Solar system project ideas that use real numbers, by grade

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Seven solar system projects for school or home, built on NASA's real sizes and distances: a toilet-paper solar system, a planet walk, paper planets to scale and more.

The best solar system projects use the real numbers, because the real numbers are the surprise. On a model where Earth is a 1 cm paper circle, Jupiter is 11.2 cm across and the Sun is about 109 cm, wider than a child's arm span. On a toilet-paper roll where one square is 30 million kilometers, Earth is 5 squares from the Sun and Neptune is about 150. Below are seven projects, with every number worked out from NASA's planetary fact sheets, the same numbers Peabody's Space pages use, and which grades each one suits.

Styrofoam balls on coat-hanger wire are the classic solar system project, and they nearly always get the sizes and the gaps wrong, because both can't fit on one desk. A child who builds Jupiter as a tennis ball and Earth as a marble a hand's width away learns the order of the planets but not the solar system. The projects here pick one thing, size or distance or time, and get it right.

1. Paper planets to scale (K–2 and up)

Cut circles from paper with Earth exactly 1 cm across. Then every other planet's width, in centimeters, is how many Earths wide it is. From NASA's diameters:

- Planet: Mercury · Width (Earth = 1 cm): 0.4 cm
- Planet: Venus · Width (Earth = 1 cm): 0.9 cm
- Planet: Earth · Width (Earth = 1 cm): 1 cm
- Planet: Mars · Width (Earth = 1 cm): 0.5 cm
- Planet: Jupiter · Width (Earth = 1 cm): 11.2 cm
- Planet: Saturn · Width (Earth = 1 cm): 9.4 cm (without its rings)
- Planet: Uranus · Width (Earth = 1 cm): 4.0 cm
- Planet: Neptune · Width (Earth = 1 cm): 3.9 cm

The Sun, at the same scale, is a circle about 109 cm across. Tape four sheets of newspaper together and draw it with a string and a pencil, then lay Earth on top. Younger children can just compare: how many Earths fit across Jupiter? Peabody's planets at true scale draws them side by side and prints a sheet.

2. The toilet-paper solar system (grades 2–5)

Roll out toilet paper down a hallway, with one square standing for 30 million kilometers. The Sun sits at the start. Mark each planet at its average distance from the Sun:

- Mercury: about 2 squares
- Venus: about 3.5 squares
- Earth: 5 squares
- Mars: about 7.5 squares
- Jupiter: about 26 squares
- Saturn: about 48 squares
- Uranus: about 96 squares
- Neptune: about 150 squares

The first four planets crowd together in the first few squares, and then the gaps open up enormously. That is the whole lesson: the inner solar system is small, and the outer one is mostly empty.

3. A planet walk with a basketball Sun (grades 3–8)

Get size and distance right at the same time, outdoors. If the Sun is a basketball, NASA's numbers make Earth a speck about 2.2 mm across, about 26 meters away, and Neptune about 778 meters away, almost half a mile. Peabody's Planet Walk works out every planet's size and step count for a basketball, a softball or a ping-pong ball Sun, and prints signs to put down as you go. Walking it takes ten minutes and nobody forgets it.

4. How old would you be? (grades 2–6)

A year is one trip around the Sun, and every planet's trip takes a different time. A 10-year-old on Earth would be over 41 on Mercury, about 16 on Venus, about 5 on Mars and not yet 1 on Jupiter, by NASA's year lengths. Children can work out their own ages with a calculator: age × 365.25 ÷ the planet's year in days. Peabody's My Space Card does it for every world and prints a card to check against.

5. Light-minutes (grades 5–8)

Light covers about 300,000 kilometers every second. Divide each planet's distance from the Sun by that and sunlight takes about 3 minutes to reach Mercury, about 8.3 minutes to reach Earth, about 43 minutes to Jupiter and over 4 hours to Neptune. Make a timeline on a long strip of paper, one centimeter a minute, and mark when sunlight "arrives" at each planet. It turns distance into something a child can feel: the Sun we see is the Sun of eight minutes ago.

6. A moons bar chart (grades 1–4)

By NASA's count, Mercury and Venus have no moons, Earth has 1, Mars has 2, Jupiter 95, Saturn 274, Uranus 28 and Neptune 16. A bar chart on squared paper, one square for every ten moons, makes Saturn's bar run off the page, which is the best part. Older children can add that the counts keep changing as telescopes find more. Our How many moons? quiz uses the same numbers.

7. A temperature number line (grades 3–6)

Draw a number line from ?250 °C to 500 °C and place each planet's average temperature from NASA's fact sheets. The surprise: Venus, at about 464 °C, is hotter than Mercury at about 167 °C, even though Mercury is closer to the Sun. Venus's thick air traps its heat. Our Hot or cold? quiz asks the same question three worlds at a time.

Where the numbers come from

Every number above comes from the NASA planetary fact sheets, which Peabody's eleven worlds read from, with distances as averages: planets' orbits are slightly oval, so each one is a little closer or farther at different times. The data is free to download as a spreadsheet, with each number's source, for a class that wants to work its own. Pluto is a dwarf planet, so it isn't in the tables; our guide Why Pluto isn't a planet explains the 2006 rules. Our post on the planets in order has the order and a way to remember it.

Questions teachers and parents ask

What is the easiest solar system project for kindergarten?

Paper planets to scale. Cut circles, and compare Earth with Jupiter and the Sun. No numbers beyond "how many Earths fit across".

Can you make a solar system model with both sizes and distances to scale?

Not on a desk. With a basketball Sun, Earth is a 2.2 mm speck 26 meters away, and Neptune is about 778 meters away. That is why the planet walk goes outdoors.

Where can my child find the real numbers?

On NASA's planetary fact sheets, or Peabody's free worlds spreadsheet, which comes from them and names the source of each number.

Peabody (peabody.kids) is free through the end of 2026, with no ads and no sign-up, and nothing your child taps on the space pages is sent anywhere. When the project is done, the library has stories at your child's reading level.

Sources

- NASA planetary fact sheets (nssdc.gsfc.nasa.gov), via Peabody's worlds table: diameters, distances, year lengths, mean temperatures, moons.
- Peabody's Planet Walk for the basketball-Sun scale.

Free at peabody.kids/blog/solar-system-project-ideas