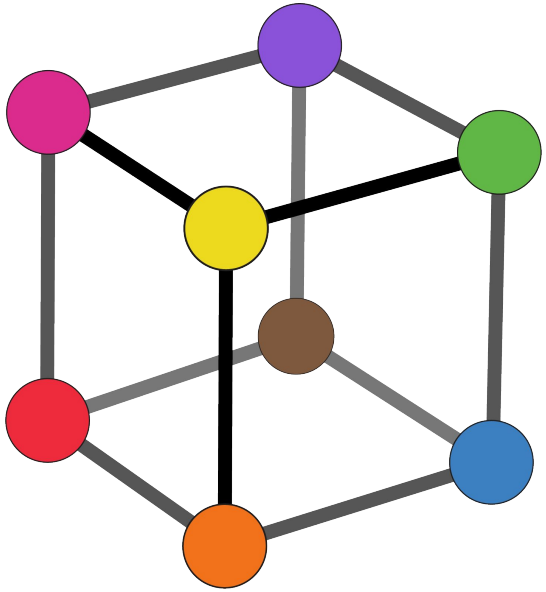
Prime Cubes



Julia Robinson Mathematics Festival

Inspired by Greisy Winicki-Landman

App

jrmf.org

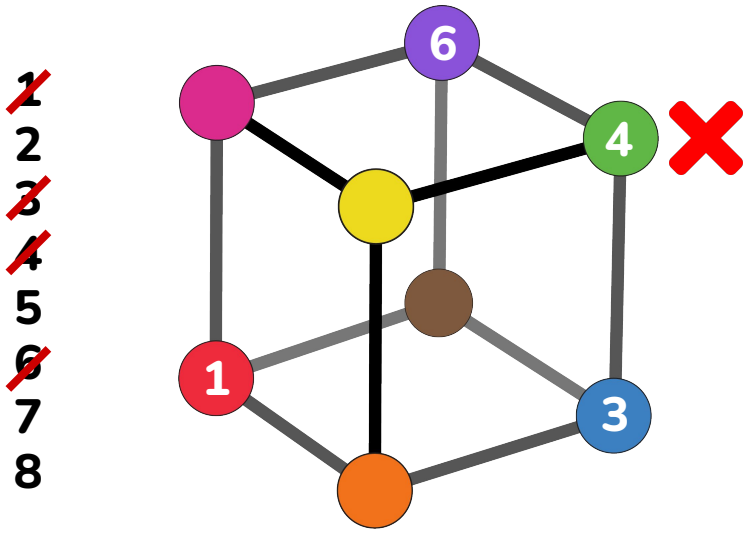
Prime Cubes Instructions

Objective

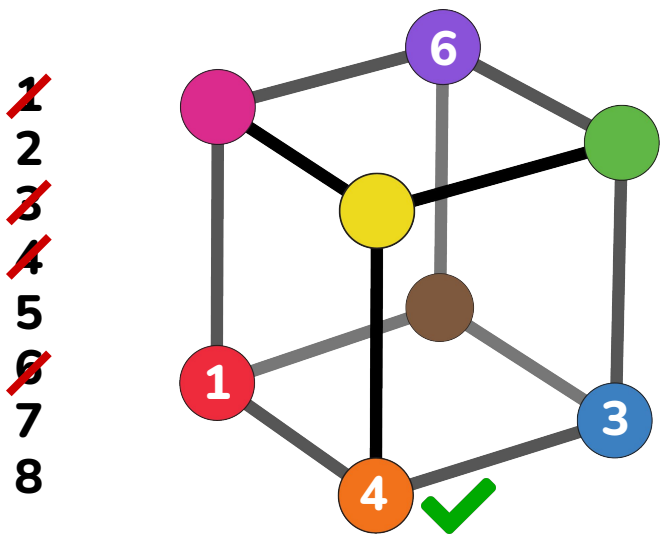
- The winner is the last player to place a number on the cube while following the rules.

Rules

- Players take turns placing one of the numbers from 1-8 on the vertices of a cube.
- Players do not need to place numbers in numerical order, e.g. Player 1 can start with 3.
- A number cannot be used more than once.
- If an edge connects two numbers, their sum must be prime.



Player 2 cannot place the 4 on the green vertex because 6 + 4 = 10, which is not a prime number.



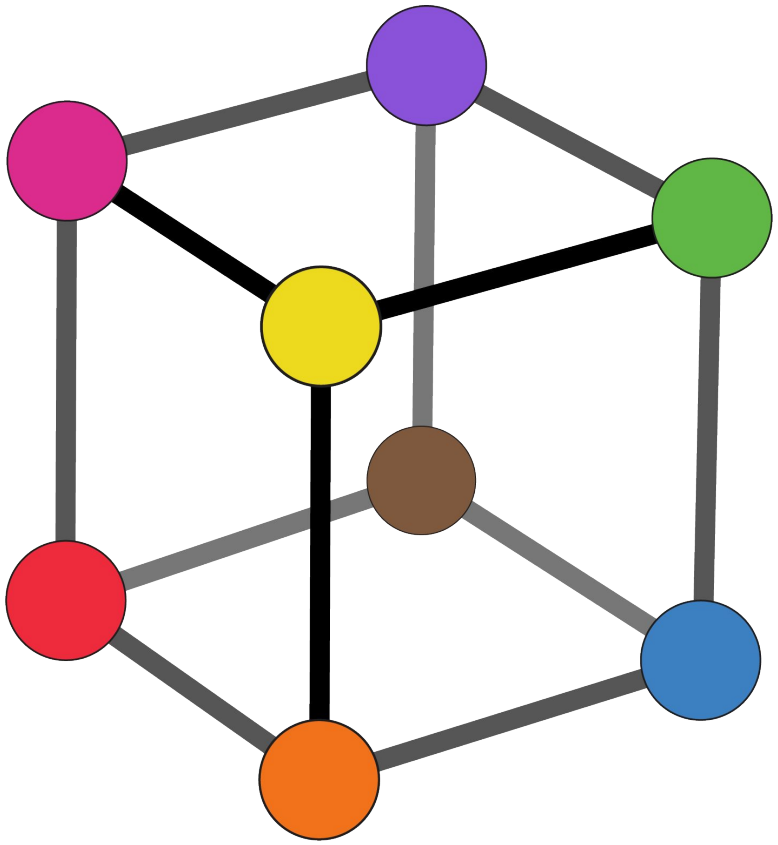
Player 2 can place the 4 on the orange vertex because
1 + 4 = 5 and 3 + 4 = 7, both of which are prime numbers.

Revised on 2021.09.15

Prime Cubes

1. Can a game of Prime Cubes use all 8 numbers? If not, what is the longest game of Prime Cubes you can have? How do you know it's the longest game?
2. What is the shortest game of Prime Cubes you can have? How do you know it's the shortest game?
3. Can you find a winning strategy for either Player 1 or Player 2?

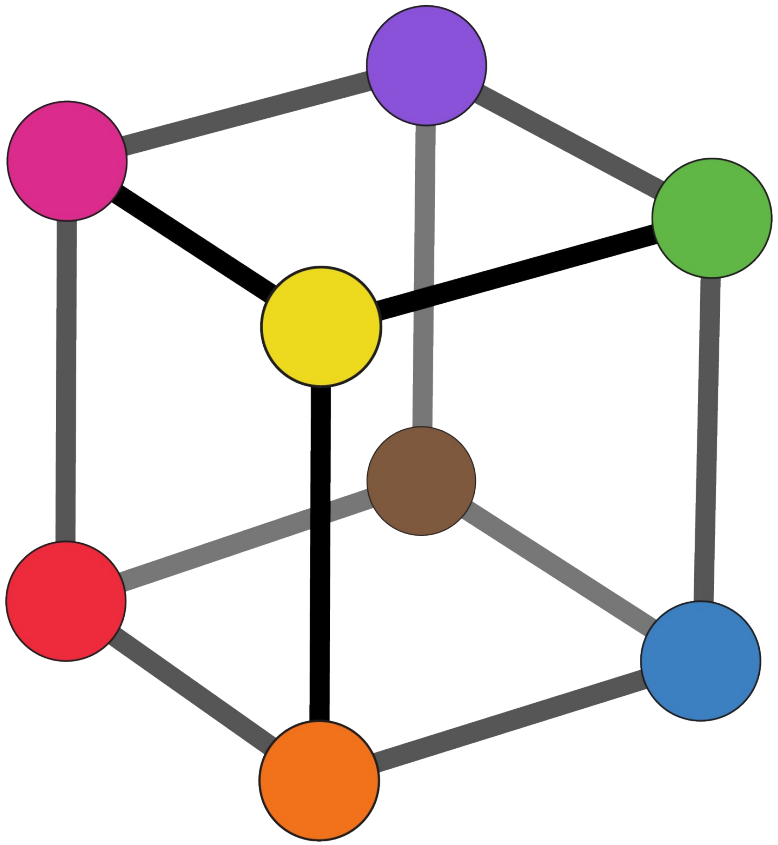
1
2
3
4
5
6
7
8



More Prime Cubes

1. How do your answers to the previous questions change if instead of using the numbers 1-8, you use the following consecutive numbers:
   a. 0, 1, 2, 3, 4, 5, 6, and 7?
   b. 2, 3, 4, 5, 6, 7, 8, and 9?
   c. 3, 4, 5, 6, 7, 8, 9, and 10?
   d. A different set of 8 consecutive whole numbers?

0
1
2
3
4
5
6
7

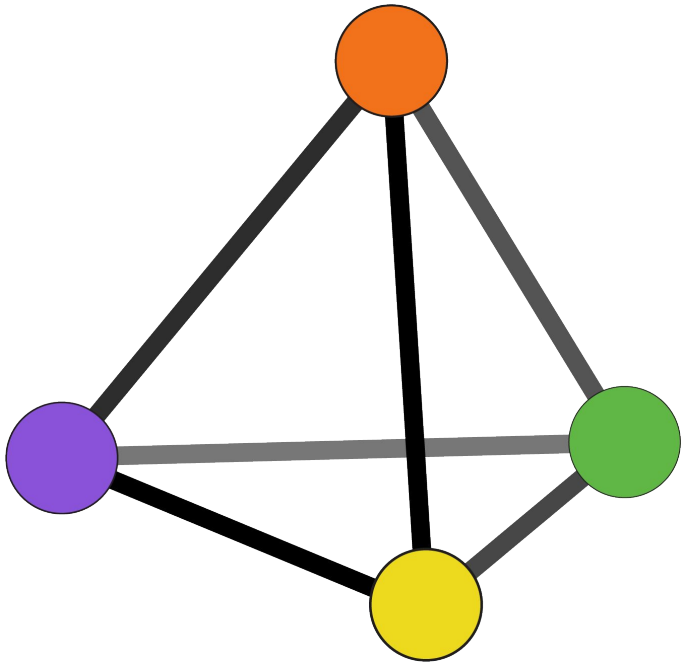


Prime Pyramids 3

Try playing this game on a triangular pyramid. In Prime Pyramids 3, players take turns placing the numbers 1-4. All of the other rules are the same.

1. What is the longest game of Prime Pyramids 3 you can have?
2. What is the shortest game?
3. Can you find a winning strategy for either Player 1 or Player 2?
4. How do your answers to the previous questions change if you use a different set of 4 consecutive whole numbers?

1
2
3
4

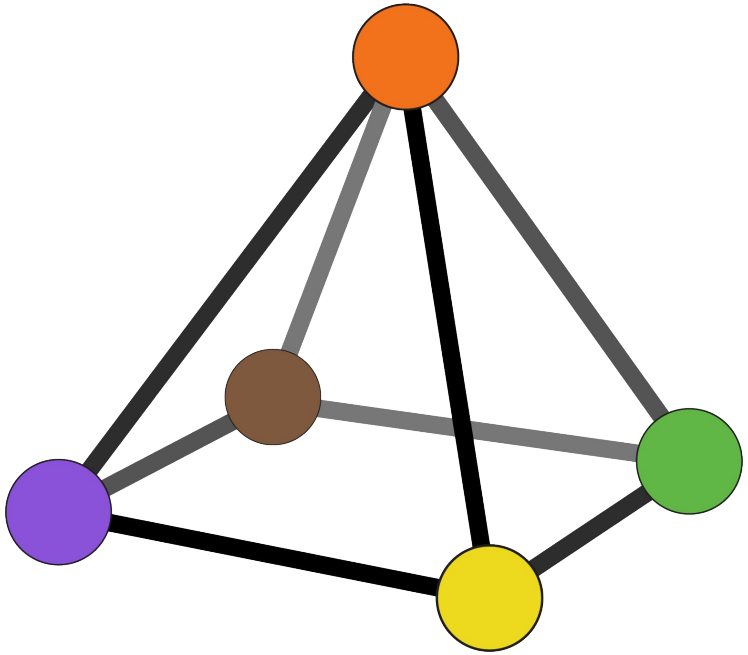


Prime Pyramids 4

Try playing this game on a square pyramid. In Prime Pyramids 4, players take turns placing the numbers 1-5. All of the other rules are the same.

1. What is the longest game of Prime Pyramids 4 you can have?
2. What is the shortest game?
3. Can you find a winning strategy for either Player 1 or Player 2?
4. How do your answers to the previous questions change if you use a different set of 5 consecutive whole numbers?

1
2
3
4
5

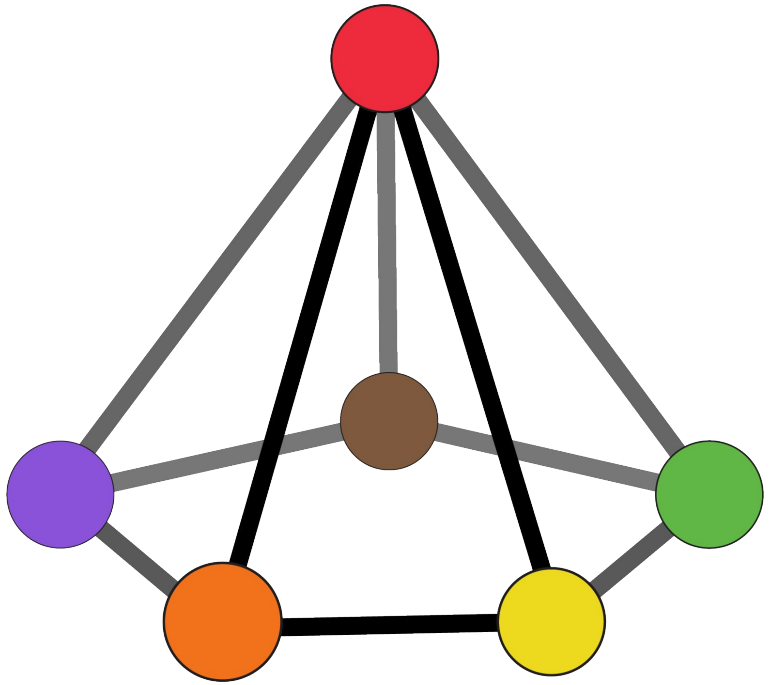


Prime Pyramids 5

Try playing this game on a pentagonal pyramid. In Prime Pyramids 5, players take turns placing the numbers 1-6. All of the other rules are the same.

1. What is the longest game of Prime Pyramids 5 you can have?
2. What is the shortest game?
3. Can you find a winning strategy for either Player 1 or Player 2?
4. How do your answers to the previous questions change if you use a different set of 6 consecutive whole numbers?

1
2
3
4
5
6

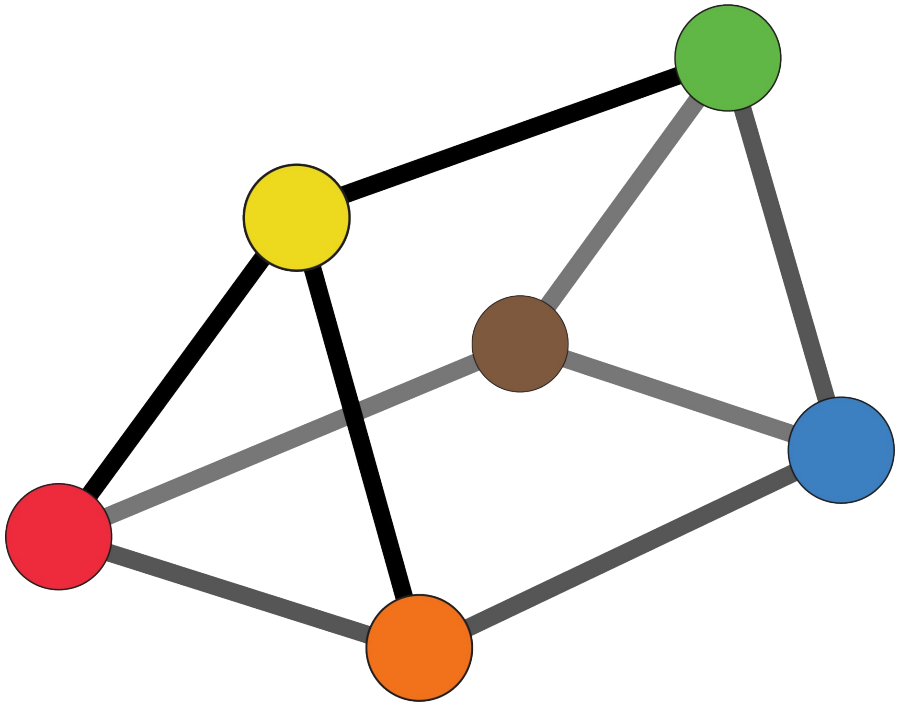


Prime Prisms 3

Try playing this game on a triangular prism. In Prime Prisms 3, players take turns placing the numbers 1-6. All of the other rules are the same.

1. What is the longest game of Prime Prisms 3 you can have?
2. What is the shortest game?
3. Can you find a winning strategy for either Player 1 or Player 2?
4. How do your answers to the previous questions change if you use a different set of 6 consecutive whole numbers?

1
2
3
4
5
6

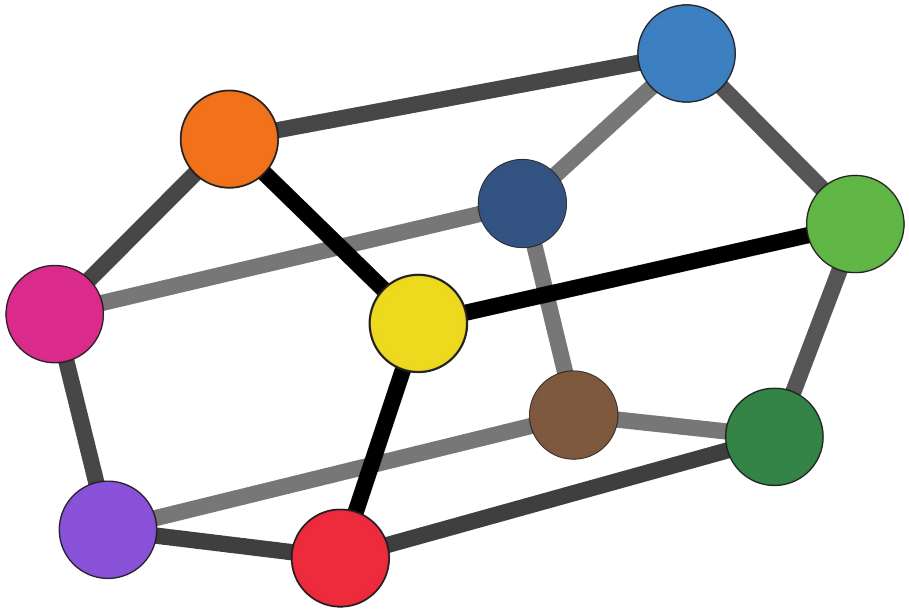


Prime Prisms 5

Try playing this game on a pentagonal prism. In Prime Prisms 5, players take turns placing the numbers 1-10. All of the other rules are the same.

1. What is the longest game of Prime Prisms 5 you can have?
2. What is the shortest game?
3. Can you find a winning strategy for either Player 1 or Player 2?
4. How do your answers to the previous questions change if you use a different set of 10 consecutive whole numbers?

1 6
2 7
3 8
4 9
5 10



Prime Prisms 6

Try playing this game on a hexagonal prism. In Prime Prisms 6, players take turns placing the numbers 1-10. All of the other rules are the same.

1. What is the longest game of Prime Prisms 6 you can have?
2. What is the shortest game?
3. Can you find a winning strategy for either Player 1 or Player 2?
4. How do your answers to the previous questions change if you use a different set of 12 consecutive whole numbers?

1 7
2 8
3 9
4 10
5 11
6 12