**Topic**: Distance between polar points

**Question**: Calculate the distance between the polar coordinate points.

$$(1,\pi)$$

$$\left(1,\frac{\pi}{3}\right)$$

# **Answer choices**:

A 
$$\sqrt{5}$$

B 
$$\sqrt{3}$$

#### Solution: B

To find the distance between two polar coordinates, we'll use the formula

$$D = \sqrt{r_1^2 + r_2^2 - 2r_1r_2\cos(\theta_1 - \theta_2)}$$

where  $(r_1, \theta_1)$  and  $(r_2, \theta_2)$  are the given polar points. It doesn't matter which point we use for  $(r_1, \theta_1)$  and  $(r_2, \theta_2)$ , but it's easier to make  $\theta_1$  the larger of the two  $\theta$  values, since we subtract  $\theta_2$  from  $\theta_1$ .

We'll set

$$(r_1, \theta_1) = (1, \pi)$$

$$\left(r_2, \theta_2\right) = \left(1, \frac{\pi}{3}\right)$$

Plugging these points into the distance formula, we get

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

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

$$D = \sqrt{2 - 2\left(-\frac{1}{2}\right)}$$

$$D = \sqrt{2+1}$$

$$D = \sqrt{3}$$

**Topic**: Distance between polar points

Question: Calculate the distance between the polar coordinate points.

$$\left(3, \frac{4\pi}{3}\right)$$

$$\left(2, \frac{\pi}{2}\right)$$

$$\left(2,\frac{\pi}{2}\right)$$

### **Answer choices**:

A 
$$\sqrt{13 + 6\sqrt{3}}$$
B 
$$\sqrt{13 - 6\sqrt{3}}$$

B 
$$\sqrt{13 - 6\sqrt{3}}$$

D 
$$\sqrt{19}$$

#### Solution: A

To find the distance between two polar coordinates, we'll use the formula

$$D = \sqrt{r_1^2 + r_2^2 - 2r_1r_2\cos(\theta_1 - \theta_2)}$$

where  $(r_1, \theta_1)$  and  $(r_2, \theta_2)$  are the given polar points. It doesn't matter which point we use for  $(r_1, \theta_1)$  and  $(r_2, \theta_2)$ , but it's easier to make  $\theta_1$  the larger of the two  $\theta$  values, since we subtract  $\theta_2$  from  $\theta_1$ .

We'll set

$$\left(r_1, \theta_1\right) = \left(3, \frac{4\pi}{3}\right)$$

$$\left(r_2, \theta_2\right) = \left(2, \frac{\pi}{2}\right)$$

Plugging these points into the distance formula, we get

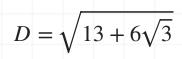
$$D = \sqrt{(3)^2 + (2)^2 - 2(3)(2)\cos\left(\frac{4\pi}{3} - \frac{\pi}{2}\right)}$$

$$D = \sqrt{9 + 4 - 12\cos\left(\frac{8\pi}{6} - \frac{3\pi}{6}\right)}$$

$$D = \sqrt{13 - 12\cos\left(\frac{5\pi}{6}\right)}$$

$$D = \sqrt{13 - 12\left(-\frac{\sqrt{3}}{2}\right)}$$







**Topic**: Distance between polar points

Question: Calculate the distance between the polar coordinate points.

$$\left(5,\frac{\pi}{4}\right)$$

$$\left(5, \frac{\pi}{4}\right)$$

$$\left(3, \frac{3\pi}{2}\right)$$

### **Answer choices:**

A 
$$\sqrt{34-15\sqrt{2}}$$
B  $\sqrt{23\sqrt{2}}$ 
C  $\sqrt{11\sqrt{2}}$ 
D  $\sqrt{34+15\sqrt{2}}$ 

B 
$$\sqrt{23\sqrt{2}}$$

$$C \sim \sqrt{11\sqrt{2}}$$

$$D \qquad \sqrt{34 + 15\sqrt{2}}$$

## Solution: D

To find the distance between two polar coordinates, we'll use the formula

$$D = \sqrt{r_1^2 + r_2^2 - 2r_1r_2\cos(\theta_1 - \theta_2)}$$

where  $(r_1, \theta_1)$  and  $(r_2, \theta_2)$  are the given polar points. It doesn't matter which point we use for  $(r_1, \theta_1)$  and  $(r_2, \theta_2)$ , but it's easier to make  $\theta_1$  the larger of the two  $\theta$  values, since we subtract  $\theta_2$  from  $\theta_1$ .

We'll set

$$\left(r_1, \theta_1\right) = \left(3, \frac{3\pi}{2}\right)$$

$$\left(r_2, \theta_2\right) = \left(5, \frac{\pi}{4}\right)$$

Plugging these points into the distance formula, we get

$$D = \sqrt{(3)^2 + (5)^2 - 2(3)(5)\cos\left(\frac{3\pi}{2} - \frac{\pi}{4}\right)}$$

$$D = \sqrt{9 + 25 - 30\cos\left(\frac{6\pi}{4} - \frac{\pi}{4}\right)}$$

$$D = \sqrt{34 - 30\cos\left(\frac{5\pi}{4}\right)}$$

$$D = \sqrt{34 - 30\left(-\frac{\sqrt{2}}{2}\right)}$$

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