

5.3 Linear Combinations

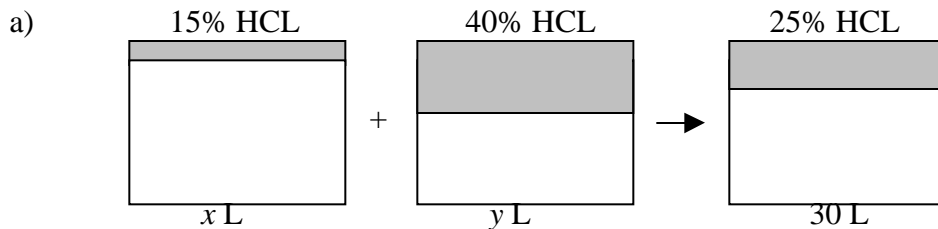
1)

a) $\frac{\$28}{10 \text{ lbs}} = \frac{\$2.80}{1 \text{ lb}} = \$2.80 \text{ per pound}$

b) The cost per pound of the mixture was closer to that of peanuts.

c) There should be more *peanuts* than cashews in the mixture because the cost per pound of the peanut (\$2/lb) is much closer to the cost per pound of the whole mixture (\$2.80/lb) than the cost per pound of the cashews (\$5/lb).

3)



b) Let x and y be the respective volumes (L) of the 15% and 40% solutions.
 $x + y = 30$

c) $0.15x + 0.40y = 0.25(30)$

d) Solve both equations for y (i.e.: get them in the form $y =$) and enter both equations into the calculator. Find an appropriate window for viewing the point of intersection of both lines. The x -coordinate of this point is the volume of the 15% solution and the y -coordinate is the volume of the 40% solution.

5) The equation $4x + 10y = 16$ is a distance equation. The term $4x$ represents the distance (mi) Jason travels and $10y$ represents the distance (mi) Nathan traveled. The 16 in the equation means that the total distance they both traveled was 16 miles. The equation $x = y + \frac{1}{2}$ is a time equation. x represents the time Jason traveled and y represents the time Nathan traveled. The presence of $\frac{1}{2}$ in the equation indicates that Jason has traveled $\frac{1}{2}$ hr longer than Nathan.

7)

a) Let x be the amount of chocolate raspberry beans (lbs)
 Let y be the amount of French vanilla coffee beans (lbs)

b)

	Amount of coffee beans (lbs)	Price per lb (\$)	Total (\$)
Chocolate Raspberry	x	4	$4x$
French Vanilla	y	6	$6y$
Totals	3		13

c) $x + y = 3$ $y = 3 - x$
 $4x + 6y = 13$

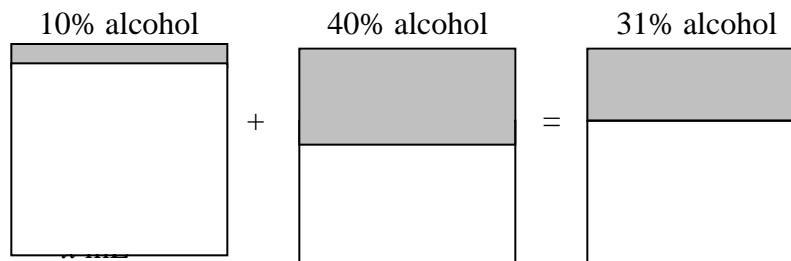
d) $4x + 6(3 - x) = 13$
 $4x + 18 - 6x = 13$
 $-2x + 18 = 13$
 $-2x = -5$
 $x = \frac{5}{2} = 2.5$

Therefore $y = 3 - (2.5) = 0.5$

There are 2.5 lbs of chocolate raspberry beans and 0.5 lbs of French vanilla beans in the mix.

9)

a)



b)

Let y be the amount (in mL) of 40% solution in the mixed solution.

c) $x + y = 600$
 $0.10x + 0.40y = (0.31)(600)$ or $0.10x + 0.40y = 186$

d) $x + y = 600$ $y = -x + 600$ so graph $Y_1 = -X + 600$.
 $0.10x + 0.40y = 186$ $y = -0.25x + 465$ so graph $Y_2 = -0.25X + 465$.

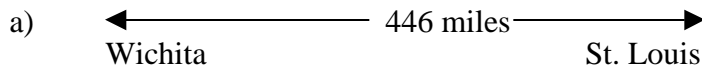
Window

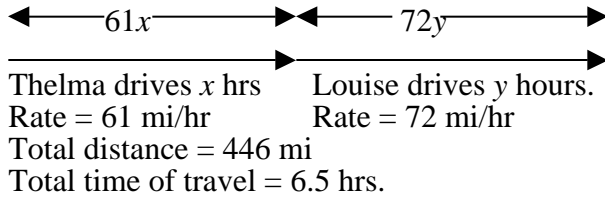
$X_{\min} = 0$ $X_{\max} = 940$ $X_{\text{scl}} = 94$
 $Y_{\min} = 0$ $Y_{\max} = 600$ $Y_{\text{scl}} = 60$

Hit 2^{nd} CALC 5 (intersect). Hit ENTER 3 times to get $X = 180$, $Y = 420$.
 180 mL of the 10% solution and 420 mL of the 40% solution were mixed to yield 600 mL of a 31% solution.

e) The answer seems reasonable. Since the concentration of the mixture (31%) is closer to that of the 40% solution, we expect more of that solution to be in the mixture. Also, the sum of the solutions is 600 mL.

11)





- b) Let x be the time (in hrs) that Thelma drove.
 Let y be the time (in hrs) that Louise drove.
 $x + y = 6.5$
 $61x + 72y = 446$

- c) $y = 6.5 - x$
 $61x + 72(6.5 - x) = 446$
 $61x + 468 - 72x = 446$
 $-11x + 468 = 446$
 $-11x = -22$
 $x = 2$
 $y = 6.5 - (2) = 4.5$

- d) Thelma drove 2 hrs and Louise drove 4.5 hrs.

- 13) Let x be the number of ordinary seats sold (for \$4 each).
 Let y be the number of special seats sold (for \$12 each).

$$x + y = 600$$

$$4x + 12y = 3040$$

- a) A window that includes the point of intersection is obviously necessary.
 A good one to trace would be
 $X_{\min} = 0$ $X_{\max} = 940$ $X_{\text{scl}} = 94$
 $Y_{\min} = 0$ $Y_{\max} = 600$ $Y_{\text{scl}} = 60$
- b) Solution: (520, 80)
 520 ordinary seats were sold and 80 special seats were sold.

- 15) Let x be the amt of money borrowed from the source requiring 7.5% interest.
 Let y be the amt of money borrowed from the source requiring 11.25% interest.

$$x + y = 5600$$

$$0.075x + 0.1125y = 476.25$$

Solve by substitution:

$$y = 5600 - x$$

$$0.075x + 0.1125(5600 - x) = 476.25$$

$$0.075x + 630 - 0.1125x = 476.25$$

$$-0.0375x + 630 = 476.25$$

$$0.0375x + 476.25 = 630$$

$$0.0375x = 153.75$$

$$x = 4100$$

$$y = 5600 - (4100) = 1500$$

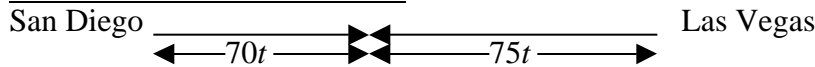
\$4100 was borrowed from the source requiring 7.5% interest and \$1500 was borrowed from the source requiring 11.25% interest.

Skill and Review

17) UNDERSTAND THE PROBLEM

We need to find the time that two cars (initially 338 miles apart and heading towards each other) meet. We are given that both start traveling at 2:00 PM, one car travels 70 mi/hr, and the other car travels 75 mi/hr.

VISUALIZE THE PROBLEM



ASSIGN VARIABLE(S)

Let t be the number of hours it takes for the cars to meet.

WRITE EQUATION(S)

The car leaving from San Diego travels a distance of $70t$ miles. The car leaving Las Vegas travels a total of $75t$ miles. The original distance between them was 338 miles. Thus we can write the equation $70t + 75t = 338$.

SOLVE EQUATION(S)

$$70t + 75t = 338$$

$$145t = 338$$

$$t = \frac{338}{145} \quad 2.33 \text{ hrs}$$

ANSWER THE QUESTION

The cars will meet approximately 2.33 hours after 2:00 PM. Since $2.33 = 2\frac{1}{3}$, and since $\frac{1}{3} \text{ hr} = \frac{1}{3}(60 \text{ min}) = 20 \text{ min}$ the cars will meet approximately 2 hours and 20 minutes after 2:00 PM. So the cars will meet around 4:20 PM.

CHECK YOUR ANSWER

Our approximation is correct. Since our exact answer was $t = \frac{338}{145}$ hrs, substitution of this value for t in the original equation satisfies it:

$$70\left(\frac{338}{145}\right) + 75\left(\frac{338}{145}\right) = 338$$

$$145\left(\frac{338}{145}\right) = 338$$

$$338 = 338$$

19)
$$\frac{x}{3.2} = \frac{-24}{7}$$

$$7x = (-24)(3.2)$$

$$7x = -76.8$$

$$x = -11.0 \quad \text{Answer rounded to the nearest whole number}$$