

Math 96--Mixture Word Problems Using Two Equations--page 1

Name _____

Date _____

We're going to solve mixture word problems with two equations (so we need two variables). One way to organize your information is to use a chart. Observe carefully. By the way, all the "math" will be left up to you so you have the opportunity to "do the math". The answers for examples a-g appear before the homework.

Part A: Chemistry Mixture Problems

- a. A chemist mixes some 70% solution with some 40% solution to obtain 120 gallons of 50% solution. Find the number of gallons of each solution.

Think: $x =$ gallons of 70% solution
 $y =$ gallons of 40% solution

	strength (in %)	how many gallons	amount of pure (% times how many gallons)
1 st solution	0.70	x	$0.70(x)$
2 nd solution	0.40	y	$0.40(y)$
Final sol.	0.50	120	$0.50(120)$

The "how many gallons" column gives one equation; the "amount of pure" column gives the second equation.

$x + y = 120$ because gal + gal = total gal
 $.70x + .40y = .50(120)$ because %(gal) + %(gal) = %(total gal)

- b. A pharmacist mixes two different strengths of peroxide. If she mixes a 1% with a 9% solution to obtain 60 ml of a 4% solution, how many ml of each type solution does she use?

Think: $x =$ ml of 1%
 $y =$ ml of 9%

	strength (in %)	how many ml	amount of pure (% times how many ml)
1 st solution	0.01	x	$0.01(x)$
2 nd solution	0.09	y	$0.09(y)$
Final sol.	0.04	60	$0.04(60)$

$x + y = 60$ because ml + ml = total ml
 $.01x + .09y = .04(60)$ because %(ml) + %(ml) = %(total ml)

Part C: General Mixture Problems

- f. A company manufactures some spigots at \$25 each and others at \$32 each. If the company sold 50 spigots and made \$1334, find the number of each type spigot sold.

Think: $x =$ spigots at \$25 each
 $y =$ spigots at \$32 each

	\$ for one spigot	how many spigots	total value (\$ for one times how many spigots)
1 st	25	x	$25(x)$
2 nd	32	y	$32(y)$
overall		50	\$1334

$x + y = 50$ because spigots + spigots = total spigots
 $25x + 32y = 1334$ because \$(spigots) + \$(spigots) = total \$

- g. A grocer mixed \$1.80 a pound peanuts with \$3.20 a pound chocolate to obtain 50 pounds of a mixture worth \$2.92 a pound. Find the number of pounds of each item used.

Think: $x =$ pounds of peanuts
 $y =$ pounds of chocolate

	\$ for one pound	how many pounds	total value (\$ for one times how many pounds)
1 st	1.80	x	$1.80(x)$
2 nd	3.20	y	$3.20(y)$
overall	2.92	50	$2.92(50)$

$x + y = 50$ because pounds + pounds = total pounds
 $1.80x + 3.20y = 2.92(50)$ because \$(pounds) + \$(pounds) = \$_{ending}(pounds_{total})

You should work a through g to make sure you can do the math :) and then check your results (see below). Then you should try the worksheet.

- Answers:
- a. $x = 40$ gallons of 70%; $y = 80$ gallons of 40%
 - b. $x = 37.5$ ml of 1%; $y = 22.5$ ml of 9%
 - c. $x = 20$ liters at 32%; $y = 60$ liters at 10%
 - d. $x = \$3500$ at 6%; $y = \$6500$ at 8%
 - e. $x = \$11,000$ at 5%; $y = \$17,000$ at 7%
 - f. $x = 38$ spigots at \$25 each; $y = 12$ spigots at \$32 each
 - g. $x = 10$ lbs peanuts at \$1.80 a pound; $y = 40$ lbs chocolate at \$3.20 a pound

Now try these.

1. A 25% acid solution must be added to a 40% solution to get 240 liters of 30% acid solution. How many of each solution must be used?
2. A 50% antifreeze must be mixed with a 20% antifreeze to get 250 gallons of 32% antifreeze solution. How many of each must be used?

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3. A certain metal is 40% tin. A 40% tin metal must be mixed with a 70% tin metal to get 150 kilograms of metal that is 52% tin. How much of each must be used?
4. A 1% solution should be mixed with a 4% solution to get 75 ml of 2% solution. How much of each must be used?
5. A 60% acid solution must be mixed with a 75% acid solution to get 20 liters of a 72% solution. How much of each must be used?
6. Gloria invested some money at 18%, and \$3000 less than this at 20%. The total annual interest is \$3200. How much is invested at each rate?
7. Marty inherited a sum of money from a relative. He deposits some of the money at 16%, and \$4000 more than this at 12%. He earns \$3840 in interest per year. How much is invested at each rate?
8. Evelyn invested some money at 10%, and \$5000 more than this at 14%. Her total annual interest was \$3100. How much was invested at each rate?
9. Joe invested some money at 8%, and \$3000 more than twice as much at 10%. The total annual interest was \$2540. How much was invested at each rate?
10. Larry has \$20,000 to invest, some at 5% and some at 7%. If the annual interest is \$1240, how much is invested at each rate?
11. Mary has \$35,000 to invest, some at 6% and some at 9%. If the annual interest is \$2760, how much is invested at each rate?
12. \$50,000 is invested, some at 8% and some at 15%. If the average yield is 11%, find the amount invested at each rate. (Round to the nearest hundredth.)
13. Ink worth \$100 per barrel will be mixed with ink worth \$60 per barrel to get 48 barrels of ink worth \$75 per barrel. How many barrels of each type of ink should be used?
14. Helen has 2 more dimes than nickels. Altogether she has \$1.70. How many coins of each type does she have?
15. A bank teller has some five-dollar bills and some twenty-dollar bills. The teller has 5 more twenties than fives. The total value of the money is \$725. How many of each type of bill does she have?
16. A merchant wishes to mix candy worth \$5 per pound with candy worth \$2 per pound to get 60 pounds of a mixture that can be sold for \$3 per pound. How many pounds of each type of candy should be used?
17. A merchant wishes to mix some candy worth \$1.50 a pound with some candy worth \$5.50 a pound to get 240 pounds of candy worth \$3.50 per pound. How many pounds of the \$5.50 candy should she use?

Answer Key.

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|----|---|----|---|
| 1. | $x + y = 240$
$.25(x) + .40(y) = .30(240)$
$x = 160$ liters of 25% solution
$y = 80$ liters of 40% solution | 2. | $x + y = 250$
$.50(x) + .20(y) = .32(250)$
$x = 100$ gallons of 50% antifreeze
$y = 150$ gallons of 20% antifreeze |
| 3. | $x + y = 150$
$.40(x) + .70(y) = .52(150)$
$x = 90$ kilograms of 40% tin metal
$y = 60$ kilograms of 70% tin metal | 4. | $x + y = 75$
$.01(x) + .04(y) = .02(75)$
$x = 50$ ml of 1% solution
$y = 25$ ml of 4% solution |
| 5. | $x + y = 20$
$.60(x) + .75(y) = .72(20)$
$x = 4$ liters of 60% solution
$y = 16$ liters of 75% solution | 6. | $y = x - 3000$
$.18(x) + .20(y) = 3200$
$x = \$10,000$ at 18%
$y = \$7000$ at 20% |

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7. $y = x + 4000$
 $.16(x) + .12(y) = 3840$
 $x = \$12,000$ at 16%
 $y = \$16,000$ at 12%

8. $y = x + 5000$
 $.10(x) + .14(y) = \$3100$
 $x = \$10,000$ at 10%
 $y = \$15,000$ at 14%

9. $y = 2x + 3000$
 $.08(x) + .10(y) = 2540$
 $x = \$8,000$ at 8%
 $y = \$19,000$ at 10%

10. $x + y = 20,000$
 $.05(x) + .07(y) = 1240$
 $x = \$8,000$ at 5%;
 $y = \$12,000$ at 7%

11. $x + y = 35,000$
 $.06(x) + .09(y) = 2760$
 $x = \$13,000$ at 6%
 $y = \$22,000$ at 9%

12. $x + y = 50,000$
 $.08(x) + .15(y) = .11(50,000)$
 $x = \$28,571.43$ at 8%
 $y = \$21,428.57$ at 15%

13. $x + y = 48$
 $100(x) + 60(y) = 75(48)$
 $x = 18$ barrels of \$100 ink
 $y = 30$ barrels of \$60 ink

14. $y = x + 2$
 $.05(x) + .10(y) = 1.70$
 $x = 10$ nickels
 $y = 12$ dimes

15. $y = x + 5$
 $5(x) + 20(y) = 725$
 $x = 25$ five-dollar bills
 $y = 30$ twenty-dollar bills

16. $x + y = 60$
 $5(x) + 2(y) = 3(60)$
 $x = 20$ pounds of \$5 candy
 $y = 40$ pounds of \$2 candy

17. $x + y = 240$
 $1.50(x) + 5.50(y) = 3.50(240)$
 $x = 120$ pounds of \$1.50 candy
 $y = 120$ pounds of \$5.50 candy