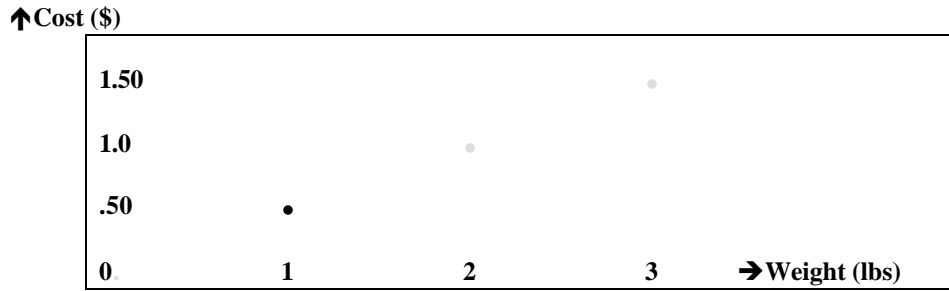


Background: Points & Lines

If 1 lb of sugar costs \$0.50, 2 lbs cost \$1, 3 lbs, ... \$1.50, etc



We can write:

$$\text{Cost} = 0.50 \times \text{Weight}$$

for 5 lbs, $\text{Cost} = 0.50 \times 5 = \2.50 ...

If there is a delivery charge of \$1.30 per order, then:

$$\text{Cost} = \$1.30 + 0.50 \times \text{Weight}$$

And $\text{Cost} = \$1.30 + 0.50 \times 5 = \3.80 for 5 pounds...

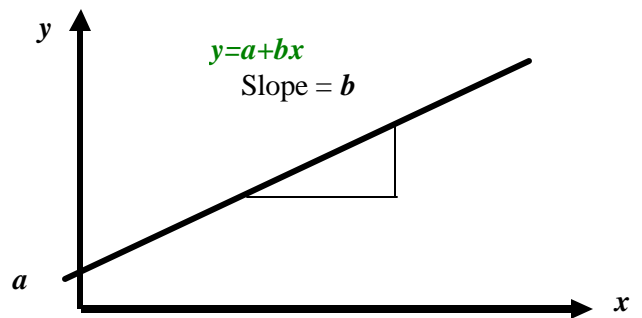
This linear equation is a mathematical model of the transaction

In general, the equation of a straight line is

$$y = a + bx$$

If $x = 0$ then $y = a$

If $y = 0$ then $x = -\frac{a}{b}$



(Try other values, e.g., $x = +\frac{a}{b}$)

$$y = a + bx = a + b\frac{a}{b} = ?$$

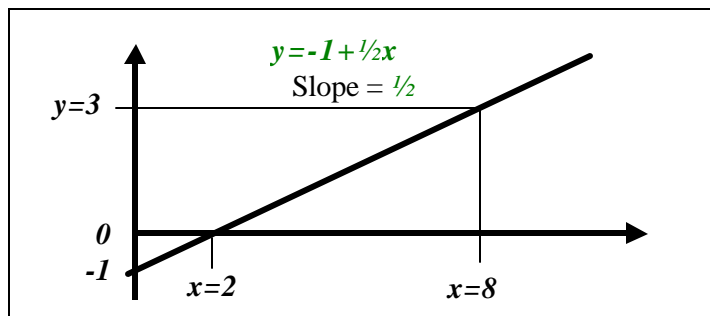
I. The equation determines the line

Plot the line, $y = -1 + \frac{1}{2}x$



II. Any 2 points also determine a line.

The points $(x=1, y=6)$ and $(x=5, y=30)$ fix the line.



The slope is
$$b = \frac{y_2 - y_1}{x_2 - x_1} = \frac{30 - 6}{5 - 1} = \frac{24}{4} = 6$$

Find the intercept by using the value of b and one of the points:

$$6 = a + (6)(1) \text{ therefore, } a = 0 \text{ ...steep slope, zero intercept...}$$

Any 2 distinct points can be fitted with a unique line.

However, 3 or more points form a scattergram.

They can be fitted with a unique line only when $r=1$ (or $r = -1$)

If r is significant (i.e., not too close to zero), then a line may adequately describe the relationship between x & y (explanatory & response?).

