Activity 1: How Big, How Far: The Earth and Moon

The Earth and Moon have been called a "double planet". In this activity you will discover how big (or small) and how close (or far away) the moon really is.

Materials

Earth globe – as large as you have available
Ball of string – with individual strings about 5 times the diameter of the globe for each student
Balloons (round) – can be inflated to at least a fourth of the diameter of the globe you have chosen.
Measuring tape or meter stick for each group of students

Activity

1. Inflate your balloon until you think it is the size that the Moon would be if the Earth were only as big as the globe in the classroom. Do not tie your balloon, but hold onto it tightly.

2. Watch as your teacher stretches a string around the equator of the Earth globe. The length of this string equals the globe's circumference.

4. The moon's diameter is a fourth of the diameter of the Earth. So the moon's circumference is also a fourth of the Earth's circumference. Watch as your teacher folds the Earth circumference string in fourths. The result is the circumference of the moon balloon. Your teacher will measure the length of the folded string to find the circumference of the moon balloon.

5. Use your string to measure the circumferences of your balloon. Use a measuring tape or meter stick to determine how long your circumference is. Then calculate the difference between your circumference and the correct answer. Record your answers below.

6. Adjust the size of your balloon until it is the correct size compared to the Earth globe.

7. Now place your balloon at the correct scale distance from the Earth globe. Make your best guess about how far away the moon should be. Using a measuring tape, measure how far away your balloon is from the Earth globe. Record it below.

8. The moon balloon should be at a distance that it 9.5 times the circumference of the Earth globe. Multiply the Earth circumference string length by 9.5. Now use a measuring tape to measure how far your balloon is from the Earth globe. Subtract to find the difference between your distance and the correct distance. Record it on the table below.

Your balloon circumference: ______ The correct circumference: _____ Difference: ________

Your balloon distance: ___________ The correct distance: __________ Difference: ________

9. Make a drawing on notebook paper showing the Earth and moon at the correct relative sizes and distances.

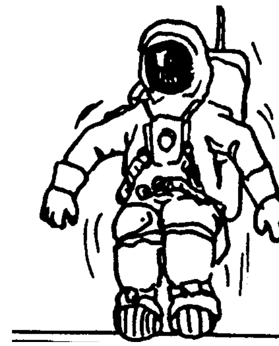
Activity 2: Lunar Olympics

The Moon has a weaker gravity pull on its surface than the Earth does. Discover how your Earth-trained muscles will make you a super star athlete.

Materials: measuring tape, classroom books

Activity

How high could you jump?



Stand next to a wall and reach as high as you can. With a piece of tape, mark how high you can reach. Measure this height with a tape measure. This is your reach. Then jump and mark how much higher your hand can touch with another piece of tape. Measure the difference in heights between your jumping height and your reach. Fill in the table below.

On Earth:

Reach: ___________ Jumping height: _________

Jumping height – Reach = ____________

Take this number and multiply it by 6. Add this number to your reach. This will be how high you can jump on the moon. Fill in the table below.

On the Moon:

Reach (same as on Earth): _________

Jumping height – Reach (6 times the Earth value): ____________

Jumping height (value above + reach): __________________

Could you dunk a basketball on the moon? _________________

How much can you lift?

Sit in a chair with your back against the back of the chair and your hands in your lap. Ask a friend to place three textbooks in your hands. Try to life these books about 20 centimeters. If you can lift them, add more books, one at a time.

What is the greatest number of books that your hands can lift?

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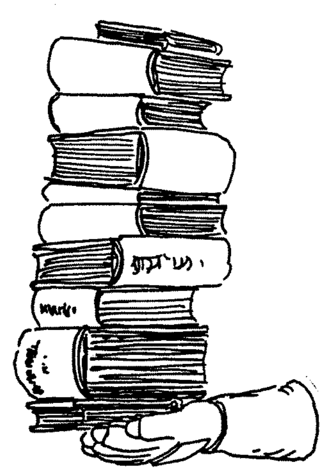


On the Moon you could like six times as many books.

How many books co0uld you lift on the Moon? _________________

Imagine how strong you would feel if you could lift that many books with just your hands.

What sports would be the most fun on the moon? When would you have to change the rules?

What would happen if you were born on the moon with only the muscle strength you need for the moon and decided to go to Earth?

Activity 3: Keeping Cool on the Moon

The moon has no atmosphere. The human body must be surrounded by air. To explore the Moon, astronauts must have a spacesuit that is like a balloon. The suit is inflated with air and does not leak. Even the gloves must be pressurized.

Materials: rubber glove and nylon glove

Activities

Wear a rubber glove for at least five minutes. Keep you hand moving the whole time by picking up objects or just opening and closing your fist.

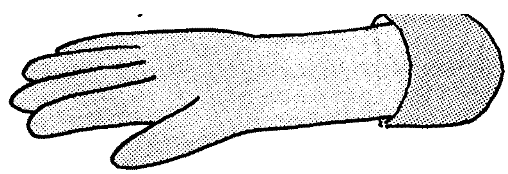
How does your hand feel after five minutes?

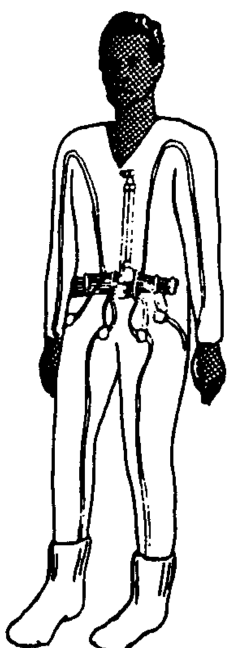
Why?

Take your hand out of the glove and wave it around in the air. How does it feel?

Why?

Put a nylon glove on and then add the rubber glove. Exercise the hand again for five minutes. What effect does the nylon glove have?





Astronauts wear nylon gloves under their pressurized gloves when they leave their spacecraft or moon bases. Astronauts also wear a nylon undergarment with little tubes in it. Cool water is pumped through the tubes. Why is this suit needed?

Activity 4: Designing a liquid cooling garment (LCG)

Outside of their spacecraft on the Moon, astronauts must wear a pressurized spacecraft, which protects the whole body from vacuum conditions. This suit contains several layers: a liquid cooling garment, a pressure garment, and a thermal micrometeoroid garment. The thermal micrometeoroid garment keeps in the astronaut's body heats and protects the pressure garment from any rips. The pressure garment is inflated to about four pounds per square inch (psi). (Sea level atmospheric pressure on Earth is 14 psi). Like a balloon, this garment does not leak air. Beneath the pressure garment is a Liquid Cooling Garment.

The Liquid Cooling Garment is made of nylon with little tubes sewn into it. These tubes are worn next to the body. Water is circulated through the tubes.

Activity
Materials
Thin plastic aquarium tubing, funnel, pan, ice water, and thermometer

1. To simulate this effect, wrap thin plastic tubing around a student's arm many times, as the drawing shows. The tubing must be warn next to the skill at all times, but be sure that it doesn't hinder circulation.

2. Another students places a funnel into the top of the tube and pours ice water through the tubing very slowly. The water is caught in a pan at the elbow.

3. Record the water temperature at the funnel and at the elbow.

Water temperature at the funnel: ________ Water temperature at the elbow: __________

What causes the water to change temperature?

4. Disconnect the funnel and beaker from the tubing, but leave the tubing in place around the student's arm. Tape the ends of the tubing so that the tubing will not move.
5. Ask the student to run as fast as possible in place for five minutes. Then repeat the first part of the experiment – dripping the water slowly through the tubing. Record temperature readings again.

Water temperature at funnel: __________ Water temperature at elbow: ________________
6. Compare the change in water temperature with the first experience. Explain the difference.

7. Why would an astronaut want to regulate the temperature or speed of the water flowing through the tubes of the Liquid Cooling Garment?