



4. The following breakdown outlines the number of rooms, bathrooms, fireplaces, and elevators in the U.S. White House.



- $r$     $b$     $f$     $e$
- Combined there are 198 rooms, bathrooms, fireplaces, and elevators
  - The number of rooms exceeds the number of bathrooms plus fireplaces by 69.
  - The difference between the number of fireplaces and elevators is 25.
  - If the number of bathrooms is tripled, it exceeds the number of fireplaces plus elevators by 74.

Determine the number of rooms, bathrooms, fireplaces and elevators in the White House.

$$r + b + f + e = 198$$

$$r = (b + f) + 69 \Rightarrow r - b - f = 69$$

$$f - e = 25$$

$$3b = (f + e) + 74 \Rightarrow 3b - f - e = 74$$

$$\text{rref} \begin{bmatrix} 1 & 1 & 1 & 1 & 198 \\ 1 & -1 & -1 & 0 & 69 \\ 0 & 0 & 1 & -1 & 25 \\ 0 & 3 & -1 & -1 & 74 \end{bmatrix}$$

132 rooms, 35 baths,  
28 fireplaces, 3 elev.

5. Italy and France combined for a total of 46 penalties during the 2006 FIFA World Cup. The penalties were a combination of fouls, yellow cards (cautions), and red cards (expulsions). There was one less red card than half the number of yellow cards and one more foul than 8 times the total number of cards. How many of each type of penalty were there during the match?

$$f + y + r = 46$$

$$r = \frac{1}{2}y - 1 \Rightarrow -\frac{1}{2}y + r = -1$$

$$f = 8(y + r) + 1 \Rightarrow f - 8y - 8r = 1$$

$$\text{rref} \begin{bmatrix} 1 & 1 & 1 & 46 \\ 0 & -1/2 & 1 & -1 \\ 1 & -8 & -8 & 1 \end{bmatrix}$$

41 fouls, 4 yellow cards,  
1 red card

6. Michelle has a piggy bank that has 75 total coins in it that consists of nickels, dimes, and quarters. The total value of the money in the piggy bank is \$12.75. The number of dimes is also twice the number of nickels in the piggy bank. How many of each coin (nickel, dime, quarter) does she have in the bank?

$$n + d + q = 75$$

$$.05n + .1d + .25q = 12.75$$

$$d = 2n \Rightarrow -2n + d = 0$$

$$\text{rref} \begin{bmatrix} 1 & 1 & 1 & 75 \\ .05 & .1 & .25 & 12.75 \\ -2 & 1 & 0 & 0 \end{bmatrix}$$

12 nickels, 24 dimes,  
39 quarters