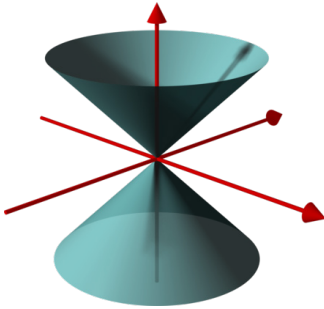


INTERNATIONAL
STEM OLYMPIAD
GRAND FINAL GERMANY

GRADES 6-7-8

MATHEMATICS

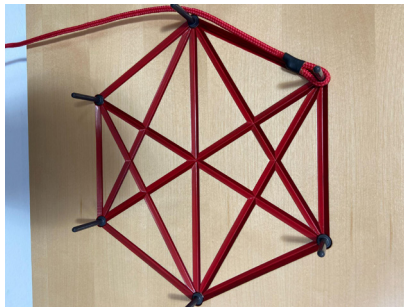
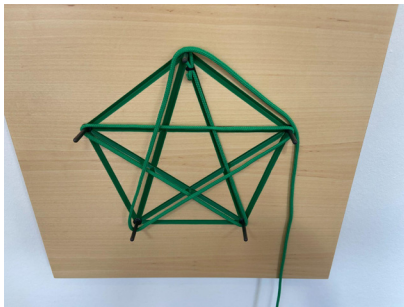
1 -



What shape would be formed if you cut the above conic sections with a vertical plane, given that the plane does not pass through the vertices?

- A) B) C) D)

2 -



Leonhard Euler was an 18th century mathematician who made many discoveries in many fields of math, and even has a special number named after him.

An Euler pattern is a circuit or path that uses every edge of a graph exactly once. The difference is that an Euler circuit starts and ends at the same vertex while an Euler path starts and ends at different vertices.

Are the two patterns above Euler circuits or paths?

- A) B) C) D)

3 -

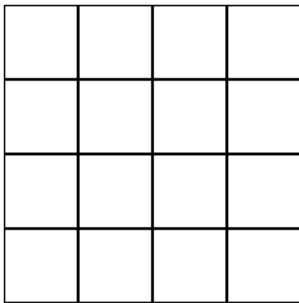
The Fibonacci sequence starts with the numbers 1 and 1, and then each successive number is the sum of the two previous numbers, so it starts 1, 1, 2, 3, 5, 8, 13...

As we take the ratio of each number to its preceding number, the ratios start to approach the Golden Ratio.

Which of the following is the closest approximation to the Golden Ratio?

- A) B) C) D)

4 -



Given a 4x4 grid as above and told to put the four numbers 1, 2, 3, and 4 into each row, how many combinations are there to do this so that there are no numbers repeated in any row or column?

- A) B) C) D)

5 -



In the British Premier League of football, there are twenty teams, and during a season, each team plays every other team twice. How many matches are played in total during a season?

- A) B) C) D)