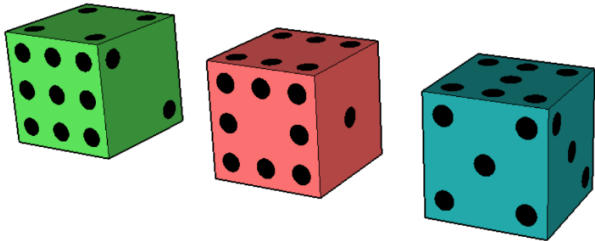


Non-transitive Dice

Age 11 to 14
Challenge Level ★★

[Non-transitive Dice printable sheet](#)

Here are three dice that are used to play a game for two players:



Each player chooses a different die.
They roll their dice.
The winner is the person whose die shows the bigger number.

Alison and Charlie are playing the game. Charlie wants to go first so Alison lets him.

Was that such a good idea?

Can you advise Alison on which die to choose once she knows which die Charlie has selected?

Look through this slideshow to see our solution...

The red die has the numbers {1, 1, 6, 6, 8, 8}

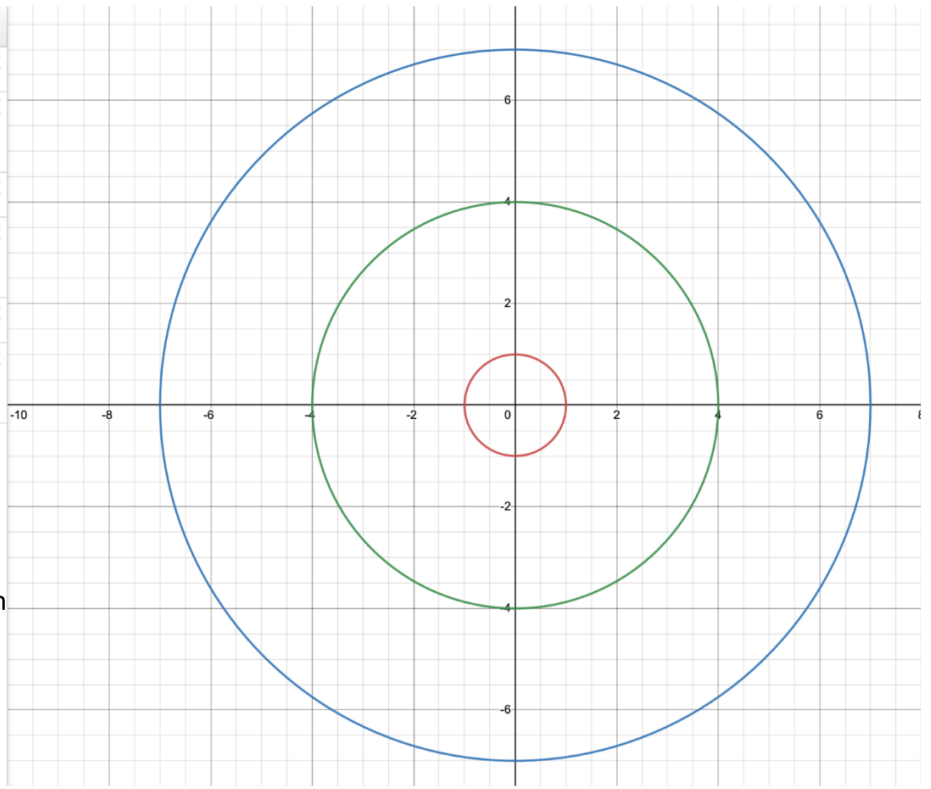
The green die has the numbers {2, 2, 4, 4, 9, 9}

The blue die has the numbers {3, 3, 5, 5, 7, 7}

Randomise Button

- Put in the different values on each die into Desmos
- Select 2 dice to face each other
- Press the randomise button 20 times, and record how many times each dice wins
- Do this for each pairing of dice

Desmos



Results

It was a good idea!

I charlie picks Alison should pick

R	→	G
B	→	R
G	→	B

Using desmos we random rolled both dices and noted down the winner of each round

Final Answer

Each player chooses a different die.
They roll their dice.
The winner is the person whose die shows the bigger number.

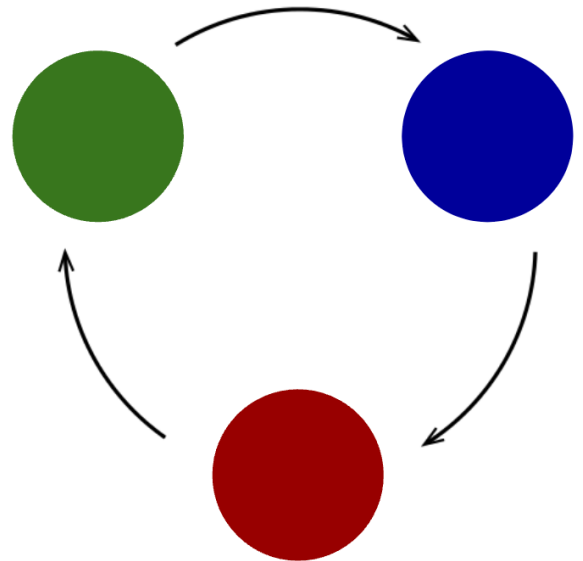
Alison and Charlie are playing the game. Charlie wants to go first so Alison lets him.

Was that such a good idea?

Can you advise Alison on which die to choose once she knows which die Charlie has selected?

This was a good idea, as our results have showed that whatever Charlie chooses, Alison can choose something that can beat it.

If Charlie chooses the red dice, Alison should choose the green dice, as from our data, as it wins 75% of the time against the red one. If he chooses green, Alison should choose blue, as it wins 55% of the time. Finally, if he chooses green, she should choose red, as it wins 60% of the time.



Solution by Juan and Lucas
Link to Desmos Graphing Calculator
<https://www.desmos.com/calculator>