

More on Matrices Key

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

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

row \times column $2 \times 3 \quad 3 \times 3$
 3. $-\frac{1}{2} \left(\begin{bmatrix} 1 & 6 & -3 \\ 2 & -4 & -1 \end{bmatrix} \cdot \begin{bmatrix} -1 & 4 & 0 \\ 3 & -5 & 2 \\ -4 & 3 & -2 \end{bmatrix} \right)$

$= -\frac{1}{2} \begin{bmatrix} 29 & -35 & 18 \\ -10 & 25 & -6 \end{bmatrix} = \begin{bmatrix} -29/2 & 35/2 & -9 \\ 5 & -25/2 & 3 \end{bmatrix}$

4. $C = \begin{bmatrix} 6 & -4 \\ 3 & -2 \end{bmatrix}$ $\text{Det} = -12 - (-12) = 0$
↖ Inverse does not exist.

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

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

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

$$8. \begin{vmatrix} 3 & 4 & -1 & 3 & 4 \\ -2 & 3 & 0 & -2 & 3 \\ 1 & 2 & 0 & 1 & 2 \end{vmatrix}$$

$$(0+0+4) - (-3+0+0)$$

$$4+3 = \boxed{7}$$

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

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

$$7x^2 = 28$$

$$x^2 = 4$$

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

$$10. 2(x+2) + 5 = 7$$

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

$$2x + 9 = 7$$

$$2x = -2$$

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

$$2(y-3) + -4 = 1$$

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

$$2y - 10 = 1$$

$$2y = 11$$

$$\boxed{y = \frac{11}{2}}$$

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

$$\rightarrow \text{Det } -14 - 12 = -26$$

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

$$\begin{bmatrix} x \\ y \end{bmatrix} = -\frac{1}{26} \begin{bmatrix} 19 \\ 23 \end{bmatrix}$$

$$\boxed{x = -\frac{19}{26} \quad y = -\frac{23}{26}}$$

$$12. \begin{bmatrix} x & -7 \\ 3 & y \end{bmatrix} \begin{bmatrix} 2 \\ 5 \end{bmatrix} = \begin{bmatrix} 10 \\ 1 \end{bmatrix}$$

$$2x - 35 = 10$$

$$2x = 45$$

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

$$6 + 5y = 1$$

$$5y = -5$$

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

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

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

$2 \times 3 \quad 3 \times 2 = 2 \times 2$

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

$$b. \begin{bmatrix} 2 & 4 \\ -6 & -12 \end{bmatrix} \quad \text{Det } -24 - (-24) = 0 \quad \text{inverse does not exist}$$

16. square

17. 2×1

$$18. \quad \begin{array}{l} w = \text{width} \\ L = \text{length} \end{array} \quad \begin{array}{l} 2L + 2w = 86 \Rightarrow 2L + 2w = 86 \\ 2w - L = 2 \Rightarrow -L + 2w = 2 \end{array}$$

$$\begin{bmatrix} 2 & 2 \\ -1 & 2 \end{bmatrix} \begin{bmatrix} L \\ w \end{bmatrix} = \begin{bmatrix} 86 \\ 2 \end{bmatrix} \quad \text{Det } 4 - (-2) = 6$$

$$\begin{bmatrix} L \\ w \end{bmatrix} = \frac{1}{6} \begin{bmatrix} 2 & -2 \\ 1 & 2 \end{bmatrix} \begin{bmatrix} 86 \\ 2 \end{bmatrix}$$

$$= \frac{1}{6} \begin{bmatrix} 168 \\ 90 \end{bmatrix} = \begin{bmatrix} 28 \\ 15 \end{bmatrix}$$

19. $g = \# \text{ bars}$ $2g + 3c = 21.83$
 $c = \# \text{ coffees}$ $5g + c = 15.90$

$$\begin{bmatrix} 2 & 3 \\ 5 & 1 \end{bmatrix} \begin{bmatrix} g \\ c \end{bmatrix} = \begin{bmatrix} 21.83 \\ 15.90 \end{bmatrix} \quad \text{Det } 2-15 = -13$$

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

$$\begin{bmatrix} g \\ c \end{bmatrix} = -\frac{1}{13} \begin{bmatrix} -25.84 \\ -77.35 \end{bmatrix}$$

$\text{granola bars} = \$1.99$ $\text{coffee} = \$5.95$
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20. $b = \# \text{ buffet}$ $b + m = 26$
 $m = \# \text{ steak meal}$ $12.99b + 15.95m = 364.38$

$$\begin{bmatrix} 1 & 1 \\ 12.99 & 15.95 \end{bmatrix} \begin{bmatrix} b \\ m \end{bmatrix} = \begin{bmatrix} 26 \\ 364.38 \end{bmatrix} \quad \text{Det } 15.95 - 12.99 = 2.96$$

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

$$\begin{bmatrix} b \\ m \end{bmatrix} = \frac{1}{2.96} \begin{bmatrix} 50.32 \\ 26.64 \end{bmatrix}$$

17 buffet 9 steak meals
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21. $x = \#$ of cheaper lollipops
 $y = \#$ of pricier lollipops

$$\begin{aligned} x + y &= 40 \\ .35x + .5y &= 17 \end{aligned}$$

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

$$\text{Det } .5 - .35 = .15$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \frac{1}{.15} \begin{bmatrix} .5 & -1 \\ -.35 & 1 \end{bmatrix} \begin{bmatrix} 40 \\ 17 \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \end{bmatrix} = \frac{1}{.15} \begin{bmatrix} 3 \\ 3 \end{bmatrix}$$

20 cheaper lollipops
 20 pricier lollipops

22. $x = \#$ of \$6 books
 $y = \#$ of \$7 books

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

$$\begin{bmatrix} 1 & 1 \\ 6 & 7 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 27 \\ 177 \end{bmatrix} \quad \text{Det } 7 - 6 = 1$$

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

$$\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 12 \\ 15 \end{bmatrix}$$

12 \$6 books
 15 \$7 books

23. $a = \#$ of adult tix
 $s = \#$ of student tix

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

$$\begin{bmatrix} 1 & 1 \\ 4 & 2.5 \end{bmatrix} \begin{bmatrix} a \\ s \end{bmatrix} = \begin{bmatrix} 125 \\ 413 \end{bmatrix} \quad \text{Det } 2.5 - 4 = -1.5$$

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

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

67 adult tix
 58 student tix