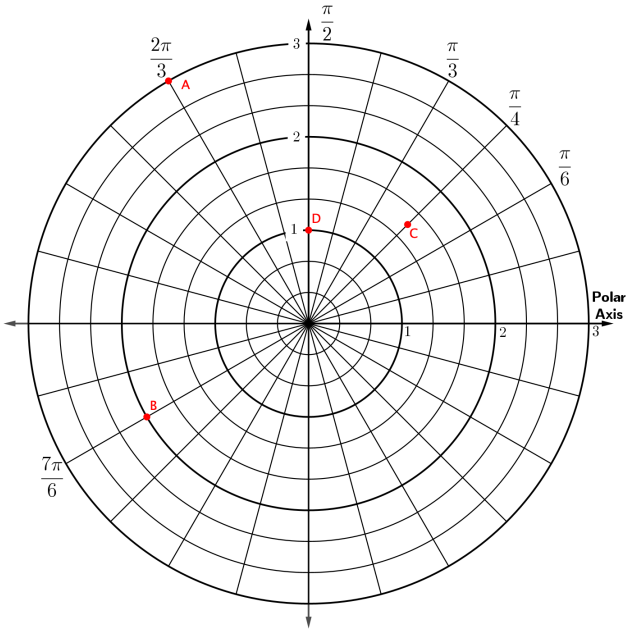
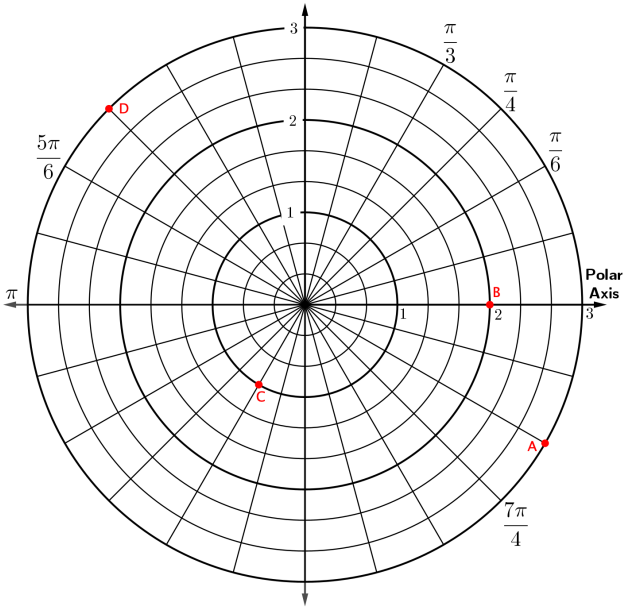


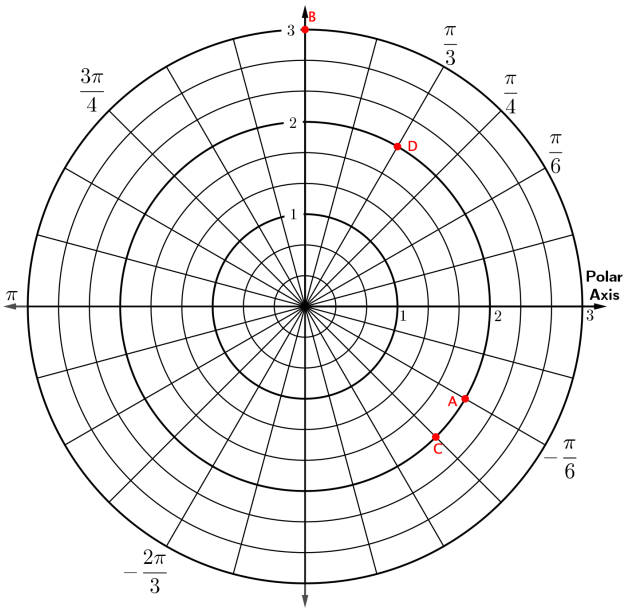
1. Plot (and label) the following polar coordinates on the polar coordinate grid above.

$A\left(3, \frac{2\pi}{3}\right)$ $B\left(2, \frac{7\pi}{6}\right)$ $C\left(1.5, \frac{\pi}{4}\right)$ $D\left(1, \frac{\pi}{2}\right)$



2. Plot (and label) the following polar coordinates on the polar coordinate grid above.

$A\left(-3, \frac{5\pi}{6}\right)$ $B(-2, \pi)$ $C\left(-1, \frac{\pi}{3}\right)$ $D\left(-3, \frac{7\pi}{4}\right)$



3. Plot (and label) the following polar coordinates on the polar coordinate grid above.

$A\left(2,-\frac{\pi}{6}\right)$ $B\left(-3,-\frac{\pi}{2}\right)$ $C\left(-2,\frac{3\pi}{4}\right)$ $D\left(-2,-\frac{2\pi}{3}\right)$

4. The location of a point in the plane is given by polar coordinates $\left(4,\frac{5\pi}{6}\right)$. Write two different representations for this point in polar coordinates.

$\theta \pm 2\pi k$ rotates full circles in the opposite or same direction then r stays the same. $\theta \pm \pi k$ rotates half circles in either direction then r is the opposite.

Any two of these or others $\underbrace{\left(4,\frac{17\pi}{6}\right)}_{\frac{5\pi}{6}+2\pi}, \underbrace{\left(4,-\frac{7\pi}{6}\right)}_{\frac{5\pi}{6}-2\pi}, \underbrace{\left(-4,-\frac{\pi}{6}\right)}_{\frac{5\pi}{6}-\pi}$, or $\underbrace{\left(-4,\frac{11\pi}{6}\right)}_{\frac{5\pi}{6}+\pi}$

5. The location of a point in the plane is given by polar coordinates $\left(-3,\frac{5\pi}{4}\right)$. Write two different representations for this point in polar coordinates.

$\theta \pm 2\pi k$ rotates full circles in the opposite or same direction then r stays the same. $\theta \pm \pi k$ rotates half circles in either direction then r is the opposite.

Any two of these or others $\underbrace{\left(-3,\frac{13\pi}{4}\right)}_{\frac{5\pi}{4}+2\pi}, \underbrace{\left(-3,-\frac{3\pi}{4}\right)}_{\frac{5\pi}{4}-2\pi}, \underbrace{\left(3,\frac{\pi}{4}\right)}_{\frac{5\pi}{4}-\pi}$, or $\underbrace{\left(3,\frac{9\pi}{4}\right)}_{\frac{5\pi}{4}+\pi}$

6. The location of a point in the plane is given by polar coordinates $\left(2,\frac{3\pi}{2}\right)$. Write two different representations for this point in polar coordinates.

$\theta \pm 2\pi k$ rotates full circles in the opposite or same direction then r stays the same. $\theta \pm \pi k$ rotates half circles in either direction then r is the opposite.

Any two of these or others $\underbrace{\left(2,\frac{7\pi}{2}\right)}_{\frac{3\pi}{2}+2\pi}, \underbrace{\left(2,-\frac{\pi}{2}\right)}_{\frac{3\pi}{2}-2\pi}, \underbrace{\left(-2,\frac{\pi}{2}\right)}_{\frac{3\pi}{2}-\pi}$, or $\underbrace{\left(-2,\frac{5\pi}{2}\right)}_{\frac{3\pi}{2}+\pi}$

7. The location of a point in the plane is given by polar coordinates $\left(5, \frac{4\pi}{3}\right)$. Which of the following gives another representation for this point in polar coordinates?

(A) $\left(-5, -\frac{4\pi}{3}\right)$ (B) $\left(-5, \frac{4\pi}{3}\right)$ (C) $\left(5, -\frac{2\pi}{3}\right)$ (D) $\left(5, -\frac{\pi}{3}\right)$

$\theta \pm 2\pi k$ rotates full circles in the opposite or same direction then r stays the same. $\theta \pm \pi k$ rotates half circles in either direction then r is the opposite.

Any two of these or others $\underbrace{\left(5, \frac{10\pi}{3}\right)}_{\frac{4\pi}{3}+2\pi}, \underbrace{\left(5, -\frac{2\pi}{3}\right)}_{\frac{4\pi}{3}-2\pi}, \underbrace{\left(-5, \frac{\pi}{3}\right)}_{\frac{4\pi}{3}-\pi}$, or $\underbrace{\left(-5, \frac{7\pi}{3}\right)}_{\frac{4\pi}{3}+\pi}$

8. The location of a point in the plane is given by polar coordinates $\left(-2, \frac{\pi}{2}\right)$. Which of the following gives another representation for this point in polar coordinates?

(A) $\left(-2, \frac{3\pi}{2}\right)$ (B) $\left(2, \frac{\pi}{2}\right)$ (C) $\left(2, -\frac{3\pi}{2}\right)$ (D) $\left(2, -\frac{\pi}{2}\right)$

$\underbrace{\left(-2, \frac{5\pi}{2}\right)}_{\frac{\pi}{2}+2\pi}, \underbrace{\left(-2, -\frac{3\pi}{2}\right)}_{\frac{\pi}{2}-2\pi}, \underbrace{\left(2, -\frac{\pi}{2}\right)}_{\frac{\pi}{2}-\pi}$, or $\underbrace{\left(2, \frac{3\pi}{2}\right)}_{\frac{\pi}{2}+\pi}$

9. The location of a point in the plane is given by polar coordinates $\left(-4, \frac{5\pi}{6}\right)$. Which of the following gives another representation for this point in polar coordinates?

(A) $\left(4, \frac{5\pi}{6}\right)$ (B) $\left(4, \frac{7\pi}{6}\right)$ (C) $\left(4, \frac{11\pi}{6}\right)$ (D) $\left(-4, -\frac{5\pi}{6}\right)$

$\underbrace{\left(-4, \frac{17\pi}{6}\right)}_{\frac{5\pi}{6}+2\pi}, \underbrace{\left(-4, -\frac{7\pi}{6}\right)}_{\frac{5\pi}{6}-2\pi}, \underbrace{\left(4, -\frac{\pi}{6}\right)}_{\frac{5\pi}{6}-\pi}$, or $\underbrace{\left(4, \frac{11\pi}{6}\right)}_{\frac{5\pi}{6}+\pi}$

10. The location of point A in polar coordinates (r, θ) is $\left(2, \frac{5\pi}{3}\right)$. Which of the following describes the location of point A in rectangular coordinates (x, y)?

(A) $\left(1, \sqrt{3}\right)$ (B) $\left(-1, \sqrt{3}\right)$ (C) $\left(1, -\sqrt{3}\right)$ (D) $\left(\sqrt{3}, -1\right)$

$x = 2\cos\left(\frac{5\pi}{3}\right) = 2\left(\frac{1}{2}\right) = 1$ $y = 2\sin\left(\frac{5\pi}{3}\right) = 2\left(-\frac{\sqrt{3}}{2}\right) = -\sqrt{3}$

11. The location of point B in polar coordinates (r, θ) is $\left(1, \frac{2\pi}{3}\right)$. Which of the following describes the location of point B in rectangular coordinates (x, y)?

(A) $\left(-\frac{1}{2}, -\frac{\sqrt{3}}{2}\right)$ (B) $\left(\frac{1}{2}, -\frac{\sqrt{3}}{2}\right)$ (C) $\left(-\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$ (D) $\left(-\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$

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

12. The location of point X in polar coordinates (r, θ) is $\left(-4, \frac{\pi}{3}\right)$. Which of the following describes the location of point X in rectangular coordinates (x, y)?

(A) $\left(2, 2\sqrt{3}\right)$ (B) $\left(2\sqrt{3}, 2\right)$ (C) $\left(-2, -2\sqrt{3}\right)$ (D) $\left(2, -2\sqrt{3}\right)$

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

13. The location of point D in polar coordinates (r, θ) is $\left(-1, -\frac{\pi}{6}\right)$. Which of the following describes the location of point D in rectangular coordinates (x, y)?

(A) $\left(\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$ (B) $\left(-\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$ (C) $\left(\frac{\sqrt{3}}{2}, -\frac{1}{2}\right)$ (D) $\left(-\frac{\sqrt{3}}{2}, -\frac{1}{2}\right)$

$x = -\cos\left(-\frac{\pi}{6}\right) = -\frac{\sqrt{3}}{2}$ $y = -\sin\left(-\frac{\pi}{6}\right) = \frac{1}{2}$

14. The location of point X in rectangular coordinates (x, y) is $(3, 0)$. Which of the following describes the location of point X in polar coordinates (r, θ)?

(A) $\left(3, \frac{\pi}{2}\right)$ (B) $(3, \pi)$ (C) $(-3, \pi)$ (D) $(-3, 2\pi)$

$(3)^2 + 0^2 = 9$ $r = \pm 3$ $\tan\frac{0}{3} = 0$ $\theta = 0, \pi$ $(-3, \pi)$

15. The location of point A in rectangular coordinates (x, y) is $\left(-\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$. Which of the following describes the location of point A in polar coordinates (r, θ)?

(A) $\left(1, \frac{\pi}{3}\right)$ (B) $\left(1, \frac{5\pi}{6}\right)$ (C) $\left(1, \frac{2\pi}{3}\right)$ (D) $\left(1, \frac{4\pi}{3}\right)$

$\left(-\frac{1}{2}\right)^2 + \left(\frac{\sqrt{3}}{2}\right)^2 = \frac{1}{4} + \frac{3}{4} = 1$ $r = \pm 1$ $\tan\frac{\sqrt{3}/2}{-1/2} = -\sqrt{3}$ $\theta = \frac{2\pi}{3}$ $\left(1, \frac{2\pi}{3}\right)$

16. The location of point B in rectangular coordinates (x, y) is $\left(-\sqrt{2}, -\sqrt{2}\right)$. Which of the following describes the location of point B in polar coordinates (r, θ)?

(A) $\left(2, \frac{5\pi}{4}\right)$ (B) $\left(2, \frac{7\pi}{4}\right)$ (C) $\left(-2, \frac{5\pi}{4}\right)$ (D) $\left(-2, \frac{7\pi}{4}\right)$

$\left(-\sqrt{2}\right)^2 + \left(-\sqrt{2}\right)^2 = 4$ $r = \pm 2$ $\tan\frac{-\sqrt{2}}{-\sqrt{2}} = 1$ $\theta = \frac{\pi}{4}, \frac{5\pi}{4}$ $\left(2, \frac{5\pi}{4}\right)$

17. A complex number is represented by a point in the complex plane. The complex number has the rectangular coordinates $(2,-2)$. Which of the following is one way to express the complex number using its polar coordinates (r,θ)?

(A) $\left(2\sqrt{2}\cos\left(\frac{\pi}{4}\right)\right)+i\left(2\sqrt{2}\sin\left(\frac{\pi}{4}\right)\right)$

(B) $\left(2\cos\left(\frac{\pi}{4}\right)\right)+i\left(2\sin\left(\frac{\pi}{4}\right)\right)$

(C) $\left(2\sqrt{2}\cos\left(-\frac{\pi}{4}\right)\right)+i\left(2\sqrt{2}\sin\left(-\frac{\pi}{4}\right)\right)$

(D) $\left(2\cos\left(-\frac{\pi}{4}\right)\right)+i\left(2\sin\left(-\frac{\pi}{4}\right)\right)$

$(2)^2+(-2)^2=8 \qquad r=\sqrt{8}=\pm 2\sqrt{2}$

$\tan\frac{-2}{2}=-1 \qquad \theta=-\frac{\pi}{4}$

18. A complex number is represented by a point in the complex plane. The complex number has the rectangular coordinates $\left(-\frac{\sqrt{3}}{2},-\frac{1}{2}\right)$. Which of the following is one way to express the complex number using its polar coordinates (r,θ)?

(A) $\left(\cos\left(\frac{5\pi}{6}\right)\right)+i\left(\sin\left(\frac{5\pi}{6}\right)\right)$

(B) $\left(\cos\left(\frac{7\pi}{6}\right)\right)+i\left(\sin\left(\frac{7\pi}{6}\right)\right)$

(C) $\left(\cos\left(\frac{4\pi}{3}\right)\right)+i\left(\sin\left(\frac{4\pi}{3}\right)\right)$

(D) $\left(4\cos\left(-\frac{\pi}{6}\right)\right)+i\left(4\sin\left(-\frac{\pi}{6}\right)\right)$

$\left(-\frac{\sqrt{3}}{2}\right)^2+\left(-\frac{1}{2}\right)^2=\frac{3}{4}+\frac{1}{4}=1 \qquad r=\pm 1$

$\tan\frac{-1/2}{-\sqrt{3}/2}=\frac{1}{\sqrt{3}} \qquad \theta=\frac{\pi}{6},\frac{7\pi}{6}$

19. A complex number is represented by a point in the complex plane. In polar coordinates, the complex number can be expressed as $\left(2\cos\left(-\frac{\pi}{3}\right)\right)+i\left(2\sin\left(-\frac{\pi}{3}\right)\right)$. Express the complex number using its rectangular coordinates (x,y).

(A) $\left(1,\sqrt{3}\right)$ (B) $\left(1,-\sqrt{3}\right)$ (C) $\left(-\sqrt{3},1\right)$ (D) $\left(2,2\sqrt{3}\right)$

$x=2\cos\left(-\frac{\pi}{3}\right)=2\left(\frac{1}{2}\right)=1 \qquad y=2\sin\left(-\frac{\pi}{3}\right)=2\left(-\frac{\sqrt{3}}{2}\right)=-\sqrt{3} \qquad (1,-\sqrt{3})$

20. A complex number is represented by a point in the complex plane. In polar coordinates, the complex number can be expressed as $\left(10\cos\left(\frac{5\pi}{4}\right)\right)+i\left(10\sin\left(\frac{5\pi}{4}\right)\right)$. Express the complex number using its rectangular coordinates (x,y).

(A) $\left(-5\sqrt{2},-5\sqrt{2}\right)$ (B) $\left(-5\sqrt{2},\ 5\sqrt{2}\right)$ (C) $\left(5\sqrt{2},-5\sqrt{2}\right)$ (D) $\left(5\sqrt{2},\ 5\sqrt{2}\right)$

$x=10\cos\left(\frac{5\pi}{4}\right)=10\left(-\frac{\sqrt{2}}{2}\right)=-5\sqrt{2} \qquad y=10\sin\left(\frac{5\pi}{4}\right)=10\left(-\frac{\sqrt{2}}{2}\right)=-5\sqrt{2} \qquad (-5\sqrt{2},-5\sqrt{2})$