In-Class Assignment #4

FALL 2012
(943-DW)
SEPT 21ST 2012

(1) Let x_1 = Amount of 20% alcohol soln
x_2 = Amount of 75% alcohol soln

T = Total final solution (35% alc.)

Equations:

$x_1 + x_2 = T$ (A)
$x_1 = 60$ (B)

Alcohol: $0.2x_1 + 0.75x_2 = 0.35T$ (C)

Sub in (A) & (B) $0.2(60) + 0.75x_2 = 0.35(60 + x_2)$

$12 + 0.75x_2 = 21 + 0.35x_2$

$0.4x_2 = 9$

$x_2 = 22.5\ L$

22.5 L must be added

(b) $x_1 + x_2 = T$ (A)
$x_1 = 60$ (B)

Alcohol:

Sub in (A) & (B) $0.2(60) + 0.75x_2 = 0.45T$

$12 + 0.75x_2 = 0.45(60 + x_2)$

$12 + 0.75x_2 = 27 + 0.45x_2$

$0.3x_2 = 15$

$x_2 = 50\ L$

50 L must be added
There is not enough room in the tank.

(2) Let x_1 = Amount of 75% alcohol solution being used

x_2 = Amount of 20% alcohol solution remaining

T = Total Amount of 60% Alc. soln

Equations

$x_1 + x_2 = T$ (A)

$T = 100$ (B)

$x_1 + x_2 = 100$

$x_1 = 100 - x_2$

Alcohol Equn:

$0.75x_1 + 0.2x_2 = 0.6T$ (C)

Sub in (A) & (B)

$0.75(100 - x_2) + 0.2x_2 = 0.6(100)$

$75 - 0.75x_2 + 0.2x_2 = 60$

$15 = 0.55x_2$

$x_2 = 27.27$

$x_1 = 72.727$

72.73 L must replace the 20% alcohol solution.

(3)

Mix A

3/5 = 60% sand

2/5 = 40% salt

Mix B

1/5 = 20% sand

4/5 = 80% salt

Final

10 kg

50% sand

50% salt

Let x_A = Amount of mix A

x_B = Amount of mix B

Equations

$$x_A + x_B = 10$$

Sand:

$$0.6x_A + 0.2x_B = 0.5(10)$$

$$0.6(10 - x_B) + 0.2x_B = 5$$

$$6 - 0.6x_B + 0.2x_B = 5$$

$$0.4x_B = 1$$

$$x_B = 2.5 \text{ kg}$$

There should be 7.5 kg of mix A & 2.5 kg of mix B.

(4)

First ½ run

S_1 = speed of 1st ½ run

d_1 = distance of 1st ½ run

t_1 = time of 1st ½ run

Second ½ run

S_2 = speed of 2nd ½

d_2 = dist. " "

t_2 = time " "

Equations:

$S_1 = 10$ Km/h $\quad S_2 = 6$ Km hr

$t_1 + t_2 = 2.5$

$d_1 = d_2$

$d_1 = S_1 t_1 \quad d_2 = S_2 t_2$

we get $d_1 = d_2$

$S_1 t_1 = S_2 t_2$

$10 t_1 = 6 t_2$

$10(2.5 - t_2) = 6 t_2$

$25 - 10t_2 = 6 t_2$

$16 t_2 = 25 \longrightarrow t_2 = 25/16$ hrs.

$$d_2 = s_2 t_2$$
$$= 6\left(\frac{25}{16}\right) = 9.375 \text{ Km}$$

THE RUNNER TRAVELS 9.375 Km BEFORE TURNING AROUND.

(5)

JAMES

s_1 = JAMES' speed
d_1 = " " distance
t_1 = " " time traveled

PAUL

s_2 = Paul's speed
d_2 = " " distance
t_2 = " " time

EQUATIONS

$t_1 = t_2$ (traveled same amount of time)
$s_1 = 70$ Km/h
$s_2 = 75$ Km/h
$d_1 + d_2 = 580$
$t_1 = \frac{d_1}{s_1}$ $t_2 = \frac{d_2}{s_2}$

We get $t_1 = t_2$

$$\frac{d_1}{s_1} = \frac{d_2}{s_2}$$

$$\frac{d_1}{70} = \frac{d_2}{75}$$

$$\frac{580 - d_2}{70} = \frac{d_2}{75}$$

$$75(580 - d_2) = 70 d_2$$
$$43{,}500 - 75 d_2 = 70 d_2$$
$$43500 = 145 d_2$$
$$d_2 = 300$$

(5)

Paul traveled 300km @ 75km/hr

$$t_2 = \frac{d_2}{S_2} = \frac{300}{75} = 4 \text{ hrs}$$

He left 4 hrs before noon, at 8:00 A.M.

(6)

Student 1		Student 2	
d_1	distance	d_2	distance
t_1	time	t_2	time
S_1	speed	S_2	speed

Equations

$t_1 = t_2$ (travel same amount of time)

$S_1 = 20$ Km/h $\quad S_2 = 16$ Km/h

$$d_1 + d_2 = 65$$
$$d_2 = 65 - d_1$$

$$t_1 = \frac{d_1}{S_1} \qquad t_2 = \frac{d_2}{S_2}$$

we get: $t_1 = t_2$

$$\frac{d_1}{S_1} = \frac{d_2}{S_2}$$

$$\frac{d_1}{20} = \frac{d_2}{16} \Longrightarrow 16 d_1 = 20 d_2$$

$$16 d_1 = 20(65 - d_1)$$
$$16 d_1 = 1300 - 20 d_1$$
$$36 d_1 = 1300$$
$$d_1 = 36.11 \text{ KM}$$

$$t_1 = \frac{d_1}{S_1} = \frac{36.11}{20} = 1.805 \text{ hrs}$$

1.805 hrs = 108.3 minutes = 1 hr 48 minutes

At 11:48 AM they will be 65 Km apart.