Bell work

Your long distance service provider charges you $.06 per minute plus a monthly access fee of $4.95. For referring a friend, you receive a $10 service credit this month. If your long-distance bill is $7.85, how many long-distance minutes did you use?

What do you know?	What do we need to solve? How do we do it?
Cost per minute: $.06 Monthly access fee: $4.95 Referral credit: $10.00 Amount due on the bill: $7.85	Amount minutes used, x. 7.85 = .06x + 4.95 – 10 Combine like term 7.85 = .06x – 5.05 Get x by adding 5.05 to both sides +5.05 +5.05 12.90 = .06x Solve for x by divide .06 to both sides. .06 .06 215 = x You used 215 minutes for this month.

Systems of Equations

A system of equations is a collection of two or more equations with a same set of unknowns. In solving a system of equations, we try to find values for each of the unknowns that will satisfy every equation in the system. The equations in the system can be linear or non-linear. There are three methods for solving systems of equations: Substitution method, Elimination method, and Graphing.

The **substitution method** is most useful for systems of 2 equations in 2 unknowns. The main idea here is that we solve one of the equations for one of the unknowns, and then substitute the result into the other equation.

Example 1: Solve the following system by substitution	**Solution:**	
$2x + 3y = 5$ $x + y = 5$		1. 4x + 2y = 10 x – y = 13
$x + y = 5$ $y = 5 - x$	**Step 1:** Solve one of the equations for either **x** = or **y** =. We will solve second equation for y.	
$2x + 3y = 5$ $2x + 3(5 - x) = 5$		
$2x + 3(5 - x) = 5$ $2x + 15 - 3x = 5$ $-x + 15 = 5$ $-x = 5 - 15$ $x = 10$	**Step 2:** Substitute the solution from step 1 into the second equation. **Step 3:** Solve this new equation.	
$y = 5 - x$ $y = 5 - 10$ $y = -5$	**Step 4:** Solve for the second variable	
$x + y = 5$ 10 – 5 = 5 ☺	**Step 5:** Check your answer.	

The **elimination method** of solving systems of equations is also called the addition method. To solve a system of equations by elimination we transform the system such that one variable "cancels out".

Example 2. Solve the following problem by elimination.

$3x - y = 5$

$x + y = 3$

$3x - y = 5$
$x + y = 3$ } *add equations*

$4x = 8$

$x = 2$

$x + y = 3$

$2 + y = 3$

$y = 1$

$3x - y = 5$

$3(2) - (1) = 5$ ☺

Solution:

In this example we will eliminate the y term. To do so, we can add the equations together.

In order to solve for y, take the value for **x** and substitute it back into either one of the original equations.

Check your answer.

Example 3

$x + 3y = -5$

$4x - y = 6$

$x + 3y = -5$ *Multiply by* -4

$4x - y = 6$

$-4x - 12y = 20$
$4x - y = 6$ } *Add equations*

$-13y = 26$

$y = -2$

$x + 3y = -5$

$x + 3 \cdot (-2) = -5$

$x - 6 = -5$

$x = 1$

$x + 3y = -5$
$(1) + 3(-2) = -5$ ☺

Look at the x - coefficients. Multiply the first equation by -4, to set up the x-coefficients to cancel.

Take the value for **y** and substitute it back into either one of the original equations.

Check your answer.

2. $y = 4x - 9$
   $y = x - 3$

3. $8x - 6y = -20$
   $-16x + 7y = 30$

4. $6x - 12y = 24$
   $-x - 6y = 4$

Class work: Solve and graph for each system

a. The school that Stefan goes to is selling tickets to a choral performance. On the first day of ticket sales the school sold 3 seniors tickets and 1 child ticket for a total of $38. The school took in $52 on the second day by selling 3 senior citizen tickets and 2 child tickets. Find the price of a senior citizen ticket and the price of a child ticket. Senior citizen ticket:

What do you know?	What do we need to solve? How do we do it?
Tickets: s = senior c = child First day: Sold 3 seniors and 1 child tickets for $38. Model: 3s + 1c = 38 Second day: Sold 3 seniors and 2 child tickets for $52. Model: 3s + 2c = 52	3s + c = 38 3s + 2c = 52

b. Yellowstone National Park is a popular field trip destination. This year the senior class at High School A and the senior class at High School B both planned trips there. The senior class at High School A rented and filled 7 vans and 10 buses with 332 students. High School B rented and filled 4 vans and 15 buses with 459 students. Each van and each bus carried the same number of students. Find the number of students in each van and in each bus.

What do you know?	What do we need to solve? How do we do it?
Tickets: v = van b = bus School A 7 vans and 10 buses filled 332 students Model: 7v + 10b = 332 School B 4 vans and 15 buses filled 459 students Model: 4v + 15b = 459	7v + 10b = 332 4v + 15b = 459

A system of linear inequalities in two variables consists of at least two linear inequalities in the same variables. The solution of a linear inequality is the ordered pair that is a solution to all inequalities in the system and the graph of the linear inequality is the graph of all solutions of the system

Solving systems of inequalities by either elimination, substitution or graphing.

Graph Systems of Inequalities

5. $y > 4x - 3$
   $y \geq -2x + 3$

6. $x \leq -3$
   $5x + 3y \geq -9$

7. $4x - 3y < 9$
   $x + 3y > 6$

215; $8, child ticket: $14; Van: 6, Bus: 29;(2, -1); (-1, 2); (2, -1)