

Solving Linear Systems - I've Got Bigger Problems!

In groups of 4, complete the following tasks.

Task 1:

Newmarket has two competing car rental companies.

- For a compact car, Aurora High's Wrecks charges a daily rate of \$30 plus 25¢ per km driven.
- For the same size of car, G.W. William's Motors simply charges 40¢ per km driven.

1. Write an equation for the fees charged by each car rental company. Define the variables (provide 'let' statements)

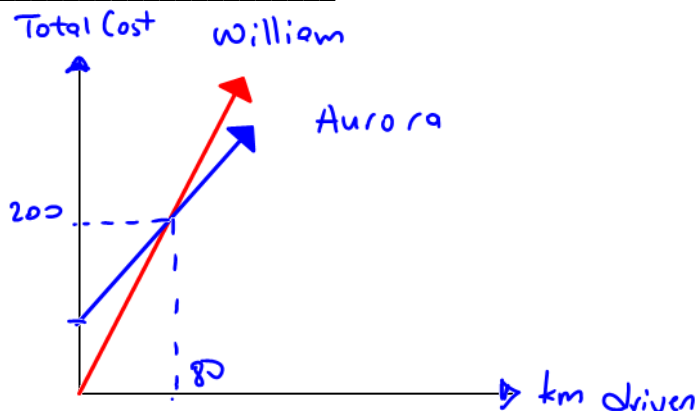
Let x represent cost per km

Let y represent total rental cost

Aurora High's Wrecks: ① $y = 0.25x + 30$

G.W. William's Motors: ② $y = 0.40x$

2. Sketch a graph to model the scenario & label the equations.



3. Solve the linear system algebraically.

sub ① into ② $-0.25x$ $-0.25x$ sub

$$0.25x + 30 = 0.40x$$

$$\frac{30}{0.15} = \frac{0.15x}{0.15}$$

$x = 200$

$$y = 0.40x$$

$$= 0.40(200)$$

$y = 80$

$\therefore \text{POI } (200, 80)$

4. What does the point of intersection represent in this scenario?

When you drive 200 km, no matter which company you choose, the total cost is \$80. (BREAK-EVEN)

5. What does the graph indicate about which company you should rent from?

km driven > 80 , go with Aurora
 km driven < 80 , " " William
 km driven $= 80$, no difference

$>$ bigger than
 $<$ less than

Task 2:

Wylie's Sporting Goods sells footballs and soccer balls. Mr. Peres bought 3 footballs and 4 soccer balls and spent \$126. Mr. Bulut bought 5 footballs and 2 soccer balls and spent \$140. How much do footballs and soccer balls cost?

- Write an equation for Mr. Peres' and Mr. Bulut's purchases. Define the variables (provide 'let' statements)

Let f represent the cost per one football

Let s represent the cost per one soccer ball

Mr. Peres: ① $126 = 3f + 4s$

Mr. Bulut: ② $140 = 5f + 2s$

- Solve your system of equations above in order to determine how much the balls cost.

Action 1

$$\begin{array}{r} 126 = 3f + 4s \\ \boxed{-} \quad 280 = 10f + 4s \\ \hline -154 = -7f \\ \frac{-154}{-7} = \frac{-7f}{-7} \\ \boxed{f = 22} \end{array}$$

Action 2

$$\begin{array}{r} 126 = 3f + 4s \\ 126 \overset{-66}{=} 3(22) + 4s \overset{-66}{} \\ \hline 60 = 4s \\ \frac{60}{4} = \frac{4s}{4} \\ \boxed{s = 15} \end{array}$$

\therefore Football \$22
Soccer \$15

multiply by 2 to eliminate 's'

Task 3:

When Billy Bob rented a car for 4 days and drove 200 km, the charge was \$136. When he rented the same car for 7 days and drove 600 km the charge was \$288. What were the charge per day and the charge per km?

- Write an equation for each of Billy Bob's cases. Define the variables (provide 'let' statements)

Let d represent charge per day

Let k represent charge per km

Case #1: $136 = 4d + 200k$ Case #2: $288 = 7d + 600k$

- Solve your system of equations above in order to determine each charge.

Plan

Action 1

$$\begin{array}{r} 408 = 12d + 600k \\ \boxed{-} \quad 288 = 7d + 600k \\ \hline 120 = 5d \\ \frac{120}{5} = \frac{5d}{5} \\ \boxed{24 = d} \end{array}$$

Action 2

$$\begin{array}{r} 136 = 4d + 200k \\ 136 = 4(24) + 200k \\ \hline 136 = 96 + 200k \\ \frac{40}{200} = \frac{200k}{200} \\ \boxed{0.20 = k} \end{array}$$

Conclusion

\therefore Charge/day = \$24
Charge/km = \$0.20 or 20¢

Task 4:

James looks in his TV cabinet and finds some old Beta and VHS tapes. He has 17 tapes in all. He finds that he has 3 more Beta tapes than VHS tapes. How many of each type does he have?

- Write an equation for each set of given information. Define the variables (provide 'let' statements)

Let b represent the number of Beta tapes

Let v represent the number of VHS tapes

#1: $b + v = 17$ #2: $b = v + 3$

- Solve your system of equations above in order to determine how many of each he has.

PLAN

Action 1

sub ② into ①

$$b + v = 17$$

$$(v + 3) + v = 17$$

$$\frac{2v}{2} = \frac{14}{2}$$

$$v = 7$$

Action 2

sub

$$b = v + 3$$

$$b = 7 + 3$$

$$b = 10$$

CONCLUSION

∴ James has 10 Beta and 7 VHS tapes.

Task 5:

The sum of two numbers is 7. Three times one of the numbers is 15 more than the other number. Find the numbers.

- Write an equation for each set of given information. Define the variables (provide 'let' statements)

Let m represent the first number

Let n represent the second number

#1: $m + n = 7$ #2: $3m = n + 15$

- Solve your system of equations above in order to determine each number.

Plan

Action 1

Rearrange ① to isolate m then sub into ②

$$m + n = 7$$

$$m = 7 - n$$

Action 2

sub

$$3m = n + 15$$

$$3(7 - n) = n + 15$$

$$21 - 3n = n + 15$$

$$21 - 15 = 4n + 15 - 15$$

$$\frac{6}{4} = \frac{4n}{4} \Rightarrow n = 1.5$$

Action 3

$$m + n = 7$$

$$1.5 + n = 7$$

$$n = 5.5$$

CONCLUSION

∴ The numbers are 1.5 and 5.5

Task 6:

Rehman invests his summer earnings of \$3050. He invests part of the money at 8%/year and the rest at 7.5%/year. After 1 year, these investments earn \$242 in interest. How much did he invest at each rate?

Plan
Let e represent the amount of money invested @ 8%/year
Let s represent the amount of money invested @ 7.5%/year

#1: $3050 = e + s$ Multiply #1 by 0.08 to eli. e #2: $242 = 0.08e + 0.075s$

Action 1

$$\begin{array}{r} 244 = 0.08e + 0.08s \\ \boxed{-} \quad 242 = 0.08e + 0.075s \\ \hline 2 = 0.005s \\ \frac{2}{0.005} = \frac{0.005s}{0.005} \\ \boxed{s = 400} \end{array}$$

Action 2

$$\begin{array}{r} 3050 = e + s \\ \quad \quad \quad -400 \\ \hline 3050 = e + 400 \\ \boxed{2650 = e} \end{array}$$

Conclusion
 \therefore Rehman invested \$400 @ 7.5%/year and \$2650 @ 8%/year.

Task 7:

One type of granola has 30% nuts, by mass. A second type of granola has 15% nuts. What mass of each type needs to be mixed to make 600 g of granola that will have 21% nuts?

PLAN
Let x represent the amount of 30% nut TYPE
Let y represent the amount of 15% nut TYPE

Total g #1: $x + y = 600$ Mult #1 by 0.15 #2: $0.30x + 0.15y = 0.21(600)$

ACTION 1

$$\begin{array}{r} 0.15x + 0.15y = 90 \\ \boxed{-} \quad 0.30x + 0.15y = 126 \\ \hline -0.15x = -36 \\ \frac{-0.15x}{-0.15} = \frac{-36}{-0.15} \\ \boxed{x = 240} \end{array}$$

ACTION 2

$$\begin{array}{r} x + y = 600 \\ 240 + y = 600 \\ \hline y = 600 - 240 \\ \boxed{y = 360} \end{array}$$

CONC
 240g of 30% nut type needs to be mixed with 360g of 15% nut type of granola.

Task 8:

Ken has \$3.80 in nickels and dimes. If there are 50 coins altogether, how many dimes are there?