):

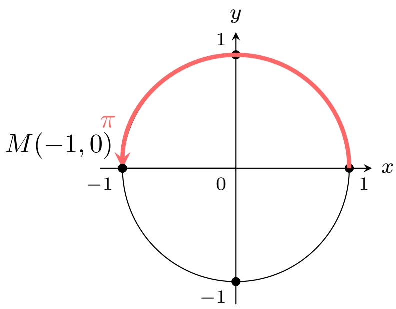


$\cos\left(\frac{\pi}{2}\right) = 0$ x-coordinate
$\sin\left(\frac{\pi}{2}\right) = 1$ y-coordinate

Ex 23: Find the values:

- $\cos(\pi) = \boxed{-1}$
- $\sin(\pi) = \boxed{0}$

Answer: On the unit circle, the point corresponding to the angle π has coordinates $(-1, 0)$:

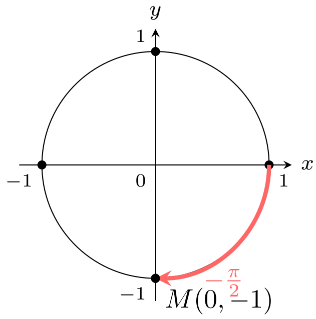


$\cos(\pi) = -1$ x-coordinate
$\sin(\pi) = 0$ y-coordinate

Ex 24: Find the values:

- $\cos\left(-\frac{\pi}{2}\right) = \boxed{0}$
- $\sin\left(-\frac{\pi}{2}\right) = \boxed{-1}$

Answer: On the unit circle, the point corresponding to the angle $-\frac{\pi}{2}$ has coordinates $(0, -1)$:

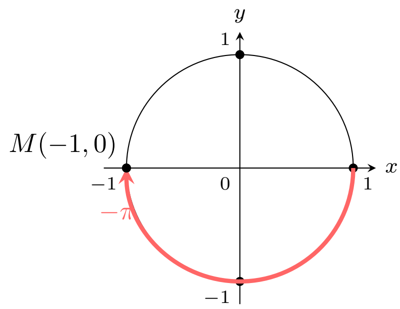


$\cos\left(-\frac{\pi}{2}\right) = 0$ x-coordinate
$\sin\left(-\frac{\pi}{2}\right) = -1$ y-coordinate

Ex 25: Find the values:

- $\cos(-\pi) = \boxed{-1}$
- $\sin(-\pi) = \boxed{0}$

Answer: On the unit circle, the point corresponding to the angle $-\pi$ has coordinates $(-1, 0)$:

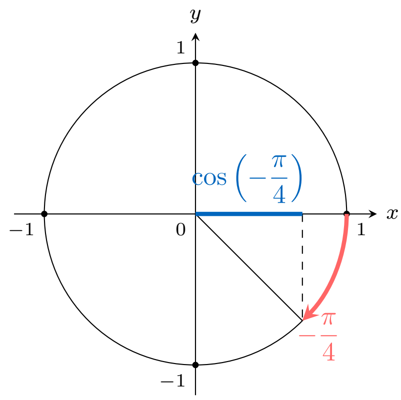


$\cos(-\pi) = -1$ x-coordinate
$\sin(-\pi) = 0$ y-coordinate

B.3 DETERMINING THE SIGN OF SINE AND COSINE

Ex 26: Determine the sign of $\cos\left(-\frac{\pi}{4}\right)$: $\boxed{+}$.

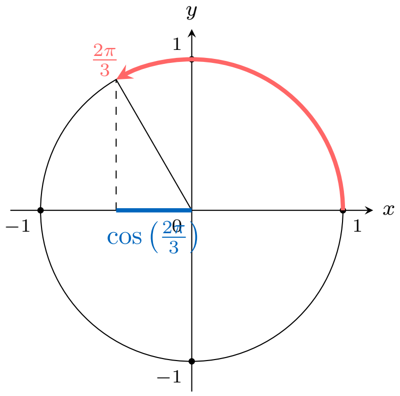
Answer: On the unit circle, the angle $-\frac{\pi}{4}$ (or $-45°$) lies in Quadrant 4, where the x-coordinate (cosine) is positive:



Thus, $\cos\left(-\frac{\pi}{4}\right)$, is positive.

Ex 27: Determine the sign of $\cos\left(\frac{2\pi}{3}\right)$: $\boxed{-}$.

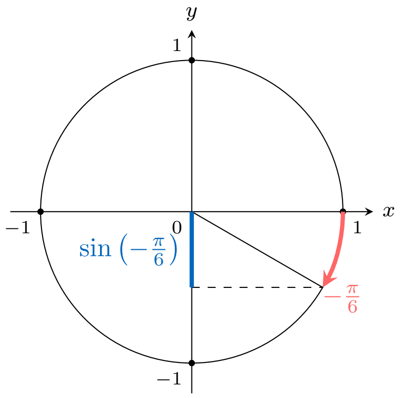
Answer: On the unit circle, the angle $\frac{2\pi}{3}$ (or $120°$) lies in Quadrant 2, where the x-coordinate (cosine) is negative:



Thus, $\cos\left(\frac{2\pi}{3}\right)$ is negative.

Ex 28: Determine the sign of $\sin\left(-\frac{\pi}{6}\right)$: $\boxed{-}$.

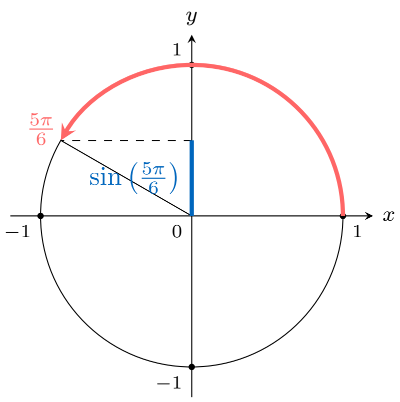
Answer: On the unit circle, the angle $-\frac{\pi}{6}$ (or $-30°$) lies in Quadrant 4, where the y-coordinate (sine) is negative:



Thus, $\sin\left(-\frac{\pi}{6}\right)$ is negative.

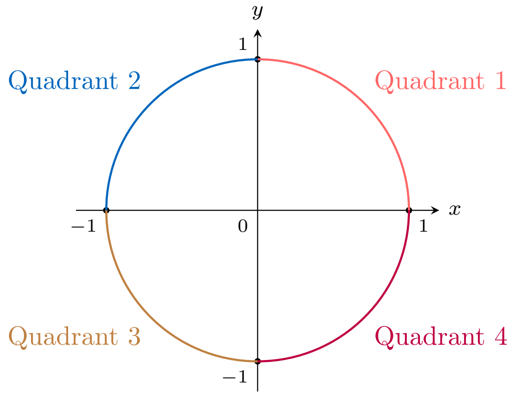
Ex 29: Determine the sign of $\sin\left(\frac{5\pi}{6}\right)$: $\boxed{+}$.

Answer: On the unit circle, the angle $\frac{5\pi}{6}$ (or $150°$) lies in Quadrant 2, where the y-coordinate (sine) is positive:



Thus, $\sin\left(\frac{5\pi}{6}\right)$ is positive.

Ex 30:



- For the quadrant 1, $\cos\theta$ is $\boxed{+}$ and $\sin\theta$ is $\boxed{+}$.
- For the quadrant 2, $\cos\theta$ is $\boxed{-}$ and $\sin\theta$ is $\boxed{+}$.
- For the quadrant 3, $\cos\theta$ is $\boxed{-}$ and $\sin\theta$ is $\boxed{-}$.
- For the quadrant 4, $\cos\theta$ is $\boxed{+}$ and $\sin\theta$ is $\boxed{-}$.

Answer:

Quadrant	$\cos\theta$	$\sin\theta$
1	$+$	$+$
2	$-$	$+$
3	$-$	$-$
4	$+$	$-$

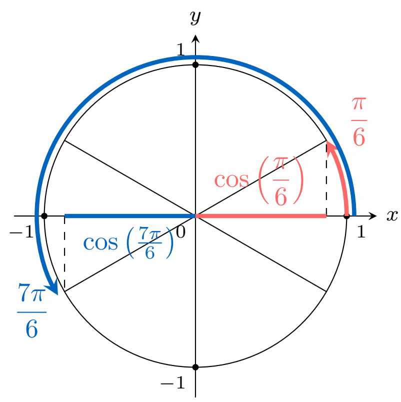
C TRIGONOMETRIC PROPERTIES

C.1 EXPRESSING TRIGONOMETRIC VALUES IN TERMS OF REFERENCE ANGLES

Ex 31: Express $\cos\left(\frac{7\pi}{6}\right)$ in terms of sine or cosine of $\frac{\pi}{6}$ (use a unit circle):

$$\cos\left(\frac{7\pi}{6}\right) = \boxed{-\cos(\frac{\pi}{6})}$$

Answer:

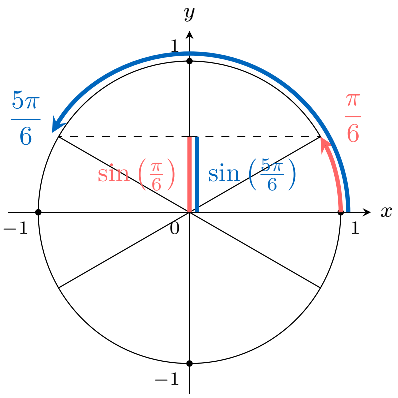


$$\cos\left(\frac{7\pi}{6}\right) = \cos\left(\pi + \frac{\pi}{6}\right)$$
$$= -\cos\left(\frac{\pi}{6}\right)$$

Ex 32: Express $\sin\left(\frac{5\pi}{6}\right)$ in terms of sine or cosine of $\frac{\pi}{6}$ (use a unit circle):

$$\sin\left(\frac{5\pi}{6}\right) = \boxed{\sin(\frac{\pi}{6})}$$

Answer:

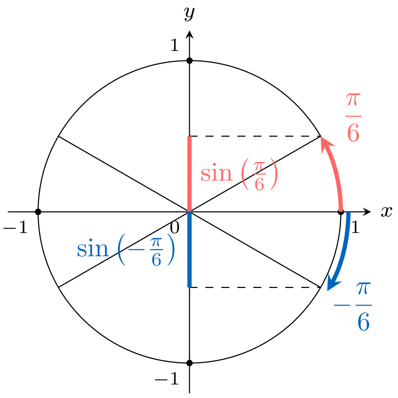


$$\begin{aligned}\sin\left(\frac{5\pi}{6}\right) &= \sin\left(\pi-\frac{\pi}{6}\right)\\ &= \sin\left(\frac{\pi}{6}\right)\end{aligned}$$

Ex 33: Express $\sin\left(-\frac{\pi}{6}\right)$ in terms of sine or cosine of $\frac{\pi}{6}$ (use a unit circle):

$$\sin\left(-\tfrac{\pi}{6}\right) = \boxed{-\sin(\frac{\pi}{6})}$$

Answer:

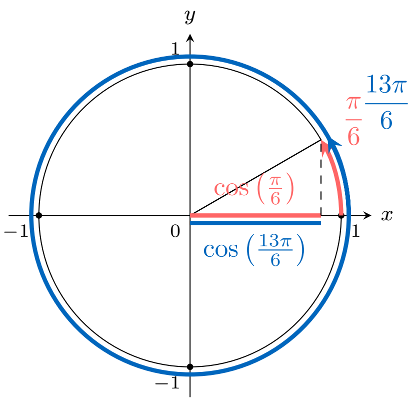


$$\sin\left(-\frac{\pi}{6}\right) = -\sin\left(\frac{\pi}{6}\right)$$

Ex 34: Express $\cos\left(\frac{13\pi}{6}\right)$ in terms of cosine or sine of $\frac{\pi}{6}$ (use a unit circle):

$$\cos\left(\tfrac{13\pi}{6}\right) = \boxed{\cos(\frac{\pi}{6})}$$

Answer:

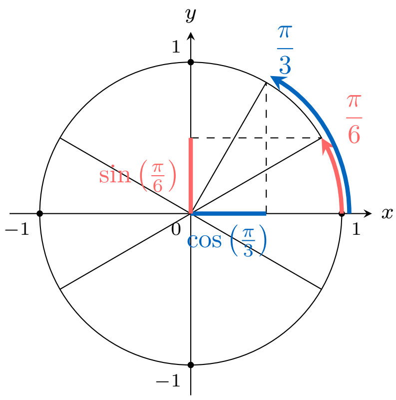


$$\begin{aligned}\cos\left(\frac{13\pi}{6}\right) &= \cos\left(2\pi+\frac{\pi}{6}\right)\\ &= \cos\left(\frac{\pi}{6}\right)\end{aligned}$$

Ex 35: Express $\cos\left(\frac{\pi}{3}\right)$ in terms of sine or cosine of $\frac{\pi}{6}$ (use a unit circle):

$$\cos\left(\frac{\pi}{3}\right) = \boxed{\sin(\frac{\pi}{6})}$$

Answer:



$$\begin{aligned}\cos\left(\frac{\pi}{3}\right) &= \cos\left(\frac{\pi}{2}-\frac{\pi}{6}\right)\\ &= \sin\left(\frac{\pi}{6}\right)\end{aligned}$$

C.2 EXPLAINING TRIGONOMETRIC EQUALITIES

Ex 36: Explain why $\cos\left(\frac{13\pi}{6}\right) = \cos\left(\frac{\pi}{6}\right)$.

Answer:

$$\begin{aligned}\cos\left(\frac{13\pi}{6}\right) &= \cos\left(\frac{12\pi}{6}+\frac{\pi}{6}\right)\\ &= \cos\left(2\pi+\frac{\pi}{6}\right)\\ &= \cos\left(\frac{\pi}{6}\right)\end{aligned}$$

Ex 37: Explain why $\cos\left(\frac{7\pi}{6}\right) = -\cos\left(\frac{\pi}{6}\right)$.

Answer:

$$\begin{aligned}\cos\left(\frac{7\pi}{6}\right) &= \cos\left(\frac{6\pi}{6}+\frac{\pi}{6}\right)\\ &= \cos\left(\pi+\frac{\pi}{6}\right)\\ &= -\cos\left(\frac{\pi}{6}\right)\end{aligned}$$

Ex 38: Explain why $\sin\left(\frac{\pi}{4}\right) = -\sin\left(-\frac{\pi}{4}\right)$.

Answer:

$$\sin\left(\frac{\pi}{4}\right) = -\sin\left(-\frac{\pi}{4}\right) \quad (\sin(-x) \quad = -\sin(x))$$

Ex 39: Explain why $\sin\left(\frac{5\pi}{4}\right) = -\sin\left(\frac{\pi}{4}\right)$.

Answer:

$$\begin{aligned}\sin\left(\frac{5\pi}{4}\right) &= \sin\left(\pi+\frac{\pi}{4}\right)\\ &= -\sin\left(\frac{\pi}{4}\right)\end{aligned}$$

because $\sin(\pi+x) = -\sin(x)$.

Ex 40: Explain why $\sin\left(\frac{5\pi}{2}\right) = \sin\left(\frac{\pi}{2}\right)$.

Answer:

$$\begin{aligned}\sin\left(\frac{5\pi}{2}\right) &= \sin\left(2\pi+\frac{\pi}{2}\right)\\ &= \sin\left(\frac{\pi}{2}\right)\end{aligned}$$

C.3 FINDING EXACT TRIGONOMETRIC VALUES USING THE PYTHAGOREAN IDENTITY

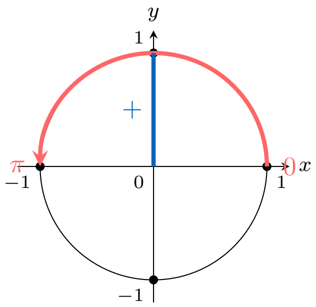
Ex 41: Find the exact value of $\sin\theta$ if $\cos\theta = \frac{\sqrt{3}}{2}$ and $0 \leq \theta \leq \pi$.

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

Answer: We use the Pythagorean identity:

$$\begin{aligned}
\cos^2\theta + \sin^2\theta &= 1 \\
\left(\frac{\sqrt{3}}{2}\right)^2 + \sin^2\theta &= 1 \\
\frac{3}{4} + \sin^2\theta &= 1 \\
\sin^2\theta &= 1 - \frac{3}{4} \\
\sin^2\theta &= \frac{1}{4} \\
\sin\theta &= \pm\frac{1}{2}
\end{aligned}$$

To determine the sign, note that $0 \leq \theta \leq \pi$ corresponds to Quadrants I and II, where $\sin\theta \geq 0$.So, $\boxed{\sin\theta = \frac{1}{2}}$.



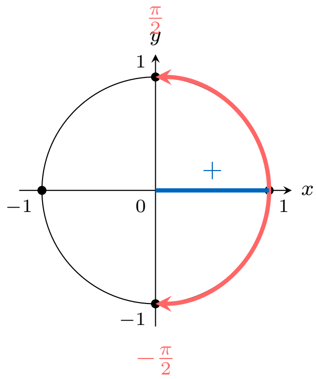
Ex 42: Find the exact value of $\cos\theta$ if $\sin\theta = \frac{1}{\sqrt{2}}$ and $-\frac{\pi}{2} \leq \theta < \frac{\pi}{2}$.

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

Answer: We use the Pythagorean identity:

$$\begin{aligned}
\cos^2\theta + \sin^2\theta &= 1 \\
\cos^2\theta + \left(\frac{1}{\sqrt{2}}\right)^2 &= 1 \\
\cos^2\theta + \frac{2}{4} &= 1 \\
\cos^2\theta + \frac{1}{2} &= 1 \\
\cos^2\theta &= 1 - \frac{1}{2} \\
\cos^2\theta &= \frac{1}{2} \\
\cos\theta &= \pm\frac{1}{\sqrt{2}}
\end{aligned}$$

To determine the sign, note that $-\frac{\pi}{2} \leq \theta < \frac{\pi}{2}$ corresponds to Quadrants I and IV, where $\cos\theta$ is positive.So, $\boxed{\cos\theta = \frac{1}{\sqrt{2}}}$.



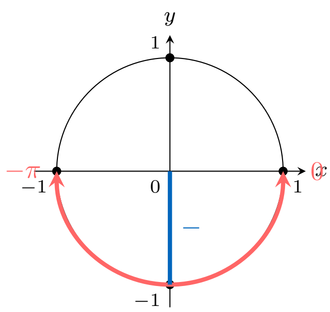
Ex 43: Find the exact value of $\sin\theta$ if $\cos\theta = \frac{1}{2}$ and $-\pi \leq \theta < 0$.

$$\sin\theta = \boxed{-\frac{\sqrt{3}}{2}}$$

Answer: We use the Pythagorean identity:

$$\begin{aligned}
\cos^2\theta + \sin^2\theta &= 1 \\
\left(\frac{1}{2}\right)^2 + \sin^2\theta &= 1 \\
\frac{1}{4} + \sin^2\theta &= 1 \\
\sin^2\theta &= 1 - \frac{1}{4} \\
\sin^2\theta &= \frac{3}{4} \\
\sin\theta &= \pm\frac{\sqrt{3}}{2}
\end{aligned}$$

To determine the sign, note that $-\pi \leq \theta < 0$ corresponds to Quadrants III and IV, where $\sin\theta < 0$.So, $\boxed{\sin\theta = -\frac{\sqrt{3}}{2}}$.



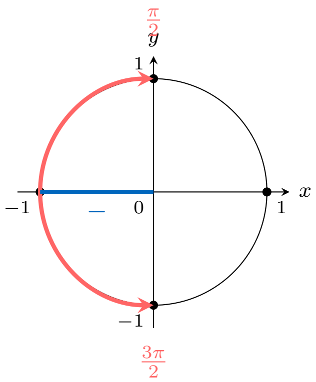
Ex 44: Find the exact value of $\cos\theta$ if $\sin\theta = \frac{1}{\sqrt{2}}$ and $\frac{\pi}{2} < \theta < \frac{3\pi}{2}$.

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

Answer: We use the Pythagorean identity:

$$\cos^2\theta + \sin^2\theta = 1$$
$$\cos^2\theta + \left(\frac{1}{\sqrt{2}}\right)^2 = 1$$
$$\cos^2\theta + \frac{1}{2} = 1$$
$$\cos^2\theta = 1 - \frac{1}{2}$$
$$\cos^2\theta = \frac{1}{2}$$
$$\cos\theta = \pm\frac{1}{\sqrt{2}}$$

To determine the sign, note that $\frac{\pi}{2} < \theta < \frac{3\pi}{2}$ corresponds to Quadrants II and III, where $\cos\theta < 0$.So, $\boxed{\cos\theta = -\frac{1}{\sqrt{2}}}$.



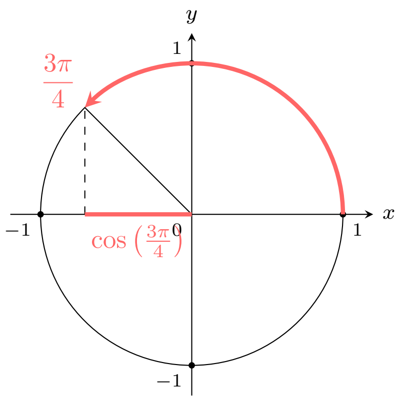
D MULTIPLES OF $\frac{\pi}{4}$

D.1 READING TRIGONOMETRIC VALUES FOR MULTIPLES OF $\pi/4$

Ex 45: Use a unit circle to find:

$$\cos\left(\frac{3\pi}{4}\right) = \boxed{-\frac{1}{\sqrt{2}}}$$

Answer:



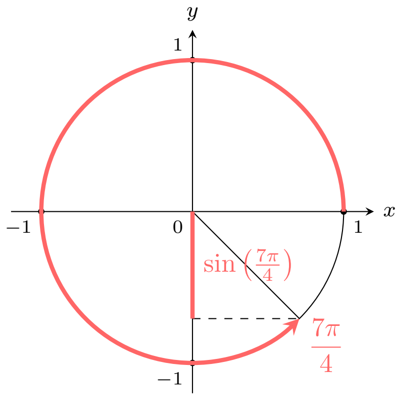
On the unit circle, the angle $3\pi/4$ is in the second quadrant, so the cosine (the x-coordinate) is negative:

$$\cos\left(\frac{3\pi}{4}\right) = -\frac{1}{\sqrt{2}}$$

Ex 46: Use a unit circle to find:

$$\sin\left(\frac{7\pi}{4}\right) = \boxed{-\frac{1}{\sqrt{2}}}$$

Answer:



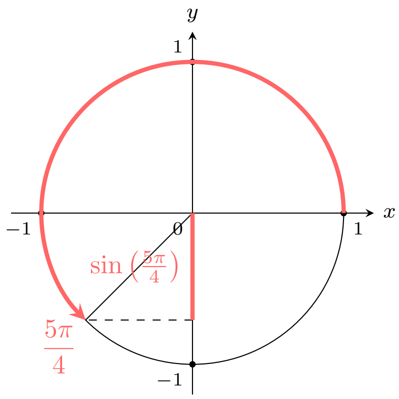
On the unit circle, the angle $7\pi/4$ is in the fourth quadrant, so the sine (the y-coordinate) is negative:

$$\sin\left(\frac{7\pi}{4}\right) = -\frac{1}{\sqrt{2}}$$

Ex 47: Use a unit circle to find:

$$\sin\left(\frac{5\pi}{4}\right) = \boxed{-\frac{1}{\sqrt{2}}}$$

Answer:



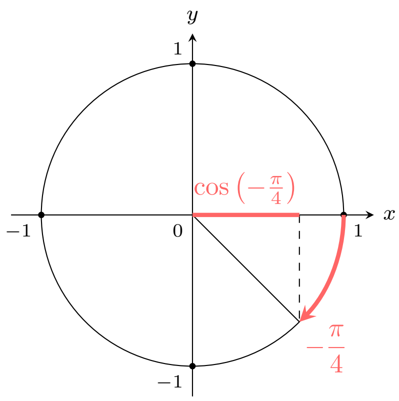
On the unit circle, the angle $5\pi/4$ is in the third quadrant, so the sine (the y-coordinate) is negative:

$$\sin\left(\frac{5\pi}{4}\right) = -\frac{1}{\sqrt{2}}$$

Ex 48: Use a unit circle to find:

$$\cos\left(-\frac{\pi}{4}\right) = \boxed{\frac{1}{\sqrt{2}}}$$

Answer:



On the unit circle, the angle $-\pi/4$ is in the fourth quadrant, so the cosine (the x-coordinate) is positive:

$$\cos\left(-\frac{\pi}{4}\right) = \frac{1}{\sqrt{2}}$$

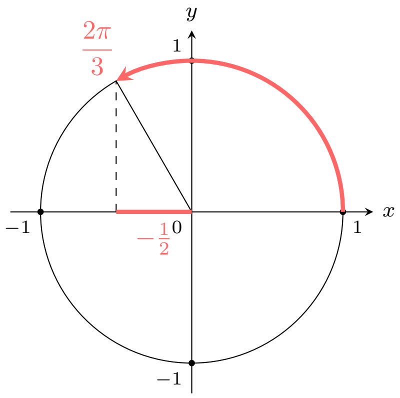
E MULTIPLES OF $\frac{\pi}{6}$

E.1 READING TRIGONOMETRIC VALUES FOR MULTIPLES OF $\pi/6$

Ex 49: Use a unit circle to find:

$$\cos\left(\frac{2\pi}{3}\right) = \boxed{-\frac{1}{2}}$$

Answer:



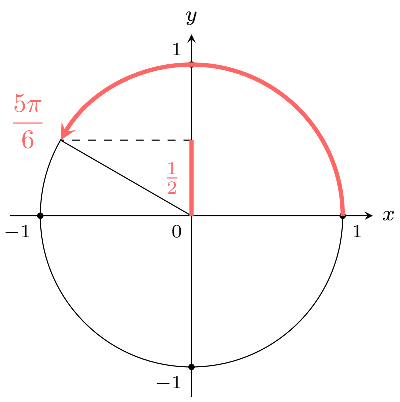
On the unit circle, the angle $2\pi/3$ is in the second quadrant, so the cosine (the x-coordinate) is negative:

$$\cos\left(\frac{2\pi}{3}\right) = -\frac{1}{2}$$

Ex 50: Use a unit circle to find:

$$\sin\left(\frac{5\pi}{6}\right) = \boxed{\frac{1}{2}}$$

Answer:



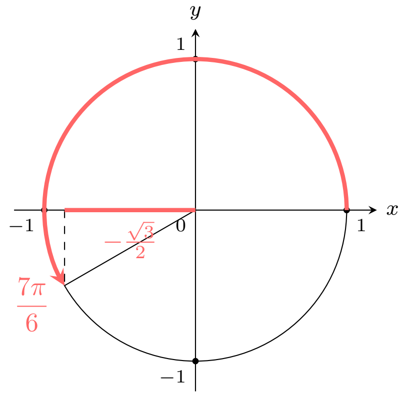
On the unit circle, the angle $5\pi/6$ is in the second quadrant, so the sine (the y-coordinate) is positive:

$$\sin\left(\frac{5\pi}{6}\right) = \frac{1}{2}$$

Ex 51: Use a unit circle to find:

$$\cos\left(\frac{7\pi}{6}\right) = \boxed{-\frac{\sqrt{3}}{2}}$$

Answer:



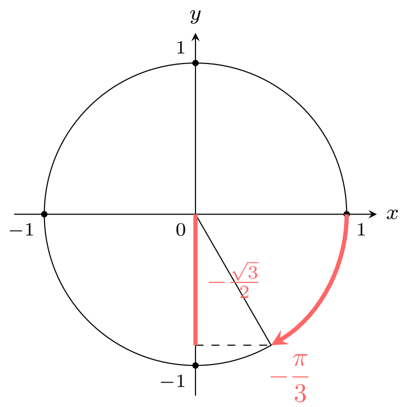
On the unit circle, the angle $7\pi/6$ is in the third quadrant, so the cosine (the x-coordinate) is negative:

$$\cos\left(\frac{7\pi}{6}\right) = -\frac{\sqrt{3}}{2}$$

Ex 52: Use a unit circle to find:

$$\sin\left(-\frac{\pi}{3}\right) = \boxed{-\frac{\sqrt{3}}{2}}$$

Answer:



On the unit circle, the angle $-\pi/3$ is in the fourth quadrant, so the sine (the y-coordinate) is negative:

$$\sin\left(-\frac{\pi}{3}\right) = -\frac{\sqrt{3}}{2}$$