

ASTRAL



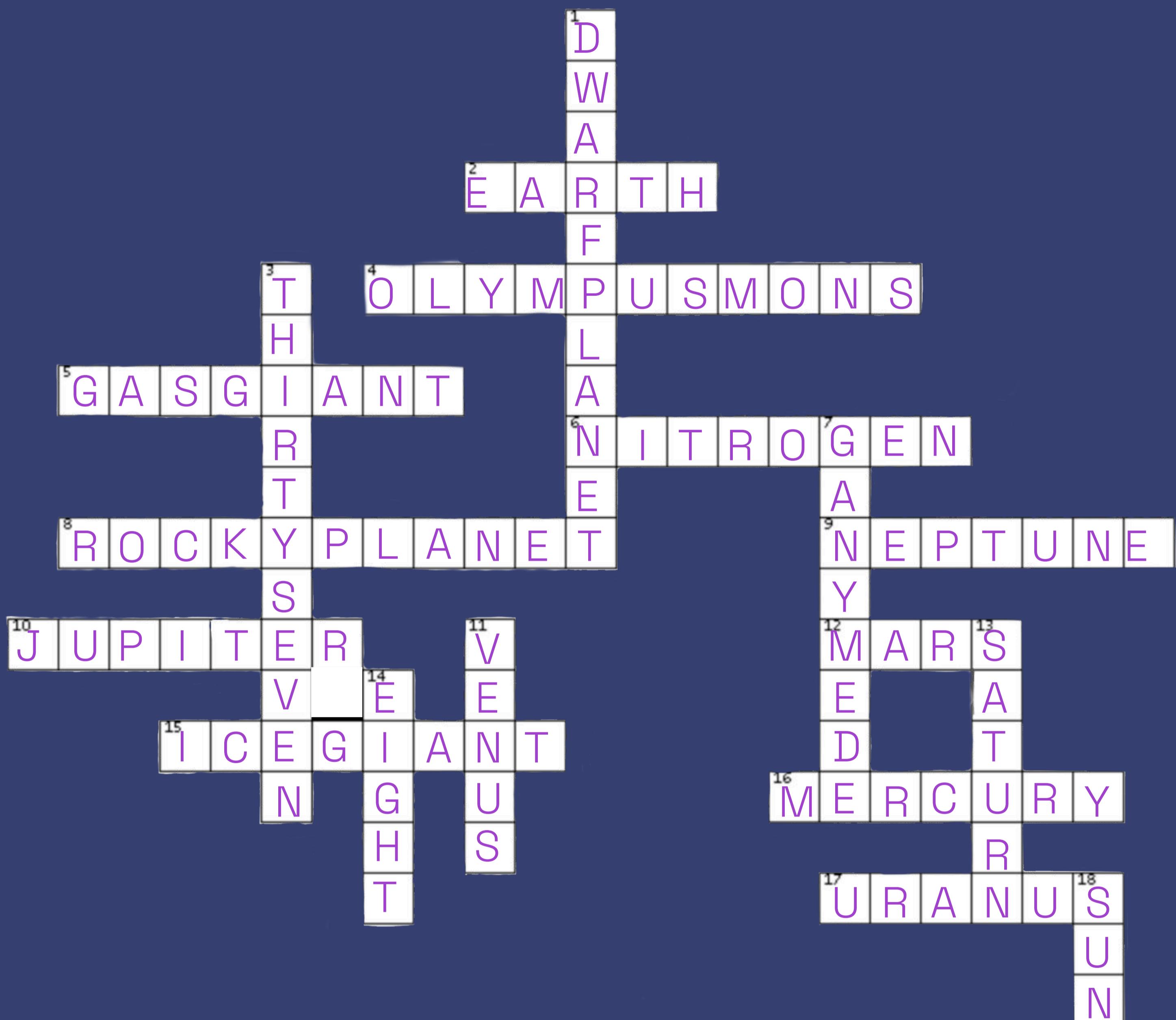
ACTIVITIES SECTION (Answers)





ASTRAL

Crossword



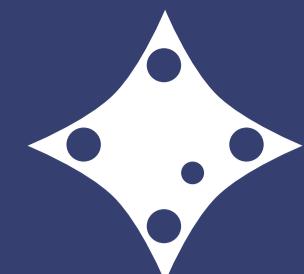
ACROSS

2. Has a tidally locked moon
4. What is the name of Mars' tallest volcano?
5. What type of planet is Saturn?
6. What Gas makes up 78% of Earth's atmosphere?
8. What type of planet is Venus?
9. Sometimes further from the Sun than Pluto
10. Has a storm that is wider than the Earth
12. ____ Bar
15. What type of planet is Uranus?
16. Has a crater named after Dr Seuss
17. Winter last for 21 years

DOWN

1. Small celestial body orbiting the Sun
3. What is Mars' gravity as a % of Earths?
7. What moon of Jupiter is larger than Mercury?
11. Has the most extreme greenhouse effect
13. Furthest planet discovered by eye
14. How many Planets in the Solar System?
18. Closest Star

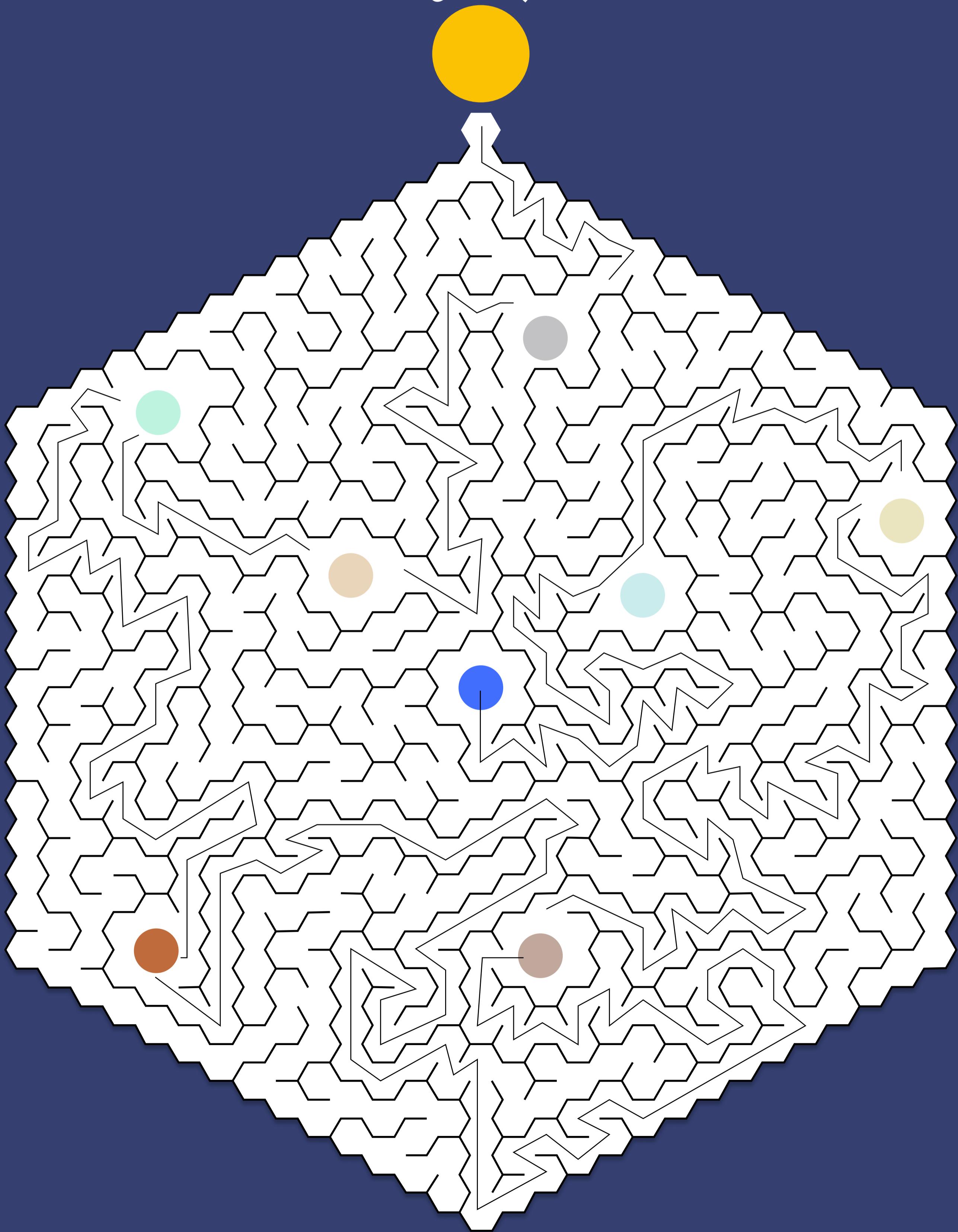
Maze



ASTRAL

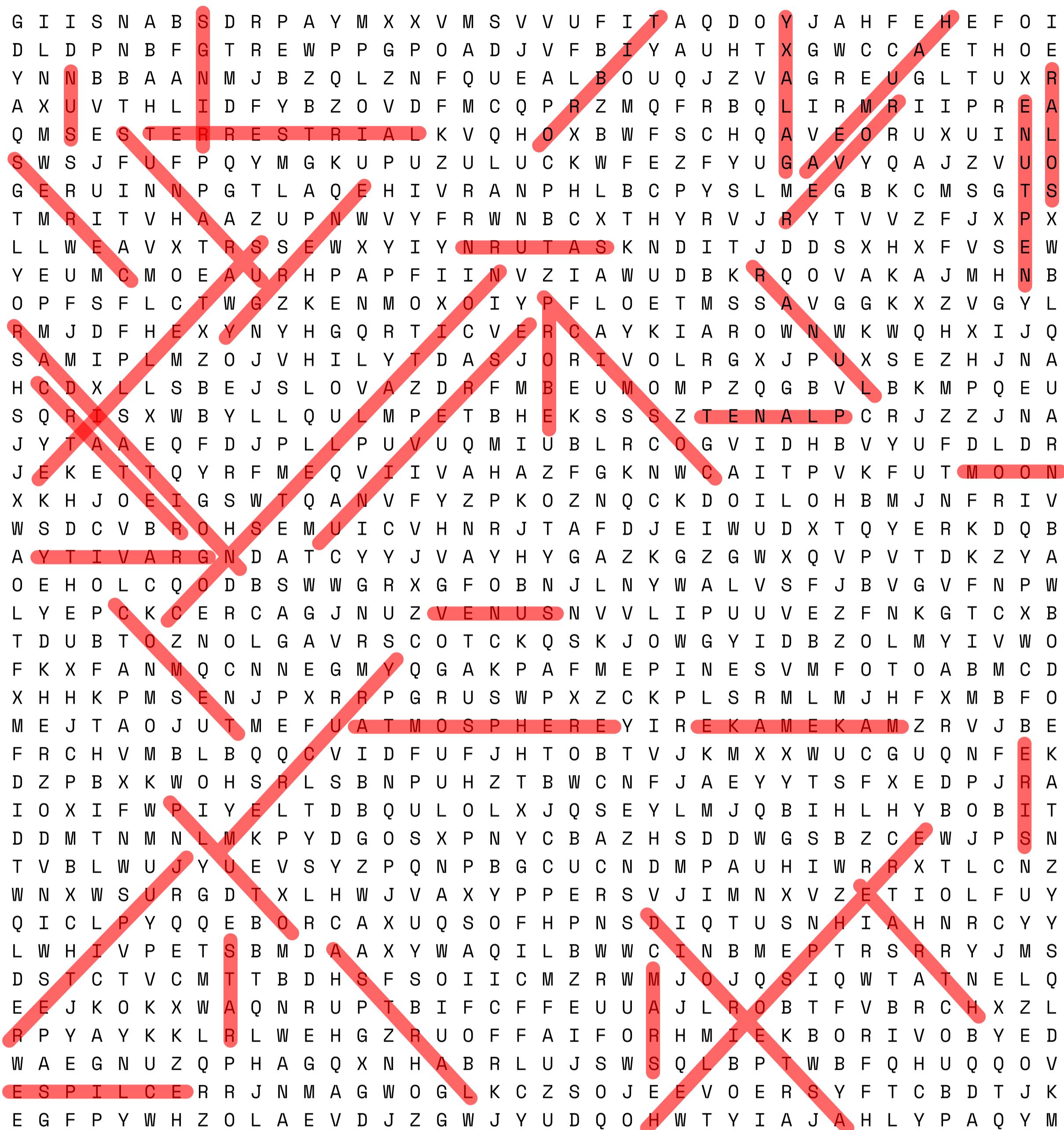
Guide your spaceship through
the Solar System, taking images and
data from each planet in the
correct order.

S U N





ASTRAL



ASTEROID

ASTRAL

ATMOSPHERE

CERES

COMET

CONSTELLATION

COSMIC

CRATER

EARTH

ECLIPSE

ENERGY

ERIS

GALAXY

GRAVITY

HAUMEA

HELIOSPHERE

JUPITER

LUNAR

MAKE, MAKE

MARS

MERCURY

MOON

NEPTUNE

ORBIT

PLANET

PLUTO

PROBE

RADIATION

RINGS

ROVER

SATELLITE

SATURN

SOLAR

STAR

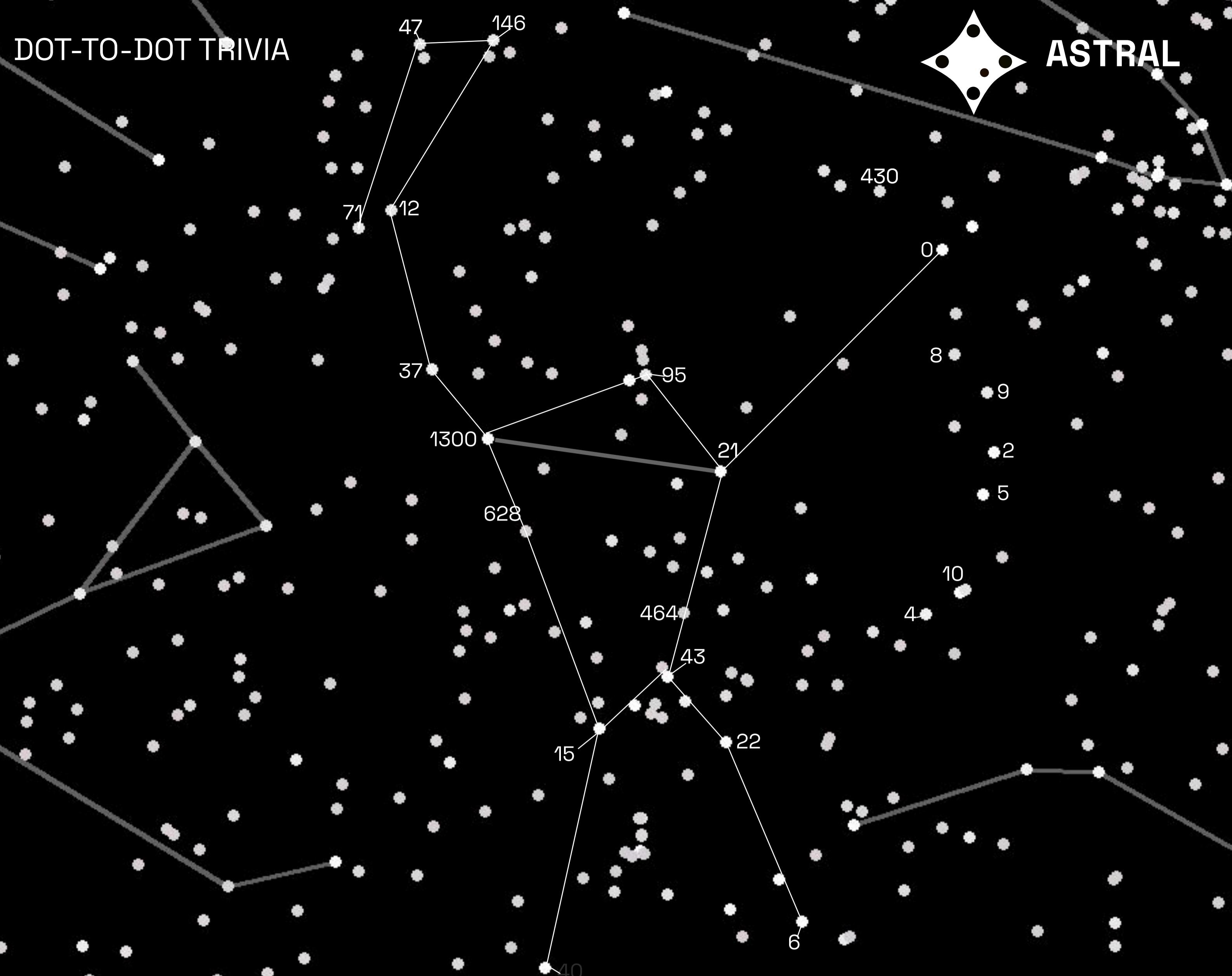
SUN

TERRESTRIAL

UNIVERSE

URANUS

VENUS



Line1: Start at Q1

1. How hot is a day on Mercury? - 430
2. How many moons does Venus have? - 0
3. How many minutes does it take sunlight to reach Earth? - 8
4. How many times wider is Saturn compared to Earth? - 9
5. How many moons does Haumea have? - 2
6. How many dwarf planets orbit the sun? - 5
7. How many times further from the Sun is Neptune compared to Uranus? - 10
8. How many times wider is the Earth compared to the Moon? - 4

Line 2 - Start from the dot from Line 1: Question 2

1. What percentage of Earth's atmosphere is oxygen? - 21
2. What percentage of Earth's size is Venus? - 95
3. How many Earths could fit inside Jupiter? - 1300
4. How many Earth days in a Martian year? - 628
5. How many times heavier is Uranus compared to Earth? - 15
6. In how many million years will Phobos crash into Mars? - 40

Line 3 - Start from the dot 21 from Line 2: Question 1

1. What is the surface temperature of Venus? - 464
2. How many minutes does it take sunlight to reach Jupiter? - 43
3. To the nearest kilometre, how tall is the tallest mountain in the solar system? 22
4. How many sides does the storm at Saturn's North Pole have? - 6

Line 4 - Start at the dot from Line 2: Question 3

1. What percentage of Earth's gravity does Mars have? - 37
2. To the nearest kilometre, what is Earth's escape velocity? - 12
3. How many confirmed moons does Saturn have? - 146
4. How many degrees from its axis is Neptune's magnetic field tilted? - 47
5. To the nearest percent, how much of Earth's surface is covered in water? - 71



Calculation of the Size of the Moon on the Horizon

1. Coin Test Method

- Hold the coin at arm's length and compare its size to the Moon when it's on the horizon.
- Wait until the Moon is higher in the sky (overhead) and repeat the comparison.

2. Photographic Comparison

- Take a photo of the Moon when it's near the horizon.
- Take another photo when the Moon is overhead.
- Compare the Moon's size in both photos.

3. Measuring with Fingers

- Extend your arm fully and use your thumb or finger to measure the Moon's diameter when it's on the horizon.
- Repeat the measurement when the Moon is overhead.

Calculation of the Speed of the Planets

Planet	Distance from Sun (km)	Orbital Period (s)	Speed (km/s)
Mercury	57,909,227	7,600,543	47.87
Venus	108,209,475	19,414,149	35.02
Earth	149,597,870	31,557,600	29.78
Mars	227,943,824	59,354,032	24.07
Jupiter	778,340,821	374,335,776	13.07
Saturn	1,426,666,422	929,596,608	9.69
Uranus	2,870,658,186	2,651,370,336	6.81
Neptune	4,498,396,441	5,200,418,560	5.43



Exercise: Working out angle as seen from other planets without using diameter of sun

As D (diameter) is a constant, we can equate D for two planets (Earth and another unknown planet) to derive a general equation for the angle that the sun subtends when viewed on any unknown planet:

$$r_{Earth}\theta_{Earth} = r_{Planet}\theta_{Planet}$$

$$\theta_{Planet} = \frac{r_{Earth}\theta_{Earth}}{r_{Planet}}$$

It can be helpful to use astronomical units for the radius of the orbits of the planets - the orbital radius of the Earth is 1 AU.

Now substitute in values, the answer should be approximately 0.339°.

Scaling relations answers

Exercises:

Derive a formula for the Intensity of solar radiation on a planet using the Intensity on Earth, and the distances between Sun and the Earth, and Sun the planet.

$$I = 1.4 \times \left(\frac{\text{Earth to Sun distance}}{\text{Planet to Sun distance}} \right)^2 \text{ kW m}^{-2}$$

1.4 kM/m^2 is intensity received by sun

Using the formula that was derived in the previous question, calculate the intensity of solar radiation received by Mercury

$$I = 1.4 \times \left(\frac{1.5 \times 10^{11}}{5.8 \times 10^{10}} \right)^2 \text{ kW m}^{-2}$$

$$I = 9.36 \text{ kW m}^{-2}$$
