



OMG 2019 MathsTram

TREN TRAM

	1				2		
				1			
		4	2				
	1						2
		3					
					1		

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HOW TO PLAY TREN

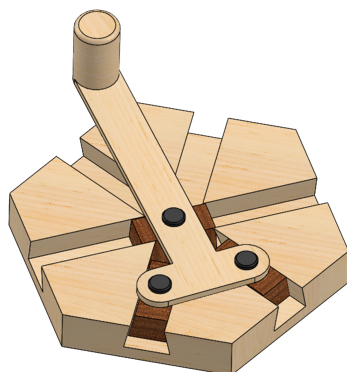
Place blocks (trams) of size 1x2 or 1x3 in the grid above. Each number in the grid should be part of one tram.

The number in the tram describes the total number of squares it can travel in the direction of its short edge (forward or backward).

Note: trams can travel until they encounter another tram or the edge of the grid. No trams can overlap.

TRAM-MEL OF ARCHIMEDES

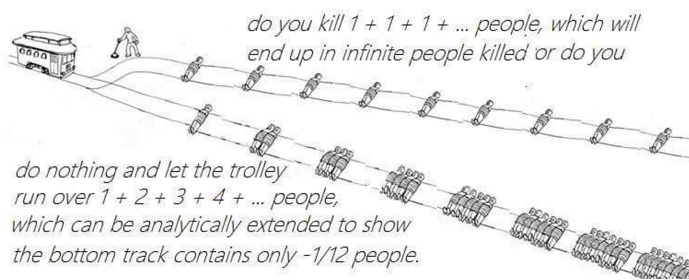
The "Useless machine," or Trammel of Archimedes, is composed of shuttles that move along straight channels, connected by pivots to a rod, as shown on the right.



If you attach a pen to the rod handle and move it, what shape will it draw? Why?

What does the centre of the other end of the rod draw, and how is this related to the first shape?

The Reimann Zeta Function



TRAM NUMBERS

Christchurch Tramway's seven trams have the numbers:

{11, 15, 152, 178, 244, 411, 1888}

- Which tram has a square composed of digits 0-4?
- Which tram number can be written both as the sum of two squares **and** the sum of two fifth powers?
- How many ways can you find to combine the tram numbers using the four basic operations to create another tram number?

DON'T BE A BUFFOON

While working on a shunting problem in the tram shed, Rata accidentally drops her favourite points bar (the reason it's her favourite because it is exactly the same length as the distance between each rail). The tram shed is very large has many parallel sections of equally-spaced track. What is the probability that her crowbar will land in a position where it crosses a rail?

**TRAM
+TRAM
CRASH**

OH NO!

Can you find a solution where each unique letter represents a digit?

MÖBIUS TRACK?

The tram loop does a figure-8 loop of Christchurch central... with a twist! If you stay in the same seat for two circuits the view out your window shows you everything on the trams left, and everything on the trams right. How is this possible?