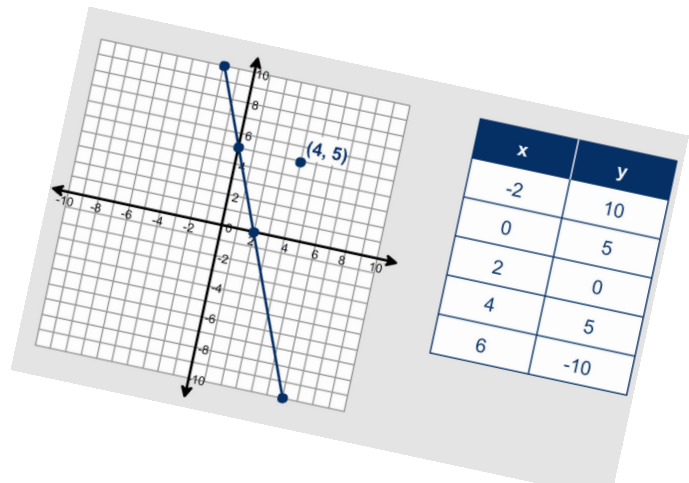# LINEAR RELATIONS

SEMINAR NOTES
Learning Guide 7
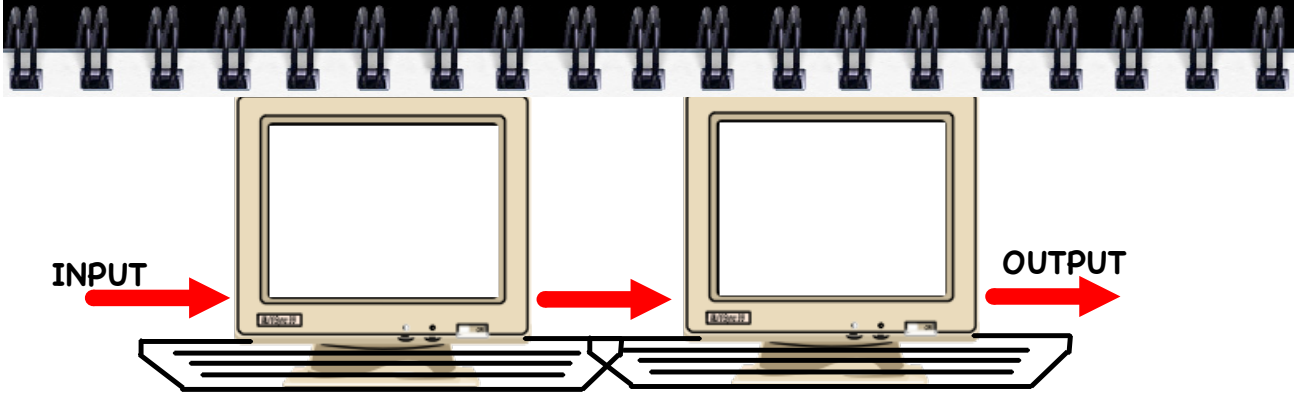
Linear Relations
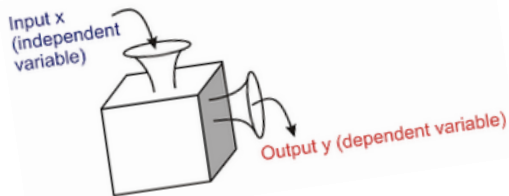
NUMBER PATTERNS

"INPUT OUTPUT MACHINE"

Ex. $y = 2x$

INPUT

OUTPUT
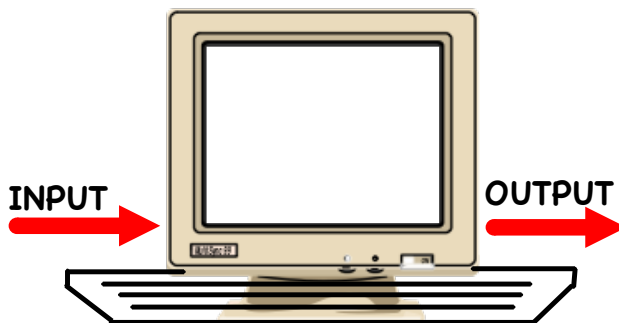
INPUT	OUTPUT

INPUT ⟶ ⟶ OUTPUT

| Ex. | $y = -4x + 2$ |

INPUT	OUTPUT
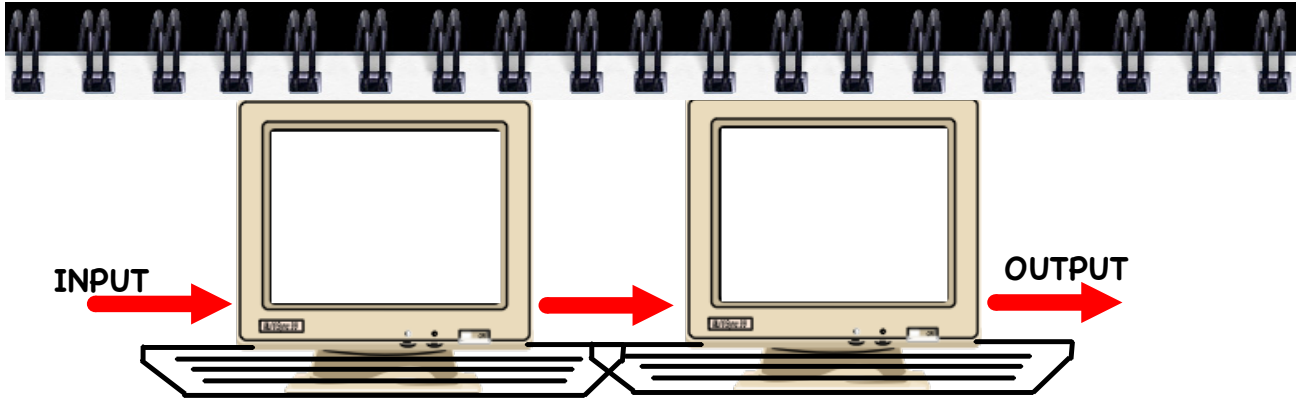
INPUT ➡️ ➡️ OUTPUT

Try $y = 3x - 4$

INPUT	OUTPUT

Ex.

1. This pattern of squares continues.

Figure 1   Figure 2   Figure 3   Figure 4

INPUT	OUTPUT
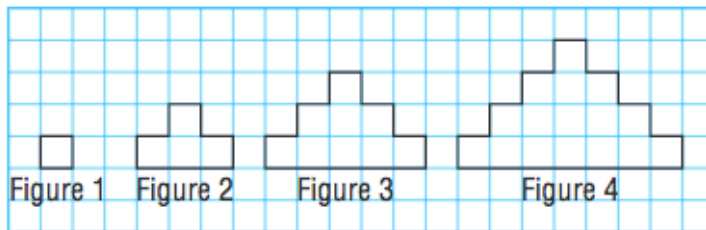
a) Make a table that shows the figure number, n, and the perimeter of a figure, P. What patterns do you see?

b) Write an expression for the perimeter of figure n.

c) What is the perimeter of figure 40?

d) Write an equation that relates P to n.

e) Which figure has a perimeter of 136 units? How do you know?

INPUT →   → OUTPUT
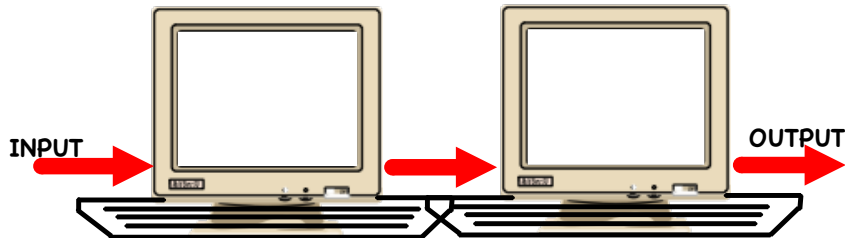
2. A phone company charges a fixed cost of $10 per month, plus $0.25 per minute for long distance calling.

a) Write an equation that relates the monthly cost, C dollars, to t, the time in minutes.

b) In one month, the time for the long distance calls was 55 minutes. What was the monthly cost?

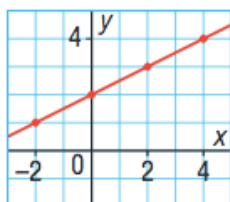c) For one month, the cost was $22.50. How many minutes of long distance calls were made?

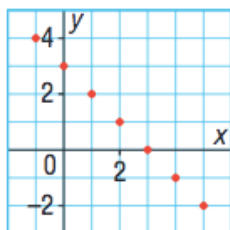| INPUT	OUTPUT

INPUT → → OUTPUT
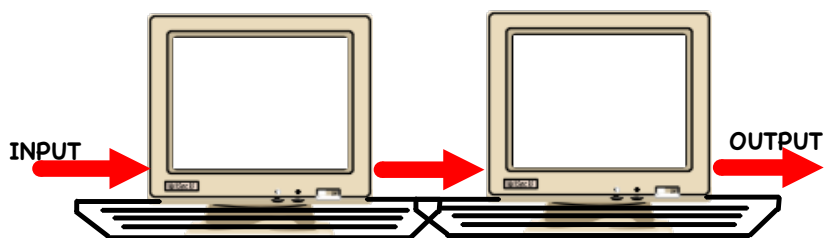
LINEAR RELATION or NOT?

Ex.

A. Looking at a Graph

Yes / No

Why? _____

_____

Yes / No

Why? _____

_____
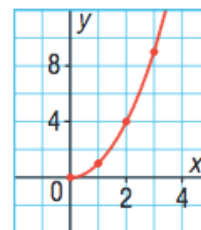
Yes / No

Why? _____

_____

B. Looking at a Table of Values

x	y
0	0
1	2
2	6
3	12
4	20

Yes / No

Why? _____

_____

x	y
1	3
4	5
7	7
10	9
13	11

Yes / No

Why? _____

_____

C. Looking at a Equation

i) $y = 2x + 1$

Yes / No

Why? _____

_____

ii) $y = 5x^2 + 1$

Yes / No

Why? _____

_____

TABLE OF VALUES TO A GRAPH

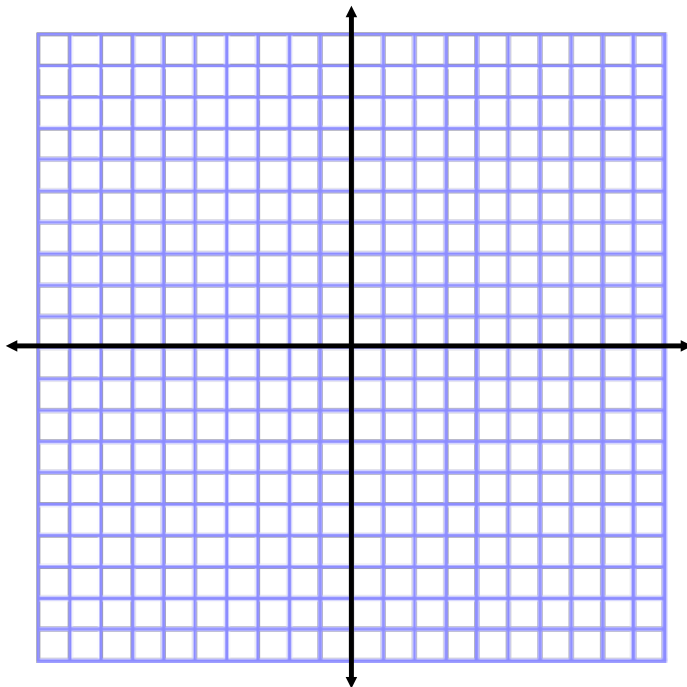**Ex.** Create a table of values for each linear relation, then graph the relation.

x		y	(x, y)

a) $y = -3x$

c) $y = 2 - 4x$

e) $y = -3 + x$

Create a table of values for each linear relation, then graph the relation.

b) $y = 2x$

d) $y = -2x + 4$

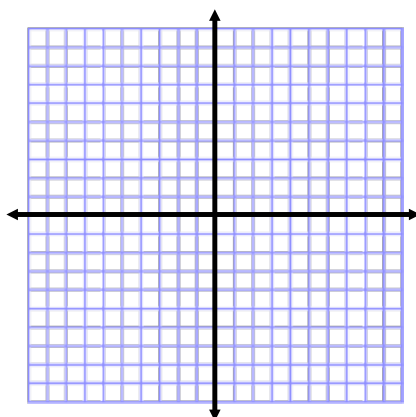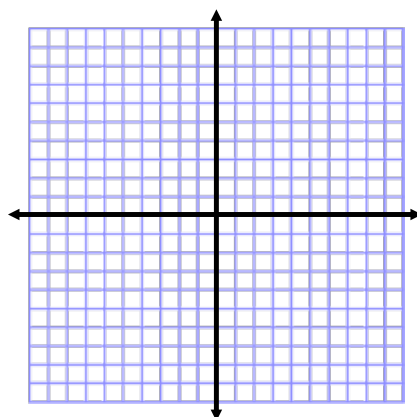f) $y = -x + 3$

x		y	(x, y)

x		y	(x, y)

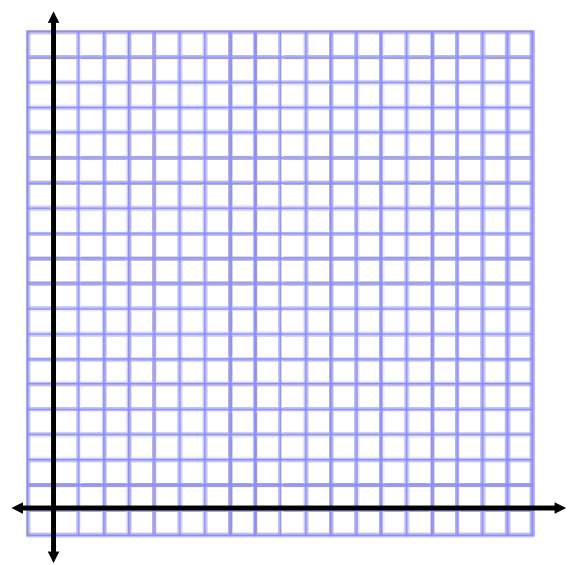| x		y	(x, y)
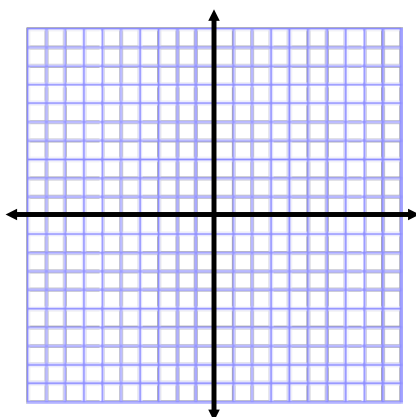
Try

Alicia buys a $300-jacket on lay away. She made a down payment of $30 and is paying $15 per week. The total paid, P dollars, after n weeks can be represented by the equation $P = 15n + 30$.

a) Create a table of values to show the total paid in each of the first 5 weeks.

b) Graph the data. Should you join the points on the graph? Explain.

x		y	(x, y)

Try

Each table of values represents a linear relation. Copy and complete each table. Explain your reasoning.

a)

x	y
1	10
2	14
3	
4	
5	

b)

x	y
1	
3	−10
5	−14
7	
9	

c)

x	y
−2	
−1	
0	−3
1	3
2	

d)

x	y
2	
4	−2
6	−5
8	
10	

Horizontal and Vertical Lines

Horizontal lines have the form y = # and vertical lines have the form x = #.

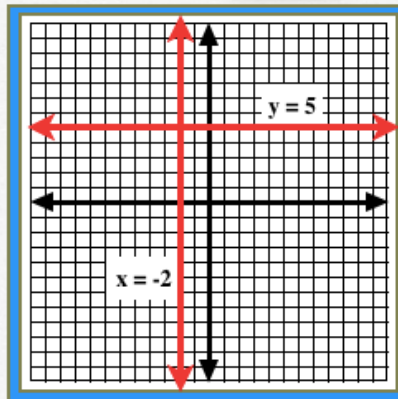- Solve the equation for y or x.
- Graph the horizontal or vertical line.

Ex. Graph the following line.　　　　**Ex.** Graph the following line.

Solve the equation for y.

Solve the equation for x.

$$2y - 4 = 6$$
$$2y = 6 + 4$$
$$\frac{2y}{2} = \frac{10}{2}$$
$$y = 5$$

Graph the horizontal line.

$$2x + 3 = -1$$
$$2x = -1 - 3$$
$$\frac{2x}{2} = \frac{-4}{2}$$
$$x = -2$$

Graph the vertical line.

y = 5

x = -2

Try Graph each equation.

i) $y = 1$ ii) $x = -4$ $iii) -4x + 1 = -7$