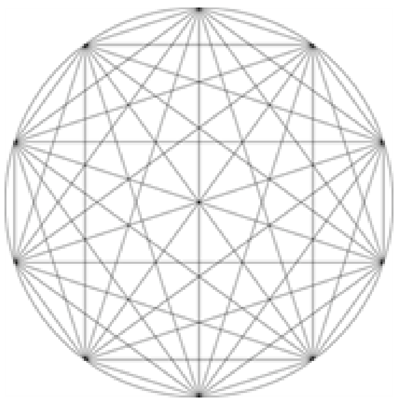
Weekly problems

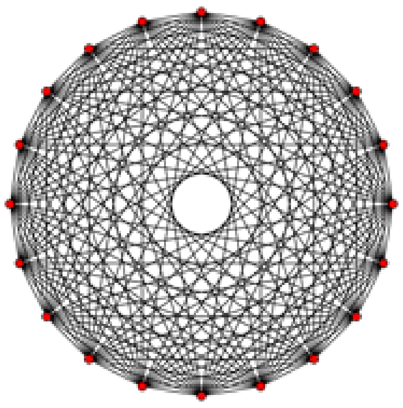
Problem #1

Mystic Rose

A mystic rose is a beautiful image created by joining together points that are equally spaced around a circle.



10 Point Mystic Rose

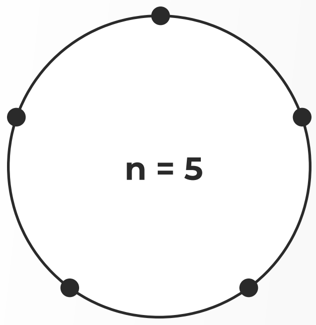


20 Point Mystic Rose

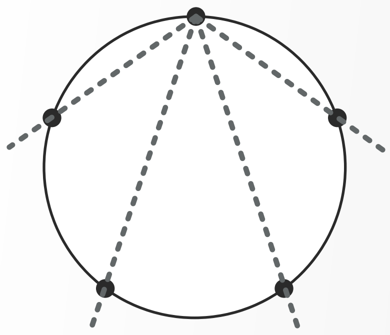
A line joins each point to the other points.

Start by **drawing some simple mystic roses** e.g. 5 points

- Draw a circle using a compass or draw round a circular object.
- There is 360° in a circle.
  We must space the 5 points evenly apart.
  360° ÷ 5 = 72°.
  Using a protractor mark every 72°



- Then draw a line from the point to another



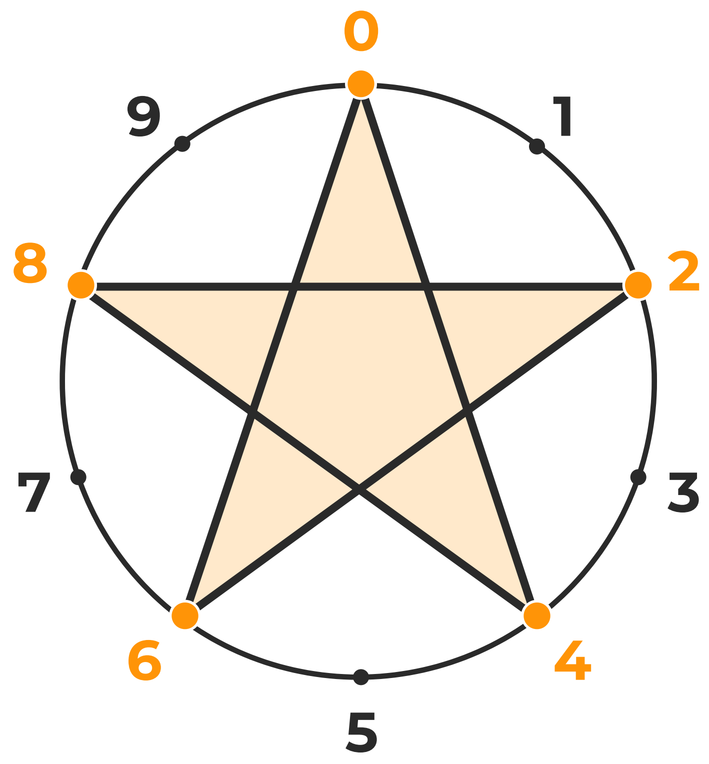
- Continue to join all of the points to other points with a line
- How many lines have you drawn? Try drawing some more mystic roses with different number of points
- Is there a connection between the number of points and the number of lines?

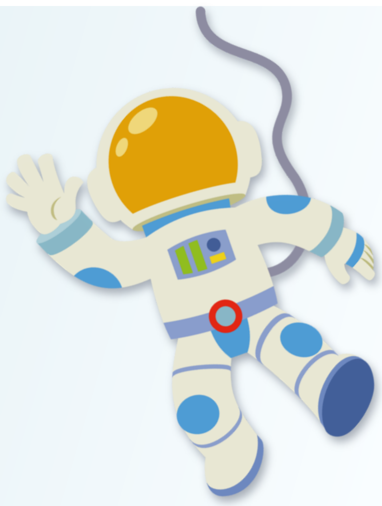
Problem #2

Other Mystic Rose Patterns

This pattern is made from **4x table**.
Write out the 4x table and only join the ones digit (in orange).

0 x 4 = 0	5 x 4 = 20
1 x 4 = 4	6 x 4 = 24
2 x 4 = 8	7 x 4 = 28
3 x 4 = 12	8 x 4 = 32
4 x 4 = 16	9 x 4 = 36

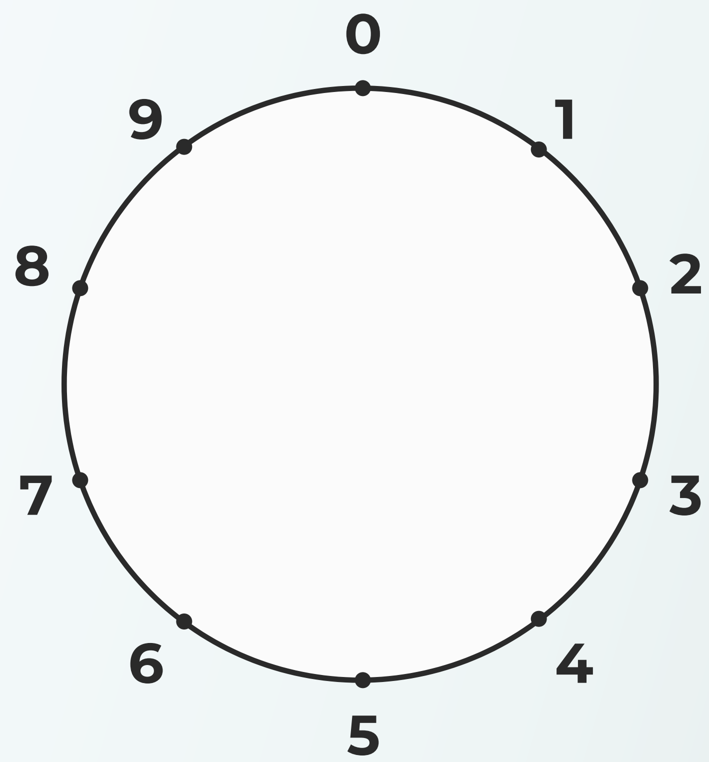




Try this with times tables from 1 to 12. Using the template or draw your own.

What do you notice?

Are there any times tables with the same pattern?



Problem #3

Draw a regular square, pentagon, hexagon, octagon...

How did you do it?
How do you know it's regular?

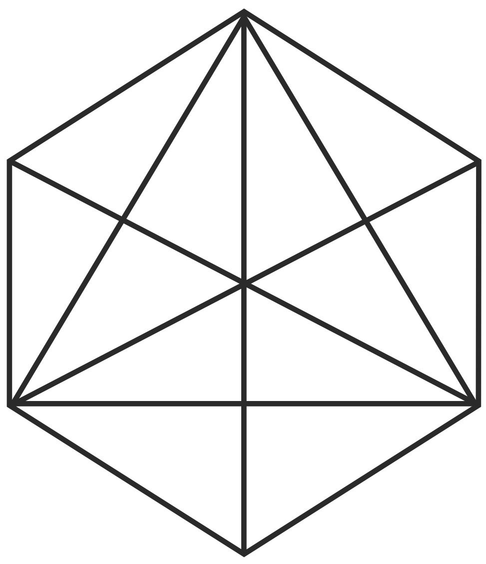
Problem #4

How many **squares**?

How many different **sets of 4 dots** can be joined to form a square?

Problem #5

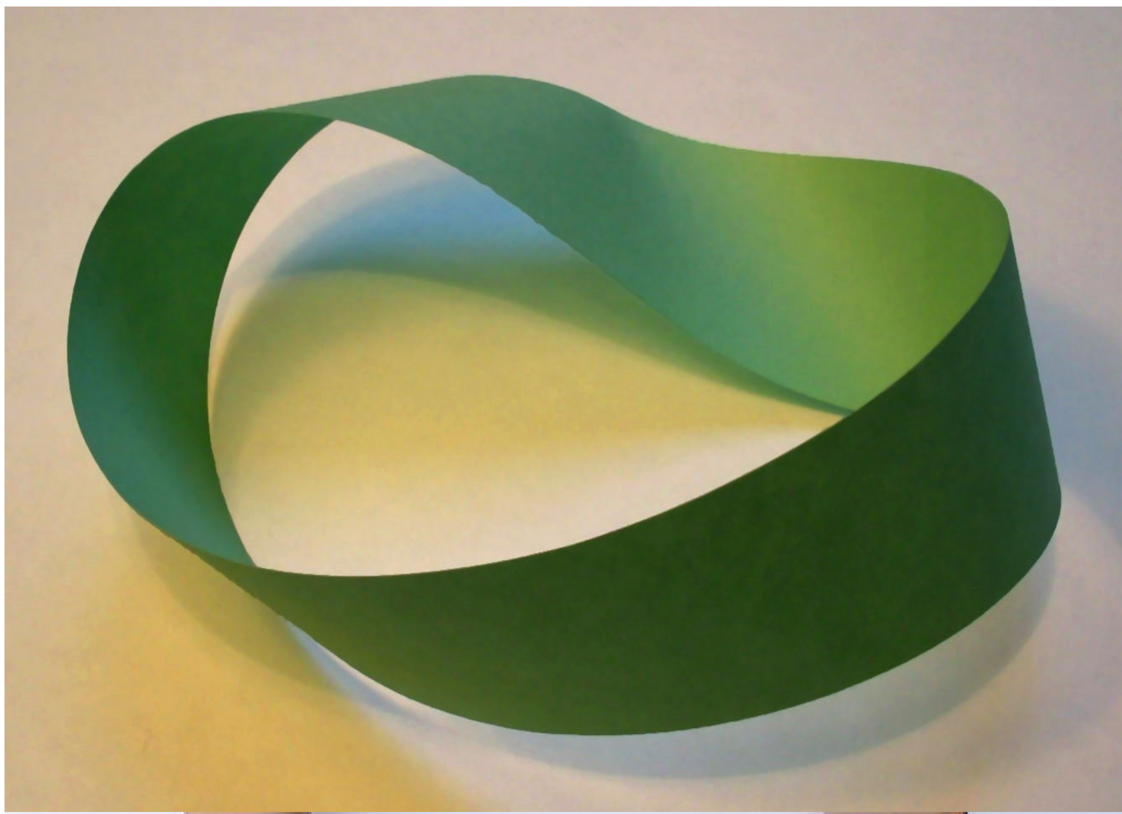
How many **triangles** in this hexagon can you see?



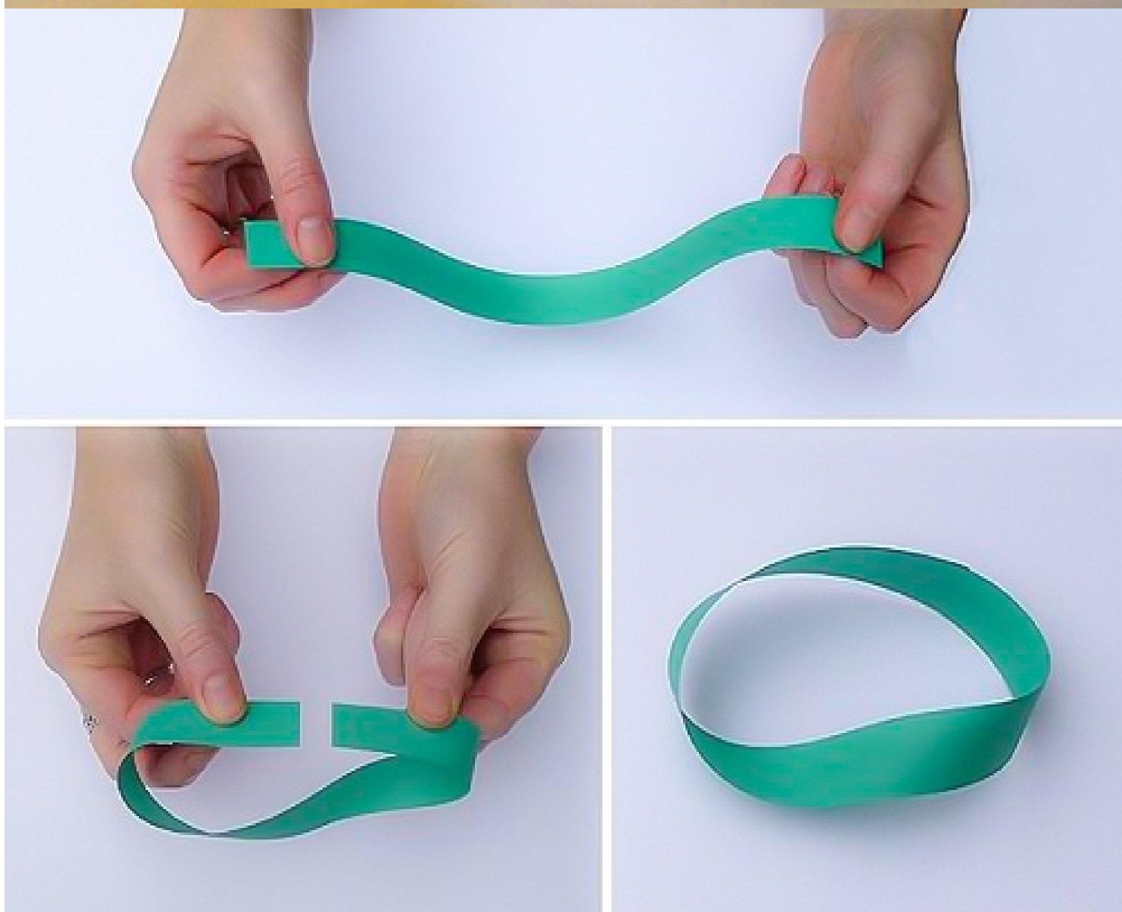
Problem #6

Is it possible to have a piece of paper **with only one side**?

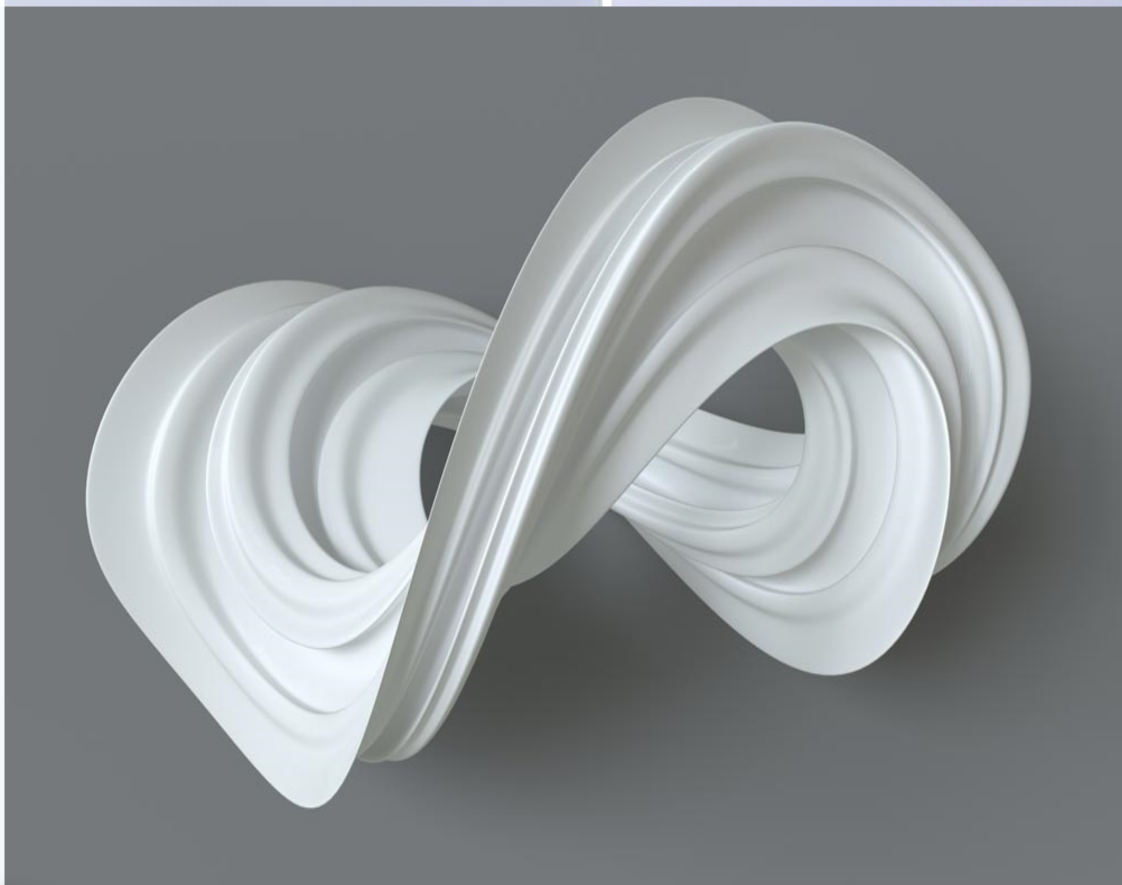
Möbuis discovered the one sided strip in 1858, while working on the geometric theory of polyhedra.



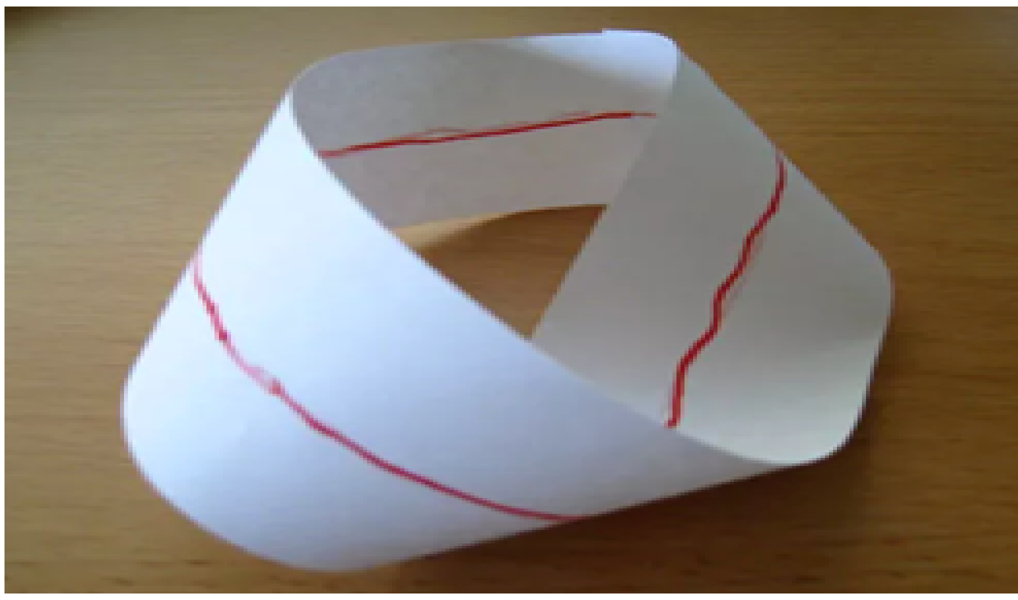
A **Möbuis strip** can be created by taking a strip of paper, giving it an odd number of half twists, then taping or glueing the ends back together to form a loop.



Put a **mark** on the strip.
This is the start point.
How many times do you go round the strip before you get back to the start point?



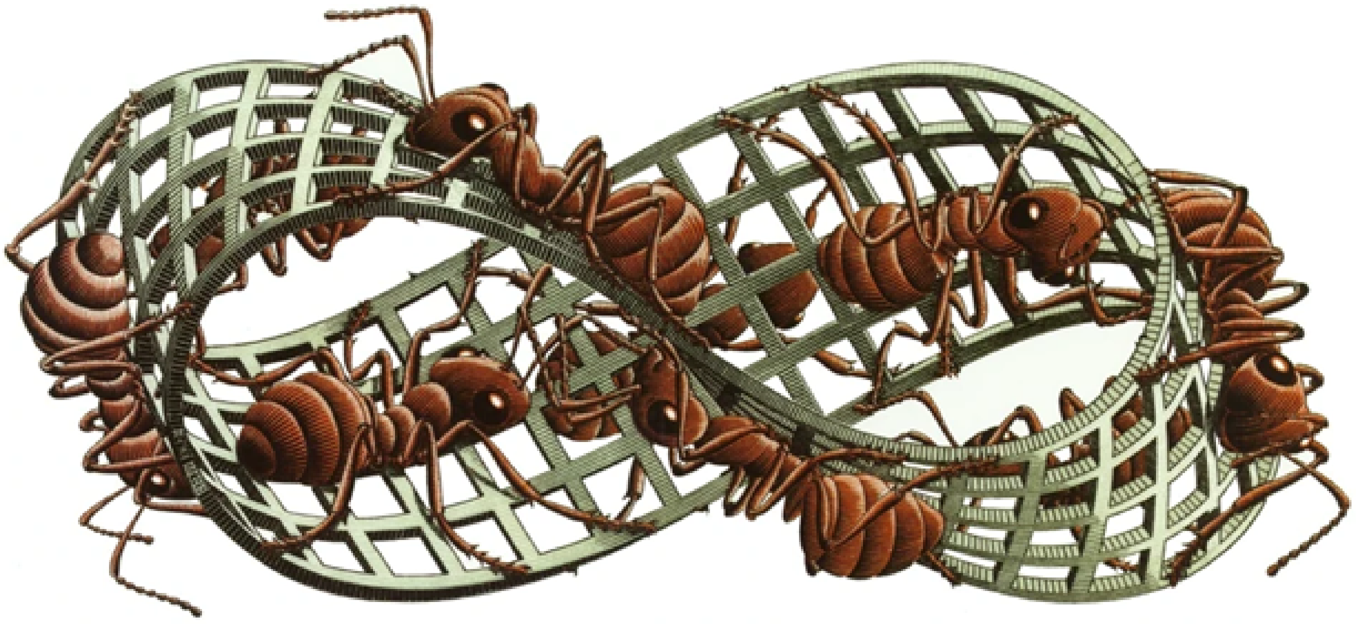
Take a pencil and draw a line along the centre of the strip.
Cut along the line.
What do you think will happen?
What happens?



This time, instead of drawing a line down the middle, make your starting point one third of the way from the edge of the Möbius strip.
Continue the line until you reach the starting point.
You will see two parallel lines on the surface.
Cut the strip.

What do you think will happen this time?

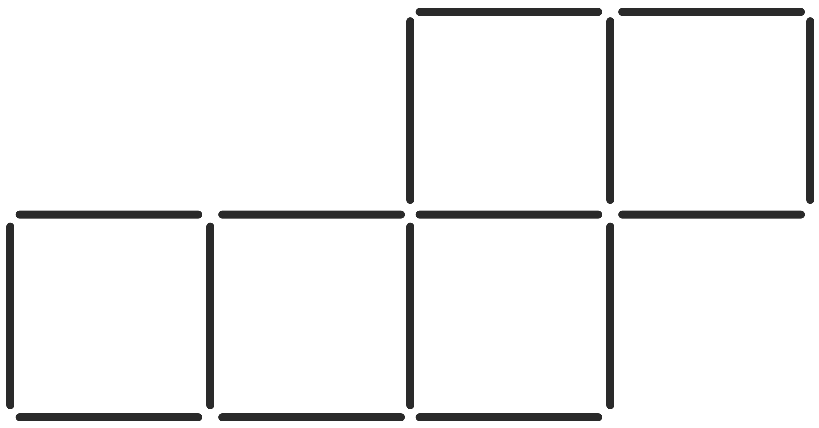
This print is a woodcut from 1963 by M.C.Escher. A line of red ants march stolidly along a Möbius strip. Because the strip they are on is non-orientable, their little universe has only one endless side. The insects are literally travelling forever.



Problem #7

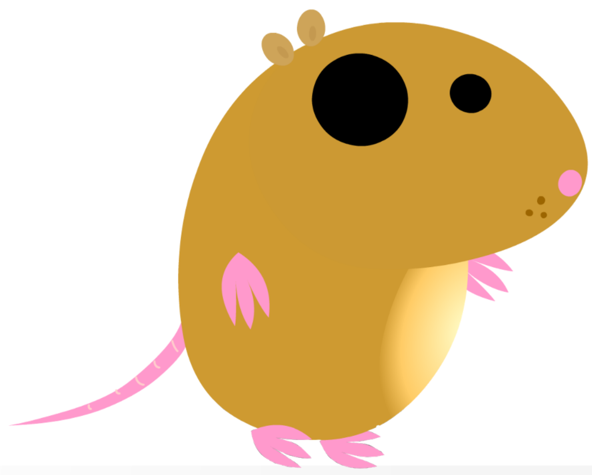
A Sticky Problem

Arrange **16 sticks** in the pattern below.

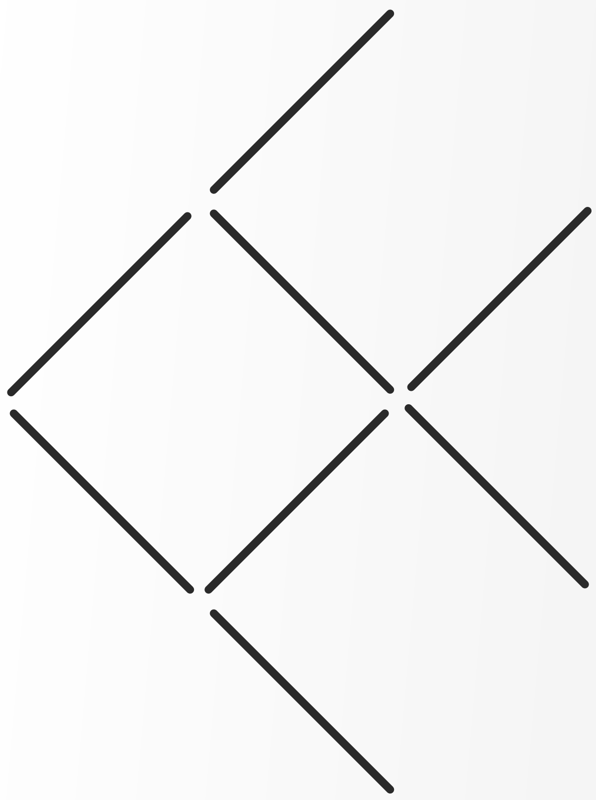


Move **only 2 sticks** so that there are 4 squares instead of 5.

You can not remove any sticks and you can not leave any open squares.



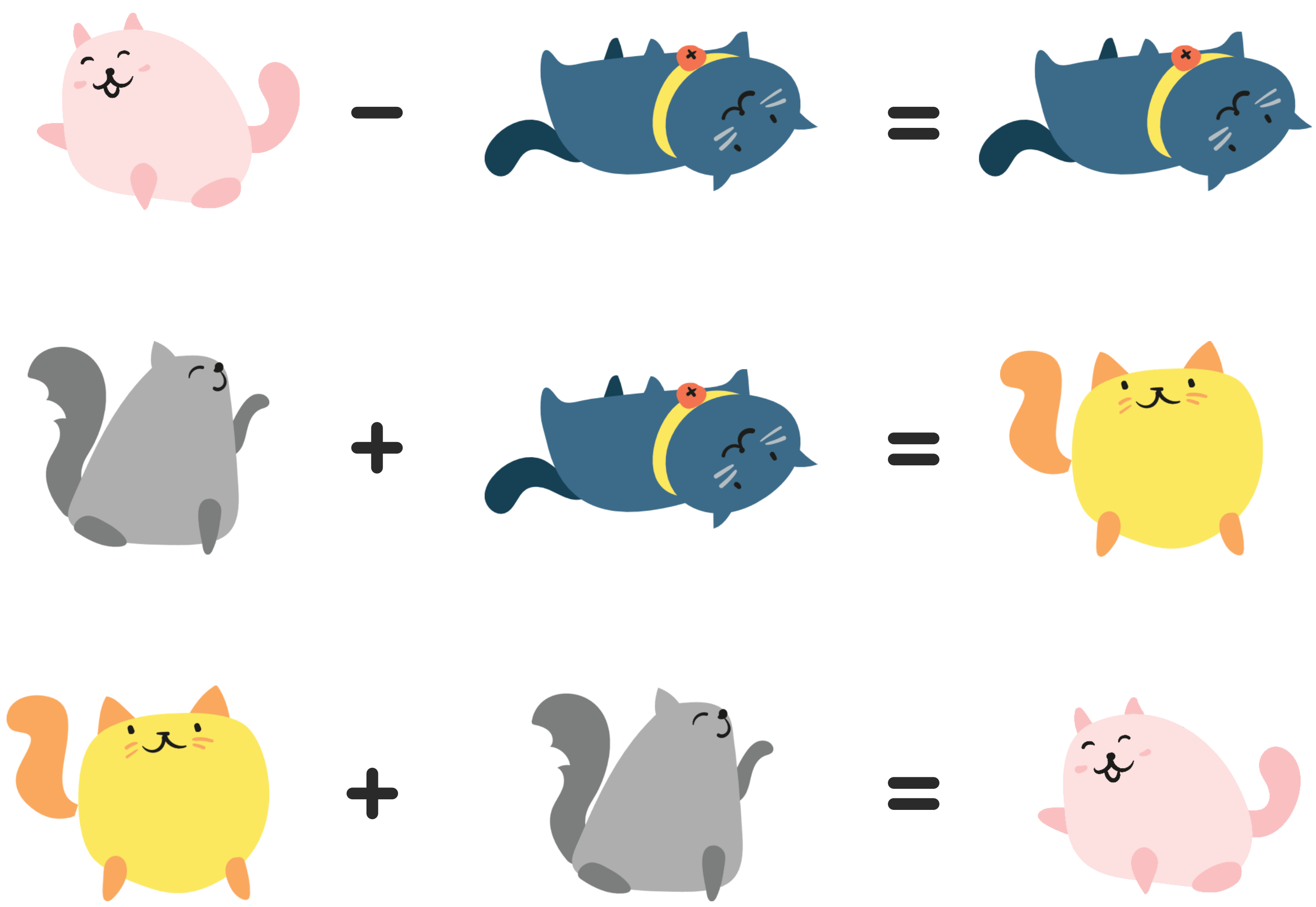
Have a go at this fishy problem.
Move 3 sticks to make the fish swim in the opposite direction.

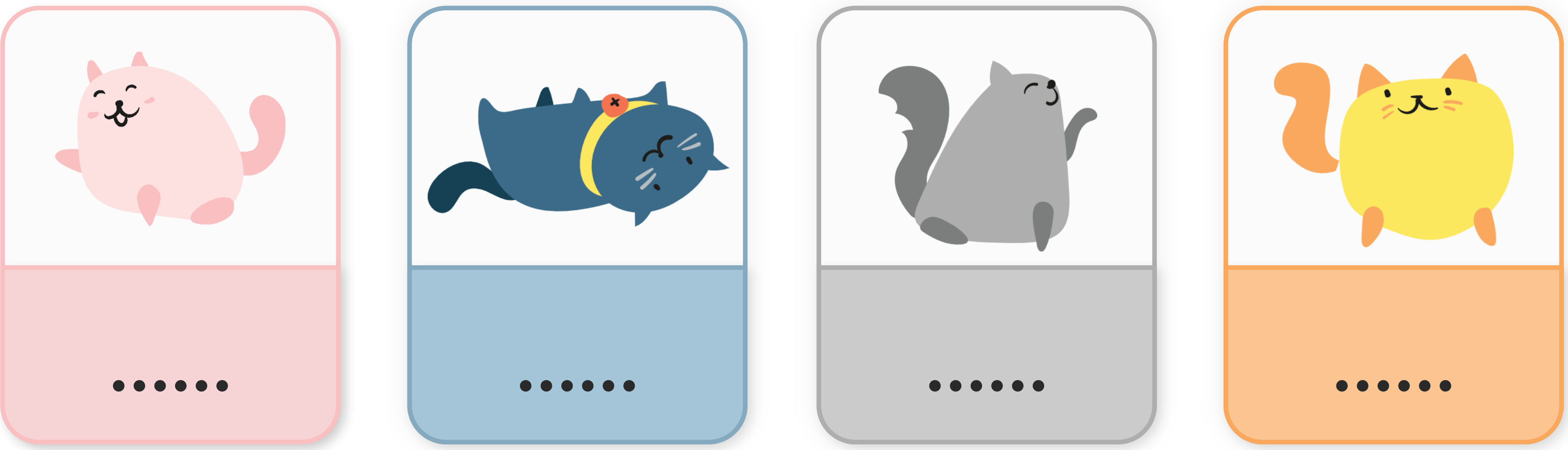


Problem #8

Cats!

Each cat stands for a different number. Each number is not more than 5. Write the number each cat stands for.

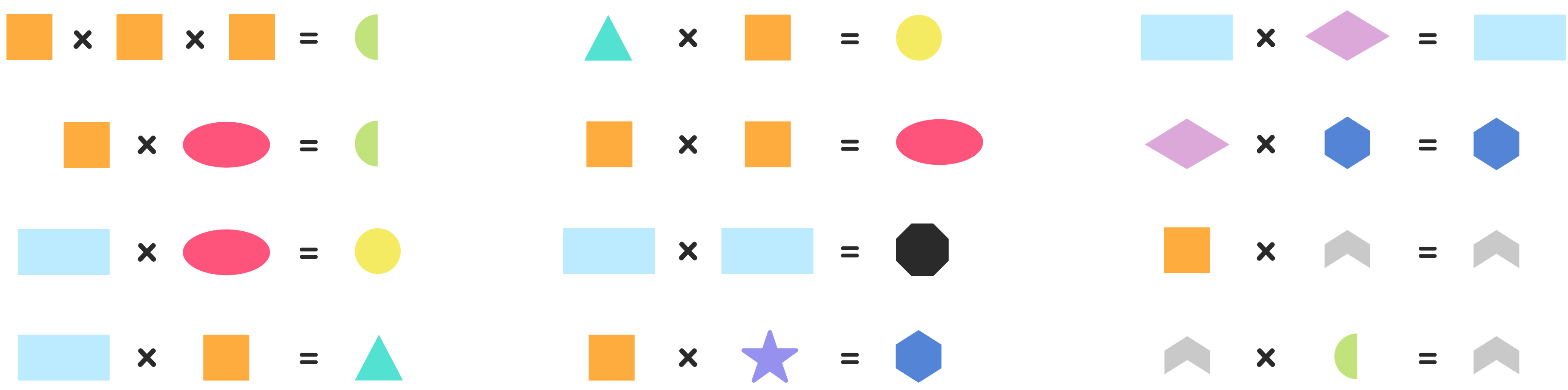


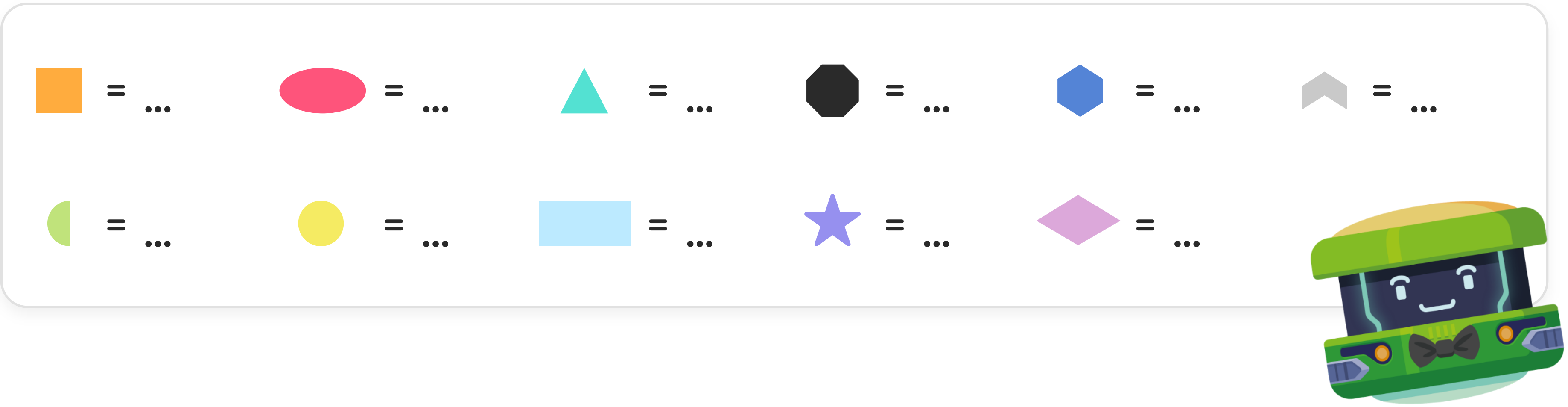


Shape Times Shape (Adapted From Nrich)

Have a go at this one.
The coloured shapes stand for eleven of the numbers from 0 to 12. Each shape is a different number.

Can you work out what they are from the multiplications below?



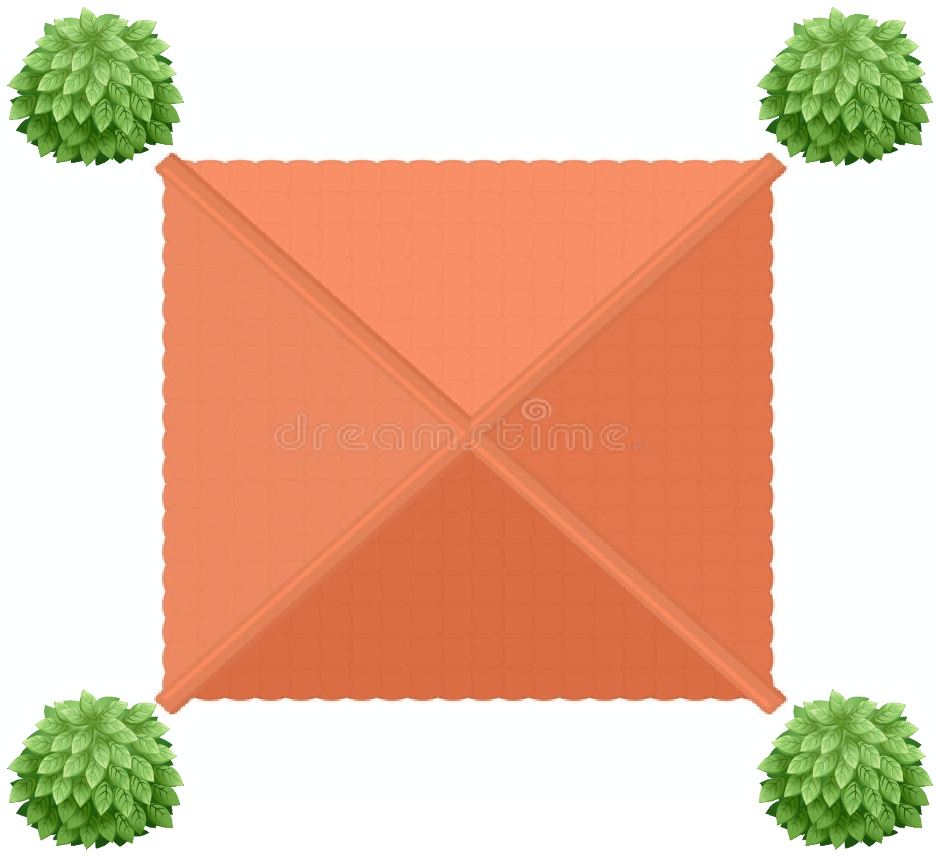


Problem #9

Square House

The owners of the square house want to double the size of their home whilst maintaining the square shape.
There are 4 trees on the corners of the house and the owners can't move them.
They don't want to build another floor above or below in the basement.

How can they do it? Is it possible?



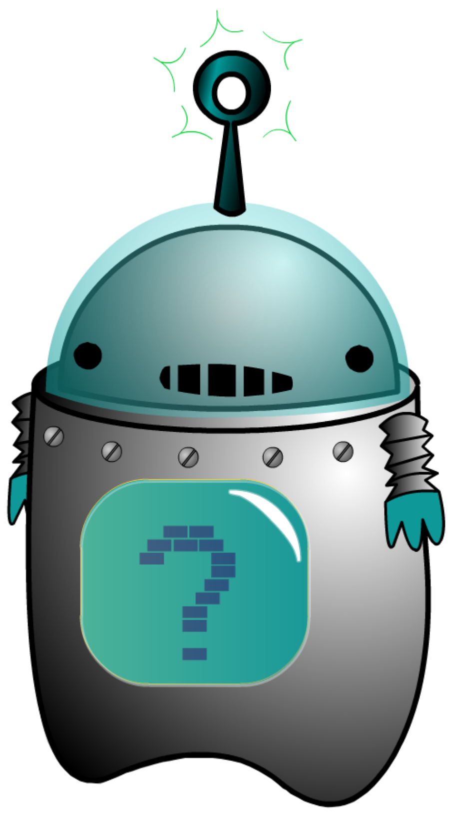
Problem #10

Palindrome Numbers

Palindrome is a word, sentence or number that reads the same forward and backwards.
For example, 121 or 17371.

Try this...

- Write down any 2-digit number e.g. 15
- Write down the number reversed e.g. 51
- Add the two numbers together 15 + 51 = 66
- 66 is a palindrome



Have a go.

Sometimes you need to repeat the process of reversing and adding

E.g. 68 + 86 = 154
154 + 451 = 605
605 + 506 = 1111

Try out other numbers. Oddly it's impossible to make a palindrome from 196.

There is a date and time this year (2022) that is a palindrome. Can you work it out?