

Topic: Scalar multiplication

Question: Use scalar multiplication to simplify the expression.

$$4 \begin{bmatrix} 5 & 2 & 1 \\ -2 & 4 & 7 \end{bmatrix}$$

Answer choices:

A $\begin{bmatrix} 9 & 6 & 5 \\ 2 & 8 & 11 \end{bmatrix}$

B $\begin{bmatrix} 20 & 8 & 4 \\ -2 & 4 & 7 \end{bmatrix}$

C $\begin{bmatrix} 5 & 2 & 1 \\ -8 & 16 & 28 \end{bmatrix}$

D $\begin{bmatrix} 20 & 8 & 4 \\ -8 & 16 & 28 \end{bmatrix}$



Solution: D

In this problem, 4 is the scalar. We distribute the scalar across every entry in the matrix, and the result of the scalar multiplication is

$$4 \begin{bmatrix} 5 & 2 & 1 \\ -2 & 4 & 7 \end{bmatrix}$$

$$\begin{bmatrix} 4(5) & 4(2) & 4(1) \\ 4(-2) & 4(4) & 4(7) \end{bmatrix}$$

$$\begin{bmatrix} 20 & 8 & 4 \\ -8 & 16 & 28 \end{bmatrix}$$



Topic: Scalar multiplication**Question:** Solve for X .

$$3 \begin{bmatrix} 7 & 1 \\ 8 & 3 \end{bmatrix} + X = -4 \begin{bmatrix} 0 & -5 \\ -2 & 3 \end{bmatrix}$$

Answer choices:

A $X = \begin{bmatrix} -21 & 17 \\ -16 & -21 \end{bmatrix}$

B $X = \begin{bmatrix} 21 & 23 \\ 32 & -3 \end{bmatrix}$

C $X = \begin{bmatrix} 21 & -17 \\ 16 & 21 \end{bmatrix}$

D $X = \begin{bmatrix} -21 & -23 \\ -32 & 3 \end{bmatrix}$



Solution: A

Apply the scalars to the matrices.

$$\begin{bmatrix} 3(7) & 3(1) \\ 3(8) & 3(3) \end{bmatrix} + X = \begin{bmatrix} -4(0) & -4(-5) \\ -4(-2) & -4(3) \end{bmatrix}$$

$$\begin{bmatrix} 21 & 3 \\ 24 & 9 \end{bmatrix} + X = \begin{bmatrix} 0 & 20 \\ 8 & -12 \end{bmatrix}$$

Subtract the matrix on the left from both sides of the equation in order to isolate X .

$$X = \begin{bmatrix} 0 & 20 \\ 8 & -12 \end{bmatrix} - \begin{bmatrix} 21 & 3 \\ 24 & 9 \end{bmatrix}$$

$$X = \begin{bmatrix} 0 - 21 & 20 - 3 \\ 8 - 24 & -12 - 9 \end{bmatrix}$$

$$X = \begin{bmatrix} -21 & 17 \\ -16 & -21 \end{bmatrix}$$



Topic: Scalar multiplication**Question:** Use scalar multiplication to find $-(1/2)A + 3B$.

$$A = \begin{bmatrix} 4 & -2 & 0 \\ -8 & 10 & -5 \end{bmatrix}$$

$$B = \begin{bmatrix} -1 & 0 & -3 \\ 5 & -5 & 0 \end{bmatrix}$$

Answer choices:

A $\begin{bmatrix} -5 & -1 & -9 \\ 11 & -20 & \frac{5}{2} \end{bmatrix}$

B $\begin{bmatrix} -5 & 1 & -9 \\ 11 & -20 & \frac{5}{2} \end{bmatrix}$

C $\begin{bmatrix} -5 & 1 & -9 \\ 19 & -20 & \frac{5}{2} \end{bmatrix}$

D $\begin{bmatrix} 1 & 4 & -6 \\ 19 & 10 & 2 \end{bmatrix}$



Solution: C

Substitute the matrices into the expression.

$$-\frac{1}{2}A + 3B$$

$$-\frac{1}{2} \begin{bmatrix} 4 & -2 & 0 \\ -8 & 10 & -5 \end{bmatrix} + 3 \begin{bmatrix} -1 & 0 & -3 \\ 5 & -5 & 0 \end{bmatrix}$$

Apply the scalars to the matrices.

$$\begin{bmatrix} -\frac{1}{2}(4) & -\frac{1}{2}(-2) & -\frac{1}{2}(0) \\ -\frac{1}{2}(-8) & -\frac{1}{2}(10) & -\frac{1}{2}(-5) \end{bmatrix} + \begin{bmatrix} 3(-1) & 3(0) & 3(-3) \\ 3(5) & 3(-5) & 3(0) \end{bmatrix}$$

$$\begin{bmatrix} -2 & 1 & 0 \\ 4 & -5 & \frac{5}{2} \end{bmatrix} + \begin{bmatrix} -3 & 0 & -9 \\ 15 & -15 & 0 \end{bmatrix}$$

Add the matrices.

$$\begin{bmatrix} (-2) + (-3) & 1 + 0 & 0 + (-9) \\ 4 + 15 & -5 + (-15) & \frac{5}{2} + 0 \end{bmatrix}$$

$$\begin{bmatrix} -5 & 1 & -9 \\ 19 & -20 & \frac{5}{2} \end{bmatrix}$$

