

Word Problem Notes

→ A # of adults → C # of children

- 1) 1000 tickets were sold. Adult tickets cost \$8.50, children's cost \$4.50, and a total of \$7300 was collected. How many tickets of each kind were sold?

$$A + C = 1000$$

$$8.5A + 4.5C = 7300$$

In calculator ✓ A

$$\begin{bmatrix} 1 & 1 \\ 8.5 & 4.5 \end{bmatrix} \begin{bmatrix} A \\ C \end{bmatrix} = \begin{bmatrix} 1000 \\ 7300 \end{bmatrix}$$

In calculator evaluate $A^{-1}B$

$$\begin{bmatrix} A \\ C \end{bmatrix} = \begin{bmatrix} 700 \\ 300 \end{bmatrix}$$

- 2) Mrs. B. invested \$58,855; part at an interest rate of 5%, and part at an interest rate of 8%. The total interest collected on the investment was \$3,929. How much did she invest at each rate?

$$X + Y = 58,855$$

$$.05X + .08Y = 3,929$$

$$\begin{bmatrix} 1 & 1 \\ .05 & .08 \end{bmatrix} \begin{bmatrix} X \\ Y \end{bmatrix} = \begin{bmatrix} 58,855 \\ 3,929 \end{bmatrix}$$

$$\begin{bmatrix} X \\ Y \end{bmatrix} = \begin{bmatrix} 25,980 \\ 32,875 \end{bmatrix}$$

- 3) Samantha has 44 coins, consisting of quarters, dimes, and nickels which total \$7.15. There are twice as many nickels as dimes. How many of each does she have?

$$Q + D + N = 44$$

$$25Q + .10D + .05N = 7.15$$

$$0Q - 2D + N = 0$$

$$\begin{matrix} N = 2D \\ D = 1 \\ N = 2 \end{matrix}$$

~~$$\begin{matrix} D = 2N \\ N = 1 \\ D = 2 \end{matrix}$$~~

$$N - 2D = 0$$

$$\begin{bmatrix} 1 & 1 & 1 \\ 25 & .10 & .05 \\ 0 & -2 & 1 \end{bmatrix} \begin{bmatrix} Q \\ D \\ N \end{bmatrix} = \begin{bmatrix} 44 \\ 7.15 \\ 0 \end{bmatrix}$$

$$\begin{bmatrix} Q \\ D \\ N \end{bmatrix} = \begin{bmatrix} 23 \\ 7 \\ 14 \end{bmatrix}$$

$B \rightarrow$ speed of boat
in still water

$C \rightarrow$ speed of the current

- 4) A boat traveled 168 miles each way downstream and back. The trip downstream took 12 hours. The trip back took 21 hours. Find the speed of the boat in still water and the speed of the current.

$$B + C = \frac{168}{12} \rightarrow B + C = 14$$

+ +

$$B - C = \frac{168}{21} \rightarrow B - C = 8$$

$$\begin{aligned} 2B &= 22 \\ B &= 11 \end{aligned}$$

$$\begin{aligned} 11 + C &= 14 \rightarrow C = 3 \\ 11 - C &= 8 \end{aligned}$$

Boat \rightarrow 11 mph
Current \rightarrow 3 mph

If the following matrix does not have an inverse, find the value of x .

$$\det[A] = 0$$

5) $\begin{bmatrix} -5 & 4 \\ 9 & x \end{bmatrix}$

$$-5x = 36$$

$$-5x - 36 = 0$$

$$x = -\frac{36}{5}$$

Evaluate. Remember, this is the notation for the determinant of a matrix.

6) $\begin{vmatrix} 5 & 2 \\ 4 & -5 \end{vmatrix} = -25 - 8 = -33$

Find the inverse of each matrix.

7) $\begin{bmatrix} -14 & 21 \\ 4 & -6 \end{bmatrix}$

standard
 $\begin{bmatrix} a & b \\ c & d \end{bmatrix}$

1) $\det[A]$

2) $\frac{1}{\det[A]} \begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$

$$\begin{aligned} \det \begin{bmatrix} -14 & 21 \\ 4 & -6 \end{bmatrix} \\ = (-14)(-6) - (4)(21) \\ = 84 - 84 = 0 \end{aligned}$$

No inverse exists

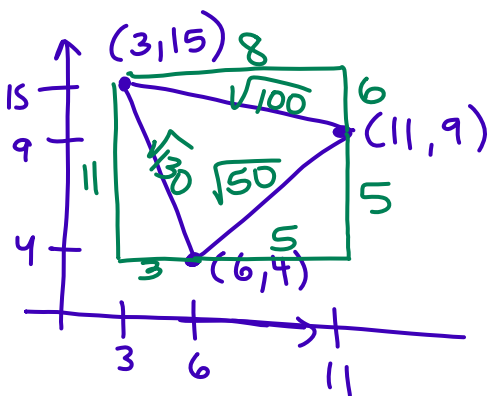
8) $\begin{bmatrix} -8 & 3 \\ -1 & -1 \end{bmatrix}$

$$\det \begin{bmatrix} -8 & 3 \\ -1 & -1 \end{bmatrix} = 8 - -3 = 11$$

$$\frac{1}{11} \begin{bmatrix} -1 & -3 \\ 1 & -8 \end{bmatrix}$$

Find the area of a triangle with the given vertices.

9) (3, 15), (6, 4), and (11, 9)



$$(\sqrt{100})^2 = (\sqrt{130})^2 + (\sqrt{50})^2 - 2(\sqrt{130})(\sqrt{50})\cos C$$

$$\cos^{-1}\left(\frac{100 - 130 - 50}{-2\sqrt{130}\sqrt{50}}\right) = \cancel{\cos} C$$

$$A_{\Delta} = \frac{1}{2}(\sqrt{130})(\sqrt{50})\sin(60.255\dots)$$

$$= 35$$

$$\frac{1}{2} \det \begin{bmatrix} 3 & 15 & 1 \\ 6 & 4 & 1 \\ 11 & 9 & 1 \end{bmatrix} = 35$$

10) (-1, 7), (2, 6), and (4, -3)

11) (-2, 5), (4, 2), and (0, 7)

$$\left| \frac{1}{2} \det \begin{bmatrix} -1 & 7 & 1 \\ 2 & 6 & 1 \\ 4 & -3 & 1 \end{bmatrix} \right|$$

$$\left| \frac{1}{2} \det \begin{bmatrix} -2 & 5 & 1 \\ 4 & 2 & 1 \\ 0 & 7 & 1 \end{bmatrix} \right|$$

$$= 12.5$$

$$= 9$$