



TEACHER PACK

The solar system with honest physics, for your classroom

solarbench.im · free for children's education · supported by BroadbandSwitch.uk
Suitable for Key Stage 2 and 3 · Earth and Space topics · no accounts, no logins, no personal data

Five-minute setup

What it is

SolarBench is a free website that shows the real solar system, live: the planets are where they really are today, Earth's daylight matches the actual time, and the Moon shows tonight's true phase. It runs in any modern browser on the classroom projector, laptops or tablets. Nothing to install, nothing to sign into.

The projector lesson (10-15 minutes)

Open solarbench.im on the big screen and press ■ **GUIDED TOUR**. Thirteen stops, big text, auto-advancing: the Sun, every planet, the dwarf planets and Voyager 1. Press **NEXT** to move at your own pace, or let it run. Afterwards, press ■ **TONIGHT** and show the class exactly what will be over their houses this evening: tonight's moon phase and which planets they can find. Homework that involves going outside and looking up.

Class boards (2 minutes to set up)

Invent a class code: any 4-10 letters and numbers, for example **OAK6SPACE**. Pupils open ■ **TONIGHT** → **MY STUFF**, type the code and a space-themed nickname (star names, not real names). Any stress test or speed test they submit now appears on your class's own private top ten as well as the world board. Codes are shared secrets: pick something unguessable, and make a new one next term if you like.

Things pupils can be set loose on

The 15 **missions** (badge wall, bottom left) are self-guided exploring: meet every planet, catch a solar flare, rewind time to before Sputnik. The **question of the day** builds a streak, one question each day, answers explained. The **time machine** shows the sky on anyone's birthday. The **REWIND** button runs the solar system backwards, and **TRUE SCALE** shows how empty space honestly is: both make excellent discussion starters.

Honesty notes for the teacher

Positions, orbits, spins, tilts, moon phase and daylight are computed from real NASA/JPL data for the actual date shown. Sizes and distances are gently compressed so everything fits on one screen (**TRUE SCALE** shows the truth), the solar flares are dramatised, and only a sprinkle of the ~16,000 real satellites is drawn. The app says all of this itself in **ABOUT**. Privacy details, written for children, are at solarbench.im/privacy.html.

Worksheet 1 · Planet detectives

Ages 7-11 · click planets in SolarBench to open their fact cards

1. Which planet would float in a bath of water? (Clue: it has amazing rings.)

2. Find the hottest planet. Why is it hotter than Mercury, even though Mercury is closer to the Sun?

3. A 30 kg child stands on Jupiter. What would they weigh there? And on the Moon?

4. How long does sunlight take to reach Earth?

5. Which planet spins lying on its side, and how many years of daylight does each pole get?

6. Click THE SUN and watch it. What are the dark patches called, and are they hot or cold spots?

7. Press ■ TONIGHT. What is the Moon doing tonight, and which planets could you find this evening?

Finished? Try the mission: meet all eight planets and earn the Planet Explorer badge.

Worksheet 2 · Honest physics

Ages 11-14 · uses REWIND, TRUE SCALE and the time controls

1. Set time to 1s = 1 WK and watch Mercury. Where on its orbit does it move fastest? Which of Kepler's laws is this?

2. Flip TRUE SCALE. Describe what happens, and explain why the app normally compresses distances.

3. Why do all the planets orbit in nearly the same flat plane? (The Sun's card knows.) Name two objects that break the rule.

4. Click Earth. What is the REAL reason for seasons? What common wrong answer does the card rule out?

5. Use REWIND to travel to a date before October 1957. What disappears from around Earth, and why?

6. Find Voyager 1. How long does its radio signal take to reach Earth, and what does that tell you about its distance?

7. The Moon's card says it drifts 3.8 cm from Earth each year. Estimate how much further away it has moved in your lifetime.

Worksheet 3 - Space data lab

Ages 9-14 · recording real numbers from the model

Fill the table using each planet's fact card. "From Sun now" changes with the real date: you are recording live data.

Planet	From Sun now (AU)	Length of day	Moons	One fact that surprised you
Mercury				
Venus				
Earth				
Mars				
Jupiter				
Saturn				
Uranus				
Neptune				

Extension: run the STRESS TEST on two different school devices and compare how many cosmic objects each held. Why might one machine manage more than another? Submit with your class code and check the class board.

Answer notes

Worksheet 1

1. Saturn: less dense than water.
2. Venus: its thick carbon dioxide atmosphere traps heat (greenhouse effect).
3. About 71 kg on Jupiter; about 5 kg on the Moon.
4. 8 minutes 20 seconds.
5. Uranus: 42 years of daylight then 42 of night at each pole.
6. Sunspots: slightly cooler patches, about 3,500°C.
7. Tonight's answer changes daily: accept anything matching the panel.

Worksheet 2

1. Fastest nearest the Sun (perihelion): Kepler's second law, equal areas in equal times.
2. Planets shrink to specks separated by darkness; compression keeps everything visible at once.
3. They formed from one spinning disc of gas and dust; comets (Halley) and dwarf planets (Pluto, Eris) break the rule.
4. Axial tilt (23.4°), not distance: Earth is actually closest to the Sun in January.
5. Every satellite vanishes: Sputnik, the first, launched in October 1957.
6. Almost a full day at light speed: Voyager 1 is roughly a light-day (about 25 billion km) away.
7. About 3.8 cm × their age in years: roughly 40-50 cm for an 11-14 year old.

Worksheet 3

Distances vary with the real date (roughly: Mercury 0.3-0.5, Venus 0.7, Earth 1.0, Mars 1.4-1.7, Jupiter 5.0-5.5, Saturn 9.0-10.0, Uranus 18-20, Neptune 30). Days: 1,408 h, 5,832 h (backwards), 24 h, 24.6 h, 9.9 h, 10.7 h, 17.2 h (backwards), 16.1 h. Moons: 0, 0, 1, 2, 115, 293, 29, 16.

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