

More on Matrices

$$1. \quad 3 \left(\begin{bmatrix} -3 & 2 \\ 0 & 5 \end{bmatrix} - \begin{bmatrix} 6 & -4 \\ 3 & -2 \end{bmatrix} \right) = 3 \begin{bmatrix} -9 & 6 \\ -3 & 7 \end{bmatrix} = \boxed{\begin{bmatrix} -27 & 18 \\ -9 & 21 \end{bmatrix}}$$

$$2. \quad (-10 + -32 + 0) - (0 + -6 + -24) \\ -42 - (-30) = \boxed{-12}$$

$$3. \quad -\frac{1}{2} \begin{bmatrix} 1 & 6 & -3 \\ 2 & -4 & -1 \end{bmatrix} \cdot \begin{bmatrix} -1 & 4 & 0 \\ 3 & -5 & 2 \\ -4 & 3 & -2 \end{bmatrix} = -\frac{1}{2} \begin{bmatrix} 29 & -35 & 18 \\ -10 & 25 & -6 \end{bmatrix} \\ = \boxed{\begin{bmatrix} -14.5 & 17.5 & -9 \\ 5 & -12.5 & 3 \end{bmatrix}}$$

$$4. \quad -12 - (-12) \quad C^{-1} \text{ does not exist!}$$

$$5. \quad \begin{bmatrix} 2 & -3 \\ 4 & -1 \end{bmatrix} \cdot \begin{bmatrix} 2 & -3 \\ 4 & -1 \end{bmatrix} = \boxed{\begin{bmatrix} -8 & -3 \\ 4 & -11 \end{bmatrix}}$$

$$6. \quad -2 - (-12) = \boxed{10}$$

$$7. \quad 2 \begin{bmatrix} -3 & 2 \\ 0 & 5 \end{bmatrix} - 3 \begin{bmatrix} 2 & -3 \\ 4 & -1 \end{bmatrix} + \begin{bmatrix} 6 & -4 \\ 3 & -2 \end{bmatrix} \\ \begin{bmatrix} -6 & 4 \\ 0 & 10 \end{bmatrix} + \begin{bmatrix} -6 & 9 \\ -12 & 3 \end{bmatrix} + \begin{bmatrix} 6 & -4 \\ 3 & -2 \end{bmatrix} = \boxed{\begin{bmatrix} -6 & 9 \\ -9 & 11 \end{bmatrix}}$$

8. Column 3

$$\begin{array}{|c|c|c|} \hline + & - & + \\ \hline - & + & - \\ \hline + & - & + \\ \hline \end{array} \quad \begin{array}{|c|c|c|} \hline -1 & -2 & 3 \\ \hline & 1 & 2 \\ \hline \end{array} \quad \begin{array}{|c|c|c|} \hline -0 & 3 & 4 \\ \hline & 1 & 2 \\ \hline \end{array} \quad \begin{array}{|c|c|c|} \hline +0 & 3 & 4 \\ \hline & & -2 & 3 \\ \hline \end{array} \\ = -1(-4-3) = -1(-7) = \boxed{7}$$

$$\begin{aligned}
 9. \quad -30 - (-7x^2) &= -2 \\
 7x^2 - 30 &= -2 \\
 7x^2 &= 28 \\
 x^2 &= 4 \\
 \boxed{x = \pm 2}
 \end{aligned}$$

$$\begin{aligned}
 10. \quad 2(x+2) + 5 &= 7 \\
 2x + 4 + 5 &= 7 \\
 2x + 9 &= 7 \\
 2x &= -2 \\
 \boxed{x = -1}
 \end{aligned}$$

$$\begin{aligned}
 2(y-3) - 4 &= 1 \\
 2y - 6 - 4 &= 1 \\
 2y - 10 &= 1 \\
 2y &= 11 \\
 \boxed{y = 5.5}
 \end{aligned}$$

$$\begin{aligned}
 11. \quad \begin{bmatrix} 2 & 4 \\ 3 & -7 \end{bmatrix} \cdot \begin{bmatrix} x \\ y \end{bmatrix} &= \begin{bmatrix} -5 \\ 4 \end{bmatrix} \\
 \begin{bmatrix} x \\ y \end{bmatrix} &= \frac{1}{-26} \begin{bmatrix} -7 & -4 \\ -3 & 2 \end{bmatrix} \cdot \begin{bmatrix} -5 \\ 4 \end{bmatrix} \\
 \begin{bmatrix} x \\ y \end{bmatrix} &= -\frac{1}{26} \begin{bmatrix} 19 \\ 23 \end{bmatrix} \\
 \boxed{x = \frac{-19}{26} \quad y = \frac{-23}{26}}
 \end{aligned}$$

$$\begin{aligned}
 12. \quad \begin{bmatrix} x-7 \\ 3-y \end{bmatrix} \cdot \begin{bmatrix} 2 \\ 5 \end{bmatrix} &= \begin{bmatrix} 10 \\ 1 \end{bmatrix} \\
 2x - 35 &= 10 & 6 + 5y &= 1 \\
 2x &= 45 & 5y &= -5 \\
 \boxed{x = 22.5} & & \boxed{y = -1}
 \end{aligned}$$

$$13. \quad \begin{bmatrix} 3 & -1 \\ 0 & 2 \end{bmatrix} \cdot \begin{bmatrix} 1 & 6 \\ 2 & -1 \end{bmatrix} = \boxed{\begin{bmatrix} 1 & 19 \\ 4 & -2 \end{bmatrix}}$$

$$14. \quad \begin{bmatrix} 1 & 5 & -4 \\ 6 & 0 & -1 \end{bmatrix} \cdot \begin{bmatrix} 2 & -1 \\ 3 & -3 \\ 1 & 1 \end{bmatrix} = \boxed{\begin{bmatrix} 13 & -20 \\ 11 & -7 \end{bmatrix}}$$

$$15. a) -6 - (-16) = 10$$

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

$$b) -24 - (-24) = 0$$

inverse does not exist

16. square

17. 2×1

18. $w = \text{width}$

$$2L + 2W = 86$$

$$\begin{cases} 2L + 2W = 86 \\ -L + 2W = 2 \end{cases}$$

$L = \text{length}$

$$2W - L = 2$$

$$-L + 2W = 2$$

$$\begin{bmatrix} 2 & 2 \\ -1 & 2 \end{bmatrix} \begin{bmatrix} L \\ W \end{bmatrix} = \begin{bmatrix} 86 \\ 2 \end{bmatrix}$$

$$\begin{array}{l} \text{length} = 28 \text{ inches} \\ \text{width} = 15 \text{ inches} \end{array}$$

$$\begin{aligned} \begin{bmatrix} L \\ W \end{bmatrix} &= \frac{1}{6} \begin{bmatrix} 2 & -2 \\ 1 & 2 \end{bmatrix} \begin{bmatrix} 86 \\ 2 \end{bmatrix} \\ &= \frac{1}{6} \begin{bmatrix} 168 \\ 90 \end{bmatrix} = \begin{bmatrix} 28 \\ 15 \end{bmatrix} \end{aligned}$$

19. $g = \# \text{ bars}$

$$2g + 3c = 21.83$$

$c = \# \text{ coffee}$

$$5g + c = 15.90$$

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

$$\begin{array}{l} \text{granola bar} = \$1.99 \\ \text{coffee} = \$5.95 \end{array}$$

$$\begin{aligned} \begin{bmatrix} g \\ c \end{bmatrix} &= \frac{1}{-13} \begin{bmatrix} 1 & -3 \\ -5 & 2 \end{bmatrix} \begin{bmatrix} 21.83 \\ 15.90 \end{bmatrix} \\ &= \frac{1}{-13} \begin{bmatrix} -25.87 \\ -77.35 \end{bmatrix} = \begin{bmatrix} 1.99 \\ 5.95 \end{bmatrix} \end{aligned}$$

20. $b = \# \text{ buffet}$ $b + m = 26$
 $m = \# \text{ steak meal}$ $12.99b + 15.95m = 364.38$

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

$$\begin{bmatrix} b \\ m \end{bmatrix} = \frac{1}{2.96} \begin{bmatrix} 15.95 & -1 \\ -12.99 & 1 \end{bmatrix} \cdot \begin{bmatrix} 26 \\ 364.38 \end{bmatrix}$$

$$= \frac{1}{2.96} \begin{bmatrix} 50.32 \\ 26.64 \end{bmatrix} = \begin{bmatrix} 17 \\ 9 \end{bmatrix}$$

17 buffets
9 steak meals

21. $x = \# \text{ cheaper lollis}$ $x + y = 40$
 $y = \# \text{ pricier lollis}$ $0.35x + 0.5y = 17$

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

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

$$= \frac{1}{0.15} \begin{bmatrix} 3 \\ 3 \end{bmatrix} = \begin{bmatrix} 20 \\ 20 \end{bmatrix}$$

20 of each

22. $x = \# \text{ \$6 books}$ $x + y = 27$
 $y = \# \text{ \$7 books}$ $6x + 7y = 177$

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

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

$$\boxed{\begin{array}{l} 12 \text{ \$6 books} \\ 15 \text{ \$7 books} \end{array}} = \begin{bmatrix} 12 \\ 15 \end{bmatrix}$$

23. $a = \# \text{ adult tax}$ $a + s = 125$
 $s = \# \text{ student tax}$ $4a + 2.5s = 413$

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

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

$$\boxed{\begin{array}{l} 67 \text{ adult tax} \\ 58 \text{ student tax} \end{array}} = \frac{1}{-1.5} \begin{bmatrix} -100.5 \\ -87 \end{bmatrix} = \begin{bmatrix} 67 \\ 58 \end{bmatrix}$$

