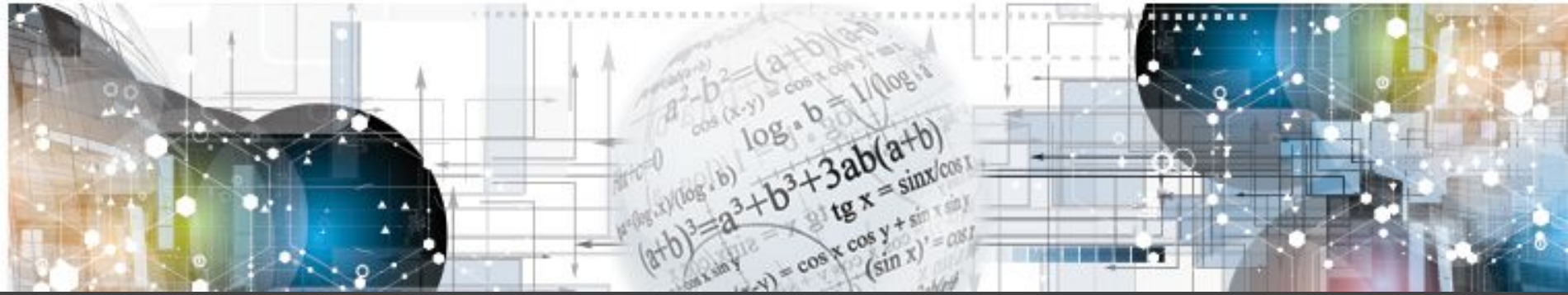


For the Love of Spatial Thinking

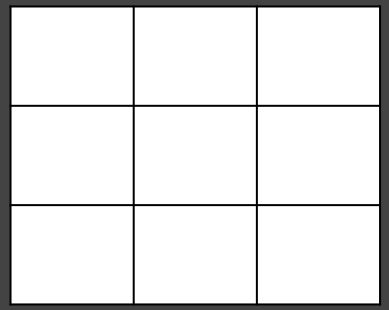
Slide Show: goo.gl/Lr8Umw

Website With Links: goo.gl/ryfQLJ

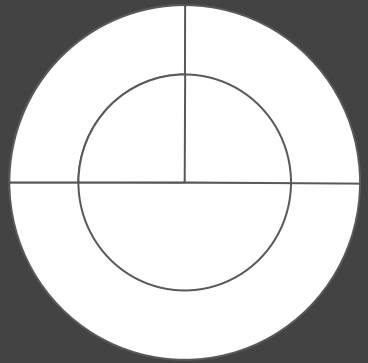
Kevin Shonk, Baden P.S.
Currently at CEMC
7 & 8 Math Courseware
kshonk@uwaterloo.ca

What is the fewest number of colours required to colour each challenge?
*Spaces that share an edge may not be the same colour.

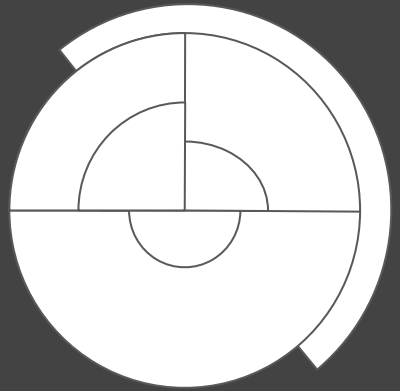
Play



Challenge 1

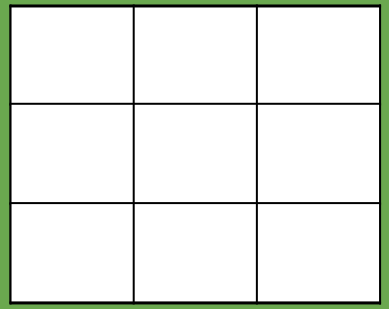


Challenge 2

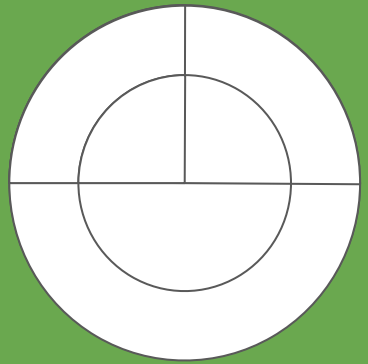


Challenge 3

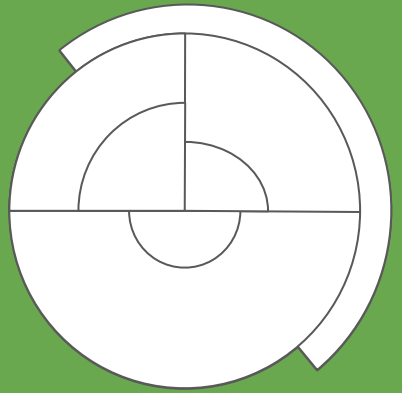
What is the fewest number of colours required to colour each challenge?
*Spaces that share an edge may not be the same colour.



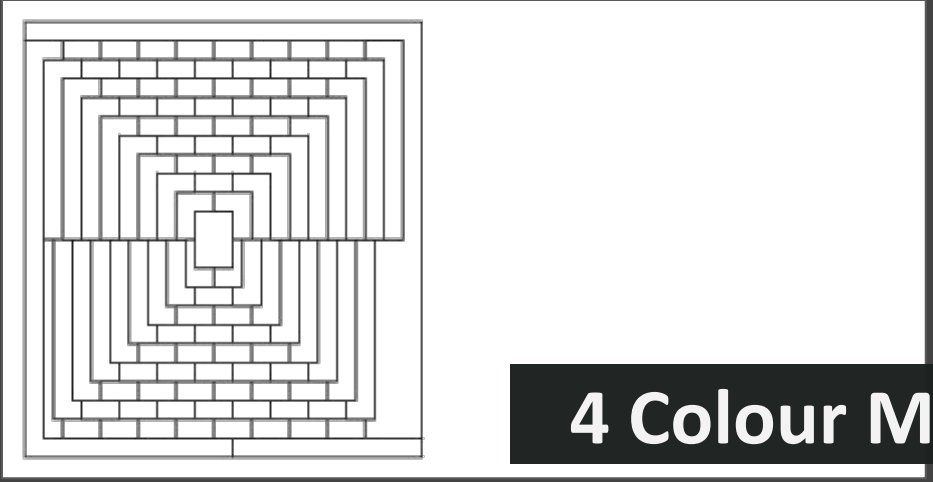
2 Colours

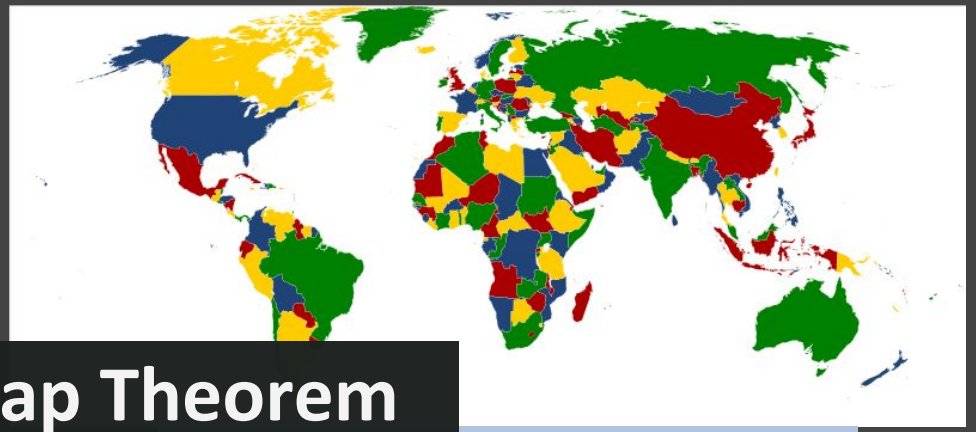


3 Colours

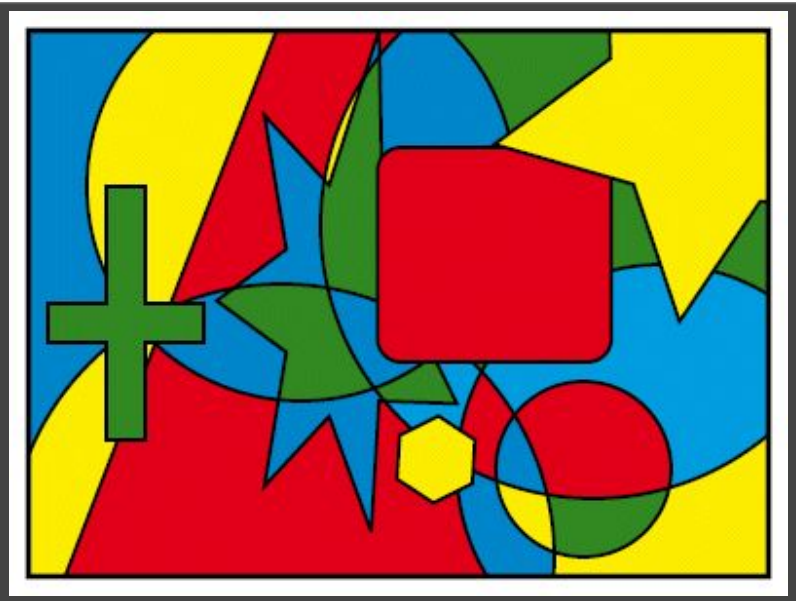


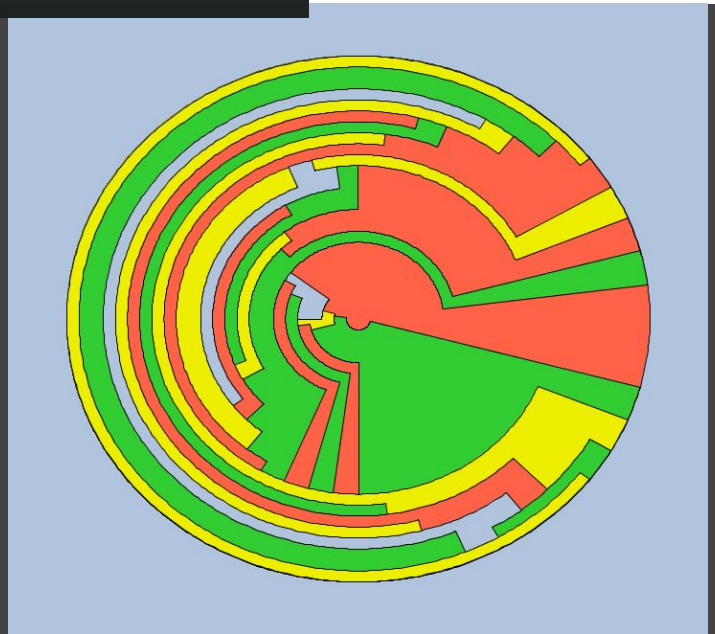
4 Colours



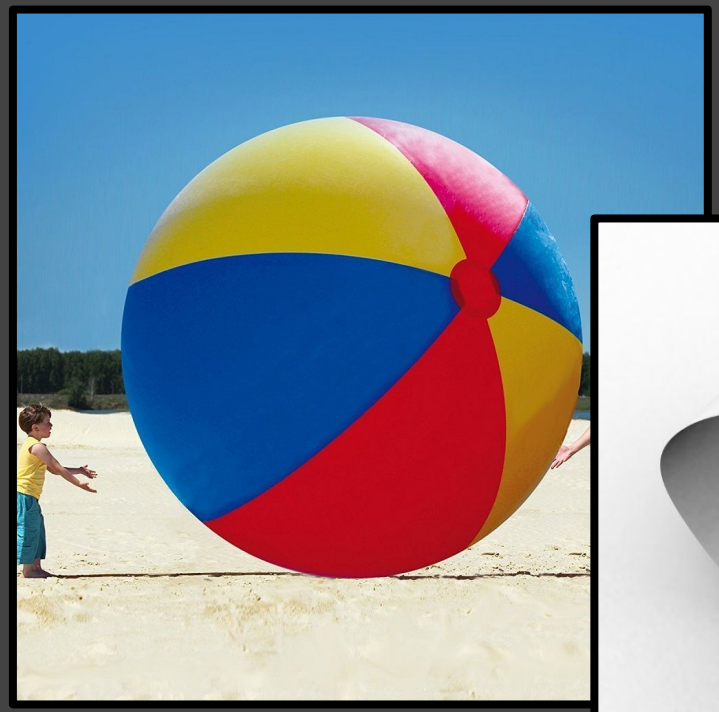


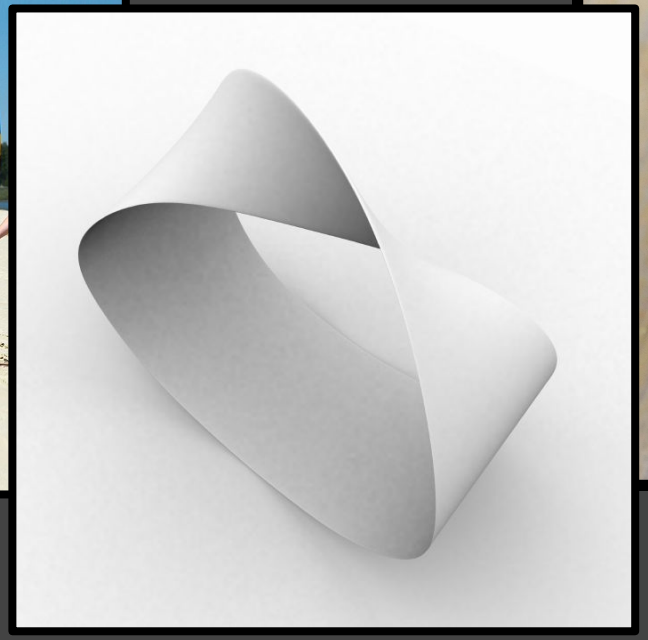
4 Colour Map Theorem





Extend



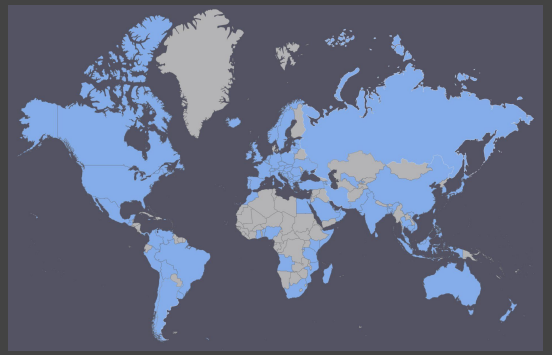


International Mathematicians Salute

GLOBAL MATH WEEK

exploding dots

Oct. 10-17, 2017
1.3 million Students



James Tanton
Mathematician in Residence
Mathematical Association of America
www.jamestanton.com
@jamestanton

The 1 Information Slide

Spatial Thinking

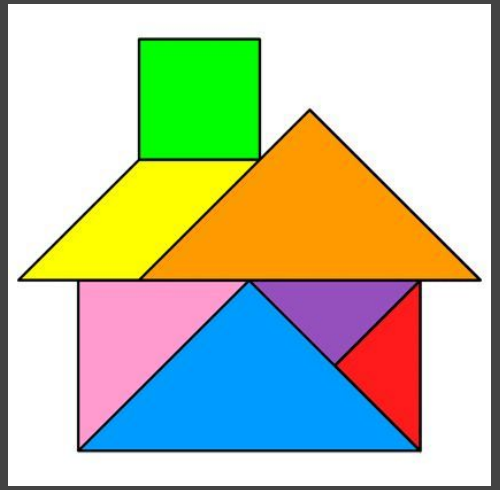
Spatial Reasoning

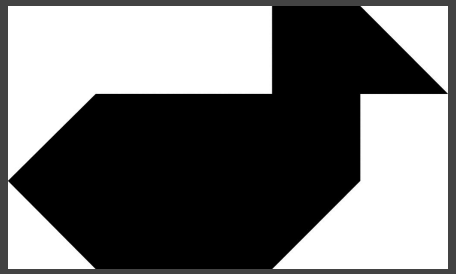
Spatial Sense

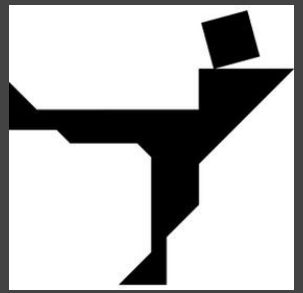
Location and movement of objects in space

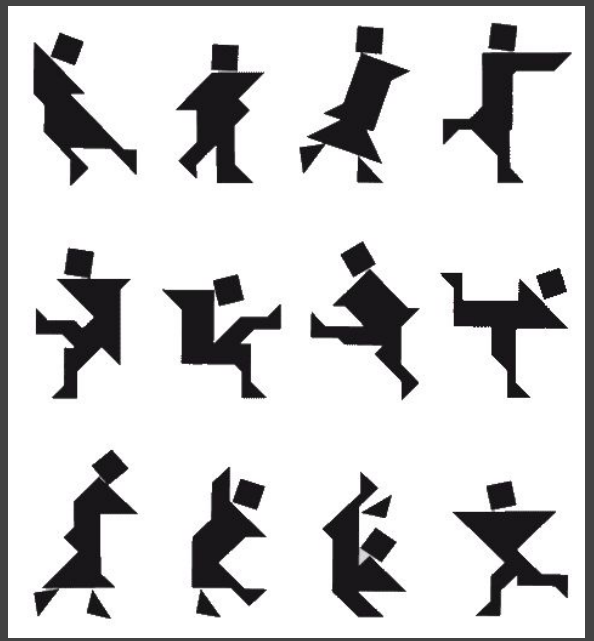
Developed by visualizing, drawing and comparing figures in various positions

Spatial thinking can be fostered with the right kind of instruction

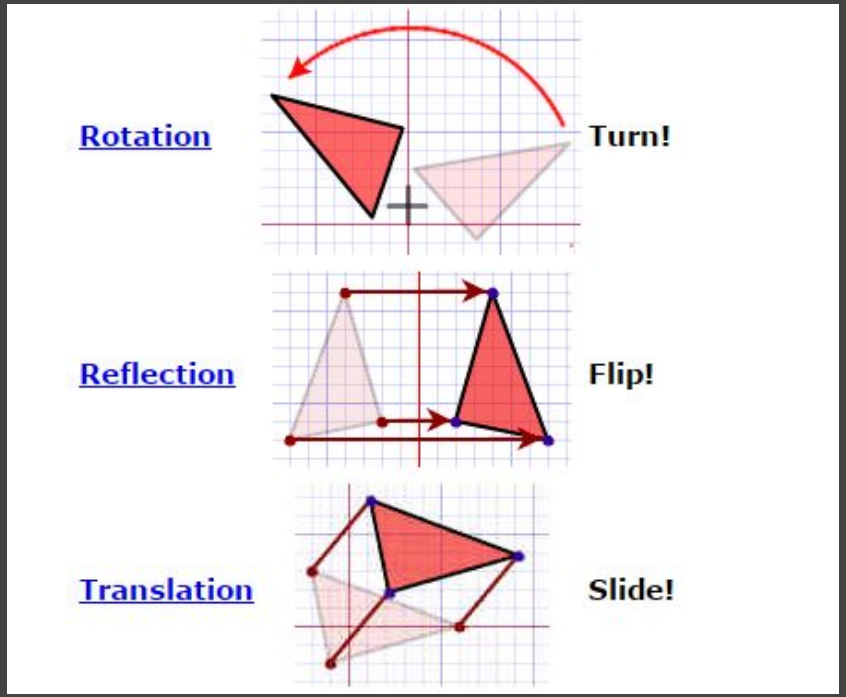




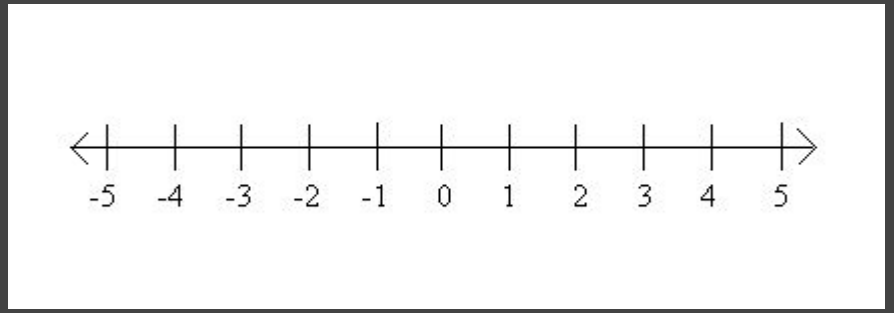




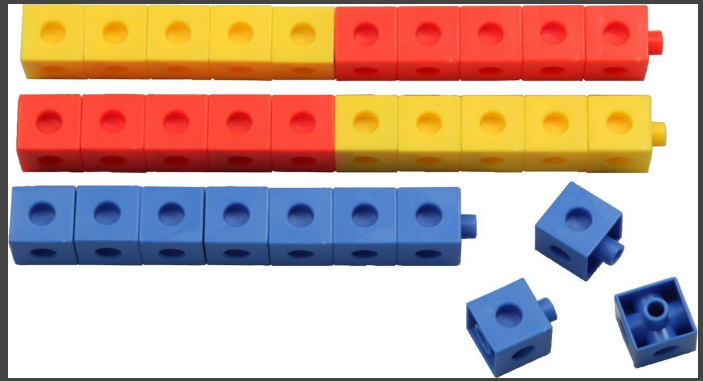
Transformations

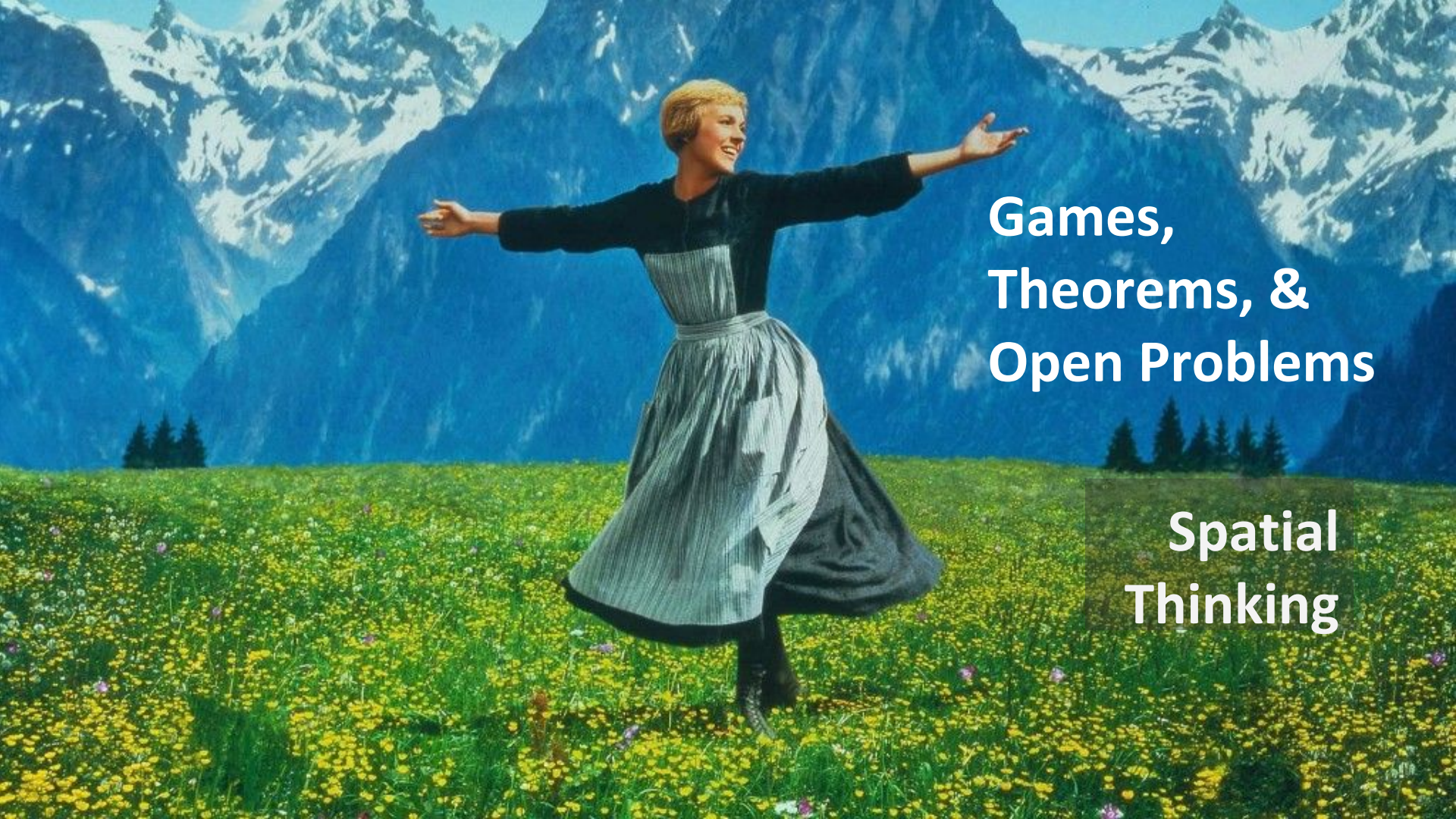


Number Lines



Cubes




Games,
Theorems, &
Open Problems
Spatial
Thinking

Good Will Hunting

Good Will Hunting

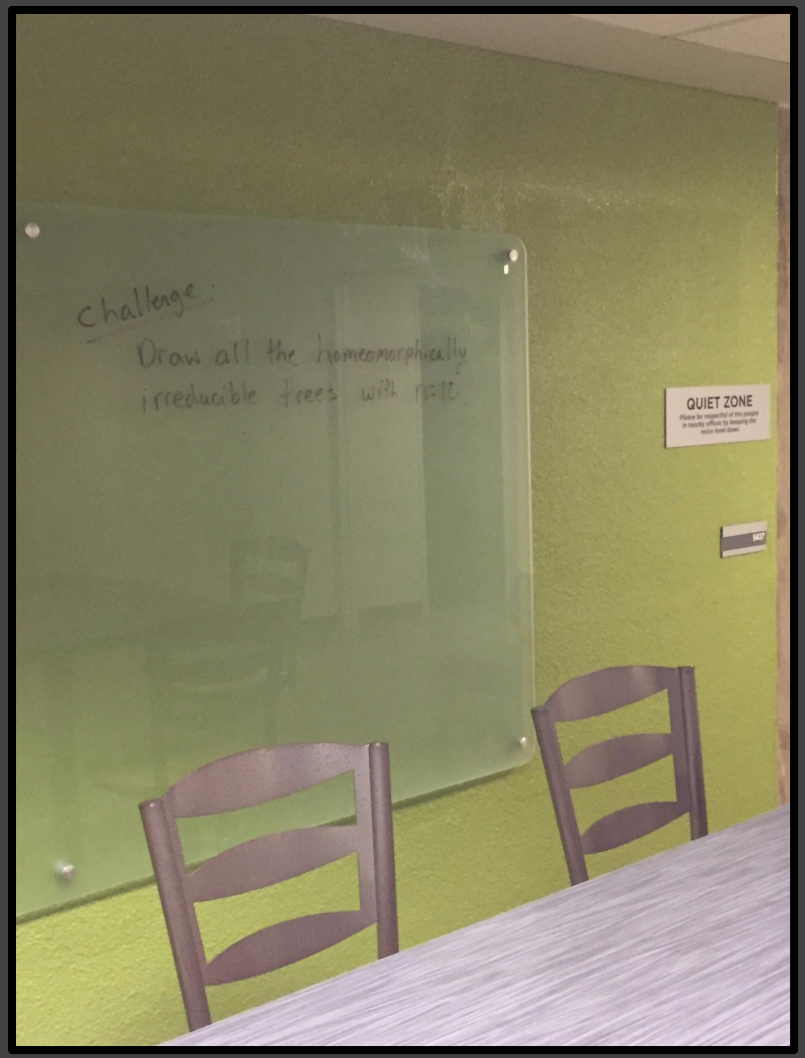
Draw all the Homeomorphically Irreducible Trees with n=10.

Network of dots and lines (No Cycles)

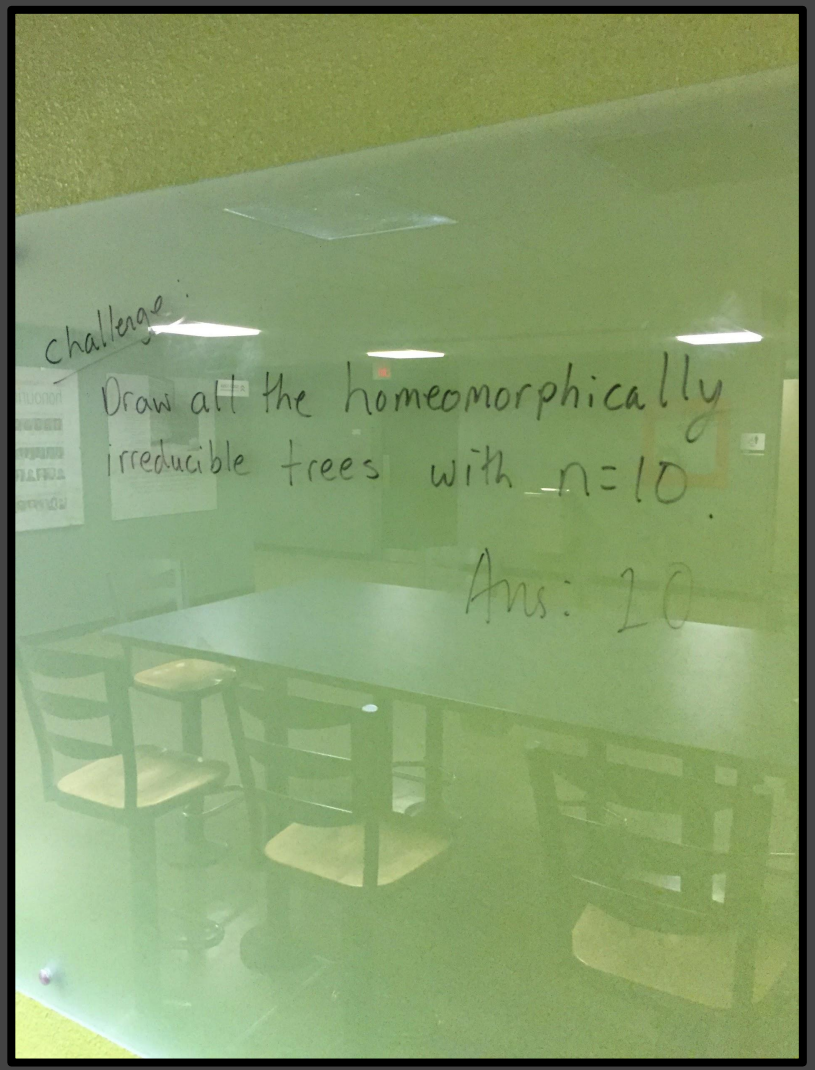
Number of dots (10)

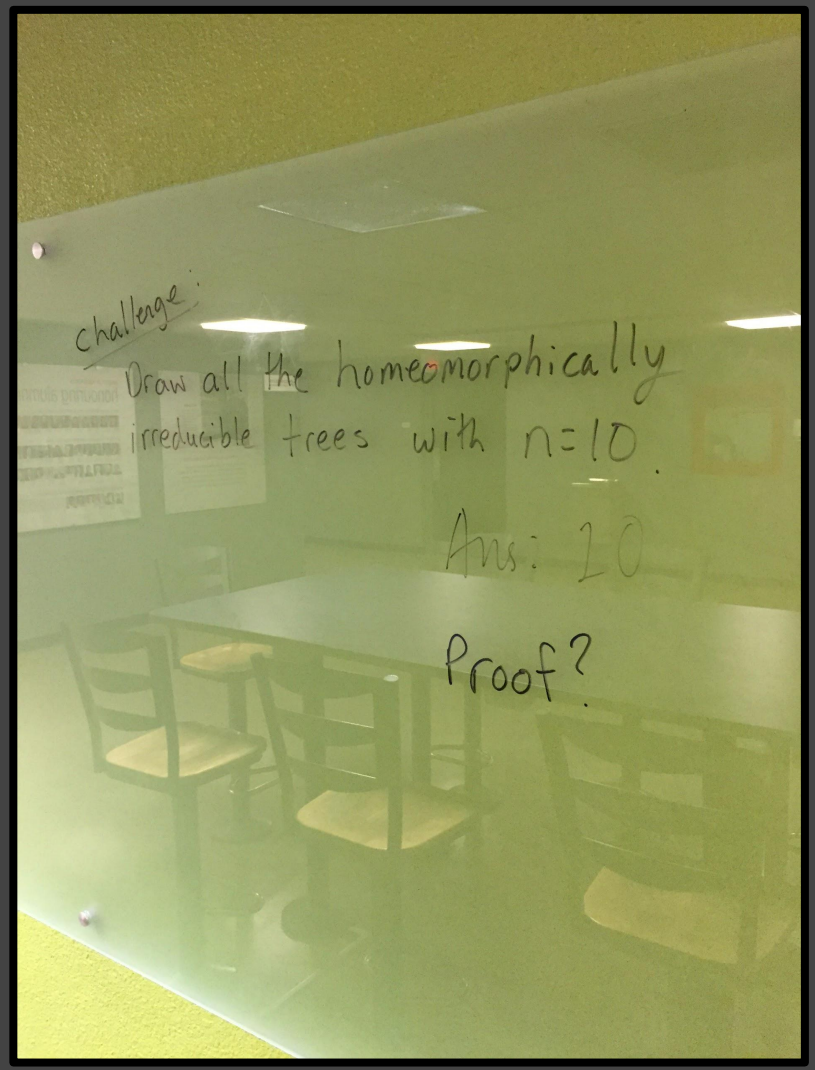
Play

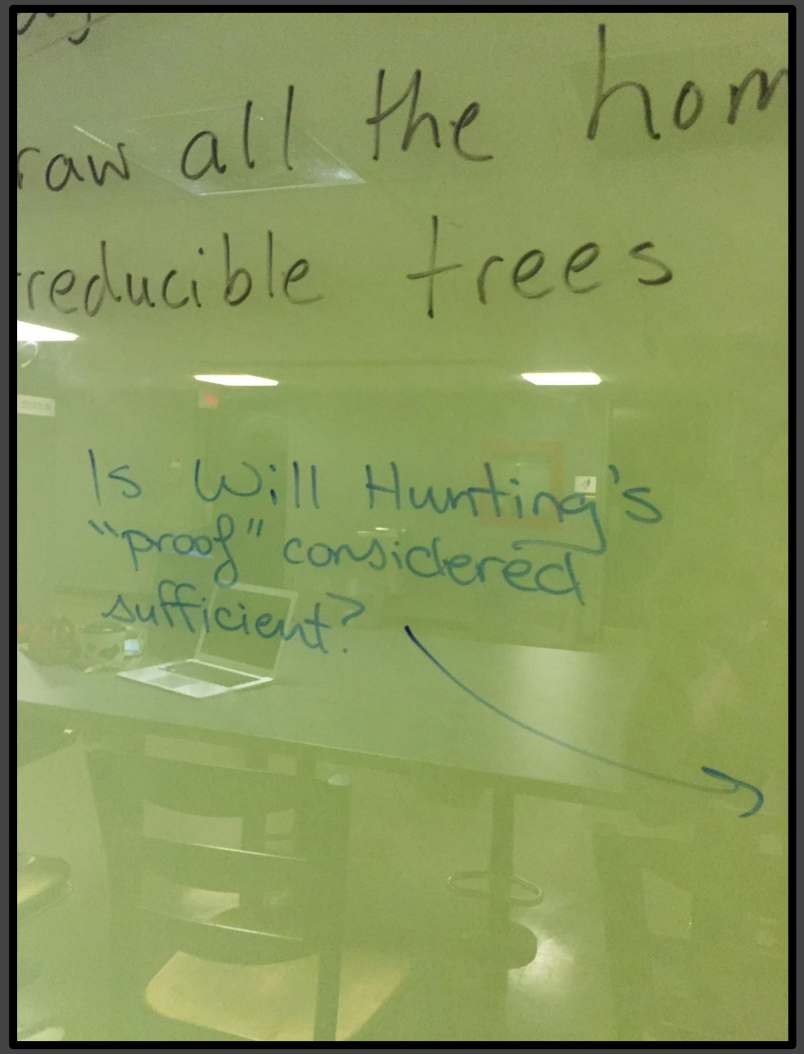
(Numberphile: James Grime)

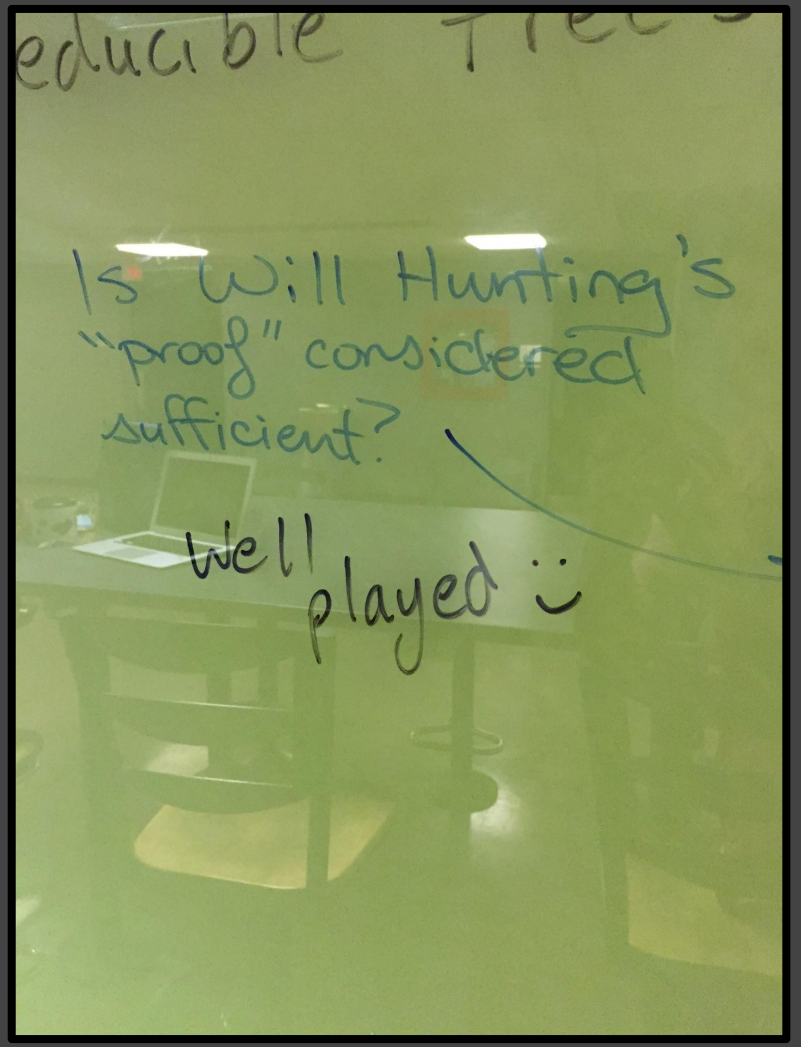

Challenge:
Draw all the homeomorphically
irreducible trees with n=10.
QUIET ZONE

Challenge:
Draw all the homeomorphically
irreducible trees with n=10.


Challenge:
Draw all the homeomorphically irreducible trees with n=10.
Ans: 10


Challenge:
Draw all the homeomorphically irreducible trees with n=10.
Ans: 10
Proof?


raw all the hom
reducible trees
Is Will Hunting's
"proof" considered
sufficient?


educible
Is Will Hunting's
"proof" considered
sufficient?
Well played :)

Extend

Good Will Hunting

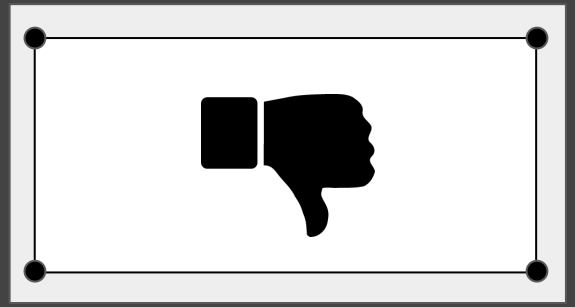
How many trees for other n's?

n=6, 7, 8, 9, 11, 12?

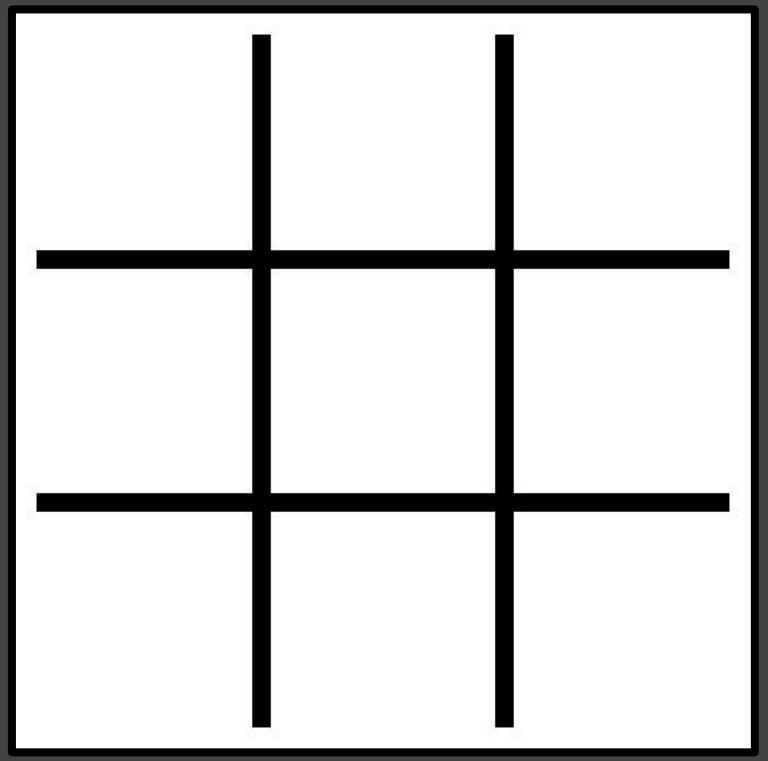
Is there a pattern?

No Rectangles Problem

(Larry Guth, MIT)

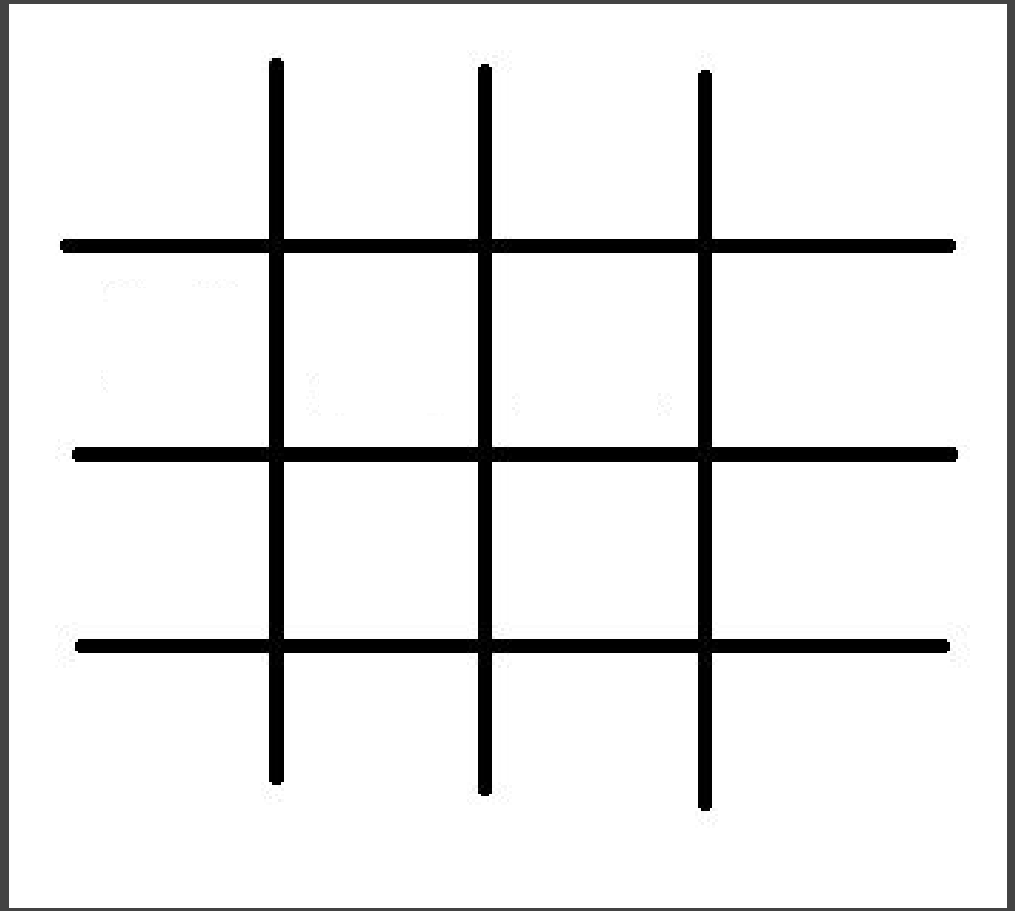


Play



How many dots can you place in a 3x3 grid without creating a rectangle?

Play

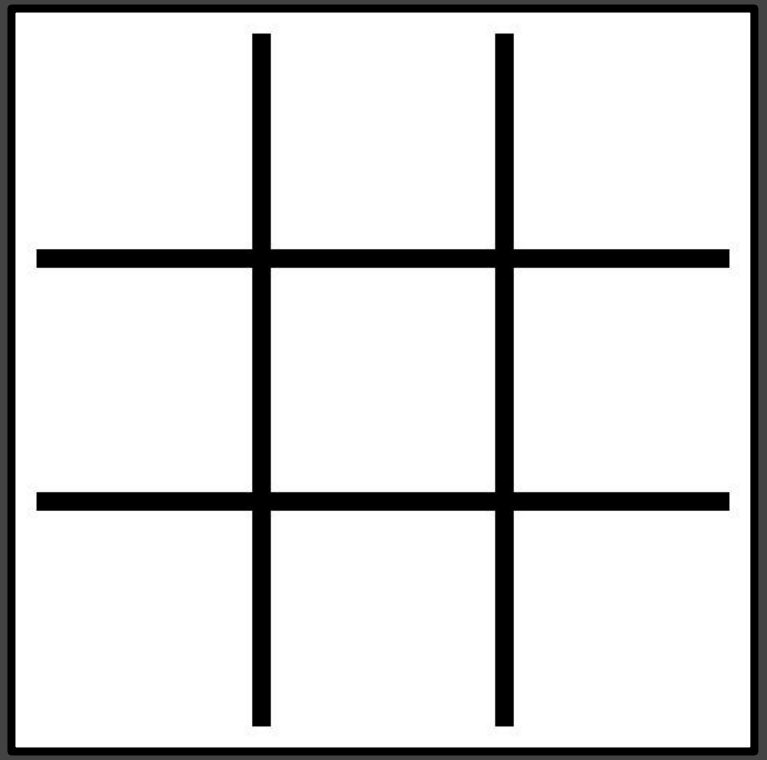


Extend

No Rectangles Problem

Larger N x N grids

Open problem in mathematics



Brussel Sprouts

(Numberphile: Teena Gerhardt)

Each turn:

1. Player must connect any 2 free ends without crossing another line.

2. Put a slash in your new line to create 2 new free ends.

Winner is the last person to make a legal move!

Play

Euler Characteristic: V - E + F = 2

Using the Euler characteristic,

moves = starting vertices + free ends - 2

moves = 2 + 8 - 2

moves = 8

Even # moves = player 2 win!

Brussel Sprouts Cheat Sheet

Crosses (n)	Moves	Winner
1	3	Player 1
2	8	Player 2
3	13	Player 1
4	18	Player 2

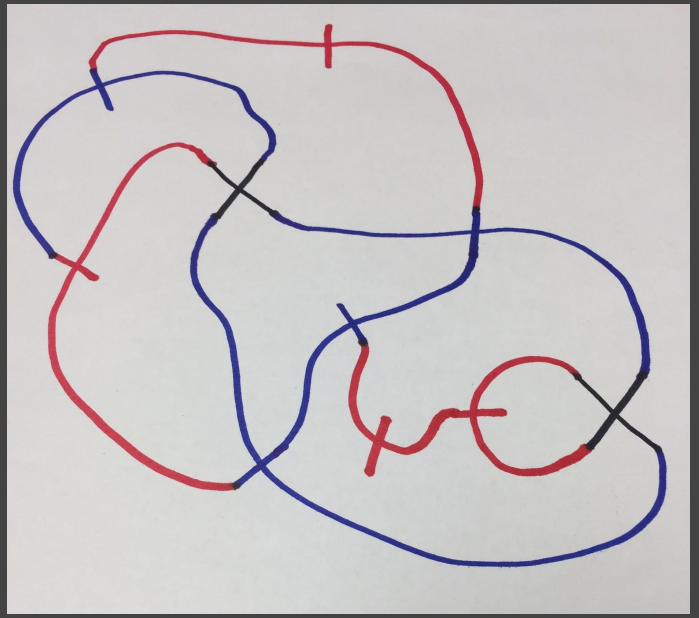
Number of Moves = **5n - 2**

Extend

Brussel Sprouts

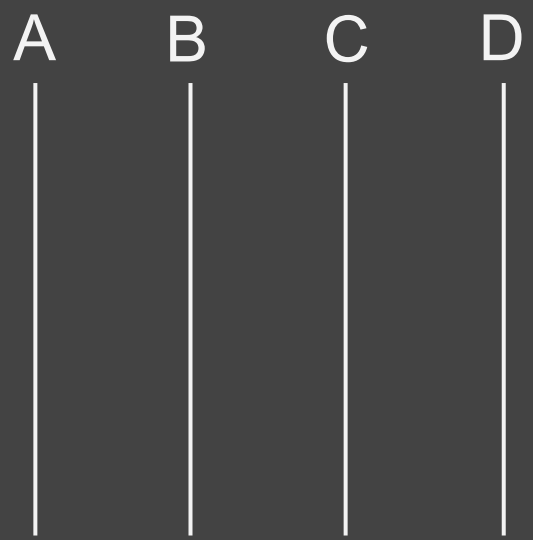
Vary starting positions

Sprouts



Amida Kuji - (Network Lottery)

(Making Mathematics)



Add as many horizontal lines as you would like. Horizontal lines may NOT touch.

Will 2 letters ever end up on the same finish?

Amida-Kuji Challenges

Challenges	1	2	3	4
Start Position	A B C D	A B C D	A B C D	A B C D E F
Finish Position	B A D C	D C B A	C D A B	B F A C E D

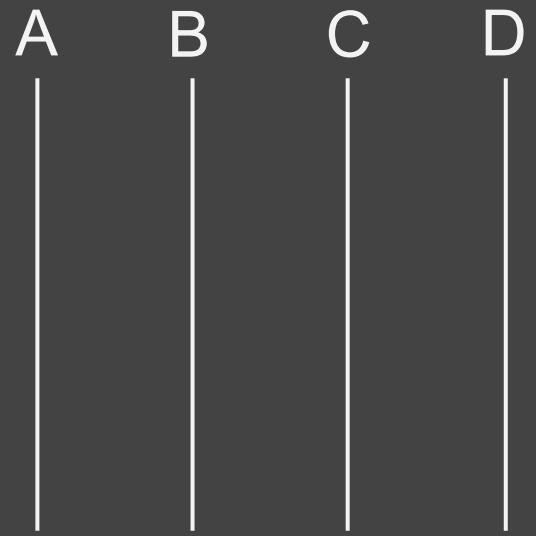
Play

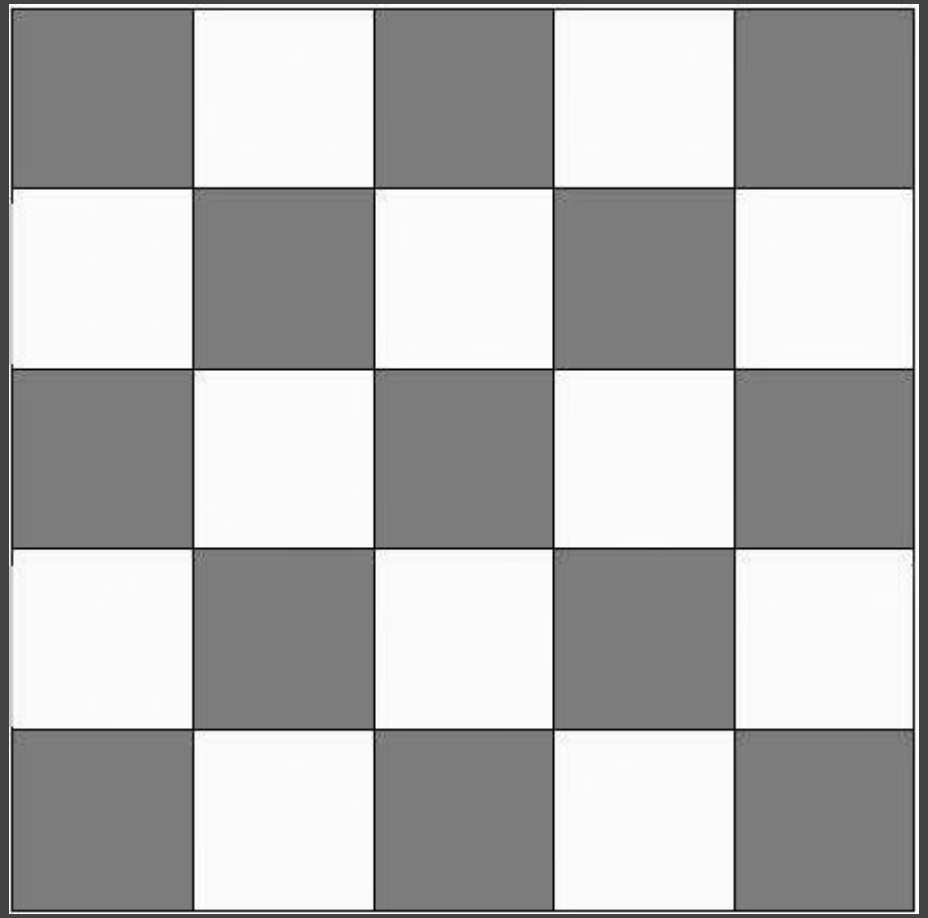
Extend

Amida Kuji

More variables

Are all outcomes possible?





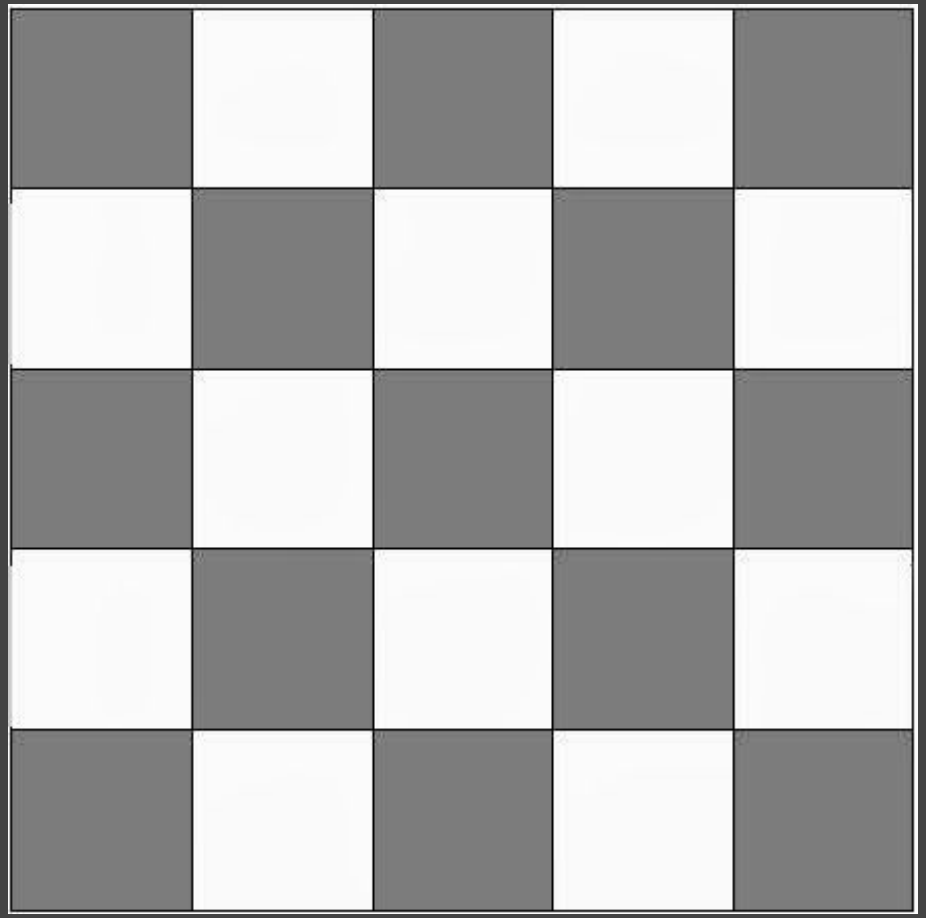
Grid Paths

(James Tanton)

Draw a path that goes through all squares once.

To move from one square to another, the squares must share an edge.

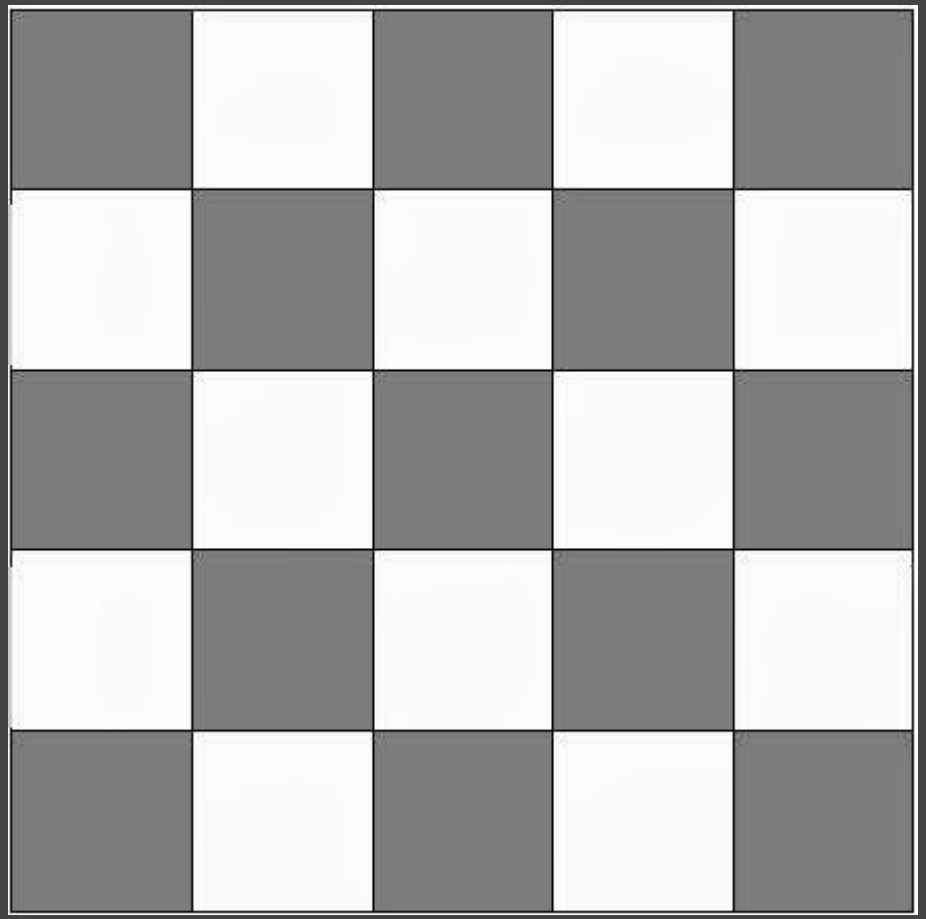
Play



Extend

Grid Paths

- Smaller grids
- Larger grids
- Rectangle grids



The Utilities Puzzle

(ancient)

Goal:
Connect each house to each utility (9 lines) without crossing any lines.

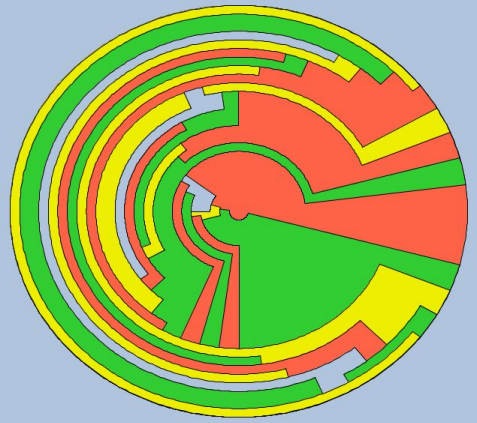
Play

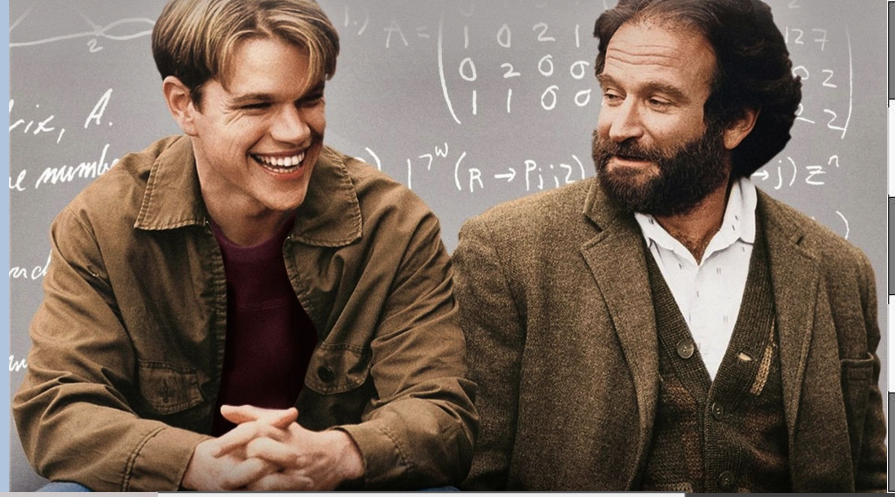
Extend

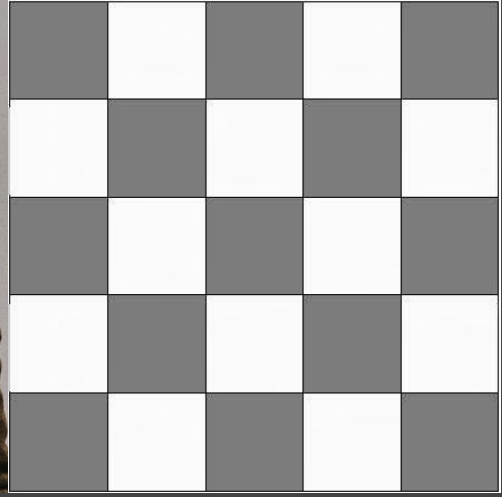
The Utilities Puzzle

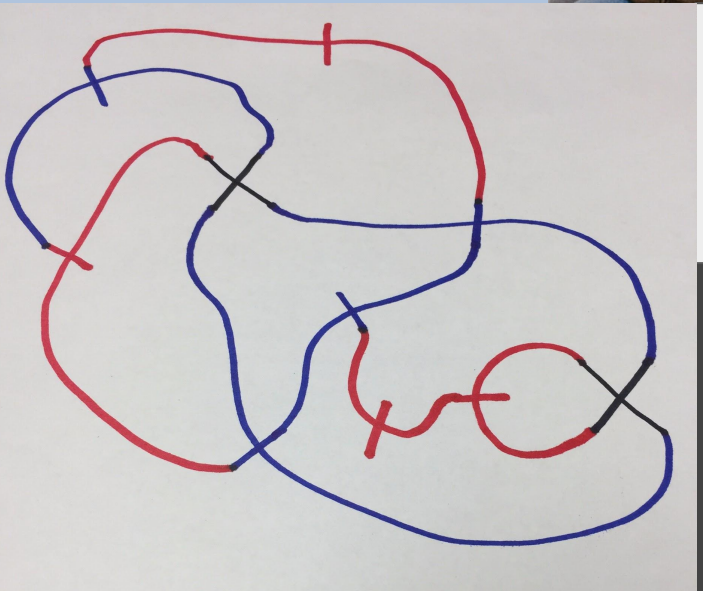
On a sphere?

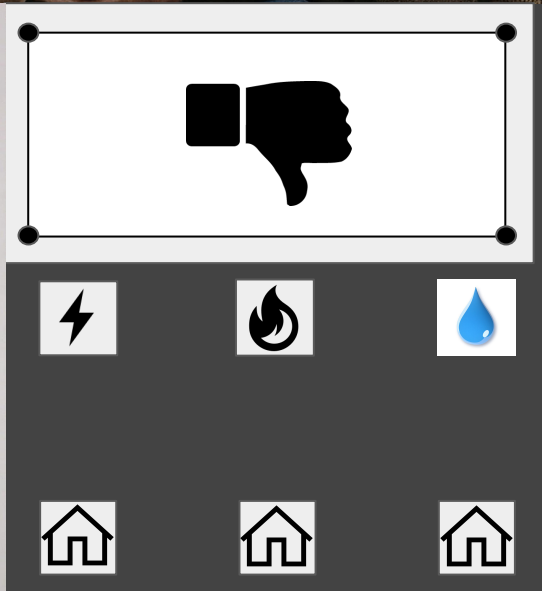
On a torus?

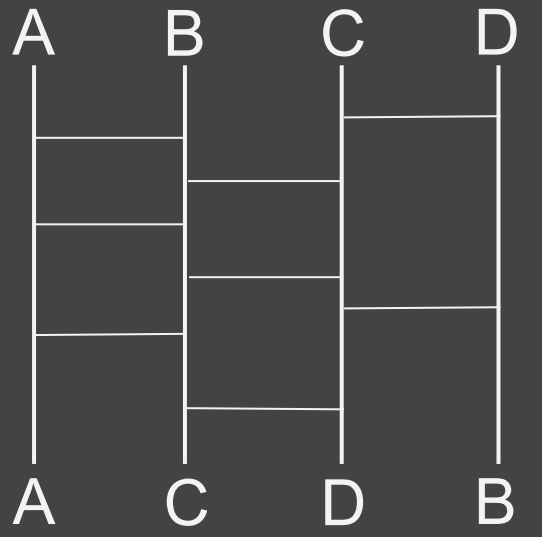








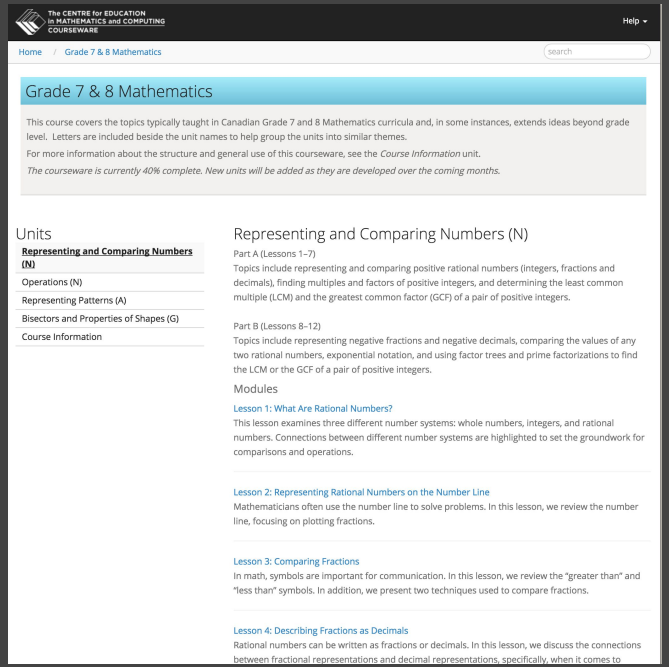



A
B
C
D
A
C
D
B

Shameless Plugs

cemc.uwaterloo.ca

7 & 8 Math Courseware

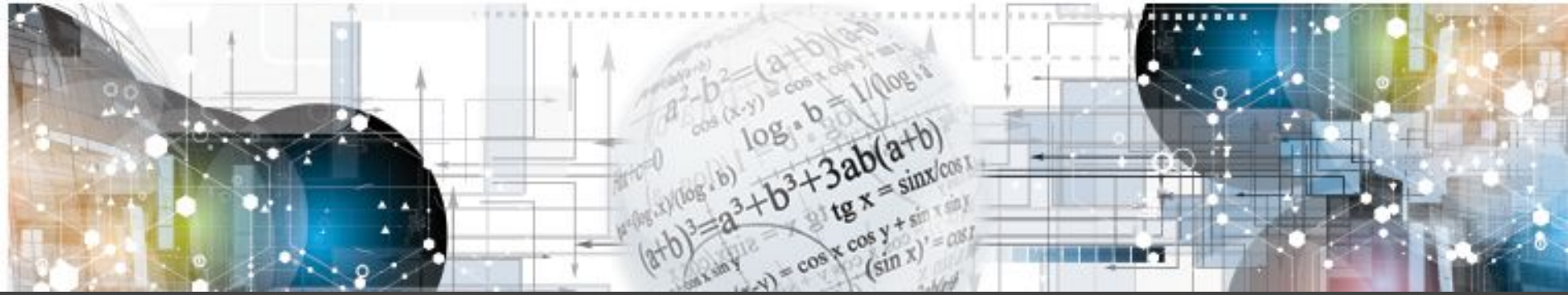


CEMC Math and Computing Contests

Gauss in May

Problem Set Generator!

Beaver Computing Challenge: November



For the Love of Spatial Thinking

Kevin Shonk, Baden P.S.
Currently at CEMC
7 & 8 Math Courseware
kshonk@uwaterloo.ca

Slide Show Link: goo.gl/Lr8Umw

Website with Links: goo.gl/ryfQLJ