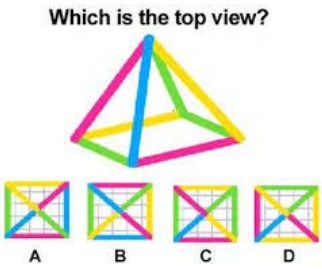

Ramona Scholar in MATHEMATICS Summer 2022

GRADES 9-10 — Mathematical Exploration and Presentation

Answer the following question:
Suppose that among a group of people it is true that any two are "friends" or "strangers." Of course, these relationships are symmetric, i.e., if X is a friend of Y, then Y is also a friend of X. If we get to decide, arbitrarily, the individuals that are friends and those that are strangers, how big of a group would we need in order to guarantee that we would always find three people who are mutual friends or three people who are mutual strangers?

Do all the following

1. Create a poster that presents your solution in a fully detailed, organized, and readable manner, so that an individual with no background knowledge can understand the solution.
2. Create a 3-minute video presenting your poster and walking through your solution.
3. Submit a 1-2 page original paper on the field of mathematics known as *Graph Theory*.

GRADES 11-12 — Mathematical Exploration and Presentation

Answer the following question:
The Suez Canal is 160 km in length between Port Said (km 0) in the north and Suez (km 160) in the south., The Canal has only one-way passage except at the El Ballah Bypass (km 51 to 60) and at Bitter Lakes (km 100 to 116) where two-way traffic or the holding of ships can take place. The following conditions (and others in special cases) are imposed upon the traffic:

- *The velocity of the ships is 14 km/hr.*
- *Separation between ships (traveling in the same direction) is 10 minutes.*
- *The number of northbound and southbound ships should be nearly equal.*

a) How many (regular) ships can get through the Suez Canal in one 24 hour day?

b) Resolve (a) with the following constraint: There must be a 30 minute separation between the last (e.g. northbound) ship in a convoy and the first (e.g., southbound ship passing in an opposing convoy at the Canal entry (or reentry) points.

Do all the following

1. Create a poster that presents your solution in a fully detailed, organized, and readable manner, so that an individual with no background knowledge can understand the solution.
2. Create a 3 minute video presenting your poster and walking through your solution.
3. Submit a 1-2 page original paper on the field of mathematics known as *Mathematical Optimization.*

See Mr. Ambrose or Ms. Luna in the Fall and be a Ramona Scholar!