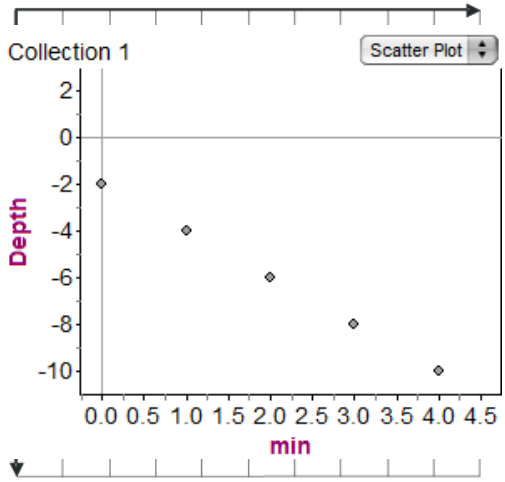
3.7.2: Using What You Have Discovered

Deep Sea Divers

The table below shows data collected as divers descend below sea level. Calculate the first differences. Use the first differences to determine if the relationship is linear or non-linear. Check your solution by graphing. Include labels and titles.

Time (min)	Depth (m)	First Differences
0	-2	
1	-4	
2	-6	
3	-8	
4	-10	

The relationship is:

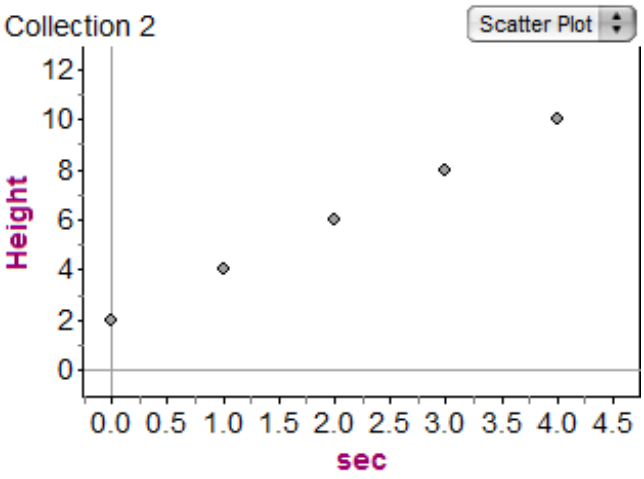


Hot Air Ballooning

The table shows data collected as a hot air balloon leaves the ground. Calculate the first differences. Use the first differences to determine if the relationship is linear or non-linear. Check your solution by graphing. Include labels and titles.

Time (sec)	Height (m)	First Differences
0	2	
1	4	
2	6	
3	8	
4	10	

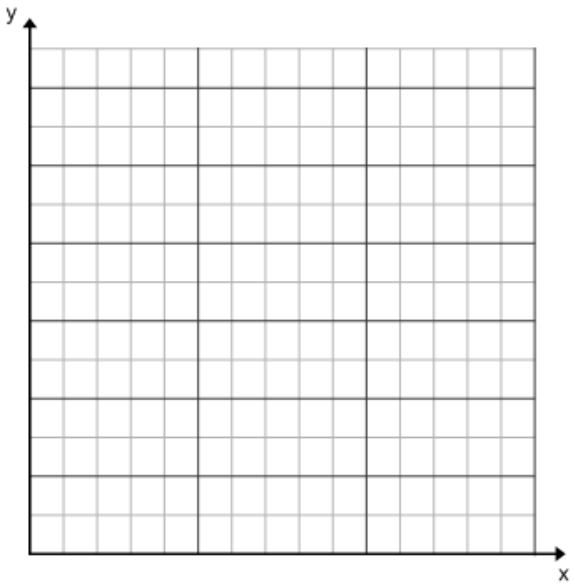
The relationship is:



Example 1

Plankton and seaweed, which are the basis of ocean food chain, need sunlight to survive.
As sunlight enters the ocean, it is absorbed and scattered by the water.
The table and graph show how the amount of sunlight that penetrates clear tropical ocean water changes with depth.

Depth (m)	Light penetration (%)
0	100
25	50
75	10
150	1



1. Is the data linear?

2. Create a scatter plot and draw a curve of best fit.

3. Describe the relationship between depth and light penetration.

4. What percent of light penetrates the water at a depth of 40m? Is this interpolation or extrapolation?

5. What depth of water only allows 5% of light penetration? Is this interpolation or extrapolation?

Example 2

Example

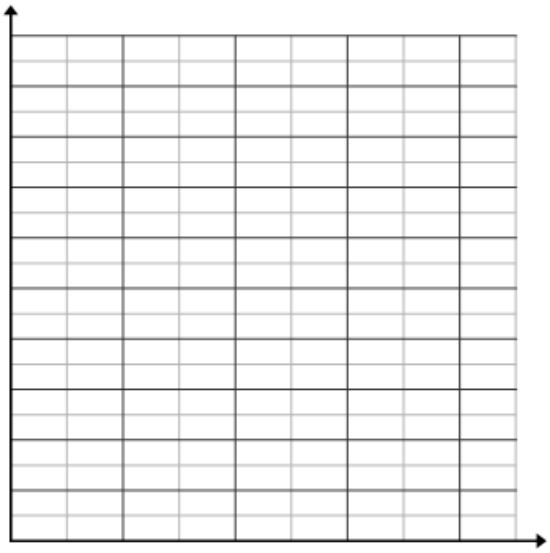
A typical North American adult consumes about 200 mg of caffeine a day.
Caffeine has a half-life of about 6 h.
This means that about 6 h after consumption, half the caffeine remains in a person's body.

Caffeine occurs naturally in coffee beans, cocoa beans, kola nuts, and tea leaves. It is also found in products, such as coffee, tea, some energy drinks and soft drinks.

a) Copy and complete the table below to show how much caffeine is left in a person's body over time.

Time (h)	Mass of caffeine (mg)
0	200
6	
12	
18	
24	

b) What trends do you see in the data? What do you think the graph will look like?



c) Graph the data. Describe the graph. How does the graph compare to your prediction in part b?

d) About how much caffeine will remain after 9 h? After 36 h? What assumption did you make?

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