7.0.1 – THE MOULD THAT GROWS!

Experiment A

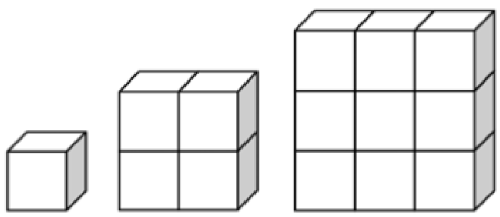
You find a sandwich in the back of your desk. It has been there for a long time. You know this because it has been infected with a particular mould. The mould grows in the following way: if there is 1 "blob" of mould today, then there will be 4 blobs tomorrow, 9 blobs the next day, and so on. Model this relationship using the Cube-a-links.

Purpose

Explore the relationship between the side length and the total number of cubes.

Procedure

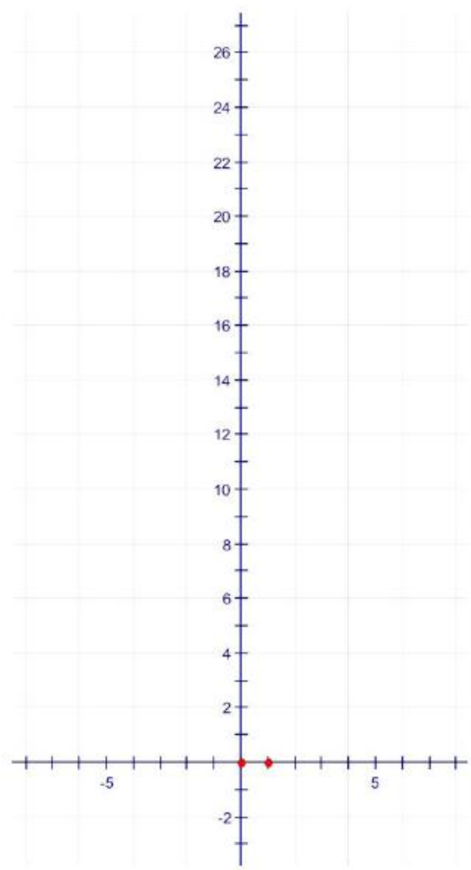
1. Build the following sequence of models, using the cubes.



2. Using the cubes, construct the ***next three models*** in the sequence and sketch them next to the others.

3. Complete the table below, illustrating the relationship between the side length and total number of cubes. Also complete the first and second differences (remember to subtract the number farther down the table from the number higher up the table!).

Side Length	***Number of Cubes***	***First Differences***	***Second Differences***
0	0		
1	1	1 – 0 = 1	



4. Graph this relationship on the axes provided to the right, using the "Side Length" as your "x" values and the "Number of Cubes" as your "y" values.

5. What is the relationship between the side length and number of cubes?

7.0.2 – THE BALL THAT SOARS!

Experiment B

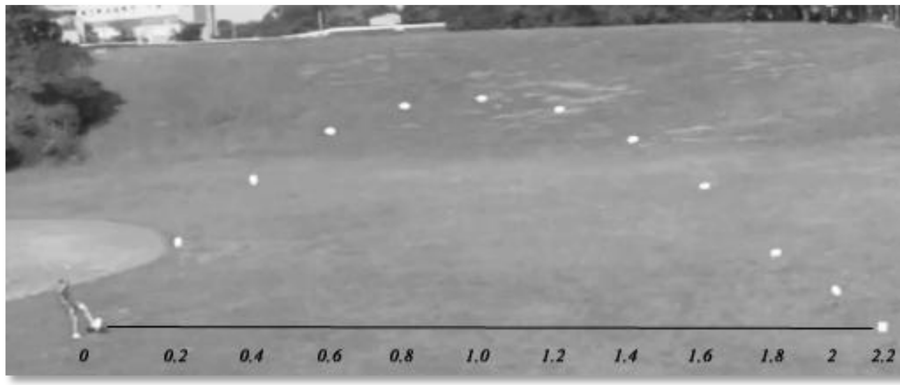
You are shown a photograph of an athlete kicking a rugby ball. The path of the ball through the air can be seen in the photograph. The rugby coach wants an analysis of the athlete's performance, based on the height of the ball and the length of the time that the ball is in the air. Make some measurements from the photograph and help the coach analyze the data.

Purpose

Explore the relationship between the time that a ball is in the air and the height of the ball in the air.

Procedure

1. Complete the table below by making measurements of the height of the ball (in metres) at the times indicated (in seconds). Also complete the first and second differences (remember to subtract the number farther down the table from the number higher up the table).



Trace the path of the rugby ball ("connect" the dots).
For the measurements, let 1 cm = 1 m

2. Does the rugby ball reach a single maximum value (a high point) or a single minimum value (a low point)?

   ____

3. **What** is the maximum/minimum value reached by the rugby ball?

   ____

4. **When** does the maximum/minimum value occur for the rugby ball in this photograph?

   ____

5. At **what height** was the ball when it was first kicked?

   ____

6. **How many times** does the rugby ball reach a height of 1 metre above the ground?

   ____

7. For **how long** is the rugby ball at a height ***greater*** than 2 metres?

   ____

Time (s)	*Height (m)*	*First Differences*	*Second Differences*
0	0	___ – 0 = ___	
0.2			
0.4			
0.6			
0.8			
1.0			
1.2			
1.4			
1.6			
1.8			
2.0			
2.2			

7.0.3 – THE MAN THAT BUNGEES!

Experiment C

You are given some data from a man who bungee-jumped for his 20th birthday. He jumped off a bridge over a raging river. The data represents the path the man takes as he leaps off the bridge, falls towards the ground, and springs back up towards the bridge again. The man wants to brag to his friends about how close he came to touching the water.

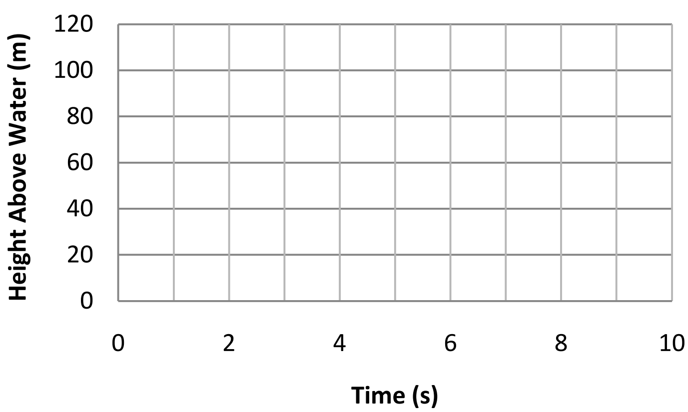
Purpose

Explore the relationship between the length of time a man is in the air and the distance he is away from the water.

Procedure

1. Complete the first and second differences in the table to the right (remember to subtract the number farther down the table from the number higher up the table!).

2. Graph the data from the table on the right on the blank graph below, connecting each point to the other from the beginning to the end.



Time (s)	*Height (m)*	*First Differences*	*Second Differences*
0	118	85 – 118 = – 33	
1	85		
2	58		
3	37		
4	22		
5	13		
6	10		
7	13		
8	22		
9	37		
10	58		

3. At **what time** is the man standing on the bridge before jumping? ______________________________________

4. **How high** is the bridge that the man jumps off to bungee jump? ______________________________________

5. After he jumps, does the man reach a single maximum value (a high point) or a single minimum value (a low point)? ______________________________________

6. **What** is the maximum/minimum value reached by the man? ______________________________________

7. **When** does the maximum/minimum value occur for the man as he bungee-jumps? ______________________________________

8. At **what time(s)** is the man 37 metres above the water? ______________________________________

9. For **how long** is the man closer to the water than 20 metres? ______________________________________

7.0.4 – THE AREA THAT CONTAINS!

Experiment D

You want to make an enclosed rectangular space for your pet iguana, Percy. You have 12 panels that you can place around the outside of an area to enclose it. As you care for your pet iguana tremendously, you want to make the greatest area that you can out of the panels that you are given. Model this relationship using paperclips, where 1 paperclip = 1 panel.

Purpose

Explore the relationship between side lengths of a rectangle in finding the biggest possible area.

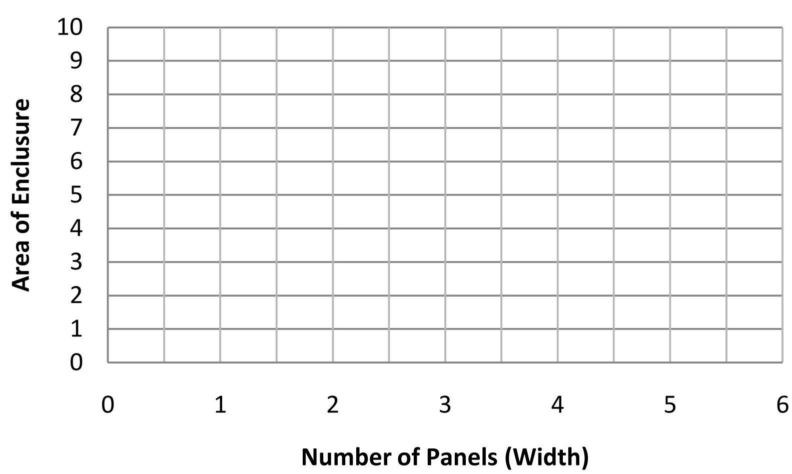
Procedure

1. Experiment with the 12 paperclips to calculate different possible areas for the enclosed space. Keep track of your data in the table below. Sketch your different enclosures in the space provided. You need to make rectangular enclosures with ***six*** different widths, in addition to the sample width of zero.

Number of Panels Width	***Number of Panels Length***	***Area of Enclosure***
0	6	0 x 6 = 0

w = 0, A = 0

2. Graph your findings on the empty grid to the right, using the “Number of Panels (Width)” as the “x” values and the “Area of Enclosure” as the “y” values.



3. At **what values of the width** does the total area of the enclosure equal zero?

____

4. What is the **maximum area** for the enclosure, using only the 12 panels provided?

____

5. What do you notice about the **width** and **length** of the rectangle as the area approaches a maximum value?

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