

Solutions to applications Problems 10/27/15

- ① Given 3 sulfa pills & 4 penicillin pills cost \$144.85
 5 sulfa pills & 2 penicillin pills cost \$142.25

want cost of each pill

System $3x + 4y = 144.85$
 $5x + 2y = 142.25$

most efficient method

$3x + 4y = 144.85$
 $-2(5x + 2y) = -142.25$

new system

$3x + 4y = 144.85$
 $-10x - 4y = -284.50$

$-7x = -139.65$

$\frac{-7x}{-7} = \frac{-139.65}{-7}$

$x = 19.95$

Sulfa pills cost \$19.95 a pill
 Penicillin pills cost \$21.25

new system

Brute Force method

$-5(3x + 4y) = -5(144.85)$
 $3(5x + 2y) = 3(142.25)$

$-15x - 20y = -724.25$
 $15x + 6y = 426.75$

$-14y = -297.50$

$\frac{-14y}{-14} = \frac{-297.50}{-14}$

$y = 21.25$

$3x + 4(21.25) = 144.85$

$3x + 85 = 144.85$

-85

$3x = 59.85$

$x = 19.95$

$\frac{3x = 59.85}{3}$

② Given: 46 mph in city, 51 mph on highway
621 miles driven, 13 gallons used

system $46x + 51y = 621$

$$x + y = 13$$

$$-46(x+y) = -46(13)$$

$$\frac{46x + 51y = 621}{-46x - 46y = -598}$$

$$46x + 51y = 621$$

$$-46x - 46y = -598$$

$$5y = 23$$

$$\frac{5y}{5} = \frac{23}{5}$$

$$y = 4.6$$

$$x + 4.6 = 13$$

$$-4.6 - 4.6$$

$$x = 8.4$$

The civic used 8.4 gallons in city
4.6 gallons on highway

$$\checkmark \checkmark 46(8.4) + 51(4.6) = 621$$

$$\checkmark 8.4 + 4.6 = 13 \checkmark$$

$x = \#$ of gallons used in city
 $y = \#$ of gallons used on highway

③ Given: Invested 15000 earned 1140.70
 Invested some at 7% , some at 9%

want $x = \$$ invested @ 7% $y = \$$ invested @ 9%

System $x + y = 15000$ (total \$ invested)
 $0.07x + 0.09y = 1140.70$ (total \$ earned from investments)

Suggestion (multiply by 100 to remove decimals)

new system

$$x + y = 15000$$

$$7x + 9y = 114070$$

$$-7(x + y) = -7(15000)$$

$$7x + 9y = 114070$$

$$-7x - 7y = -105000$$

$$7x + 9y = 114070$$

$$2y = 9070 \rightarrow$$

$$\frac{2y}{2} = \frac{9070}{2}$$

$$y = 4535$$

$$x + 4535 = 15000$$

$$-4535 \quad -4535$$

$$x = 10465$$

$$0.07(10465) + 0.09(4535)$$

$$= 1140.70$$

$$10465 + 4535 =$$

$$15000$$

④ Given

Pay ① 18 day time 22 evenings = \$ 436.50

Pay ② 30 daytime 10 evening = \$ 427.50

Wast Pay rates for day/h- and night/h-

system $18x + 22y = 436.50$

$30x + 10y = 427.50$

Brute Force Method

$-30(18x + 22y) = 436.50$

$18(30x + 10y) = 427.50$

$-540x - 660y = -1309.5$

$540x + 180y = 769.5$

$-480y = -540$

$-480y = -540$

-480

$y = 11.25$

$18(x) + 22(11.25) = 436.50$

$18x + 247.5 = 436.5 \rightarrow$

$\checkmark \checkmark 18(10.5) + 22(11.25) = 436.5$

$\checkmark \checkmark 30(10.5) + 10(11.25) = 427.5$

You earn \$10.50/h in day

You earn \$11.25/h in evening

$18x + 247.5 - 247.5 = 436.5 - 247.5 = 189$

$\frac{18x}{18} = \frac{189}{18} \quad \frac{1x}{1} = 10.5$

⑤ Given $2.1x + 0.9y = 2.88$

$x + y = 2$

want amount of peanuts used & amount of raisins used

$$2.1x + 0.9y = 2.88$$

$$2.1x + 0.9y = 2.88$$

$$-0.9x + y = -2$$

$$-0.9x - 0.9y = -1.8$$

$$-1.2x = 1.08$$

$$\frac{1.2x}{1.2} = \frac{1.08}{1.2}$$

$$x = 0.9$$

→

$$0.9 + y = 2$$

$$-0.9$$

$$y = 1.1$$

We used 1.1 lbs of peanuts
0.9 lbs of raisins

$$2.1(0.9) + 0.9(1.1) =$$

$$2.88$$

$$0.9 + 1.1 = 2$$

⑥ Robbie Gould made 616 kicks for 1132 pts
 some kicks = 1 pt others = 3 pts

$x + y = 616$ # of kicks
 $y = \text{field goals made}$

$1x + 3y = 1132$ # of pts
 $x = \text{extra pts made}$

$$-(x + y = 616)$$

$$x + 3y = 1132$$

$$\checkmark \checkmark \quad 358 + 258 = 616$$

$$\checkmark \checkmark \quad 358 + 3(258) = 1132$$

$$\begin{array}{r} -1x - y = -616 \\ x + 3y = 1132 \\ \hline \end{array}$$

Robbie made 358 extra pts
 made 258 field goals

$$2y = 516$$

$$\frac{2y}{2} = \frac{516}{2}$$

$$\boxed{y = 258}$$

→

$$\begin{array}{r} x + 258 = 616 \\ -258 \quad -258 \\ \hline \end{array}$$

$$\boxed{x = 358}$$

⑦

Given

Margie feeds 164 cats \$ 24 dogs

Margie has food budget \$ 4240

Dogs cost twice as much as cat food.

Let $x = \text{cats } \$$ $y = \text{dogs } \$$

$$164x + 24y = 4240 \text{ total } \$$$

$$y = 2x \text{ dog/cat relationship}$$

Substitution- $164x + 24(2x) = 4240$

$$164 + 48x = 4240$$

$$212x = 4240$$

$$\frac{212x}{212} = \frac{4240}{212}$$

$$\boxed{x = 20}$$

$$164(20) + 24(40) = 4240$$

$$40 = 2(20)$$

$$y = 2(20) = 40$$

$\boxed{\begin{array}{l} \text{\$20 to feed/mo. a cat} \\ \text{\$40 to feed/mo. a dog} \end{array}}$

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200 small + 100 large pitchers = 800 cups
large - small = 2 cups

$$\begin{array}{r} \text{System} \\ 200x + 100y = 800 \\ -1x + y = 2 \end{array}$$

$$\begin{array}{r} 200x + 100y = 800 \\ 200(-1x + 1y) = 200(2) \end{array}$$

$$\begin{array}{r} 200x + 100y = 800 \\ -200x + 200y = 400 \end{array}$$

$$300y = 1200$$

$$\frac{300y}{300} = \frac{1200}{300}$$

$$\boxed{y = 4}$$

$$-1x + 4 = 2$$

$$-1x - 4 = -4$$

$$\frac{-1x = -2}{-1x = -2}$$

$$\boxed{x = 2}$$

$$\begin{array}{l} \checkmark \checkmark \\ 200(2) + 100(4) = 800 \\ -2 + 4 = 2 \end{array}$$

the small pitcher holds 2 cups
the large pitcher - holds 4 cups