THE 2024 YOUNG MATHEMATICAL STORY AUTHORS (YMSA) COMPETITION

THE STUART J. MURPHY AWARD

(THE 8-11 YEARS OLD CATEGORY)

LONGLISTED

‘Thirsty Professor Maths’ by Daniel Sprake (10 years old)

at The Hall School (UK)

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#YMSAMaths

Thirsty Professor Maths

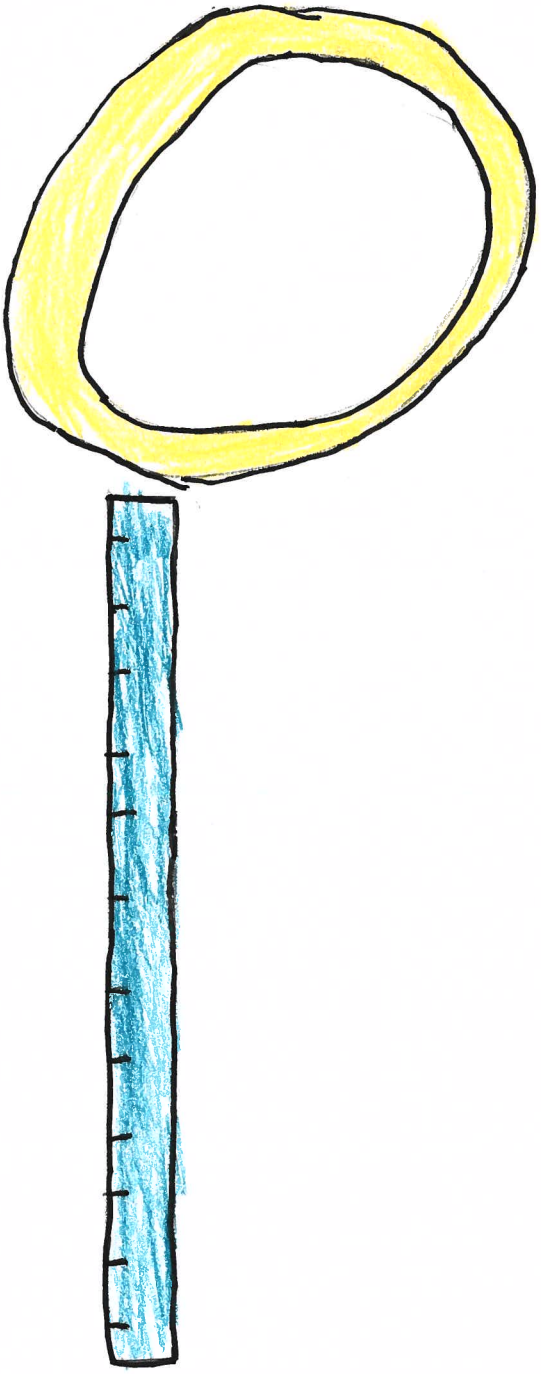
Daniel Sprake, The Hall school, London

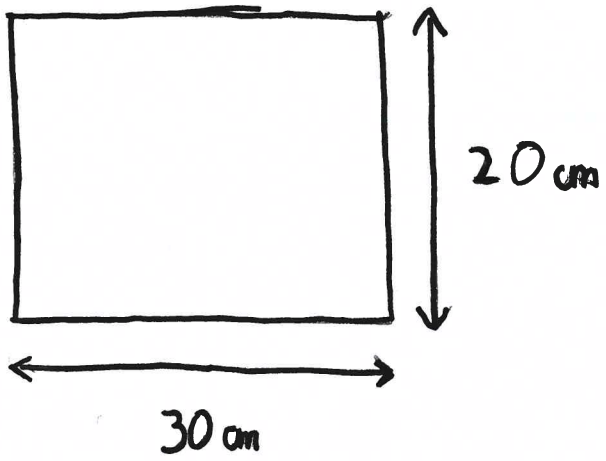
Chapter 1: The Problem

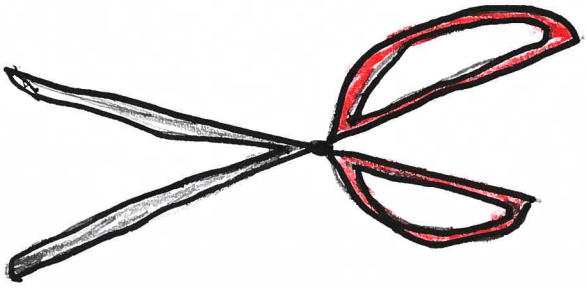
Professor Maths is walking through the desert after getting lost on the way to the school he taught at. He is extremely thirsty after walking a while with no water. He sees a rain cloud and thinks "How can I collect as much water as possible?"

Professor maths feels in his pockets and finds:

- A 30cm x 20cm piece of waterproof paper,
- A ruler,
- A pencil,
- A pair of scissors; and
- A roll of Sellotape







Chapter 2: The Solution

Professor Maths figures out that he could make a tray to catch the water by cutting a square from each corner of the paper and fold the edges up to make a tray.

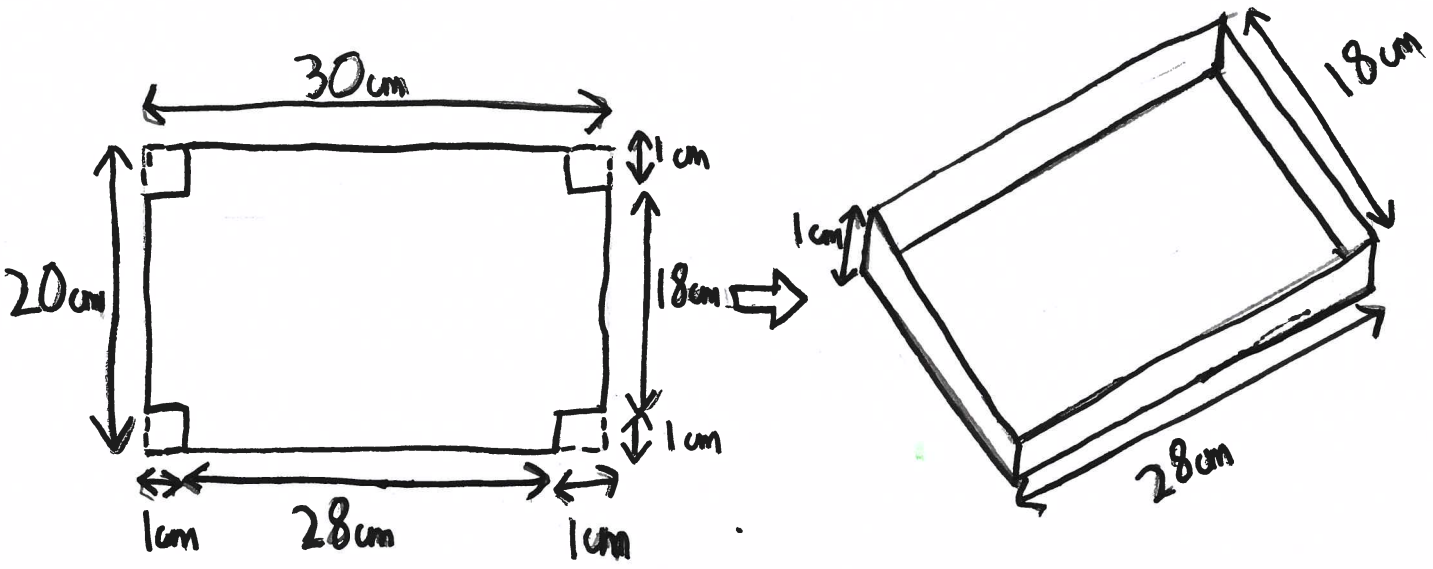
The volume of the tray depends on the size of the square he cuts out.

Volume = Length x Width x Height

In this case the hight is equal to the size of the square he cuts out; the length is equal to the length of the paper minus 2x the size of the square he cuts out; and the width is equal to the width of the paper minus 2x the size of the square he cuts out.

For example, if he cuts out a square with a side of 1cm from each corner the volume of the tray would be 18x28x1 which is 504cm^3.

To check this the professor draws a diagram of what the tray would look like.



Chapter 3: How to find the BEST solution

The professor then thinks what size square he should cut off to make the tray that can capture the most water (i.e. the tray with the biggest volume.)

To try and find an answer the professor then makes a table of the different volumes he gets from cutting various sizes of squares.

Square Cut (cm)	Height (cm)	Length (cm)	Width (cm)	Volume (cm^3)
1	1	28	18	**504**
2	2	26	16	**832**
3	3	24	14	**1008**
4	4	22	12	**1056**
5	5	20	10	**1000**
6	6	18	8	**864**
7	7	16	6	**672**
8	8	14	4	**448**
9	9	12	2	**216**

He looks at the table and sees that the highest volume is 4 but he figures out that the very highest volume could be anywhere between 3 and 5.

This time he draws a table between 3 and 5 with gaps of 0.2 centimetres.

Square Cut (cm)	Height (cm)	Length (cm)	Width (cm)	Volume (cm^3)
3.0	3.0	24.0	14.0	**1008.0**
3.2	3.2	23.6	13.6	**1027.1**
3.4	3.4	23.2	13.2	**1041.2**
3.6	3.6	22.8	12.8	**1050.6**
3.8	3.8	22.4	12.4	**1055.5**

4.0	4.0	22.0	12.0	**1056.0**
4.2	4.2	21.6	11.6	**1052.4**
4.4	4.4	21.2	11.2	**1044.7**
4.6	4.6	20.8	10.8	**1033.3**
4.8	4.8	20.4	10.4	**1018.4**

The professor then figures out that the best amount to cut off the corner is 4 cm.

Chapter 4: The Outcome

Professor Maths then cut out 4 cm from each corner, folded up the edges and stuck them together with Sellotape and made his tray.

He made his tray just in time because it just started to rain. The professor then put his tray on the cracked ground watching it fill. When the rain stopped the tray was full and the professor took a long, big drink.

After he had his drink, he had enough energy to find his way back to the school he taught at only 5 minuets late!

Blurb

Professor Maths gets lost in a desert on the way to the school he taught at and has no water. How does he escape?

About The Author

My name is Daniel Sprake and I live in London, England. I go to the Hall School in Belsize Park. I chose to write this story to show how volume works and what it can do.