THE 2025 YOUNG MATHEMATICAL STORY AUTHORS (YMSA) COMPETITION

THE STUART J. MURPHY AWARD
(THE 8-11 YEARS OLD CATEGORY)

WINNER

‘Once Upon a Highest Common Factor’
by Samara Dhankar (11 years old)
at Oberoi International School (India)

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

www.mathsthroughstories.org/ymsa2025

#YMSAMaths

SAMARA DHANKAR OBEROI INTERNATIONAL SCHOOL JVLR

Introducing Marianne

"Her world was more alike and less different

For she saw the common factors everywhere present

Soon will come alive in this tale each character

When Marianne learns about the Highest Common Factor"

Have you ever dreamed of stepping inside your favourite books?

In the magical town of Booksville, this dream was lived by the people every day. Here, people didn't just read stories—they entered them! They could explore the deep woods alongside little Red Riding Hood, or venture inside other books.

But for young Marianne Sterling, a spirited young child, magic wasn't only in books—it was hidden in numbers. **She had a unique way of seeing the world, when others saw differences, she looked for common factors that connected things, numbers and even people.**

For instance, even though her mother was French and her father was African, she saw that both shared the greatest common factor – Love – and also of being loving parents.

One day, Marianne entered her math text book and came across the concept of **HCF- the highest factor that will divide two or more numbers with no remainder, which combined two of her favourite things: numbers and finding common factors.**

Marianne delved further into the book, and found herself in the word problems section. She saw a girl standing with some treats, looking puzzled. Marianne saw this as an opportunity to test her newfound knowledge of HCF, and asked the girl what the matter was.

Illustration 1- Marianne and her family

Paedyn

"A girl, a dilemma and a Rainbow"

"I'm Paedyn", said the girl from the math book.

"Tomorrow is my birthday celebration at school, for which I'm distributing 18 chocolates and 12 cake pops but I want to divide them equally among my friends without leftovers. What is the maximum number of friends with whom I can distribute my treats?" Paedyn asked.

Marianne exclaimed, "Using HCF, we can find the highest number that can evenly divide both chocolates and cake pops". Marianne started finding the HCF of 18 (chocolates) and 12 (cake pops) using the **'Factor Rainbow'** method. "What's a factor?" Paedyn asked. **"A factor is a number that divides another number exactly—with no remainder,"** Marianne replied.

Illustration 2 – Paedyn's Dilemma

She created a factor rainbow for 18, writing its factors 1 on the left and 18 on the right of an arc. Then Marianne wrote 2 and 9, followed by 3 and 6 (their products are equal to 18). She skipped 4 and 5, as they were not factors, and then stopped as she had listed all factors of 18. Then she created a factor rainbow for 12. Looking at both the factor rainbows, she identified that the common factors of 18 and 12 were 1, 2, 3, 6, and the highest of these common factors was 6.

This meant that Paedyn could distribute her treats equally among 6 friends, each receiving 3 chocolates and 2 cake pops. Marianne using her knowledge of HCF not only resolved Paedyn's dilemma but also helped in **fair distribution of treats amongst her friends without any wastage**.

Pleased with herself, Marianne shared her discovery with Paedyn and transported herself back home. *Little did she know that this newfound knowledge of HCF would be her beacon on the trail of thrilling adventures that were about to unfold.*

Illustration 3- Factor Rainbow used to find HCF

Alice

"Fair teams for a Fair game"

It was the morning of Marianne's birthday and the day dawned bright and warm. The rays of the sun kissed Marianne's face as she lay in bed, dejected because her trip to the Archipelago (a neighbouring island) had been cancelled due to her parents' *unexpected work commitments*.

Before clouds of despair could overshadow *a day so perfect*, Marianne had a sudden spark of hope. She remembered that in Booksville, **adventure was never far away**.

So she decided to start the day by entering her favourite books of fairy tales, eager to get lost in the enchanted world. However, she had to be careful of the fact that if she did not leave the book within an hour, she would be trapped in those pages forever.

Without further ado, Marianne entered the book, **Alice in Wonderland**.

She placed her magical blue bookmark inside the book and suddenly plunged into darkness. After falling for quiet sometime, she landed at the bottom, where she found a little door with a golden key. Unlocking it, she slipped through to see a crowd gathered around the King and Queen of Hearts, who were arguing over something.

"*Only girls* should participate in the Winter Croquet Games!" the Queen shouted. "No, I think *only boys* should play!" the King disagreed. Amidst this chaos, sitting puzzled in one corner was Alice who was assigned the duty of organising the croquet event". True to her curiosity, Marianne approached her and offered to help.

Alice told Marianne that there were **30 boys and 45 girls** and she was trying to divide all the boys and girls equally into groups for the Winter Croquet Event. Marianne suggested that using HCF they can find the largest number of groups that they could make, with same number of boys and girls in each group for a **fair and an inclusive** game.

"Find the factors, big and small.
Identify the common ones, match them all!
The highest one will lead us, and show us the way.
Hence In the end, HCF saves the day!"
exclaimed Marianne with joy.

She opened her red diary, and decided to **find HCF by Prime Factorisation** using the **Factor Tree** method this time. She started by breaking down 30 and 45 into its prime factors (factors that are prime i.e. a number that is only divisible by 1 and itself).

She found the prime factorisation of 30, and 45, and identified their common prime factors as 3 and 5. To find the HCF, she multiplied these factors to get 15. Thus they would be able to divide the children into 15 equal groups, with 2 boys and 3 girls in each group**.** Alice went over to the Queen, who was pleased with the fair solution, and immediately arranged for a grand tea party with the whole of Wonderland.

Illustration 4- Marianne helping Alice make fair teams using HCF

Marianne realised that with HCF, she not only helped Alice **build fair and balanced teams** but also ensured an **inclusive match where both boy and girls got an opportunity to play together**. Marianne, now eager to return home, exchanged goodbye, put the bookmark back into the book and was immediately whisked out of this tale by Lewis Carroll.

Belle

"A child, a teacher and a purple scroll of paper"

Upon returning home, Marianne was filled with joys of spring. Eager to explore more, she settled on **'Beauty and the Beast'** as the next book to enter. As she placed the bookmark inside, Marianne swirled and swirled and finally landed inside the enormous castle of the 'Beast'. She was immediately greeted by Mrs. Potts (the teapot) and Chip (the teacup).

Marianne spotted Belle with a scroll of paper. "She's trying to create worksheets to help children learn how to read and write," Mrs. Potts informed. Belle wished to **empower the children** of her tiny village by teaching them how to read and write.

She had bought a purple scroll of paper with a length of 150 cm, and a width of 90 cm and now wanted to cut the scroll into equal squares for the worksheets, making sure that no paper was wasted.

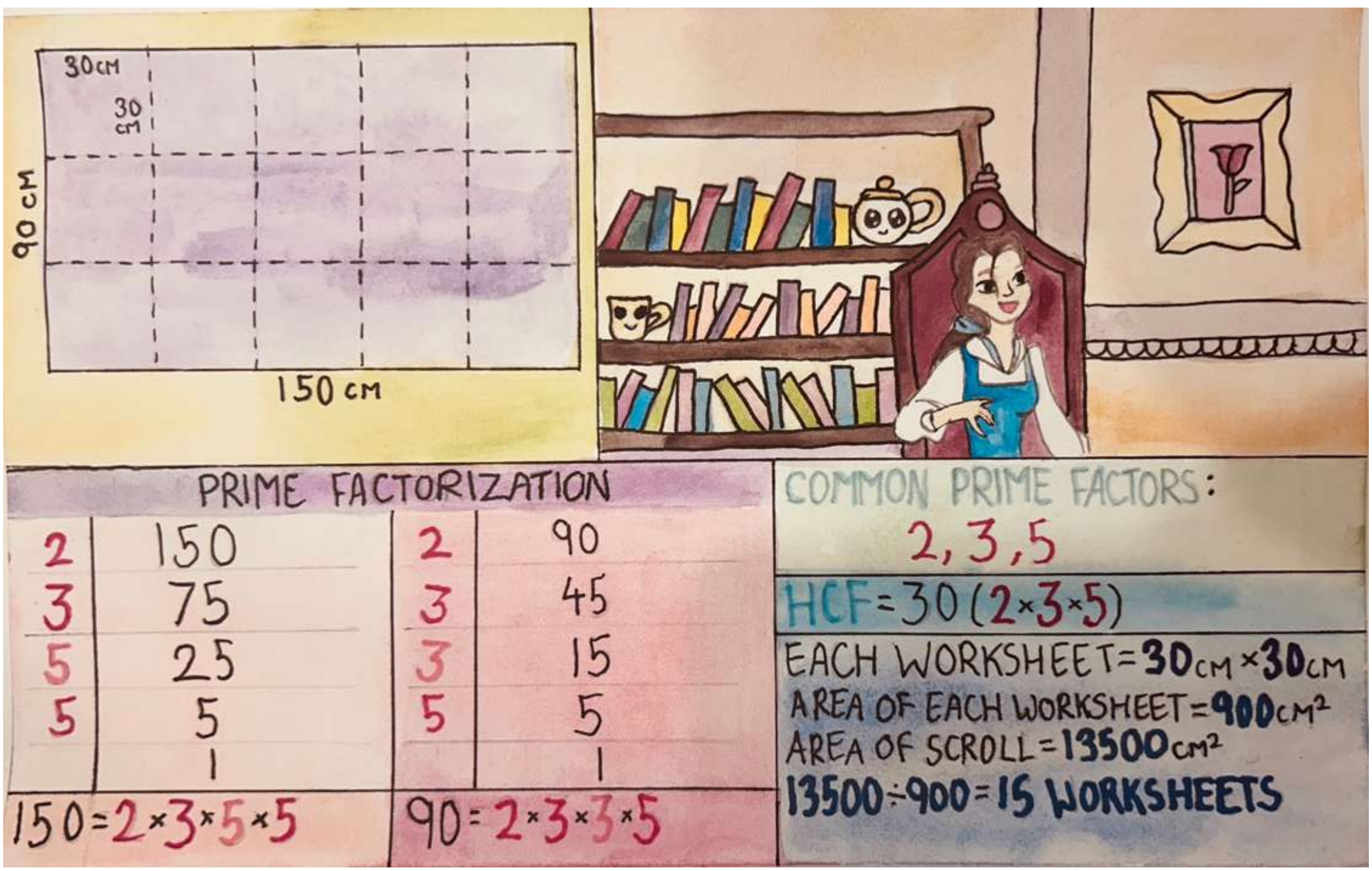

Illustration 5 - HCF helps Belle cut 15 sheets

Marianne used HCF to find the largest possible square size that can be cut. Listing factors method would take too much time to find HCF of 150 and 90 since the numbers were large. So she used the '**Prime Factorization'** method, where you keep on dividing the number by prime factors until you get the remainder equal to 1. Then, you do the same steps for the other number, and multiply the common factors to get the HCF. Marianne did the prime factorisation for 90 and 150, and identified that the common prime factors were 2, 3, 5. She multiplied the common prime factors to get the HCF, which was 30. Thus the length and width of each square had to be 30 cm.

Area of each such square =30 cm x 30 cm = 900 square centimetres. Total area of scroll= 90cm x 150 cm= 13500 square centimetres. So the total no. of squares that could be cut from the scroll = Area of Scroll/Area of each square, which equalled to 15.

Belle expressed her gratitude to Marianne and made 15 square worksheets of 30 cm x 30 cm from the scroll**. In the end HCF did save the day.**

HCF ensured efficient utilisation of resources with zero wastage, benefitting as many children as possible and also gave a child an opportunity to learn.

The End - Happily Ever After!

After an adventure filled day, Marianne decided to transport herself back home in time. She learned that in every problem she faced, the solution was in the power of sharing and discovering the greatest common factors. **Whether it was fair distribution of treats, or responsible consumption with no wastage or whether it was making fair inclusive teams, the HCF reminded her that it is important to focus on what we share in common rather than on our differences.** Just like in all the fairy tales there is always one thing common - **all have "the happily ever after!"**

As she entered her room, bright lights turned on. "Surprise!" shouted her parents. "We know how disappointed you were when we cancelled our trip to the Archipelago, so we decided to postpone our work trip, and we bought tickets for the Archipelago!'' Said Gabrielle, Marianne's mother. Marianne shifted her gaze to her bed, and spotted 3 tickets, along with her suitcase. She ran and hugged her parents, and before long, she was at the Archipelago. However, she kept thinking, "**The HCF reminds us that true peace and unity comes from distributing and sharing equally and focusing on what truly unites us all. The "*happily ever after*" moment for our real world shall come when everyone gets their fair and equal share**."

Indeed this was her most thoughtful birthday celebration ever!

Story Blurb

Marianne lives in the magical town of Booksville, where people can enter books. When her birthday trip to the Archipelago is cancelled, she decides to enter her fairy tales from her childhood, where each story presents dilemmas that test her knowledge of HCF (Highest Common Factor). Will Marianne be able to solve these challenges to appear as the hero of her own fairy-tale? The pages of the fairy tales are turning, and the adventure lies ahead!

About The Author

I'm Samara Dhankar, and I'm 11 years old and currently studying in Oberoi International School, the JVLR campus located in Mumbai, India. This is my third year participating in YMSA, and I look forward to writing more math stories later on too, as it combines two of my favourite things: mathematics, and writing stories. I am an Indian classical and Western vocalist, and also love playing the violin. I love experimenting, which is why I have used water-colours, alcohol markers and colour pencils for my illustrations.

This year, I wanted to add a touch of fantasy to my story. So I created a magical town of Booksville where the books come alive, allowing people to enter books. In this fantasy setting, I wanted to celebrate a cherished part of our childhood: the timeless charm of fairy tales. To bring diversity, each chapter of my story is inspired by the protagonist of fairy tales of different origins. I used HCF to portray how we should find the highest common factors between us, instead of focusing on finding differences, and share things equally. After all, "Just like in fairy tales, the happily ever after comes when everyone gets their fair and equitable share"