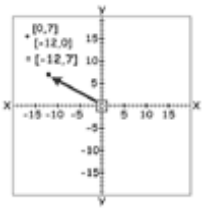
http://spaceplace.nasa.gov &
http://spaceplace.nasa.gov/en/educators/teachers_page2.htm

Math-related Activities

For the classroom:

The following classroom activity articles developed by NASA's "The Space Place" educational outreach program have been published in past issues of The Technology Teacher, the journal of the International Technology Education Association (ITEA) (http://www.iteawww.org/). These activities are now available in Adobe Acrobat (.pdf) format so that all teachers may use them.



Dampen That Drift!
http://spaceplace.nasa.gov/en/educators/ST7_vectors.pdf
In very simple terms, this activity introduces vectors, and their addition and subtraction, without need for geometry, algebra, or trigonometry. To shed light on some of the greatest mysteries of the universe, space scientists and engineers are working to perfect a technology called space interferometry. Several spacecraft carrying telescopes or other types of instruments are flown in formation. They work together as if part of one giant, rigid instrument. This activity article explains a system for eliminating almost all the tiny disturbances in this virtual structure caused by random forces in space.
Disciplines: Math (introduces vectors), physics (force, motion)
Activity: Group activity (game) and discussion.

Reinventing Time
http://spaceplace.nasa.gov/en/educators/NMP_timekeeping.pdf
Summarizes the history of timekeeping technology and secondary inventions people used to reconcile our mechanical timekeeping with our master timekeeper, the Sun. Explains the analemma curve and how to use it to calculate the exact time of high noon in any location.
Disciplines: Earth's coordinate system, astronomy, technology and society, math
Activity: Group activity and discussion.

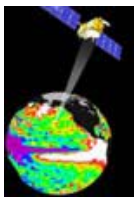
Launch a Frisbee into Orbit
http://spaceplace.nasa.gov/en/educators/st5_frisbee_toy.pdf
How is launching a spacecraft like throwing a Frisbee? Describes the analysis process that went into the design of a clever mechanism for releasing multiple "nanosatellites" into orbit from a rocket, while imparting the necessary spin to make them work properly. Introduces angular velocity, angular acceleration, rotational inertia, and torque, and shows how concepts are used to design mechanism to impart proper rate of spin. Gives patterns and instructions for building a cardboard toy "Nanosat Launcher" that works very much like the real thing.
Disciplines: Physics, math, and engineering design.
Activity: Hands-on small and large group activity.

Chasing down a Satellite
http://spaceplace.nasa.gov/en/educators/ST6_orbits.pdf
Clearly explains and illustrates the concepts behind Kepler's Laws of planetary motion, Newton's laws of gravitation, and how satellites can stay "up" in Earth orbit without constant application of thrust. Even without the equations (beyond most middle school students, but not high school algebra or physics students), the article nonetheless supports a discussion about satellites, orbits, or the International Space Station (since part of the activity is learning how to spot it in the night sky).
Disciplines: Math, physics, technology
Activity: Reading, discussion, math exercise, sky watching.

Math-related Classroom Activities (cont'd)

Write the Book on Weather Metrics
http://spaceplace.nasa.gov/en/educators/GOES_weather_book.pdf
Introduces weather terminology. Invites students to investigate how we measure the weather and other characteristics of the atmosphere and create their own "Book of Weather Metrics."
Disciplines: Math, science, technology, art
Activity: Individual creative classroom and homework assignment.

Packing for a L-o-o-o-ng Trip to Mars
http://spaceplace.nasa.gov/en/educators/mars_packing.pdf
Decide what you will need to take on a 2-1/2 year journey to Mars. Then plan how to fit everything into a 1-cubic-meter box, using only a measuring tape, pencil and paper, and math.
Disciplines: Math, space science
Activity: Group (cooperation, compromise), technical drawing, discussion

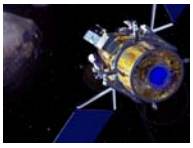


Mapping the Watery Hills and Dales
http://spaceplace.nasa.gov/en/educators/jason_gps.pdf
Learn how the Global Positioning System satellites work. Find out how the Topex and Jason-1 satellites use GPS data in making very precise topological maps of the oceans.
Disciplines: Earth science, geometry, space technology
Activity: Entire class, indoor, game-type demonstration

Be Glad You're Not a Cyclops!
http://spaceplace.nasa.gov/en/educators/urbie_stereo_vision.pdf
What is stereoscopic vision and why do we need it?
Disciplines: Biology, math
Activity: Pairs (in turn within large group), hands-on experiment, indoor

De-twinkling the Stars
http://spaceplace.nasa.gov/en/educators/adaptive_optics.pdf
How do astronomers remove the distortion in starlight caused by Earth's atmosphere?
Disciplines: Physics, math, Earth science, astronomy
Activity: Large group, kinesthetic, outdoor

Make a Scale Model of the Solar System
http://spaceplace.nasa.gov/en/educators/comet_orbits_cnsr.pdf
Drawing a scale model of the orbits of the planets and some short-period comets.
Disciplines: Math, physics, astronomy
Activity: Individual and large group, hands on, indoor and outdoor. Adaptable to grades 9-12.



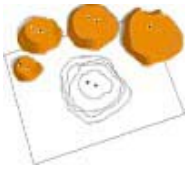
You've Got Algo-rhythm!
http://spaceplace.nasa.gov/en/educators/beacon_monitor.pdf
How do space scientists program a computer to be smart enough to make up its own mind?
Disciplines: Math, language arts, visual arts
Activity: Small groups (3-5), kinesthetic, hands-on, indoor

Some Other Math-related Activities and Fun Facts

What is the Secret Code Used by the Voyager Spacecraft?
http://spaceplace.nasa.gov/en/kids/vgr_fact1.shtml
Learn the "secret code" spacecraft use to send images back from space. Introduces the "language" of computers and spacecraft. Binary and hexadecimal notation explained simply and clearly. Fun fact, with lots of great pictures of the planets.

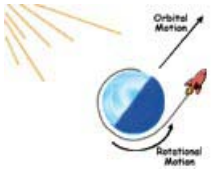
What Batteries Will Last into Your Old Age?
http://spaceplace.jpl.nasa.gov/en/kids/st5_bats.shtml
Find out how long the special batteries being tried in space would last if you could use them in your Gameboy. Enter your age now, the number of hours you play each day, then hit the calculate button to find out how old you will be before you would have to put in new batteries.

How Are Space Engineers Way Wilier Than Superheroes?
http://spaceplace.nasa.gov/en/kids/dsn_fact1.shtml
Learn about the super "hearing" of the huge antennas used to receive the tiny signals from far away spacecraft. Get a sense of tiny fractions and decimals, such as 1 thousandth and 1 millionth.



Make a Topographical Map
http://spaceplace.nasa.gov/en/kids/srtm_makemap.shtml
Build your own mountain of clay or Play-Doh, then make a topo map of it. Teaches how topo maps are made and how to read them. Explains how radar is used from space to make topo maps of Earth.

Shrink a Building Three Ways
http://spaceplace.nasa.gov/en/kids/eo3_compression.shtml
See how a "skyscraper's worth" of information can be shrunk to a tiny handful without losing the important stuff. Interactive multimedia demonstration shows three different ways (algorithms) to compress data gathered by a spacecraft before sending it back to Earth.



Launch a Rocket from a Spinning Planet
http://spaceplace.nasa.gov/en/kids/ds1_mgr.shtml
Playground demonstration (using a merry-go-round) of angular momentum and why rockets are launched in a certain direction and at a certain time to take advantage of Earth's rotational velocity. Includes explanation, with animated graphics.

How Far Can a spacecraft Fly in One School Year?
http://spaceplace.nasa.gov/en/kids/ds1fact2.shtml
How big a ball of yarn would you need in order to reach from right here to the Deep Space 1 spacecraft 188 million kilometers from Earth?

We welcome teacher feedback!
Please send to spaceplace@jpl.nasa.gov