1.4 Intersection of Straight Lines

Break-Even Point

The cost to make a sofa is \$600 per sofa plus a fixed setup cost of \$4,500. Each sofa sells for \$750.

The linear Cost, Revenue, and Profit functions for this problem are:

$C(x) = 600x + 4500$

$R(x) = 750x$

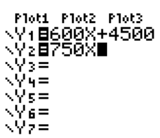
$P(x) = 150x - 4500$

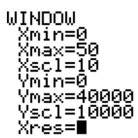
Where x is the number of sofas and C, R and P are in dollars.

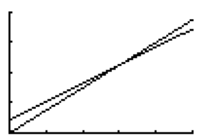
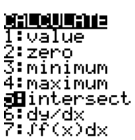
How many sofas need to be made and sold for the company to break-even?

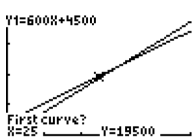
Find where the profit is equal to zero,

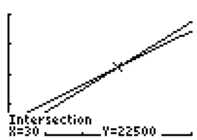
Or, find where Revenue = Cost









Demand

The quantity demanded of a computer monitor is 7,500 units when the unit price is \$750.
At a unit price of \$700, the quantity demanded increases to 9,000 units. Assume this relationship is linear.

Let x be an independent variable representing the number of monitors consumers are willing to buy (the quantity demanded). Let p be the dependent variable representing the unit price.

(x, p) = (________, ________)

(x, p) = (________, ________)

Find the equation of the line that passes through these two points.

A demand equation expresses the relationship between the unit selling price and the quantity demanded by consumers.

Supply

The manufacturer will not market any of the computer monitors if the price is $600 or lower.
However, for each $50 increase in the unit price above $600, the manufacturer will produce 1000 additional units.
Assume this relationship is linear.

Let x be an independent variable representing the number of monitors suppliers are willing to produce.
Let p be the dependent variable representing the unit price.

(x, p) = (________, ________)

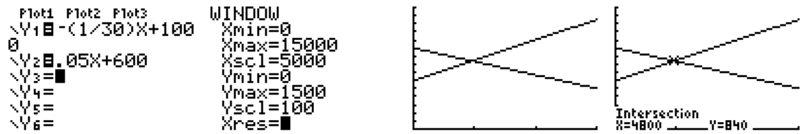
(x, p) = (________, ________)

Find the equation of the line that passes through these two points.

The supply equation expresses the relationship between the unit selling price and the quantity supplied by the producers.

Equilibrium Point

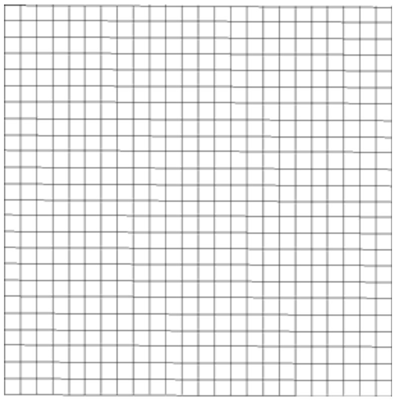
The equilibrium point is where the supply equals the demand.

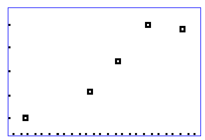


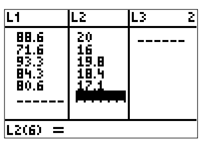
1.5 Linear Regression

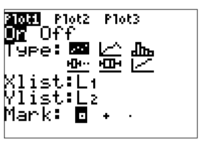
The data below was collected about crickets. Draw a scatter plot.

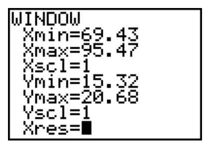
Temp. (^{o}F)	88.6	71.6	93.3	84.3	80.6
Chirps/sec	20.0	16.0	19.8	18.4	17.1





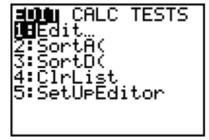


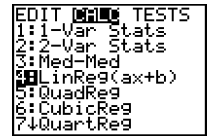


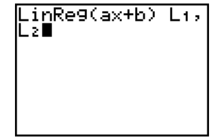


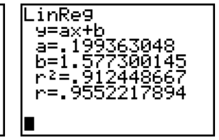
Find a line that takes all of the data into account.
The line should come as close as possible to all the data points.

The line that has the smallest sum of the distance from all the points is the least squares (or regression) line.









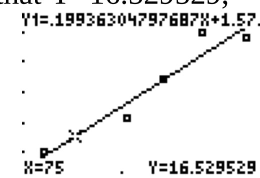
Regression equation is $y = 0.1994x + 1.5773$

The correlation coefficient, r measure how close the data points are to the line.

The closer the value is to |1|, the better the linear fit is.
If the value is near 0, the data is not very linear.
Use the equation of the regression line for estimates

Example - If the temperature was 75F, how many cricket chirps would you expect to hear?

Answer Using the [VALUE] function, find that Y=16.529529,



Expect to hear about 16.5 chirps per second

Example - If you counted 19 chirps per second, what was the temperature?

Answer - The temperature is about 87.4 degrees.