Foundations of Math and Pre–Calculus 10 Name: _____

6.4 – **Applications of Linear Systems WORKSHEET** Block: _____

Complete on separate paper, show all work, give sentence answers*

1. Let x represent the larger of two numbers and y the smaller. Write algebraic expressions for
   a. the sum of the numbers
   b. six times the larger plus two times the smaller
   c. the larger subtracted from five times the smaller

2. Tickets to a college swim meet cost $10 for general admission and $5 for students. There were x general admission tickets and y student tickets sold. Write algebraic expressions for
   a. the total number of tickets sold
   b. the revenue, in dollars, from the general admission tickets
   c. the revenue, in dollars, from the student tickets
   d. the total revenue from all of the tickets

Notice that in #2, two equations resulted that involve both x and y. One of the equations is from 2a, and the other from 2d. When you solve word problems that have two unknown quantities (usually x and y), you need to build two equations to be able to solve the problem. Thus, you have a system of equations, and can solve it by graphing, substitution, or elimination.

3. Two shirts and one sweater cost $60. Three shirts and two sweaters cost $104. Write a system of equations to represent this problem. Start by giving a *let statement* for x and for y. Then, *solve the system* to find the cost of one shirt and the cost of one sweater.

4. The length of a basketball court is 7 meters longer than its width. The perimeter of basketball court is 82m. Draw a diagram for assistance, give let statements, build two equations, and find the length of the court and the width of the court.

5. For the puppet play at the library, tickets for adults and tickets for children were sold. *Give let statements.* The total number of tickets sold was 256. *Write your first equation.* Tickets for adults cost $5 each and tickets for children cost $2 each. The total revenue was $767. *Write your second equation.* How many adult tickets were sold and how many children tickets were sold? *Solve the system.*

6. At a fitness centre, the initiation fee is twice the cost of the monthly fee. If the cost of the initiation fee plus 7 months of fitness is $252, what is the initiation fee and monthly fee?

7. A person invested $2000. A portion of the $2000 was invested at 4% per year. The other portion was invested at 5% per year (*when you put % in an equation, change to decimal…4% would be 0.04*). After one year, the total interest earned was $95. How much was invested at 4% and how much was invested at 5%.
   Hint: Let x = portion of $2000 invested at 4% and let y = portion of $2000 invested at 5%...build two equations…solve by substitution.

8. Jennifer had a total of $500 invested in high-yield investments. Part of the $500 was invested at 7% per year and the rest at 10% per year. After one year, the total interest earned was $44. How much did Jennifer invest at each rate?

9. The area of Regina is two thirds of the area of Calgary. The difference in the areas of the two cities is 1 700 km^2. What is the area of each city?

10. Balcony seats for the gymnastics championships costs $10, and floor-level seats cost $15. The total number of tickets sold was 331. The total revenue from sales was $3 915. How many balcony seats were sold? Floor-level?

Answers:

1. (a) x + y (b) 6x + 2y (c) 5y – x
2. (a) x + y (b) 10x (c) 5y (d) 10x + 5y
3. Shirt: $16 & Sweater: $28
4. length: 24m & width: 17m
5. 85 adult tickets & 171 children tickets
6. initiation fee is $56, monthly $28
7. $500 invested at 4%, $1500 invested at 5%
8. $200 invested at 7%, $300 invested at 10%
9. area of Regina is 3400km^2 and area of Calgary is 5100km^2
10. 210 balcony seats and 121 floor seats

7.7 - Word Problems ANSWER KEY.

1. a) $x+y$ sum means add (b) $6x+2y$ (c) $5y-x$ larger subtracted from smaller

2. a) $x+y$ (b) $10x$ (x = number of tickets, 10 per ticket) (c) $5y$ (d) $10x+5y$

3. Let x = cost of one shirt
Let y = cost of one sweater

① $2x + y = 60$ (2 shirts and 1 sweater)
② $3x + 2y = 104$

Solve system to find x and y (x = cost of one shirt, y = cost of one sweater)

get y by itself in eqn ①

$2x + y = 60$
$-2x \quad -2x$
$y = 60-2x$

② $3x + 2y = 104$

$3x + 2(60-2x) = 104$
$3x + 120 - 4x = 104$
$-1x + 120 = 104$
$-120 \quad -120$
$\frac{-1x}{-1} = \frac{-16}{-1}$
$x = 16$

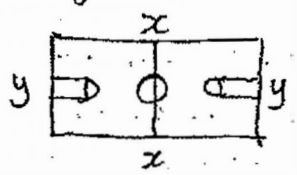
substitute into one of original equations.

$2x + y = 60$
$2(16) + y = 60$
$32 + y = 60$
$-32 \quad -32$
$y = 28$

Solution: (16, 28)
The cost of one shirt is \$16 and one sweater is \$28.

4. Let x = length
Let y = width.

① $x = y+7$ (length is 7m longer than width)



Perimeter = $x+x+y+y = 2x+2y$.
② $2x+2y = 82$

① $x = y+7$
② $2x+2y = 82$

$2(y+7)+2y = 82$
$2y+14+2y = 82$
$4y+14 = 82$
$-14 \quad -14$
$\frac{4y}{4} = \frac{68}{4}$
$y = 17$

① $x = y+7$
$x = 17+7$
$x = 24$

(24, 17)
The length of the court is 24m and the width is 17m.

5. Let x = # of tickets for adults
Let y = # of tickets for children.

① $x + y = 256$
② $5x + 2y = 767$

Use ① to get x or y by itself.

① $x = 256 - y$
② $5x + 2y = 767$

$5(256 - y) + 2y = 767$
$1280 - 5y + 2y = 767$
$1280 - 3y = 767$
$-1280 \quad -1280$
$\frac{-3y}{-3} = \frac{-513}{-3}$
$y = 171$

① $x + y = 256$
$x + 171 = 256$
$x = 85$

85 adult tickets and 171 childrens tickets were sold.

6. Let x = initiation fee
Let y = monthly fee

① $x = 2y$
② $x + 7y = 252$

① $x = 2y$
② $x + 7y = 252$
$2y + 7y = 252$
$\frac{9y}{9} = \frac{252}{9}$
$y = 28$

① $x = 2y$
$x = 2(28)$
$x = 56$

(56, 28)

The initiation fee is \$56 and the monthly fee is \$28.

7. Let x = portion of \$2000 invested at 4%
Let y = portion of \$2000 invested at 5%

first equation: $x + y = 2000$

amount of interest made is 4% of x and 5% of y.
$0.04x$ $0.05y$

so ② $0.04x + 0.05y = 95$

① $x + y = 2000$
② $0.04x + 0.05y = 95$

rearrange ① to get x or y by itself.

① $y = 2000 - x$
② $0.04x + 0.05y = 95$

$0.04x + 0.05(2000 - x) = 95$
$0.04x + 100 - 0.05x = 95$
$-0.01x + 100 = 95$
$-0.01x = -5$
$x = 500$

① $x + y = 2000$
$500 + y = 2000$
$y = 1500$

(500, 1500)

\$500 was invested at 4%, and \$1500 was invested at 5%

8. Let x = portion of \$500 invested at 7%
Let y = portion of \$500 invested at 10%

① $x + y = 500$
② $0.07x + 0.10y = 44$

① $x = 500 - y$
② $0.07x + 0.10y = 44$

$0.07(500-y) + 0.10y = 44$
$35 - 0.07y + 0.10y = 44$
$35 + 0.03y = 44$
$0.03y = 9$
$y = 300$

① $x + y = 500$
$x + 300 = 500$
$x = 200$.

(200, 300)

\$200 was invested at 7% and \$300 at 10%.

9. Let x = area of Regina
Let y = area of Calgary.
Regina is $\frac{2}{3}$ of Calgary

① $x = \frac{2}{3}y$
② $y - x = 1700$

↖ Calgary first because it's larger than Regina.

① $x = \frac{2}{3}y$
② $y - x = 1700$

$1y - \frac{2}{3}y = 1700$
$\frac{3}{3}y - \frac{2}{3}y = 1700$
$\frac{1}{3}y = 1700$
$\frac{y}{3} = 1700$

$\frac{y}{3} = 1700$ (3)
$y = 5100$

② $y - x = 1700$
$5100 - x = 1700$
$x = 3400$

(3400, 5100)

The area of Regina is $3400\ km^2$ and the area of Calgary is $5100\ km^2$

10. Let x = number of balcony seats sold
Let y = number of floor level seats sold.

① $x + y = 331$
② $10x + 15y = 3915$

① $x = 331 - y$

$10(331-y) + 15y = 3915$
$3310 - 10y + 15y = 3915$
$3310 + 5y = 3915$
$-3310 \quad -3310$

$\frac{5}{5}y = \frac{605}{5}$
$y = 121$

① $x + y = 331$
$x + 121 = 331$
$x = 210$

(210, 121)

210 balcony seats were sold, and 121 floor seats were sold.