Topic: Matrix multiplication

Question: Find the product of matrices A and B.

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

$$B = \begin{bmatrix} 9 & 1 \\ 6 & -1 \end{bmatrix}$$

Answer choices:

A $A \cdot B = \begin{bmatrix} 43 & 3 \\ -5 & 6 \end{bmatrix}$

B $A \cdot B = \begin{bmatrix} 0 & -14 \\ 23 & 4 \end{bmatrix}$

C $A \cdot B = \begin{bmatrix} 57 & 3 \\ -12 & 2 \end{bmatrix}$

D $A \cdot B = \begin{bmatrix} 9 & 6 \\ 23 & -8 \end{bmatrix}$

Solution: C

Multiply matrix A by matrix B.

$$A \cdot B = \begin{bmatrix} 5 & 2 \\ 0 & -2 \end{bmatrix} \cdot \begin{bmatrix} 9 & 1 \\ 6 & -1 \end{bmatrix}$$

$$A \cdot B = \begin{bmatrix} 5(9) + 2(6) & 5(1) + 2(-1) \\ 0(9) + (-2)(6) & 0(1) + (-2)(-1) \end{bmatrix}$$

$$A \cdot B = \begin{bmatrix} 57 & 3 \\ -12 & 2 \end{bmatrix}$$

Topic: Matrix multiplication

Question: Find the product of matrices A and B.

$$A = \begin{bmatrix} 7 & 2 & -4 \\ -5 & 10 & 3 \end{bmatrix}$$

$$B = \begin{bmatrix} 7 & 1 \\ 7 & 2 \\ -2 & 6 \end{bmatrix}$$

Answer choices:

A $A \cdot B = \begin{bmatrix} 71 & -13 \\ 29 & 33 \end{bmatrix}$

B $A \cdot B = \begin{bmatrix} 45 & -30 \\ -16 & 52 \end{bmatrix}$

C $A \cdot B = \begin{bmatrix} -41 & 56 \\ 29 & -16 \end{bmatrix}$

D $A \cdot B = \begin{bmatrix} 43 & 33 \\ 82 & 19 \end{bmatrix}$

Solution: A

Multiply matrix A by matrix B.

$$A \cdot B = \begin{bmatrix} 7 & 2 & -4 \\ -5 & 10 & 3 \end{bmatrix} \cdot \begin{bmatrix} 7 & 1 \\ 7 & 2 \\ -2 & 6 \end{bmatrix}$$

$$A \cdot B = \begin{bmatrix} 7(7) + 2(7) + (-4)(-2) & 7(1) + 2(2) + (-4)(6) \\ (-5)(7) + 10(7) + 3(-2) & (-5)(1) + 10(2) + 3(6) \end{bmatrix}$$

$$A \cdot B = \begin{bmatrix} 71 & -13 \\ 29 & 33 \end{bmatrix}$$

Topic: Matrix multiplication

Question: Use the distributive property to find $A(B+C)$.

$$A = \begin{bmatrix} 3 & -1 \\ 1 & 4 \end{bmatrix}$$

$$B = \begin{bmatrix} 5 & 2 \\ -2 & 3 \end{bmatrix}$$

$$C = \begin{bmatrix} 2 & 0 \\ 6 & 2 \end{bmatrix}$$

Answer choices:

A $A(B+C) = \begin{bmatrix} -2 & 15 \\ 3 & 32 \end{bmatrix}$

B $A(B+C) = \begin{bmatrix} 17 & 1 \\ 23 & 22 \end{bmatrix}$

C $A(B+C) = \begin{bmatrix} 3 & -14 \\ 27 & 1 \end{bmatrix}$

D $A(B+C) = \begin{bmatrix} 8 & 9 \\ -14 & 17 \end{bmatrix}$

Solution: B

Applying the distributive property to the initial expression, we get

$$A(B+C) = AB + AC$$

Now use matrix multiplication.

$$AB + AC = \begin{bmatrix} 3 & -1 \\ 1 & 4 \end{bmatrix} \cdot \begin{bmatrix} 5 & 2 \\ -2 & 3 \end{bmatrix} + \begin{bmatrix} 3 & -1 \\ 1 & 4 \end{bmatrix} \begin{bmatrix} 2 & 0 \\ 6 & 2 \end{bmatrix}$$

$$AB + AC = \begin{bmatrix} 3(5)+(-1)(-2) & 3(2)+(-1)(3) \\ 1(5)+4(-2) & 1(2)+4(3) \end{bmatrix} + \begin{bmatrix} 3(2)+(-1)(6) & 3(0)+(-1)(2) \\ 1(2)+4(6) & 1(0)+4(2) \end{bmatrix}$$

$$AB + AC = \begin{bmatrix} 17 & 3 \\ -3 & 14 \end{bmatrix} + \begin{bmatrix} 0 & -2 \\ 26 & 8 \end{bmatrix}$$

Adding the matrices gives

$$AB + AC = \begin{bmatrix} 17+0 & 3+(-2) \\ -3+26 & 14+8 \end{bmatrix}$$

$$AB + AC = \begin{bmatrix} 17 & 1 \\ 23 & 22 \end{bmatrix}$$

So the value of the original expression is

$$A(B+C) = \begin{bmatrix} 17 & 1 \\ 23 & 22 \end{bmatrix}$$