

## Matrix Word Problems!

- 1) The sum of 3 integers is 48. If the first integer is doubled (and the others remain the same), the sum is 60. If the second integer is doubled (and the others remain the same), the sum is 63. What are these integers?

3 integers:  $x, y, z$

$$\textcircled{1} \quad x + y + z = 48$$

$$\textcircled{2} \quad 2x + y + z = 60$$

$$\textcircled{3} \quad x + 2y + z = 63$$

$$\begin{bmatrix} 1 & 1 & 1 \\ 2 & 1 & 1 \\ 1 & 2 & 1 \end{bmatrix} \cdot \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 48 \\ 60 \\ 63 \end{bmatrix}$$

$$X = A^{-1} \cdot B = \begin{bmatrix} 12 \\ 15 \\ 21 \end{bmatrix}$$

Numbers are:  
12, 15, 21

- 2) The owner of a candy store mixed some peanuts worth \$3 per pound, some cashews worth \$9 per pound, and some Brazil nuts worth \$9 per pound to get 50 pounds of a mixture that would sell for \$6 per pound. She used 15 fewer pounds of cashews than peanuts. How many pounds of each did she use?

$p$  = lbs of peanuts  
 $c$  = lbs of cashews  
 $b$  = lbs of Brazil nuts

$$\textcircled{1} \quad p + c + b = 50 \quad (\text{lbs})$$

$$\textcircled{2} \quad 3p + 9c + 9b = 50(6) \quad (\text{cost})$$

$$\textcircled{3} \quad c = p - 15 \rightarrow -p + c + 0b = -15$$

$$\begin{bmatrix} 1 & 1 & 1 \\ 3 & 9 & 9 \\ -1 & 1 & 0 \end{bmatrix} \cdot \begin{bmatrix} p \\ c \\ b \end{bmatrix} = \begin{bmatrix} 50 \\ 300 \\ -15 \end{bmatrix}$$

$$A^{-1} \cdot B = \begin{bmatrix} 25 \\ 10 \\ 15 \end{bmatrix}$$

25 lbs peanuts  
10 lbs cashews  
15 lbs brazil nuts

- 3) A tour group stops at a highway restaurant and is given a choice of hamburgers, chicken sandwiches, and salads. If the group orders 12 hamburgers, 21 chicken sandwiches, and 19 salads, the cost is \$79. If the group orders 16 hamburgers, 14 chicken sandwiches, and 22 salads, the cost is \$77.80. A salad and a chicken sandwich together cost as much as 3 hamburgers. What is the cost of each meal?

$$\textcircled{1} \quad 12h + 21c + 19s = 79$$

$$\textcircled{2} \quad 16h + 14c + 22s = 77.80$$

$$\textcircled{3} \quad s + c = 3h \rightarrow -3h + c + s = 0$$

$$\begin{bmatrix} 12 & 21 & 19 \\ 16 & 14 & 22 \\ -3 & 1 & 1 \end{bmatrix} \cdot \begin{bmatrix} h \\ c \\ s \end{bmatrix} = \begin{bmatrix} 79 \\ 77.80 \\ 0 \end{bmatrix}$$

$$A^{-1} \cdot B = \begin{bmatrix} h \\ c \\ s \end{bmatrix} = \begin{bmatrix} 1.1 \\ 1.55 \\ 1.75 \end{bmatrix}$$

hamburger : \$1.10  
chicken : \$1.55  
salad : \$1.75

