

Warm-up: SAT Workbook: 4.2: 1, 2, 3, 7

Simplify.

1. $2 \times 5 + 6 \times (-8)$ 2. $(6 + 4)(10 - 3)$ 3. $-4(3x - 8)$

4. $\frac{1}{2}\left(\frac{3}{4}x + \frac{2}{5}\right)$

5. $3.2(6.1x - 4.7)$

FCAT:

Jeff and Sam each bought paper, ink cartridges, and computer disks. The first matrix shows the number of each item Jeff and Sam bought. The second matrix shows the cost of each item. What is the total cost of all items bought by Jeff and Sam? Show your work.

	Paper	Ink Cartridges	Computer Disks		Cost
Jeff	4	3	2	Paper	\$4.50
Sam	5	5	2	Ink Cartridges	\$5.75
				Computer Disks	\$4.50



1. **Multiple Choice** If A is a 4×5 matrix and B is a 5×4 matrix, what are the dimensions of BA ?

- (A) 4×4
- (B) 5×5
- (C) 4×5
- (D) 5×4
- (E) BA is not defined

2. Multiple Choice If A is a 1×3 matrix and B is a 3×1 matrix, what are the dimensions of AB ?

- (A) 1×1 (B) 3×3
 (C) 1×3 (D) 3×1
 (E) AB is not defined

3. Multiple Choice What is the product of

$$\begin{bmatrix} -2 & 3 \\ 1 & -4 \end{bmatrix} \text{ and } \begin{bmatrix} 0 & 2 \\ 3 & -6 \end{bmatrix}?$$

- (A) $\begin{bmatrix} 6 & -8 \\ -24 & 27 \end{bmatrix}$ (B) $\begin{bmatrix} 8 & -12 \\ 2 & 26 \end{bmatrix}$
 (C) $\begin{bmatrix} 2 & -8 \\ -12 & 33 \end{bmatrix}$ (D) $\begin{bmatrix} 9 & -22 \\ -12 & 26 \end{bmatrix}$
 (E) $\begin{bmatrix} 9 & 22 \\ 12 & -26 \end{bmatrix}$

7. Multiple Choice What is $A(B + C)$ if

$$A = \begin{bmatrix} 3 & -2 \\ -6 & -1 \end{bmatrix}, B = \begin{bmatrix} -1 \\ 0 \end{bmatrix} \text{ and } C = \begin{bmatrix} 5 \\ 2 \end{bmatrix}?$$

A $\begin{bmatrix} -8 \\ 26 \end{bmatrix}$

B $\begin{bmatrix} 4 \\ -14 \end{bmatrix}$

C $\begin{bmatrix} 8 \\ 26 \end{bmatrix}$

D $\begin{bmatrix} -4 \\ 14 \end{bmatrix}$

E $\begin{bmatrix} 8 \\ -26 \end{bmatrix}$

Answers: 3M.2 17-33 odd, 37-39

17. [2] 19. $\begin{bmatrix} 4 & 11 \\ 12 & 3 \end{bmatrix}$

21. Not defined; the number of columns in the left matrix (3) does not equal the number of rows in the right matrix (2).

23. $\begin{bmatrix} -1.3 \\ 0.9 \end{bmatrix}$

26. $\begin{bmatrix} 3 & 12 & 6 \\ 25 & -73 & 18 \\ -7 & 59 & -14 \end{bmatrix}$

27. $\begin{bmatrix} 16 & -16 \\ 16 & -8 \end{bmatrix}$

29. $\begin{bmatrix} 8 & -5 & 8 \\ -1 & 1 & 1 \\ 7 & -30 & -35 \end{bmatrix}$

31. $\begin{bmatrix} 0 & -30 \\ 12 & -51 \end{bmatrix}$

33. $x = 2, y = 8$

37. Matrix B $\begin{bmatrix} 6 \\ 5 \\ 4 \end{bmatrix}$

38. $\begin{bmatrix} 59 \\ 60 \\ 62 \end{bmatrix}$

39. Team 3; 62 points

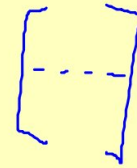
Associated with each square matrix is a real number called its **determinant**.
The determinant of a matrix A is denoted by $\det A$ or by $|A|$

If $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$ then $\det A = |A| = \begin{vmatrix} a & b \\ c & d \end{vmatrix} = ad - bc$

Find $\begin{vmatrix} 7 & 2 \\ 2 & 3 \end{vmatrix} = 21 - 4 = 17$

Find $\begin{vmatrix} 4 & 3 & 1 & 4 & 3 \\ 5 & -7 & 0 & 5 & -7 \\ 1 & -2 & 2 & 1 & -2 \end{vmatrix} = -56 + 0 + -10 - (30 + 0 + -7) = -66 - 23 = -89$

2x3 3x1



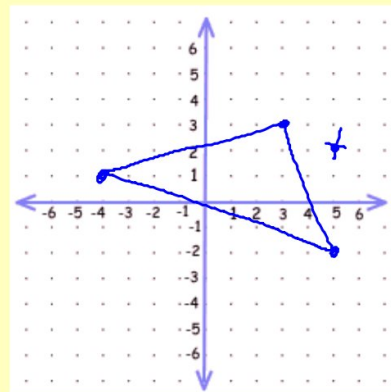
The area of a triangle with vertices (x_1, y_1) , (x_2, y_2) , and (x_3, y_3) is given by

$$\text{Area} = \pm \frac{1}{2} \begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix}$$

where the symbol \pm indicates that the appropriate sign should be chosen to yield a positive value.

Find the area of a triangle with vertices $(5, -2)$, $(3, 3)$, and $(-4, 1)$

$$\text{Area} = \pm \frac{1}{2} \begin{vmatrix} 5 & -2 & 1 \\ 3 & 3 & 1 \\ -4 & 1 & 1 \end{vmatrix}$$



2 × 2 DETERMINANTS Evaluate the determinant of the matrix.

13. $\begin{bmatrix} 8 & 0 \\ -1 & 3 \end{bmatrix}$

17. $\begin{bmatrix} 1 & 8 \\ 5 & 9 \end{bmatrix}$

3 × 3 DETERMINANTS Evaluate the determinant of the matrix.

21. $\begin{bmatrix} 12 & 4 & -1 \\ -2 & 3 & 2 \\ 5 & 8 & 1 \end{bmatrix}$

25. $\begin{bmatrix} -4 & 0 & -1 \\ 0 & 8 & 9 \\ 0 & 5 & 2 \end{bmatrix}$

29. $\begin{bmatrix} 15 & 4 & -10 \\ -10 & 0 & 6 \\ -8 & 2 & -14 \end{bmatrix}$

AREA OF A TRIANGLE Find the area of the triangle with the given vertices.

33. $A(-4, 2), B(3, -1), C(-2, -2)$

35. $A(1, 3), B(-2, 6), C(-1, 1)$

Perform the indicated operation(s).

2. $\begin{bmatrix} -8 & 0 \\ 5 & -2 \end{bmatrix} - \begin{bmatrix} -3 & 7 \\ 5 & -1 \end{bmatrix}$


4. $\begin{bmatrix} 4 & -6 & 10 \\ 3 & 6 & 0 \\ 9 & -4 & 5 \end{bmatrix} - 4 \begin{bmatrix} 2 & -1 & -3 \\ 0 & 6 & -5 \\ -2 & 0 & 1 \end{bmatrix}$

6. $\begin{bmatrix} 2 & -1 & 3 \\ 2 & 4 & 0 \end{bmatrix} \begin{bmatrix} 1 & 0 \\ 9 & -3 \\ 4 & -6 \end{bmatrix}$

Evaluate the determinant of the matrix.

8. $\begin{bmatrix} 9 & -3 \\ 6 & -2 \end{bmatrix}$

10. $\begin{bmatrix} 12 & 5 & -6 \\ 2 & 2 & 3 \\ 1 & 0 & -3 \end{bmatrix}$

17.  **GARDENING** You are planning to turn a triangular region of your yard into a garden. The vertices of the triangle are $(0, 0)$, $(5, 2)$, and $(3, 6)$ where the coordinates are measured in feet. Find the area of the triangular region. (Lesson 4.3)

$$13. 24 - 0 = 24$$

$$17. 9 - 40 = -31$$

$$21. (36 + 40 + 16) - (-15 + 192 - 8) = 92 - 169 = -77$$

$$25. (-64 + 0 + 0) - (0 - 180 + 0) = -64 + 180 = 116$$

$$29. (0 - 192 + 200) - (0 + 180 + 560) = 8 - 740 = -732$$

$$\begin{aligned} 33. A &= \pm \frac{1}{2} \begin{vmatrix} -4 & 2 & 1 \\ 3 & -1 & 1 \\ -2 & -2 & 1 \end{vmatrix} \\ &= \pm \frac{1}{2} [(4 - 4 - 6) - (2 + 8 + 6)] \\ &= \pm \frac{1}{2} (-6 - 16) = 11 \end{aligned}$$

$$\begin{aligned} 35. A &= \pm \frac{1}{2} \begin{vmatrix} 1 & 3 & 1 \\ -2 & 6 & 1 \\ -1 & 1 & 1 \end{vmatrix} \\ &= \pm \frac{1}{2} [(6 - 3 - 2) - (-6 + 1 - 6)] \\ &= \pm \frac{1}{2} [1 + 11] = 6 \end{aligned}$$

$$2. \begin{bmatrix} -5 & -7 \\ 0 & -1 \end{bmatrix}$$

$$4. \begin{bmatrix} 4 & -6 & 10 \\ 3 & 6 & 0 \\ 9 & -4 & 5 \end{bmatrix} + \begin{bmatrix} -8 & 4 & 12 \\ 0 & -24 & 20 \\ 8 & 0 & -4 \end{bmatrix} = \begin{bmatrix} -4 & -2 & 22 \\ 3 & -18 & 20 \\ 17 & -4 & 1 \end{bmatrix}$$

$$\begin{aligned} 6. & \begin{bmatrix} 2(1) - 1(9) + 3(4) & 2(0) - 1(-3) + 3(-6) \\ 2(1) + 4(9) + 0(4) & 2(0) + 4(-3) + 0(-6) \end{bmatrix} = \\ & \begin{bmatrix} 5 & -15 \\ 38 & -12 \end{bmatrix} \end{aligned}$$

$$8. -18 + 18 = 0$$

3M.3 - 7

$$10. (-72 + 15 + 0) - (-12 + 0 - 30) = -57 + 42 \\ = -15$$

$$17. A = \pm \frac{1}{2} \begin{vmatrix} 0 & 0 & 1 \\ 5 & 2 & 1 \\ 3 & 6 & 1 \end{vmatrix} \\ = \pm \frac{1}{2} [(0 + 0 + 30) - (6 + 0 + 0)] \\ = \pm \frac{1}{2} (30 - 6) = \pm \frac{1}{2} (24) = 12 \text{ ft}^2$$