

## MATH 6: HANDOUT 13

### 1. ALGEBRA: SYSTEMS OF LINEAR EQUATIONS

Systems of linear equations are two or more linear equations that are using the same variables, hold true at the same time and have to be solved together. Knowing how to solve systems of equations is useful especially when solving word problems. We are going to learn today how to solve a system of two linear equations using the substitution method and practice solving word problems.

When using the substitution method, select the simpler equation and try to express one variable in terms of the other variable, then substitute the variable in the other equation. You end up with an equation in one variable that you already know how to solve.

Let's look at an example:

$$\begin{cases} 6x - 5y = -3 \\ x + y = 5 \end{cases}$$

Let's choose the second equation  $x + y = 5$ ,  $x = 5 - y$ . Substitute  $x$  with  $5 - y$  in the first equation.  $6(5 - y) - 5y = -3$ ,  $30 - 6y - 5y = -3$ ,  $11y = 30 + 3$ ,  $y = 3$ . To find  $x$ , substitute  $y$  in the second equation.  $x = 5 - 3$ ,  $x = 2$ . You can always check that your answer is correct by plugging in 2 for  $x$  and 3 for  $y$  in the original two equations.

### 2. HOMEWORK

1.  $\begin{cases} 5x + 2y = 16 \\ 2x + 3y = 13 \end{cases}$
2.  $\begin{cases} \frac{5}{6}x - \frac{9}{10}y = -2 \\ \frac{1}{3}x + \frac{2}{5}y = 3 \end{cases}$
3.  $2(x + 1) + 3(y - 1) = 9$   
 $3(x + 2) - 2(y + 1) = 6$
4. The sum of two numbers is 27. Twice the larger number is 11 less than 3 times the smaller number. What are the two numbers?
5. The sum of two numbers is  $\frac{41}{35}$  and the difference is  $\frac{1}{35}$ . What are the two numbers?
6. A motor boat can travel 45 miles downstream in 3 hours and 22 miles upstream in 2 hours. Find the speed of the boat in still water and find the speed of the current. (Hint: speed=distance/time)
7. A 2-digit number is larger by 9 than the number with the digits reversed. The sum of the digits is 7. Find the number.
8. After paying a 30% tax on a property sold, three businessmen shared the amount left in the ratio  $3 : 2 : 2$ . If the businessman whose share was the largest received 21,000\$, how much was the property worth before paying the tax?
- \*9. A tank can be filled in 10 minutes from faucet A at a rate of 50ml/s. If another faucet B is turned on when the tank is one-third full, it will take another 4 minutes and 10 seconds to fill the tank. Find the flow of water from faucet B.