Math-I 110 3.3 Notes

Solve general applications of systems of two equations

1. The sum of two numbers is 14. The first number is $\frac{2}{5}$ of the second number. What are the numbers?

$x + y = 14$

$x = \frac{2}{5}y$

HW.

2. A nontoxic wood furniture polish can be made by mixing mineral (or olive) oil with vinegar. To make a 19-oz batch for a squirt bottle, Jazmyn uses an amount of mineral oil that is 4 oz more than twice the amount of vinegar. How much of each ingredient is required?

x = vinegar, y = mineral oil

$x + y = 19$

$y = 2x + 4$

3. Two angles are supplementary one angle is 4° less than three times the other. Find the measures of the angles.

$x + y = 180$

$y = 3x - 4$

Supplementary ⇒ angles add to 180°

Complementary ⇒ angles add to 90°

4. Two angles are complementary. Their difference is 22 °. Find the two angles.

$x + y = 90$

$x - y = 22$

$2x = 112 \Rightarrow x = 56$

$56 + y = 90$

$y = 34$

5. Anna purchased 33 strings for her autoharp. Wrapped strings cost \$3.99 each and unwrapped strings cost \$ 2.99 each. If she paid a total of \$116.67 for the strings, how many of each type did she buy?

x → wrapped, y → unwrapped

$x + y = 33 \Rightarrow y = 33 - x$

$3.99x + 2.99y = 116.67 \Rightarrow 3.99x + 2.99(33 - x) = 116.67$

$3.99x + 98.67 - 2.99x = 116.67 \Rightarrow x = 116.67 - 98.67 = 18$

$\Rightarrow x = 18 \Rightarrow y = 33 - 18 = 15$

18 wrapped and 15 unwrapped strings.

6. There is an online group that knits items for nursing homes and shelters. For a recent campaign, they spent a total of 982 hr. knitting hats and scarves. Each hat takes 9 hr. to knit and each scarf takes 11 hr. to knit. If they donated 100 items, how many of each did they knit?

hats → x, scarves → y

$x + y = 100 \rightarrow y = 100 - x$ (Substitute)

$9x + 11y = 982$

$x = 59, \; y = 41$

Solve total-value and mixture applications using systems of two equations

1. Each course at college X is worth either 2 or 3 credits. The members of the swim team are taking a total of 49 courses that are worth a total of 109 credits. How many 2-credit courses and how many 3-credit courses are being taken?

Let be x in number

y

$x + y = 49$

$2x + 3y = 109$

$2x + 2y = 98$

Subtract

$y = 11 \Rightarrow x + 11 = 49 \Rightarrow x = 38$

38 2-credit course and 11 3-credit courses.

2. An office supplies company recently charged $54.99 per case of regular paper and $72.99 per case of paper made of recycled fibers. Last semester, a copy center spent $1645.74 for 26 cases of paper. How many of each type were purchased?

x = regular paper, y = recycled fibers

$x + y = 26$

$54.99x + 72.99y = 1645.74$

Multiply with 54.99 →

$54.99x + 54.99y = 1429.74$

$18y = 216$

$\Rightarrow y = 12$

$x + 12 = 26 \Rightarrow x = 14$

14 regular and 12 recycled fiber cases.

3. A home improvement retailer recently sold 8.5-watt LED bulbs for $3.99 each and 18-watt LED bulbs for $8.97 each. If a hospital purchased 200 such bulbs for a total of $1445.40, how many of each type did they purchase?

x be # 8.5W LED bulbs

y be # 18W LED bulbs

$$\left.\begin{aligned} x + y &= 200 \\ 3.99x + 8.97y &= 1445.40 \end{aligned}\right\} \text{HW.}$$

4. An amusement park charges $78.95 for an adult admission and $56.95 for a junior admission. One Thursday, the park collected $23,208.00 from a total of 360 adults and juniors. How many admissions of each type were sold?

x = adults, y = juniors

$x + y = 360$

$78.95x + 56.95y = 23208$

Multiply with 78.95 →

$78.95x + 78.95y = 360 \times 78.95$

-ve no. y = -ve no.

5. The Coffee Counter charges $7.00 per pound for Kenyan French Roast coffee and $11.00 per pound for Sumatran coffee. How much of each type should be used to make a 26-pound blend that sells for $9.00 per pound?

for mixture ⇒ Total cost of 26-Pound blend = 9 x 26 = $ 234

Let Kenyar French roast be x pounds

Sumatran be y pounds.

$(x+y=26)\times 7 \Rightarrow -7x-7y=-182$

$7x+11y=234$

add

$4y=52 \Rightarrow y=13 \Rightarrow x=13$

6. A local culinary market sells ground sumac for $1.25 per ounce and ground thyme for $1.50 per ounce. You want to make a 20-oz seasoning blend using the two spices that sells for $1.30 per ounce. How much of each spice should you use?

let x oz of sumac, y oz of thyme

$(x+y=20)\times 1.25$

$1.25x+1.50y=1.30\times 20=26$ } Hw.

7. An experiment requires mixing a 50%-acid solution with a 20%-acid solution to create 200 mL of a 26%-acid solution. How much 50%-acid solution and how much 20%-acid solution should be used? ~~Complete the table shown to the right~~.

x mL y mL

$[x+y=200]\times -20$

$\left(\frac{50}{100}x+\frac{20}{100}y=\frac{26}{100}\cdot 200\right)\times 100$

$\Rightarrow 50x+20y=5200$

$-20x-20y=-4000$

$30x = 1200 \Rightarrow x = 40\ mL$

$\Rightarrow y = 160\ mL$