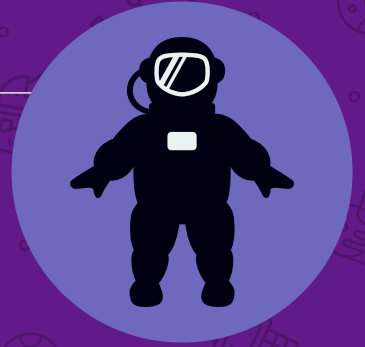


Start with a Book: Space Rangers

Moving and Working in Space



Introduction

Getting ready to live and work in space takes a lot of preparation. It can take up to two years of training to become an astronaut and get assigned to a mission. Astronauts face challenges from how to deal with weightlessness to dangers from space debris and malfunctioning technology when they travel and live in space (at the International Space Station). In these activities, kids learn about the space environment and some of the physical challenges faced by astronauts.

Supplies

- Timer
- Work gloves (2 pairs)
- Winter gloves (2 pairs)
- 4 carabiners or binder clips
- 50 feet of thin rope or heavy string
- 4 chairs
- 2 empty plastic jars with screw-on lids, such as a peanut butter jar
- LEGO® bricks (10 bricks in a container with a lid)
- Stopwatch

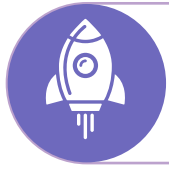
This allows two “astronauts” to go on a spacewalk at one time.

Get kids thinking

ASK KIDS: If you are an astronaut who lives and works in space, where do you sleep? And eat? And work?

Share a quick overview of [What It’s Like to Live on the International Space Station](https://www.businessinsider.com/what-its-like-to-live-on-the-international-space-station-2015-9) with kids: [businessinsider.com/what-its-like-to-live-on-the-international-space-station-2015-9](https://www.businessinsider.com/what-its-like-to-live-on-the-international-space-station-2015-9)

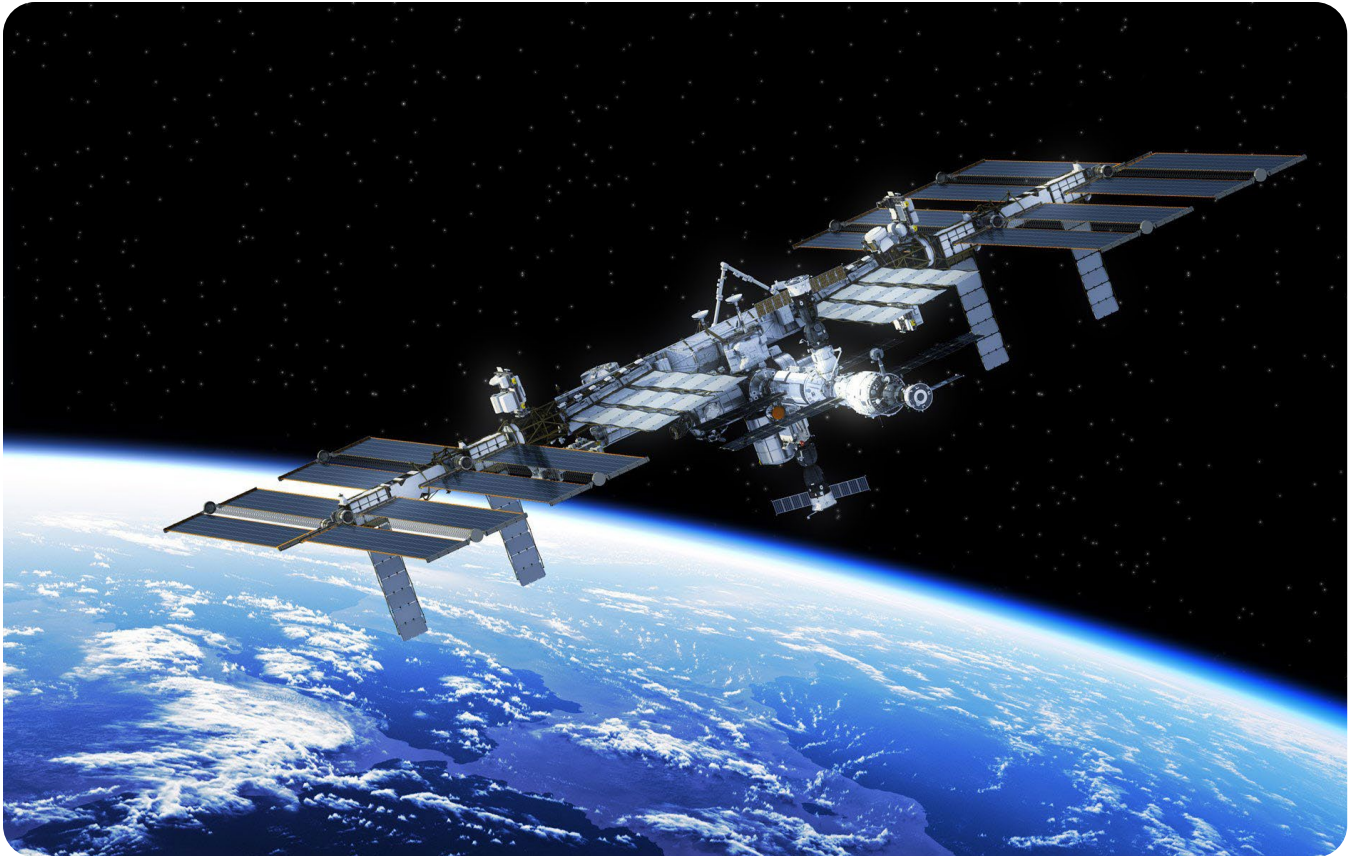




Start with a Book: Space Rangers

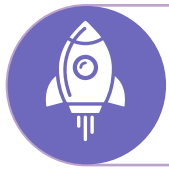
Moving and Working in Space

The International Space Station



The International Space Station. Photo © NASA





Start with a Book: Space Rangers

Moving and Working in Space

Or follow astronauts on the International Space Station in a series of videos as they explain their daily routines: nasa.gov/audience/foreducators/stem-on-station/dayinthelife

To get to live and work on the space station, astronauts train to improve their overall physical fitness. **ASK KIDS:** Why is that important? What kinds of work do astronauts do that require good strength and balance? How does living in space affect an astronaut's body? How would you get prepared to go to space?

Let's get started!

When exploring space, astronauts complete many physical tasks and must be able to twist, bend, lift, and carry massive objects to do their work. Even "walking" takes different physical effort in the reduced gravity environment of space, with astronauts pushing and pulling themselves from one place to another.

And being physically fit and continuing regular exercise (2 hours a day on the International Space Station!) is the most effective way to counteract the effects of weightlessness on the human body to maintain muscle strength and good bone health.

Lead kids through this **ASTRONAUT WORKOUT** and get them talking about how these exercises would benefit them when training to work and live in space.



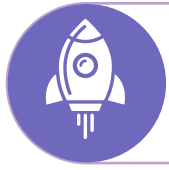
Flight Engineer Karen Nyberg exercising in the International Space Station. Photo © NASA

Astronaut workout

STRETCH

In the reduced gravity environment of space, NASA has found that the height of astronauts increases approximately 3% over the first 3 to 4 days in space. Everybody's body stretches in space! Stretch with your arms high above your head and hold for 30 seconds. Repeat 4 times.





Start with a Book: Space Rangers

Moving and Working in Space

BALANCE

How long can you balance on one leg? Try to balance on your right leg for 60 seconds. Now try to balance on your left leg for 60 seconds. Try each leg again, this time with eyes closed.

Extra challenge: Pass a ball back and forth with a friend while balancing on one leg.

FLOAT

Get used to the position of floating in space. Lie on your stomach and stretch your arms out like an airplane. Hold for 30 seconds. Relax, then repeat 4 times.

Extra challenge: Raise your chest up and move your arms like you are swimming using the breaststroke.

BEAR CRAWL

Get down on your hands and feet (facing the floor) and walk on all fours like a bear, without your knees touching the ground. Try to go 20 feet [to where I am standing]. Rest for a minute. Bear crawl back to where you started. Repeat.

CRAB WALK

Sit on the ground and put your arms and hands behind you, with your knees bent and feet on the floor. Lift yourself off the ground (facing upwards). Try to go 20 feet [to where I am standing]. Rest for a minute. Crab walk back to where you started. Repeat.

JUMP

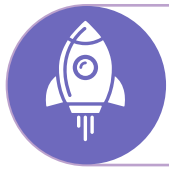
Jump as high off the floor as you can, and land lightly. Keep jumping for 30 seconds.

Extra challenge: Start your jump in a squat position and return to squat when you land. Jump for 30 seconds.

BREATHE

Life in space can be stressful. Breathing exercises can relax you. Take a deep breath in as you raise your arms over your head. Let the breath out as you drop your arms down. Repeat for one minute or more.





Work in space

Now that everyone is warmed up, have kids put balance and agility to use as they see what it might be like to have to repair something on the outside of a spacecraft.

ASK KIDS: Have you ever had to wear something that made it hard to move around? Like lots of layers of clothes or a costume? Something that was too big or too small?

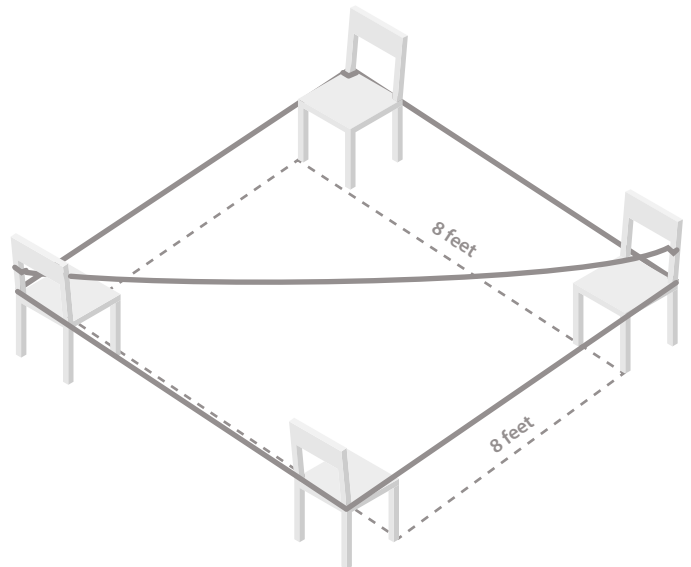
Talk about the challenges for an astronaut having to work in a space suit to complete tasks while out in space. You may want to have kids explore **NASA'S INTERACTIVE SPACESUIT EXPERIENCE:** nasa.gov/audience/foreducators/spacesuits/home/clickable_suit.html

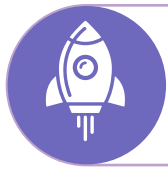


Spacewalk outside the International Space Station.
Photo © NASA

WHILE THEY EXPLORE, YOU CAN SET UP THE SPACEWALK AND WORK STATIONS

- To create the spacewalk area, set 4 chairs in a square about 8 feet apart. Tie lengths of rope securely from one chair to the next to form a square, and then cross the rope diagonally across the middle of the square and secure to the chairs to create slide wires for astronaut tethers. There should be some slack.
- To prepare a tether, cut 2 feet of rope and tie one end to a carabiner or to the metal loop of a binder clip. Tie the other end of the rope to a second carabiner or binder clip.
- On one chair, set an opened jar and a closed jar on the seat.
- At the opposite chair, set the box of LEGO bricks.
- On a remaining empty chair, place sets of gloves.





Start with a Book: Space Rangers

Moving and Working in Space

Get your astronauts ready to go! **ASK KIDS:** Why do astronauts go on spacewalks? How do they stay safe during spacewalks?

Talk about how spacewalks let astronauts work, do science, test new equipment or repair satellites or spacecraft that are in space. Explain that the spacewalk today includes:

- Opening one “vent” (opening a closed jar) and closing another “vent” (closing an open jar)
- Increasing the length of a robotic arm (connecting 5 LEGO® bricks)

As part of their spacewalk, kids must remain attached to their tether and slide wire. In order to get to both work stations, they must slide their carabiners/clips to an adjacent rope and then attach themselves to that rope.

And to protect against the hostile environment of space, kids need to wear gloves. Astronaut gloves have multiple layers, so kids should put on 2 pairs of gloves.

Two astronauts can spacewalk at a time, but for safety reasons, should not pass each other. Have kids look for a different route.

Astronauts can spacewalk for many, many hours. But this spacewalk is a race against the clock. See how quickly all your astronauts can complete the tasks.

After the spacewalk, **ASK KIDS:** What was the spacewalk experience like? What things were challenging about it? How did the tethers work? Are there other ways to keep astronauts in place?

[Adapted from the Canadian Space Agency’s activity "Moving and Working in Space"]
asc-csa.gc.ca/eng/educators/resources/working.asp

More astronaut training activities

TRAIN LIKE AN ASTRONAUT: ADAPTED PHYSICAL ACTIVITY STRATEGIES

nasa.gov/sites/default/files/ape_all_as_one_tla.pdf

TRAIN LIKE AN ASTRONAUT

stem.org.uk/missionx/resources

