

Solving Linear Systems – I've Got Problems!

Practice Makes Progress!

1. Carl's Car Rental Company charges a flat rate of \$20 plus 25¢ per km. Cally's Car Rental Company charges a flat rate of \$10 plus 30¢ per km.
- a. Develop an equation to represent the cost of renting a car from each company. Let x represent the number of km driven and y represent the total cost.

25 ¢ = \$0.25
30 ¢ = \$0.30

① Carl's Car Rental Company $y = 0.25x + 20$
② Cally's Car Rental Company $y = 0.30x + 10$

Where do the two lines intersect? What does this point represent?

① $y = 0.25x + 20$
② $y = 0.30x + 10$

sub \rightarrow
① \rightarrow ②

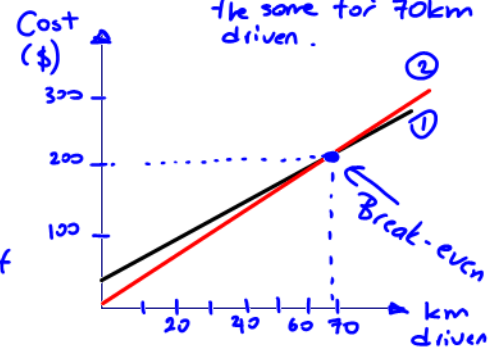
$0.30x + 10 = 0.25x + 20$
 $0.30x = 0.25x + 10$
 $0.05x = 10$
 $\frac{0.05x}{0.05} = \frac{10}{0.05}$
 $x = 200$

$y = 0.25x + 20$ sub $x = 200$
 $y = 0.25(200) + 20$
 $y = 50 + 20$
 $y = 70$

The POI is $(200, 70)$
Each company costs the same for 70km driven.

- b. **Sketch** the graphs and label the lines.
- c. Which company will be cheapest if you plan to drive 300km?

You pay less with Carl's Car Rental Co if you plan to drive 300km because its graph grows slower compared to that of Cally's after POI.



2. There are two competing video stores. Video Mania rents videos for \$2 each plus a one-time membership fee of \$10. Cool Movies rents videos for \$2.50 each with NO membership fee. When will the cost be the same at either rental store?

Let v be the number of videos rented

Let c be the total charge

Video Mania $c = 2v + 10$ ①

Cool Movie $c = 2.5v$ ②

Sub ① in ②

$2v + 10 = 2.5v$

$\frac{10}{0.5} = \frac{0.5v}{0.5}$

$v = 20$

$c = 2.5v$ $v = 20$

$= 2.5(20)$

$c = 50$

POI $(50, 20)$

The cost will be the same which is \$50 when 20 videos rented.

$(50, 20)$

3. When Chana rented a car for three days and drove 160km, the charge was \$124. When she rented the same car for five days and drove 400km, the charge was \$240. What was the charge per day and the charge per km?

Let d be the cost per day $\textcircled{1} 3d + 160k = 124$
Let k be the cost per km driven $\textcircled{2} 5d + 400k = 240$

Step 1 Rearrange $\textcircled{2}$ in $y = mx + b$ form to isolate d

$$5d + 400k = 240$$

$$\frac{5d}{5} = \frac{240 - 400k}{5}$$

$$\textcircled{3} d = 48 - 80k$$

Step 2 Sub $\textcircled{3}$ into $\textcircled{1}$ where you see d

$$3(48 - 80k) + 160k = 124$$

$$144 - 240k + 160k = 124$$

$$-80k = -20$$

$$\frac{-80k}{-80} = \frac{-20}{-80}$$

$$k = \frac{1}{4}$$

\downarrow
 $k = 0.25$
 $= 25 \text{¢}$

Step 3

$$3d + 160k = 124 \quad k = \frac{1}{4}$$

$$3d + 160\left(\frac{1}{4}\right) = 124$$

$$3d + 40 = 124$$

$$\frac{3d}{3} = \frac{84}{3}$$

$$d = 28$$

\therefore The charge per km is 25¢ and per day is \$28.

4. Charlotte invested \$800, part at 9% per year and the rest at 12% per year. After one year, the total interest earned was \$79.50. How much did she invest at each rate?

Let n be the amount invested at 9% $\textcircled{1} n + t = 800$
Let t be the amount invested at 12% $\textcircled{2} 0.09n + 0.12t = 79.50$

Step 1 Rearrange $\textcircled{1}$ to isolate n

$$n + t = 800$$

$$\textcircled{3} n = 800 - t$$

Step 2 Sub $\textcircled{3}$ into $\textcircled{2}$

$$0.09(800 - t) + 0.12t = 79.50$$

$$72 - 0.09t + 0.12t = 79.5$$

$$0.03t = 7.5$$

$$\frac{0.03t}{0.03} = \frac{7.5}{0.03}$$

$$t = 250$$

Step 3

$$n + t = 800 \quad t = 250$$

$$n + 250 = 800$$

$$n = 550$$

\therefore She invested \$550 @ 9% and \$250 @ 12%.

5. The sum of two numbers is 9. Three times one of the numbers is 15 more than the other number. Find the numbers.

Let x & y be the two numbers $\textcircled{1} x + y = 9$
 $\textcircled{2} 3x - y = 15$

Step 1 Rearrange $\textcircled{1}$ to isolate "x"

$$x + y = 9$$

$$\textcircled{3} x = 9 - y$$

Step 2 Sub

$$3x - y = 15$$

$$3(9 - y) - y = 15$$

$$27 - 3y - y = 15$$

$$-4y = -12$$

$$\frac{-4y}{-4} = \frac{-12}{-4}$$

$$y = 3$$

Step 3 Sub

$$x + y = 9$$

$$x + 3 = 9$$

$$x = 6$$

$\therefore x = 6$
 $y = 3$

6. For the school play, one adult ticket costs \$5.00 and one student ticket costs \$3.00. Twice as many student tickets as adult tickets were sold. The total revenue was \$1650. How many of each kind of ticket were sold?

7. Martin wants to hire a plumbing company to fix his leaky faucet. Plumbers R Us charges \$50 for the initial consultation and \$30/hr for any work required. Faucet Fixers charges \$30 for the initial consultation and \$40/hr for labour. Which company should Martin choose? What assumptions did you make?