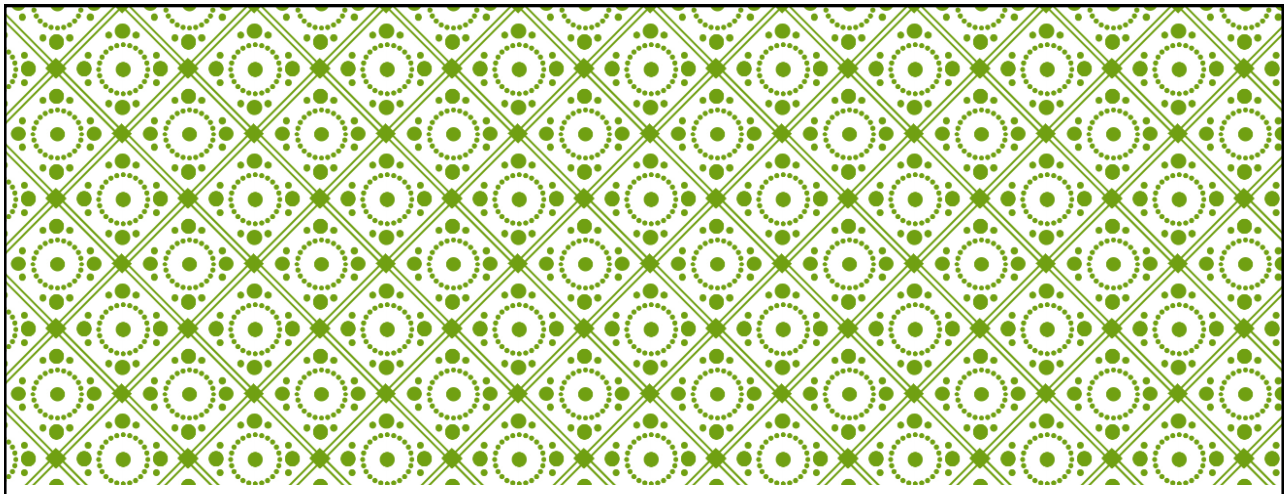

CSCI 2200
FOUNDATIONS OF COMPUTER SCIENCE

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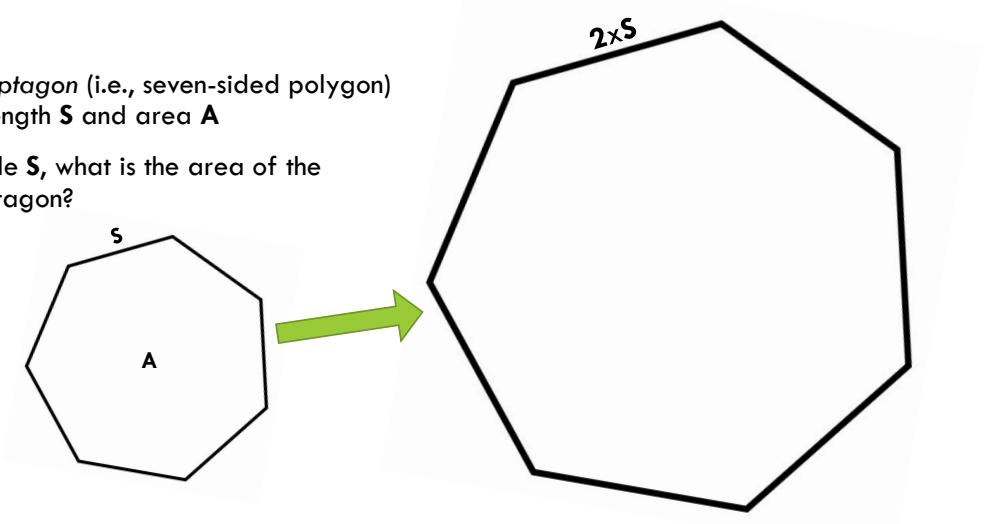
Fall 2022

EXAMPLES – TWO-DIMENSIONAL GEOMETRY

Given a *heptagon* (i.e., seven-sided polygon) with side length **S** and area **A**

If we double **S**, what is the area of the larger heptagon?



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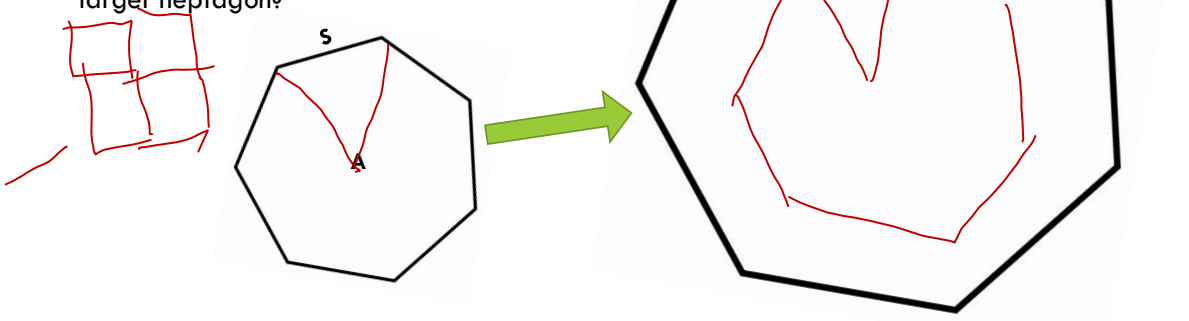


EXAMPLES – SHUTTLE BUS TIMINGS

Bus station **A** dispatches buses every six minutes

At bus station **B**, the manager rolls a standard six-sided die every minute and dispatches a bus if the roll is a three

Assume buses run 24 hours per day, seven days a week

How many buses leave per day?

What is the average time between buses?

If you arrive at a bus stop, how many minutes do you have to wait on average?

Answering these (and other important) questions requires discrete math!

EXAMPLES – MODELING COVID-19

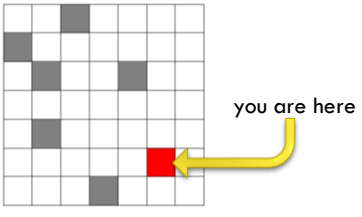
A square gets infected if two or more adjacent neighbors (N/S/E/W) are infected

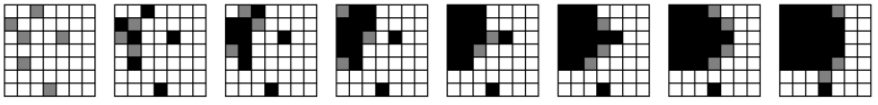
Given six initial gray infections, who gets infected?

Minimum number of infections to infect everyone?

Given a finite number of vaccinations available, who should we immunize?

How do we model this?





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EXAMPLES – FRIENDSHIP (SOCIAL) NETWORKS

Model friendships (or acquaintances or etc.) using nodes to represent people and edges to represent the friendship relationship

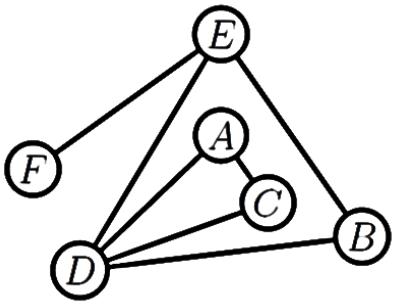
Who is popular? Who is not…?

Who would you advertise a new product to?

Definition: in a *friendship clique*, everyone is friends with everyone else

How many friendship cliques are there?

What might a friendship clique represent?



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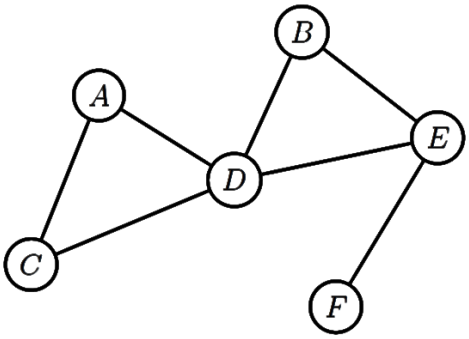
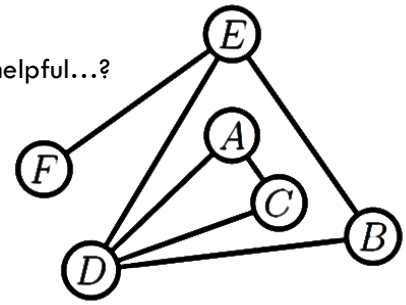
EXAMPLES – FRIENDSHIP (SOCIAL) NETWORKS

These two graphs are equivalent (i.e., isomorphic):



Is that helpful…?



EXAMPLES – PÓLYA'S MOUSE

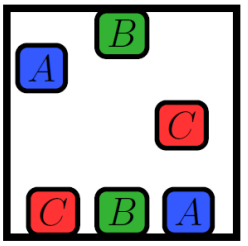
"A mouse tries to escape from an old-fashioned cage. After many futile attempts bouncing back-and-forth, thumping his body against the cage bars, he finally finds one place where the bars are *slightly* wider apart. The mouse, bruised and battered escapes through this small opening, and to his elation, finds freedom." – Pólya

Connect tiles of the same letter with wires

Wires cannot cross, enter tiles, or leave the box

Can this be done?

If not, can you prove it is impossible?



Answering these (and other important) questions requires discrete math!

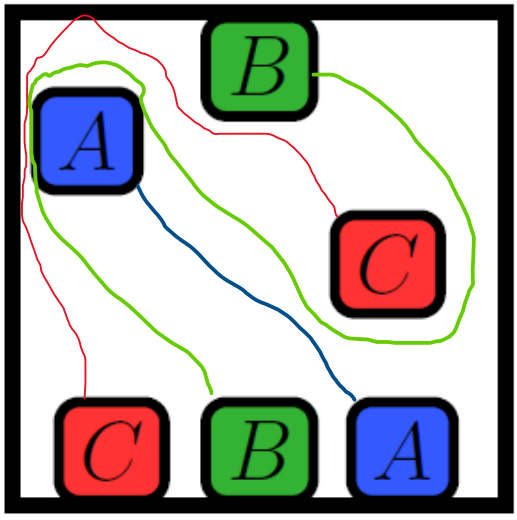
EXAMPLES – PÓLYA'S MOUSE – SOLUTION

Understand and model the problem you are trying to solve

Tinker to better understand the problem (look for easy cases)

Be bold and formulate a conjecture about the problem

Prove the conjecture (if you can…)



WHAT NEXT…?

Get the textbook

Tinker with the problems shown on the last few slides

Read the Preface and Chapters 0 and 1 of the textbook

Turn on Submitty email notifications

Re-read the syllabus slides and post any questions on the Discussion Forum

Email me directly (goldsd3@rpi.edu) about any registration/SIS issues

See you on Friday…