Topic: Angle between a vector and the x-axis

Question: What is the angle between the vector $\mathbf{i} + \mathbf{j}$ and the positive direction of the x-axis?

Answer choices:

A 45°

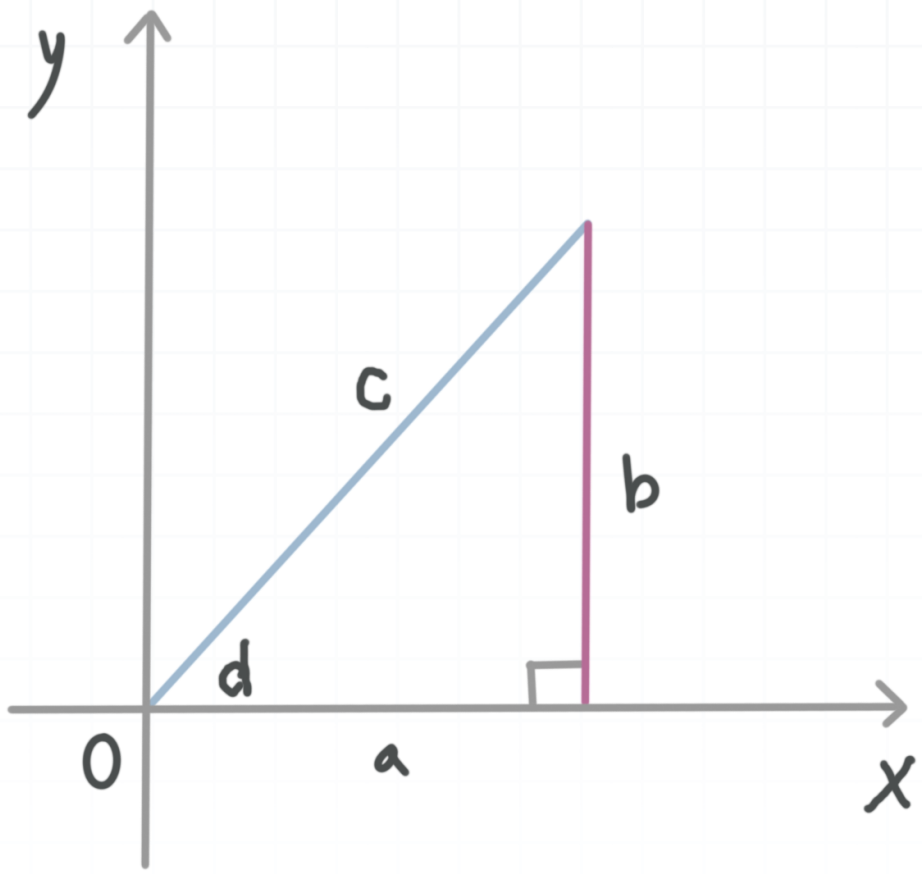
B 135°

C 60°

D 75°

Solution: A

To calculate the angle between a vector $a\mathbf{i} + b\mathbf{j}$ and the positive direction of the x-axis, we start by sketching the vector.



The a represents the coefficient in front of the $\mathbf{i}$ term in the given vector, the b represents the coefficient in front of the $\mathbf{j}$ term in the given vector, the c represents the vector, and the d represents the angle we're trying to solve for. To find the angle, we can use the formula

$$d = \tan^{-1}\left(\frac{b}{a}\right)$$

Remember this formula will give us the answer in radians. You can then use the conversion factor

$$x^\circ = \frac{d \times 180^\circ}{\pi}$$

To solve for the angle between the vector $\mathbf{i} + \mathbf{j}$ and the positive direction of the x-axis, we can see that $a = 1$ and $b = 1$. We can then use the formula for the angle.

$$d = \tan^{-1}\left(\frac{b}{a}\right)$$

$$d = \tan^{-1}\left(\frac{1}{1}\right)$$

$$d = \tan^{-1}(1)$$

$$d = 0.785$$

Now we can convert from radians to degrees using the conversion factor and $d = 0.785$.

$$x^\circ = \frac{d \times 180^\circ}{\pi}$$

$$x^\circ = \frac{(0.785)180^\circ}{\pi}$$

$$x^\circ = 45^\circ$$

The angle between the vector $\mathbf{i} + \mathbf{j}$ and the positive direction of the x-axis is 45°.

Topic: Angle between a vector and the x-axis

Question: What is the angle between the vector $2\mathbf{i} + \mathbf{j}$ and the positive direction of the x-axis?

Answer choices:

A $53.2°$

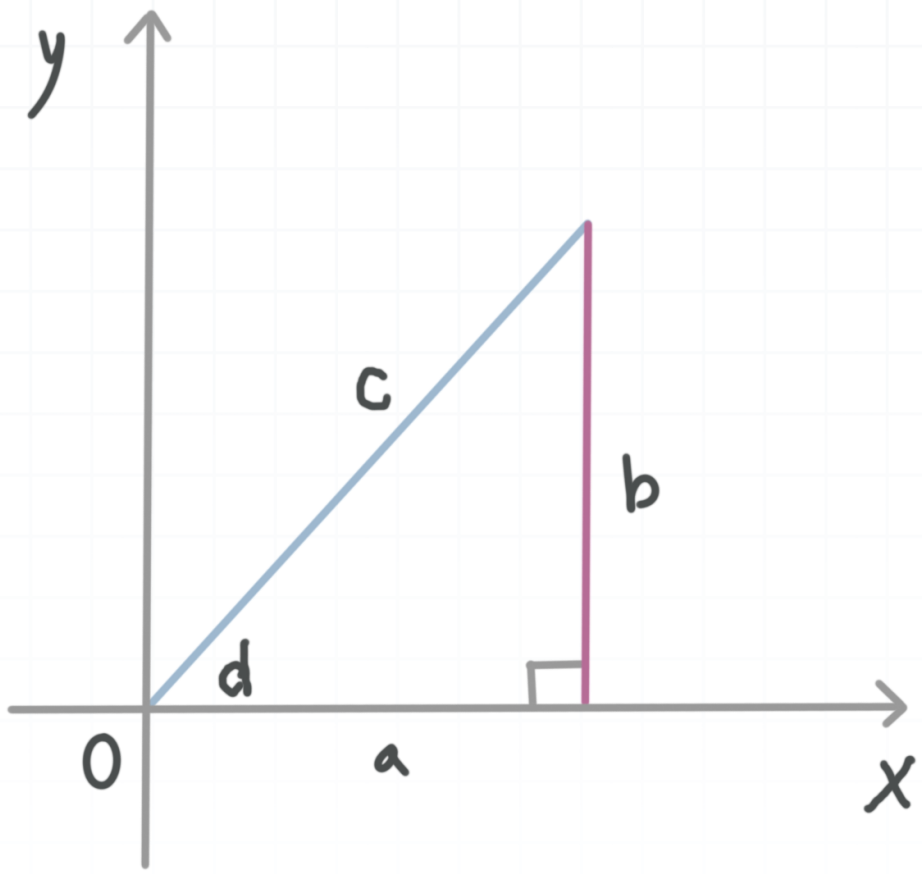
B $116.6°$

C $26.6°$

D $143.2°$

Solution: C

To calculate the angle between a vector $a\mathbf{i} + b\mathbf{j}$ and the positive direction of the x-axis, we start by sketching the vector.



The a represents the coefficient in front of the $\mathbf{i}$ term in the given vector, the b represents the coefficient in front of the $\mathbf{j}$ term in the given vector, the c represents the vector, and the d represents the angle we're trying to solve for. To find the angle, we can use the formula

$$d = \tan^{-1}\left(\frac{b}{a}\right)$$

Remember this formula will give us the answer in radians. You can then use the conversion factor

$$x^\circ = \frac{d \times 180^\circ}{\pi}$$

To solve for the angle between the vector $2\mathbf{i} + \mathbf{j}$ and the positive direction of the x-axis, we can see that $a = 2$ and $b = 1$. We can then use the formula for the angle.

$$d = \tan^{-1}\left(\frac{b}{a}\right)$$

$$d = \tan^{-1}\left(\frac{1}{2}\right)$$

$$d = 0.464$$

Now we can convert from radians to degrees using the conversion factor and $d = 0.464$.

$$x^\circ = \frac{d \times 180^\circ}{\pi}$$

$$x^\circ = \frac{(0.464)180^\circ}{\pi}$$

$$x^\circ = 26.6^\circ$$

The angle between the vector $2\mathbf{i} + \mathbf{j}$ and the positive direction of the x-axis is 26.6°.

Topic: Angle between a vector and the x-axis

Question: What is the angle between the vector $2\mathbf{i} + \sqrt{2}\mathbf{j}$ and the positive direction of the x-axis?

Answer choices:

A $65.2°$

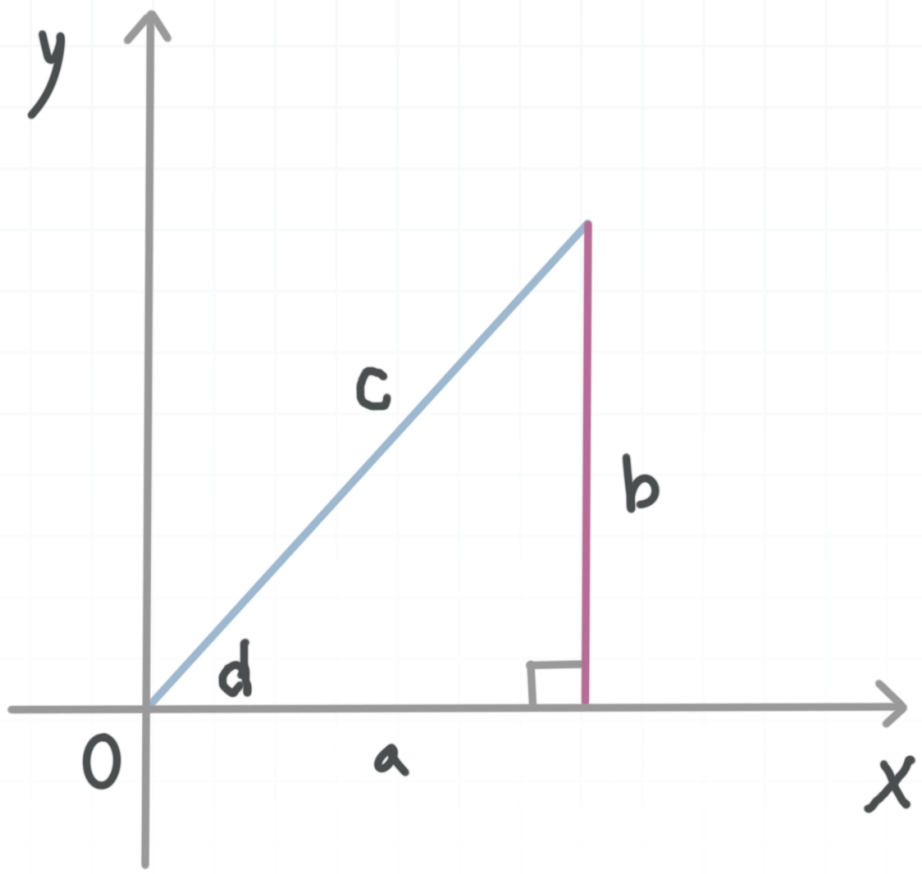
B $35.2°$

C $125.2°$

D $155.2°$

Solution: B

To calculate the angle between a vector $a\mathbf{i} + b\mathbf{j}$ and the positive direction of the x-axis, we start by sketching the vector.



The a represents the coefficient in front of the $\mathbf{i}$ term in the given vector, the b represents the coefficient in front of the $\mathbf{j}$ term in the given vector, the c represents the vector, and the d represents the angle we're trying to solve for. To find the angle, we can use the formula

$$d = \tan^{-1}\left(\frac{b}{a}\right)$$

Remember this formula will give us the answer in radians. You can then use the conversion factor

$$x^\circ = \frac{d \times 180^\circ}{\pi}$$

To solve for the angle between the vector $2\mathbf{i}+\sqrt{2}\mathbf{j}$ and the positive direction of the x-axis, we can see that $a=2$ and $b=\sqrt{2}$. We can then use the formula for the angle.

$$d=\tan^{-1}\left(\frac{b}{a}\right)$$

$$d=\tan^{-1}\left(\frac{\sqrt{2}}{2}\right)$$

$$d=0.615$$

Now we can convert from radians to degrees using the conversion factor and $d=0.615$.

$$x^\circ=\frac{d\times 180^\circ}{\pi}$$

$$x^\circ=\frac{(0.615)180^\circ}{\pi}$$

$$x^\circ=35.2^\circ$$

The angle between the vector $2\mathbf{i}+\sqrt{2}\mathbf{j}$ and the positive direction of the x-axis is 35.2°.