

Lesson Title - Graphing in Scratch - Making Connections

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Class(es) - MFM1P/MPM1D

Overall Expectations:

B2. Demonstrate an understanding of the characteristics of a linear relation

B3. Connect various representations of a linear relation.

Specific Expectations:

- Determine other representations of a linear relation, given one representation.
- Identify, through investigation, some properties of linear relations

Learning goal:

- Make connections between block code in Scratch, the output (graph) and the corresponding table of values.
- Characterize a linear vs. nonlinear relationship on a graph and on a table of values by recognizing when the change is constant.
- Use block coding in Scratch to plot points and create a mathematical relationship.

Activity Description:

Warm Up:

Table 1: Match the graph to the table of values. Cut out the graphs and tables of values and place around the room. Students try to match the graphs with the tables of values. They should record their results on a piece of paper. Take up as a group.

Lesson:

Activity works best in pairs or groups of 3. Students start by completing a matching activity by matching code with its corresponding graph and table of values. Once they have matched everything together they complete the graph by adding the axes and a scale. They also complete the table of values. In order to do this, students will need to carefully read the code and consider the starting position.

Students are then given a table where they are given one representation (code, graph or table of values) and they need to complete the missing representation.

Lesson Inspiration:

This lesson was inspired by the following link, which could be the follow up lesson:

<http://researchideas.ca/mc/try-this-plotting-points-in-scratch/>

Graphing with Scratch - Making Connections

Teacher notes/prep:

- If it is students first time using [Scratch](#), start with an introduction (Click Create and you may have to enable Adobe Flash).
 - Consider showing:
 - A tour of the Scratch interface - Sprite, Stage, Block Area, and Scripting Area
 - The event block “When green flag clicked”
 - How to add the “pen” extension and the stamp block
 - Understand the importance of Sprite movements and location.
- *It is important for students to know that the code connects to the sprite and backdrop
- For table 1, print large (ledger paper), cut up, and randomize, one copy per class.
- For table 2, print large (ledger paper), cut up, and randomize, one copy per pair or triple.
- For table 3, consider sharing electronically so students can use screenshots to complete the table.
- Note - students should realize the scale is always the same.

Potential extension:

Challenge students to make the code more efficient.

Here is an example for a linear relation: <https://scratch.mit.edu/projects/285223459/editor/>

Follow Up: Match the equations to the graphs - identifying linear and non-linear relations from different representations.

Student Instructions:

For [Table 1](#): Match the table of values to the graph

For Table 2:

1. Match the code with the correct graph. Two versions one is [academic](#) and one is [applied](#). The applied has axes on one of the graphs
2. Add the axes to the graph and a scale.
3. Represent the relationship as a table of values.
4. Go to the link <https://scratch.mit.edu/projects/286889581/> and duplicate the code to see if produces the graph you thought it would.

For [Table 3](#): Complete the table and try it out on Scratch to see if it matches.

Table 1:

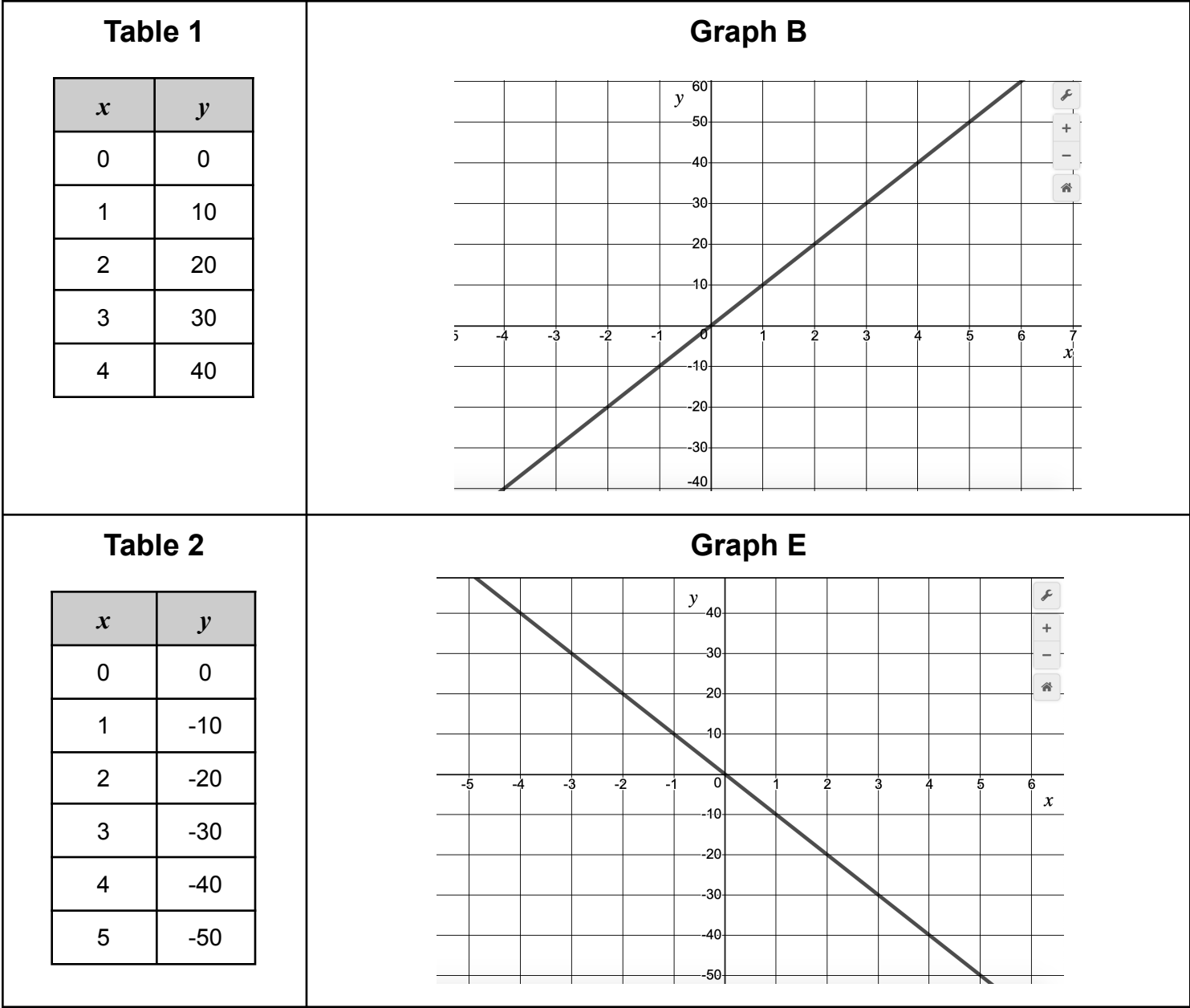
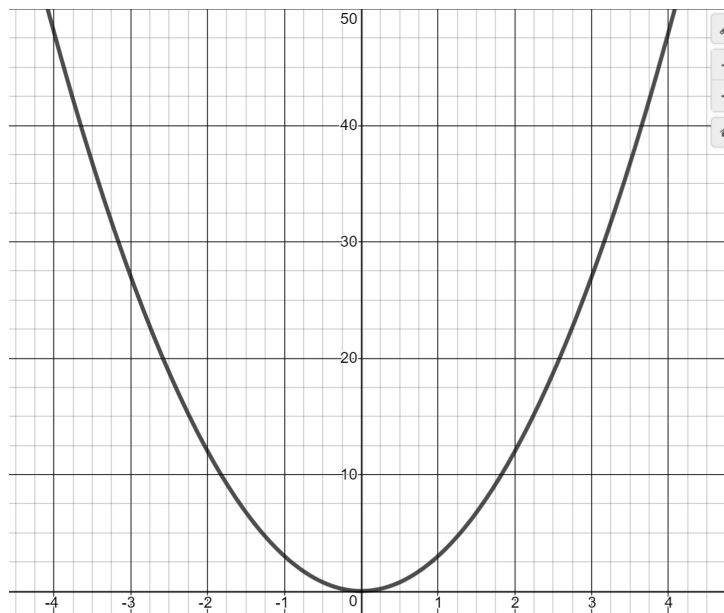


Table 3

x	y
-4	48
-2	12
-1	3
0	0
1	3
3	27

Graph D**Table 4**

x	y
0	0
1	1
2	4
3	9
4	16

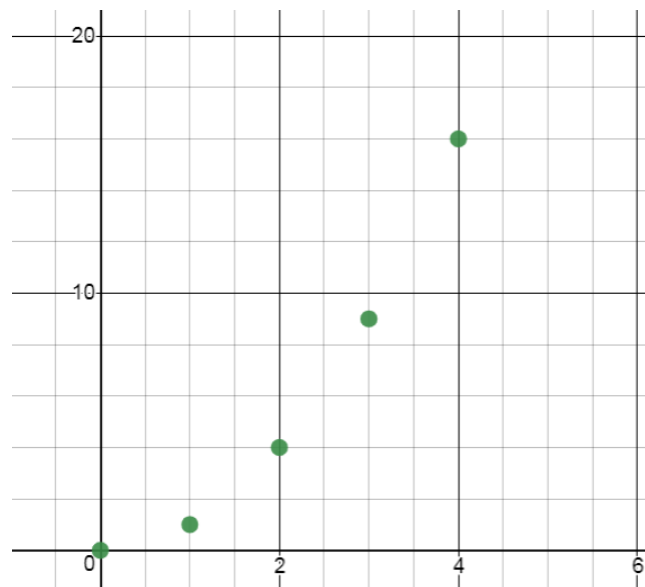
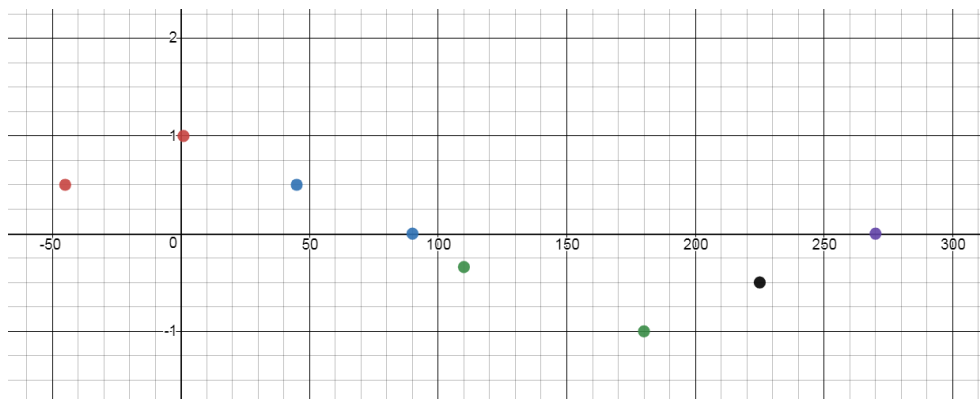
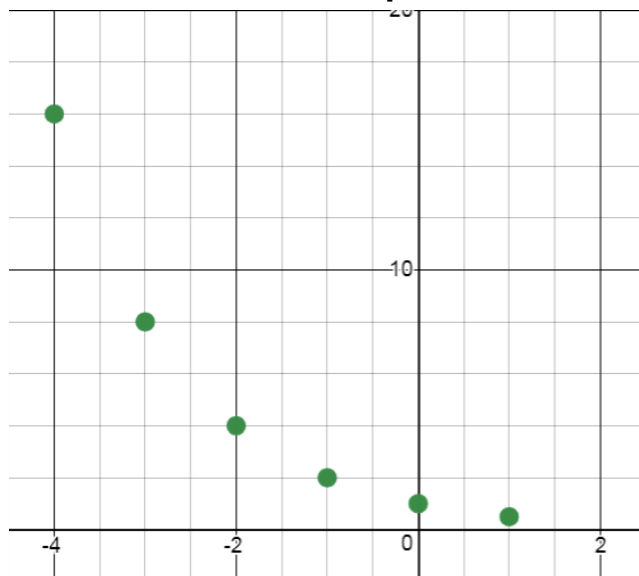
Graph F

Table 5

x	y
-45	0.5
0	1
45	0.5
90	0
110	-0.14
180	-1
225	-0.5
270	0

Graph C**Table 6**

x	y
-4	16
-3	8
-2	4
-1	2
0	1

Graph A

```

when green flag clicked
  hide
  erase all
  go to x: 0 y: 0
  stamp
  go to x: 10 y: 10
  stamp
  go to x: 20 y: 20
  stamp
  go to x: 30 y: 30
  stamp
  go to x: 40 y: 40
  stamp
  stop all

```

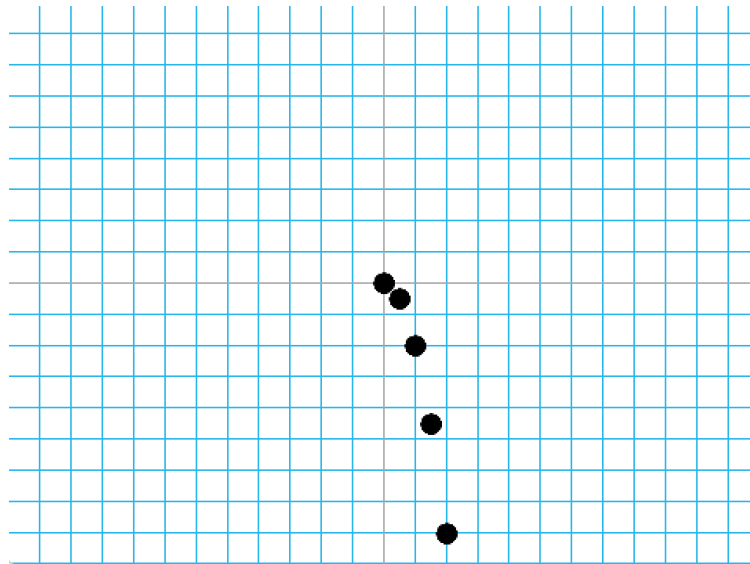
A scatter plot on a Cartesian coordinate system. The x-axis is labeled 'x' and the y-axis is labeled 'y'. Major tick marks are labeled at -100 and 100 on both axes. A dashed vertical line is drawn at x = 50. Five data points are plotted, showing a clear upward trend from left to right.


```

when clicked
hide
erase all
go to x: 0 y: 0
stamp
go to x: 10 y: -10
stamp
go to x: 20 y: -40
stamp
go to x: 30 y: -90
stamp
go to x: 40 y: -160
stamp
stop all

```

The Relationship Between x and y

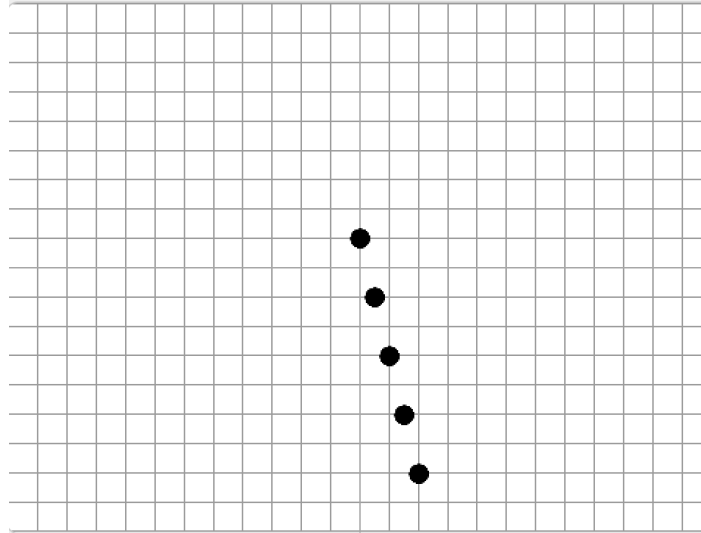



```

when green flag clicked
  hide
  erase all
  go to x: 0 y: 20
  stamp
  go to x: 10 y: -20
  stamp
  go to x: 20 y: -60
  stamp
  go to x: 30 y: -100
  stamp
  go to x: 40 y: -140
  stamp
  stop all

```

The Relationship Between x and y



when  clicked

hide

 erase all

go to x: 0 y: 40

 stamp

go to x: 20 y: 30

 stamp

go to x: 40 y: 0

 stamp

go to x: 60 y: -50

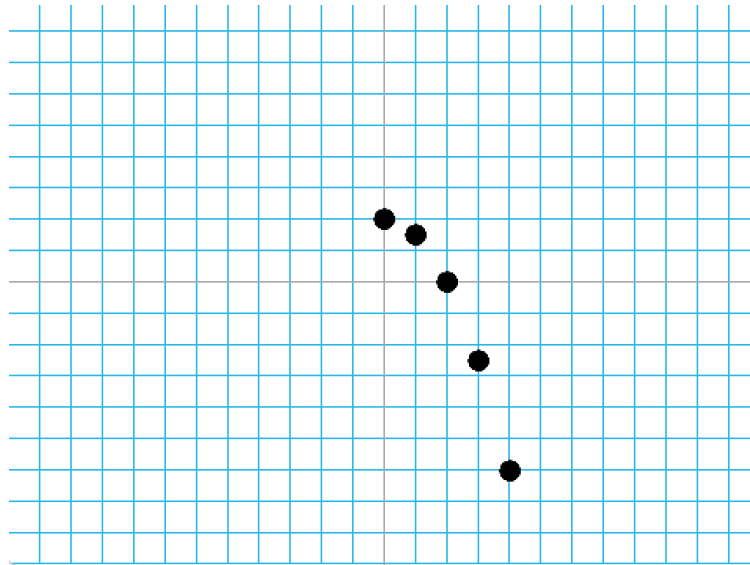
 stamp

go to x: 80 y: -120

 stamp

stop all ▼

The Relationship Between x and y



x	y
10	
	-50

Table 2: Complete the table

Code

when clicked

hide

erase all

wait1 seconds

go to x: -140 y: -100

stamp

go to x: -120 y: -80

stamp

go to x: -100 y: -40

stamp

go to x: -80 y: 40

stamp

go to x: -60 y: 160

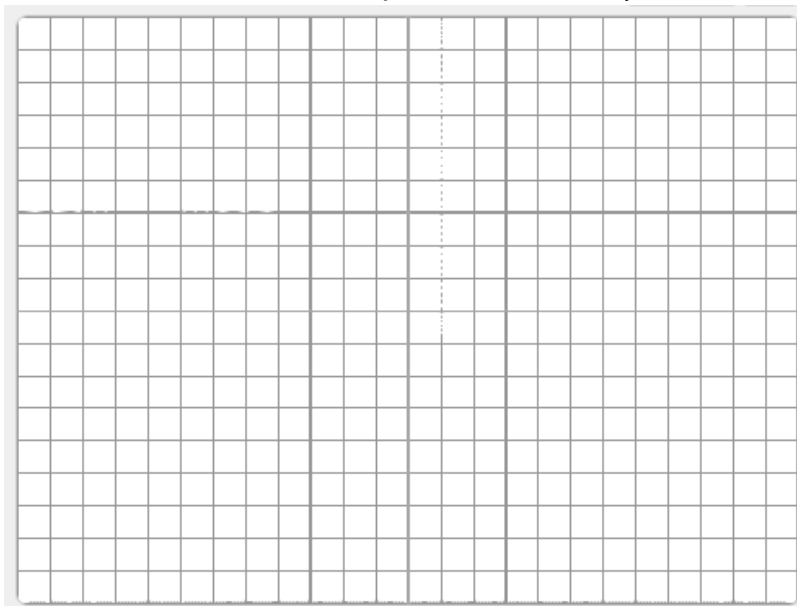
stamp

Graph

The Relationship Between x and y

Table of Values

The Relationship Between x and y



x	y
0	70
20	110
60	150
80	170
120	130

The Relationship Between x and y

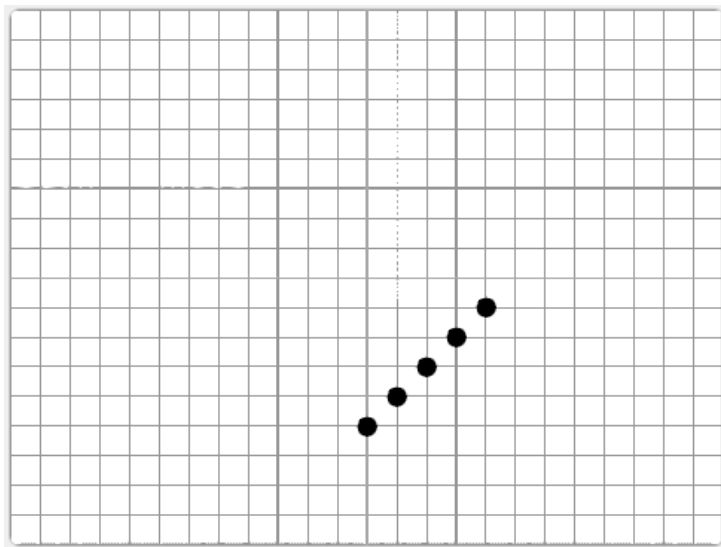


Table 2 Academic

when  clicked

hide

 erase all

go to x: 0 y: 0

 stamp

go to x: 10 y: 10

 stamp

go to x: 20 y: 20

 stamp

go to x: 30 y: 30

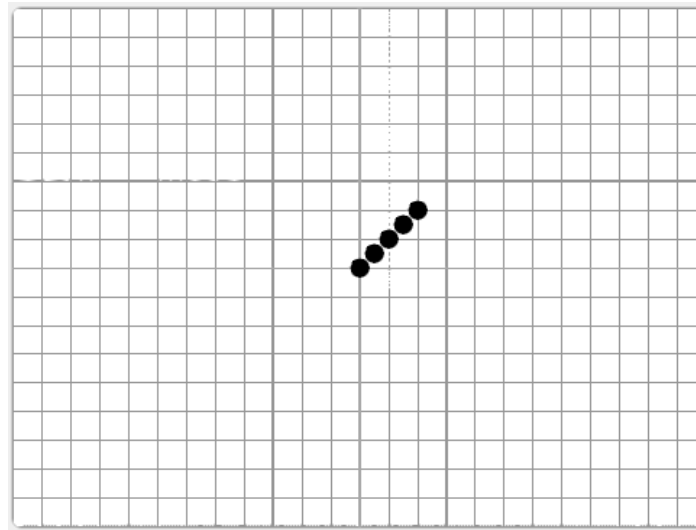
 stamp

go to x: 40 y: 40

 stamp

stop all a

The Relationship Between x and y



when clicked

hide

erase all

go to x: 0 y: 0

stamp

go to x: 10 y: -10

stamp

go to x: 20 y: -40

stamp

go to x: 30 y: -90

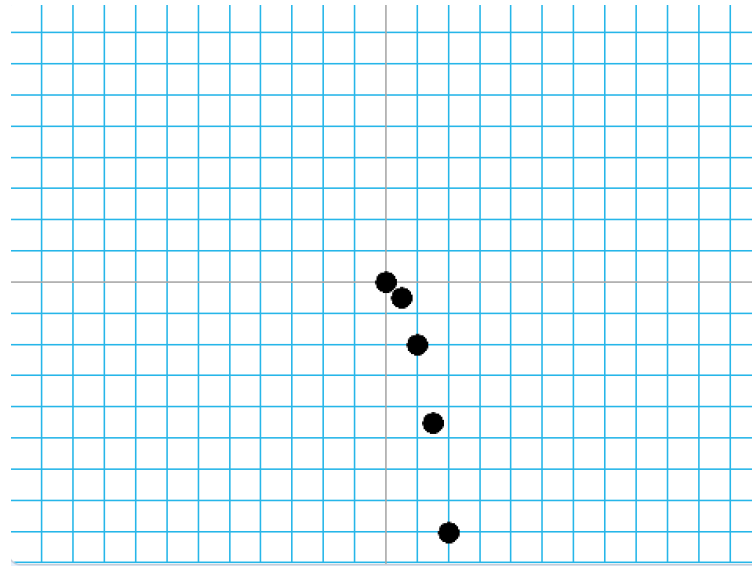
stamp

go to x: 40 y: -160

stamp

stop all

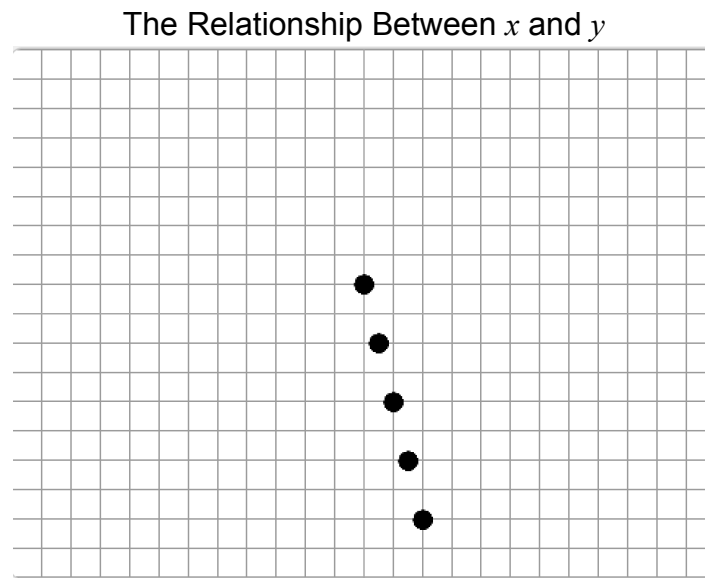
The Relationship Between x and y




```

when green flag clicked
  hide
  erase all
  go to x: 0 y: 20
  stamp
  go to x: 10 y: -20
  stamp
  go to x: 20 y: -60
  stamp
  go to x: 30 y: -100
  stamp
  go to x: 40 y: -140
  stamp
  stop all

```



when clicked

hide

erase all

go to x: 0 y: 40

stamp

go to x: 20 y: 30

stamp

go to x: 40 y: 0

stamp

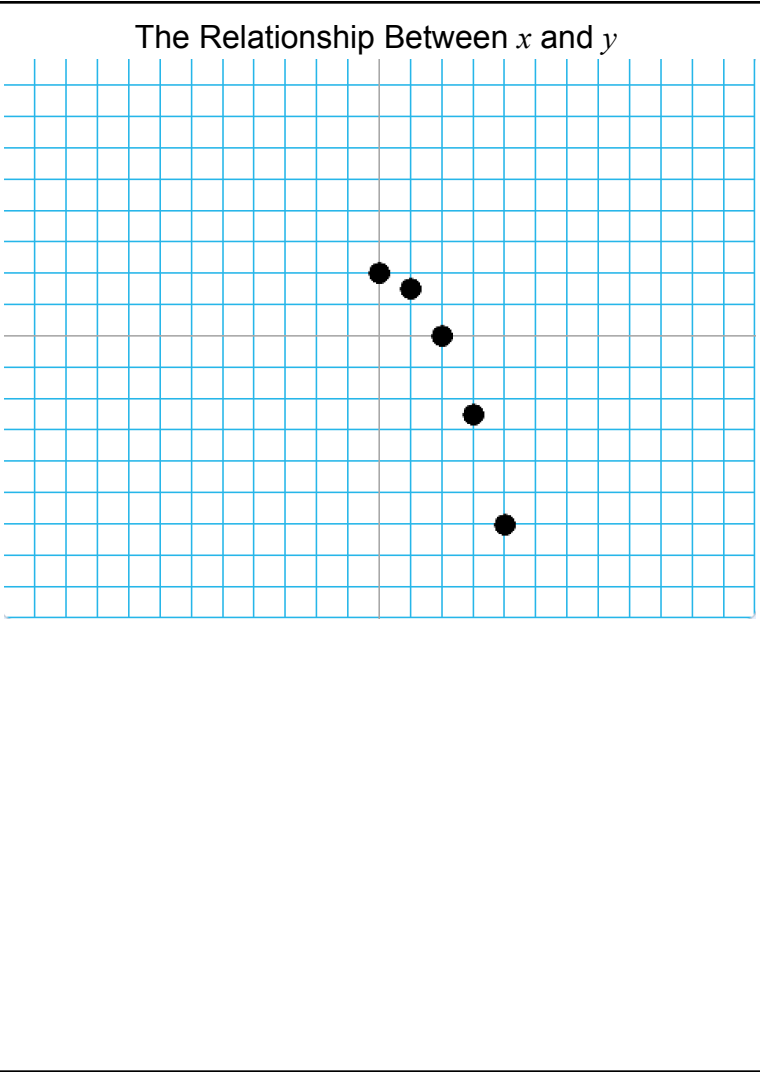
go to x: 60 y: -50

stamp

go to x: 80 y: -120

stamp

stop all

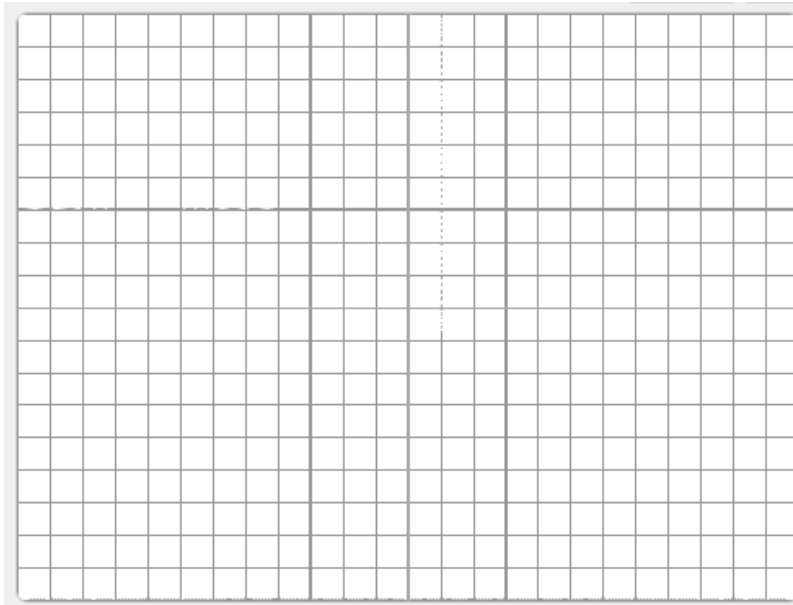


x	y
20	
	-50

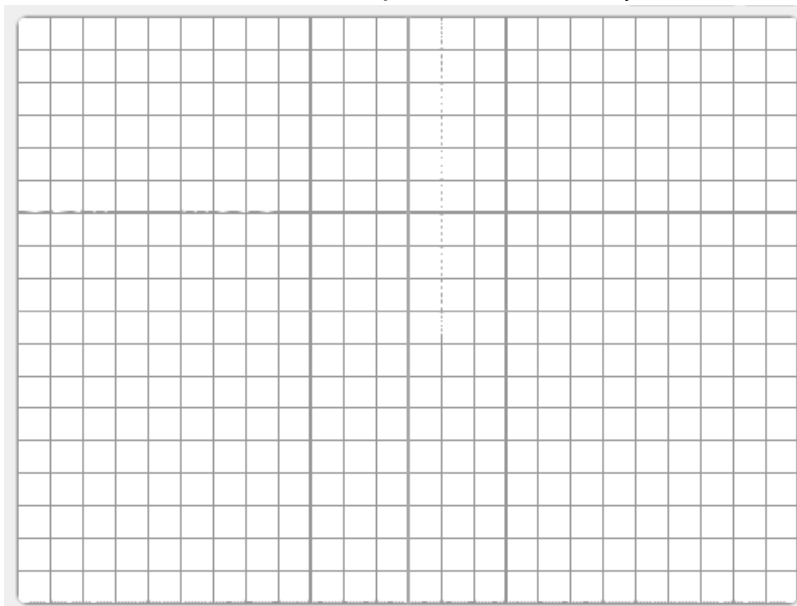
[illegible]


```
when green flag clicked
hide
erase all
wait 1 seconds
go to x: -140 y: -100
stamp
go to x: -120 y: -80
stamp
go to x: -100 y: -40
stamp
go to x: -80 y: 40
stamp
go to x: -60 y: 160
stamp
```

The Relationship Between x and y



The Relationship Between x and y



x	y
0	100
20	140
60	180
80	200
120	160