



THE 2022 YOUNG MATHEMATICAL STORY AUTHOR (YMSA) COMPETITION

THE CINDY NEUSCHWANDER AWARD
(THE 12-15 YEARS OLD CATEGORY)

SHORTLISTED

‘Escher’s Pegasi Tessellation’ by Jonathan Yuan (12 years old)
at Dulwich College Beijing (China)

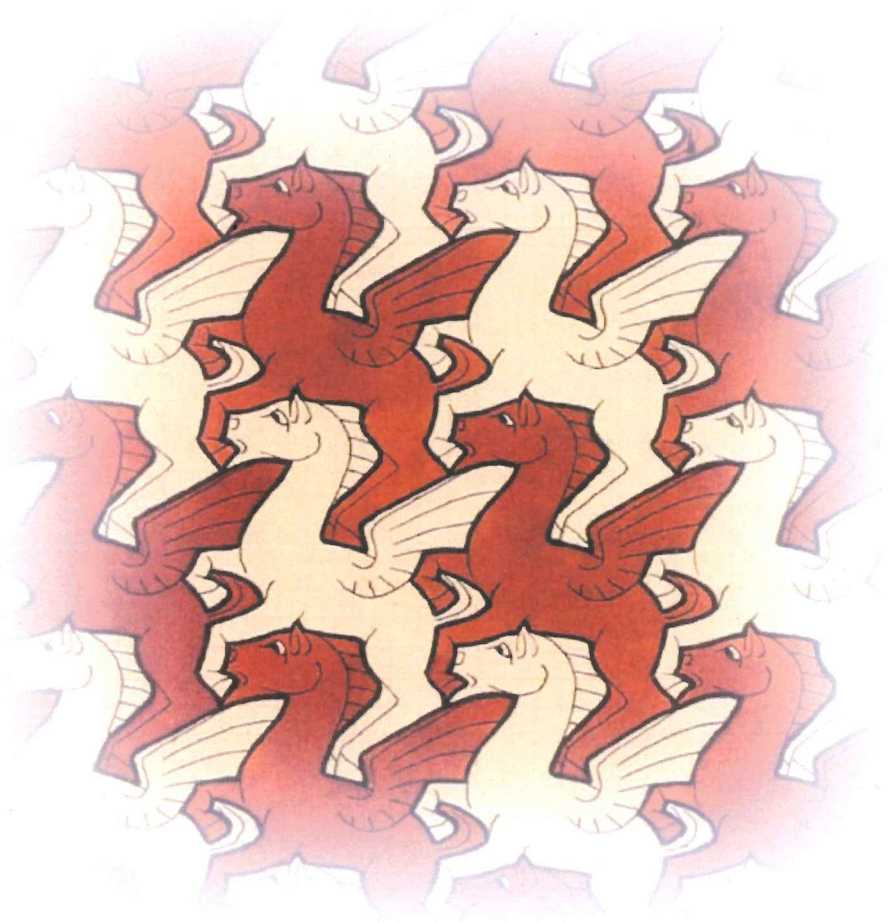
You can read the author’s inspiration for the story and the judges’ comments
on:

www.mathsthroughstories.org/ymsa2022

#YMSAMaths

Escher's Pegasi Tessellation

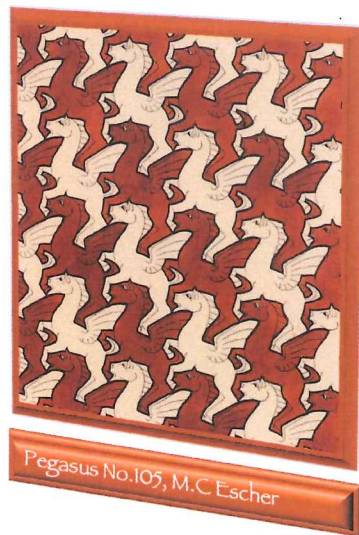
Jonathan Yuan



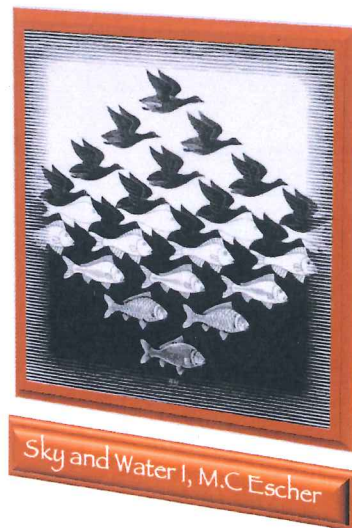
Max is and his family is visiting a Local museum. It is currently hosting an exhibition on Escher, a Dutch graphic artist who makes mathematically inspired art. Upon entering, he sees many different tessellations and woodcut lined against the walls. There are fish, swans, and bees, of different colour, fitting together perfectly!



"Max!" calls his father "come take a look at this. Max turns and hurries to where his father is standing next to a picture of white winged horses on a red background.



Pegasus No.105, M.C Escher



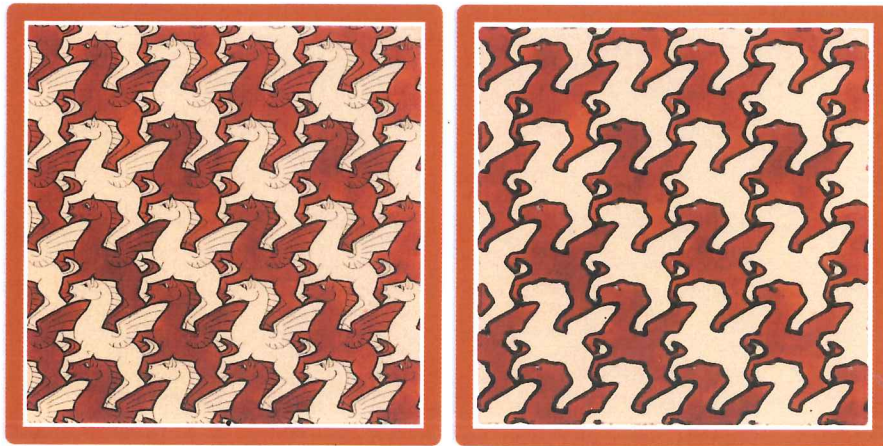
Sky and Water I, M.C Escher

"Look, Max, what a wonderful picture," says his father, "I like how the red Pegasi seems to be rearing on its hind legs"

"Don't you mean *white* Pegasi?" asks Max, confused.

"Well, it depends how you look at it" replies his father, "it's either red Pegasi on a white background or white Pegasi on a red background."

"Fascinating," breaths Max.



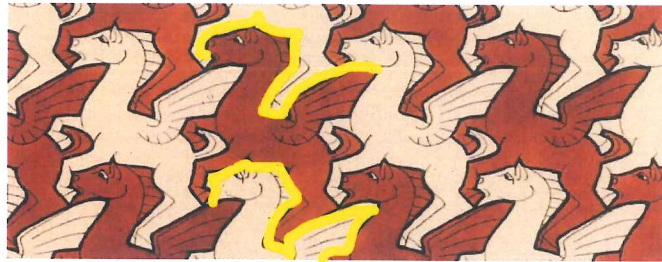
When Max gets home, he wonders how such a pattern could be drawn. After thinking for a long time with no solution, He goes to the kitchen to find his father.

"Easy," says his father, Let me show you.

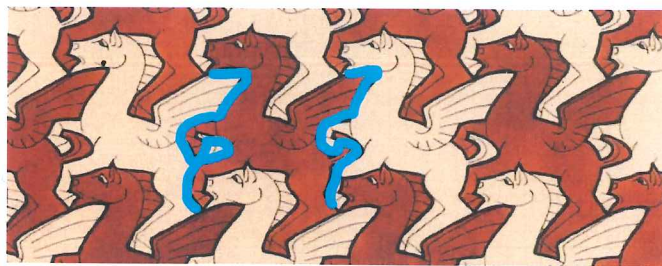
"First of all, we need a piece of paper," says his father, and Max runs off to his room to get supplies. "Now," says his father, "let's begin."



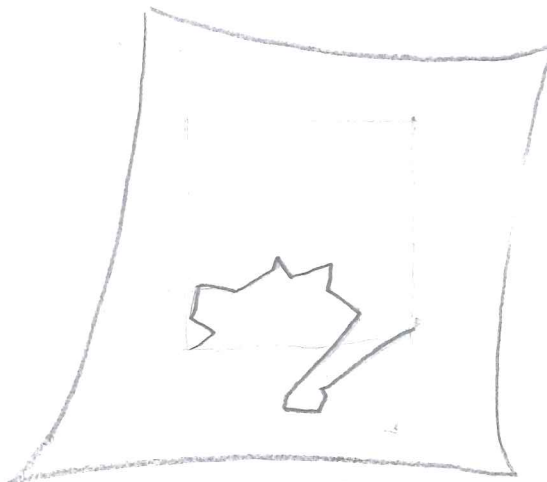
"As you can see," says his father, "this top part (highlighted in yellow) is the same as this bottom part here (Also highlighted in yellow), because the top of the horse connects with the bottom part of another horse."

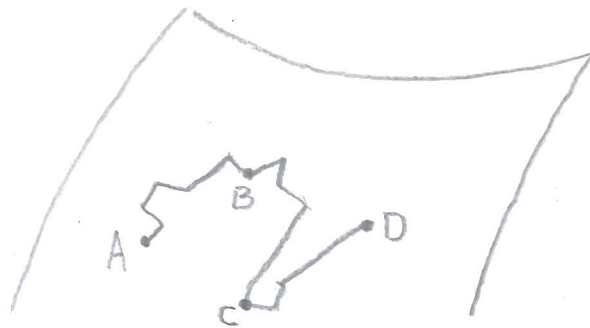


"The lines on the sides are the same too!" exclaims Max, "but how on earth can we draw two of these curvy lines to be the exact same shape and level with each other?"



"Aha!" says his father, "this is where the maths comes in. A translation is a transformation that occurs when a figure is moved from one location to another location without changing its size, shape, or orientation. In the coordinate plane we can draw the translation if we know the direction and how far the figure should be moved, in this case the length of the square. To draw two of these lines, we can first draw a rough square (each side 3cm), and one of the lines on the bottom."





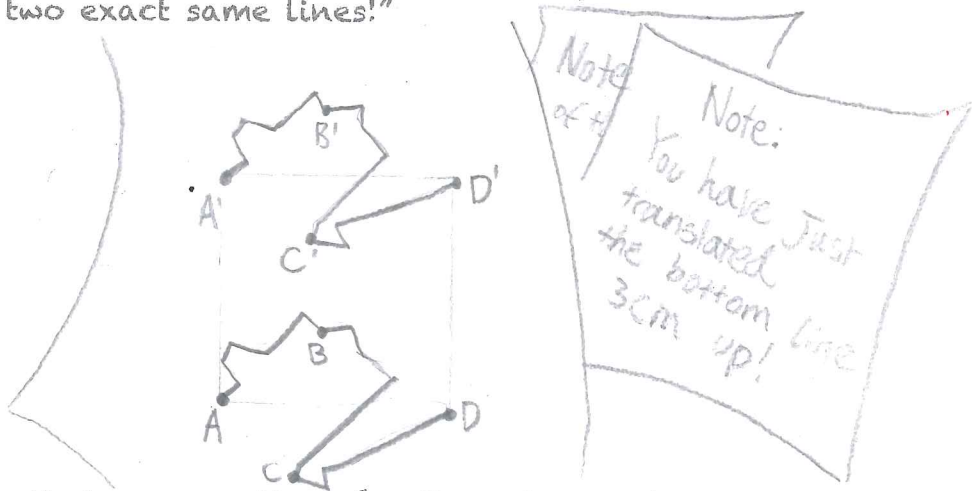
"Then, you label the four major points of the line as A, B, C, and D (or any other 4 letters)"

"With that done, we can mark the points directly above points A, B, C, and D. Mark the new points A', B', C', and D', respectively."

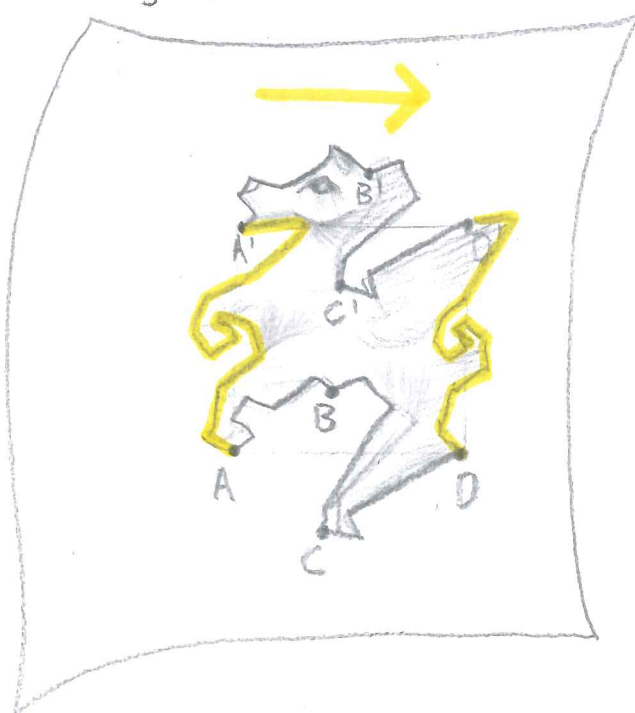
Note:
each of these points are 3cm higher than the ones below



"Using the bottom line as guidance, join up A', B', C', and D'. Now you have two exact same lines!"



"I can use that same method for the side lines!" exclaims Max, "Now I can draw a Pegasus!"



"Good," says his father, "now try to finish the rest of the picture."

And that was just what he did.

The End

Seen a tessellation before? In this book you can learn how to draw one using mathematics! (Which won't make it boring) Find out more in this interesting book.

