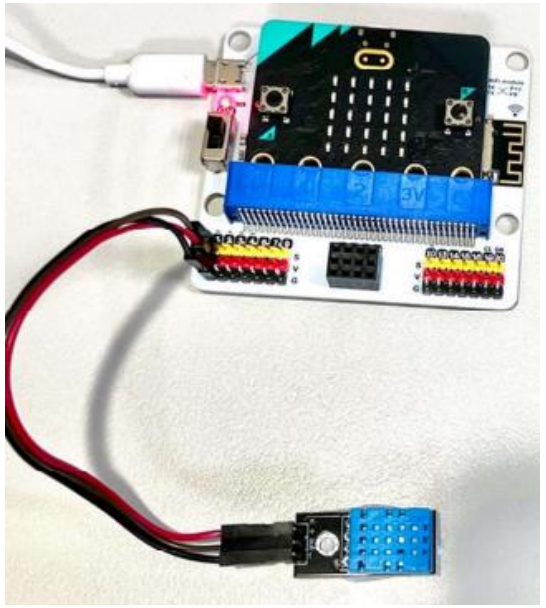
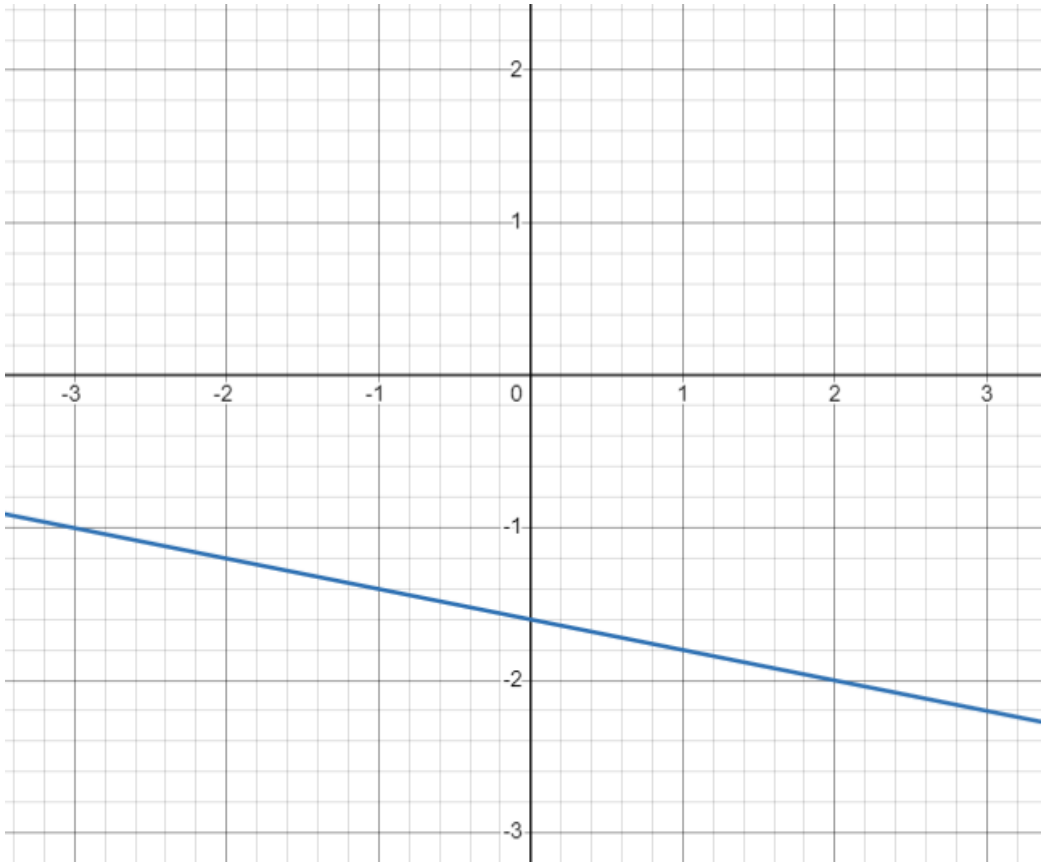
Smart Shelter

Analysis of

Temperature Data

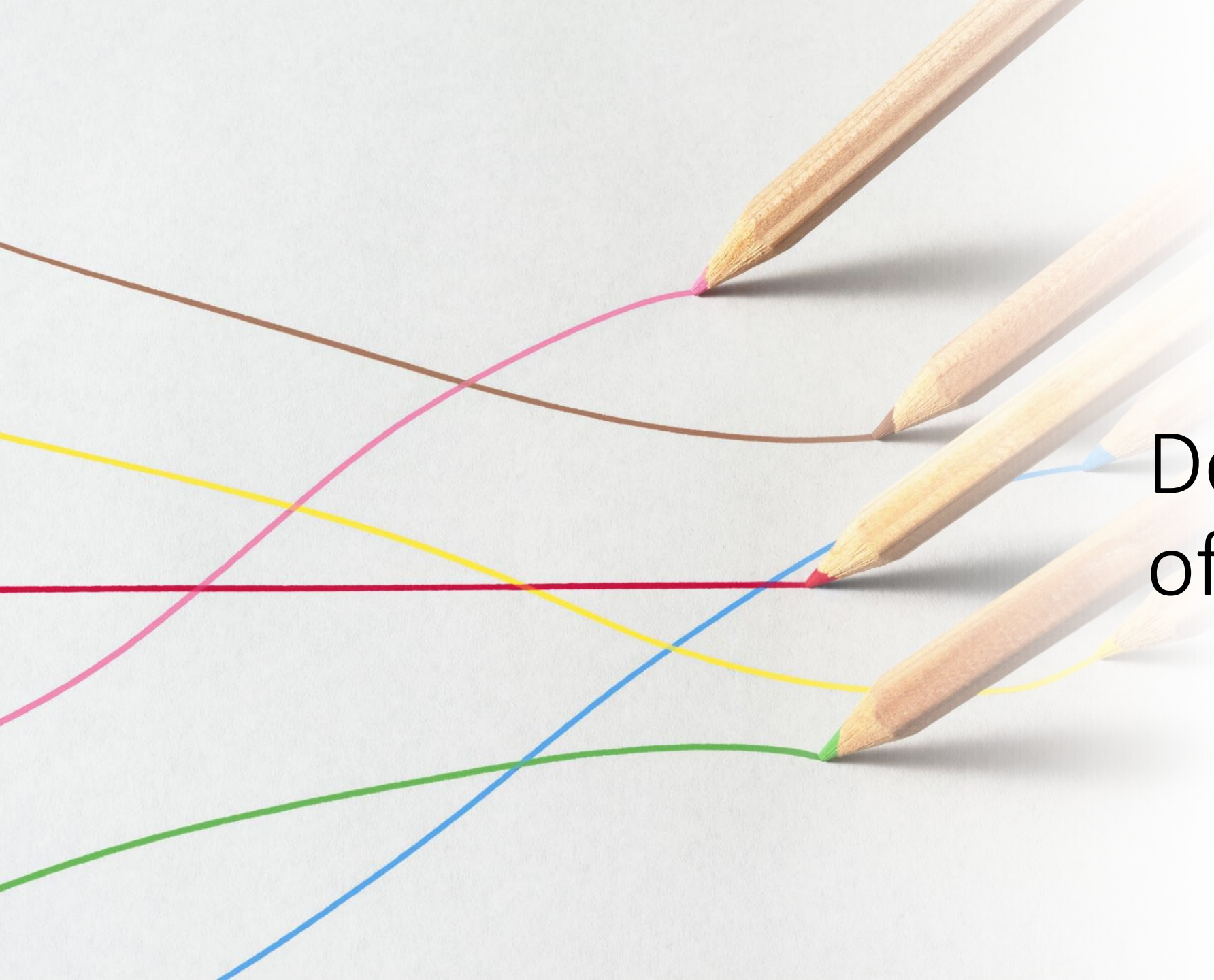


Exploration of Linear Equations



Links to the Activity

- https://student.desmos.com/join/ee7ua3?lang=en



Demonstration of best-fit lines

Link to the Demo Google Sheet

- https://docs.google.com/spreadsheets/d/18mzGXqNuDY3REWnJvG2zc3YvVDpufwol1GjAzaaaqzI/edit?usp=sharing

Conclusion

- For $y = mx + c$,
- Meaning of m :
  - Slope
- Meaning of c :
  - Vertical Intercept

What can best-fit lines do?

Give a better slope for comparison

Describe the relation of quantities.

Make predictions.

Data Analysis with authentic Data

What’s the problem? How to resolve?

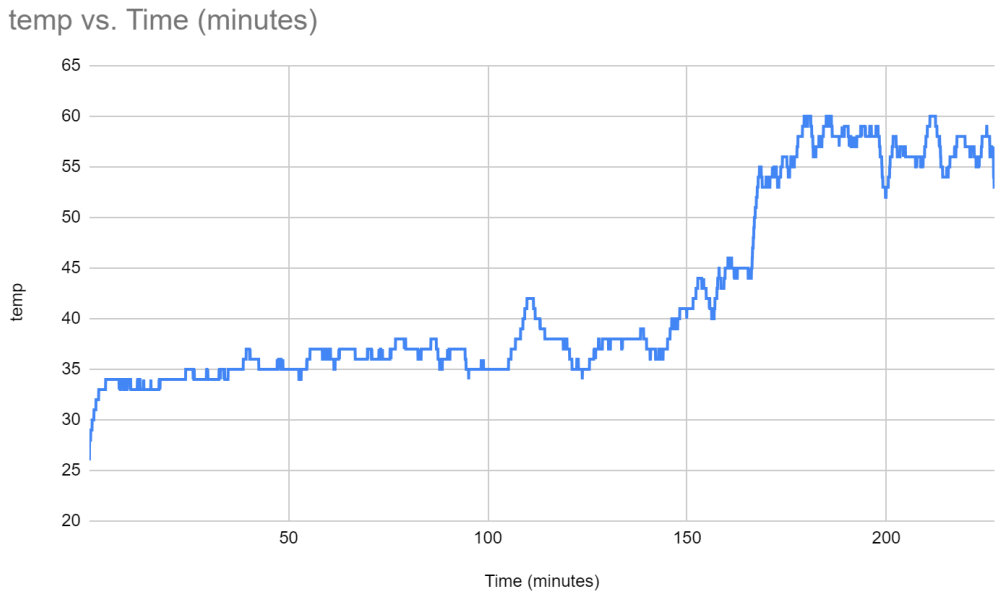
Time (minutes)	temp
0.01	23
0.05	23
0.1	23
0.15	23
0.01	27
0.06	28
0.11	28
0.15	28
0.2	28
0.24	28
0.29	29

226.84	57
226.89	56
226.94	54
226.98	54
227.03	54
227.07	53
227.12	53
227.17	53
0.02	36
0.06	36
0.11	35

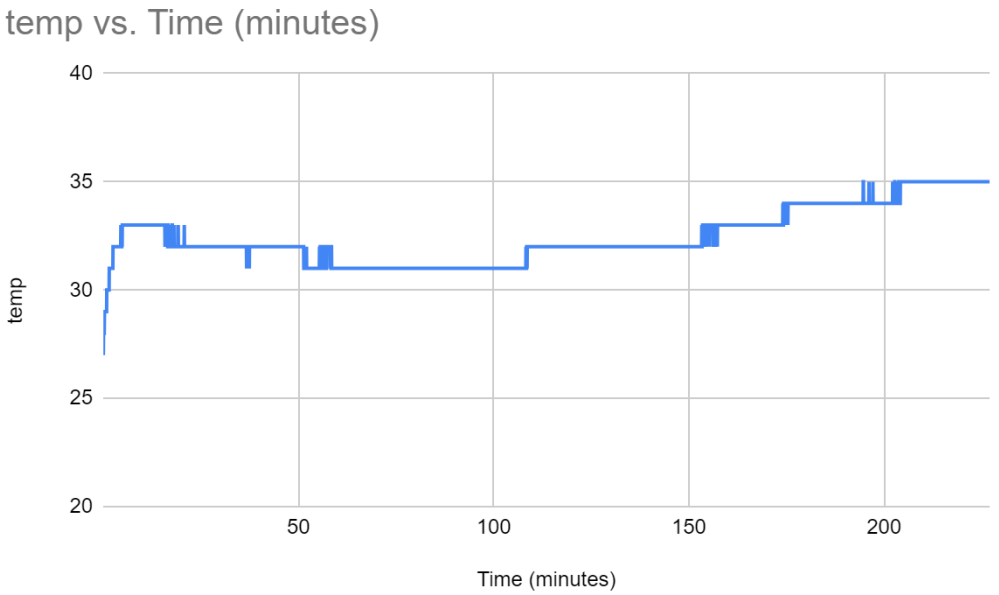
2024-05-08T15:13:34+0	28
2024-05-08T15:13:50+0	28
2024-05-08T15:14:05+0	28
2024-05-08T15:20:19+0	0
2024-05-08T15:20:35+0	28.9
2024-05-08T15:20:51+0	30.2
2024-05-09T07:36:22+0	0
2024-05-09T07:36:38+0	28.5
2024-05-09T07:36:53+0	29.5
2024-05-09T07:37:08+0	30.2
2024-05-09T07:37:24+0	31.3
2024-05-09T07:37:39+0	31.8
2024-05-09T07:37:55+0	32.3
2024-05-09T07:38:11+0	32.8
2024-05-09T07:38:27+0	33.1

Results from Mr. Man's Trials

(A) Sensor on Ground



(B) Sensor in A4 Paper Box

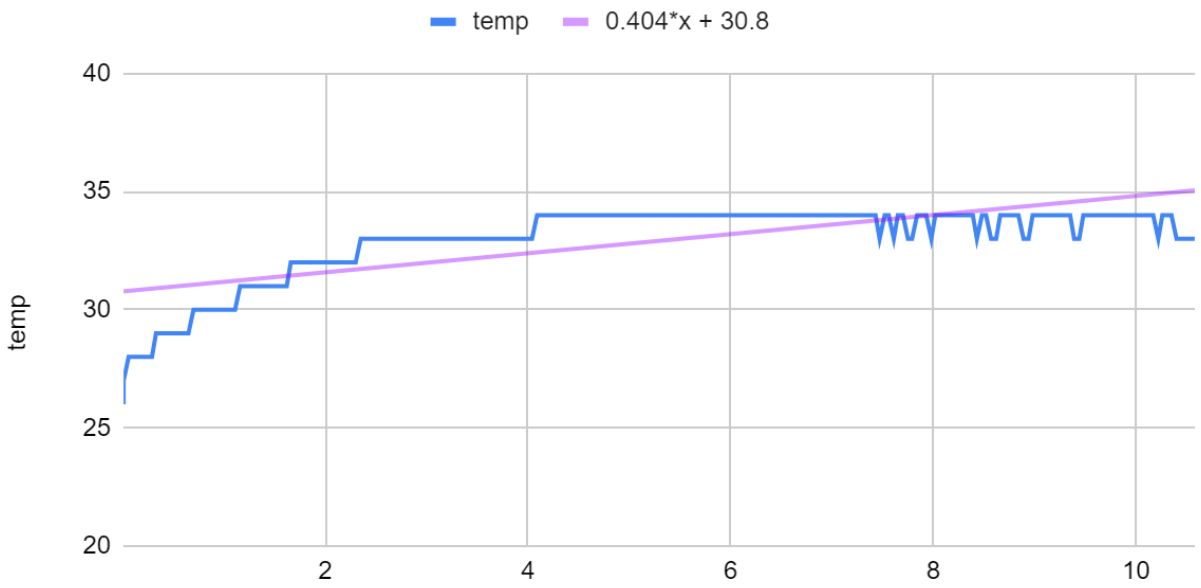


Can you describe the trend?

Make a guess of what happened after 150 minutes?

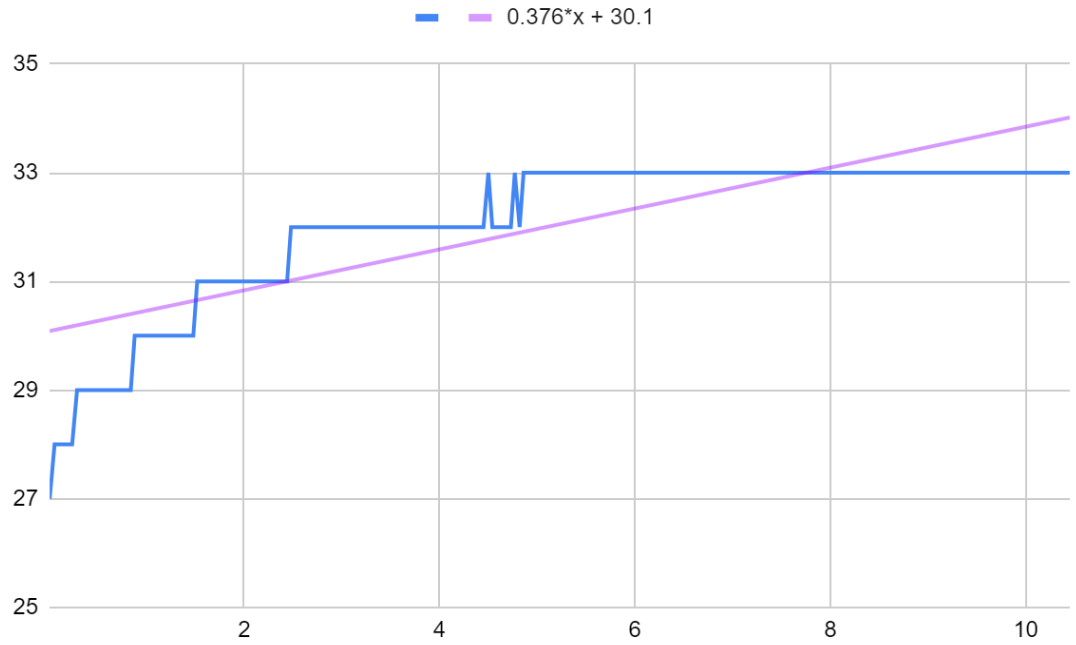
Focus on first 10 minutes

(A) Sensor on Ground



Slope = 0.404

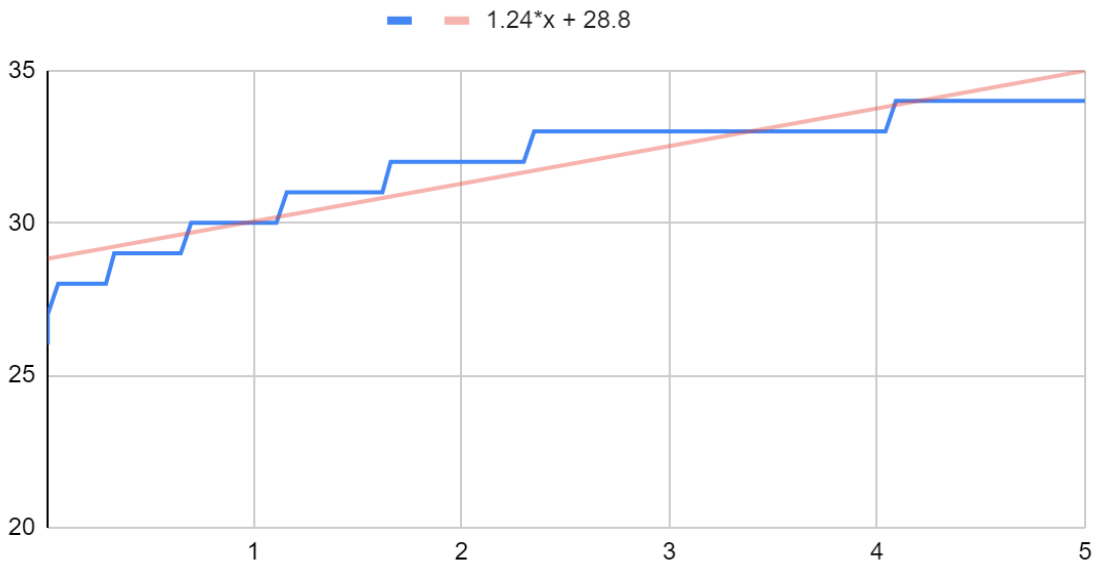
(B) Sensor in A4 Paper Box



Slope = 0.376

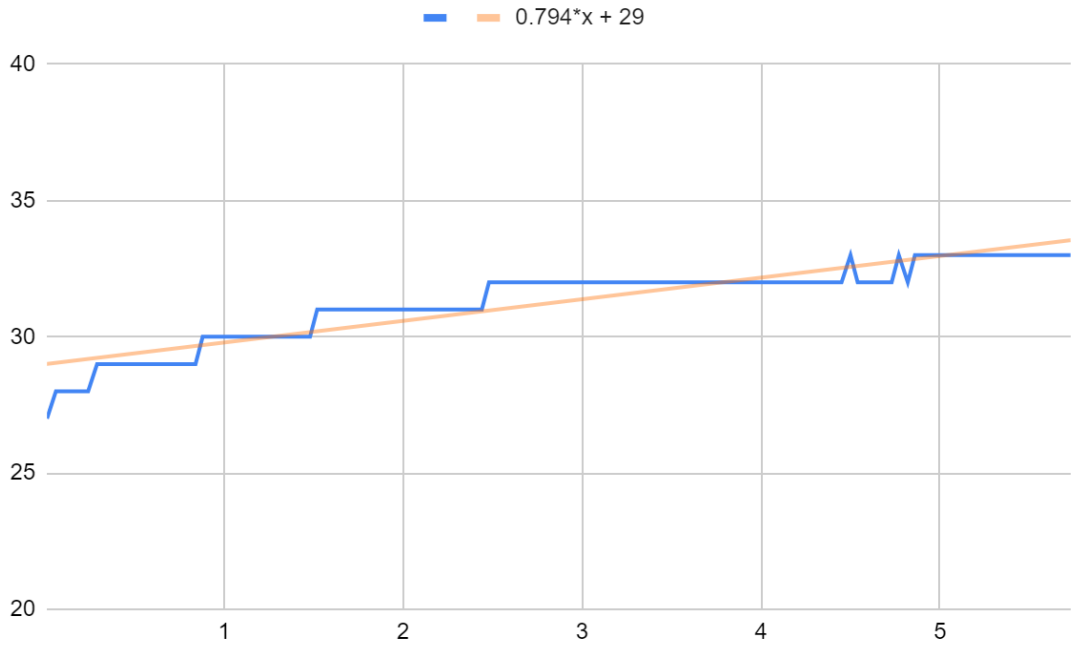
Focus on first 5 minutes

(A) Sensor on Ground



Slope = 1.24

(B) Sensor in A4 Paper Box



Slope = 0.794

Data Analysis

Open the Google Sheet in Google Classroom

Step 0 : Clear any data rows with mistakes.

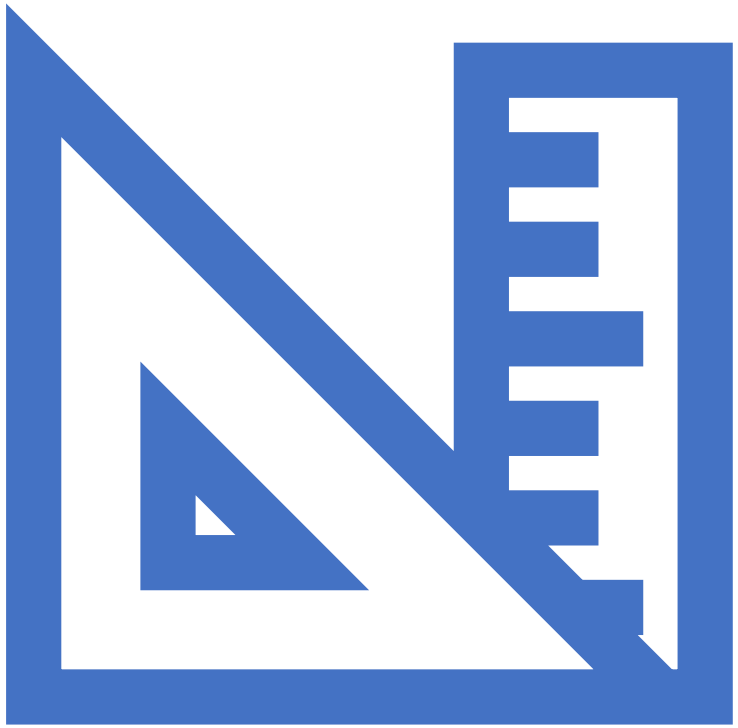
Step 1 : Plot the broken-line graph.

Step 2 : Select a suitable part of the data and plot some more graph(s). Adjust the graph to give the best view.

Step 3 : Find the slope of the best-fit line that can represent the rate of temperate increase.

Google Sheet with Students' Data

- You can start doing the analysis and graph plotting in the Google Sheet storing your Micro:bit Data



Presentation

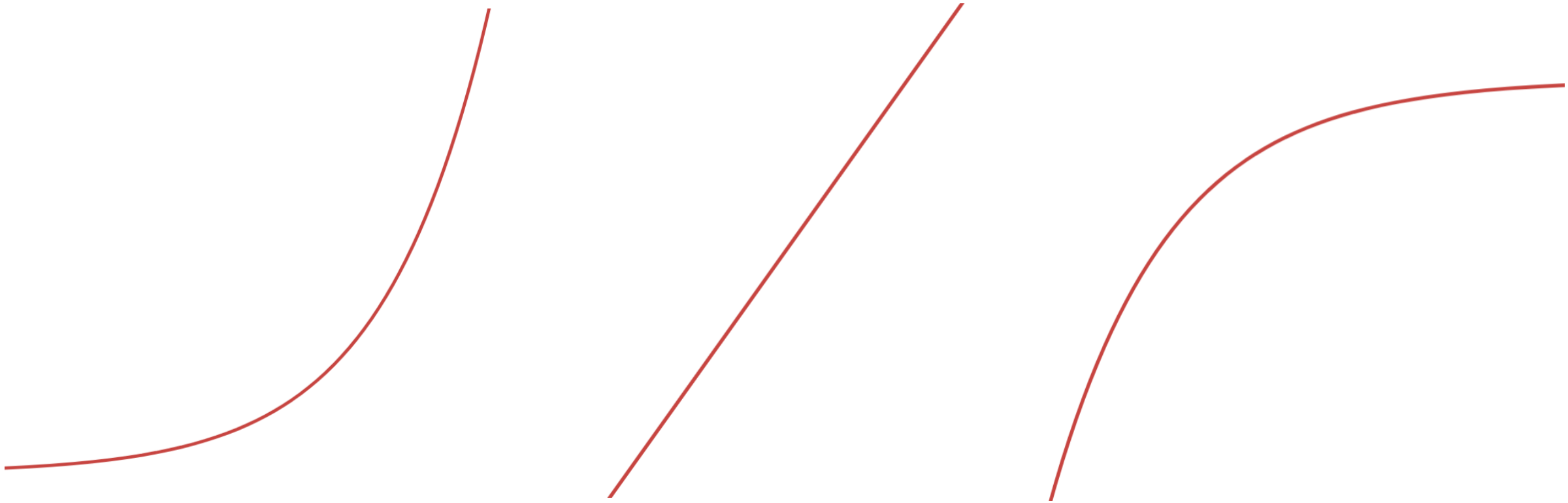
- Overall Observation
- Selected Parts and Slope Obtained
- Conclusion :
  Do the data reflect about the effectiveness of your design?

Remark: Unit of the Slope

- 0.404 degree / min vs 7.81×10^{-3} degree / second

Extra Question:

Which graph is the best representation of the temperature increase?



Conclusion

- $y = mx + c$
- Slope can be used to describe the rate of increase or decrease.
- Slope of best-fit line can be found with the aid of computer software or online apps.

Group Discussion

Complete the related parts of the log-book

How well can the shelter reduce the rate of temperature increase?

How can we improve the designs, data collection and data analysis?