MaPP Challenge '19 – To Infinity And Beyond

Mathematical Puzzle Programs
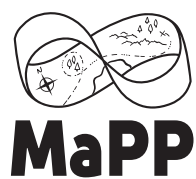
Version 2018/08/31

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Part I

About

MaPP Challenge '19 - To Infinity And Beyond
Scoresheet

Game Control and your team each have a copy of this scoresheet. When submitting solutions, bring your team's copy to Game Control to be updated.

School Name	Team Name/ID	League

Opening Puzzle: Where No One Has Gone Before — Used to unlock Main Puzzles

Main Puzzles
1500VP for each Main Puzzle solved; Time Solved used to break ties in VP

		Time Solved	VP Earned
1	Clontz - Hamiltonian Decompositions		
2	Carrigan - Art gallery problems		
3	Couch - Matroids(?)		
4	Clontz/Varagona - Idempotent Relations		

Cryptic Puzzles
500VP for each Cryptic Puzzle solved; Time Solved used to break ties in VP

		Time Solved	VP Earned
1	Clontz - Constellations		
2	Clair - Space Travel		
3	Clontz/Reiter - KenKenKen		
4	Clontz/Harshbarger - Word Problem		

Bonus Puzzle
Up to 500VP for best submission

Holshouser - Origami	First Submission	Second Submission	Third Submission	VP Earned

Metapuzzle
1000VP if solved, Time Solved used to break ties in VP

	Time Solved	VP Earned
???		

Up to 500VP if earned, Time Acquired used to break ties in VP

	Time Acquired	VP Earned
Additional VP		

10,000VP Maximum

Total VP Earned

Part II

Puzzles

Where No One Has Gone Before

Today's adventure begins as your team's ship launches into space. Space Fleet has provided you a **Galaxy Map** to guide you on your way. (Actually, several copies have been provided to you! Take care of these copies, as you will refer to the Galaxy Map several times throughout the adventure.) Each dot on the map refers to a different solar system, named on the map.

Space Fleet commands you to first visit the four **Core Systems** of the galaxy. You can recognize a Core System by the fact that it is located in the middle of a regular polygon (all sides are the same length) formed by either three, four, five, or seven other systems. An example is shown below.

Where No One Has Gone Before
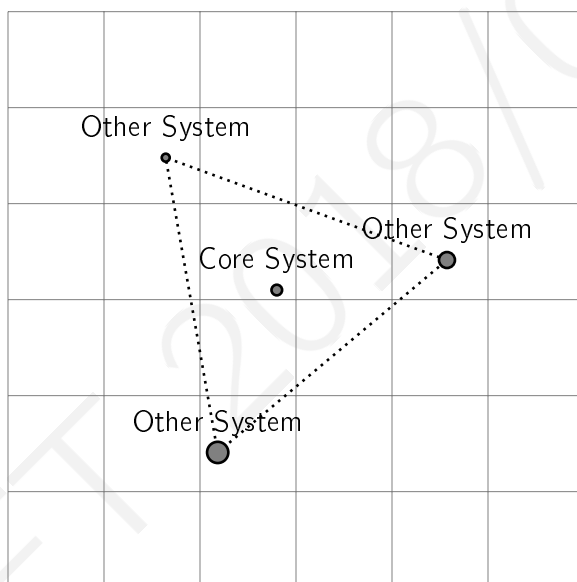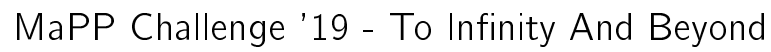
Galaxy Chart
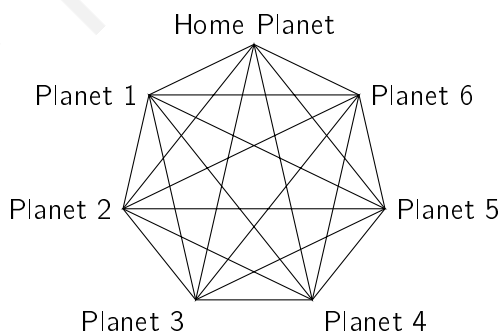
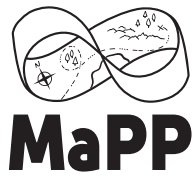# MaPP Challenge '19 - To Infinity And Beyond
Good News Everyone
Main Puzzle 1

On this system, you find yourself caught up in the misadventures of PlanEx, an intergalactic delivery company led by the eccentric old mathematician Dr. Farnswell. In the name of good relations between galaxies, you agree to help him with the following puzzle.

- PlanEx makes deliveries to six different planets (not including their own) on Mondays, Wednesdays, and Fridays.

- Each day, a different company on each planet receives the delivery, listed below in order of Mon/Wed/Fri.

    - Planet 1: Venus Co. / Rave Co. / Photon Co.
    - Planet 2: Comet Co. / Solar Co. / Light Co.
    - Planet 3: Belt Co. / Techno Co. / Alarm Co.
    - Planet 4: Acme Co. / Alpha Co. / Uranium Co.
    - Planet 5: Oxygen Co. / Helmet Co. / Neo Co.
    - Planet 6: Star Co. / Orion Co. / Tele Co.

- Their ship may travel directly between any two planets, but due to galactic regulations, they may not travel directly between the same two planets twice in the same week (regardless of direction).

Can you help Farnswell complete his Delivery Schedule? If so, the missing company names will reveal one of the hidden codewords.

Good News Everyone

Delivery Schedule

	1st	2nd	3rd	4th	5th	6th
Monday	Comet	◯	Venus	Oxygen	Belt	◯
Wednesday	◯	◯	Solar	◯	Helmet	Alpha
Friday	◯	Light	◯	◯	◯	Photon

Home Planet → (Monday, Wednesday, Friday)

(Monday, Wednesday, Friday) → Home Planet

Good News Everyone

Solution

The numbers below coorrespond to each company's planet.

	1st	2nd	3rd	4th	5th	6th
Monday	**Comet** 2	Acme 4	**Venus** 1	**Oxygen** 5	**Belt** 3	Star 6
Wednesday	Techno 3	Rave 1	**Solar** 2	Orion 6	**Helmet** 5	**Alpha** 4
Friday	Neo 5	**Light** 2	Alarm 3	Uranium 4	Tele 6	**Photon** 1

Home Planet → ... → Home Planet

Using the first letters of the filled-in company names, the solution ASTRONAUT is revealed.
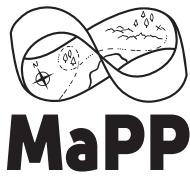
Jumping Through Hyperspace

Main Puzzle 4

On this system, your adventure takes you to a racous space saloon, swapping tales with Jan Duet, an infamous smuggler with a heart of gold.

She explains to you that in the early days of hyperspace travel, engines could instantly transport ships between only certain locations on a six-lightyear continuum. These options were illustrated using a graph, where the horizontal coordinate represents starting positions, and the vertical coordinate represents ending positions.

The goal of a hyperspace engine is to be **ideal**: the collection of possible destinations from each point using exactly one teleportation should be exactly the same as the collection of possible destinations using exactly two teleportations.

This means Example A is not ideal. Position 1 teleports to positions 5 and 6, but from positions 5 and 6, there are two problems: a new destination 3 can be reached, and the destiation 5 can no longer be reached.

However, Example B is ideal. From 0, any position can be reached after either one or two teleportations. From 2, positions 3 and 6 can be reached after either one or two teleportations. From 4, only position 6 can be reached after one or two teleportations. From 5.5, positions 5.5 and 6 can be reached after one or two teleportations. And so on.

Jan suggests that you review your **Hyperspace Engines** document; perhaps the illustrations representing ideal engines will reveal a hidden message?
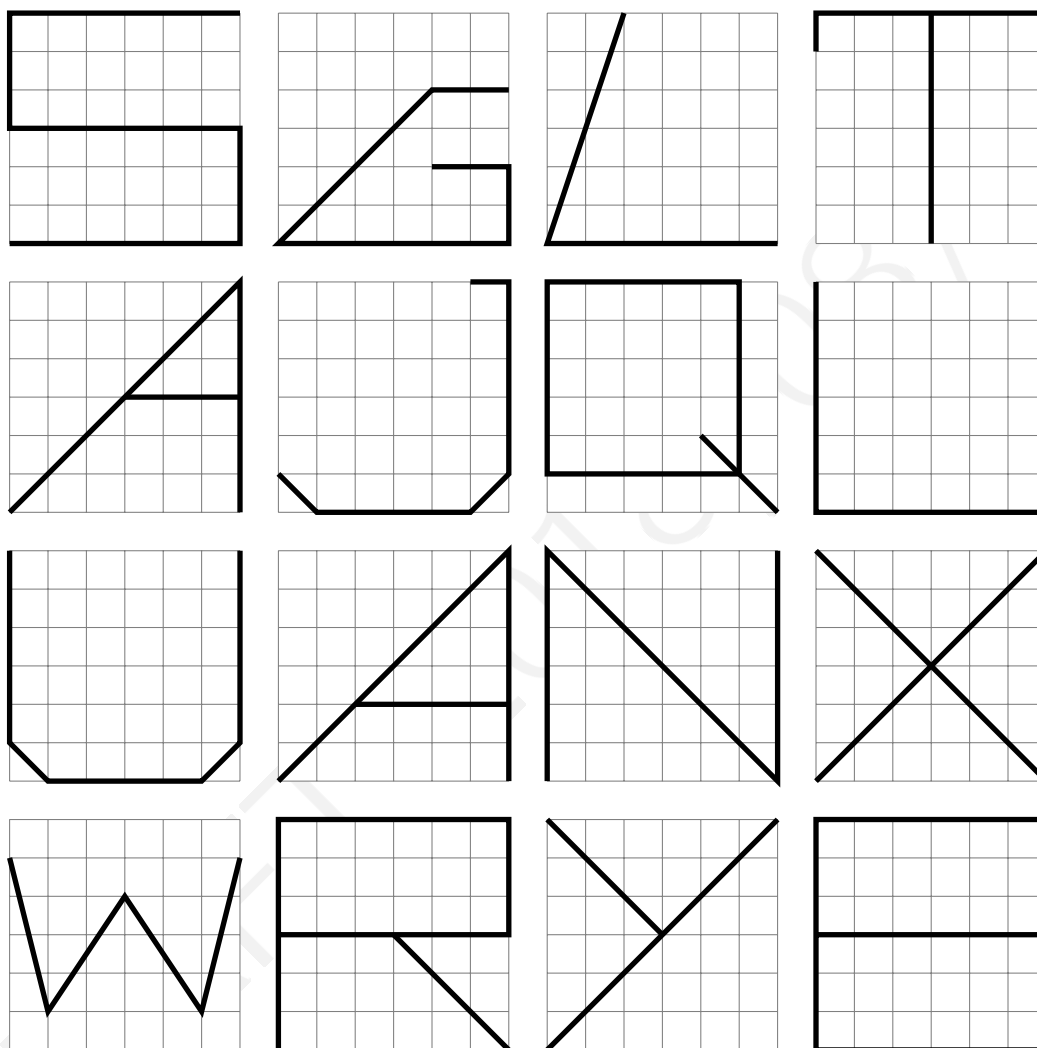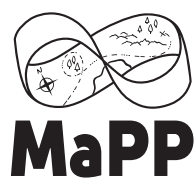

Example A: non-ideal
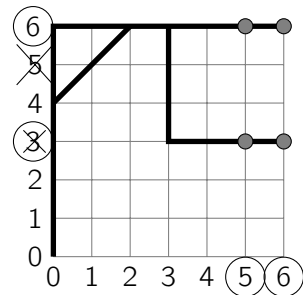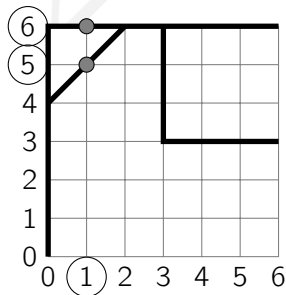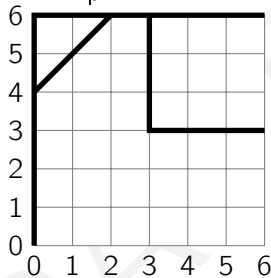
Example B: ideal
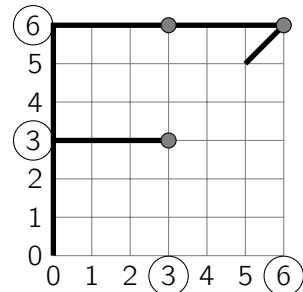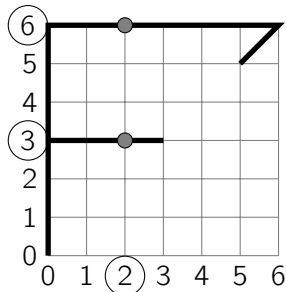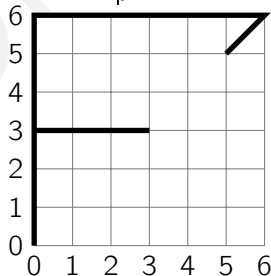
Jumping Through Hyperspace

Hyperspace Engines

Word Problem

Cryptic Puzzle 4
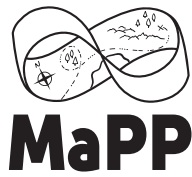
Word Problem

Mysterious Message

For a time I tried carefully to detail
biographies via large crawling testtubes...

Lamentably, composing all of the
anecdotes when curbed by finite
room, the current strategy now is
cruelly killing sound handwriting.

To convince others to sidestep

terrible lapses I erstwhile created.,

/ entreat humankind, ban laughable

cuneiform!

Part III

Solutions
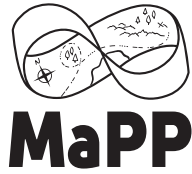
Solutions

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