

## Matrices

$$1) 3 \begin{pmatrix} -3 & 2 \\ 0 & 5 \end{pmatrix} - \begin{pmatrix} 6 & -4 \\ 3 & -2 \end{pmatrix} = 3 \begin{pmatrix} -9 & 6 \\ -3 & 7 \end{pmatrix} = \begin{pmatrix} -27 & 18 \\ -9 & 21 \end{pmatrix} \checkmark$$

$$2) |D| = (-10 + -32 + 0) - (0 + -6 + -24) \\ = (-42) - (-30) = \boxed{-12} \checkmark$$

$$3) -\frac{1}{2}(ED) = -\frac{1}{2} \left( \begin{pmatrix} 1 & 6 & -3 \\ 2 & -4 & -1 \end{pmatrix} \cdot \begin{pmatrix} -1 & 4 & 0 \\ 3 & -5 & 2 \\ -4 & 3 & -2 \end{pmatrix} \right) \\ = -\frac{1}{2} \begin{pmatrix} 29 & -35 & 18 \\ -10 & 25 & -6 \end{pmatrix} = \begin{pmatrix} -29/2 & 35/2 & -9 \\ 5 & -25/2 & 3 \end{pmatrix} \checkmark$$

$$4) C^{-1} = \frac{1}{0} \begin{pmatrix} -2 & 4 \\ -3 & 6 \end{pmatrix} \text{ not possible! } \checkmark$$

$$5) B^2 = \begin{pmatrix} 2 & -3 \\ 4 & -1 \end{pmatrix} \cdot \begin{pmatrix} 2 & -3 \\ 4 & -1 \end{pmatrix} = \begin{pmatrix} -8 & -3 \\ 4 & -11 \end{pmatrix} \checkmark$$

$$6) |B| = -2 - (-12) = \boxed{10} \checkmark$$

$$7) 2A - 3B + C = \begin{pmatrix} -6 & 4 \\ 0 & 10 \end{pmatrix} + \begin{pmatrix} -6 & 9 \\ -12 & 3 \end{pmatrix} + \begin{pmatrix} 6 & -4 \\ 3 & -2 \end{pmatrix} = \begin{pmatrix} -6 & 9 \\ -9 & 11 \end{pmatrix} \checkmark$$

$$8) \begin{vmatrix} 3 & 4 & 1 \\ -2 & 3 & 0 \\ 1 & 2 & 0 \end{vmatrix} = -1 \begin{vmatrix} -2 & 3 \\ 1 & 2 \end{vmatrix} = -1(-4-3) = -1(-7) = \boxed{7} \checkmark$$

$$9) -30 - (-7x^2) = -2$$

$$-30 + 7x^2 = -2$$

$$7x^2 = 28$$

$$x^2 = 4$$

$$\boxed{x = \pm 2} \checkmark$$

$$10) 2x + 4 + 5 = 7$$

$$2x + 9 = 7$$

$$2x = -2$$

$$\boxed{x = -1} \checkmark$$

$$2y - 6 - 4 = 1$$

$$2y - 10 = 1$$

$$2y = 11$$

$$\boxed{y = 11/2} \checkmark$$

$$11) \begin{bmatrix} 2 & 4 \\ 3 & -7 \end{bmatrix} \cdot \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} -5 \\ 4 \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \frac{1}{-26} \begin{bmatrix} -7 & -4 \\ -3 & 2 \end{bmatrix} \cdot \begin{bmatrix} -5 \\ 4 \end{bmatrix}$$

$$= \frac{1}{-26} \begin{bmatrix} 19 \\ 23 \end{bmatrix} = \left( -\frac{19}{26}, -\frac{23}{26} \right) \checkmark$$

$$12) 2x - 35 = 10$$

$$\longrightarrow 2x = 45$$

$$5y = -5$$

$$6 + 5y = 1$$

$$\boxed{x = \frac{45}{2}} \checkmark$$

$$\boxed{y = -1} \checkmark$$

$$13) \begin{bmatrix} 3 & -1 \\ 0 & 2 \end{bmatrix} \cdot \begin{bmatrix} 1 & 6 \\ 2 & -1 \end{bmatrix} = \begin{bmatrix} 1 & 19 \\ 4 & -2 \end{bmatrix} \checkmark$$

$$14) \begin{bmatrix} 1 & 5 & -4 \\ 6 & 0 & -1 \end{bmatrix} \begin{bmatrix} 2 & -1 \\ 3 & -3 \\ 1 & 1 \end{bmatrix} = \begin{bmatrix} 13 & -20 \\ 11 & -7 \end{bmatrix} \checkmark$$

$$15) a) \frac{1}{10} \begin{bmatrix} -2 & 4 \\ -4 & 3 \end{bmatrix} = \begin{bmatrix} -\frac{1}{5} & \frac{2}{5} \\ -\frac{2}{5} & \frac{3}{10} \end{bmatrix} \checkmark$$

$$b) \frac{1}{0} \begin{bmatrix} \quad \\ \quad \end{bmatrix}$$

↑ not possible.

16) Square matrix ✓

$$17) \underbrace{A_{2 \times 3} \cdot B_{3 \times 1}} = C_{2 \times 1} \checkmark$$

18)  $l = \text{length}$   
 $w = \text{width}$

$$2l + 2w = 86$$

$$2w = l + 2 \rightarrow -l + 2w = 2$$

$$\begin{bmatrix} 2 & 2 \\ -1 & 2 \end{bmatrix} \cdot \begin{bmatrix} l \\ w \end{bmatrix} = \begin{bmatrix} 86 \\ 2 \end{bmatrix}$$

$$\begin{bmatrix} l \\ w \end{bmatrix} = \frac{1}{6} \begin{bmatrix} 2 & -2 \\ 1 & 2 \end{bmatrix} \cdot \begin{bmatrix} 86 \\ 2 \end{bmatrix} = \frac{1}{6} \begin{bmatrix} 168 \\ 90 \end{bmatrix} = \begin{bmatrix} 28 \\ 15 \end{bmatrix} \checkmark$$

19)  $g = \# \text{ granola}$   
 $c = \# \text{ coffee}$

$$2g + 3c = 21.83$$

$$5g + c = 15.90$$

$$\begin{bmatrix} 2 & 3 \\ 5 & 1 \end{bmatrix} \cdot \begin{bmatrix} g \\ c \end{bmatrix} = \begin{bmatrix} 21.83 \\ 15.90 \end{bmatrix}$$

$$\begin{bmatrix} g \\ c \end{bmatrix} = \begin{bmatrix} 1.99 \\ 5.95 \end{bmatrix} \checkmark$$

$$\begin{bmatrix} g \\ c \end{bmatrix} = \frac{1}{-13} \begin{bmatrix} 1 & -3 \\ -5 & 2 \end{bmatrix} \cdot \begin{bmatrix} 21.83 \\ 15.90 \end{bmatrix} = \frac{1}{-13} \begin{bmatrix} -25.87 \\ -77.35 \end{bmatrix}$$

20)  $b = \# \text{ buffet}$

$$b + s = 26$$

$s = \# \text{ steak}$

$$12.99b + 15.95s = 364.38$$

$$\begin{bmatrix} 1 & 1 \\ 12.99 & 15.95 \end{bmatrix} \cdot \begin{bmatrix} b \\ s \end{bmatrix} = \begin{bmatrix} 26 \\ 364.38 \end{bmatrix}$$

$$\begin{bmatrix} b \\ s \end{bmatrix} = \frac{1}{2.96} \begin{bmatrix} 15.95 & -1 \\ -12.99 & 1 \end{bmatrix} \cdot \begin{bmatrix} 26 \\ 364.38 \end{bmatrix} = \begin{bmatrix} 17 \\ 9 \end{bmatrix} \leftarrow \checkmark$$

21)  $x = 50¢$  lollipop  
 $y = 35¢$  lollipop

$$\begin{aligned}x + y &= 40 \\ 0.5x + 0.35y &= 17\end{aligned}$$

$$\begin{bmatrix} 1 & 1 \\ 0.5 & 0.35 \end{bmatrix} \cdot \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 40 \\ 17 \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \frac{1}{-0.15} \begin{bmatrix} 0.35 & -1 \\ -0.5 & 1 \end{bmatrix} \cdot \begin{bmatrix} 40 \\ 17 \end{bmatrix} = \begin{bmatrix} 20 \\ 20 \end{bmatrix} \checkmark$$

22)  $x = \$6$  book  
 $y = \$7$  book

$$\begin{aligned}x + y &= 27 \\ 6x + 7y &= 177\end{aligned}$$

$$\begin{bmatrix} 1 & 1 \\ 6 & 7 \end{bmatrix} \cdot \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 27 \\ 177 \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \frac{1}{1} \begin{bmatrix} 7 & -1 \\ -6 & 1 \end{bmatrix} \cdot \begin{bmatrix} 27 \\ 177 \end{bmatrix} = \begin{bmatrix} 12 \\ 15 \end{bmatrix} \checkmark$$

23)  $a = \#$  adult tax  
 $s = \#$  student tax

$$\begin{aligned}a + s &= 125 \\ 4a + 2.5s &= 413\end{aligned}$$

$$\begin{bmatrix} 1 & 1 \\ 4 & 2.5 \end{bmatrix} \cdot \begin{bmatrix} a \\ s \end{bmatrix} = \begin{bmatrix} 125 \\ 413 \end{bmatrix}$$

$$\begin{bmatrix} a \\ s \end{bmatrix} = \frac{1}{-1.5} \begin{bmatrix} 2.5 & -1 \\ -4 & 1 \end{bmatrix} \cdot \begin{bmatrix} 125 \\ 413 \end{bmatrix} = \begin{bmatrix} 67 \\ 58 \end{bmatrix} \checkmark$$