ALGEBRA II ACTIVITY 2:
MAXIMIZING YOUR EFFORTS

In this activity we will:

- Write an objective function for the profit from selling two types of game players.
- Write a system of inequalities to represent the constraints in the problem situation.
- Graph the system of inequalities.
- Find the vertices of the feasible region and substitute their coordinates into the objective function to find the maximum profit.

Games and More, Co. is a company that produces both video and DVD game players. The video player, Gamer Gallery, requires 1.5 hours for assembly and 0.25 hours for testing. The DVD player, Major Player, requires 1 hour for assembly and 0.5 hours for testing. Each month, the Games and More manufacturing facility has 45,000 available hours for product assembly and 20,000 available hours for product testing. The Games and More, Co. earns $60 profit from each Gamer Gallery and $75 profit from each Major Player that it sells.
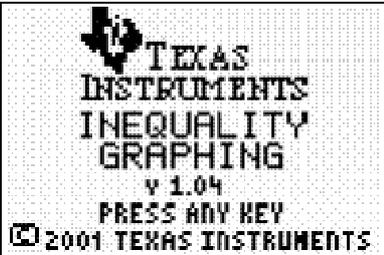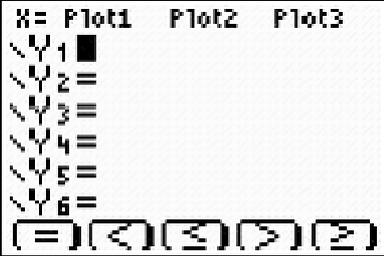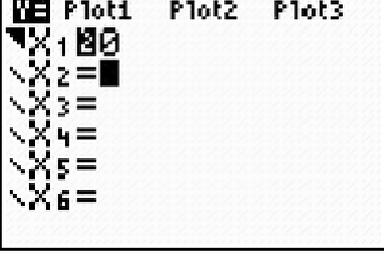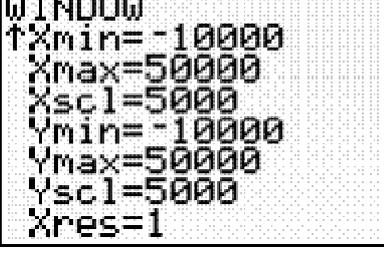
How many of each type of player should the Games and More, Co. produce in order to obtain the greatest monthly profit?

You can use linear programming to solve this manufacturing problem. Let x represent the number of Gamer Gallery players, and let y represent the number of Major Player players. Write an expression that represents the profit earned from selling Gamer Gallery and Major Player players. This is called an objective function.

$$P(x,y) = 60x + 75y$$

Determine the profit that would be earned if 50 Gamer Gallery players and 100 Major Player players were sold.
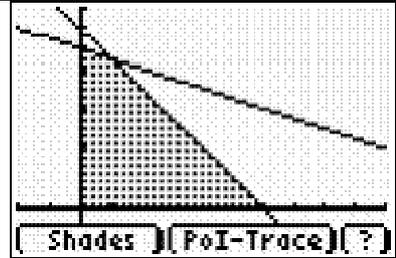
$$P(50, 100) =$$
$$60(50) + 75(100) =$$
$$\$10,500$$

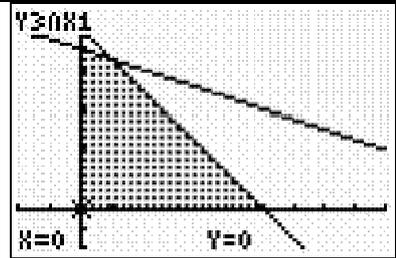|	
Write a system of inequalities that represents the restrictions (or constraints) for the problem situation. Write an inequality that represents the assembly time constraint, one for the testing time constraint, and write inequalities that show that they cannot produce a negative number of Gamer Gallery or Major Player gamers.	$1.5x + 1y \leq 45000$ $0.25x + 0.5y \leq 20000$ $x \geq 0; y \geq 0$
Turn on the Inequality Graphing APP. Press [APPS] [ALPHA] x^2 to skip to the I's, then press [ENTER].	TEXAS INSTRUMENTS INEQUALITY GRAPHING v 1.04 PRESS ANY KEY ©2001 TEXAS INSTRUMENTS
Press any key to continue. This will take you to a modified **Y=** screen. The five symbols along the bottom can be accessed by pressing [ALPHA] followed by the appropriate function key. To enter an inequality in terms of x arrow to the top (**X=**) and press [ENTER].	X= Plot1 Plot2 Plot3 \Y1■ \Y2= \Y3= \Y4= \Y5= \Y6= [=][<][≤][>][≥]
Enter the four inequalities in linear function form. Three can be entered on the **Y=** screen.	X= Plot1 Plot2 Plot3 ▶Y1■45000-1.5X ▶Y2■(20000-0.25X)/0.5 ▼Y3■0 \Y4■ \Y5= [=][<][≤][>][≥]
Use ▲ to highlight **X=** in the top left corner. Press [ENTER] and enter the final inequality.	■■ Plot1 Plot2 Plot3 ▼X1■0 \X2=■ \X3= \X4= \X5= \X6=
Press [WINDOW] and set the settings as shown.	WINDOW ↑Xmin=-10000 Xmax=50000 Xscl=5000 Ymin=-10000 Ymax=50000 Yscl=5000 Xres=1

Press GRAPH.	
Find the vertices of the feasible region. Use the **Shading** feature to show the feasible region. Press ALPHA [F1] and select **Ineq Intersection**.	
Use the Point-of-Intersection Trace (**PoI-Trace**) to find the coordinates of the vertices. Press ALPHA [F4] and use the arrows to move the cursor. Record the vertices in coordinate pair form.	
Substitute the coordinates for each vertex into the profit expression (objective function) to find the maximum profit. Based on these results, how many of each type of player results in the maximum monthly profit for Games and More Company? What is the maximum possible monthly profit?	<table>Vertex, P(g, m)</table>

Vertex	P(g, m)
(0, 0)	$0
(30000, 0)	$1,800,000
(0, 40000)	$3,000,000
(5000, 37500)	$3,112,500

To turn off the Inequality Graphing APP, press APPS ALPHA x^2 to skip to the I's, then press ENTER. Select **2: Quit Inequal**.	INEQUAL RUNNING 1:Continue 2:Quit Inequal 3:About