TRY FIVE

Ollscoil Teicneolaíochta Bhaile Átha Cliath
TU DUBLIN
Technological University Dublin

Taighde Éireann
Research Ireland

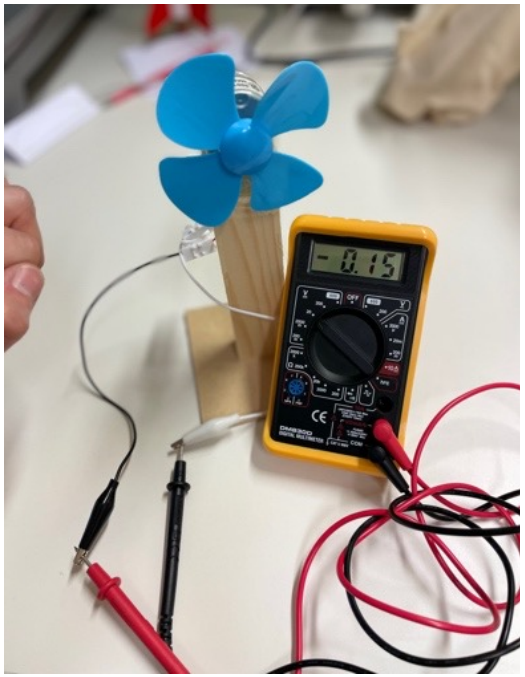
An Roinn Oideachais agus Óige
Department of Education and Youth

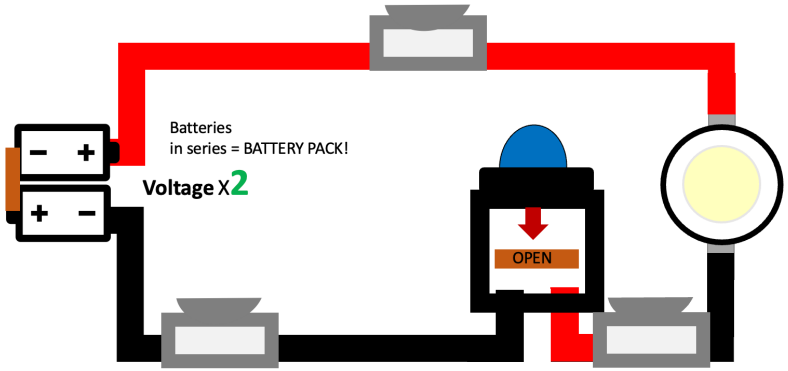
SCIENCE EDUCATION TRAINING MISSION
5
2024 - 2026

workday.

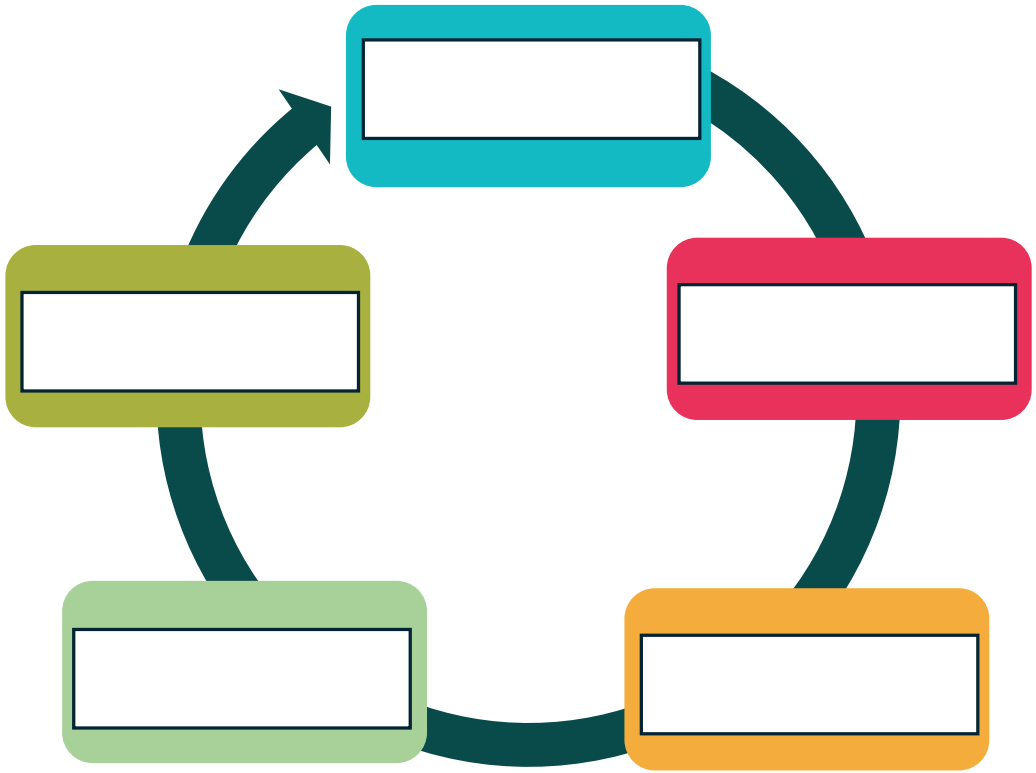
esero

What did you learn from last year?





The Scientific Method



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Mission 1: Sun, Earth, Moon

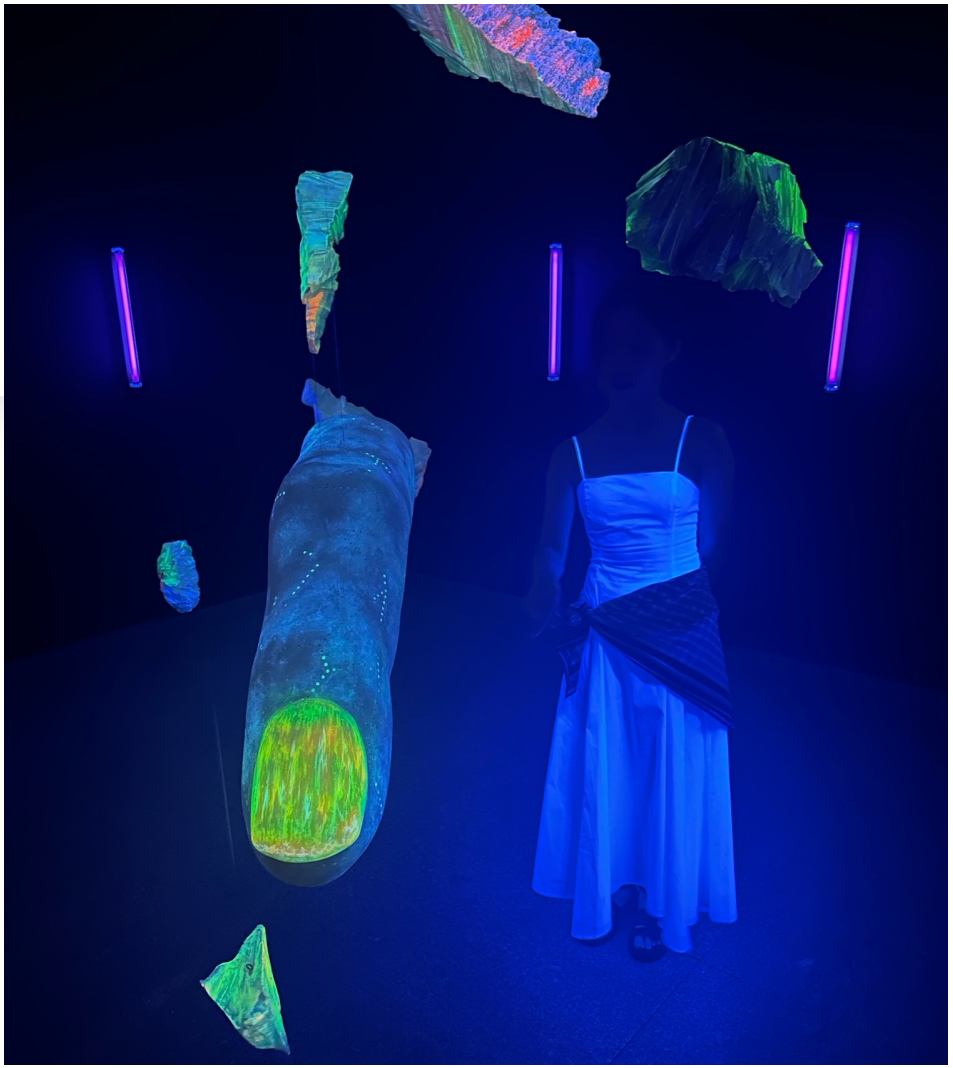
Objects can absorb and reflect light.

- The object can **absorb** (take in) some of the light.

  → Dark colours (like black) feel warmer in the sun.

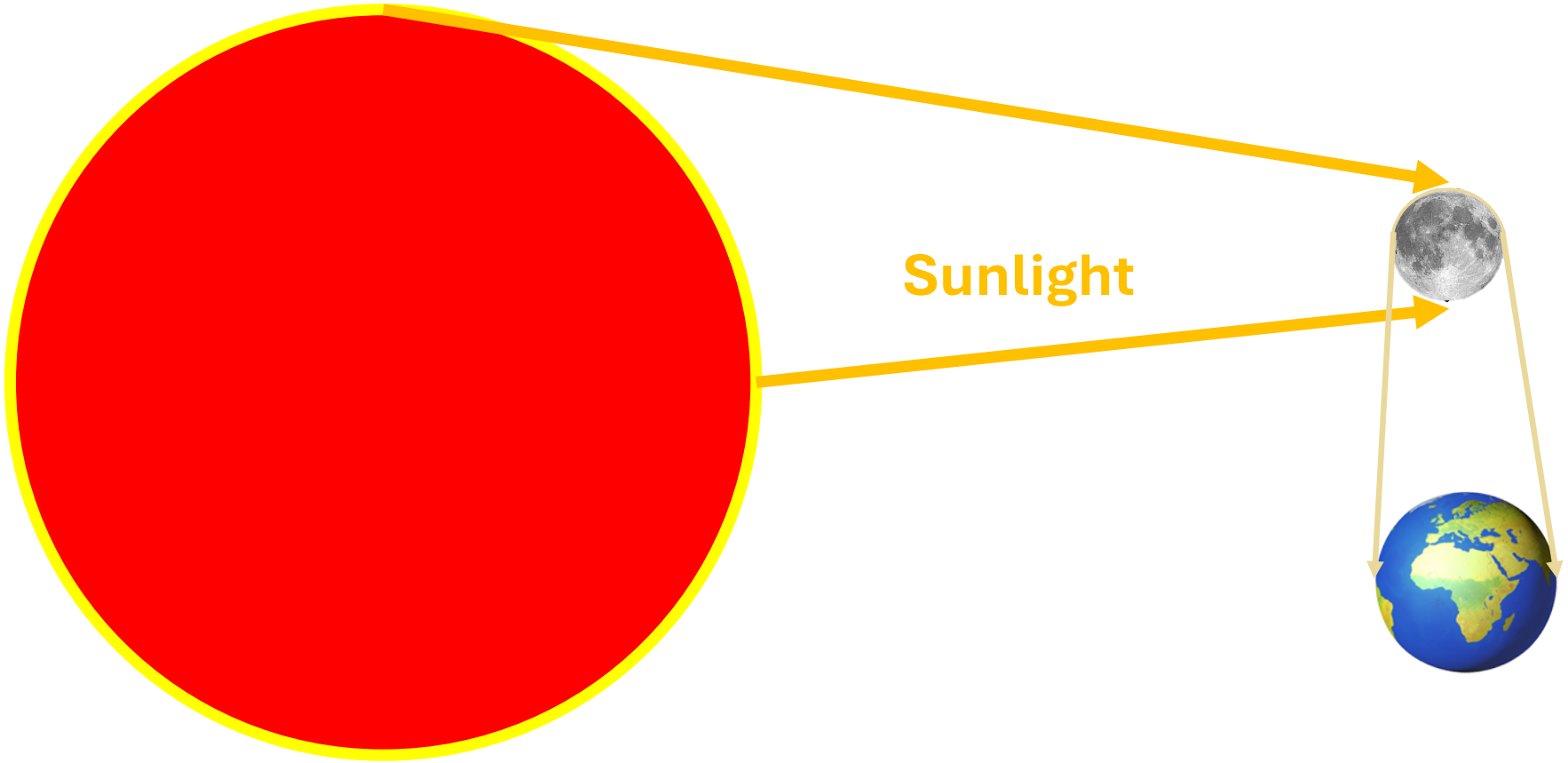
- The object can **reflect** (bounce back) some of the light.

  → Light colours (like white) feel cooler in the sun.

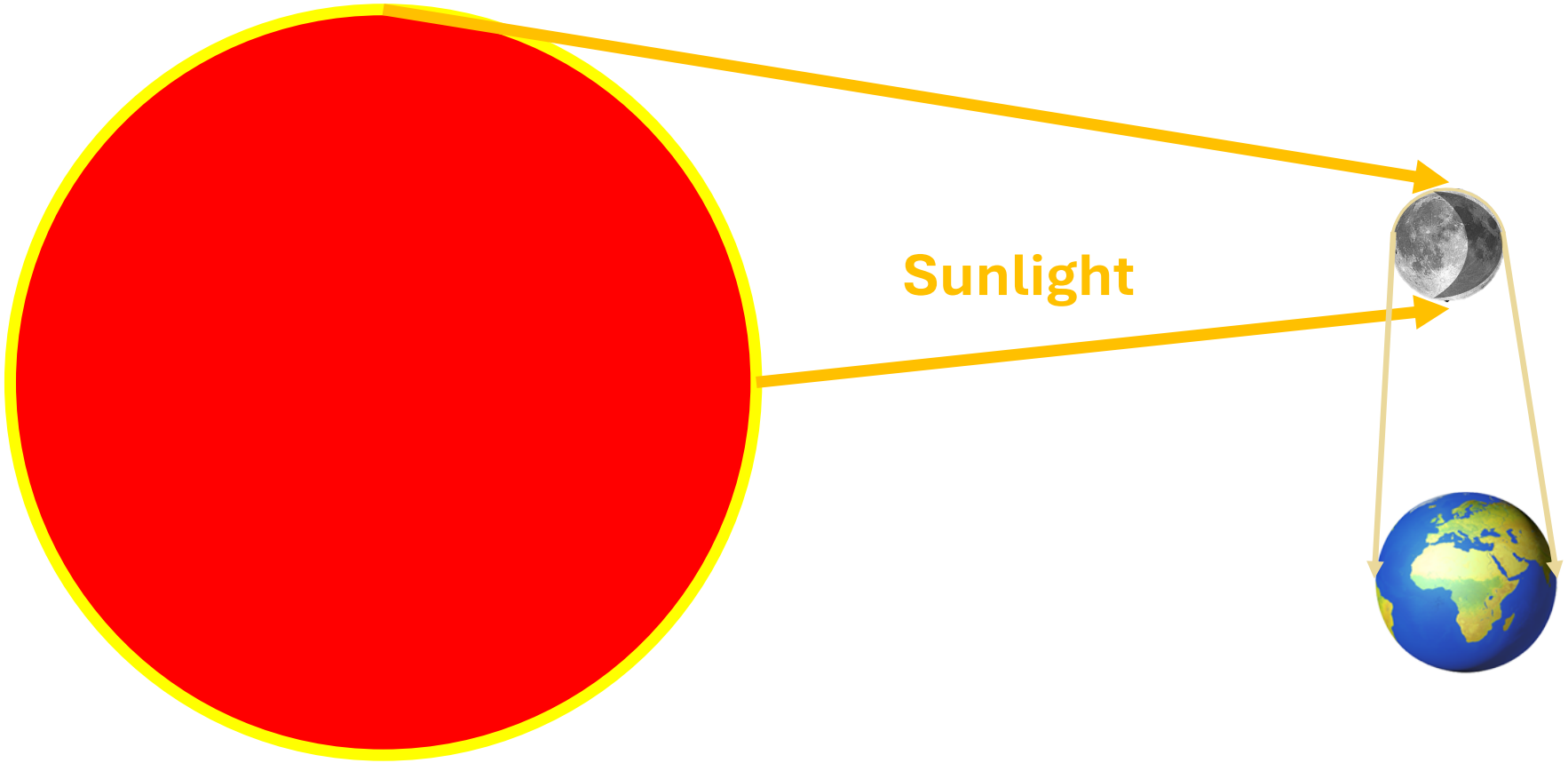


Naufus Ramírez-Figueroa; Museo Nacional Centro de Arte Reina Sofía, Madrid
UV light in the dark room makes my white dress blue
and makes fluorescent colors bright.

The moon is like a mirror or a dusty ball. It can bounce back the light from the sun.

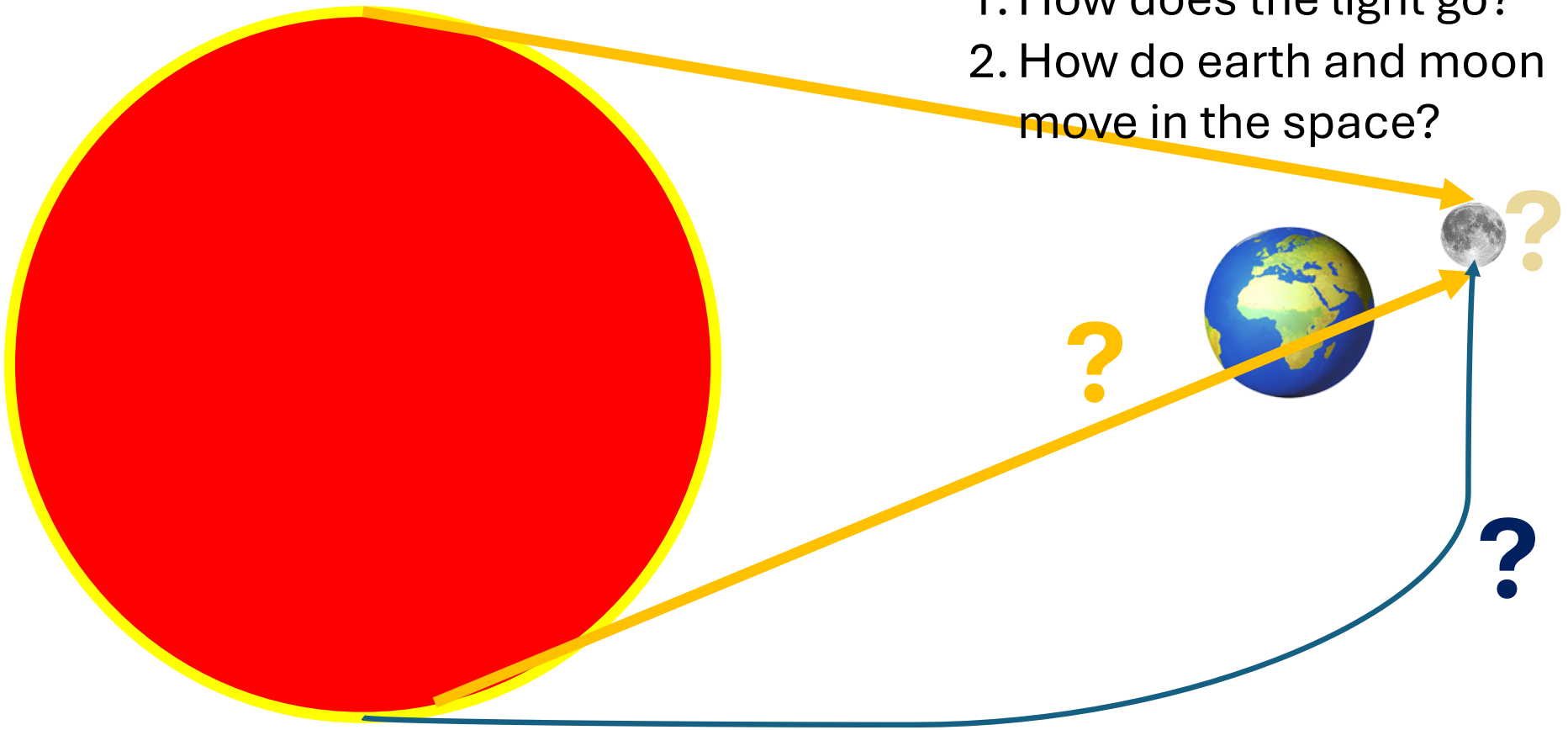


The part that faces to the sun is bright.
The part that doesn’t is shadow.

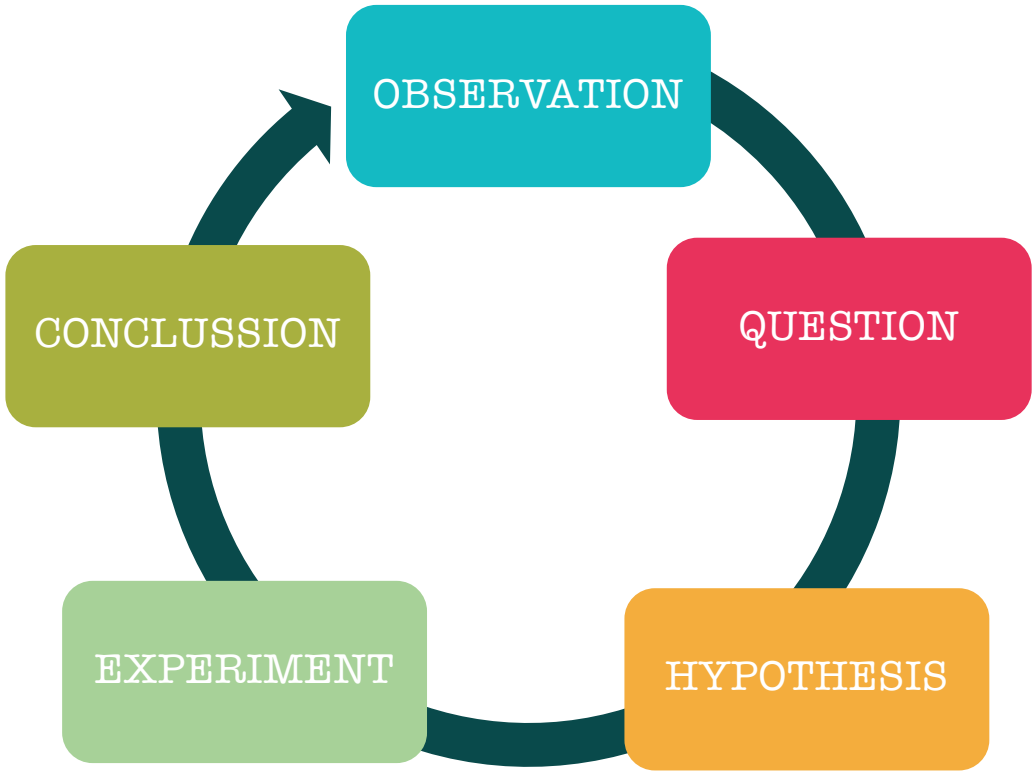


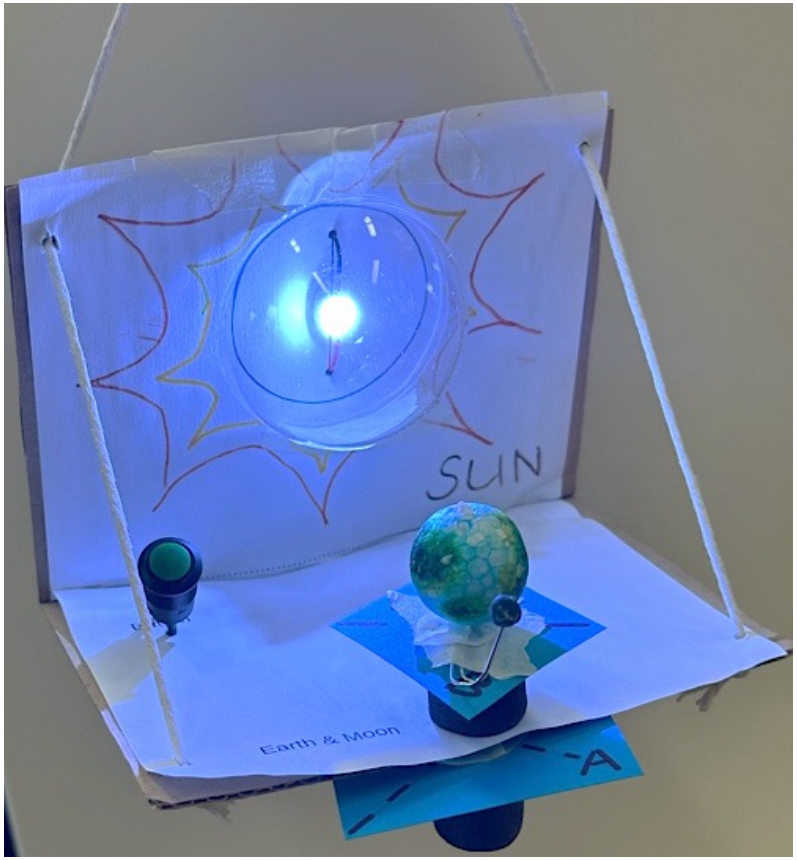
What if the earth is somewhere in the middle?

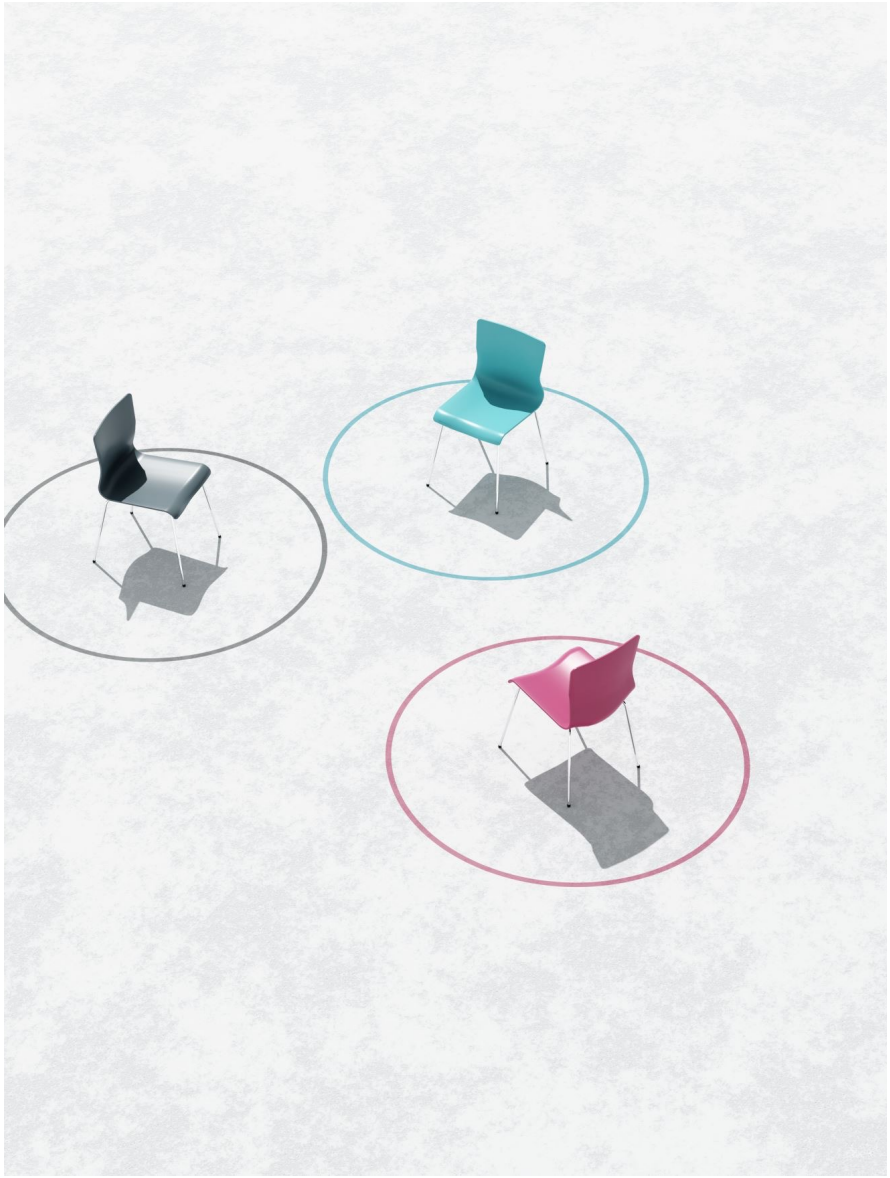
1. How does the light go?
2. How do earth and moon move in the space?



The Scientific Method



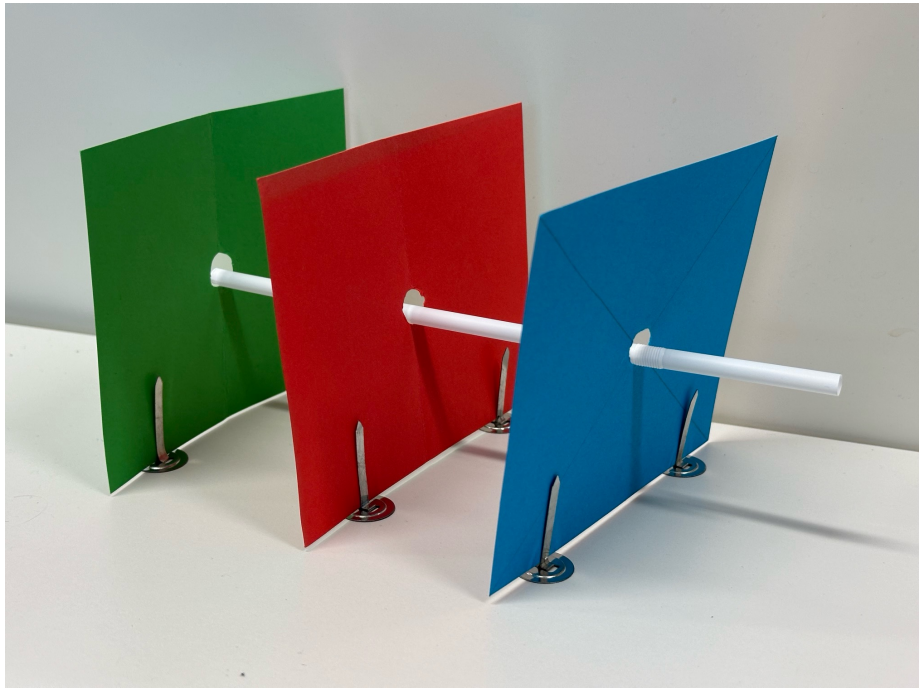




Light & Shadow

- Hypothesis: Where will the shadow be?
- Experiment & Conclusion
- Why do we have shadow?

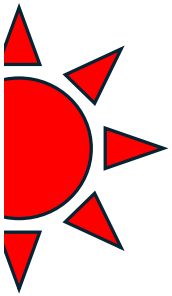
Light goes straight in clear medium!



Let’s do an experiment!

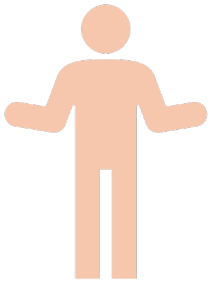
When will we have the longest shadow in a day? And the shortest?

Noon



sunset

sunrise



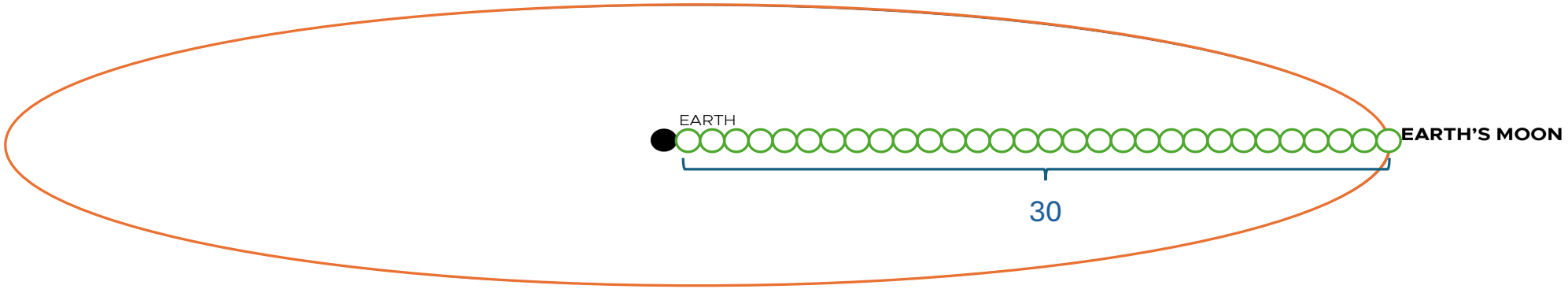
Sundial

Make a guess!

Which country has the first record of using sundial?

- Ancient Egypt: 3150-2613 BC, called Obelisk
- Ancient China: 2357–2258 BC; called *Rigui* (日晷).
- Babylon: 1500 BC; called shadow clocks.

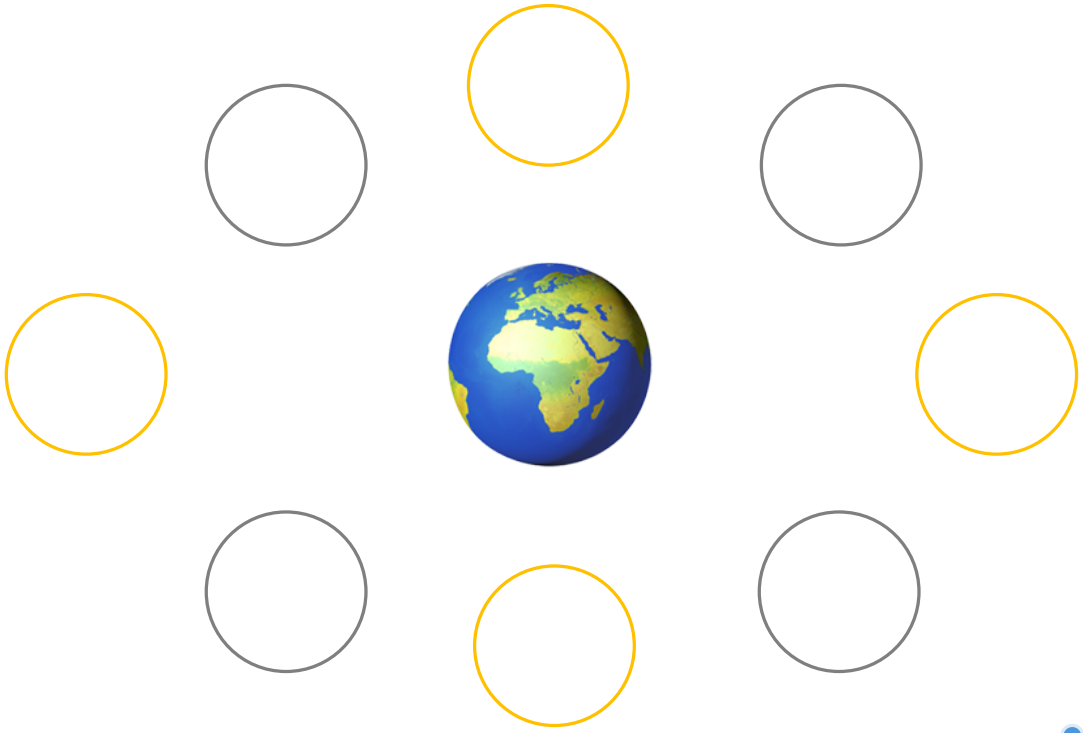
How does the moon move?



The sizes of the bodies are greatly exaggerated relative to the orbital distances.

The Moon **goes around Earth** in about **29-30 days**.

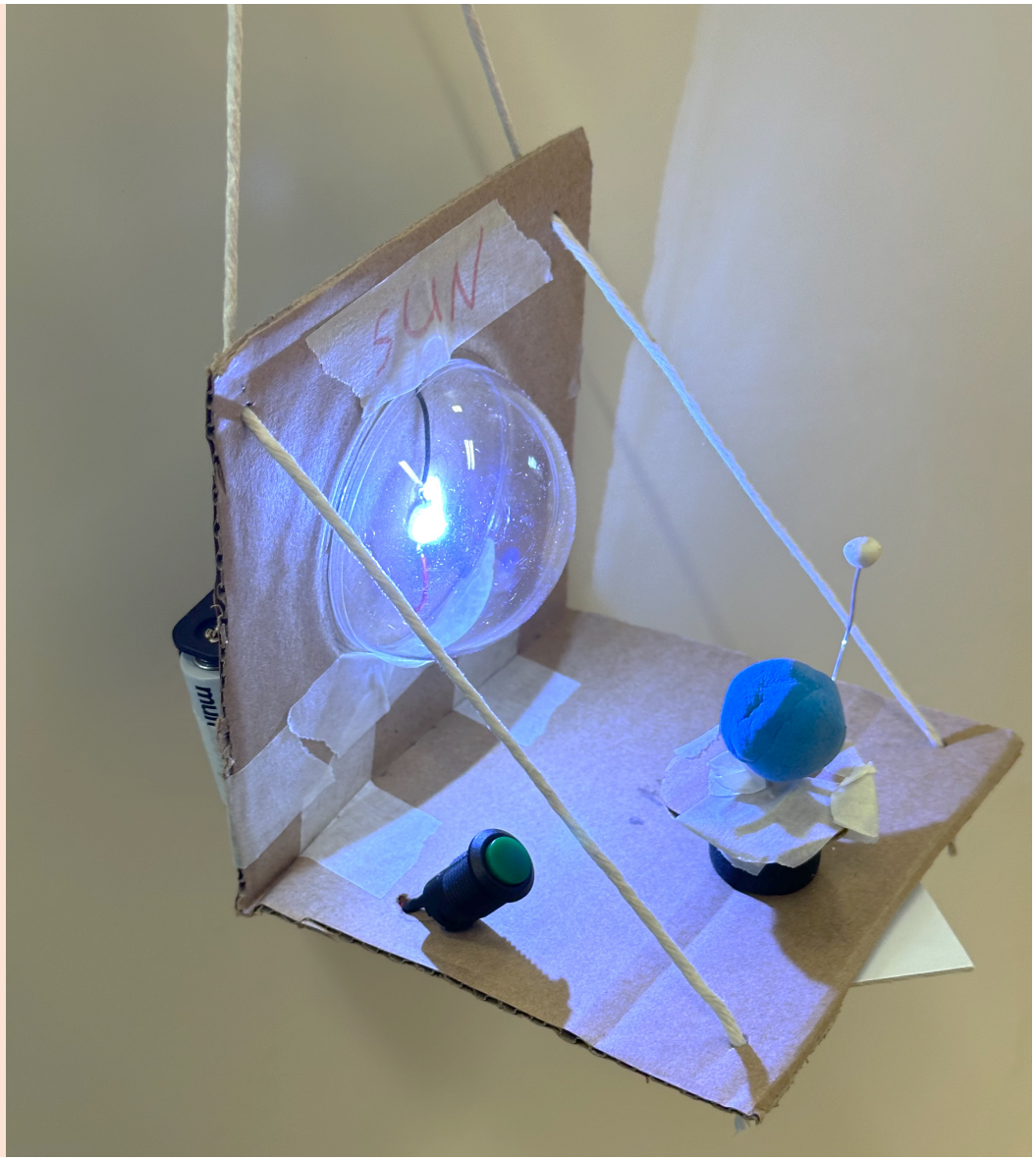
https://science.nasa.gov/moon/facts/



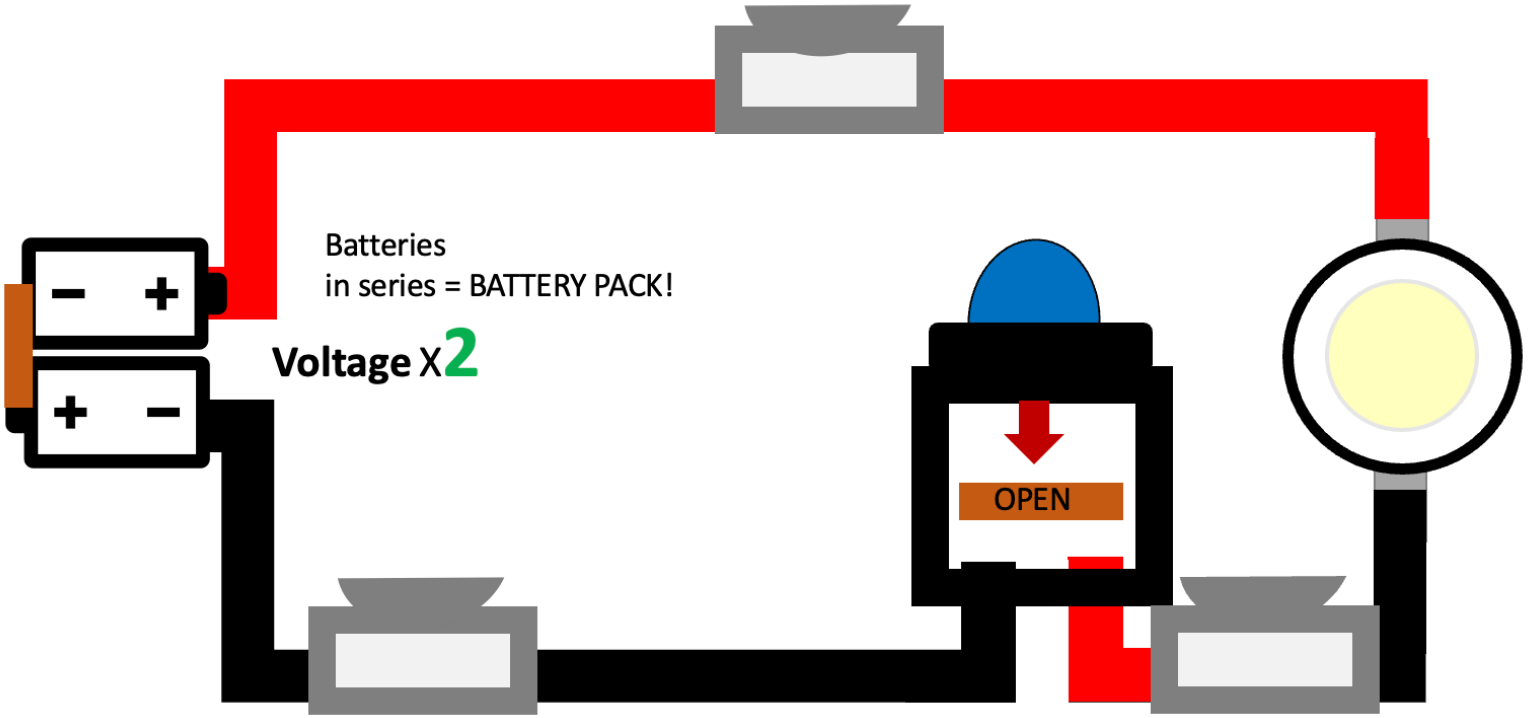
I guess...

Which part of the moon is bright?

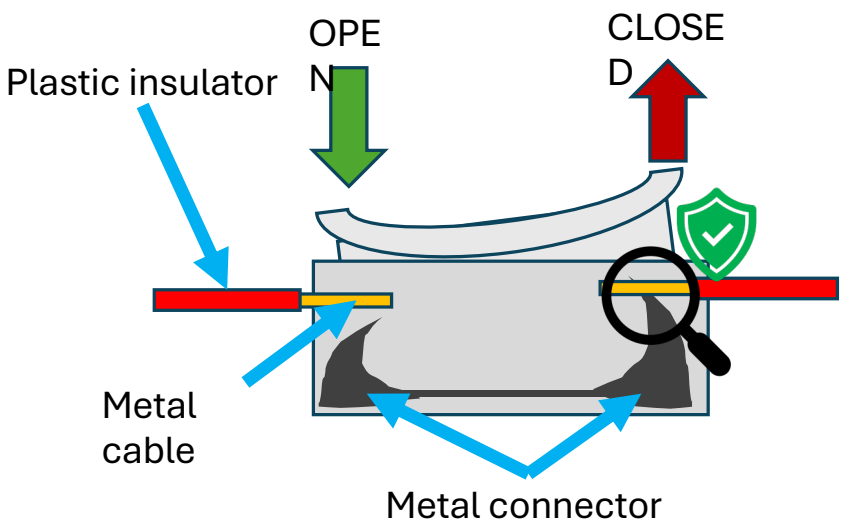
Let’s make a
model to test out!

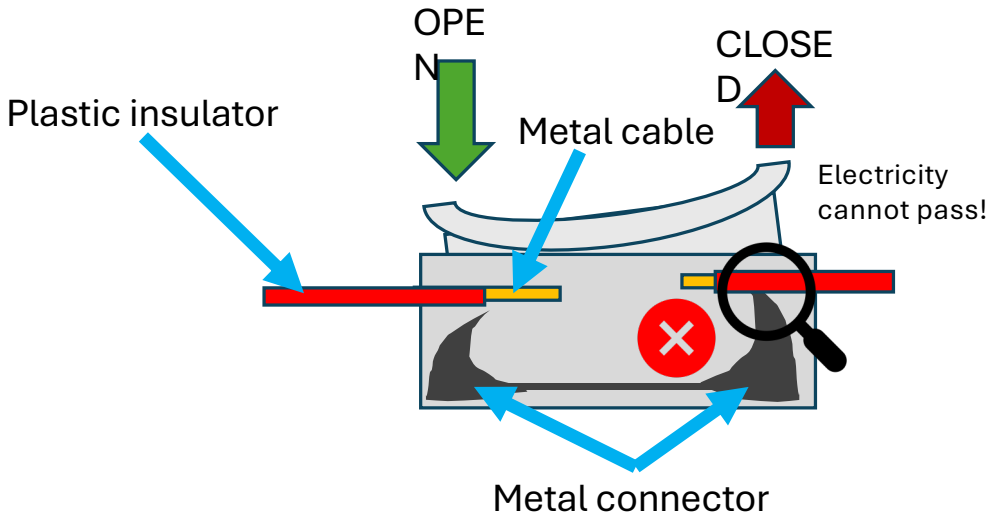


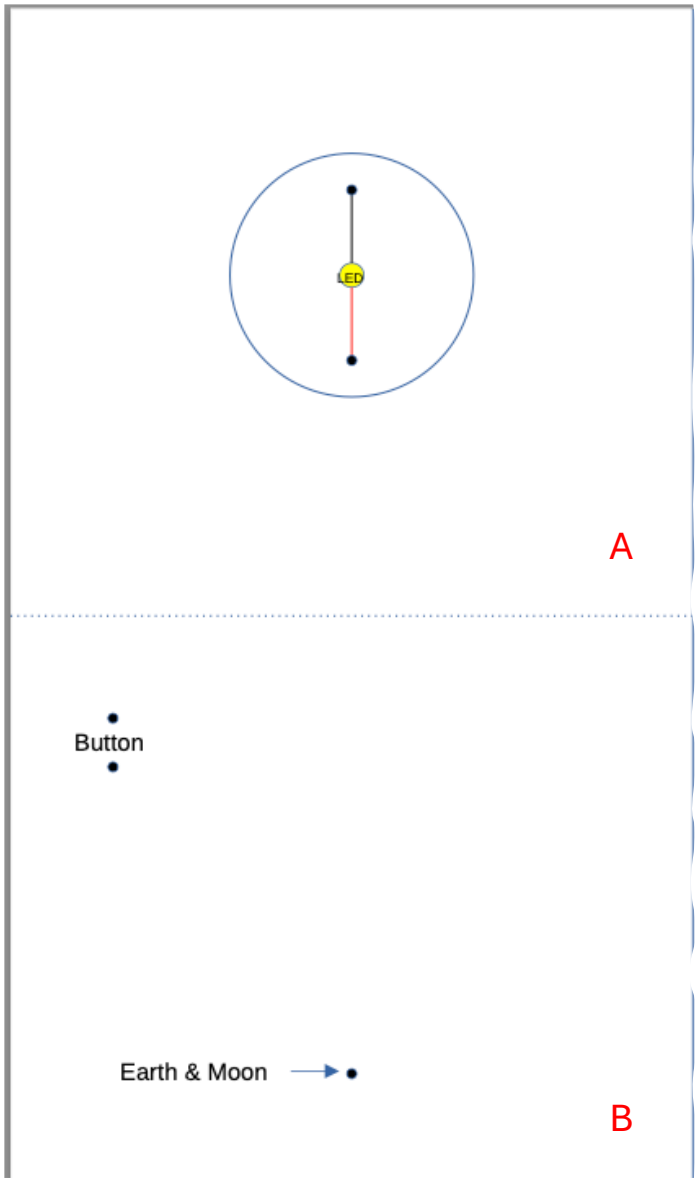
Electronics



SPRING CONNECTORS

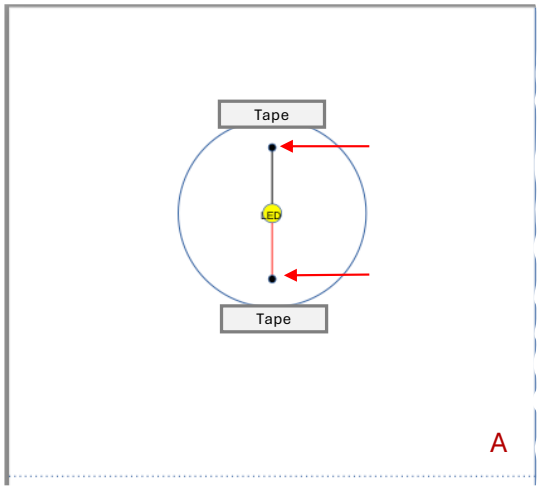


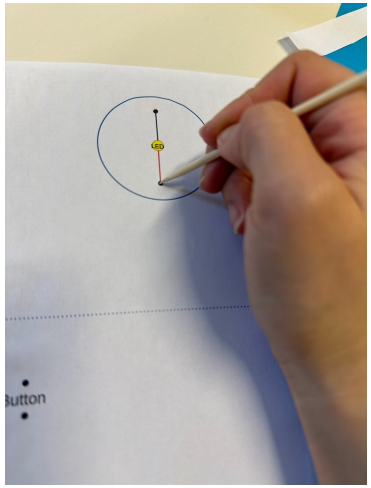


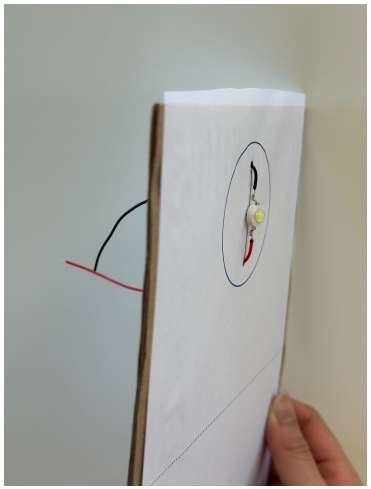


Design

- Stick the design paper with the cardboard.
- Fold the cardboard according to the dot line.







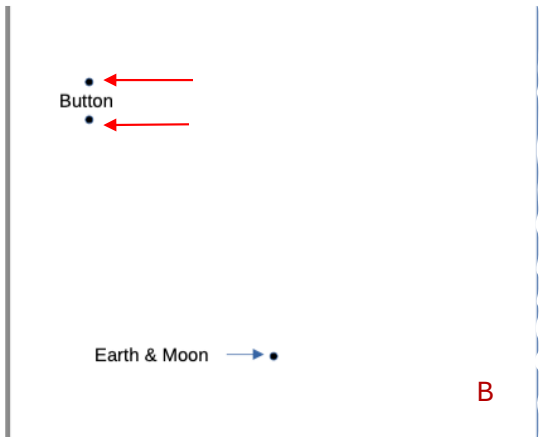
Make - Sun

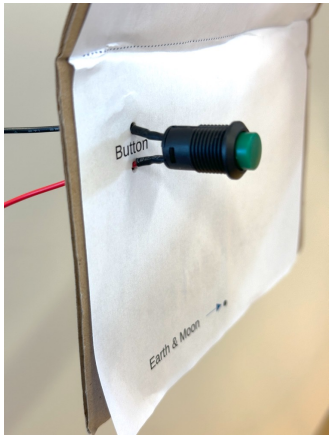
- Disconnect the LED.
- Make 2 holes on the cardboard A for the LED.
- Put the wires of the switch through the holes.
- Connect the LED back and test.

  ! Black - Black ! Red - Red !
- Use tapes to stick the clear ball on the cardboard to cover the circle.

Make – Switch

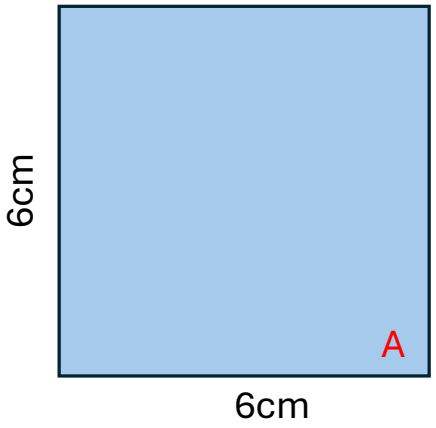
- Disconnect the switch.
- Make 2 holes on the cardboard B for the switch.
- Put the wires of the switch through the wholes.
- Connect the switch back and test.



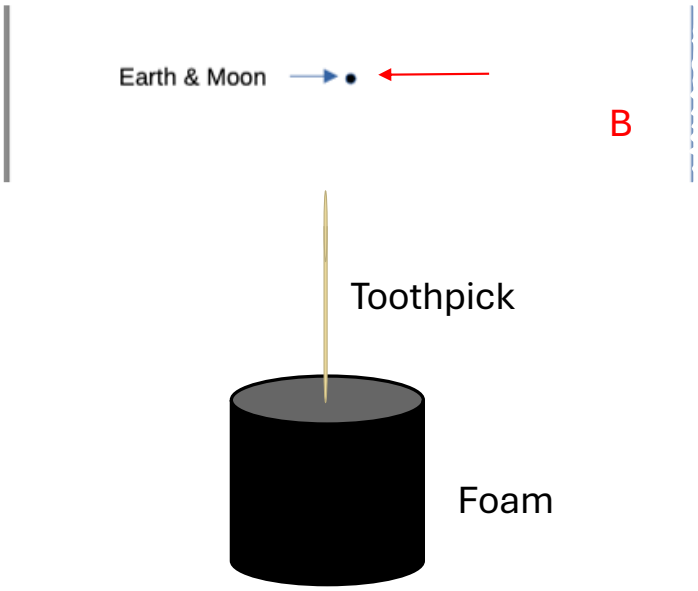


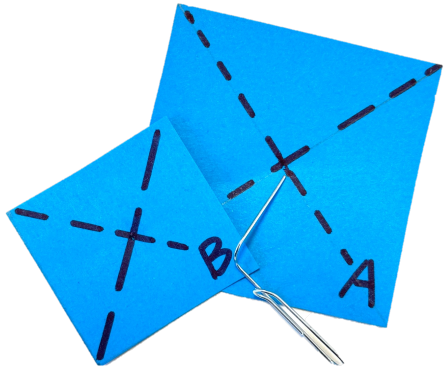
Make – Earth & Moon: Base

- Make a hole on the cardboard B.
- Use toothpick to make a hole in the centre of a foam. Don't go through.
- Cut a 6cm x 6cm square Hard paper A. Make a whole in the centre.



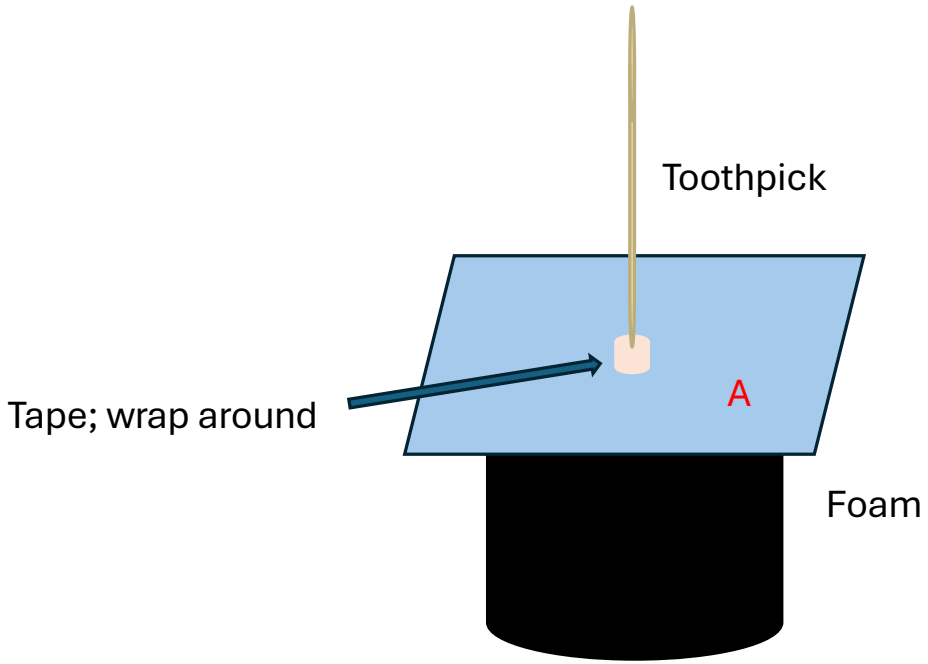
How can I find the centre of a square?





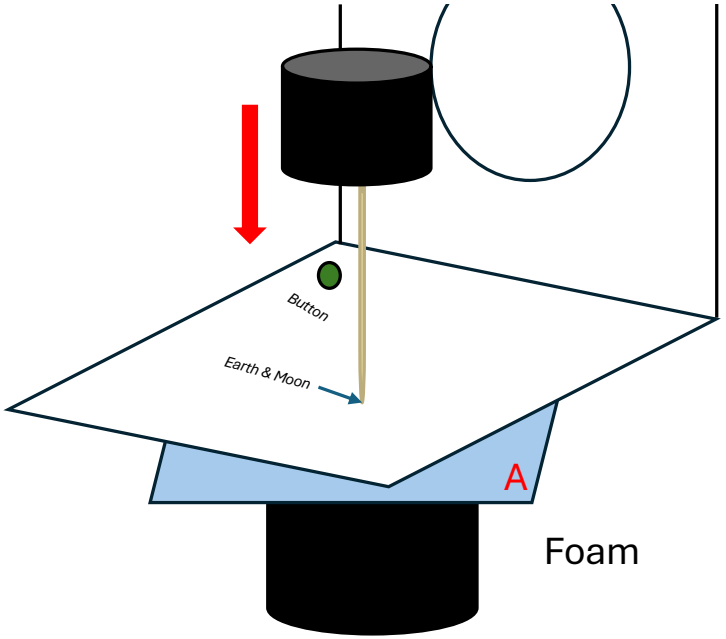
Make – Earth & Moon: Base

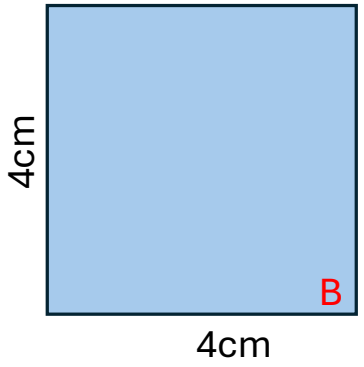
- Put Hard paper A on the foam.
- Use tapes to make sure it's attached to the toothpick.

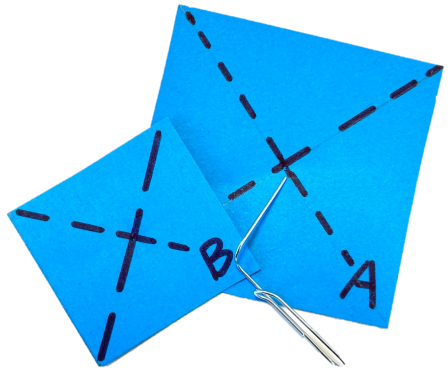


Make – Earth & Moon: Middle

- Put Cardboard B on top of Hard paper A.
- Put another foam on top of cardboard B. Make sure the hole is in the centre of the foam.
- Cut a 4cm x 4cm square Hard paper B.
- Use a paperclip to make a hole in the centre.

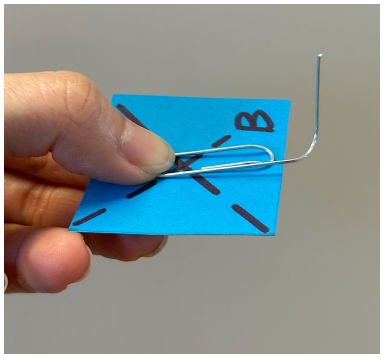


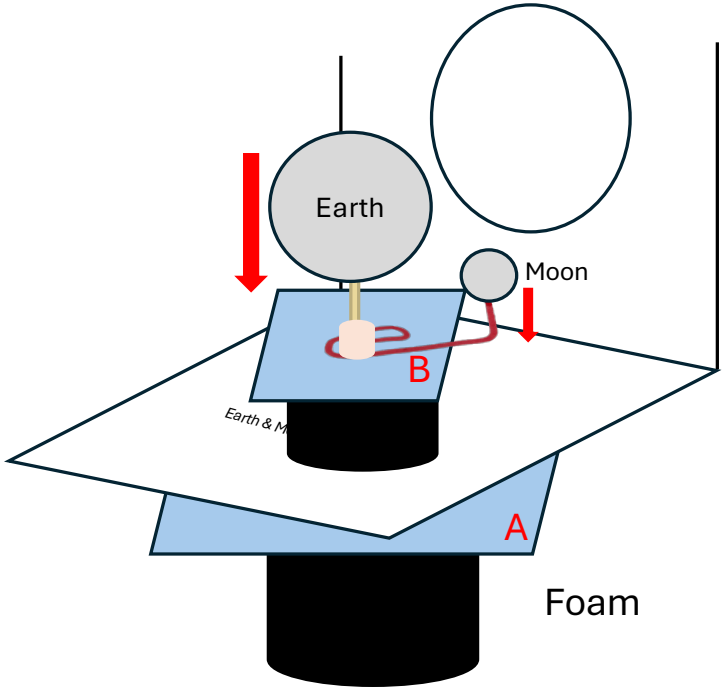




Make – Earth & Moon: Top

- Put them on the foam. Use tapes to attach Hard paper B to the toothpick.
- Put the foam ball on the toothpick.
  - This is your earth!
- Make a mini ball with air clay and put it on the paper clip.
  - This is your moon!
- Test if the moon turns when you move Hard paper A.



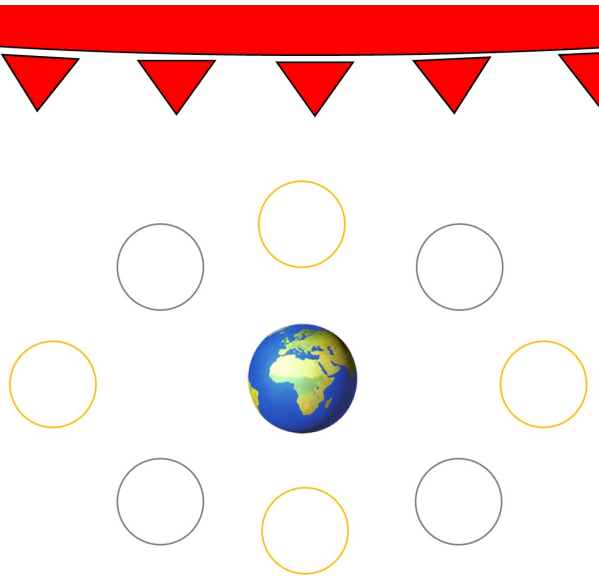



Let’s decorate!

What are the phases of the moon?

1. Try by yourself

- Operate: move the moon
- Observe and question: Which part of the moon is bright?
- Think and draw: Draw the shape in “My Conclusion”.



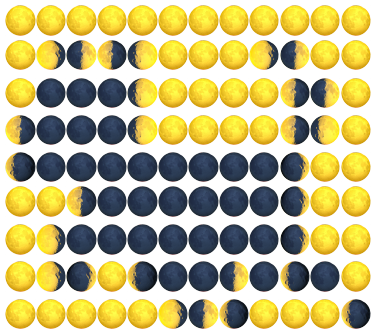
2. Discuss in group

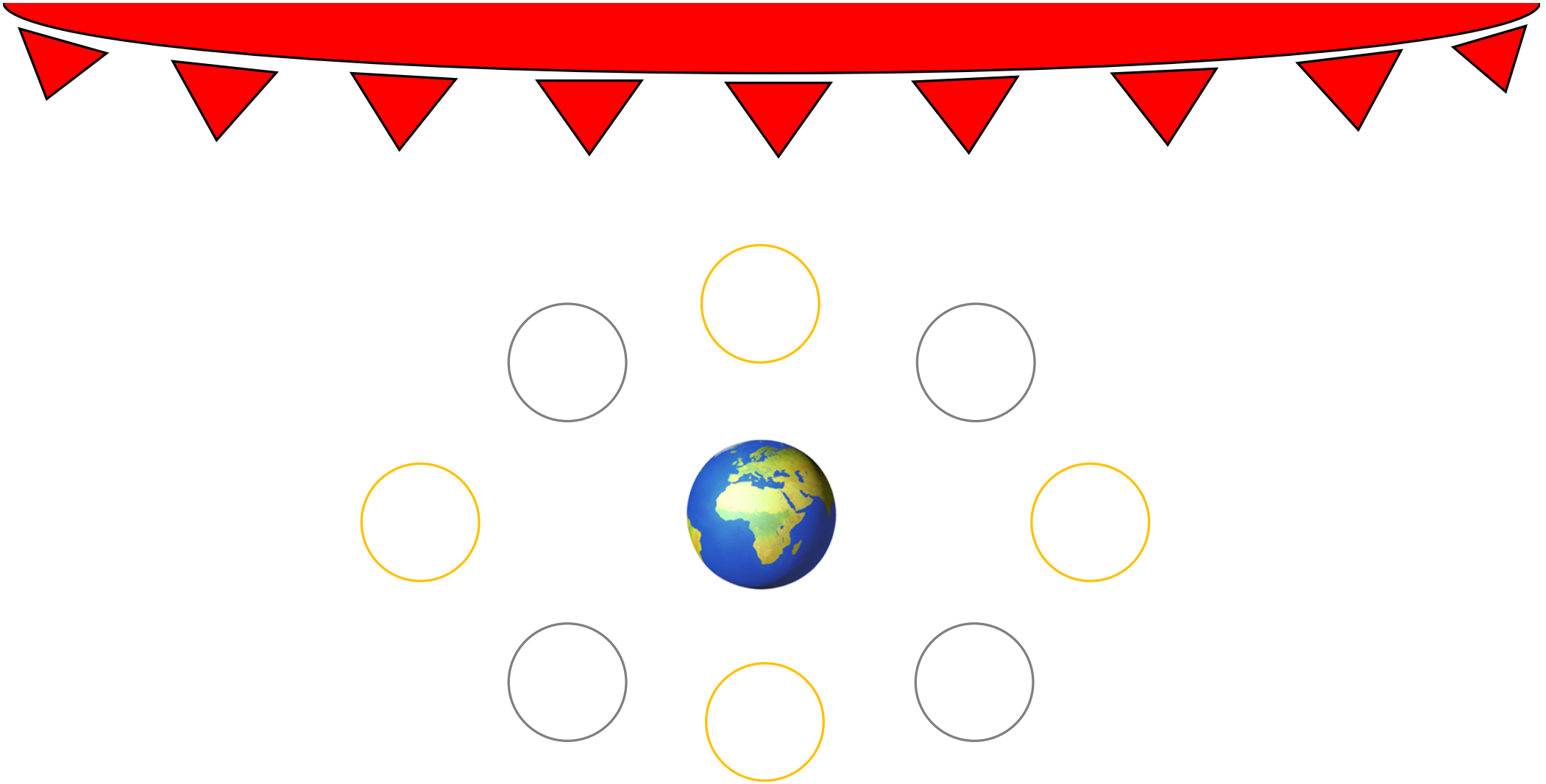
- Discuss: Share ideas in groups.
- Make a conclusion: what is the finding of your group?

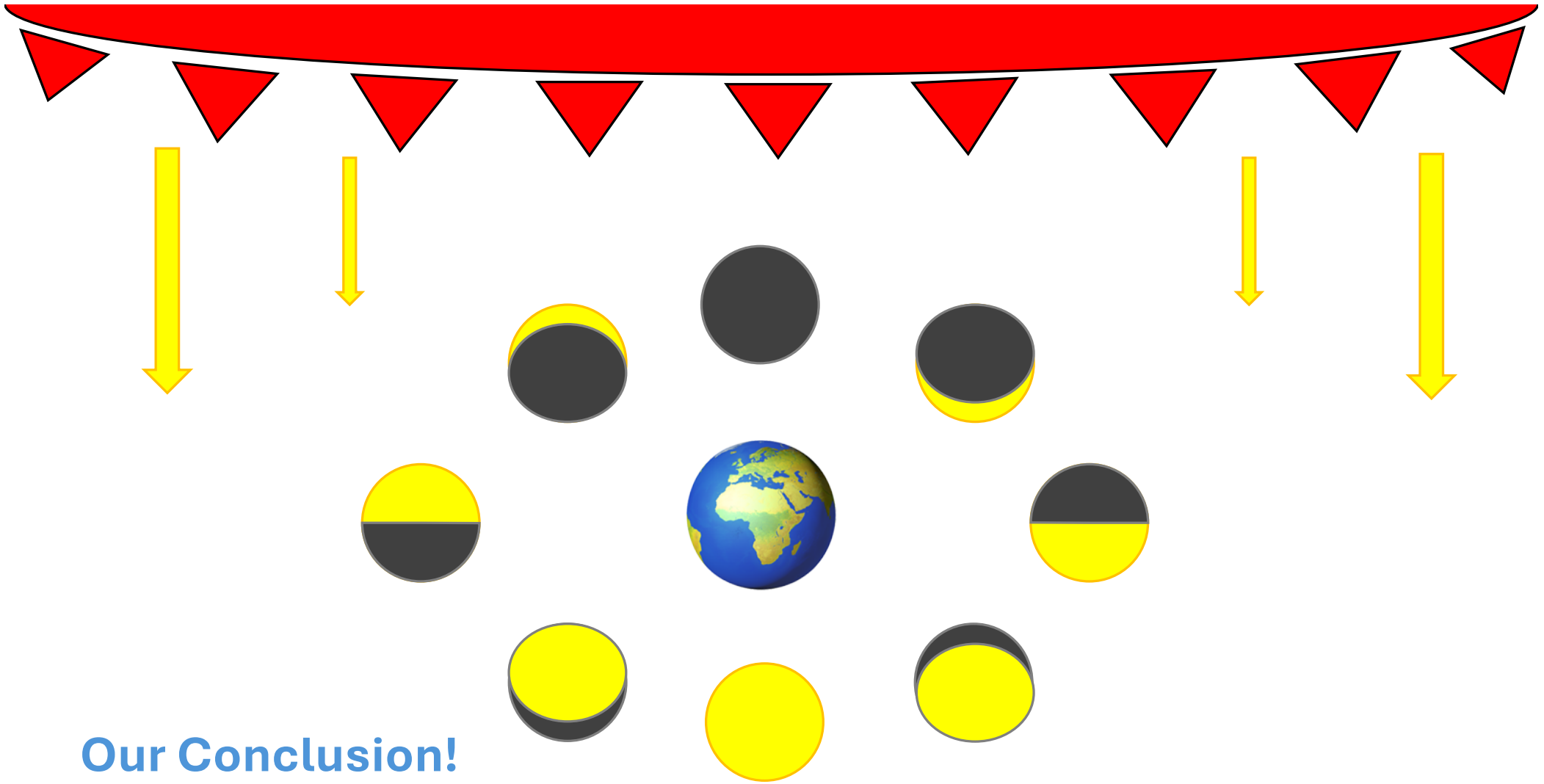
05:00

01:00

3. Share in class



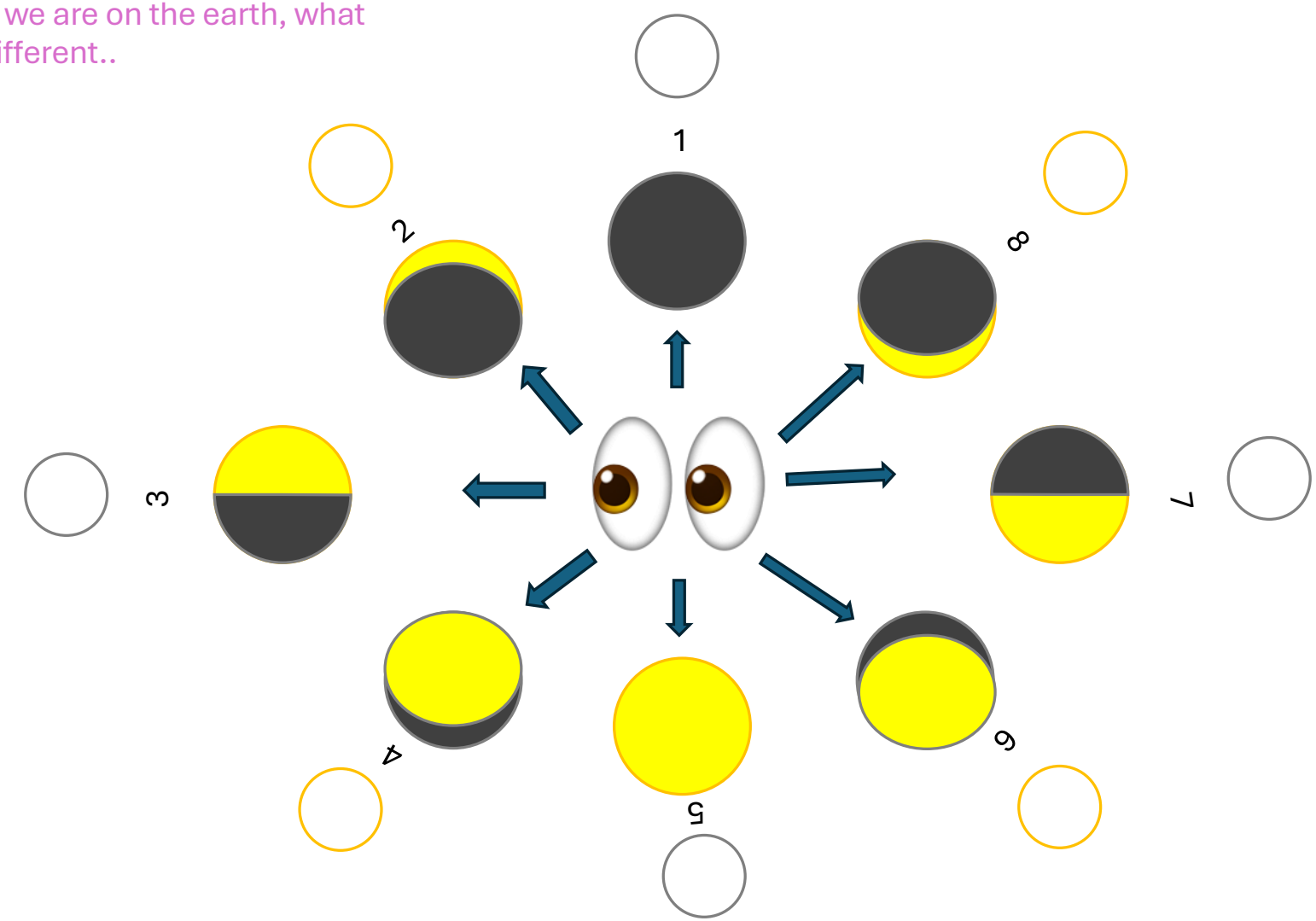


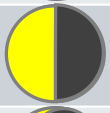


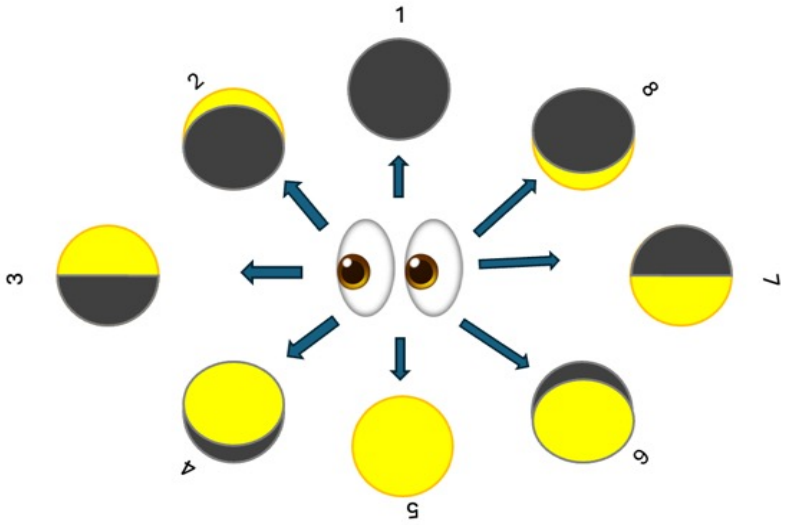
Our Conclusion!

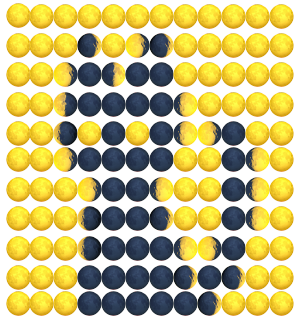
Is your hypothesis correct?

However, if we are on the earth, what we see is different..



Number	Shape	Name of the moon phase
1		New Moon
2		Waxing Crescent
3		First Quarter
4		Waxing Gibbous
5		Full Moon
6		Waning Gibbous
7		Last Quarter
8		Waning Crescent





Lunar Calendar

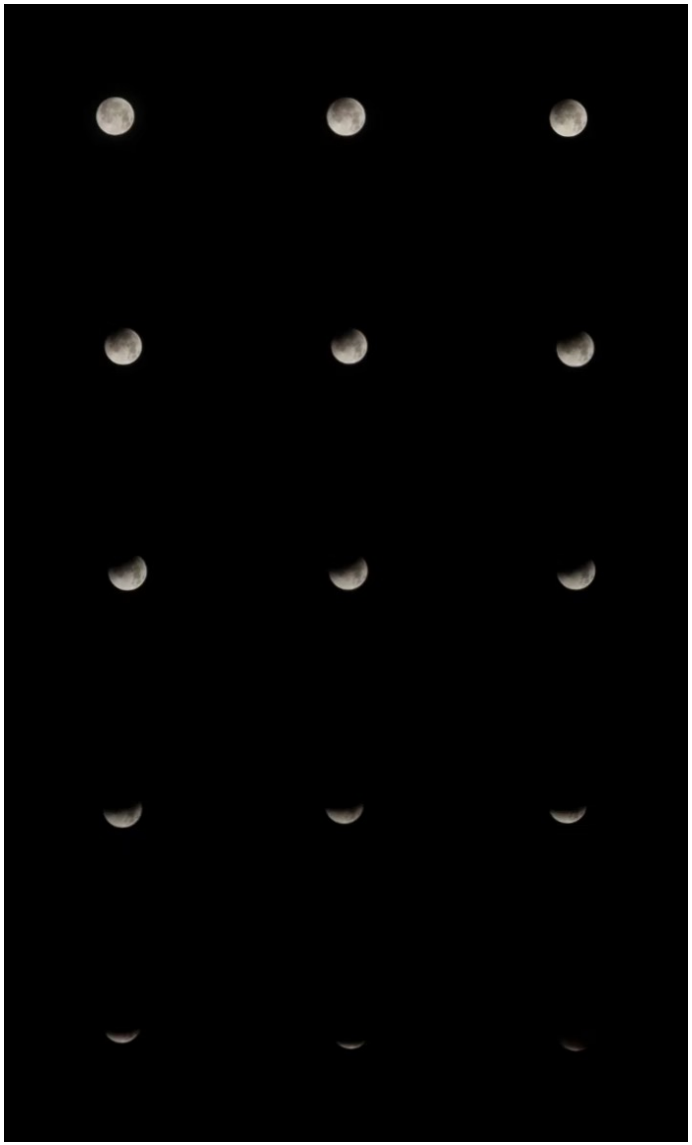
Image by © 2025, Curated Kitchenware.

One **lunar month** is the time it takes the Moon to go from **new moon → full moon → new moon again**.

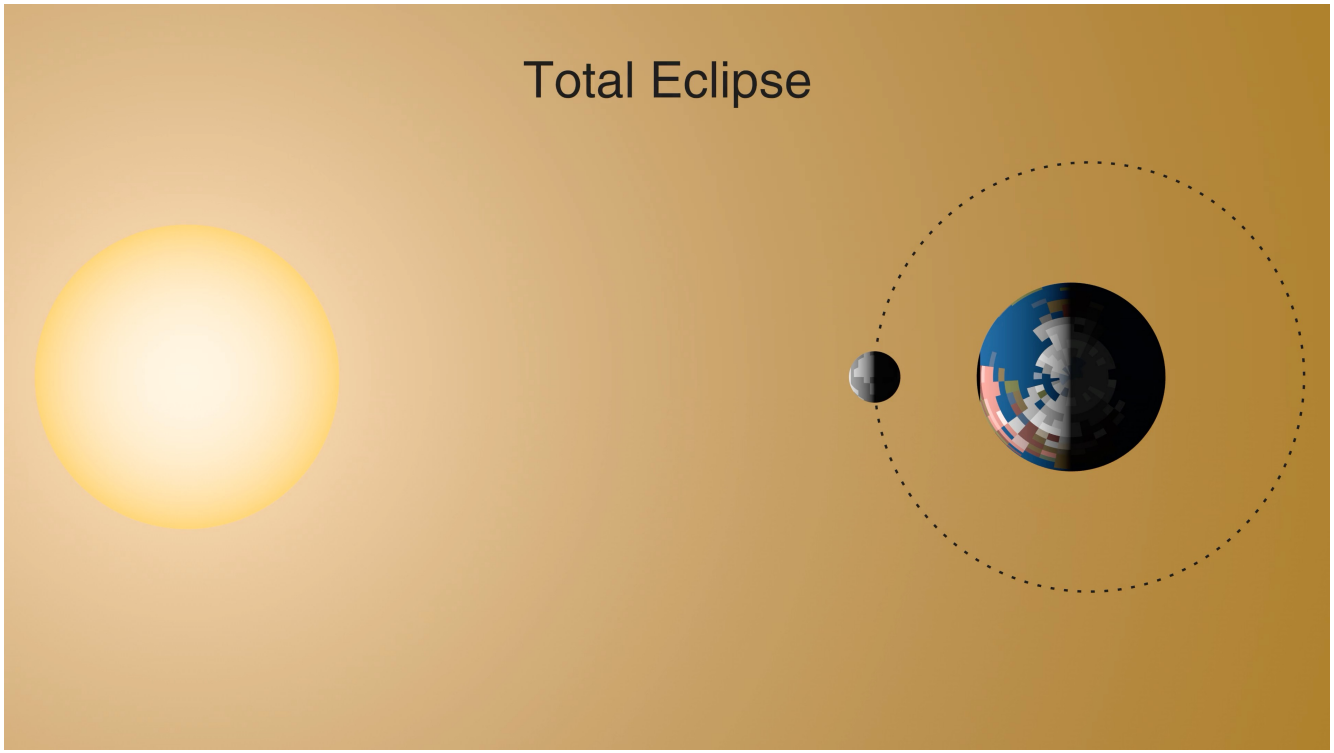
That takes about **29–30 days**.

Some cultures, like the **Chinese** and **Islamic** traditions, use the lunar calendar to decide **festivals and holidays**.

By watching the **shape of the Moon** in the night sky, people know the time in the lunar month.



Why do we have eclipse?



Credits: NASA's Scientific Visualization Studio

Add pic: 地球公转轨迹

New Mission:
Lunar Space Station

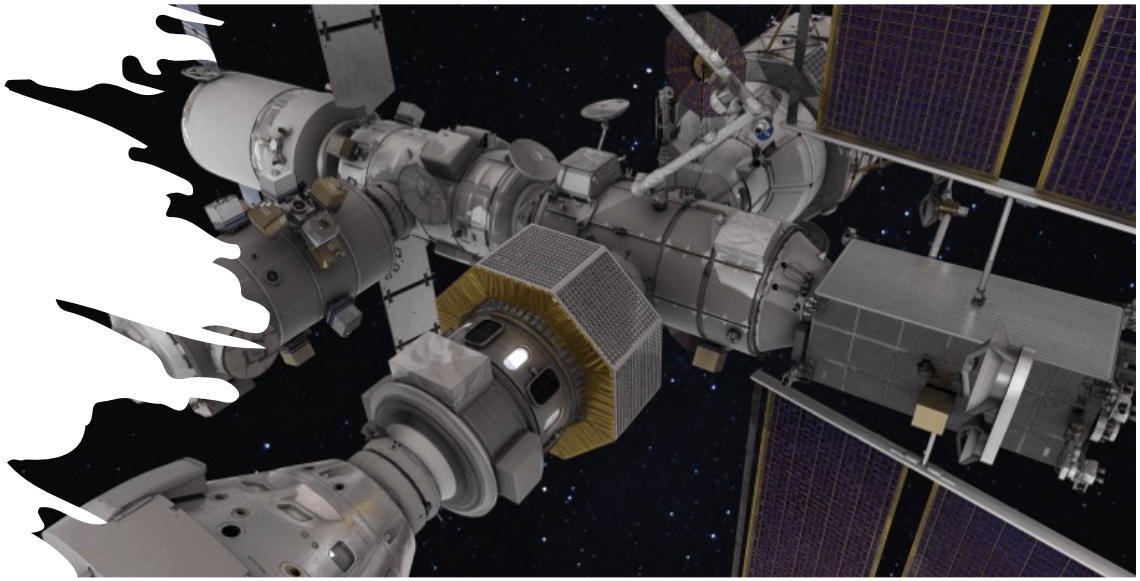
Dear Space Architect,

This is a call for your creativity and ideas! 🌟 Scientists are planning to build a **space station orbiting the Moon** to support future exploration and discovery. They cannot do it alone — **they need your help!**

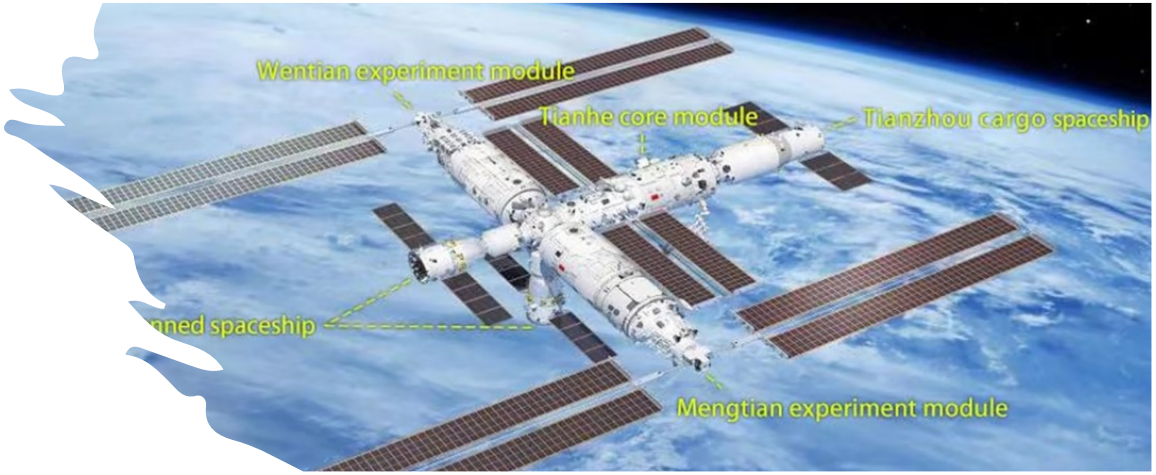
Your mission: **design and build a model of this Lunar Space Station.**

✨ Your design should include:

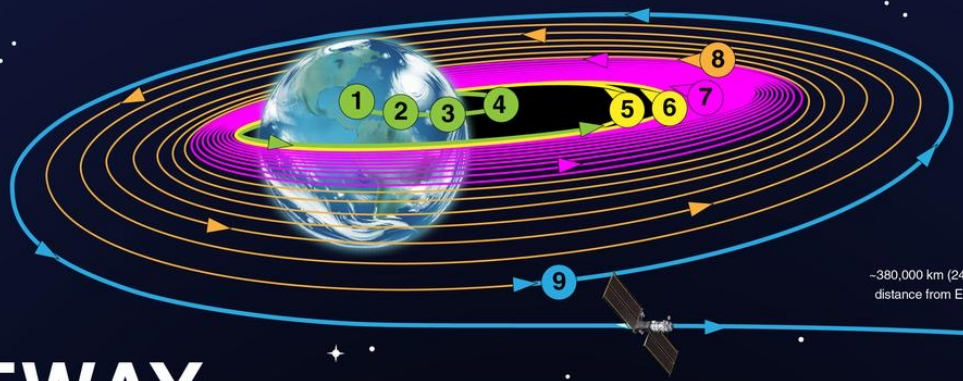
1. **An observation module**: to watch and record the Moon's phases and surface.
2. **A robotic arm**: to collect samples and do tricky tasks.
3. (**Bonus challenge!**) A **living module** and a **space farm module** (like what we had for last year's Moon Base): to make life in space more comfortable and sustainable.



Gateway Space Station
Image credit: NASA



Tiangong Space Station
Image credit: China National Space Administration



~380,000 km (240,000 miles)
distance from Earth to Moon

GATEWAY

Humanity's first space station around the Moon

1 LUNAR GATEWAY LAUNCH
Power and Propulsion Element (PPE) along with Habitation and Logistics Outpost (HALO) launch together on a Falcon Heavy launch vehicle. Falcon Heavy consists of a center core with two boosters attached, and a second stage on top of the center core.

2 BOOSTER ENGINE CUTOFF
Falcon Heavy launch vehicle reaches booster engine cutoff and boosters separate from center core.

3 CENTER CORE ENGINE BURN
The center core completes its burn and separates from the second stage.

4 SECOND STAGE ENGINE BURN
The fairing halves surrounding the spacecraft separate and the first of two second stage burns begin to place Gateway into a circular parking orbit.

5 LAUNCH VEHICLE SECOND STAGE BURN
The second stage engine restarts for its second burn, placing Gateway into a high-altitude elliptical transfer orbit in preparation for lunar spiral transit.

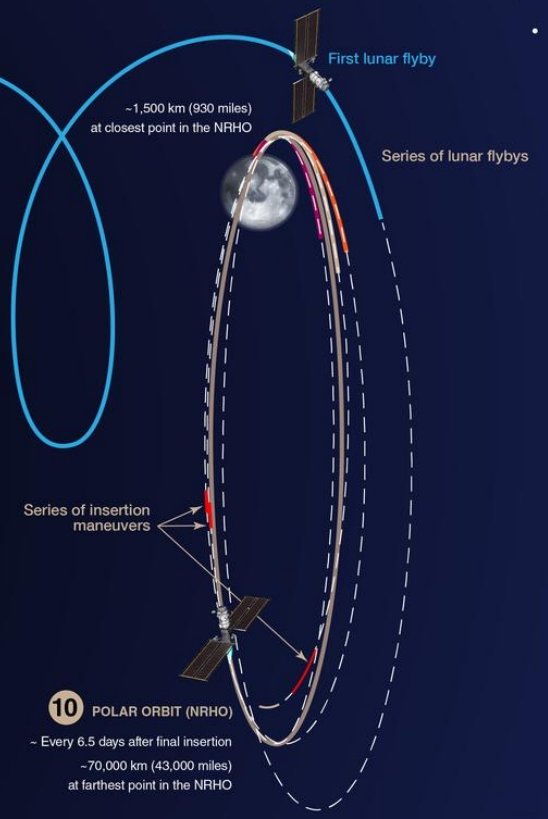
6 GATEWAY SEPARATES FROM SECOND STAGE
Once spacecraft separation is confirmed, PPE deploys roll-out solar arrays and undergoes systems checks for approximately 7 to 10 days. PPE uses its electric propulsion to start lunar transit. The solar electric propulsion system will be the highest-powered electric propulsion system ever flown, rated at 60 kW.

7 SPIRAL SUBPHASE
The first subphase, the spiral subphase, lasting approximately 300 days, is where the apogee and perigee continues to be raised beyond the Earth's protective magnetosphere and through the Van Allen Belts. Scientific payloads will collect data on radiation as they travel through the belts.

8 ALIGNMENT SUBPHASE
The next subphase is the alignment subphase. For approximately 60 days the apogee continues to raise. As Gateway approaches the Moon, a plane change will be performed to align with the Moon's orbit.

9 BALLISTIC SUBPHASE
The final subphase is the ballistic subphase. Lasting approximately 30 days, the ballistic subphase uses the Moon's gravity to perform an additional plane change, and positions Gateway closer to the Moon for lunar flybys.

10 INSERTION INTO UNIQUE POLAR ORBIT
After completing a series of lunar flybys and long thrust arcs using the electric propulsion system, it will take approximately 7 to 14 days to insert Gateway into a unique polar orbit known as Near-Rectilinear Halo Orbit (NRHO).



Artist concept: Illustration visuals are not to scale and intended for educational purposes.

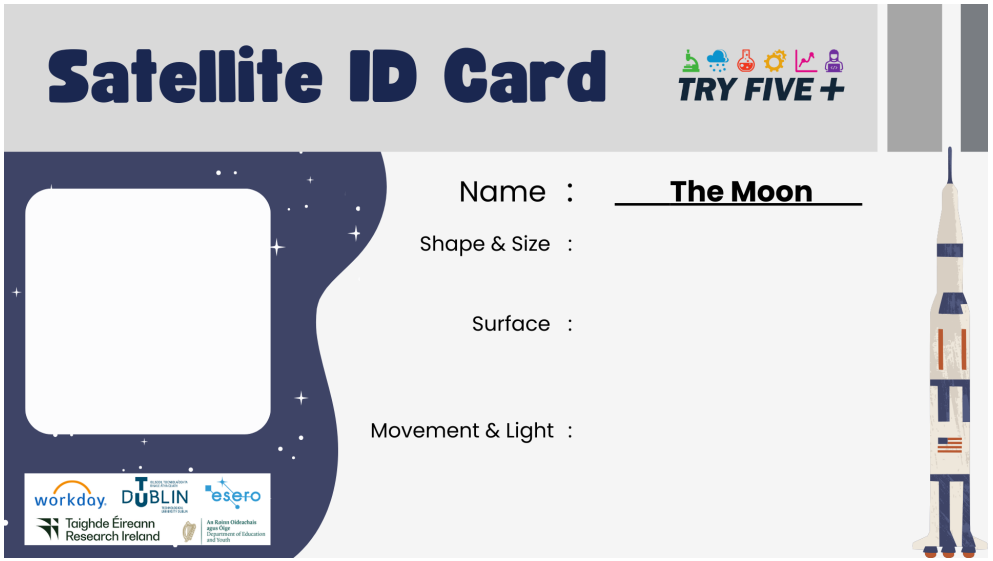
GWMM–04.10.25

What do you know about the moon?

- Shape & size
- Surface
- Movement & Light

Make an ID card for the moon

- **Read** the information in your envelope. – 2 mins!
- **Share** your information in group.
- **Categorize** all the information into:
  - Shape & size
  - Surface
  - Movement & Light
- Stick the items on the ID card!



Satellite ID Card

TRY FIVE +

Name : **The Moon**

Shape & Size :

Surface :

Movement & Light :

workday. DUBLIN TECHNOLOGICAL UNIVERSITY DUBLIN esero

Taighde Éireann Research Ireland

An Roinn Oideachais agus Óige Department of Education and Youth

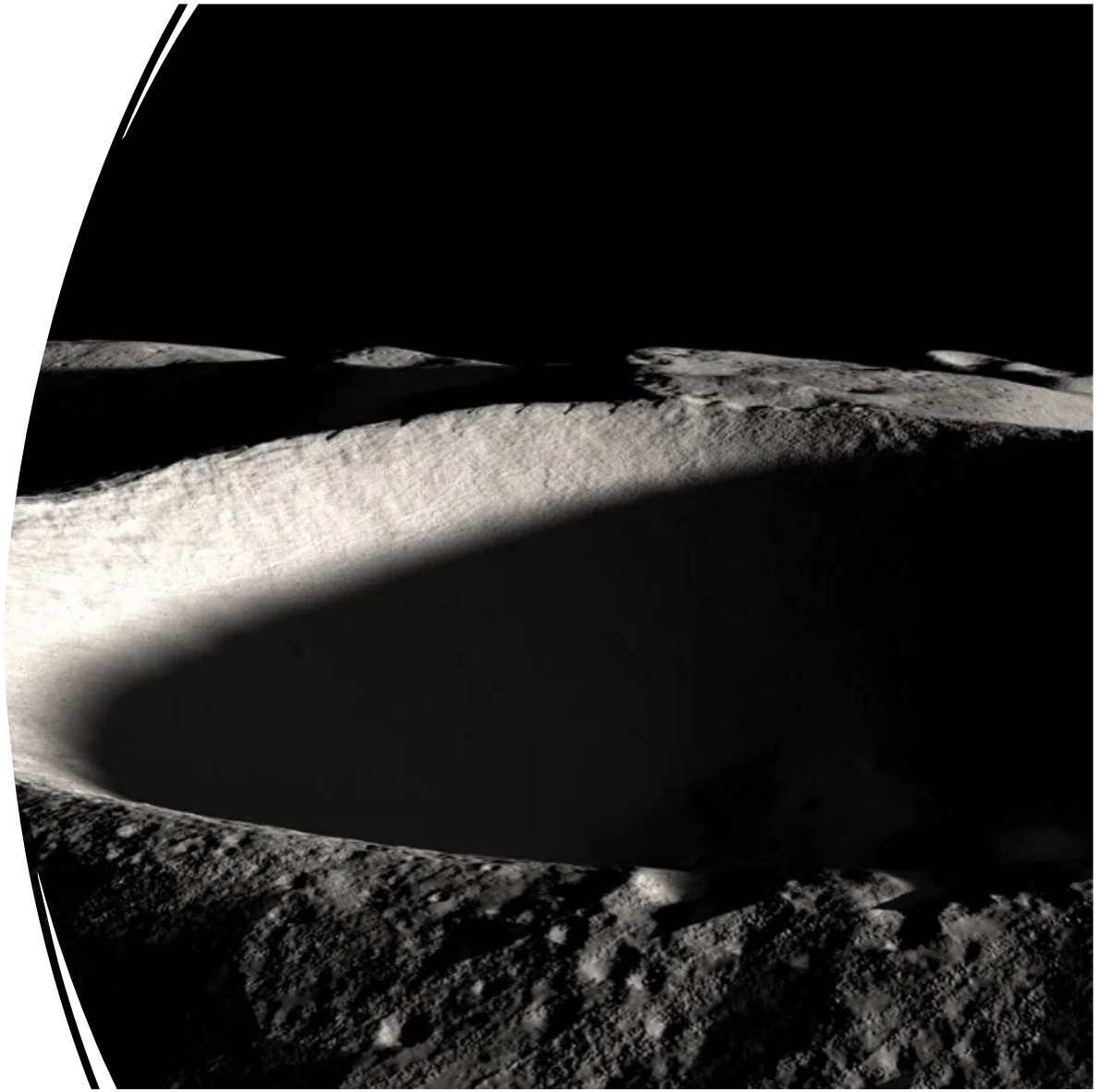
Shape & Size

- The Moon is a **round ball**.
- It is **1/4 the size of Earth**.
  - The diameter of Earth is about 12,742km.
  - The diameter of the moon is 3,474km.
  - To go all the way around the Moon, we would need about **9 million** children holding hands.

Surface

- Color: **gray**.
- Has **flat areas** called **moon seas**.
- Has **craters** made by hitting asteroids.
- No water, air, or plants.

https://science.nasa.gov/moon/facts/



Movement & Light

- The Moon **goes around Earth** in about **27 days**.
- It **spins** while moving → we **always see the same side**.
- **Moon phases**: We see different shapes of the moon in a month.
- The Moon does not make its own light → it **reflects sunlight**.
- Sometimes Earth blocks sunlight → **lunar eclipse**.

Moon in art & literature

- Painting
- Poems
- Stories
- … …

A bit more research?
Welcome to share your findings!

To explore more…

- The movement of earth:
  - Why do we have day and night?
  - Why do we have seasons?
- How will the day and night be like in the lunar space station?
  - How many times of sunrise and sunset will they see in 24 hours?
  - How will the light affect the astronauts?
  - How can we help them stay in health?
- ……