

★ Star Brightness Lab

Mission: Why does the Sun look so much brighter than every other star? Test lamps and light meters in the dark lab, then use real star data to answer the question.

Big question: Why does the Sun look brighter than other stars?

★ Warm-up: Would you rather?

Choose, then give a reason.

Read by a flashlight 1 meter away or a stadium light 1 kilometer away? ✓ **The flashlight: close lights can look brighter.**

Why does a car's headlight look dim far away but blinding up close? ✓ **Light spreads out with distance.**

Key vocabulary

Apparent brightness	How bright a light looks from where you are.
Actual brightness	How much light a star really gives off.
Light-year	The distance light travels in a year (about 9.5 trillion km).
Light meter	A tool that measures how bright light is.

1 Box 1

Predict

PREDICTION If lamp B moves to 4 m (twice as far as 2 m), the meter will read...

☐ Half of 25 ☐ One-fourth of 25 ☐ The same

Distance data

Record meter B for a normal lamp.

Distance	Meter B (units)
1 m	from simulator
2 m	from simulator
3 m	from simulator
4 m	from simulator

2 Box 2

The pattern

You predicted: _____. What happens when the distance doubles?

☐ The light looks 4 times dimmer ☐ The light looks 2 times dimmer ☐ Nothing changes

✓ **The light looks 4 times dimmer**

3 Box 3

A stronger lamp far away

In the simulator: Make lamp B **4× stronger** and find a distance where both meters read the SAME.

A 4× stronger lamp looks the same as lamp A when it is 2 m away. What does this show?

- ☐ A powerful light can look dim if it is far away ☐ Stronger lamps always look brighter
☐ Distance doesn't matter

✓ **A powerful light can look dim if it is far away**

4 Box 4

Real stars

In the simulator: Switch to **Real stars** and tap Rigel.

Rigel really gives off 120,000 times more light than the Sun. Why does it look like a tiny dot?

- ☐ It is 860 light-years away ☐ It is smaller than the Sun ☐ It is turned off at night

✓ **It is 860 light-years away**

Close vs far

Proxima Centauri is the closest star after the Sun, but we can't see it without a telescope. Use the data table: why?

- ☐ It gives off very little light ($0.0017 \times$ the Sun) ☐ It is the farthest star ☐ It is behind the Moon

✓ **It gives off very little light ($0.0017 \times$ the Sun)**

5 Box 5

Legend: 3 times as far 🏆 Legend only

A lamp reads 90 at 1 m. What would it read at 3 m?

Answer: _____ units ✓ **10**

Show your thinking:

6 Box 6

Final claim (CER)

Why does the Sun look brighter than other stars?

Claim

Look for: Names distance as the reason; at least 6 words

Evidence

Look for: Uses lamp lab data; a number from the simulator; at least 12 words

Reasoning

Look for: Connects distance to how bright it looks; Compares to other stars; at least 10 words



Exit ticket: answer the big question in your own words

Why does the Sun look brighter than other stars?

Look for: Light spreads out as it travels, so a light looks dimmer the farther away it is: twice as far looks 4 times dimmer. The Sun is an ordinary star, but it is extremely close to us, so it looks far brighter than stars that are actually much more powerful.



Completion codes

Students see a code like **ABC-I3** when they finish. The first part must match below. The letter is the level (E = Explorer, I = Investigator, L = Legend), and the number at the end is how many stars they earned.

Level	Code starts with
 Explorer	437-E
 Investigator	1XH-I
 Legend	1V3-L



Watch for these misconceptions

- "Seasons happen because Earth is closer to the Sun in summer." It is the tilt, not the distance.
- "Earth's shadow causes Moon phases." Phases come from our viewing angle of the lit half. Earth's shadow causes lunar eclipses.
- "The Sun moves across the sky." The Sun only appears to move because Earth rotates.