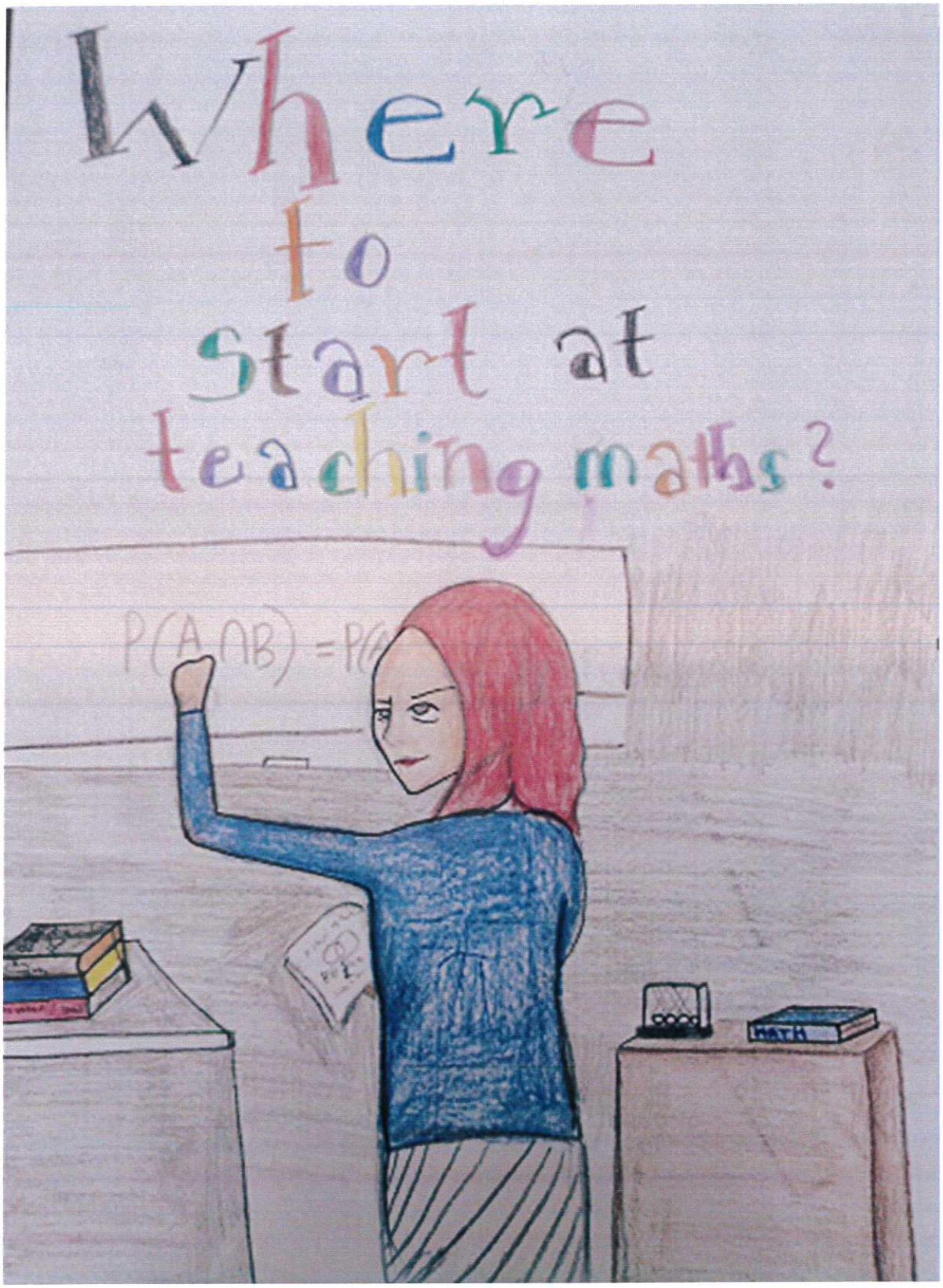


Fatima Dewan

Aged 12 Female

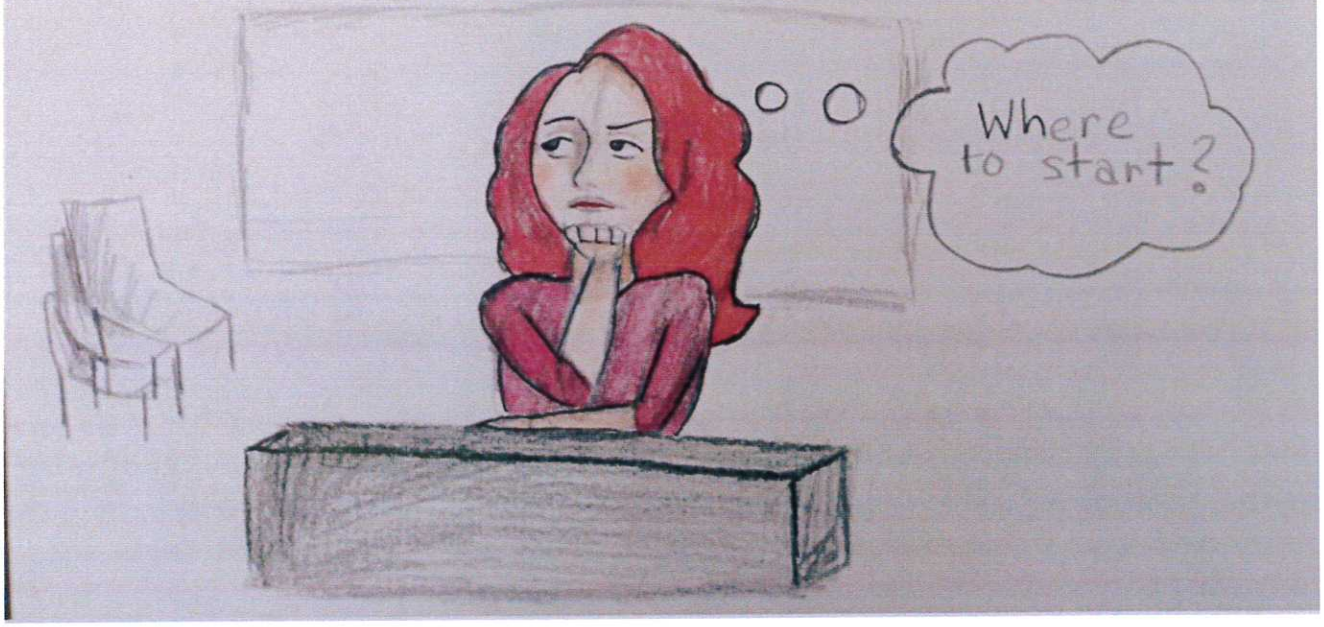
Brentford School for girls

Evgeniya's dream had always been to encourage people in mathematics. She had grown up seeing people not knowing a thing about maths, and wanted to teach everyone basic maths.

Why had no one been able to learn maths in her area? Well, she had lived and grown up in a rural village, where there was no local school or library. The nearest school was in the neighbouring town, which would be a 3 hour drive away.
She had learned all the maths she knew from old books she got from her grandfather, a retired maths teacher. After learning several fields of maths, she decided she needed to set her dream into action.

With the help of some relatives, she raises up enough money to rent an old building in the village. After that, she bought supplies and necessary equipments and got ready to teach. However, she had one problem: she didn't have any students, and didn't know where to start.

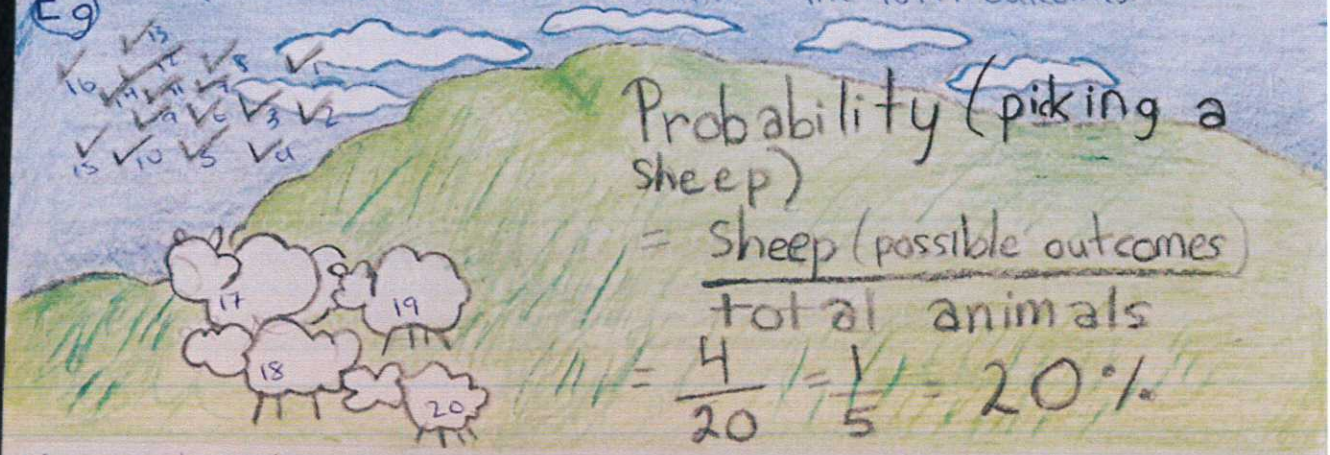
First, she needed to find students. She knew she could find students quite easily, as she knew several children well and knew that they would want to learn from her. So, with that problem solved, what should she start with? What maths topic would she want to teach first?



She realised that the most popular and prioritised fields would be the best to start with. And to find out what was the most popular maths field, what field a child was likely to have interest in, was through probability.

Evgeniya sat there, in her desk, planning out how she could work out the fields a child was most likely to have interest in. She thought more, and realised that the probability of an event happening was equal to the possible outcomes of the event ÷ the total outcomes.

Eg



Probability (picking a sheep)

$$= \frac{\text{Sheep (possible outcomes)}}{\text{total animals}}$$

$$= \frac{4}{20} = \frac{1}{5} = 20\%$$

Her mind kept on running. Now, she needed to calculate this probability, and to do that, she needed data.

The most prioritised subjects would be the most popular, and to find this information she needed to go to the nearest town and find these statistics. So, off she went to the nearest city, using all the remaining money she had on the transport fees.

The town's population of children was 1,000 she visited schools and homes, and asked students, children and teachers what the most popular maths topics were. And after enough research, she found that the most popular subjects were algebra, triginometry, calculus and complex analysis.

From the research, she found that 250 children were interested in algebra 100 were intereste'd in triginometry, 330 in calculus and 320 in complex analysis. Therefore, to find the probability:

Let A be algebra, T be triginometry, C be calculus and CA complex analysis

$P(A) = \frac{250}{1000} = \frac{25}{100} = \frac{1}{4} = 0.25 = 25\%$ chance

$P(T) = \frac{100}{1000} = 1/10 = 0.1 = 10\%$ chance

$P(C) = 330/1000 = 33/100 = 0.33 = 33\%$ chance

$P(CA) = 320/1000 = 32/100 = 0.32 = 32\%$ chance

So, now she had the probabilities of how likely a child was to like a subject. Next, she needed to get an overview of the probabilities in the entire area, so she conducted the same survey in her village.
The total number of children in her village was 700. Of those 700, ~~and~~ of these 175 liked algebra, 100 calculus, 213 trigonometry and 212 complex analysis. So, the probabilities of a child liking each:

$P(A) = \frac{175}{700} = 1/4 = 0.25 = 25\%$

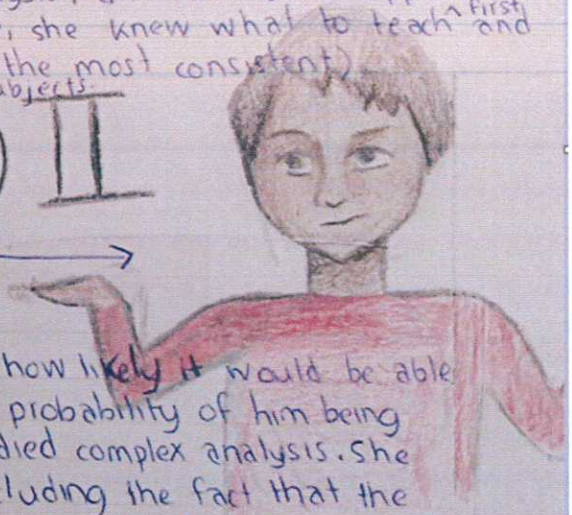
$P(C) = \frac{100}{700} = 1/7 = 0.142857\ldots \approx 14.3\%$ (1 d.p.)

$P(T) = \frac{213}{700} = 0.304286\ldots \approx 0.304$ (3 s.f.) $\approx 30.4\%$

$P(CA) = \frac{212}{700} = 0.302857\ldots \approx 0.303$ (3 s.f.) $\approx 30.3\%$

And from these results, she was able to conclude the probability of a child liking each subject. In her village, the subjects with the highest probability of a child liking it is complex analysis, and the same applies from the results in the nearest town. Therefore, she knew what to teach first and got started immediately (C.A was also the most consistent). After CA, she would teach all the other subjects.

Chapter II



After a while, however, she faced a problem:
One of her students, Aman, wanted to know how likely it would be able for him to study algebra in the town. The probability of him being able to study algebra ~~after~~ he had studied complex analysis. She used the data from the previous town, including the fact that the amount of children studying both was 80, to calculate the overall probability:
Let P(taking algebra after complex analysis) be P(A|B), the probability of taking complex analysis be P(B) and the probability of studying both be P(B&A).

$P(A|B) = P(A\&B) / P(B)$
$= (80/1000) / (320/1000)$
$= 80 / 320$
$= 1/4 = 25\%$

(so, Aman did not go)

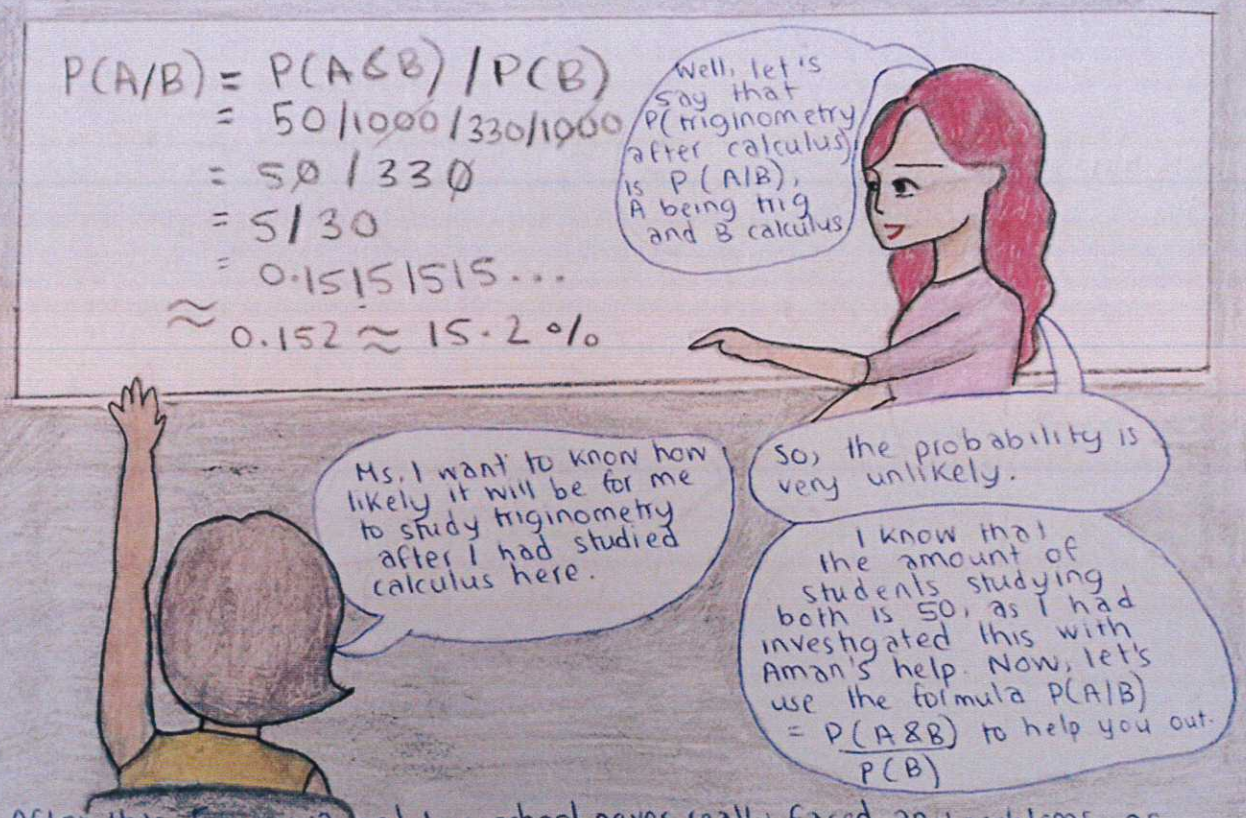
(Probabilities add up to 1. If an event has a probability of 1 then it's certain to happen. P(0.5) means in the middle. As 0.25 is less than 0.5 the event is unlikely)

since 0.25 is less than 0.50, the probability is very low. If the probability would have been above 0.50, then the event would have been more likely.

since this incident with Aman, both Aman and Evgeniya used the same formula to calculate the probabilities of students being able study in the town. That way, it was easy to decide whether or not to advise a student to study in the nearest town

for example:

$$P(A/B) = P(A \cap B) / P(B)$$
$$= 50/1000 / 330/1000$$
$$= 50/330$$
$$= 5/30$$
$$= 0.15151515\ldots$$
$$\approx 0.152 \approx 15.2\%$$



After this, Evgeniya and her school never really faced any problems, as she always had a mathematically effective way of fixing problems. Her maths school continued to thrive, and children in the area continued to expand their knowledge in maths. Whenever Evgeniya would be asked how she became so successful, she replied: "Maths. I solved most problems within my school using geometry (to fix furniture and building problems) like the time I used area to find out how much wood I needed repair my roof. I also used angles to work out where I should position my desk so that I can also see the yard. But most importantly, I used probability (my favourite field), to help out my students!"