



MaPP Challenge '19 - To Infinity And Beyond

Mathematical Puzzle Programs



MaPP Challenge '19 - To Infinity And Beyond

Table of Contents

I About	3
Scoresheet	4
II Puzzles	5
Where No One Has Gone Before	6
Opening Puzzle	6
Galaxy Chart	7
Good News Everyone	8
Main Puzzle 1	8
Delivery Schedule	9
Solution	10
Jumping Through Hyperspace	11
Main Puzzle 4	11
Hyperspace Engines	12
Word Problem	13
Cryptic Puzzle 4	13
Mysterious Message	14
III Solutions	15
Solutions	16

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

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

Cryptic Puzzles

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

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

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

Additional VP	Time Acquired	VP Earned
---------------	---------------	-----------

10,000VP Maximum

Total VP Earned

--

Part II

Puzzles



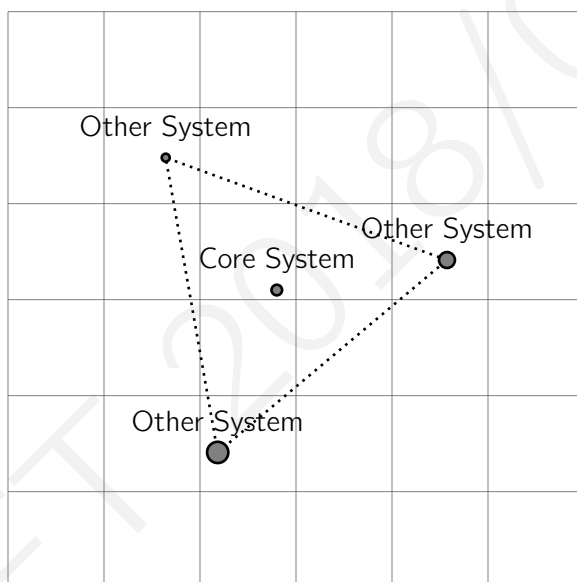
MaPP Challenge '19 - To Infinity And Beyond

Where No One Has Gone Before

Opening Puzzle

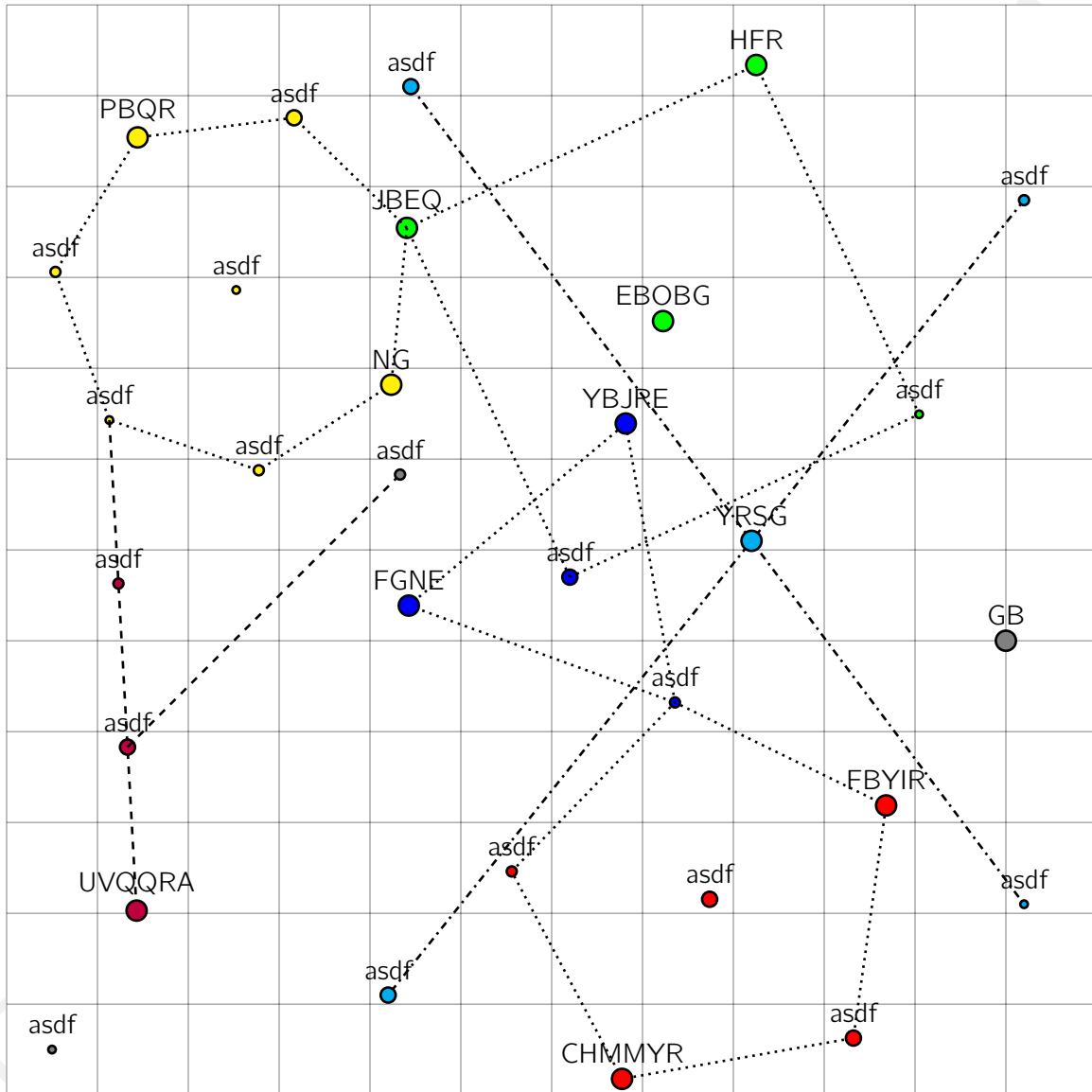
Today's adventure begins as your team's ship launches into space. Space Fleet has provided you a **Galaxy Map** to guide you on your way. (Actually, several copies have been provided to you! Take care of these copies, as you will refer to the Galaxy Map several times throughout the adventure.) Each dot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

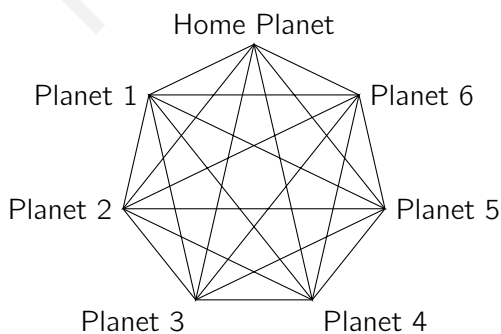
Good News Everyone

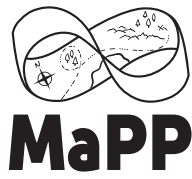
Main Puzzle 1

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.



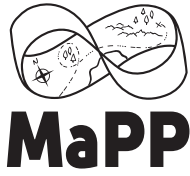


MaPP Challenge '19 - To Infinity And Beyond

Good News Everyone

Delivery Schedule

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



MaPP Challenge '19 - To Infinity And Beyond

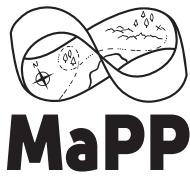
Good News Everyone

Solution

The numbers below correspond to each company's planet.

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

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



MaPP Challenge '19 - To Infinity And Beyond

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.

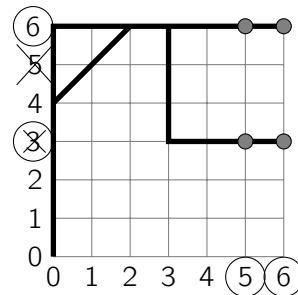
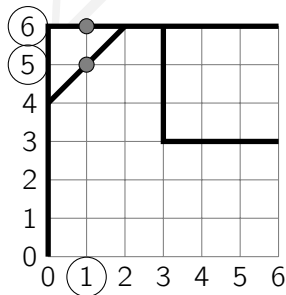
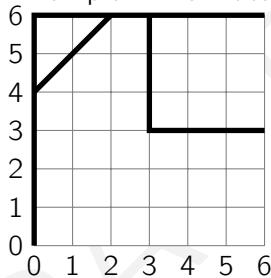
The goal of a hyperspace engine is to be **ideal**: the collection of possible destinations from each point using exactly one teleportation should be exactly the same as the collection of possible destinations using exactly two teleportations.

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 destination 5 can no longer be reached.

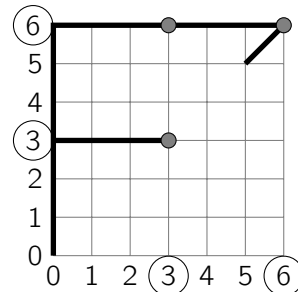
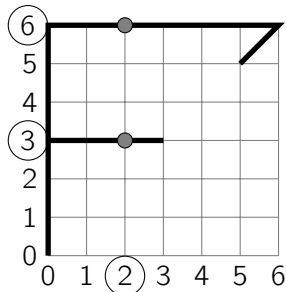
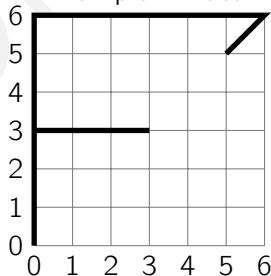
However, Example B is ideal. From 0, any position can be reached after either one or two teleportations. From 2, positions 3 and 6 can be reached after either one or two teleportations. From 4, only position 6 can be reached after one or two teleportations. From 5.5, positions 5.5 and 6 can be reached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

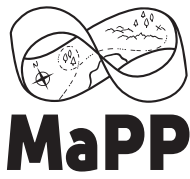
Jan suggests that you review your **Hyperspace Engines** document; perhaps the illustrations representing ideal engines will reveal a hidden message?

Example A: non-ideal



Example B: ideal

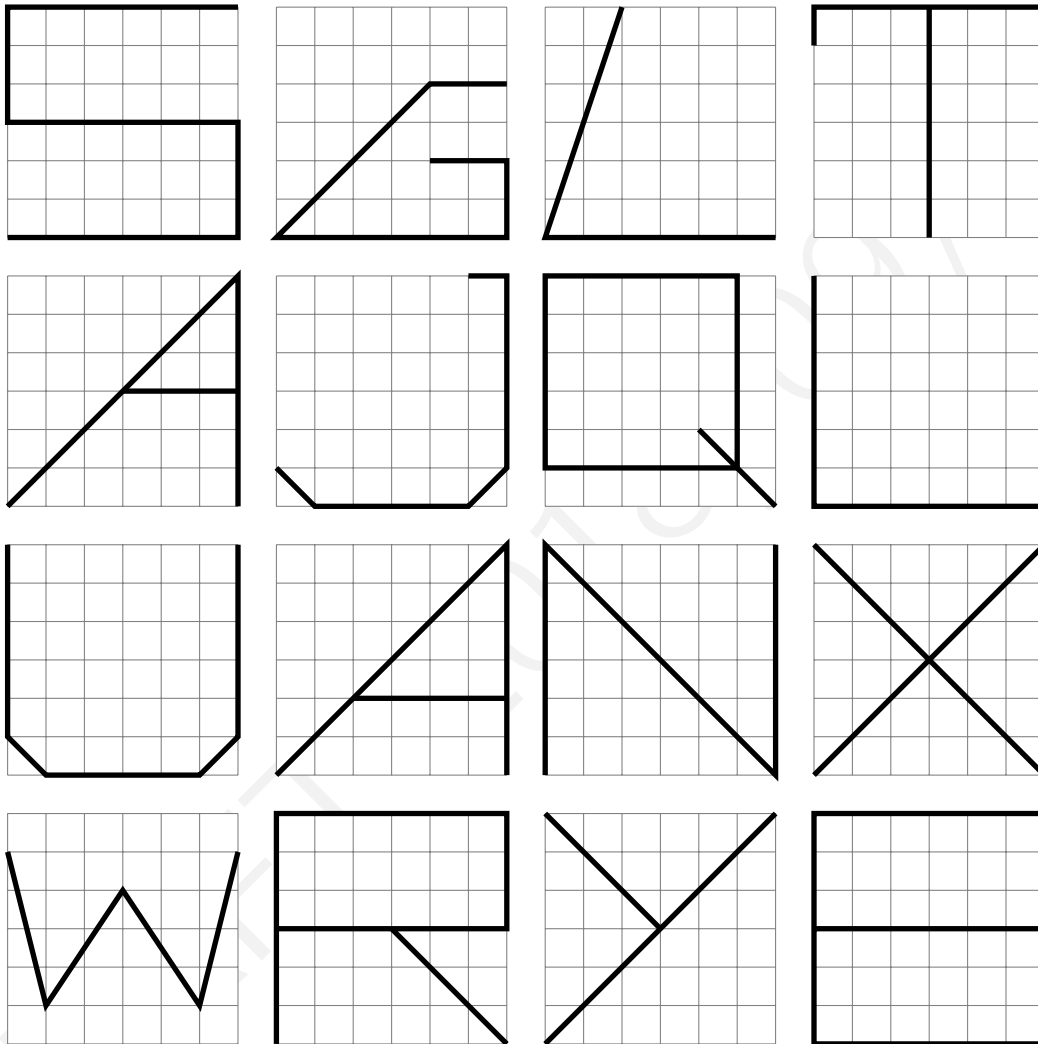


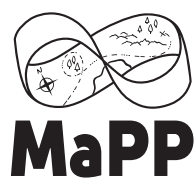


MaPP Challenge '19 - To Infinity And Beyond

Jumping Through Hyperspace

Hyperspace Engines





MaPP Challenge '19 - To Infinity And Beyond

Word Problem

Cryptic Puzzle 4

DRAFT 2018/09/01



MaPP Challenge '19 - To Infinity And Beyond

Word Problem

Mysterious Message

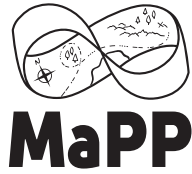
*For a time I tried carefully to detail hieroglyphics,
via large crawling textboxes.*

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

*To sidestep possible oversights /
markedly loathe, I entreat humankind,
ban laughable cuneiform!*

Part III

Solutions



MaPP Challenge '19 - To Infinity And Beyond Solutions

Suspendisse vitae elit. Aliquam arcu neque, ornare in, ullamcorper quis, commodo eu, libero. Fusce sagittis erat at erat tristique mollis. Maecenas sapien libero, molestie et, lobortis in, sodales eget, dui. Morbi ultrices rutrum lorem. Nam elementum ullamcorper leo. Morbi dui. Aliquam sagittis. Nunc placerat. Pellentesque tristique sodales est. Maecenas imperdiet lacinia velit. Cras non urna. Morbi eros pede, suscipit ac, varius vel, egestas non, eros. Praesent malesuada, diam id pretium elementum, eros sem dictum tortor, vel consectetur odio sem sed wisi.

Sed feugiat. Cum sociis natoque penatibus et magnis dis parturient montes, nascetur ridiculus mus. Ut pellentesque augue sed urna. Vestibulum diam eros, fringilla et, consectetur eu, nonummy id, sapien. Nullam at lectus. In sagittis ultrices mauris. Curabitur malesuada erat sit amet massa. Fusce blandit. Aliquam erat volutpat. Aliquam euismod. Aenean vel lectus. Nunc imperdiet justo nec dolor.

Etiam euismod. Fusce facilisis lacinia dui. Suspendisse potenti. In mi erat, cursus id, nonummy sed, ullamcorper eget, sapien. Praesent pretium, magna in eleifend egestas, pede pede pretium lorem, quis consectetur tortor sapien facilisis magna. Mauris quis magna varius nulla scelerisque imperdiet. Aliquam non quam. Aliquam porttitor quam a lacus. Praesent vel arcu ut tortor cursus volutpat. In vitae pede quis diam bibendum placerat. Fusce elementum convallis neque. Sed dolor orci, scelerisque ac, dapibus nec, ultricies ut, mi. Duis nec dui quis leo sagittis commodo.

Aliquam lectus. Vivamus leo. Quisque ornare tellus ullamcorper nulla. Mauris porttitor pharetra tortor. Sed fringilla justo sed mauris. Mauris tellus. Sed non leo. Nullam elementum, magna in cursus sodales, augue est scelerisque sapien, venenatis congue nulla arcu et pede. Ut suscipit enim vel sapien. Donec congue. Maecenas urna mi, suscipit in, placerat ut, vestibulum ut, massa. Fusce ultrices nulla et nisl.