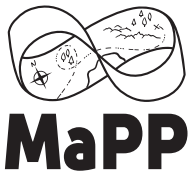
MaPP Challenge '19 - To Infinity And Beyond

Mathematical Puzzle Programs

DRAFT 2018/09/08

Version 2018/09/08



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Part I

About

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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	Good News Everyone	Time Solved	VP Earned
2	No One Can Hear You Scream	Time Solved	VP Earned
3	Wibbly-Wobbly Timey-Wimey	Time Solved	VP Earned
4	Jumping Through Hyperspace	Time Solved	VP Earned

Cryptic Puzzles

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

1	TODO	Time Solved	VP Earned
2	Clair - Space Travel	Time Solved	VP Earned
3	Clontz/Reiter - KenKenKen	Time Solved	VP Earned
4	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

To The Rescue!	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

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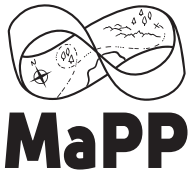

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Codes, Etc.

I'm reworking this, but we will provide at least the following to players:

- A=1,B=2,etc
- Morse
- Braille
- Binary
- ROT13

We will also provide a sheet of commonly used numbers and formulas such as $a^2 + b^2 = c^2$,

$\pi \approx 3.14159265358979323846264338327950288419716939937510582097494459230781640628620899862$

$A = \frac{1}{2}bh$, etc.

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Part II

Puzzle Book

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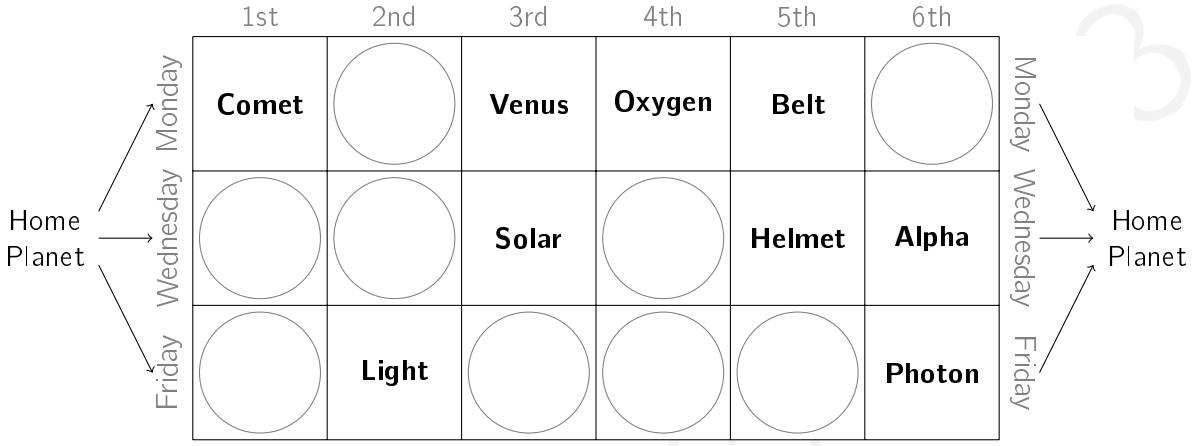
Good News Everyone

Delivery Schedule



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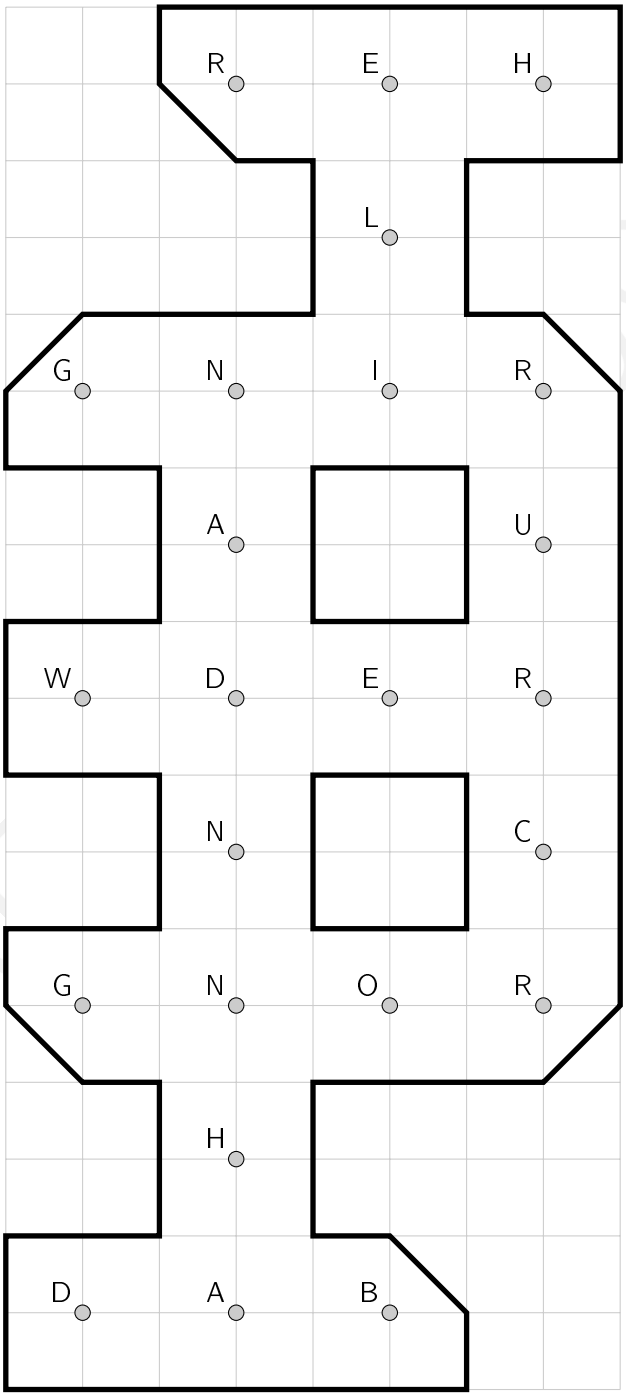
No One Can Hear You Scream

Ship Floorplan



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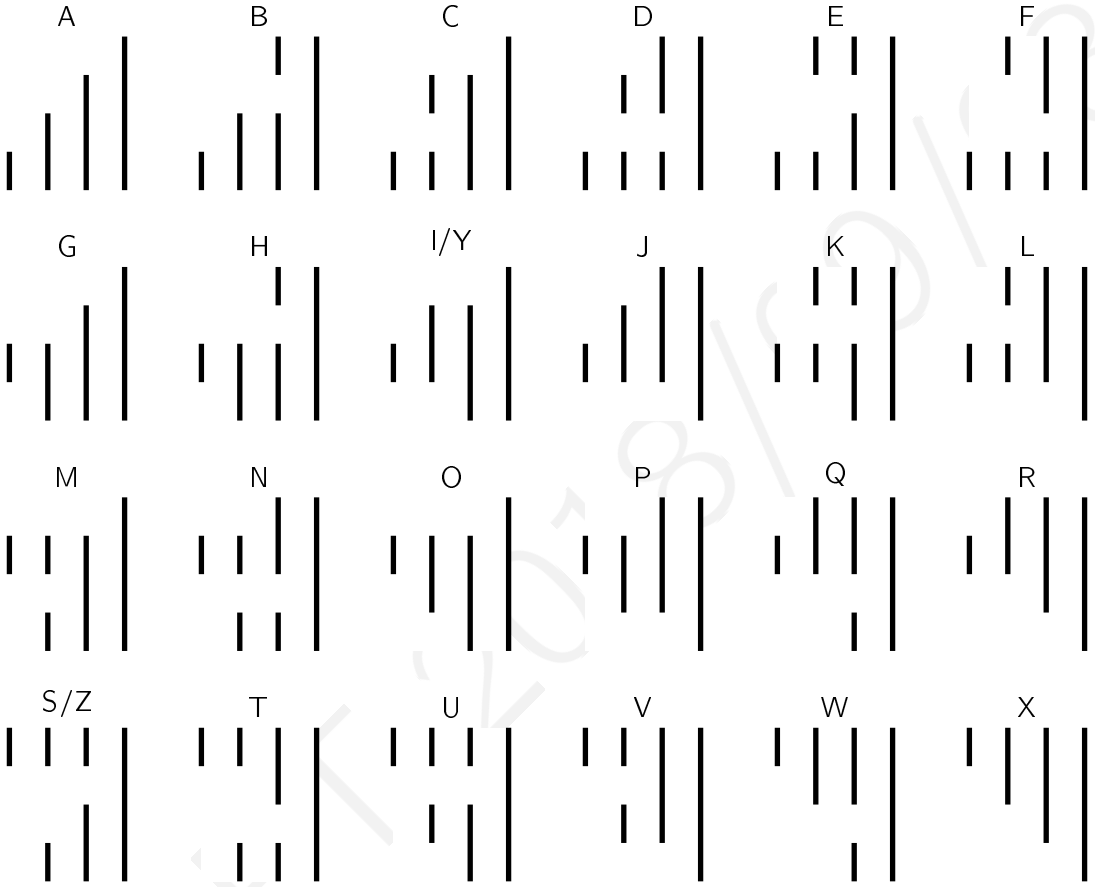
Wibbly-Wobbly Timey-Wimey

Dimensional Barcodes



01-54-62-97-99 19-32-43-48-84 11-49-68-72-80

05-08-57-78-79 20-25-42-91-99 09-40-67-77-82

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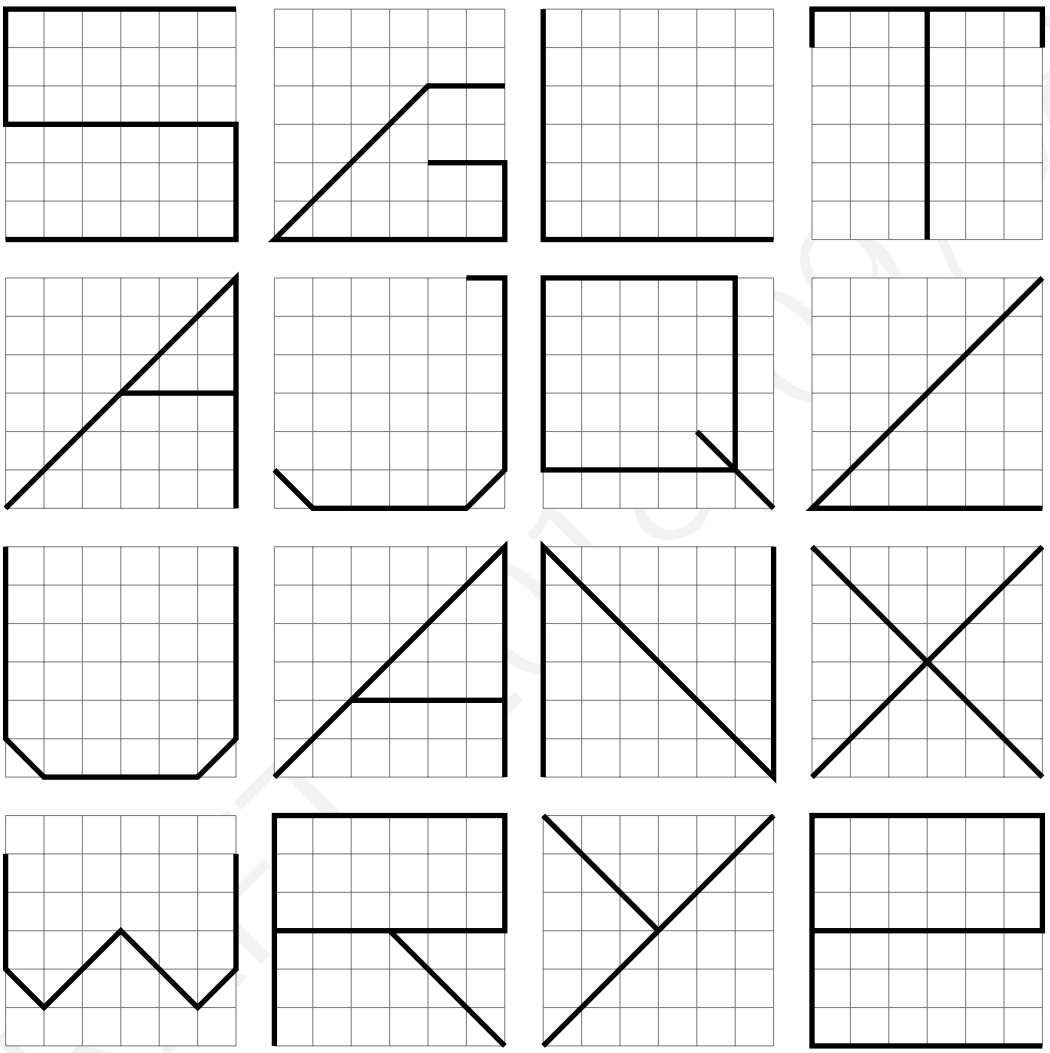
Jumping Through Hyperspace

Hyperspace Engines



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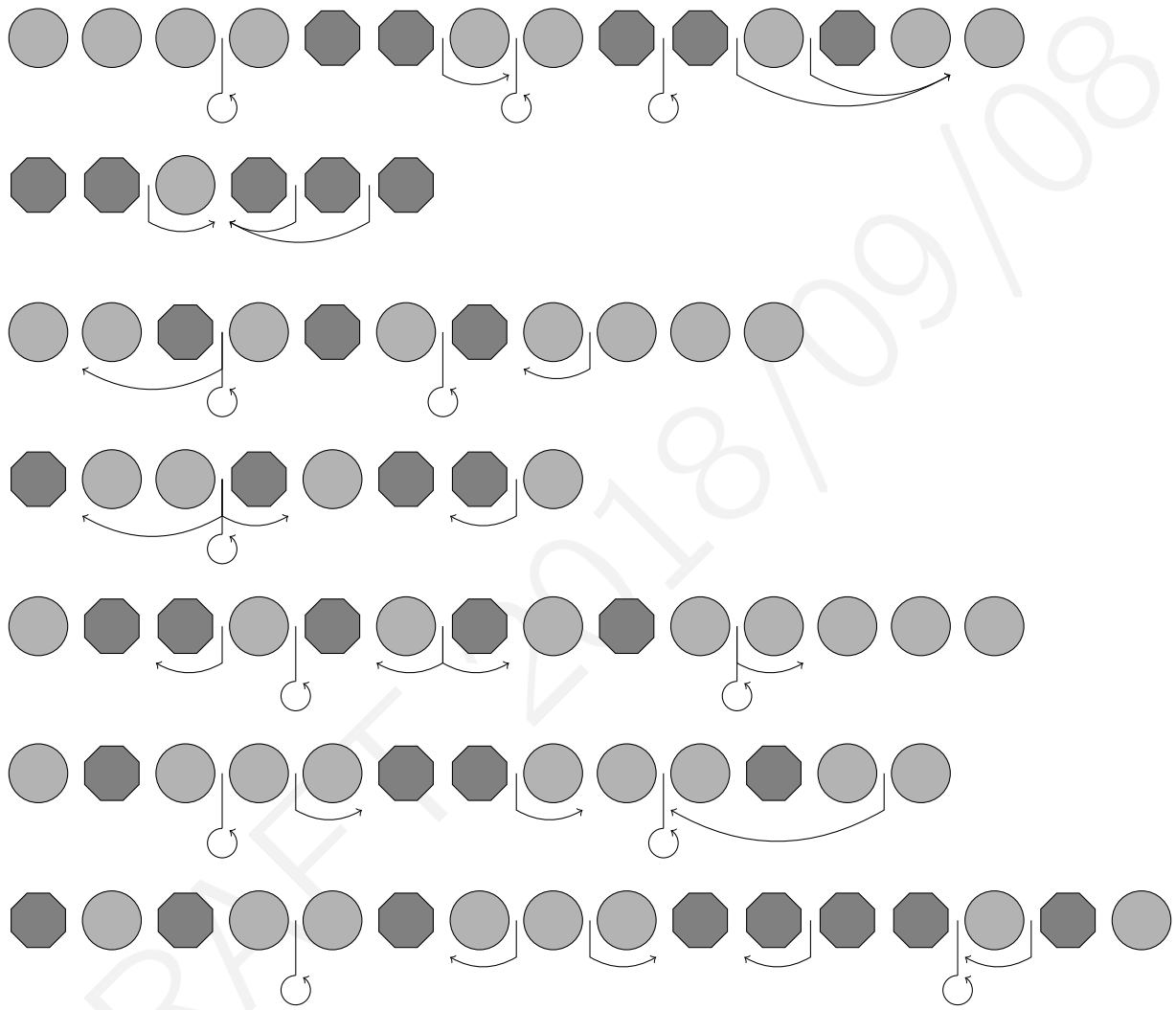
Hailing Frequencies Open

Bleeps and Bloops



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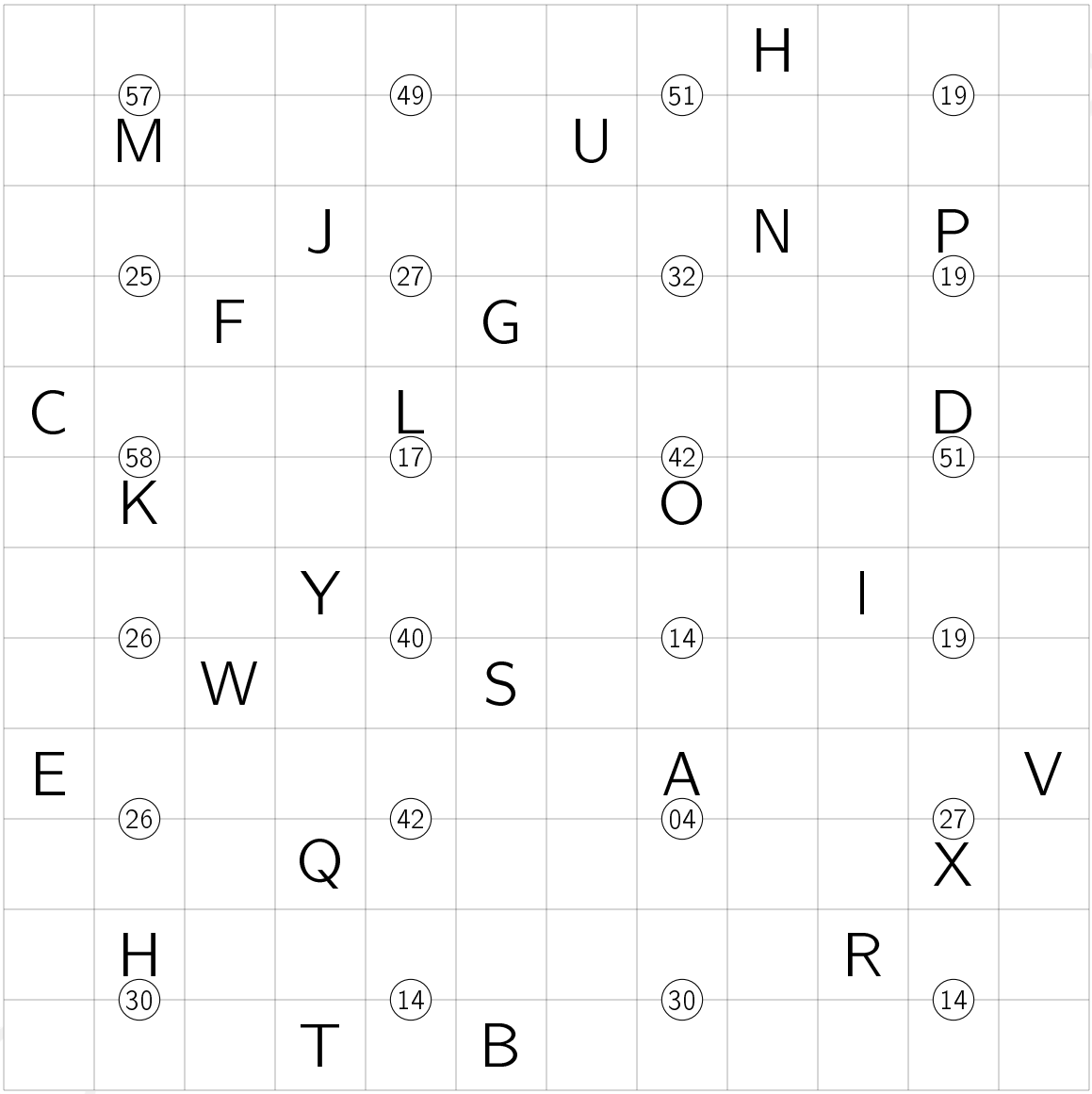
Out of Gas

Reserve Tank Switchboard



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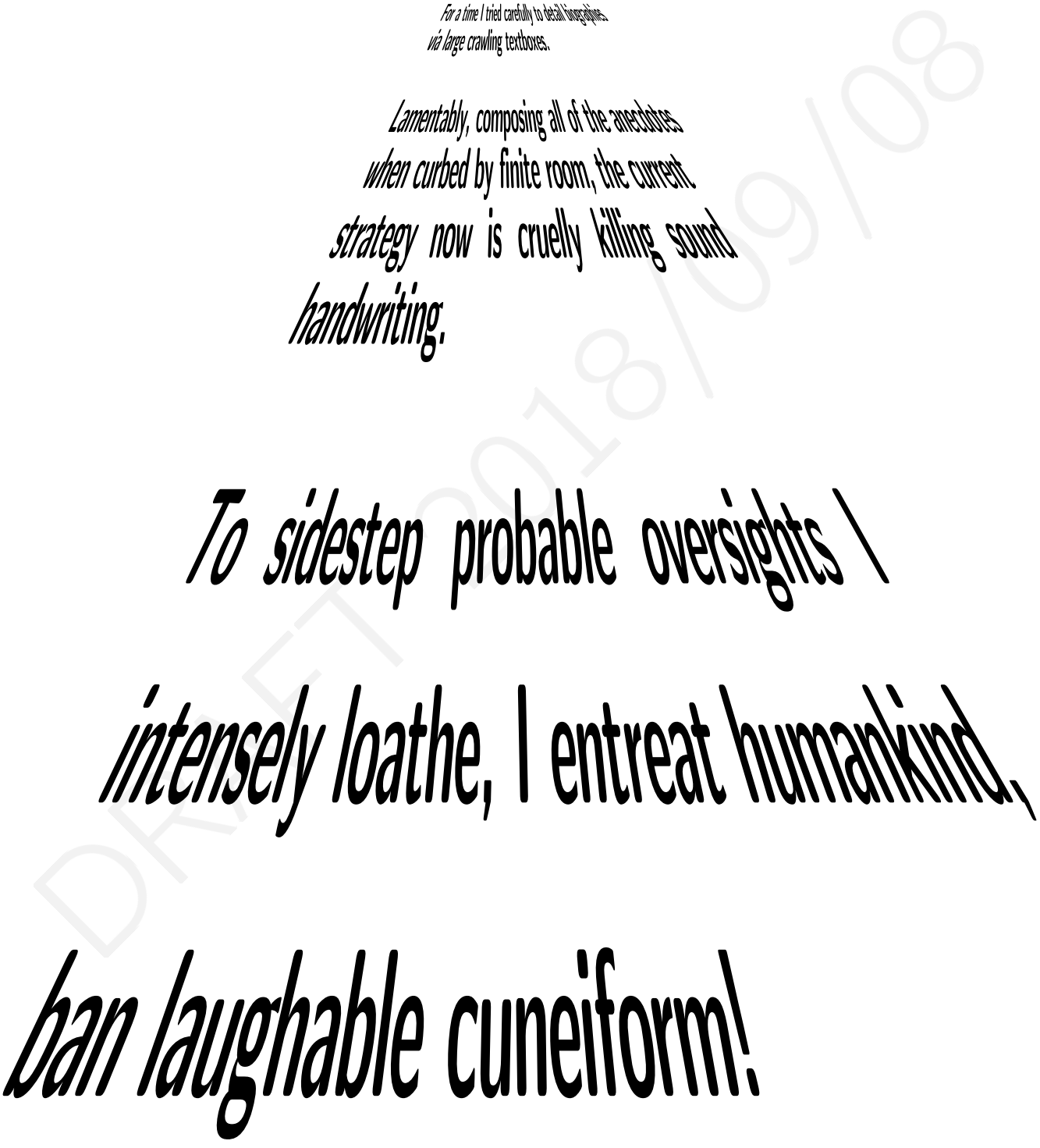
Word Problem

Mysterious Message



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Part III

Flavor Text

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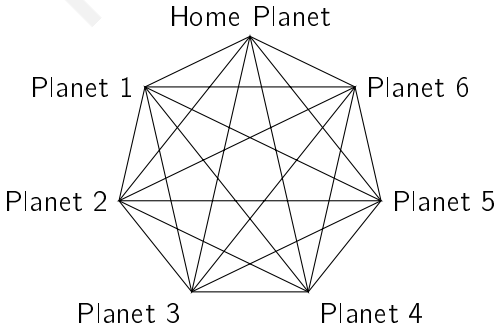
Good News Everyone

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.



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No One Can Hear You Scream

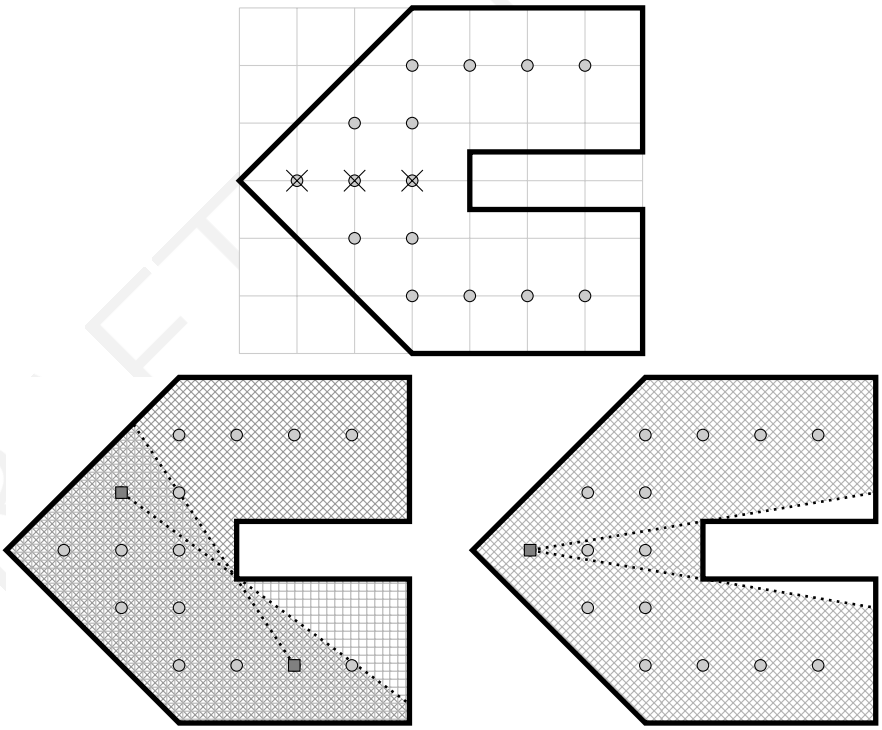
Main Puzzle 2

The one golden rule of space travel is simple: if you find a creepy egg on a previously unexplored planet, DO NOT TAKE IT BACK WITH YOU. Well, it seems Ensign S. Ridley didn't get the memo, as after a routine check on one of this system's planets, your crew finds themselves running for their lives as a mysterious alien rampages your ship!

Fortunately, there is protocol for such a situation. On your **Ship Floorplan**, several stations are marked where you can position a robotic guard to defend against the alien. Five guards must be placed such that every point within the floorplan is visible in a straight line from at least one guard.

An example for two guards is illustrated below. As long as one guard is placed within the top two rows, and the other guard is placed within the bottom two rows, the entire area of the floor is safely monitored. But if a guard is placed on any of the three stations in the middle row, there's no possible way for a second guard to monitor both the top and bottom unaccounted areas.

Your task is to identify all the guard stations on the ship that are unusable when using only five guards. In addition to saving your crew from certain death, you will also reveal a secret codeword!



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Wibbly-Wobbly Timey-Wimey

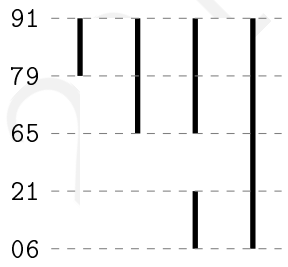
Main Puzzle 3

As though it was always destined to happen, your team has encountered the time-traveling eccentric known only as Professor Whatsit. Well, not so much "encountered" as "collided", as witnessed by the telephone-booth-shaped breach in your starboard hull.

This whacky master of time with a penchant for fezzes and bow ties promises to repair your ship, but he first needs your help preventing a Time Crash. You're not sure what that is exactly (he describes it as a "timey-wimey, wibbly-wobbly sort of thing"), but as it seems to be related to a puzzle, you agree to pitch in.

It seems that the six groups of numbers listed on your **Dimensional Barcodes** sheet coorespond to several dimensions of space-time. To convert each group into a barcode, it seems that the numbers should be written top-to-bottom in order from highest to lowest, and then these numbers should be connected in order of how close they are, with the closest numbers being connected first. The illustration below shows how the group `06-21-65-79-91` can be barcoded.

As luck would have it, the so-called "arc-word" given by these number groups is not only the key to preventing the Time Crash, but it is also one of the secret codewords your team has been looking for!



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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.

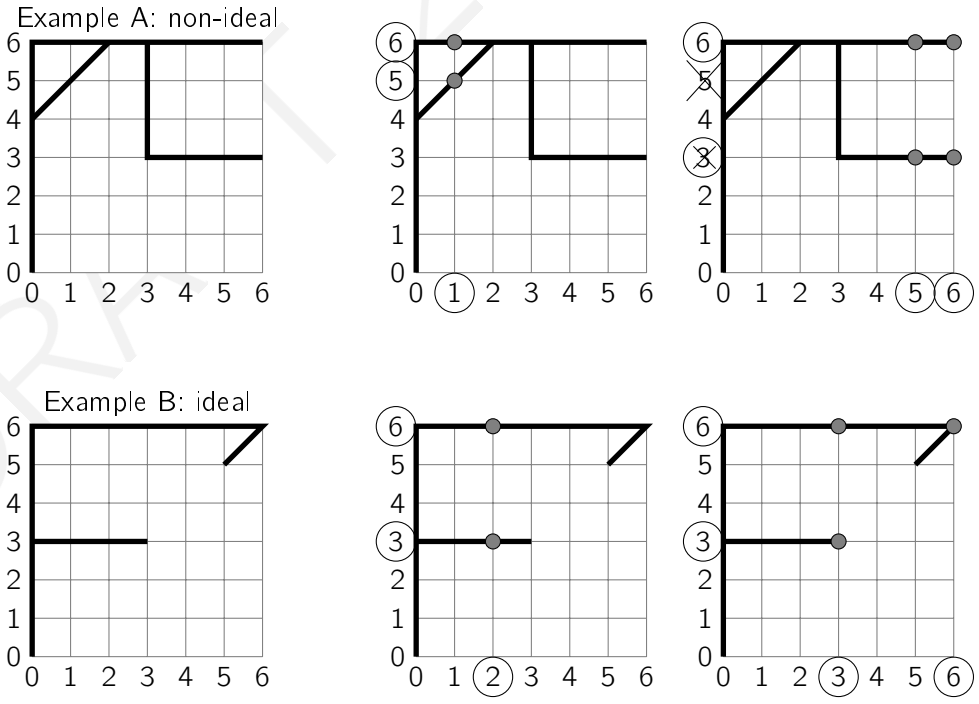
She explains to you that in the early days of hyperspace travel, engines could instantly transport ships between only certain locations on a six-lightyear continuum. These options were illustrated using a graph, where the horizontal coordinate represents starting positions, and the vertical coordinate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

The goal of a hyperspace engine is to be "ideal": the collection of possible destinations from any particular point using exactly one teleportation should be exactly the same as the collection of possible destinations that can be reached from that point 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, positions 5 and 6 can be reached after one or two teleportations. And so on (even for fractional positions!).

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



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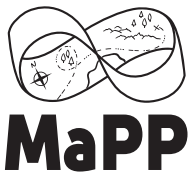

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Hailing Frequencies Open

Cryptic Puzzle 1

Zounds! Your ship has intercepted an extraterrestrial message of **Bleeps and Bloops**, where each octogon represents a *long* bleep and each circle represents a *short* bloop.

Communications Officer Uhuna says she's still working on translating the communiqué, but at first glance the message seems to translate to the following seven words.

- CREWMEN (3)
- DYE (3)
- MATT (2)
- REWIRE (5)
- SWEATED (2)
- URNS (3)
- WENCH (1)

Well, that certainly doesn't seem to be useful information. Perhaps there's more to *space travel* than meets the eye...

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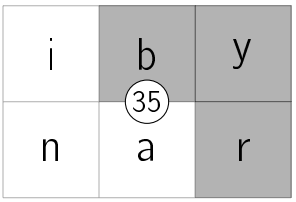
Out of Gas

Cryptic Puzzle 2

Uh-oh... unforunately, you have now found yourself stranded in a stretch of empty space with no fuel left! Maybe these firefly-class engines aren't all they're cracked up to be...

Luckily for you, your *amazing* ship's engineer Faylee does have one trick that just might save your team. There is an emergency reserve tank that can be unlocked by utilizing the **Reserve Tank Switchboard**, if you can puzzle out the meaning of the following image...



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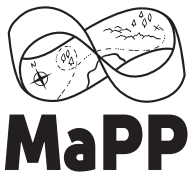

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Word Problem

Cryptic Puzzle 4

As your adventures continue, your ship comes across a **Myserious Message**, projected onto the stars themselves! You put on a John Williams soundtrack, but to no avail, as the strange communication frankly doesn't make any sense.

You contact Jan Duet, who says this isn't the first time she's come across such a message. She suggests that while she's gone to great *lengths* to decipher the true meaning of these dispatches, she always ends up chasing her tail in *circles*.

Wait! Maybe that's it?

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Part IV

Solutions

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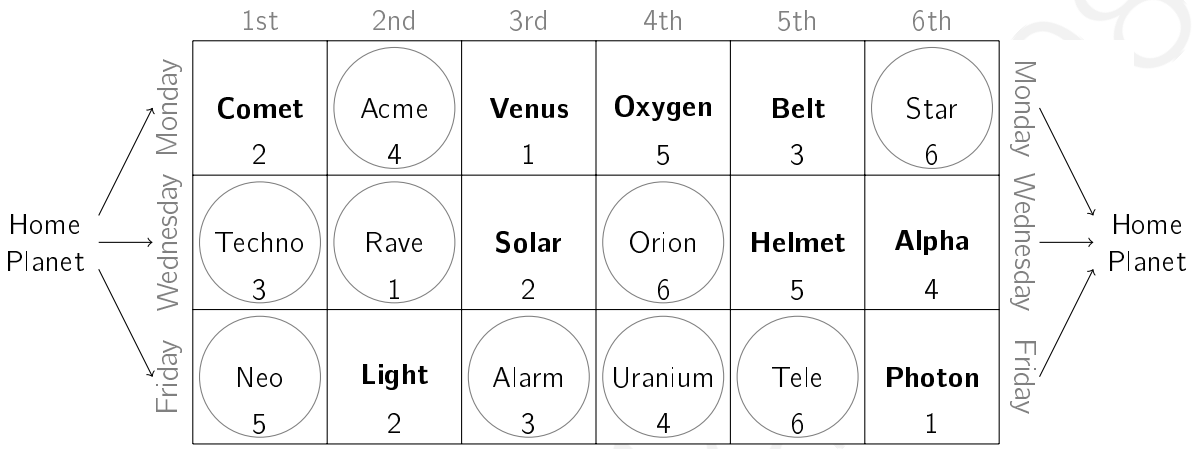
Good News Everyone

Solution

The numbers below coorrespond to each company's planet.



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

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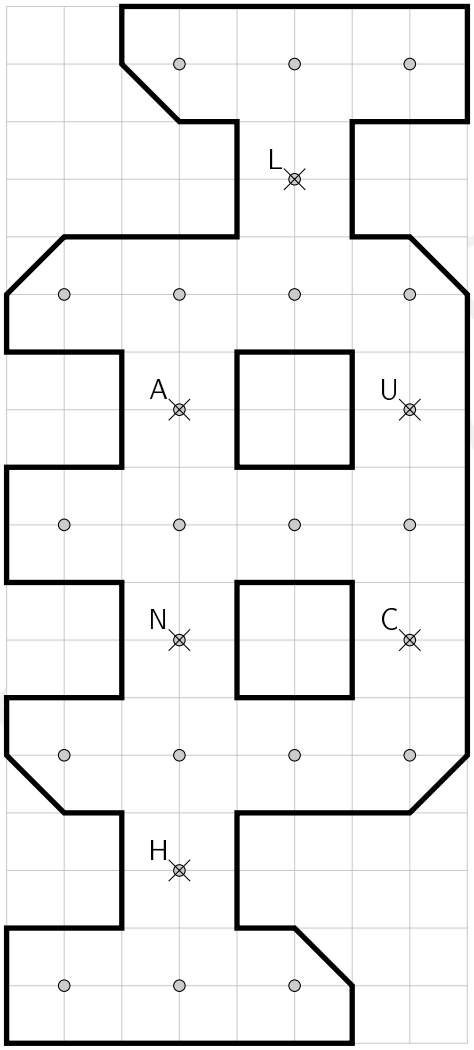
No One Can Hear You Scream

Solution

There are six unusable locations.



The letters for these stations spell out the solution `LAUNCH`.

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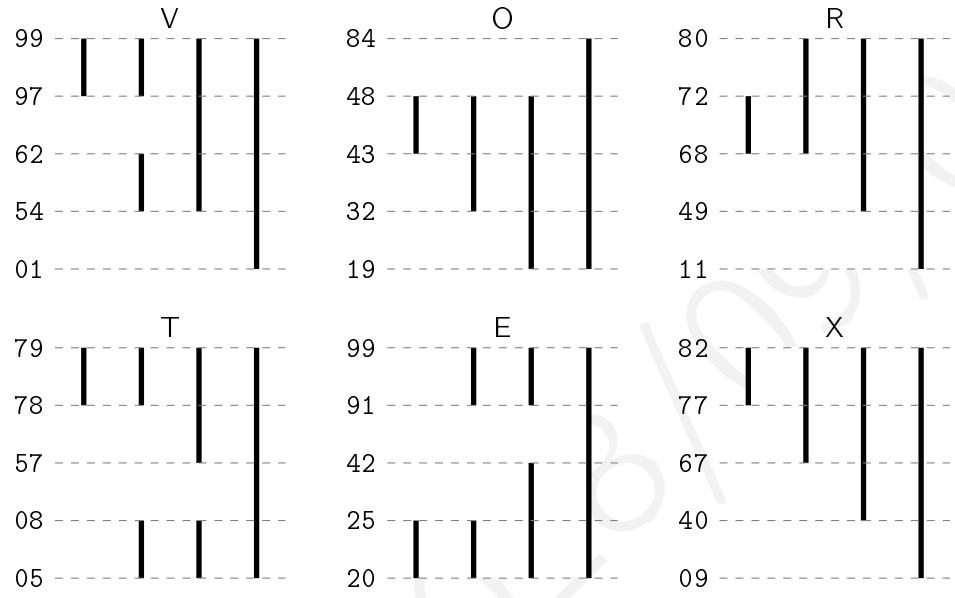
Wibbly-Wobbly Timey-Wimey

Solution



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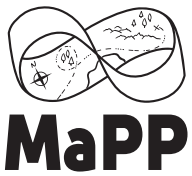

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Jumping Through Hyperspace

Solution

GALAXY

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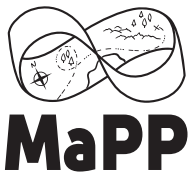

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Hailing Frequencies Open

Solution

Two Morse code messages are given: one when using the tail end of each arrow as a space, and another when using the arrow end of each arrow as a space:

- SWEATED/S(P)ACE
- MATT/G(O)
- URNS/EA(R)TH
- DYE/TI(T)AN
- WENCH/(A)NTARES
- REWIRE/RIGE(L)
- CREWMAN/CA(S)TOR

The marked letters are given by the numbers in the flavortext; they spell the solution `PORTALS`.

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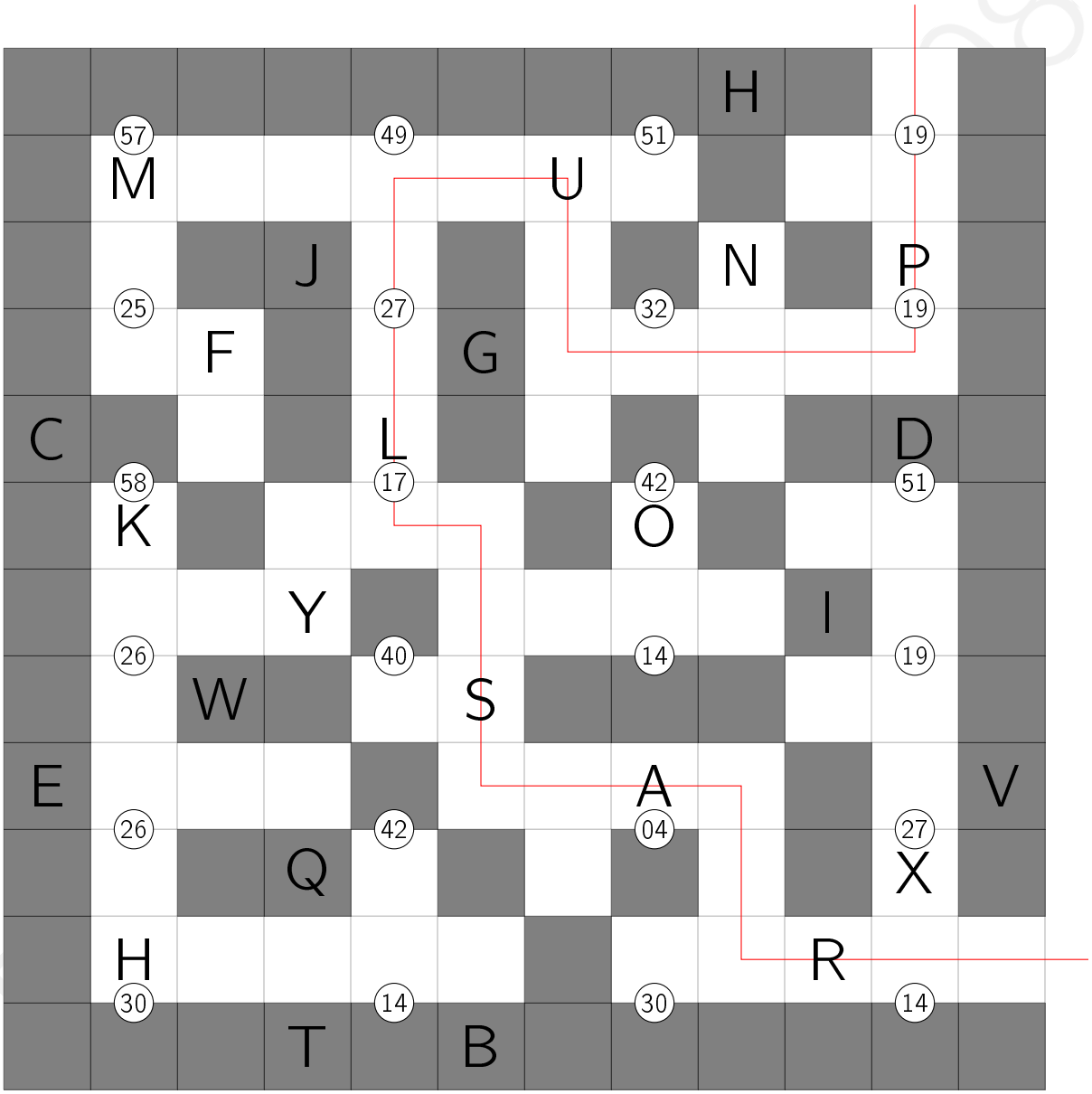
Out of Gas

Solution

Using binary to fill in the grid as in the attachment, a maze is revealed.



The solution is the letters appearing on the unique solution to the maze: PULSAR

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Word Problem

Solution

BLACK HOLE

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