

Topic: Dot products**Question:** Find the dot product.

$$\vec{x} = (5, -1)$$

$$\vec{y} = (3, 2)$$

Answer choices:

A $\vec{x} \cdot \vec{y} = 11$

B $\vec{x} \cdot \vec{y} = 13$

C $\vec{x} \cdot \vec{y} = 9$

D $\vec{x} \cdot \vec{y} = 17$



Solution: B

To find the dot product of two vectors, we multiply corresponding components, then add the products. So the dot product of $\vec{x} = (5, -1)$ and $\vec{y} = (3, 2)$ is

$$\vec{x} \cdot \vec{y} = (5)(3) + (-1)(2)$$

$$\vec{x} \cdot \vec{y} = 15 - 2$$

$$\vec{x} \cdot \vec{y} = 13$$



Topic: Dot products**Question:** Find the dot product.

$$\vec{x} = (-4, 0, 12)$$

$$\vec{y} = (9, -12, 8)$$

Answer choices:

A $\vec{x} \cdot \vec{y} = 48$

B $\vec{x} \cdot \vec{y} = 132$

C $\vec{x} \cdot \vec{y} = 72$

D $\vec{x} \cdot \vec{y} = 60$



Solution: D

To find the dot product of two vectors, we multiply corresponding components, then add the products. So the dot product of $\vec{x} = (-4, 0, 12)$ and $\vec{y} = (9, -12, 8)$ is

$$\vec{x} \cdot \vec{y} = (-4)(9) + (0)(-12) + (12)(8)$$

$$\vec{x} \cdot \vec{y} = -36 + 0 + 96$$

$$\vec{x} \cdot \vec{y} = 60$$



Topic: Dot products

Question: Use the dot product to find $3\vec{x} \cdot (-2\vec{y} - \vec{z})$.

$$\vec{x} = (-4, -2, 7)$$

$$\vec{y} = (6, -1, -10)$$

$$\vec{z} = (3, -2, 0)$$

Answer choices:

A $3\vec{x} \cdot (-2\vec{y} - \vec{z}) = 96$

B $3\vec{x} \cdot (-2\vec{y} - \vec{z}) = 576$

C $3\vec{x} \cdot (-2\vec{y} - \vec{z}) = -92$

D $3\vec{x} \cdot (-2\vec{y} - \vec{z}) = -434$



Solution: B

To simplify $3\vec{x} \cdot (-2\vec{y} - \vec{z})$, start by finding $3\vec{x}$,

$$\vec{x} = (-4, -2, 7)$$

$$3\vec{x} = 3(-4, -2, 7)$$

$$3\vec{x} = (-12, -6, 21)$$

and $-2\vec{y}$.

$$\vec{y} = (6, -1, -10)$$

$$-2\vec{y} = -2(6, -1, -10)$$

$$-2\vec{y} = (-12, 2, 20)$$

Then the difference $-2\vec{y} - \vec{z}$ is

$$-2\vec{y} - \vec{z} = \begin{bmatrix} -12 \\ 2 \\ 20 \end{bmatrix} - \begin{bmatrix} 3 \\ -2 \\ 0 \end{bmatrix}$$

$$-2\vec{y} - \vec{z} = \begin{bmatrix} -12 - 3 \\ 2 - (-2) \\ 20 - 0 \end{bmatrix}$$

$$-2\vec{y} - \vec{z} = \begin{bmatrix} -15 \\ 4 \\ 20 \end{bmatrix}$$

The dot product is then

$$3\vec{x} \cdot (-2\vec{y} - \vec{z})$$



$$[-12 \quad -6 \quad 21] \cdot \begin{bmatrix} -15 \\ 4 \\ 20 \end{bmatrix}$$

$$-12(-15) - 6(4) + 21(20)$$

$$180 - 24 + 420$$

$$576$$

