Erdös Camp
Thinking Sample

Instructions

Here are two problems we would like for you try your hand at. They serve two purposes:

1. For you to decide whether this camp is something you are interested in. If these problems don't make you think, wonder, and play, Erdös Camp may not be for you.
2. For us to get an idea of how our incoming campers think before they even arrive. We will take your ideas and use them to determine what types of questions we will ask and how we can share your ideas with other students to see the joy in collaborative problem-solving.

There are two problems. Each problem has three parts. Here is how they are set up:

- Part 1 is a fun problem you should be able to find a solution you are confident in.
- For part 2, we do not expect you to find the answer, but we would still like to see what you can figure out.
- Part 3 is an extra hard problem just for fun to get an idea of the challenging problems we will tackle during camp.

Parents:

Some of the language and vocabulary in these problems are advanced. You can help explain the problem to your child and make sure they understand what is being asked. Then, please let them do the mathematical problem-solving independently.

If you have any questions or require clarification, reach out to Meghan Vetter at mvetter@thegraysonschool.org.

Please send the completed work sample to Jess Curtiss at jcurtiss@thegraysonschool.org no later than July 10 to participate in the camp.

Name: ____________________ Rising Grade: ____________________

Problem A: Secret Messages and Avoiding Spies

You are on a secret mission to deliver a message. You need to get from start to end as quickly as possible, so you will only move right or down. You also cannot move diagonally.

1. How many different ways are there to get from the start to the end?

Start			
			End

2. A roadblock has been put in your path. How many ways are there now if you must avoid the roadblock? If you could place the roadblock on any square (except the start or end) to limit the paths for message delivery, where would you place it?

Start			
			End

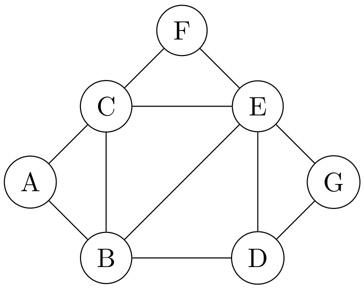
3. You are now on a 5 by 5 grid. An enemy is trying to intercept your message. Each time you travel by one square (right or down), the enemy sees where you went and moves one square also. The enemy can move right, left, up, or down. What strategy might your enemy use to increase their chances of catching you? What strategy would you use to decrease your chances of being caught?

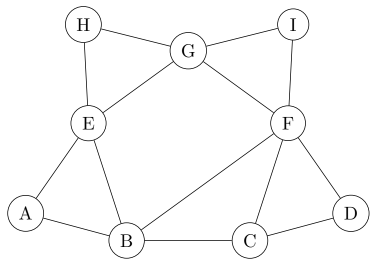
Start				Enemy Start
				End

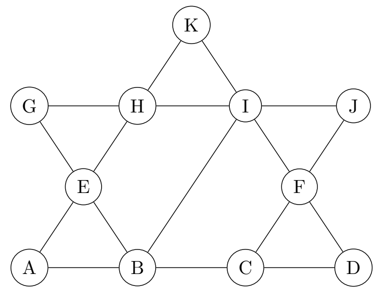
Problem B: Sharing Messages from City to City

You are on a mission to save the world. There is a message system in place with messengers at each location who can pass on information to any connected city. In the beginning, select which city to airdrop the message to. Then, decide how to disseminate the information to every other city from there. To save time (and writing), the name of each city has been abbreviated to its first letter.

1. Each time a messenger travels to another city, it takes one day. Multiply messengers can travel at the same time and each city has ten messengers stationed there. What would you do to get the message out to every city in as few days as possible? Find a strategy for each of the three maps.
   You might consider using a different color for each step. For example, use yellow for the first trips from the city, red for the next trips...

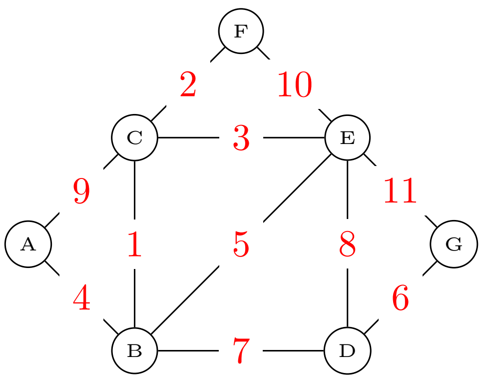






2. You have found a way for messengers to make the trips extremely quickly, so time is no longer a concern. Now, a new challenge arises! On each trip the messengers take, there is a greater chance of the message being intercepted by the enemy. What would you do to get the information to every city in as few trips as possible? Would you use the same strategy as question 1? If yes, explain why. If no, give a better strategy.

3. Now consider the labels on the lines. This is the cost of travel for each trip. What is the least expensive way to get the message to every city?



For students who would like even more brain food, here are a few interesting tangents we enjoyed wondering about when designing these questions. Feel free to think about them too!

Problem A:

- You tried finding the paths on a 4x4 square. How many paths are there on a 2x2 square? A 3x3 square?
- Have you noticed a pattern for how many paths there are based on the size of the square? If so, what is it?

Problem B:

- What other maps of cities could you find a message delivery system for? What if the cities are all in a row? Or in a circle?

Of course, there are more questions to ponder, but we will save those for camp! We hope to see you there.