

# Matrices Review

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

$$2. \quad \begin{vmatrix} -1 & 4 & 0 \\ 3 & -5 & 2 \\ -4 & 3 & -2 \end{vmatrix} \begin{vmatrix} -1 & 4 \\ 3 & -5 \\ -4 & 3 \end{vmatrix} = (-10 + -32 + 0) - (0 + -6 + -24) - 42 + 30 = \boxed{-12}$$

$$3. \quad -\frac{1}{2} \begin{bmatrix} 1 & 6 & -3 \\ 2 & -4 & -1 \end{bmatrix} \begin{bmatrix} -1 & 4 & 0 \\ 3 & -5 & 2 \\ -4 & 3 & -2 \end{bmatrix} = -\frac{1}{2} \begin{bmatrix} -1+18+12 & 4-30-9 & 0+12+6 \\ -2-12+4 & 8+20-3 & 0+-8+2 \end{bmatrix} = -\frac{1}{2} \begin{bmatrix} 29 & -35 & 18 \\ -10 & 25 & -6 \end{bmatrix} = \begin{bmatrix} -29/2 & 35/2 & -9 \\ 5 & -25/2 & 3 \end{bmatrix}$$

$$4. \quad \begin{bmatrix} 6 & -4 \\ 3 & -2 \end{bmatrix} = \frac{1}{-12+12} \leftarrow \text{stop! not possible} = 0 \div$$

$$5. \quad \begin{bmatrix} 2 & -3 \\ 4 & -1 \end{bmatrix} \begin{bmatrix} 2 & -3 \\ 4 & -1 \end{bmatrix} \begin{bmatrix} 4-12 & -6+3 \\ 8-4 & -12+1 \end{bmatrix} = \begin{bmatrix} -8 & -3 \\ 4 & -11 \end{bmatrix}$$

$$6. \quad \begin{vmatrix} 2 & -3 \\ 4 & -1 \end{vmatrix} = -2 + 12 = \boxed{10}$$

$$7. \quad 2 \begin{bmatrix} -3 & 2 \\ 0 & 5 \end{bmatrix} + -3 \begin{bmatrix} 2 & -3 \\ 4 & -1 \end{bmatrix} + \begin{bmatrix} 6 & -4 \\ 3 & -2 \end{bmatrix}$$

$$\begin{bmatrix} -6 & 4 \\ 0 & 10 \end{bmatrix} + \begin{bmatrix} -6 & 9 \\ -12 & 3 \end{bmatrix} + \begin{bmatrix} 6 & -4 \\ 3 & -2 \end{bmatrix}$$

$$\begin{bmatrix} -6 & 9 \\ -9 & 11 \end{bmatrix}$$

$$8. \begin{array}{cccccc} 3 & 4 & -1 & 3 & 4 & (0+0+4) - (-3+0+0) \\ -2 & 3 & 0 & -2 & 3 & 4 + 3 \\ 1 & 2 & 0 & 1 & 2 & \boxed{7} \end{array}$$

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

$$10. \begin{array}{ll} 2x + 4 + 5 = 7 & 2y - 6 - 4 = 1 \\ 2x + 9 = 7 & 2y - 10 = 1 \\ 2x = -2 & 2y = 11 \\ \boxed{x = -1} & \boxed{y = 11/2} \text{ or } 5\frac{1}{2} \text{ or } 5.5 \end{array}$$

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

$$\frac{1}{-14-12} \begin{bmatrix} -7 & -4 \\ -3 & 2 \end{bmatrix} \begin{bmatrix} -5 \\ 4 \end{bmatrix}$$

$$\frac{1}{26} \begin{bmatrix} 35 & -16 \\ 15 & 8 \end{bmatrix}$$

$$\frac{1}{26} \begin{bmatrix} 19 \\ 23 \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} -19/26 \\ -23/26 \end{bmatrix}$$

$$\boxed{\left( \frac{-19}{26}, \frac{-23}{26} \right)}$$

$$12. \quad 2x - 35 = 10 \quad 6 + 5y = 1$$

$$2x = 45 \quad 5y = -5$$

$$\boxed{x = \frac{45}{2}} \text{ or } 22.5 \quad \boxed{y = -1}$$

$$\text{or } 22\frac{1}{2}$$

$$13. \quad \begin{bmatrix} 3-2 & 18+1 \\ 0+4 & 0-2 \end{bmatrix} = \begin{bmatrix} 1 & 19 \\ 4 & -2 \end{bmatrix}$$

$$14. \quad \begin{bmatrix} 2+15-4 & -1-15-4 \\ 12+0-1 & -6+0-1 \end{bmatrix} = \begin{bmatrix} 13 & -20 \\ 11 & -7 \end{bmatrix}$$

$$15. \text{ a.) } \frac{1}{6+16} \begin{bmatrix} -2 & 4 \\ -4 & 3 \end{bmatrix} = \frac{1}{10} \begin{bmatrix} -2 & 4 \\ -4 & 3 \end{bmatrix} = \begin{bmatrix} -2/5 & 2/5 \\ -2/5 & 3/10 \end{bmatrix}$$

$$\text{b.) } \frac{1}{-24+24} \leftarrow \text{Stop! not possible because denominator} = 0. \text{ (determinant)}$$

16. Square

17.  $2 \times 1$

18. a.)  $L = \text{length}; W = \text{width}$

$$\text{b.) } 2L + 2W = 86 \rightarrow 2L + 2W = 86$$

$$2W = L + 2 \rightarrow -L + 2W = 2$$

$$\text{c.) } \begin{bmatrix} 2 & 2 \\ -1 & 2 \end{bmatrix} \begin{bmatrix} L \\ W \end{bmatrix} = \begin{bmatrix} 86 \\ 2 \end{bmatrix}$$

$$\text{d.) } \frac{1}{4-2} \begin{bmatrix} 2 & -2 \\ 1 & 2 \end{bmatrix} \begin{bmatrix} 86 \\ 2 \end{bmatrix} = \frac{1}{6} \begin{bmatrix} 172 - 4 \\ 86 + 4 \end{bmatrix} = \frac{1}{6} \begin{bmatrix} 168 \\ 90 \end{bmatrix} = \begin{bmatrix} 28 \\ 15 \end{bmatrix} = \begin{bmatrix} L \\ W \end{bmatrix}$$

The length of the picture is 28 inches and the width is 15 inches.

19. a.)  $g$  = granola;  $c$  = coffee

$$\begin{aligned} \text{b.) } 2g + 3c &= 21.83 \\ 5g + c &= 15.90 \end{aligned}$$

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

$$\text{d.) } \frac{1}{2-15} \begin{bmatrix} 1 & -3 \\ -5 & 2 \end{bmatrix} \begin{bmatrix} 21.83 \\ 15.90 \end{bmatrix} = \frac{1}{-13} \begin{bmatrix} 21.83 - 47.7 \\ -109.15 + 31.8 \end{bmatrix} = \frac{1}{-13} \begin{bmatrix} -25.87 \\ -77.35 \end{bmatrix}$$

$$\begin{bmatrix} 1.99 \\ 5.95 \end{bmatrix} = \begin{bmatrix} g \\ c \end{bmatrix} \quad \begin{array}{l} \text{The granola costs } \$1.99 \text{ and the} \\ \text{Coffee costs } \$5.95 \end{array}$$

20. a.)  $b$  = buffet;  $g$  = grilled steak meal

$$\begin{aligned} \text{b.) } 12.99b + 15.95g &= 364.38 \\ b + g &= 26 \end{aligned}$$

$$\text{c.) } \begin{bmatrix} 12.99 & 15.95 \\ 1 & 1 \end{bmatrix} \begin{bmatrix} b \\ g \end{bmatrix} = \begin{bmatrix} 364.38 \\ 26 \end{bmatrix}$$

$$\text{d.) } \frac{1}{12.99-15.95} \begin{bmatrix} 1 & -15.95 \\ -1 & 12.99 \end{bmatrix} \begin{bmatrix} 364.38 \\ 26 \end{bmatrix} = \frac{1}{-2.96} \begin{bmatrix} 364.38 - 414.70 \\ -364.38 + 337.74 \end{bmatrix}$$

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

17 people ordered the buffet.

21. a.)  $x = \text{lollipop 1}$  ;  $y = \text{lollipop 2}$

b.)  $.5x + .35y = 17$   
 $x + y = 40$

c.)  $\begin{bmatrix} .5 & .35 \\ 1 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 17 \\ 40 \end{bmatrix}$

d.)  $\frac{1}{.5 - .35} \begin{bmatrix} 1 & -.35 \\ -1 & .5 \end{bmatrix} \begin{bmatrix} 17 \\ 40 \end{bmatrix} = \frac{1}{.15} \begin{bmatrix} 17 - 14 \\ -17 + 20 \end{bmatrix} = \frac{1}{.15} \begin{bmatrix} 3 \\ 3 \end{bmatrix} =$

$\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 20 \\ 20 \end{bmatrix}$  She bought 20 of each kind.

22. a.)  $x = \text{book 1}$  ;  $y = \text{book 2}$   
(\$6) (\$7)

b.)  $6x + 7y = 177$   
 $x + y = 27$

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

d.)  $\frac{1}{6 - 7} \begin{bmatrix} 1 & -7 \\ -1 & 6 \end{bmatrix} \begin{bmatrix} 177 \\ 27 \end{bmatrix} = -1 \begin{bmatrix} 177 - 189 \\ -177 + 162 \end{bmatrix} = -1 \begin{bmatrix} -12 \\ -15 \end{bmatrix} =$

$\begin{bmatrix} 12 \\ 15 \end{bmatrix} = \begin{bmatrix} x \\ y \end{bmatrix}$  They sold 12 of the \$6 books  
and 15 of the \$7 books.

23. a.)  $a = \text{adults}$ ,  $s = \text{students}$

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

$$\text{c.) } \begin{bmatrix} 4 & 2.5 \\ 1 & 1 \end{bmatrix} \begin{bmatrix} a \\ s \end{bmatrix} = \begin{bmatrix} 413 \\ 125 \end{bmatrix}$$

$$\text{d.) } \frac{1}{4-2.5} \begin{bmatrix} 1 & -2.5 \\ -1 & 4 \end{bmatrix} \begin{bmatrix} 413 \\ 125 \end{bmatrix} = \frac{1}{1.5} \begin{bmatrix} 413 - 312.5 \\ -413 + 500 \end{bmatrix} =$$

$$\frac{1}{1.5} \begin{bmatrix} 100.5 \\ 87 \end{bmatrix} = \begin{bmatrix} 67 \\ 58 \end{bmatrix} = \begin{bmatrix} a \\ s \end{bmatrix}$$

67 adult and 58 student tickets were purchased.