Name: _____ CID: _____

3.1 Graphing Calculator Lab: Linear Regression

Sports Winning times for the Olympic 400-m run have been decreasing more rapidly for women than for men. Use the data in the table to find linear models for women's and men's times. Assuming that these trends continue, predict the year in which the women's winning time could equal that of the men.

Winning Times for the Olympic 400-Meter Dash (seconds)

Year	1968	1972	1976	1980	1984	1988	1992	1996	2000
Men's Time	43.86	44.66	44.26	44.60	44.27	43.87	43.50	43.49	43.84
Women's Time	52.03	51.08	49.29	48.88	48.83	48.65	48.83	48.25	49.11

SOURCE: *The World Almanac*

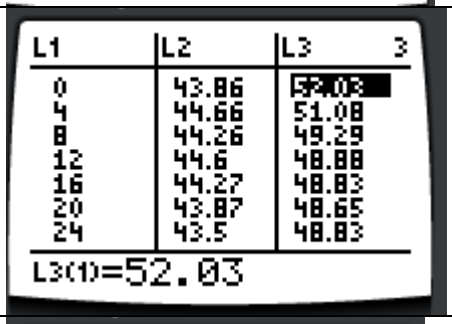
Let x = number of years since 1968.
Let y = winning times in seconds.

Clear all Entries and Clear All Lists from the Memory.

2nd + 3 ENTER
2nd + 4 ENTER
CLEAR

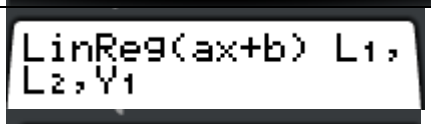
Stat / Edit – Then enter the values for the three lists. Use the arrow keys to go from one list to the next.

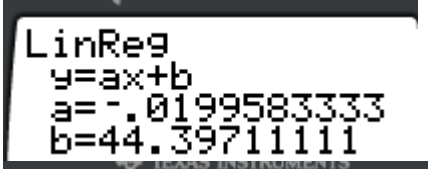
STAT ENTER

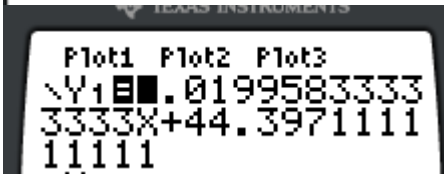


Stat / Calc / LinReg – Calculate the Linear regression equations for the data sets. Select which two lists to use as the x and y coordinates (L_1 and L_2) and select where to store the saved values (Y_1.) Use the LIST and VARS buttons to find the variables needed, and separate with commas.

CLEAR STAT) 4
2nd STAT 1 ,
2nd STAT 2 ,
VARS) 1 1
Y=



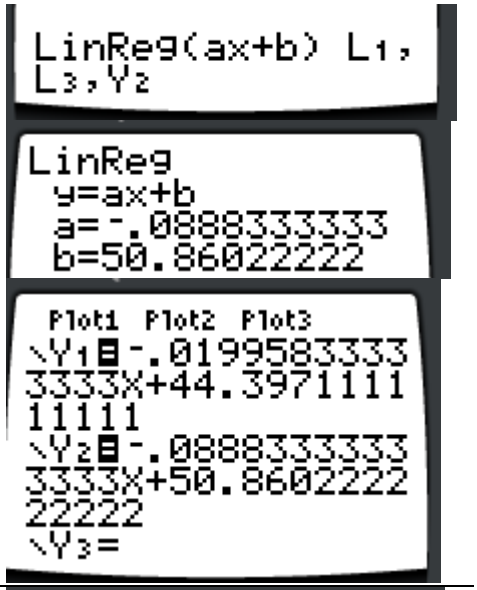




Name: _____ CID: _____

Stat / Calc / LinReg – Calculate the Linear regression equations for the data sets. Select which two lists to use as the x and y coordinates (L_1 and L_3) and select where to store the saved values (Y_2.) Use the LIST and VARS buttons to find the variables needed, and separate with commas.

CLEAR STAT) 4
2nd STAT 1 ,
2nd STAT 3 ,
VARS) 1 2
ENTER Y=



Turn on the Stat Plots to see the ordered pairs.
Accept the defaults for the first Plot (L_1 and L_2)

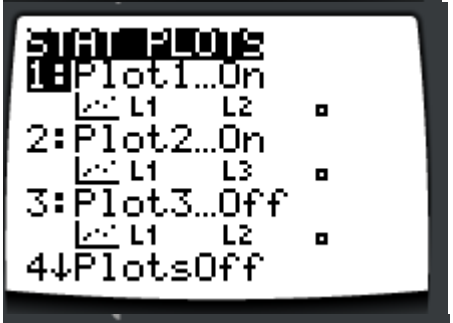
2nd Y= 1 ENTER

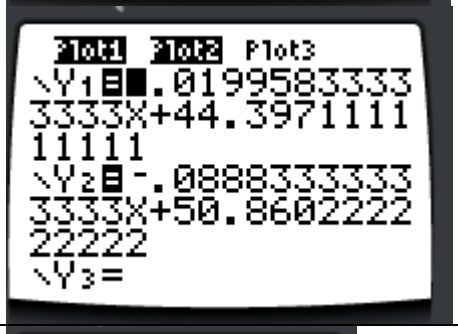
And set the second plot to show L_1 and L_3

2nd Y= 2 ENTER ▼ ▼ ▼
2nd STAT 3 ENTER

View everything to be plotted now – the two data sets, and their linear regression lines.

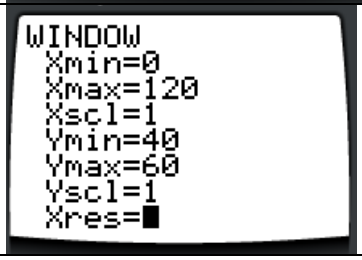
Y=





Set the Window.

WINDOW



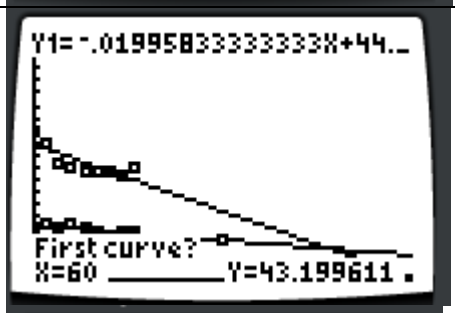
Name: _____ CID: _____

View the Graph.

GRAPH

Use Calculate / Intersect to find the intersection of the two lines.

2nd TRACE 5



Click to select the first curve, the second curve, and a "guess."

ENTER

ENTER

ENTER

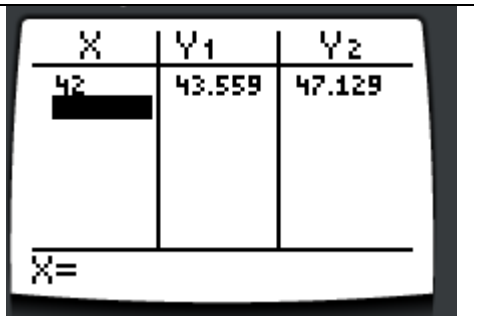
If the trends continue, the times for men and women will be equal about 100 years from 1968, in 2068.

You can use the Table function to find specific values of a function entered as Y_1 or Y_2.

Let's say we want to know the predicted time for both men and women in 2010. 2010 is 42 years from 1968, so enter 42 as the *x* value in the Table.

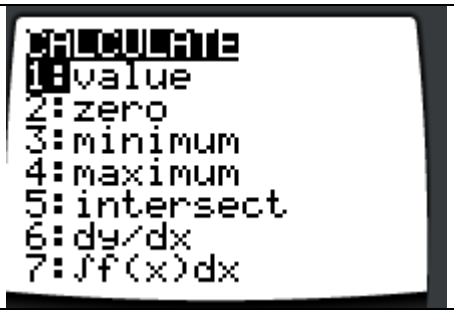
2nd GRAPH

4 2 ENTER



Men will have a time of about 43.559 seconds (Y_1) and women's time will be about 47.129 seconds (Y_2).

Experiment with other functions in the Calc menu, such as zero and value.



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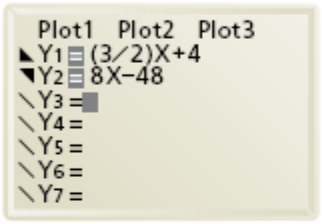
3.4 Graphing Calculator Lab: Linear Programming

From page 145…

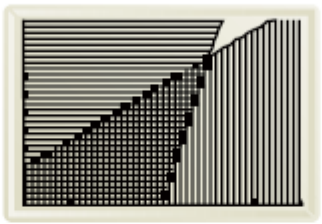
Find the values of x and y that will maximize the objective function $P = 13x + 2y$ for the constraints at the right. What is the value of P at this maximum point?

$$\begin{cases} -3x + 2y \le 8 \\ -8x + y \ge -48 \\ x \ge 0,\ y \ge 0 \end{cases}$$

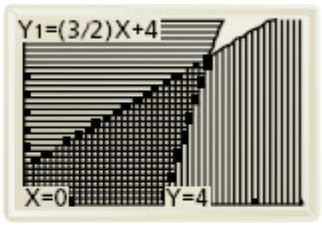
Step 1 Rewrite the first two inequalities to isolate y. Enter the inequalities.



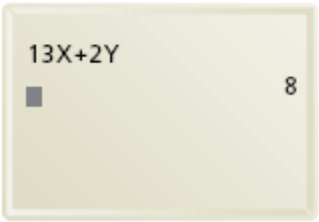
Step 2 Graph, using the window $0 \le x \le 12$, $0 \le y \le 20$.



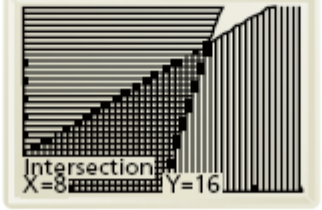
Step 3 Use the value option of **CALC** to find the upper left vertex. Press 0 ENTER.



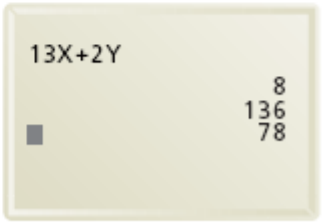
Step 4 Enter the expression for the objective function on the home screen. Press ENTER for the value of P at the vertex.



Step 5 Use the intersect option of **CALC** to find the upper right vertex. Go to the home screen and press ENTER for the value of P.



Step 6 Use the zero option of **CALC** to find the lower right vertex. Go to the home screen and press ENTER for the value of P.



Compare the values of P for the coordinates of the three vertices you found. The objective function has a value of 0 for the vertex located at the origin. The maximum value 136 occurs when $x = 8$ and $y = 16$.

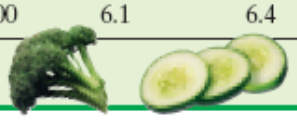
Name: _____ CID: _____

ASSIGNMENT

For Exercises 10–11, use your graphing calculator. Find linear models for each set of data. Use each model to predict the year in which the quantities will be equal.

10. Annual U.S. Consumption of Vegetables

Year	Broccoli (lb/person)	Cucumbers (lb/person)
1980	1.5	3.9
1985	2.6	4.4
1990	3.4	4.7
1995	4.3	5.6
1998	5.1	6.5
1999	6.5	6.8
2000	6.1	6.4



SOURCE: *Statistical Abstract of the United States.*
Go to www.PHSchool.com for a data update.
Web Code: agg-9041

11. U.S. Life Expectancy at Birth

Year	Men (years)	Women (years)
1970	67.1	74.7
1975	68.8	76.6
1980	70.0	77.4
1985	71.1	78.2
1990	71.8	78.8
1995	72.5	78.9
2000	74.3	79.7

SOURCE: U.S. Census Bureau.
Go to www.PHSchool.com for a data update.
Web Code: agg-9041

Problem Number	Prediction Equations		Predicted Year for Equal Quantities
10.			
11.			

EXERCISES

Find the values of x and y that maximize or minimize the objective function.

1. $\begin{cases} 4x + 3y \geq 30 \\ x + 3y \geq 21 \\ x \geq 0, y \geq 0 \end{cases}$ Minimum for $C = 5x + 8y$

2. $\begin{cases} 3x + 5y \leq 35 \\ 2x + y \leq 14 \\ x \geq 0, y \geq 0 \end{cases}$ Maximum for $P = 3x + 2y$

3. $\begin{cases} x + y \geq 8 \\ x + 5y \geq 20 \\ x \geq 0, y \geq 2 \end{cases}$ Minimum for $C = 3x + 4y$

4. $\begin{cases} x + 2y \leq 24 \\ 3x + 2y \leq 34 \\ 3x + y \leq 29 \\ x \geq 0 \end{cases}$ Maximum for $P = 2x + 3y$

Problem Number	State the Vertices	Vertex where Max or Min Occurs	Max or Min C or P
1.			
2.			
3.			
4.			