THE 2023 YOUNG MATHEMATICAL STORY AUTHOR (YMSA) COMPETITION

THE STUART J. MURPHY AWARD

(THE 8-11 YEARS OLD CATEGORY)

LONGLISTED

'Wagyu Dreams' by Rayaan Jan (10 years old)

at The Hall School (UK)

You can read the author's inspiration for the story and the judges' comments on:

www.mathsthroughstories.org/ymsa2023

#YMSAMaths

The Young Mathematical Story Author (YMSA) Competition

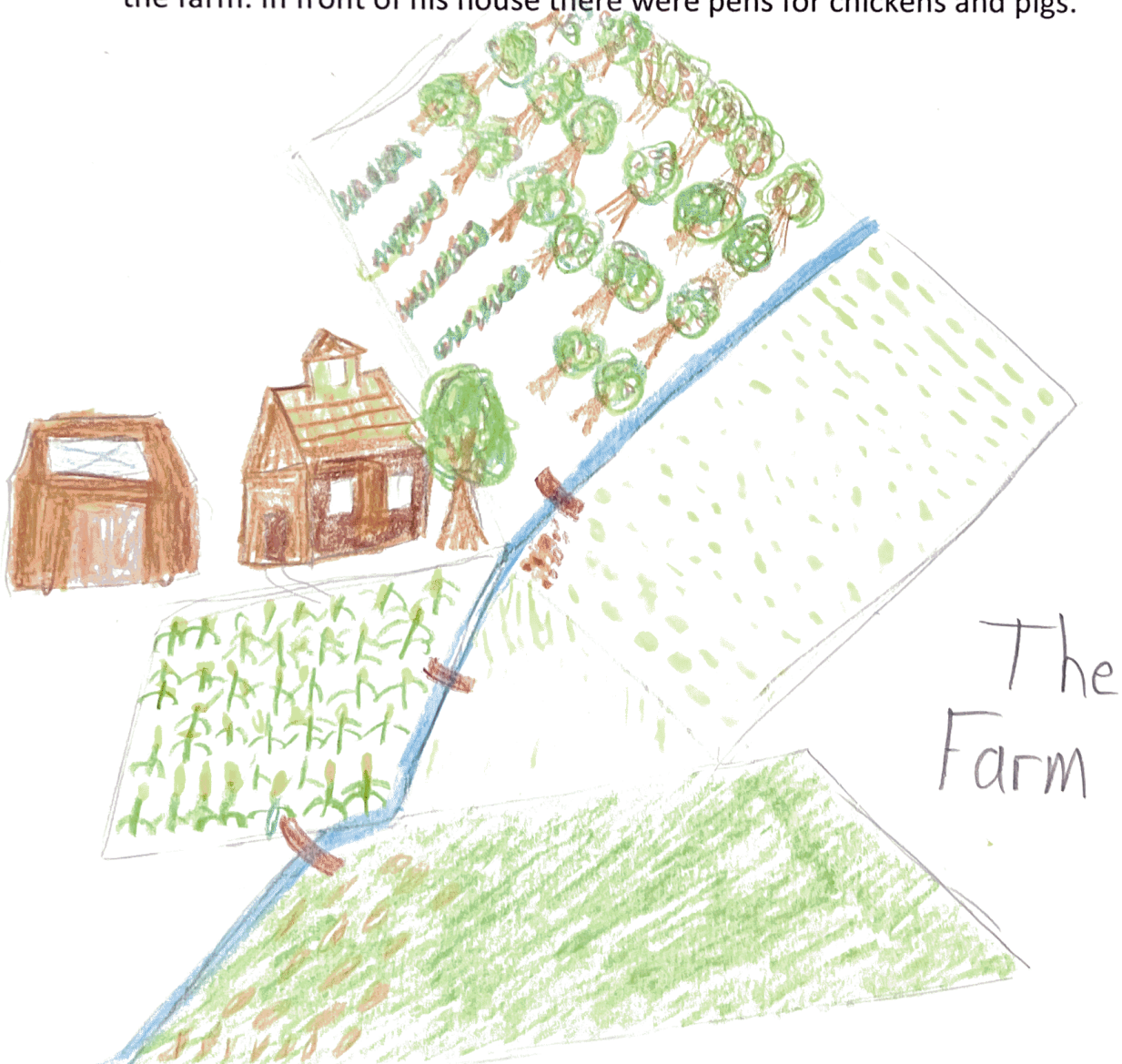
Wagyu Dreams

By Rayaan Jan
The Hall School

Chapter 1

Far far away over the soaring peaks of the Luna mountains covered with fresh, white, freezing snow, hid a beautiful valley called the Jamila valley. It was almost a perfect circle and standing in the middle of it felt like you were on the inside of a volcano looking up at the massive mountains all around you. Just like its name Jamila, the valley was beautiful with streams running through it and rich, fertile land which the local farmers took advantage of, growing lots of different crops. The mountains protected the land from extreme weather so it was a peaceful place to live and nothing bad ever happened. The only downside was that being surrounded by such huge mountains meant the valley was quite isolated and it was difficult to travel to nearby towns.

Right in the centre of the valley was Farmer Todd's farm. His family had farmed this land for generations and now he lived here with his wife and children. His farm had 5 fields. One of them was an orchard with apples and strawberries. His other fields were filled with corn, potatoes, asparagus, and carrots. A small wooden cabin was their home. It only had 2 same sized bedrooms, 1 kitchen, 1 lounge and 1 bathroom to share, which meant it was quite crammed inside. All around his cabin were the fields and the Orchard with a stream going through the farm. In front of his house there were pens for chickens and pigs.



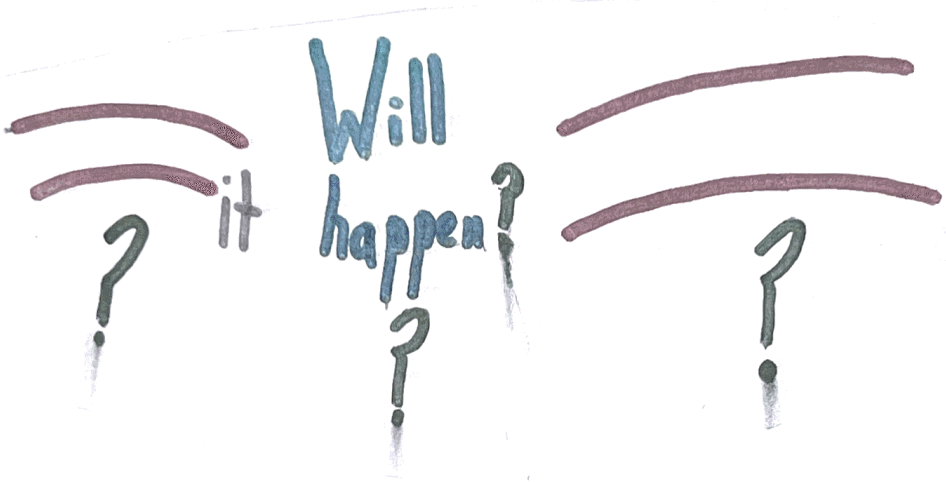
Squeezed into their tiny home were Todd and his wife Meriem, his two children Asher and Nadia and their dog Cookies and cat Halva. Sometimes it felt like you couldn't move an inch without walking into somebody and you definitely couldn't find a quiet spot to curl up with a book which is why you could usually find Asher in the loft above the barn with his head in a book with Cookies and Halva snuggled up next to him sleeping. Cookies was a Golden Retriever and Halva was a fluffy black Persian cat with blue eyes.

Chapter 2

Todd the farmer had a dilemma. For generations his farm had grown crops and he himself had made a living, supporting his family doing this for the last 20 years. However, his life-long dream was to rear Wagyu Cows. For as long as he could remember his favourite meal was a juicy wagyu steak, which he ate alongside his homegrown corn, potatoes and asparagus. His mouth was watering just thinking about it. The problem was that the closest butcher selling Wagyu was a 36-hour journey away. There wasn't even a restaurant nearby selling wagyu steaks as no one could travel regularly to buy it. None of the farms anywhere close to him had Wagyu cows. Todd thinks now is the time to make a big change and switch one of his fields from crops to a pasture for wagyu cows. He just isn't sure he can afford it and needs to work it out. Can he survive on fewer crops while the cows grow up and would he make enough money selling wagyu beef to his local butcher shops and restaurants.

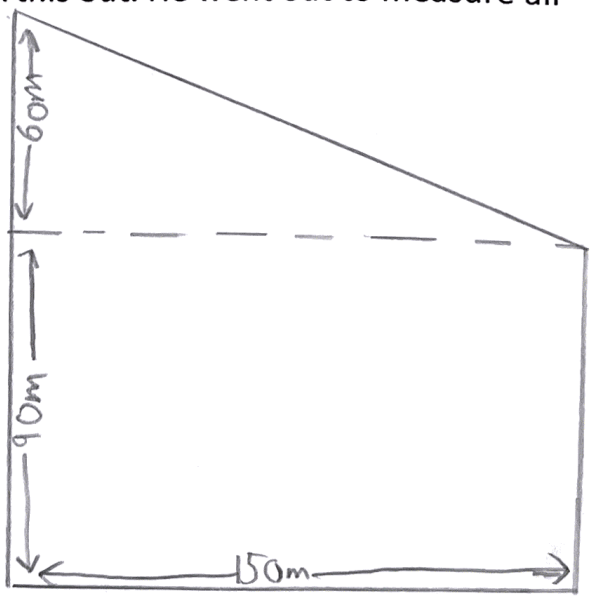
Chapter 3

Todd knew that solving this problem would be a challenge. He had to figure out which crop could be replaced with pasture to feed the Wagyu Cows without leading to a huge loss in income. To do this he needs to work out how much money he makes on each crop per metre squared and then work out if he were to swap one field for the cows would he make the same or more.
To do this Todd needs to work out the area of each field then divide his annual income for the crop in that field by the area, to find the yield per metre squared for each crop.
He can then estimate how much he could make in future from the Wagyu cows and see if this is a decent business decision. He would be happy breaking even as this has been his lifelong dream.



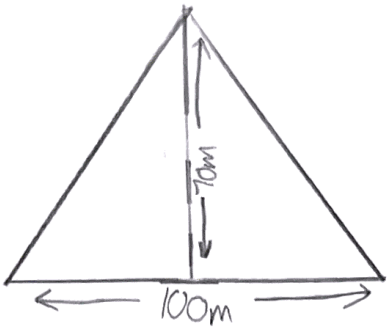
Chapter 4

First, Todd needs to work out the area of his fields. They are all different shapes so he needs to use his maths skills to work this out. He went out to measure all the fields and then worked them out.

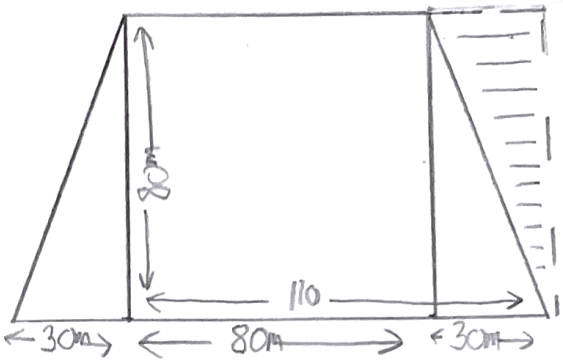


Orchard (apples and strawberries):
The orchard is a quadrilateral shape but Todd worked out that this was a rectangle and a triangle making it easier to calculate the area.
Area of the orchard = 150m x 90m + (150m x 60m) ÷ 2
= 13,500 + 9000 ÷ 2
= 18,000m²

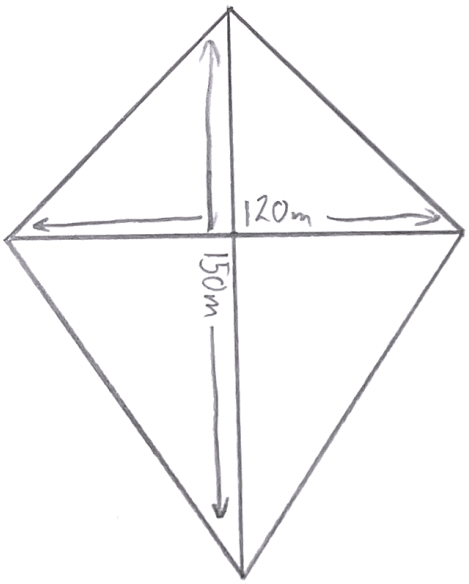
Asparagus field:
The asparagus are in a field shaped like a triangle.
Area of the asparagus field = (100m x 70m) ÷ 2
= 3500m²



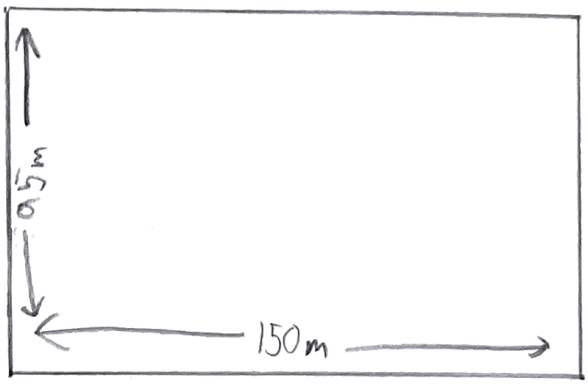
Carrot field:
The carrot field is shaped like a trapezium and Todd realised that if you split it into a square and 2 triangles, the 2 triangles were the same size exactly. In order to work out the area he flipped the triangle on one side to the other side which made the shape into a rectangle which was easy to work out the area for.
Area of the carrot field = 110m x 80m = 8,800m²



Corn field:
The corn field is shaped like a kite. Todd googled how to work out the area of a kite and realised it was the length times the width divided by 2.
Area of the corn field = (150m x 120m) ÷ 2
= 9,000m²



Potato field:
The potato is a perfect rectangle making it easy to work out the area.
Area of the potato field = 150m x 95m = 14,250m²



Chapter 5

Next Todd needs to work out how much money he makes for each metre squared for each crop. This is also called the yield. He has the annual income from selling the crops in the local markets and with the area he can work this out. The only tricky one is the orchard which is ¼ or 25% strawberries and ¾ or 75% apple trees.

Todd knows that the area of the orchard is 18,000m² and that 25% of the orchard is strawberries. To work out the area for the strawberries he must work out ¼ or 25% of 18,000. This is the same as multiplying 18,000 by 25% or ¼. That equals 4,500. Todd works this out for all the fields and percentages in the table.

Todd then needs to work out how much money each metre squared gives him each year. To do this he needs to divide the annual income by the total metres squared for each field. For example for the strawberries he takes the annual income of £13,000 divided by 4,500m² to get £2.89 for each metre squared.

Todd worked out all the yields in excel to make it easier.

Field	% field with that crop	Area of field m²	Area of crop m²	Annual income	Yield per m²
Orchard strawberries	25%	18,000	4,500	£ 13,000.00	£ 2.89
Orchard apples	75%	18,000	13,500	£ 12,000.00	£ 0.89
Asparagus	100%	3,500	3,500	£ 9,000.00	£ 2.57
Carrot	100%	8,800	8,800	£ 10,000.00	£ 1.14
Corn	100%	9,000	9,000	£ 13,000.00	£ 1.44
Potato	100%	14,250	14,250	£ 12,500.00	£ 0.88

Chapter 6

Todd would like to get 6 cows and he spoke to his friend who lives in another country and they told him that the cows would need enough space to walk around in their field and enough grass to eat but that Todd would also need to buy them some other food. Each cow needs about 1500m² of grass and space in the field.
The wagyu calves cost £20,000 when they are 6m old but he can sell the cows for £25,000-30,000 when they are 30 months old. That means he needs to let them grow and fatten up for 2 years (24 months), feeding them and letting them eat the grass in one of the fields.

He now needs to work out if he can afford it. He would be spending £120,000 on the calves and then they would need special food that costs £3,000 a year and the field with grass which means losing the income from one of his crops. But in 2 years he can sell the cows and would make £150,000 (6 x £25,000) or maybe even £180,000 (6 x £30,000).

Chapter 7

Todd looked at his fields and saw that the field of carrots was 8,800m² which would be just about enough space for 6 cows. If each cow needs about 1,500m² then 6 x 1,500 = 9,000m² and 8,800m² would be close enough.

The carrots only made him £1.14 per square metre but the field was on the other side of the asparagus, far away from the barn and farmhouse. The cows would need to sleep in the barn at night and if they walked through the asparagus to get there, they would destroy the delicate asparagus which had a very high income of £2.57 per square metre. He saw that the corn field which was 9,000m² was exactly the right size for 6 cows and was right next to the barn. The yield for corn was quite good at £1.44 per square metre but he needed to work out if he could afford to stop growing corn and have the cows instead.

The maths Todd needed to do was this:

Cows income – (cows costs + corn income for 2 years + cows food for 2 years)
Todd decided to work it out using the lower price of cows.
£150,000 – (£120,000 + £26,000 + £6,000)
= £150,000 - £152,000
= £2,000 profit

And if the cows sold for the higher price he could make more, up to £28,000.
£180,000 – £152,000 = £28,000

Todd jumped up from his cramped desk in the corner of the kitchen in the farmhouse and almost knocked it over in his excitement to go and tell his family that his plan was going to work!

Chapter 8

A few months later the corn field now filled with beautiful green grass was ready for the calves and so he set off on the long journey out of the valley to go and buy his Wagyu calves. He was driving a big truck he had borrowed from his friend farmer Bobby. A few days later he returned with his 6 calves and settled them into their field. When the first cows were sold to the butchers 2 years later Todd threw a dinner in the local steak restaurant and invited the whole village and everyone ate his favourite meal of Wagyu steak, potatoes, asparagus and corn, but this time it was Farmer Bobby's corn not his own. A very good deal.

The End

Farmer Todd had a dilemma. For years his family has farmed the fertile land in Jamila valley but his lifelong dream was to rear Wagyu cows to sell to local butchers and restaurants so that he could enjoy his favourite meal. Can he afford to make a change to what has worked for so long?

ABOUT THE AUTHOR

Hi, I am Rayaan and I am 10y old and I am in year 5 at The Hall school in London. I love maths, it is my favourite subject just barely in front of DT. I chose area because I thought it would be a fun topic to write about where I could use drawings to show what I was doing. I also came up with the idea of wagyu cows because my brother, Jacob always likes getting fancy steak when we go out for dinner. My mummy grew up in Dubai and can speak some Arabic which helped me come up with the names I used in my story, like Jamila, which means beautiful.