METHODS FOR SOLVING SYSTEMS OF LINEAR EQUATIONS

Problem:

Jason and Shamika opened savings accounts on the same day, intending to withdraw the money for weekly expenses. Jason opened his account with $800 and withdrew $30 per week. Shamika opened her account with $980 and withdrew $45 weekly. When will their accounts be equal during the same week?

Example taken from Algebra 1 Mathematics Teacher's Packet

WRITE IT ALL OUT

1. Without a calculator, one can set up a table as follows:

Week	Amount in Jason's account	Week	Amount in Shamika's account
1	800	1	980
2	770	2	935
3	740	3	890
	etc.		etc.

Complete the tables to see when the amounts in the two accounts are equal.

USING ALGEBRA

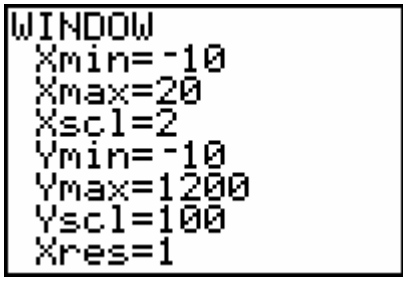
1. Write a linear equation that represents, *y*, the amount in Jason's account, given the number of weeks, *x*.

2. Write a linear equation that represents, *y*, the amount in Shamika's account, given the number of weeks, *x*.

3. Using either of the algebraic methods (substitution or elimination), solve the system of equations. What does it mean in terms of the context of the problem?

FINDING THE POINT OF INTERSECTION

1. Graph the two equations from parts 1 and 2 above. Use an appropriate window, like the one to the right. Using TRACE, find the approximate coordinates of the intersection point. One can also use the intersect option on the CALC menu.



2. Does this answer agree with the other solutions found above?

USING MATRICES

1. Take the two equations and put them into standard form, $Ax + By = C$.

2. Press the [MATRIX] key, and arrow over to **EDIT**. Select [A]. Enter matrix A which is a 2x2 matrix made up of the coefficients of x and y. What matrix did you enter? [QUIT] to return to the home screen.

3. Press the [MATRIX] key, and arrow over to **EDIT**. Select [B]. Enter matrix B which is a 2x1 matrix made up of the constants. What matrix did you enter? [QUIT] to return to the home screen.

4. You will get the solution matrix by finding $A^{-1}B$. To this, from the home screen, go to [MATRIX], and choose [A].
   Next, press the $[x^{-1}]$ key. Finally go to MATRIX, and select [B], then press [ENTER] on the home screen.
   What is your answer? What does it mean in terms of the context of the problem?

FOLLOW-UP QUESTIONS

1. When will Jason have $500 left in his account?

2. What will Jason's account balance be after 18 weeks?

3. When will Shamika have $350 left in her account?

4. What will Shamika's account balance be after 20 weeks?

5. Who will have a $0 account balance first?

6. In order to achieve a $0 balance, Jason's last withdrawal will need to be how much?

7. In order to achieve a $0 balance, Shamika's last withdrawal will need to be how much?