

System Study Guide

✓ 1.

	r	t	d
with	$x+y$.5	3
against	$x-y$	1.5	3

x = boat in still water
 y = rate of current

$$.5(x+y) = 3 \rightarrow$$

$$1.5(x-y) = 3 \rightarrow$$

$$x+y = 6$$

$$x-y = 2$$

$$2x = 8$$

$$x = 4 \quad y = 2$$

Her rowing rate is 4 km/hr and rate of current is 2 km/hr.

✓ 2.

	Amount	%	T
water	x	0	0
alcohol	20	.45	9
mix	y	.3	.3y

$$x+20 = y$$

$$9 = .3y$$

$$9 = .3(x+20)$$

$$9 = .3x + 6$$

$$3 = .3x$$

$$10 = x$$

10 L of water are needed

✓ 3.

	Amount	\$	T
#1	x	2.50	$2.50x$
#2	2	4.50	9
mix	y	3	$3y$

$$x+2 = y$$

$$2.50x + 9 = 3y$$

$$2.50x + 9 = 3(x+2)$$

$$2.50x + 9 = 3x + 6$$

$$3 = .50x$$

$$.50 \quad .50$$

$$6 = x$$

6 pounds of the \$2.50 nuts should be added.

✓ 4.



* opp. directions = add

x = Henry's speed

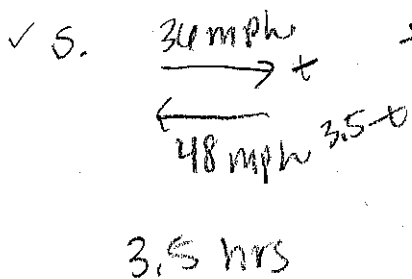
$$4x + 4(x+9) = 380$$

$$4x + 4x + 36 = 380$$

$$8x = 344$$

$$x = 43$$

Henry drove 43 mph.



* round trip \rightarrow set = * Need distance!

$t = \text{time there}$
 $30t = 48(3.5 - t)$
 $30t = 168 - 48t$
 $84t = 168$
 $t = 2$

His home is 72 miles from town.

$36(2) = 72$

✓ 6.

	Hailey	Jason
Now	X	Y
25 yrs ago	X-25	Y-25

$X - 25 = 5 + \frac{1}{3}(Y - 25)$
 $Y = 2X - 20$

$X - 25 = 5 + \frac{1}{3}Y - \frac{25}{3}$
 $X - 25 = 5 + \frac{1}{3}(2X - 20) - \frac{25}{3}$
 $9(X - 25) = 9(5 + \frac{2}{3}X - \frac{20}{3} - \frac{25}{3})$
 $9X - 225 = 45 + 6X - 78 - 75$
 $9X - 225 = -108 + 6X$
 $3X = 267$
 $X = 39$

Jason is 52 years old.

$Y = 2(39) - 20$
 $Y = 52$

✓ 7.

	Kayla	Nathan
Now	X	Y
In 4 yrs	X+4	Y+4

$X + 4 = \frac{1}{2}Y$
 $Y = 3X - 8$

$X + 4 = \frac{1}{2}(3X - 8)$
 $X + 4 = \frac{3}{2}X - 4$
 $8 = .5X$
 $16 = X$

Nathan is 40 years old.

$Y = 3(16) - 8$
 $Y = 40$

✓ 8.

	r	t	d
with	X+y	1	158
against	X-y	1	112

X = plane in still air
 Y = rate of wind

The plane in still air goes 135 km/hr; wind is 23 km/hr.

$X + Y = 158$
 $X - Y = 112$
 $2X = 270$

$X = 135$ $Y = 23$

✓ 9.

	Ann	Betty
Now	X	y
Last yr	X-1	y-1

$$\begin{aligned}
 X &= 2 + y \\
 X - 1 &= 2(y - 1) \\
 2 + y - 1 &= 2y - 2 \\
 y + 1 &= 2y - 2 \\
 3 &= y
 \end{aligned}$$

$$\begin{aligned}
 X &= 2 + 3 \\
 X &= 5
 \end{aligned}$$

Ann is 5 years old.

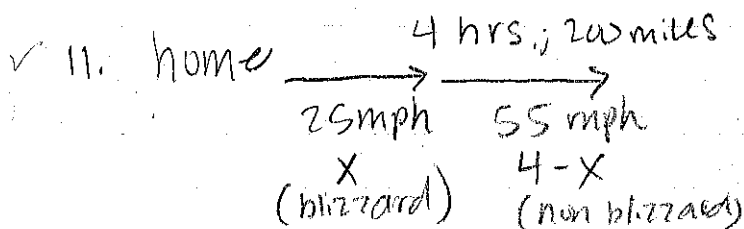
✓ 10.

	Jerry	Jennifer
Now	X	y
In 3 yrs	X+3	y+3

$$\begin{aligned}
 X &= 7 + y \\
 X + 3 &= 2(y + 3) \\
 7 + y + 3 &= 2y + 6 \\
 y + 10 &= 2y + 6 \\
 4 &= y
 \end{aligned}$$

$$\begin{aligned}
 X &= 7 + 4 \\
 X &= 11
 \end{aligned}$$

Jerry is 4 and Jennifer is 11.



$$\begin{aligned}
 25X + 55(4-X) &= 200 \\
 25X + 220 - 55X &= 200 \\
 -30X &= -20 \\
 X &= \frac{2}{3}
 \end{aligned}$$

They drove for $\frac{2}{3}$ of an hour in the blizzard.

✓ 12.

	r	t	d
with	X+120	2	y
against	X-120	3	y

X = speed of plane in still air
y = distance

$$\begin{aligned}
 2(X+120) &= y & 2X+120 &= 3X-180 \\
 3(X-120) &= y & 300 &= X
 \end{aligned}$$

$$\begin{aligned}
 y &= 2(300+120) \\
 y &= 2(360) \\
 y &= 720
 \end{aligned}$$

The speed of the plane is 300 km/hr and the distance is 720 km.

✓ 13.

	John	Father	Alice
Now	X	Y	Z
In 2 yrs.	X+2	Y+2	Z+2

$$X = 2(4)$$

$$X = 8$$

John is 8.

$$Y = 5X$$

$$X = 2Z$$

$$X + 2 + Y + 2 + Z + 2 = 58$$

$$\rightarrow X + Y + Z = 52$$

$$2Z + 5(2Z) + Z = 52$$

$$2Z + 10Z + Z = 52$$

$$13Z = 52$$

$$Z = 4$$

✓ 14. * same direction \rightarrow set = ** change to hrs!!!

Skier	$\frac{5}{6}$ hr	X mph
Snowmobile	$\frac{1}{6}$ hr.	X+16 mph

X = speed of skier

$$\frac{5}{6}X = \frac{1}{6}(X+16)$$

$$4\left(\frac{5}{6}X = \frac{1}{6}X + \frac{8}{3}\right)$$

$$5X = X + 16$$

$$4X = 16$$

$$X = 4$$

$$4 + 16 = 20$$

The snowmobile's speed is 20 mph!

✓ 15.

	man	son
Now	X	Y
11 yrs ago	X-11	Y-11

The man is 51 and the son is 31.

$$X + Y = 82$$

$$X - 11 = 2(Y - 11)$$

$$X - 11 = 2Y - 22$$

$$X = 2Y - 11$$

$$2Y - 11 + Y = 82$$

$$3Y = 93$$

$$Y = 31$$

$$X = 2(31) - 11$$

$$X = 42 - 11$$

$$X = 31$$

✓ 16.

	r	t	d
with	X+Y	1.5	900
against	X-Y	2	900

$$1.5(X+Y) = 900 \rightarrow$$

$$2(X-Y) = 900 \rightarrow$$

X = jet in still air
Y = rate of wind

$$X + Y = 600$$

$$X - Y = 450$$

$$2X = 1050$$

$$X = 525$$

The rate of the jet is 525 mph? (the wind is 75 mph.)

$$Y = 75$$

✓ 17.

	r	t	d
with	$x+y$	$\frac{1}{3}$	4
against	$x-y$	$\frac{2}{5}$	4

x = boat in still water
 y = rate of current

$$\frac{1}{3}(x+y) = 4 \rightarrow$$

$$\frac{2}{5}(x-y) = 4 \rightarrow$$

$$\begin{array}{r} x+y = 12 \\ x-y = 10 \\ \hline 2x = 22 \\ x = 11 \end{array}$$

The boat's speed is 11 km/hr and the current is 1 km/hr.

$y = 1$

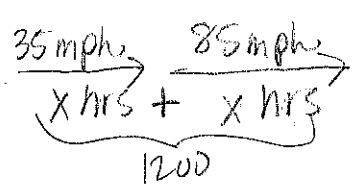
✓ 18.

	amnt	\$	T
P.J.	x	5.50	$5.50x$
O.J.	100	3	300
mix	y	3.50	$3.50y$

$$\begin{array}{r} x+100=y \\ 5.50x+300=3.50y \\ 5.50x+300=3.50(x+100) \\ 5.50x+300=3.50x+350 \\ 2x = 50 \\ x = 25 \end{array}$$

25 gallons of pineapple juice are needed.

✓ 19, same direction



x = hours

$$\begin{array}{r} 35x + 85x = 1200 \\ 120x = 1200 \\ x = 10 \end{array}$$

$35(10) = 350$
 $85(10) = 850$

The 1st leg is 350 mi and the 2nd leg is 850 mi

✓ 20.

	amnt	%	T
whole	x	.035	$.035x$
skim	3	0	0
mix	y	.02	$.02y$

$$\begin{array}{r} x+3=y \\ .035x = .02y \\ .035x = .02(x+3) \\ .035x = .02x + .06 \\ .015x = .06 \\ x = 4 \end{array}$$

4 liters of whole milk are needed.

✓ 21.

	Amount	\$	T
30%	X	.3	.3X
10%	y	.1	.1y
MIX	400	.25	100

$$\begin{aligned}
 -.3(x+y) &= 400 \\
 .3x + .1y &= 100 \\
 \hline
 -.3x - .3y &= -120 \\
 \hline
 -.2y &= -20 \\
 y &= 100 \\
 x &= 300
 \end{aligned}$$

He needs
300 lb of
30% meat and
100 lb of
10% meat.

✓ 22. *Same direction

48 mph	35 mph
5X	X

27.5 miles

X = time spent on
2nd part

$$\begin{aligned}
 48(5X) + 35X &= 27.5 \\
 240X + 35X &= 27.5 \\
 275X &= 27.5 \\
 X &= .1 \rightarrow 6 \text{ min} \\
 y &= .5 \rightarrow 30 \text{ min}
 \end{aligned}$$

36 min is
total time
spent on the
trip.

✓ 23.

	Amount	%	T
20%	X	.2	.2X
100%	y	1	y
MIX	8	.6	4.8

$$\begin{aligned}
 -1(x+y) &= 8 \\
 .2x + y &= 4.8 \\
 \hline
 -1x - y &= -8 \\
 \hline
 -.8x &= -3.2 \\
 x &= 4
 \end{aligned}$$

4 qts of the original
coolant should be
drained

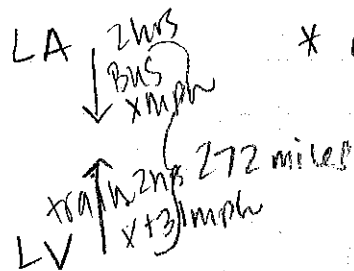
✓ 24.

	Amount	\$	T
75¢	X	.75	.75X
\$1.10	y	1.10	1.10y
MIX	50	.9	45

$$\begin{aligned}
 -.75(x+y) &= 50 \\
 .75x + 1.10y &= 45 \\
 \hline
 -.75x - .75y &= -37.5 \\
 \hline
 .35y &= 7.5 \\
 y &= 21.43 \\
 x &= 28.57
 \end{aligned}$$

Need 21.4 lb of 75¢ grass
& 28.6 lb of \$1.10 grass.

✓ 25.



* opposite directions = add
 x = speed of bus

$$2x + 2(x+31) = 272$$

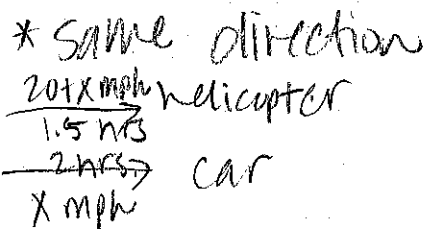
$$2x + 2x + 62 = 272$$

$$4x = 210$$

$$x = 52.5$$

The speed of the bus is 52.5 mph & the train is 83.5 mph

✓ 26.



x = speed of car

$$1.5(20+x) = 2x$$

$$30 + 1.5x = 2x$$

$$30 = .5x$$

$$60 = x$$

$$60 + 20 = 80$$

The car's speed is 60 mph and the helicopter's speed is 80 mph

✓ 27.

	man	son
Now	x	y
In 14 yrs.	$x+14$	$y+14$

$$x = 25 + y$$

$$x+14 = 2(y+14)$$

$$25 + y + 14 = 2y + 28$$

$$y + 39 = 2y + 28$$

$$11 = y$$

$$x = 25 + 11$$

$$x = 36$$

The man is 36 and the son is 11.

✓ 28.

n = nickels

d = dimes

q = quarters

$$.05n + .10d + .25q = 24.15$$

$$n = 2q$$
$$d = n + 5$$

$$.05(2q) + .10(2q + 5) + .25q = 24.15$$

$$.1q + .2q + .5 + .25q = 24.15$$

$$.55q + .5 = 24.15$$

$$.55q = 23.65$$

$$q = 43$$

$$n = 2(43) = 86$$

$$d = 86 + 5$$
$$d = 91$$

There are
43 quarters, 86 nickels,
and 91 dimes.

✓ 29. x = \$5 bills

y = \$10 bills

$$x = 3y$$

$$5x + 10y = 750$$

$$5(3y) + 10y = 750$$

$$15y + 10y = 750$$

$$25y = 750$$

$$y = 30$$

$$x = 3(30)$$

$$x = 90$$

There are 30 \$10 bills
and 90 \$5 bills.