ACT Matrix Practice

Use these matrices to solve problems 1-3 below:

$$A = \begin{pmatrix} 1 & 0 \\ 2 & -1 \end{pmatrix} \quad B = \begin{pmatrix} 0 & 2 \\ 1 & 1 \end{pmatrix} \quad C = \begin{pmatrix} 1 & 2 & -1 \\ 2 & 0 & 1 \end{pmatrix}$$

1. The sum of **A** and **B** is:

(A) $\begin{pmatrix} 1 & -2 \\ 1 & -2 \end{pmatrix}$

(B) $\begin{pmatrix} -1 & 2 \\ -1 & -2 \end{pmatrix}$

(C) $\begin{pmatrix} 1 & 2 \\ 3 & 0 \end{pmatrix}$

(D) $\begin{pmatrix} 3 & 0 \\ 3 & 0 \end{pmatrix}$

(E) Cannot be determined

2. The value of $\mathbf{B} - 2\mathbf{A}$ is:

(A) $\begin{pmatrix} 0 & 2 \\ -3 & 0 \end{pmatrix}$

(B) $\begin{pmatrix} -2 & 2 \\ -3 & 3 \end{pmatrix}$

(C) $\begin{pmatrix} -1 & 2 \\ -1 & -2 \end{pmatrix}$

(D) $\begin{pmatrix} 1 & 2 \\ 3 & 0 \end{pmatrix}$

(E) Cannot be determined

3. The value of $\mathbf{A} + \mathbf{C}$ is:

(A) $\begin{pmatrix} 2 & 2 & -1 \\ 4 & -1 & 1 \end{pmatrix}$

(B) $\begin{pmatrix} 1 & 4 & -1 \\ 3 & 1 & 1 \end{pmatrix}$

(C) $\begin{pmatrix} 1 & 3 & -1 \\ 2 & 2 & 0 \end{pmatrix}$

(D) $\begin{pmatrix} 1 & 2 & 1 \\ 2 & 1 & 2 \end{pmatrix}$

(E) Cannot be determined

4. If $A = \begin{bmatrix} 2 & -4 \\ 6 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} -2 & 4 \\ -6 & 0 \end{bmatrix}$, then $A - B = ?$

A. $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$

B. $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

C. $\begin{bmatrix} 0 & -8 \\ 0 & 0 \end{bmatrix}$

D. $\begin{bmatrix} -4 & 0 \\ -12 & 0 \end{bmatrix}$

E. $\begin{bmatrix} 4 & -8 \\ 12 & 0 \end{bmatrix}$

5. Given that $a\begin{bmatrix} 2 & 6 \\ 1 & 4 \end{bmatrix} = \begin{bmatrix} x & 27 \\ y & z \end{bmatrix}$ for some real number a, what is $x + z$?

A. $\frac{4}{3}$

B. $\frac{27}{2}$

C. 26

D. 27

E. 48

6. Daisun owns 2 sportswear stores (X and Y). She stocks 3 brands of T-shirts (A, B, and C) in each store. The matrices below show the numbers of each type of T-shirt in each store and the cost for each type of T-shirt. The value of Daisun's T-shirt inventory is computed using the costs listed. What is the total value of the T-shirt inventory for Daisun's 2 stores?

$$\begin{array}{c} \\ X \\ Y \end{array} \begin{array}{c} \begin{array}{ccc} A & B & C \end{array} \\ \begin{bmatrix} 100 & 200 & 150 \\ 120 & 50 & 100 \end{bmatrix} \end{array} \qquad \begin{array}{c} \\ A \\ B \\ C \end{array} \begin{array}{c} \text{Cost} \\ \begin{bmatrix} \$\ 5 \\ \$10 \\ \$15 \end{bmatrix} \end{array}$$

A. \$2,200
B. \$2,220
C. \$4,965
D. \$5,450
E. \$7,350

7. The *determinant* of a matrix $\begin{bmatrix} a & b \\ c & d \end{bmatrix}$ equals $ad - cb$.

What must be the value of x for the matrix $\begin{bmatrix} x & 8 \\ x & x \end{bmatrix}$ to have a determinant of -16 ?

A. -4

B. -2

C. $-\frac{8}{5}$

D. $\frac{8}{3}$

E. 4

8. If $A = \begin{bmatrix} -1 & 2 \\ 4 & 9 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & -8 \\ 1 & 1 \end{bmatrix}$ such that $A - B = \begin{bmatrix} x & y \\ z & w \end{bmatrix}$, what is the value of z?

(A) -1

(B) 0

(C) 3

(D) 4

(E) 5

9. What is the matrix product $\begin{bmatrix} a \\ 2a \\ 3a \end{bmatrix} \begin{bmatrix} 1 & 0 & -1 \end{bmatrix}$?

F. $\begin{bmatrix} a & 0 & -a \\ 2a & 0 & -2a \\ 3a & 0 & -3a \end{bmatrix}$

G. $\begin{bmatrix} a & 2a & 3a \\ 0 & 0 & 0 \\ -a & -2a & -3a \end{bmatrix}$

H. $\begin{bmatrix} 2a & 0 & -2a \end{bmatrix}$

J. $\begin{bmatrix} 6a & 0 & -6a \end{bmatrix}$

K. $\begin{bmatrix} 0 \end{bmatrix}$

10. What is the sum of x and y?

$$\begin{bmatrix} 16 & 3 \end{bmatrix} - \begin{bmatrix} 2 & -4 \end{bmatrix} = \begin{bmatrix} x & y \end{bmatrix}$$