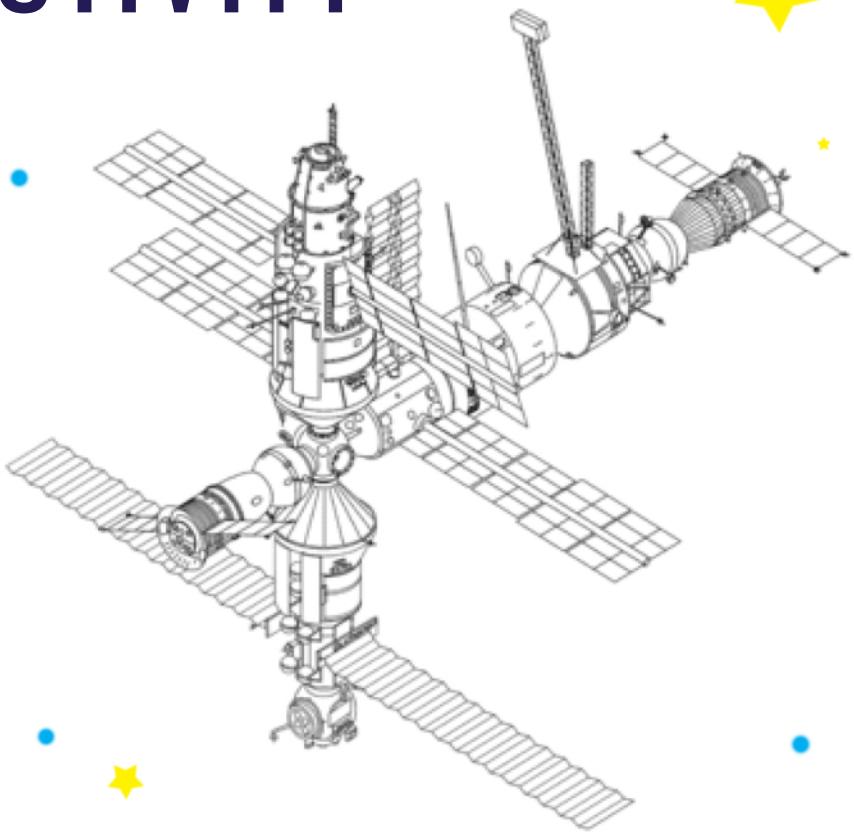
INTERNATIONAL SPACE STATION

A FAMILY SCIENCE @ HOME ACTIVITY



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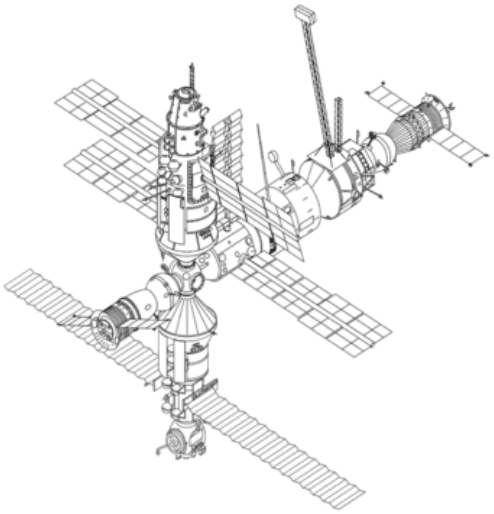
FAMILY LESSON **INTERNATIONAL SPACE STATION**

Parent Resources for International Space Station



Goals of this lesson:

- Learn the history of the International Space Station (ISS).
- Demonstrate why spacecraft stay in orbit.
- Make a paper model of the International Space Station.

For additional information, copy and paste these links into your browser:

History of all Space Stations launched from Earth:

https://www.youtube.com/watch?v=14WsSCwWFGA

Tour of the International Space Station:

https://www.youtube.com/watch?v=Snn1k_qEx20

See the Space Station from your house:

https://www.n2yo.com/

Make a paper model of the International Space Station:

Print a paper model (best on thick paper or card stock):

https://blog.doublehelix.csiro.au/wp-content/uploads/2012/08/InternationalSpaceStation.pdf

Instructions for the paper model:

https://blog.doublehelix.csiro.au/wp-content/uploads/2012/08/InternationalSpaceStationInstructions_EE_pdf-Standard.pdf

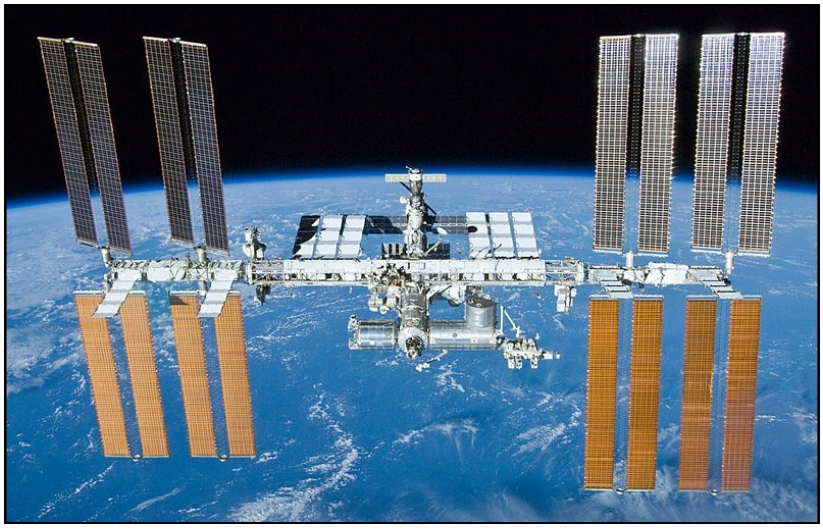
Video demonstration to build the paper model:

https://blog.doublehelix.csiro.au/wp-content/uploads/2012/08/internationalspacestation.mp4

FAMILY LESSON **INTERNATIONAL SPACE STATION**

Science in Space

The International Space Station (ISS) is the largest and most complicated spacecraft ever built. It was constructed by the combined efforts of one hundred thousand people, hundreds of companies, and sixteen countries spread over four continents. The International Space Station is the biggest human-made thing in space and the third-brightest object in the sky. It took ten years to design and build, and 42 space flights to assemble the main pieces of the space station. Construction began in space on the ISS in 1998, aided by the first reusable spacecraft: the American Space Shuttles.



The space station is in a low Earth orbit at an altitude of about 220 miles above the Earth and travels at an average speed of 17,000 miles per hour. It circles Earth 16 times a day, completing each orbit in 90 minutes. On the outside there are eight solar panels that power the space station. Together, they create up to 90 kilowatts of electricity – enough to power 13 houses!

It's 360 feet long and 250 feet wide – about the same size as a soccer field. It weighs 463 tons, about the same as 280 cars. It's so big you can see it in the night sky without a telescope or binoculars.

That may sound big for up to six astronauts to live in, but it's actually quite cramped. The bedroom for each astronaut is a small cabin, with a sleeping bag clipped into the cabin wall to stop them floating around when they sleep. The cabin also holds their computer and has room for a few other personal items.

There are also science labs where the crew can do research. There are up to 2,400 research investigations going on during an expedition so the labs can get very crowded. The crew members have to make room for each other and all their equipment.

Expedition 1 was the first long-duration stay on the International Space Station (ISS). The three-person crew stayed aboard the station for 136 days, from November 2000 to March 2001. It was the beginning of an uninterrupted human presence on the station which still continues today.

The space station allows six spaceships to be connected to it at once. These spaceships bring people and supplies from either Russia, Japan or the United States of America. In 2011, the American Space Shuttle flew for the last time. For the next nine years, the United States had to rely on Russia to ferry our American Astronauts to and from the International Space Station.

That ended on Saturday, June 30, 2020 when two American Astronauts blasted off in a SpaceX rocket. SpaceX is a private company that developed a rocket ship under the guidance of NASA, the American space agency. SpaceX rockets were successfully tested with 20 resupply flights to the International Space Station, but this mission made history because it was the first time astronauts, rather than cargo, were on board.

Those astronauts, Bob Behnken and Doug Hurley, are scheduled to stay at the space station for the next four months. They will return to Earth in their SpaceX capsule.

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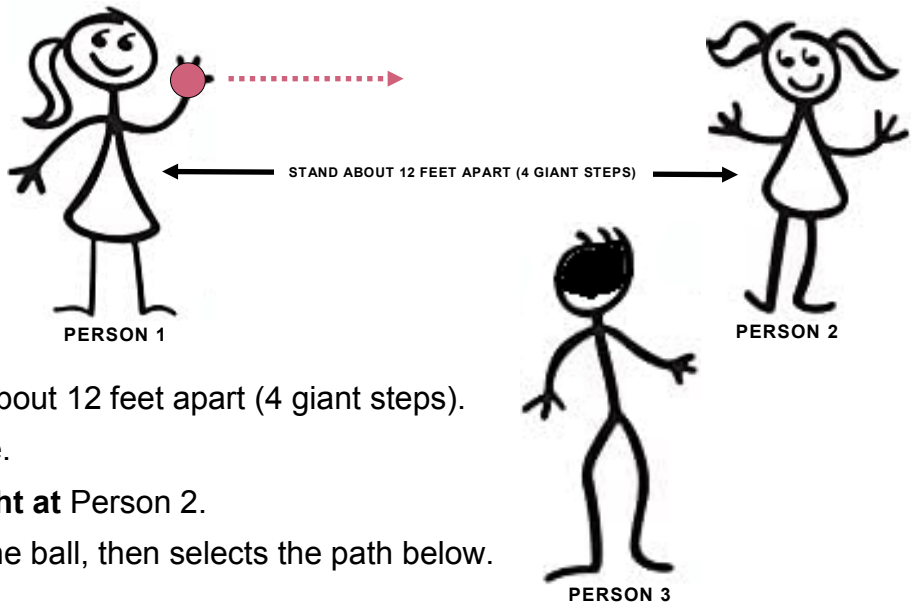
Staying in Orbit

Once a rocket ship gets to its intended height above Earth's atmosphere, and is traveling at just the right speed, the engines are shut off. At that point, the spacecraft is in orbit, and will continue to circle Earth on its own. For planet Earth, that speed is about 17,500 miles per hour. What keeps it going and going? Gravity..!

Gravity is an invisible force that pulls things toward the center of Earth. All big things have gravity, and Earth is pretty big! So, you would think that gravity would pull the spacecraft down, crashing back to Earth's surface. Here's an experiment that you can try to demonstrate why that doesn't happen. You will need 3 people and a rubber ball. Any size ball will work.

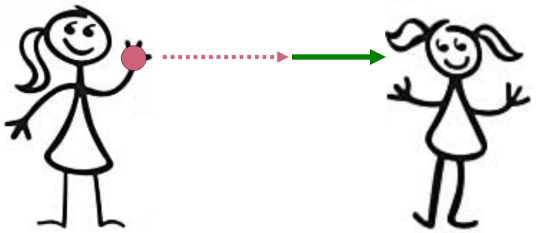
Orbiting Satellite Demonstration



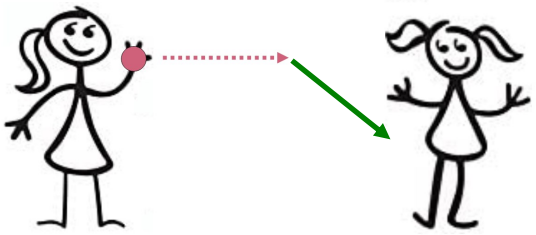
- Person 1 and Person 2 stand about 12 feet apart (4 giant steps).
- Person 3 watches from the side.
- Person 1 throws the ball **straight at** Person 2.
- Person 3 watches the path of the ball, then selects the path below.

Choose the path of your ball.

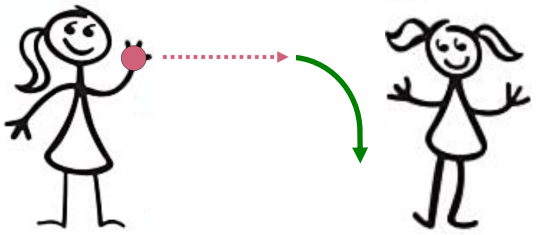
Did it continue straight? 1



Did it start straight, then fall at an angle? 2



Did it start straight, then curve toward the ground? 3



Choose the path that your ball took (put a check-mark in the box), then check your answer on the next page.

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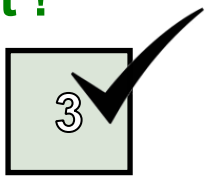
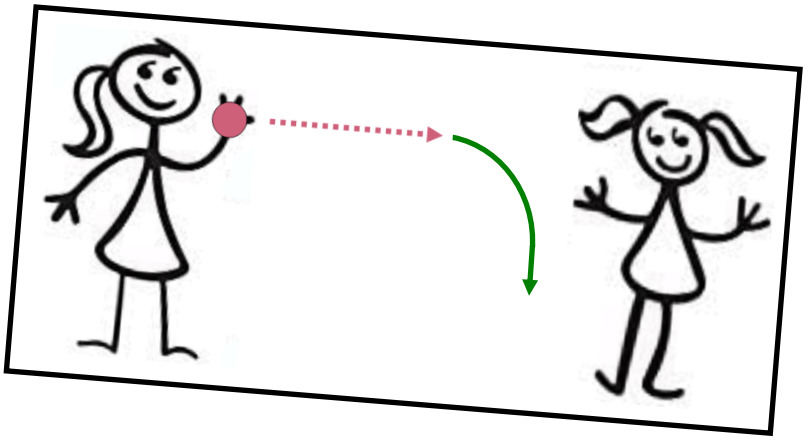
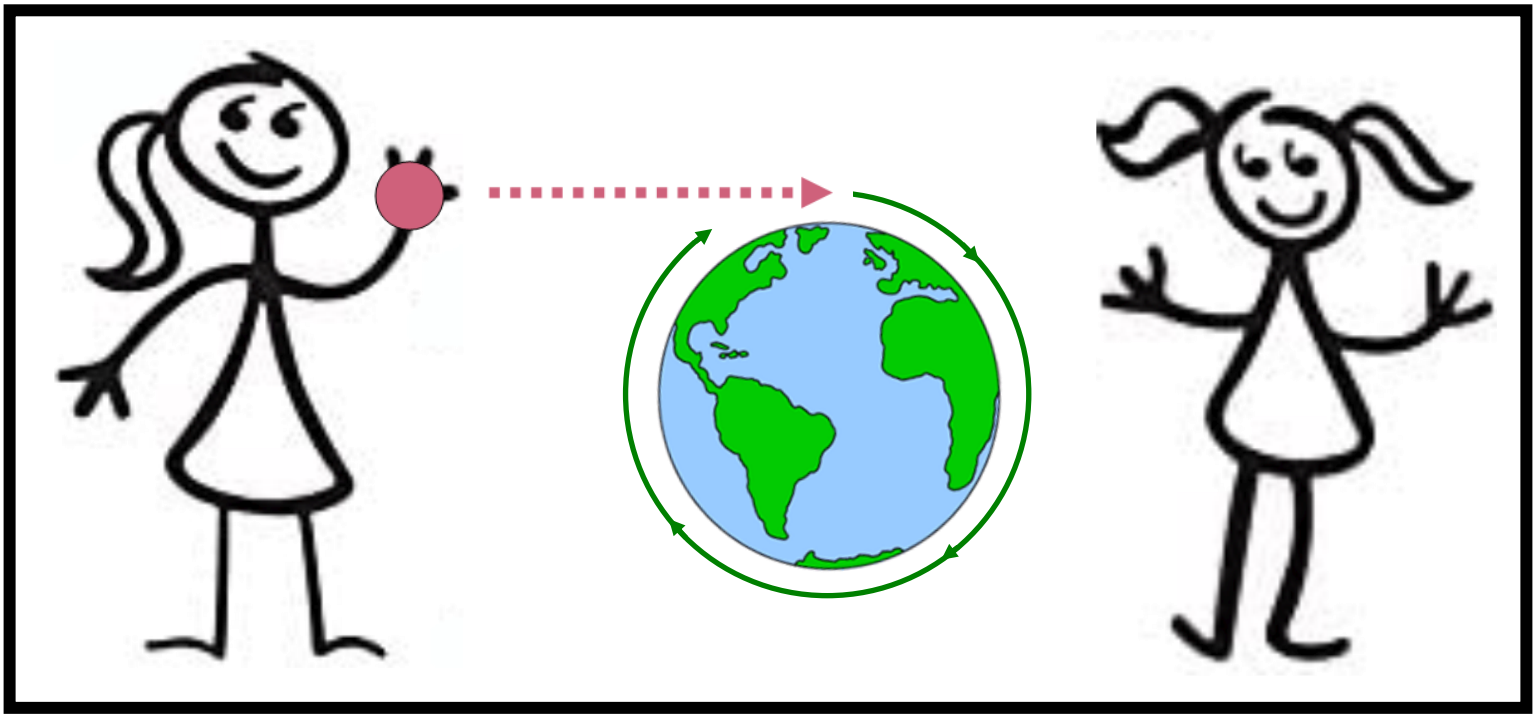
The Path of Your Ball

If you chose Box 3, you are correct !





Let's enlarge our view, and turn our little ball into a spacecraft orbiting Earth.



Just like your ball. spacecraft are being pulled down by Earth's gravity, **but at the right speed their fall toward Earth matches the curve of Earth's surface.** So the spacecraft keeps going and going, always being pulled down by gravity, but never hitting the surface of the planet. Your ball curved down. It was pulled by gravity, but it wasn't going fast enough to keep going around and around and around Earth!

Satellites and spacecraft are able to orbit around the planet because they are locked into speeds that are fast enough to overcome the downward pull of gravity. Once a rocket is outside of our atmosphere (the air that is all around Earth) then there is no friction. There's nothing to slow the rocket down, so it continues to travel at the same speed. To be in orbit around Earth, a rocket must be traveling 17,000 miles per hour.