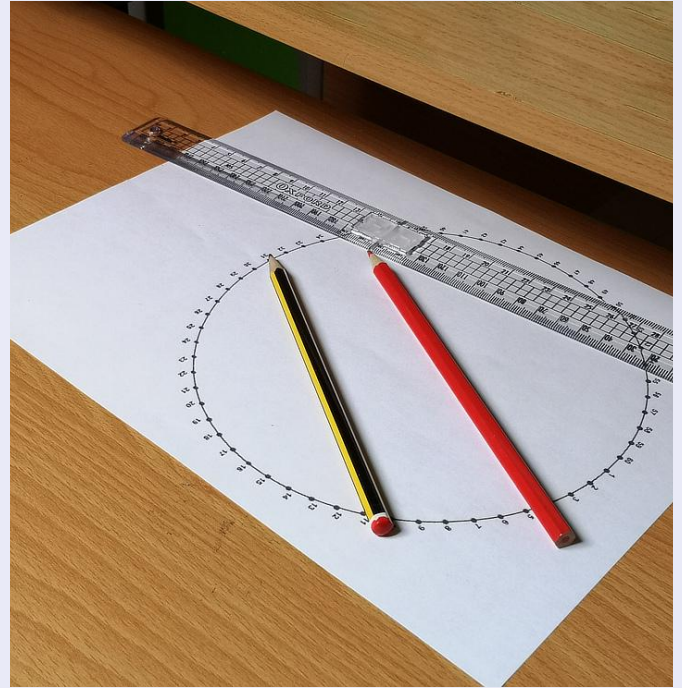# PK Challenges

# Algorithmic art

## What is this activity about?

To explore how decorative patterns can be made using very simple mathematical rules.
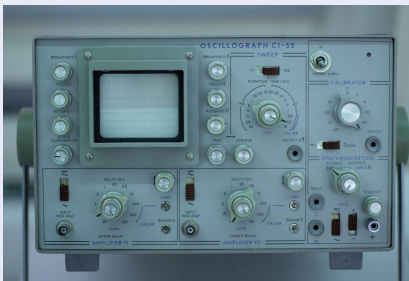
## What you need:

- a pencil
- a ruler
- a specially marked circle - print the last page of this document

## How is it linked to PK Porthcurno?

This is an oscilloscope. Telegraph engineers used oscilloscopes to investigate electrical signals. You can find out more about oscilloscopes here:
https://kids.kiddle.co/Oscilloscope

This is a Lissajous figure. Oscilloscopes make Lissajouos figures if the electrical signals follow some simple mathematical rules.
For a visual explanation of Lissajous figures:
https://www.youtube.com/watch?v=aUi8SnGGfG8
X and Y are the two electrical signals sent to the oscilloscope.

## What to do

- Print the last page of this document

- Collect your ruler and pencil

- Join point 1 to point 2 with a straight line

- Now join point 2 to point 4

- Now point 3 to point 6

- Keep going, joining each point to the point with double the number
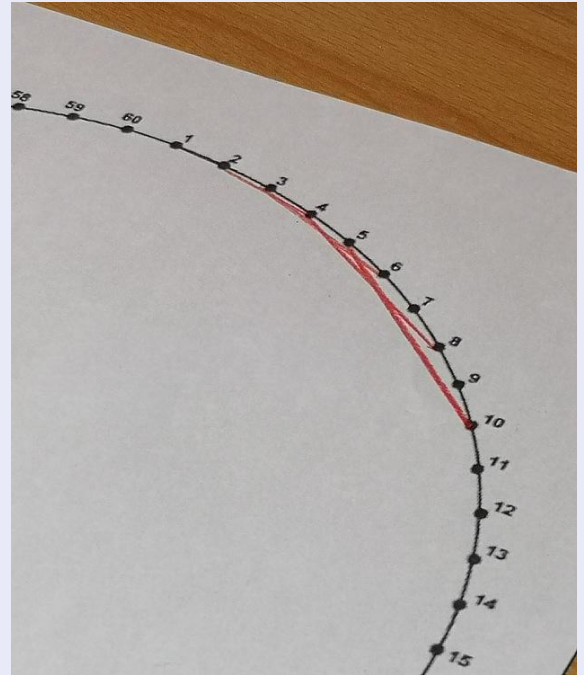


What happens when you get to 31?

- 2 x 31 is 62, but the numbers only go up to 60. The solution is simple - you just take away 60.

- So, join 31 to 2, 32 to 4, 33 to 6 and so on
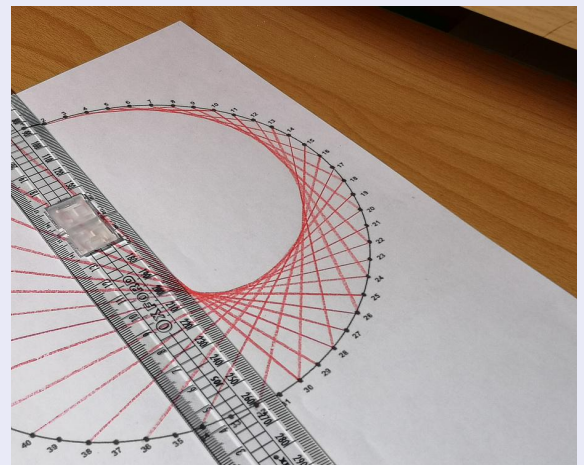


Once you have done your "multiplying by 2" pattern, try some other numbers. How does the pattern change if you multiply by 3, 4 or more?
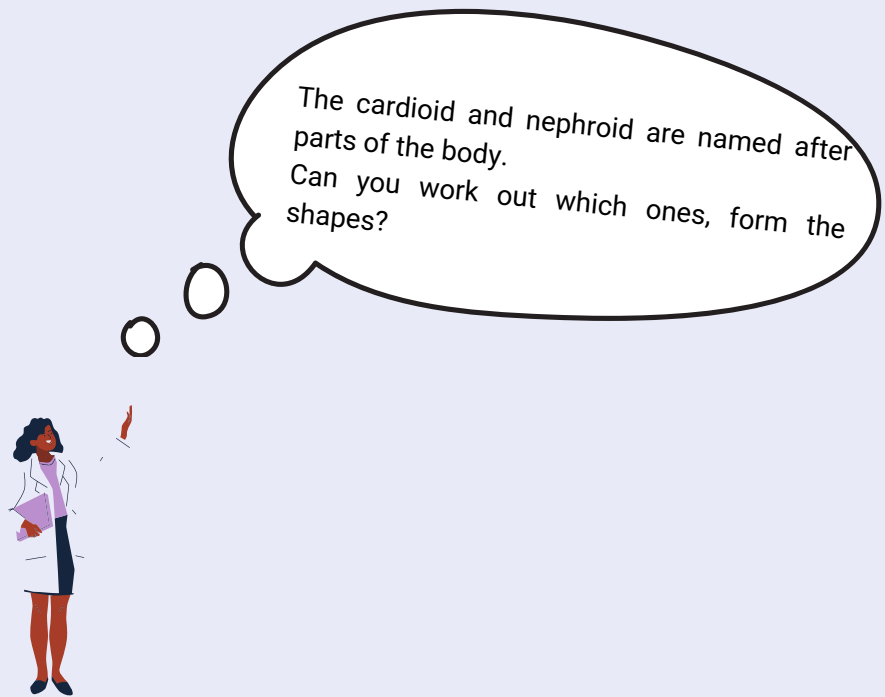
When you try multiplying by bigger numbers, if you get a number over 120, you might need to subtract 60 twice or more to get a number below 60 to join to. 33 x4 = 132. 132 - 60 = 72. 72 - 60 = 12. So join 132 to 12.

## Did you know?

The most enjoyable part of this activity is watching the pattern emerge. The patterns that are produced by multiplying by 2, 3 and 4 have names.

2:     Cardioid
3:     Nephroid
4:     Epicycloid of Cremona

The kind of calculations you did where you weren't allowed numbers over 60 is called arithmetic modulo 60. Modulo arithmetic is an interesting thing to study, and it doesn't have to be modulo 60. You probably do arithmetic modulo 12 every day - just think of a clock!

The cardioid and nephroid are named after parts of the body.
Can you work out which ones, form the shapes?

## Connect with us

Decorate the patterns you make and share on our social media channels we'd love to see them!

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#pkporthcurno, #algorithmicart #pkchallenges

# Algorithmic Art printable template