QWQED

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SCHOOLS

Grades 7 – 8

Day 1: Your Weight on each Planet

Math

Do you weigh the same on each planet???

Materials:

- Calculator

In this activity, you will learn that while your mass will not change, your weight does based on the gravitational pull of the planet. Your weight is determined by gravity. That means the more mass something has, the more gravity it tends to have. What that means is if you were to visit the planet with the largest mass, you would weigh the most there.

What to do:

First, you must determine how much mass you have (in lbs). If you are not certain, you can use an estimate. That's okay. Mass = _____

Next, convert it to kilograms (kg). **lbs. ÷ 2.20 = weight (kg)**

To find your weight on each planet, you will need to take your mass (kg) and multiply it by the gravity of each planet.

Mass x gravity = weight (N)

100 kg x 3.73 = 373 N

Planet	**What is your mass (in kg)?**	**Gravitational pull of each planet**	**Weight (in Newtons)**
Mercury		3.73	
Venus		8.87	
Earth		9.8	
Mars		3.71	
Jupiter		24.79	
Saturn		10.44	
Uranus		8.87	
Neptune		11.15	

On which planet would you weigh the most? _____

Which planet do you weigh the least? _____

Day 1: Important People in Astronomy

Science

- Obtain a notebook, or create an online journal, etc.
- Choose 1 person from the attached list & create a journal entry about their importance.
- List of astronauts in attached bio pages: Ellen Ochoa, Kalpana Chawla, Sally Ride, Mae Jemison, Guion Bluford, Alan Shepard
    - Make sure you keep these bio pages because you'll use them again for Day 2!

Biographical Data

Lyndon B. Johnson Space Center
Houston, Texas 77058

National Aeronautics and Space Administration
May 2018

ELLEN OCHOA (PH.D)
NASA ASTRONAUT

Pronunciation: **EL**-en oh-**CHO**-ah

PERSONAL DATA: Born in 1958 in Los Angeles, California, but considers La Mesa, California, to be her hometown. Married to Coe Miles of Molalla, Oregon. They have two children.

EDUCATION: Graduated from Grossmont High School, La Mesa, California, in 1975; received a Bachelor of Science degree in Physics from San Diego State University in 1980, and a Master of Science degree and Doctorate in Electrical Engineering from Stanford University in 1981 and 1985, respectively. She is honored to have six schools named for her: the Ellen Ochoa Middle School in Pasco, Washington, the Ellen Ochoa Learning Center in Cudahy, California, the Ellen Ochoa STEM Academy at Ben Milam Elementary in Grand Prairie, Texas, the Amino Ellen Ochoa Charter Middle School in Los Angeles, and the Ellen Ochoa Prep Academy in Pico Rivera, California.

ORGANIZATIONS: Fellow of the American Institute of Aeronautics and Astronautics (AIAA), Fellow of the American Association for Advancement of Science (AAAS), Member of Phi Beta Kappa and Sigma Xi honor societies.

SPECIAL HONORS: NASA awards include the Distinguished Service Medal, Exceptional Service Medal, Outstanding Leadership Medal, and four Space Flight Medals. Recipient of numerous other awards, including the Harvard Foundation Science Award, Women in Aerospace Outstanding Achievement Award, HENAAC (Hispanic Engineer National Acheivement Awards) Engineer of the Year, the Hispanic Heritage Leadership Award, the California Hall of Fame and San Diego State University Alumna of the Year.

NASA EXPERIENCE: As a doctoral student at Stanford, and later as a researcher at Sandia National Laboratories and NASA Ames Research Center, Dr. Ochoa is a co-inventor on three patents, and author of numerous technical papers.

Selected by NASA in January 1990, Dr. Ochoa became an astronaut in July 1991. A veteran of four space flights, Dr. Ochoa has logged over 978 hours in space. She was a mission specialist on STS-56 (1993), was the Payload Commander on STS-66 (1994), and was a mission specialist and flight engineer on STS-96 (1999) and STS-110 (2002). Dr. Ochoa became Director of the Lyndon B. Johnson Space Center in Houston, Texas in 2012 and retired on May 25, 2018.

SPACE FLIGHT EXPERIENCE: STS-56 ATLAS-2 Discovery (April 8-17, 1993) was a 9-day mission during which the crew conducted atmospheric and solar studies in order to better understand the effect of solar activity on the Earth's climate and environment. On this mission, Dr. Ochoa became the first Hispanic woman in space.

Dr. Ochoa was the Payload Commander on the STS-66 Atlantis Atmospheric Laboratory for Applications and Science-3 mission (November 3-14, 1994). ATLAS-3 continued the series of Spacelab flights to study the energy of the sun during an 11-year solar cycle and to learn how changes in the sun affects the earth's climate and environment.

STS-96 Discovery (May 27 to June 6, 1999) was a 10-day mission during which the crew performed the first docking to the International Space Station, and went back again on STS-110 Atlantis (April 8-19, 2002) was the 13th space shuttle mission to visit the International Space Station.

This information has been scaled down from it's original version for educational purposes. The full document can be found at: https://www.nasa.gov/astronauts/biographies/former

Biographical Data

Lyndon B. Johnson Space Center
Houston, Texas 77058

National Aeronautics and Space Administration

KALPANA CHAWLA (PH.D.)
NASA ASTRONAUT (DECEASED)

PERSONAL DATA: Born in Karnal, India. Died on February 1, 2003 over the southern United States when Space Shuttle *Columbia* and her crew perished during entry, 16 minutes prior to scheduled landing. She is survived by her husband. Kalpana Chawla enjoyed flying, hiking, back-packing, and reading. She held a Certificated Flight Instructor's license with airplane and glider ratings, Commercial Pilot's licenses for single- and multi-engine land and seaplanes, and Gliders, and instrument rating for airplanes. She enjoyed flying aerobatics and tail-wheel airplanes.

EDUCATION: Graduated from Tagore School, Karnal, India, in 1976. Bachelor of science degree in aeronautical engineering from Punjab Engineering College, India, 1982. Master of science degree in aerospace engineering from University of Texas, 1984. Doctorate of philosophy in aerospace engineering from University of Colorado, 1988.

AWARDS: Posthumously awarded the Congressional Space Medal of Honor, the NASA Space Flight Medal, and the NASA Distinguished Service Medal.

EXPERIENCE: In 1988, Kalpana Chawla started work at NASA Ames Research Center in the area of fluid dynamics. Her research concentrated on simulation of complex air flows encountered around aircraft.

NASA EXPERIENCE: Selected by NASA in December 1994, Kalpana Chawla reported to the Johnson Space Center in March 1995 as an astronaut candidate in the 15th Group of Astronauts. After completing a year of training and evaluation, she was assigned as crew representative to work technical issues for the Astronaut Office EVA/Robotics and Computer Branches. Her assignments included work on development of Robotic Situational Awareness Displays and testing space shuttle control software in the Shuttle Avionics Integration Laboratory. In November, 1996, Kalpana Chawla was assigned as mission specialist and prime robotic arm operator on STS-87. In January 1998, she was assigned as crew representative for shuttle and station flight crew equipment, and subsequently served as lead for Astronaut Office's Crew Systems and Habitability section. She flew on STS-87 (1997) and STS-107 (2003), logging 30 days, 14 hours and 54 minutes in space.

SPACE FLIGHT EXPERIENCE: STS-87 *Columbia* (November 19 to December 5, 1997). STS-87 was focused on experiments designed to study how the weightless environment of space affects various physical processes, and on observations of the Sun's outer atmospheric layers. On this flight, she became the first Indian woman in space. Two members of the crew performed an EVA (spacewalk) which featured the manual capture of a Spartan satellite, in addition to testing EVA tools and procedures for future Space Station assembly. STS-87 made 252 orbits of the Earth, traveling 6.5 million miles in in 376 hours and 34 minutes.

STS-107 *Columbia* (January 16 to February 1, 2003). The 16-day flight was a dedicated science and research mission. Working 24 hours a day, in two alternating shifts, the crew successfully conducted approximately 80 experiments. The STS-107 mission ended abruptly on February 1, 2003 when Space Shuttle *Columbia* and the crew perished during entry, 16 minutes prior to scheduled landing.

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Biographical Data

Lyndon B. Johnson Space Center
Houston, Texas 77058

National Aeronautics and Space Administration

SALLY K. RIDE (PH.D.)
NASA ASTRONAUT (DECEASED)

PERSONAL DATA: Born May 26, 1951, in Los Angeles, California. Died on July 23, 2012. She is survived by Tam O'Shaughnessy, her partner of 27 years.

EDUCATION: Graduated from Westlake High School, Los Angeles, California, in 1968; received from Stanford University a Bachelor of Science in Physics and a Bachelor of Arts in English in 1973 and a Master of Science and Doctorate in Physics in 1975 and 1978, respectively.

EXPERIENCE: Dr. Ride was selected as an astronaut candidate by NASA in January 1978. In August 1979, she completed a one-year training and evaluation period, making her eligible for assignment as a Mission Specialist on future space shuttle flight crews. She subsequently performed as an on-orbit Capsule Communicator (CAPCOM) on the STS-2 and STS-3 missions.

Dr. Ride was a Mission Specialist on STS-7, which launched from Kennedy Space Center, Florida, on June 18, 1983. She was accompanied by Captain Robert L. Crippen (spacecraft commander), Captain Frederick H. Hauck (pilot), and fellow Mission Specialists, Colonel John M. Fabian and Dr. Norman E. Thagard. This was the second flight for the orbiter Challenger and the first mission with a five-person crew. By being on this flight, she became the first American woman in space. Mission duration was 147 hours before landing on a lakebed runway at Edwards Air Force Base, California, on June 24, 1983.

Dr. Ride served as a Mission Specialist on STS 41-G, which launched from Kennedy Space Center on October 5, 1984. This was the largest crew to fly to date and included Captain Robert L. Crippen (spacecraft commander), Captain Jon A. McBride (pilot), fellow Mission Specialists, Dr. Kathryn D. Sullivan and Commander David C. Leestma, as well as two payloads specialists, Commander Marc Garneau and Paul Scully-Power. Mission duration was 197 hours and concluded with a landing at Kennedy Space Center on October 13, 1984.

In June 1985, Dr. Ride was assigned to the crew of STS 61-M. Mission training was terminated in January 1986 following the space shuttle Challenger accident. Dr. Ride served as a member of the Presidential Commission investigating the accident. Upon completion of the investigation, she was assigned to NASA Headquarters as Special Assistant to the Administrator for long-range and strategic planning.

In 1989, Dr. Ride joined the faculty at the University of California San Diego as a Professor of Physics and Director of the University of California's California Space Institute. In 2001, she founded her own company, Sally Ride Science to pursue her long-time passion of motivating girls and young women to pursue careers in science, math and technology. The company creates entertaining science programs and publications for upper elementary and middle school students and their parents and teachers.

A long-time advocate for improved science education, Dr. Ride has written five science books for children: *To Space and Back; Voyager; The Third Planet; The Mystery of Mars* and *Exploring Our Solar System*. She has also initiated and directed education projects designed to fuel middle school students' fascination with science.

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Biographical Data

Lyndon B. Johnson Space Center
Houston, Texas 77058

National Aeronautics and Space Administration

MAE C. JEMISON (M.D.)
NASA ASTRONAUT (FORMER)

PERSONAL DATA: Born October 17, 1956, in Decatur, Alabama, but considers Chicago, Illinois, to be her hometown. Recreational interests include traveling, graphic arts, photography, sewing, skiing, collecting African Art, languages (Russian, Swahili, Japanese), weight training, has an extensive dance and exercise background and is an avid reader. Her parents, Charlie & Dorothy Jemison, reside in Chicago.

EDUCATION: Graduated from Morgan Park High School, Chicago, Illinois, in 1973; received a bachelor of science degree in chemical engineering (and fulfilled the requirements for a B.A. in African and Afro-American Studies) from Stanford University in 1977, and a doctorate degree in medicine from Cornell University in 1981.

EXPERIENCE: Dr. Jemison has a background in both engineering and medical research. She has worked in the areas of computer programming, printed wiring board materials, nuclear magnetic resonance spectroscopy, computer magnetic disc production, and reproductive biology.

On return to the United States, Dr. Jemison joined CIGNA Health Plans of California in October 1985 and was working as a General Practitioner and attending graduate engineering classes in Los Angeles when selected to the astronaut program.

NASA EXPERIENCE: Dr. Jemison was selected for the astronaut program in June 1987. Her technical assignments since then have included: launch support activities at the Kennedy Space Center in Florida; verification of Shuttle computer software in the Shuttle Avionics Integration Laboratory (SAIL); Science Support Group activities.
Dr. Jemison was the first African-American astronaut and was a science mission specialist on STS-47 Spacelab-J (September 12-20, 1992). STS-47 was a cooperative mission between the United States and Japan. The eight-day mission was accomplished in 127 orbits of the Earth, and included 44 Japanese and U.S. life science and materials processing experiments. The Endeavour and her crew launched from and returned to the Kennedy Space Center in Florida. In completing her first space flight, Dr. Jemison logged 190 hours, 30 minutes, 23 seconds in space.

Dr. Jemison left NASA in March 1993.

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Biographical Data

Lyndon B. Johnson Space Center
Houston, Texas 77058

National Aeronautics and Space Administration
May 2019

GUION S. BLUFORD, JR. PH.D (COLONEL, USAF, RET.)
NASA ASTRONAUT (FORMER)

PERSONAL DATA: Born in Philadelphia, Pennsylvania, on November 22, 1942. Married to the former Linda Tull of Philadelphia, Pennsylvania. They have two grown children. Hobbies include reading, swimming, jogging, racquetball, handball, scuba diving and golf.

EDUCATION: Graduated from Overbrook Senior High School in Philadelphia, Pennsylvania, in 1960; received a bachelor of science degree in aerospace engineering from the Pennsylvania State University in 1964; a master of science degree with distinction in aerospace engineering from the Air Force Institute of Technology in 1974; a doctor of philosophy in aerospace engineering with a minor in laser physics from the Air Force Institute of Technology in 1978 and a master in business administration from the University of Houston, Clear Lake, in 1987. He has also attended the University of Pennsylvania, Wharton School of Business.

EXPERIENCE: Bluford graduated from Penn State University in 1964 as a distinguished Air Force ROTC graduate. He attended pilot training at Williams Air Force Base, Arizona, and received his pilot wings in January 1966. He then went to F-4C combat crew training in Arizona and Florida and was assigned to the 557th Tactical Fighter Squadron, Cam Ranh Bay, Vietnam. He flew 144 combat missions, 65 of which were over North Vietnam.

NASA EXPERIENCE: Bluford became a NASA astronaut in August 1979 and in 1983, he was the first African-American in space. His technical assignments have included working with space station operations, the Remote Manipulator System (RMS), Spacelab systems and experiments, space shuttle systems, payload safety issues and verifying flight software in the Shuttle Avionics Integration Laboratory (SAIL) and in the Flight Systems Laboratory (FSL). A veteran of four space flights, Bluford was a mission specialist on STS-8, STS 61-A, STS-39 and STS-53.

Bluford's first mission was STS-8, which launched from Kennedy Space Center, Florida, on August 30, 1983. This was the third flight for the orbiter Challenger and the first mission with a night launch and night landing. During the mission, the STS-8 crew deployed the Indian National Satellite (INSAT-1B), operated the Canadian-built RMS with the Payload Flight Test Article (PFTA), operated the Continuous Flow Electrophoresis System (CFES) with live cell samples, conducted medical measurements to understand biophysiological effects of spaceflight and activated four "Getaway Special" canisters. STS-8 completed 98 orbits of the Earth in 145 hours before landing at Edwards Air Force Base, California, on September 5, 1983.

Bluford then served on the crew of STS 61-A, the German D-1 Spacelab mission, which launched from Kennedy Space Center, Florida, on October 30, 1985. This mission was the first to carry eight crew members, the largest crew to fly in space, and included three European payload specialists. This was the first dedicated Spacelab mission under the direction of the German Aerospace Research Establishment (DFVLR) and the first U.S. mission in which payload control was transferred to a foreign country (German Space Operations Center, Oberpfaffenhofen, Germany). During the mission, the Global Low Orbiting Message Relay Satellite (GLOMR) was deployed from a "Getaway Special" (GAS) container, and 76 experiments were performed in Spacelab in such fields as fluid physics, materials processing, life sciences, and navigation. After completing 111 orbits of the Earth in 169 hours, Challenger landed at Edwards Air Force Base, California, on November 6, 1985.

Bluford also served on the crew of STS-39, which launched from the Kennedy Space Center, Florida, on April 28, 1991, aboard the orbiter Discovery. The crew gathered aurora, Earth-limb, celestial, and shuttle environment data with the AFP-675 payload. This payload consisted of the Cryogenic Infrared Radiance Instrumentation for Shuttle (CIRRIS-1A) experiment, Far Ultraviolet Camera experiment (FAR UV), the Uniformly Redundant Array (URA), the Quadrupole Ion Neutral Mass

With the completion of his fourth flight, Bluford has logged over 688 hours (almost 29 days) in space.

Bluford left NASA in July 1993.

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Biographical Data

Lyndon B. Johnson Space Center
Houston, Texas 77058

National Aeronautics and Space Administration

ALAN B. SHEPARD, JR. (REAR ADMIRAL, USN, RET.)
NASA ASTRONAUT (DECEASED)

PERSONAL DATA: Born November 18, 1923, in East Derry, New Hampshire. Died on July 21, 1998. His wife, Louise, died on August 25, 1998. They are survived by daughters Julie, Laura and Alice, and six grandchildren.

EDUCATION: Attended primary and secondary schools in East Derry and Derry, New Hampshire; received a Bachelor of Science degree from the United States Naval Academy in 1944.

SPECIAL HONORS: Congressional Medal of Honor (Space); Awarded two NASA Distinguished Service Medals, the NASA Exceptional Service Medal, the Navy Astronaut Wings, the Navy Distinguished Service Medal, and the Navy Distinguished Flying Cross; recipient of the Langley Medal (highest award of the Smithsonian Institution) on May 5, 1964, the Lambert Trophy, the Kinchloe Trophy, the Cabot Award, the Collier Trophy, the City of New York Gold Medal (1971), Achievement Award for 1971. Shepard was appointed by the President in July 1971 as a delegate to the 26th United Nations General Assembly and served through the entire assembly which lasted from September to December 1971.

EXPERIENCE: Shepard began his naval career, after graduation from Annapolis, on the destroyer COGSWELL, deployed in the pacific during World War II. He subsequently entered flight training at Corpus Christi, Texas, and Pensacola, Florida, and received his wings in 1947. His next assignment was with Fighter Squadron 42 at Norfolk, Virginia, and Jacksonville, Florida. He served several tours aboard aircraft carriers in the Mediterranean while with this squadron.

He returned to Patuxent for a second tour of duty and engaged in flight testing the F3H Demon, F8U Crusader, F4D Skyray, and F11F Tigercat. He was also project test pilot on the F5D Skylancer, and his last five months at Patuxent were spent as an instructor in the Test Pilot School.

He has logged more than 8,000 hours flying time--3,700 hours in jet aircraft.

NASA EXPERIENCE: Rear Admiral Shepard was one of the Mercury astronauts named by NASA in April 1959, and he holds the distinction of being the first American to journey into space. On May 5, 1961, in the Freedom 7 spacecraft, he was launched by a Redstone vehicle on a ballistic trajectory suborbital flight--a flight which carried him to an altitude of 116 statute miles and to a landing point 302 statute miles down the Atlantic Missile Range.

Shepard made his second space flight as spacecraft commander on Apollo 14, January 31 - February 9, 1971. He was accompanied on man's third lunar landing mission by Stuart A. Roosa, command module pilot, and Edgar D. Mitchell, lunar module pilot. Maneuvering their lunar module, "Antares," to a landing in the hilly upland Fra Mauro region of the moon, Shepard and Mitchell subsequently deployed and activated various scientific equipment and experiments and collected almost 100 pounds of lunar samples for return to earth.

Rear Admiral Shepard has logged a total of 216 hours and 57 minutes in space, of which 9 hours and 17 minutes were spent in lunar surface EVA. He retired from NASA and the Navy on August 1, 1974.

Day 1: Map Analysis, Perspectives of History

Social Studies

- Discovering the Unknown: Analyze the 1795 map of "new" discoveries of North America. (1795, Library of Congress Geography and Map Division Washington, D.C. 20540-4650 USA dcu. London: Published Jan. 1, 1795 by A. Arrowsmith, No. 24 Rathbone Place)
- Online access: *www.loc.gov/resource/g3300.ct000584/?r=-0.034,0.165,1.087,0.786,0*

- Explore the early map of North American explorations and complete the map analysis questions below:

Map Analysis Questions

Directions: Take a moment to explore this historic map. If viewing it digitally on the Library of Congress website, use the ability to zoom in on multiple parts of the map in great detail. If viewing it in print, carefully read the labels where you are able to do so. Next, consider the following questions while considering perspective and audience of the mapmaker and for whom it was published in 1795.

Questions to Consider:

Read the title of this map: A map exhibiting all the new discoveries in the interior parts of North America. As we consider this map almost 225 years after it was made, why might a historian consider this map title to be inaccurate? Explain.

1. How could this map title actually exhibit a bias?

2. What would a possible more accurate title be for this map?
   Bias: prejudice in favor of or against one thing, person, or group compared with another, usually in a way considered to be unfair.

3. There are multiple areas of the map that include heavy shading. Create a potential theory why the modern day areas of Florida, the Mississippi River, and Southern California be shaded in with color?

4. The East Coast of North America has many labeled geographic features. Why might the interior of North America have very few labels?

5. What is missing from this map?

6. What is one question or one area that you wonder about this map?

Day 2: Tone and Your Own Writing

English Language Arts

- Consider the tone you selected for Kennedy during Day 1. Attempt to write a single paragraph using Kennedy's tone as a challenge statement for yourself for the remainder of the semester or your year. What is something that you can choose to do, and despite it being "hard", why is it worth it, and what actionable steps you can complete? **Note: use specific words to connect to the tone of Kennedy's speech in your own challenge speech to yourself.**
- Post it somewhere visible to you every day.

Day 2 Your Age on each Planet

Math

How old are you really???

Materials:

- Calculator

This activity uses the idea of birthdays to describe the length of each planet's orbit. A day represents how many times the Earth rotates on its axis and a year is how many times the Earth goes around a star (the Sun). However, these times only apply to this planet. These times are different on each planet! So, if you go to another planet, you might be over 100 or maybe not even 1 years old yet (depending on the planet)!

What to do:

You will be calculating how old you are on each planet by completing the chart below.

How old are you today?

Days = _____ Months = _____ Years = _____

Total age in days = # days + (# Months x 30) + (# years x 365) = _____

Example:

5 years, 5 months, and 12 days = (365 x 5) + (5 x 30) + 12 = *1987 days*

Age on the planet = your age in days / Length of a year

Mercury = 1987 / 88 = **22.6 years old!**

Planet	**Length of a year (in Earth days)**	**Your age (in days)/ the length of a year**	**Age on this planet (in years)**
Mercury	88 days		
Venus	225 days		
Earth	365.25 days		
Mars	687 days		
Jupiter	*11.8 years		
Saturn	*29.4 years		
Uranus	*164 years		
Neptune	*248 years		

**Convert this to days!!!*

Day 2: Important People in Astronomy

Science

- Using your notebook or an online journal
- Choose a ***different*** person from the list from Day 1 Science and create a journal entry about why they were important in the space program.
- List of astronauts: Ellen Ochoa, Kalpana Chawla, Sally Ride, Mae Jemison, Guion Bluford, Alan Shepard

Day 2: Map Analysis, Louisiana Purchase

Social Studies

Louisiana Purchase Map of 1803

Library of Congress, Geography and Map Division

Directions: Explore the high-resolution print of the Louisiana Purchase. Read the narrative written within the map for additional information and background knowledge. Throughout questions 2-4, imagine that you are the President of the United States in the early 1800s.

Online Version: https://bit.ly/2Cu8CfK

LOUISIANA PURCHASE, 1803.

In 1763 at the close of the French and Indian Wars France ceded to Spain all French territory west of the Mississippi River, also the Island and city of New Orleans.

In 1800 Spain returned the same territory to France.

In 1803 the United States purchased the Louisiana Territory from France for $15,000,000.

In 1818 the northern boundary was determined by treaty with Great Britain.

In 1819 by treaty with Spain the southwest boundary was fixed as follows: From the Gulf of Mexico up the Sabine River to the 32nd parallel, north to the Red River, up the Red River to the 100th meridian, north to the Arkansas River, following the Arkansas River to the Rocky mountains, north to the 42nd parallel, west to the Pacific Ocean.

FLORIDA PURCHASE, 1819.

In 1763 Spain ceded Florida to England in return for Havana which had been captured by England.

In 1783, at the close of the Revolutionary War, England ceded Florida to Spain.

In 1795 by treaty with Spain the disputed boundary of West Florida was fixed at the 31st parallel.

After the purchase of Louisiana the United States claimed West Florida as a part of Louisiana.

By the treaty of 1819 for $5,000,000 Spain sold East Florida to the United States and gave up all claim to West Florida and the Oregon Country while the United States gave up all claims west of the Sabine River.

Initial Presidential "Exploration Questions"

1. From which country did the United States acquire the Louisiana Territory in 1803?

2. As President of the United States who just signed off on the purchase of this land, what are the types of information that you would now want to know about it?

3. What do you think you should warn any expedition traveling through this new purchase about? Explain and defend why you made these selections.

4. What tools and resources would you want them to take with them, remembering that it is the early 1800s and many modern tools and conveniences had not yet been invented.

5. As this expedition would be going into lands that the United States government knew little about at the time, what qualities would you want in this group? Why?

Day 3: Mood, Tone, and Space Exploration

English Language Arts

Analyzing Mood
President John F. Kennedy's 1962 Rice University Speech
Full Text: https://er.jsc.nasa.gov/seh/ricetalk.htm

Directions: You have already analyzed tone in the previous selection. Now we are going to work to build on that knowledge to extend our learning and applications to mood within the same speech.

Remember from our learning that **mood** describes the emotions that YOU, the reader, feel while you are reading a piece - or, as you're listening to a speech. **Mood** is similar to tone, but this time, it is about YOU. How does the author make YOU feel? Angry? Sad? Motivated? Inspired? There are many possible moods, as was the case with tone, and you might feel many emotions throughout different chapters or sections of a work or speech.

Consider the following lines as practice identifying **mood**:

Selection: Those who came before us made certain that this country rode the first waves of the industrial revolutions, the first waves of modern invention, and the first wave of nuclear power, and this generation does not intend to founder in the backwash of the coming age of space.

Mood: _____

Why did you select this as the mood for this phrase/line?

_____

_____

Selection: To be sure, we are behind, and will be behind for some time in manned flight. But we do not intend to stay behind, and in this decade, we shall make up and move ahead.

Mood: _____

Why did you select this as the mood for this phrase/line?

_____

_____

Selection: Well, space is there, and we're going to climb it, and the moon and the planets are there, and new hopes for knowledge and peace are there. And, therefore, as we set sail we ask God's blessing on the most hazardous and dangerous and greatest adventure on which man has ever embarked.

Mood: _____

Why did you select this as the mood for this phrase/line?

_____

_____

Now, consider the three lines you read once again. Did there seem to be a trend in the mood that you felt throughout the speech? Why do you think that Kennedy tried to set up the mood in that manner?

_____

_____

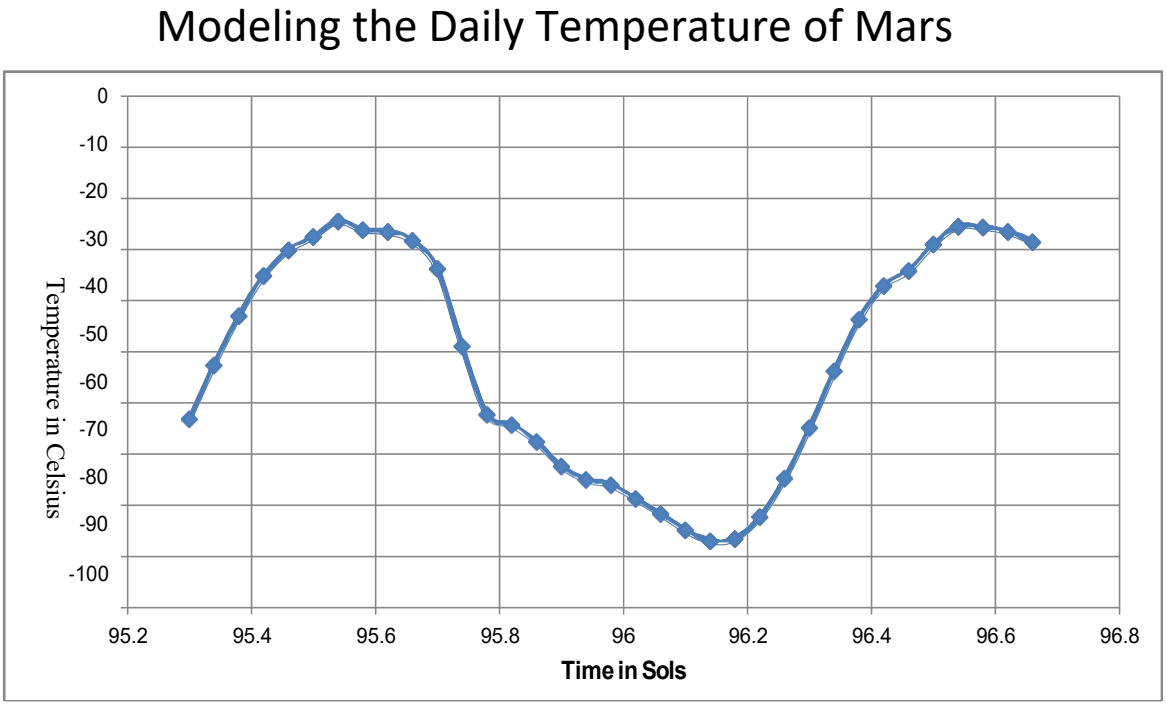
Day 3: Analyzing Coordinate Plane

Math

Interpret information regarding the Viking mission to Mars and the temperature of Mars

Materials:

- Calculator



In 1976, the NASA Viking 1 lander recorded the daily temperature of the air located 1.5 meters above the surface of Mars as shown in the graph above. The data were taken during the local Mars summer time. The horizontal scale is in local Mars days, called sols, which are slightly longer than Earth days (23 hours and 56 minutes) and last 24 hours and 37 minutes.

Problem 1 – What is the range of the Mars temperatures to the nearest degree in Celsius?

Problem 2 - What is the average temperature in Celsius for this period of time? (add the highest and lowest temperatures and divide by 2).

Problem 3 – To the nearest tenth of a sol, how soon after sol 95.0 was the lowest temperature in Celsius recorded?

Problem 4 – What is the average period of the temperature changes?

Problem 5 – What would you predict as the temperature for the Viking 1 landing site at sol 98.0?

Day 3: Exploring Mars

Science

- Research missions to mars and what some of them told us about Mars.
- A resource to get you started: http://ow.ly/XQuH50AWBov

- Using your notebook or an online journal. Write a journal entry about a specific mission to Mars and what we learned from that mission to Mars.
- Explain which mission you thought was the most important and why it was so important.

Day 3: Thomas Jefferson's letter to Lewis and Clark

Social Studies

- Conduct an analysis of Jefferson's 1803 letter to Lewis regarding the mission of the Corps of Discovery into the Louisiana Territory.
- Complete the guiding questions at the conclusion of the reading of Jefferson's letter.

Additional Video Resource:

The Corps of Discovery
https://bit.ly/31JGXzU

Transcript: Jefferson's Instructions for Meriwether Lewis

Thomas Jefferson and Early Western Explorers

Transcribed and Edited by Gerard W. Gawalt, Manuscript Division, Library of Congress. June 20 1803

To: Captain Meriwether Lewis esq. Capt. of the 1st. regimt, of Infantry of the United States

Full Transcript Available at https://www.loc.gov/exhibits/lewisandclark/transcript57.html

[ante June 20 1803]
To <Captain> Meriwether Lewis esq. Capt. of the 1st. regimt, of Infantry of the US. of A.

Your situation as Secretary of the President of the US has made you acquainted with the objects of my confidential message of Jan. 18. 1803 to the legislature; you have seen the act they passed, which they expressed in general terms, was meant to sanction these objects, and you are appointed to carry them into execution.

(5) Instruments for ascertaining by ***celestial*** observations, the geography of the country through which you will pass, have been already provided. Light articles for barter and presents among the Indians, arms for your attendants, say from 10. to 12. men, boats, tents, & other travelling apparatus with ammunition, medicine, surgical instruments and provisions you will have prepared with such aids as the Secretary at War can yield in his department; & from him also you will receive authority to (10) engage among our troops, by voluntary agreement, the number of attendants above mentioned, over whom you, as their commanding officer, are invested with all the powers the laws give in such a case.

The object of your mission is to explore the Missouri river, & such principal stream of it as by it's course and communication with the waters of the Pacific ocean whether the Columbia, Oregon, Colorado or any other river may offer the most direct & practicable water communication across this (15) continent for the purposes of commerce.

Beginning at the mouth of the Missouri, you will take careful observations of latitude & longitude at all remarkable points on the river, & especially at the mouth of rivers, at rapids, at islands, & other places & objects distinguished by such durable natural marks & characters of a durable nature kind as that they may with certainty be recognized hereafter.

(20) The course of the river between these points of observation may be supplied by the compass, the log-line & by time, corrected by the observations themselves. The variations of the compass too, in different places should be noticed.

The interesting points of the portage between the heads of the Missouri, & of the water offering the best communication with the Pacific ocean, should also be fixed by observation, & the course of that (25) water to the ocean, in the same manner as that of the Missouri.

Your observations are to be taken with great pains & accuracy, to be entered distinctly & **intelligibly** for others…fix the latitude and longitude of the places at which they were taken, and are to be rendered to the war office for the purpose of having the calculations made concurrently by proper persons within the US. several copies of these as well as of your other notes should be made at (30) leisure times, & put into the care of the most trust-worthy of your attendants, to guard by multiplying them against the accidental losses to which they will be exposed. A further guard would be that one these copies be on the paper of the birch, as less liable to injury from damp than common paper.

The commerce which may be carried on with the people inhabiting the line your will pursue, renders a (35) knowledge of those people important. You will therefore **endeavor** to make yourself acquainted with as far as a **diligent** pursuit of your journey shall admit, with the names of the nations & their numbers; the extent & limits of their possessions; their relations with other tribes of nations; their language, traditions, monuments; their ordinary occupations in agriculture, fishing, hunting, war, arts & the implements for these; their food, clothing, & domestic accommodations; the diseases prevalent (40) among them, & the remedies they use; moral & physical circumstances which distinguish them from the tribes we know; peculiarities in their laws, customs & dispositions; and articles of commerce they may need or furnish & to what extent.

Other objects worthy of notice will be the soil & face of the country, it's growth & vegetable productions, especially those not of the US. the animals of the country generally, & especially those (45) not known in the US. the remains & accounts of any which may be deemed rare or extinct; the mineral productions of every kind; but more particularly metals; limestone, pit-coal, & salt-petre; salines & mineral waters, noting the temperature of the last & such circumstances as may indicate their character; volcanic appearances; climate, as characterized by the thermometer, by the proportion of rainy, cloudy, & clear days, by lightening, hail, snow, ice, by the access & recess of (50) frost, by the winds prevailing at different seasons, the dates at which particular plants put forth or lose their flower, or leaf, times of appearance of particular birds, reptiles or insects.

Although' your route will be along the channel of the Missouri, yet you will endeavor to inform yourself, by enquiry, of the character & extent of the country watered by it's branches & especially on it's Southern side, the North river or Rio Bravo which runs into the gulph of Mexico, and the North (55) river, or Rio Colorado which runs into the gulph of California, are understood to be the principal streams heading opposite to the waters of the Missouri, and running Southwardly. Whether the dividing grounds between the Missouri & them are mountains or flat lands, what are their distance from the Missouri, the character of the intermediate country, & the people inhabiting it, are worthy of particular enquiry.

(60) The Northern waters of the Missouri are less to be enquired after, because they have been ascertained to a considerable degree, & are still in a course of ascertainment by English traders, and travellers. But if you can learn anything certain of the most Northern source of the Mississippi, & of it's position relatively to the lake of the woods, it will be interesting to us.
Two copies of your notes at least & as many more as leisure will admit, should be made & confided to (65) the care of the most trusty individuals of your attendants.

In all your intercourse with the natives, treat them in the most friendly & **conciliatory** manner which their own conduct will admit; allay all jealousies as to the object of your journey, satisfy them of it's innocence, make them acquainted with the position, extent character, peaceable & commercial dispositions of the US. of our wish to be neighborly, friendly, & useful to them.

(70) If a few of their influential chiefs within practicable distance, wish to visit us, arrange such a visit with them, and furnish them with authority to call on our officers, on their entering the US. to have them conveyed to this place at the public expense.

If any of them should wish to have some of their young people brought up with us, & taught such arts as may be useful to them, we will receive, instruct & take care of them. Such a mission whether of (75) influential chiefs or of young people would give some security to your own party.

Carry with you some matter of the kinepox; inform those of them with whom you may be, of it's efficacy as a preservative from the smallpox; & instruct & encourage them in the use of it. This may be especially done wherever you winter.

As it is impossible for us to foresee in what manner you will be received by those people, whether (80) with hospitality or hostility, so is it impossible to prescribe the exact degree of perseverance with which you are to pursue your journey. We value too much the lives of citizens to offer them to probable destruction. Your numbers will be sufficient to secure you against the unauthorized opposition of individuals or of small parties: but if a superior force authorized, or not authorized by a nation, should be arrayed against your further passage, and inflexibly determined to arrest it, you (85) must decline it's farther pursuit, and return.

In the loss of yourselves, we should lose also the information you will have acquired. By returning safely with that, you may enable us to renew the essay with better calculated means. To your own discretion therefore must be left the degree of danger you risk, and the point at which you should decline, only saying we wish you to err on the side of your safety, and to bring back your party safe (90) even if it be with less information.

Should you reach the Pacific Ocean inform yourself of the circumstances which may decide whether the furs of those parts may not be collected as advantageously at the head of the Missouri …
On your arrival on that coast endeavor to learn if there by any port within your reach frequented by the sea-vessels of any nation, & to send two of your trusty people back by sea, in such way as they (95) shall judge shall appear practicable, with a copy of your notes: and should you be of opinion that the return of your party by the way they went will be eminently dangerous, then ship the whole, & return by sea, by the way either of cape Horn, or the cape of good Hope, as you shall be able. As you will be without money, clothes or provisions, you must endeavor to use the credit of the U.S. to obtain them, for which purpose open letters of credit shall be furnished you, authorizing you to draw upon (100) the Executive of the U.S. or any of it's officers…

Should you find it safe to return by the way you go, after sending two of your party round by sea, or with your whole party, if no conveyance by sea can be found, do so; making such observations on your return, as may serve to supply, correct or confirm those made on your outward journey.

On re-entering the U.S. and reaching a place of safety, discharge any of your attendants who may (105) desire & deserve it, procuring for them immediate payment of all arrears of pay & clothing which may have incurred since their departure, and assure them that they shall be recommended to the liberality of the legislature for the grant of a soldier's portion of land each, as proposed in my message to Congress; & repair yourself with your papers to the seat of government ….

To provide, on the accident of your death, against **anarchy**, **dispersion**, & the consequent danger to (110) your party, and total failure of the enterprise, you are hereby authorized, by any instrument signed & written in your own hand, to name the person among them who shall succeed to the command on your decease, and by like instruments to change the nomination from time to time as further experience of the characters accompanying you shall point out superior fitness…

Given under my hand at the city of Washington this 20th day of June 1803.
Th. J. Pr. U.S. of A.

Directions: Read Jefferson's Letter and complete the following questions.

1. What were some of the things that Jefferson instructed the expedition to take with them? Give 3 examples with citations from the text.

2. Read lines 12-15. In your own words, explain the overall objective of this expedition.

3. In lines 16-19, Jefferson uses the term remarkable. Does this have the same meaning to what we use this word to mean today? If not, what does Jefferson mean?

4. In lines 30-33, what advice does Jefferson give to make sure all of their information returns safely?

5. From 35-42, what does Jefferson wish to learn from or about Native Americans that Lewis and Clark will encounter?

6. From 43-51, what sciences will Lewis and/or Clark need in order to provide Jefferson with the information he wants?

7. From 66 – 85, Jefferson discusses relationships with Native Americans. What do you think his motivate was in dealing with the natives? War? Peace? Learning? Defend your response.

8. Jefferson had authorized the expedition to turn around and return under what scenario?

9. What is to happen if Lewis and/or Clark are killed?

Day 4: Identifying Theme

English Language Arts

- Identify potential theme(s) of Kennedy's Rice University speech using the attached sheet.
- Kennedy's full speech (video or text): *https://er.jsc.nasa.gov/seh/ricetalk.htm*

Analyzing Theme
President John F. Kennedy's 1962 Rice University Speech
Full Text: https://er.jsc.nasa.gov/seh/ricetalk.htm

Directions: You have already analyzed tone and mood in the previous sections. Now we are going to work to build on that knowledge to extend our learning and applications to themes within the same speech.

Remember from our learning that **theme** describes the underlying message of a story, reading, or speech. Whether it is your favorite children's book or a Presidential Speech, the author is probably trying to get you to walk away with a clear message of an idea.

Access President Kennedy's full text of his speech. You will utilize the speech in an attempt to figure out what his overall or underlying message was to the American people. Within the speech, Kennedy does not overtly state what that theme is, however, uses his words to allow listeners in the audience to figure out what the message was for themselves.

Below, identify a possible theme:

_____.

Identify a sentence or phrase in the speech that supports your selected theme. Write it below:

_____

_____

Analyze how this phrase supports the theme:

_____

_____

Next, identify a second sentence or phrase that supports your selected theme. Write it below:

_____

_____

Analyze how this phrase supports the theme:

_____

_____

Next, identify a third sentence or phrase that supports your selected theme. Write it below:

_____

_____

Analyze how this phrase supports the theme:

_____

_____

TEXT OF PRESIDENT JOHN KENNEDY'S RICE STADIUM MOON SPEECH

President Pitzer, Mr. Vice President, Governor, Congressman Thomas, Senator Wiley, and Congressman Miller, Mr. Webb, Mr. Bell, scientists, distinguished guests, and ladies and gentlemen:

I appreciate your president having made me an honorary visiting professor, and I will assure you that my first lecture will be very brief.

I am delighted to be here, and I'm particularly delighted to be here on this occasion.

We meet at a college noted for knowledge, in a city noted for progress, in a State noted for strength, and we stand in need of all three, for we meet in an hour of change and challenge, in a decade of hope and fear, in an age of both knowledge and ignorance. The greater our knowledge increases, the greater our ignorance unfolds.

Despite the striking fact that most of the scientists that the world has ever known are alive and working today, despite the fact that this Nation¹s own scientific manpower is doubling every 12 years in a rate of growth more than three times that of our population as a whole, despite that, the vast stretches of the unknown and the unanswered and the unfinished still far outstrip our collective comprehension.

No man can fully grasp how far and how fast we have come, but condense, if you will, the 50,000 years of man¹s recorded history in a time span of but a half-century. Stated in these terms, we know very little about the first 40 years, except at the end of them advanced man had learned to use the skins of animals to cover them. Then about 10 years ago, under this standard, man emerged from his caves to construct other kinds of shelter. Only five years ago man learned to write and use a cart with wheels. Christianity began less than two years ago. The printing press came this year, and then less than two months ago, during this whole 50-year span of human history, the steam engine provided a new source of power.

Newton explored the meaning of gravity. Last month electric lights and telephones and automobiles and airplanes became available. Only last week did we develop penicillin and television and nuclear power, and now if America's new spacecraft succeeds in reaching Venus, we will have literally reached the stars before midnight tonight.

This is a breathtaking pace, and such a pace cannot help but create new ills as it dispels old, new ignorance, new problems, new dangers. Surely the opening vistas of space promise high costs and hardships, as well as high reward.

So it is not surprising that some would have us stay where we are a little longer to rest, to wait. But this city of Houston, this State of Texas, this country of the United States was not built by those who waited and rested and wished to look behind them. This country was conquered by those who moved forward--and so will space.

William Bradford, speaking in 1630 of the founding of the Plymouth Bay Colony, said that all great and honorable actions are accompanied with great difficulties, and both must be enterprised and overcome with answerable courage.

If this capsule history of our progress teaches us anything, it is that man, in his quest for knowledge and progress, is determined and cannot be deterred. The exploration of space will go ahead, whether we join in it or not, and it is one of the great adventures of all time, and no nation which expects to be the leader of other nations can expect to stay behind in the race for space.

Those who came before us made certain that this country rode the first waves of the industrial revolutions, the first waves of modern invention, and the first wave of nuclear power, and this generation does not intend to

founder in the backwash of the coming age of space. We mean to be a part of it--we mean to lead it. For the eyes of the world now look into space, to the moon and to the planets beyond, and we have vowed that we shall not see it governed by a hostile flag of conquest, but by a banner of freedom and peace. We have vowed that we shall not see space filled with weapons of mass destruction, but with instruments of knowledge and understanding.

Yet the vows of this Nation can only be fulfilled if we in this Nation are first, and, therefore, we intend to be first. In short, our leadership in science and in industry, our hopes for peace and security, our obligations to ourselves as well as others, all require us to make this effort, to solve these mysteries, to solve them for the good of all men, and to become the world's leading space-faring nation.

We set sail on this new sea because there is new knowledge to be gained, and new rights to be won, and they must be won and used for the progress of all people. For space science, like nuclear science and all technology, has no conscience of its own. Whether it will become a force for good or ill depends on man, and only if the United States occupies a position of pre-eminence can we help decide whether this new ocean will be a sea of peace or a new terrifying theater of war. I do not say the we should or will go unprotected against the hostile misuse of space any more than we go unprotected against the hostile use of land or sea, but I do say that space can be explored and mastered without feeding the fires of war, without repeating the mistakes that man has made in extending his writ around this globe of ours.

There is no strife, no prejudice, no national conflict in outer space as yet. Its hazards are hostile to us all. Its conquest deserves the best of all mankind, and its opportunity for peaceful cooperation many never come again. But why, some say, the moon? Why choose this as our goal? And they may well ask why climb the highest mountain? Why, 35 years ago, fly the Atlantic? Why does Rice play Texas?

We choose to go to the moon. We choose to go to the moon in this decade and do the other things, not because they are easy, but because they are hard, because that goal will serve to organize and measure the best of our energies and skills, because that challenge is one that we are willing to accept, one we are unwilling to postpone, and one which we intend to win, and the others, too.

It is for these reasons that I regard the decision last year to shift our efforts in space from low to high gear as among the most important decisions that will be made during my incumbency in the office of the Presidency.

In the last 24 hours we have seen facilities now being created for the greatest and most complex exploration in man's history. We have felt the ground shake and the air shattered by the testing of a Saturn C-1 booster rocket, many times as powerful as the Atlas which launched John Glenn, generating power equivalent to 10,000 automobiles with their accelerators on the floor. We have seen the site where the F-1 rocket engines, each one as powerful as all eight engines of the Saturn combined, will be clustered together to make the advanced Saturn missile, assembled in a new building to be built at Cape Canaveral as tall as a 48 story structure, as wide as a city block, and as long as two lengths of this field.

Within these last 19 months at least 45 satellites have circled the earth. Some 40 of them were "made in the United States of America" and they were far more sophisticated and supplied far more knowledge to the people of the world than those of the Soviet Union.

The Mariner spacecraft now on its way to Venus is the most intricate instrument in the history of space science. The accuracy of that shot is comparable to firing a missile from Cape Canaveral and dropping it in this stadium between the the 40-yard lines.

Transit satellites are helping our ships at sea to steer a safer course. Tiros satellites have given us unprecedented warnings of hurricanes and storms, and will do the same for forest fires and icebergs.

We have had our failures, but so have others, even if they do not admit them. And they may be less public.

To be sure, we are behind, and will be behind for some time in manned flight. But we do not intend to stay behind, and in this decade, we shall make up and move ahead.

The growth of our science and education will be enriched by new knowledge of our universe and environment, by new techniques of learning and mapping and observation, by new tools and computers for industry, medicine, the home as well as the school. Technical institutions, such as Rice, will reap the harvest of these gains.

And finally, the space effort itself, while still in its infancy, has already created a great number of new companies, and tens of thousands of new jobs. Space and related industries are generating new demands in investment and skilled personnel, and this city and this State, and this region, will share greatly in this growth. What was once the furthest outpost on the old frontier of the West will be the furthest outpost on the new frontier of science and space. Houston, your City of Houston, with its Manned Spacecraft Center, will become the heart of a large scientific and engineering community. During the next 5 years the National Aeronautics and Space Administration expects to double the number of scientists and engineers in this area, to increase its outlays for salaries and expenses to $60 million a year; to invest some $200 million in plant and laboratory facilities; and to direct or contract for new space efforts over $1 billion from this Center in this City.

To be sure, all this costs us all a good deal of money. This year[1]s space budget is three times what it was in January 1961, and it is greater than the space budget of the previous eight years combined. That budget now stands at $5,400 million a year--a staggering sum, though somewhat less than we pay for cigarettes and cigars every year. Space expenditures will soon rise some more, from 40 cents per person per week to more than 50 cents a week for every man, woman and child in the United Stated, for we have given this program a high national priority--even though I realize that this is in some measure an act of faith and vision, for we do not now know what benefits await us.

But if I were to say, my fellow citizens, that we shall send to the moon, 240,000 miles away from the control station in Houston, a giant rocket more than 300 feet tall, the length of this football field, made of new metal alloys, some of which have not yet been invented, capable of standing heat and stresses several times more than have ever been experienced, fitted together with a precision better than the finest watch, carrying all the equipment needed for propulsion, guidance, control, communications, food and survival, on an untried mission, to an unknown celestial body, and then return it safely to earth, re-entering the atmosphere at speeds of over 25,000 miles per hour, causing heat about half that of the temperature of the sun--almost as hot as it is here today--and do all this, and do it right, and do it first before this decade is out--then we must be bold.

I'm the one who is doing all the work, so we just want you to stay cool for a minute. [laughter]

However, I think we're going to do it, and I think that we must pay what needs to be paid. I don't think we ought to waste any money, but I think we ought to do the job. And this will be done in the decade of the sixties. It may be done while some of you are still here at school at this college and university. It will be done during the term of office of some of the people who sit here on this platform. But it will be done. And it will be done before the end of this decade.

I am delighted that this university is playing a part in putting a man on the moon as part of a great national effort of the United States of America.

Many years ago the great British explorer George Mallory, who was to die on Mount Everest, was asked why did he want to climb it. He said, "Because it is there."

Well, space is there, and we're going to climb it, and the moon and the planets are there, and new hopes for knowledge and peace are there. And, therefore, as we set sail we ask God's blessing on the most hazardous and dangerous and greatest adventure on which man has ever embarked.

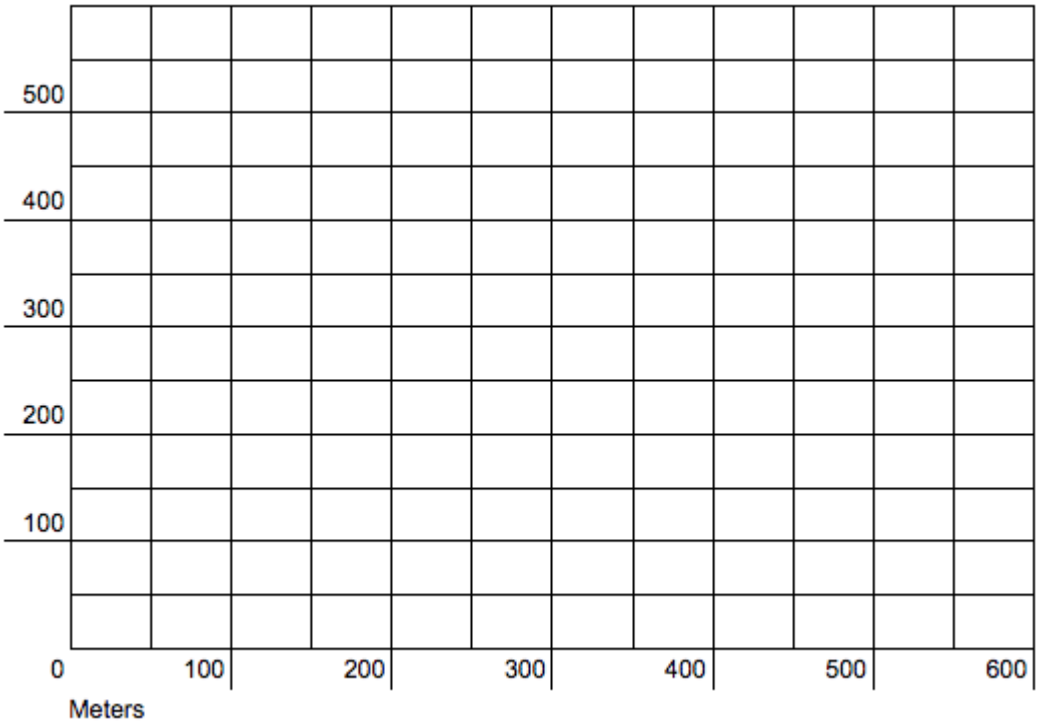
Thank you.

Day 4: Graphing Coordinate plane

Math

Practice graphing coordinates by tracking the Curiosity Rover during it's travels across the surface of Mars. You will use the data to plot points and then analyze that data.

Following the Curiosity Rover on Mars



The Curiosity Rover is traveling across the surface of Mars. We can follow its path by recording a series of destinations as ordered pairs using the local North-South location as the Y-axis, and East-West as the X-axis. Draw the coordinate grid, with units marked every 50 meters from 0 to 500 meters on each axis.

Graph the following destinations:

Day 39:(+210, +180) *Day 45*:(+315, +165) *Day 52*:(+470, +200)

Day 41:(+270,+210), *Day 48*:(+360, +175) *Day 56*:(+500, +205)

Day 42:(+300, +200), *Day 49*:(+390, +180)

Problem 1 - Along which axis was the change in position the largest?

Problem 2 - How far, in meters, did Curiosity travel between Day 42 and Day 52?

Problem 3 - What was the average speed of Curiosity between Day 42 and Day 52? (Speed = Distance/Time)

Day 4: Comparing and Contrasting Earth & Mars

Science

Using the chart provided, begin collecting data for the chart to compare the Earth & Mars. Be sure to keep this chart for Day 5, Day 6, and Day 8!

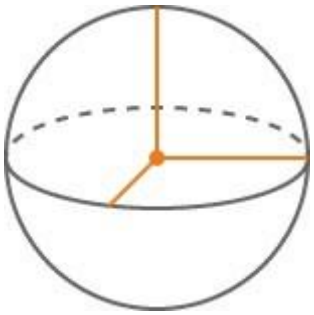
Planet	Earth	Mars
Size (Volume)		
Size (in miles or kilometers)		
What is the gravity compared to Earth?		
Period of Rotation (How long is a day?)		
Period of Revolution (How long is a year?)		
Distance from Sun (in miles or AU)		
Average temperature (use the same unit)		
Is there an atmosphere?		
What is the atmosphere made of?		
Is there life on the planet?		
Is there water on this planet?		
Can you grow plants there?		

Online Resource: https://mars.nasa.gov/all-about-mars/facts/

The Planet

Mars is no place for the faint-hearted. Arid, rocky, cold and apparently lifeless, the Red Planet offers few hospitalities. Fans of extreme sports can rejoice, however, for the Red Planet will challenge even the hardiest souls among us. Home to the largest volcano in the solar system, the deepest canyon and crazy weather and temperature patterns, Mars looms as the ultimate lonely planet destination.

Size

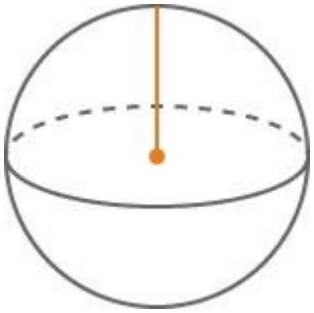


Volumetric Mean Radius

Distance from the planet's center to its surface, if the planet's volume were contained in a symmetric sphere

About half (53.2%) that of Earth

Mars:	**Earth:**
3,389.5 kilometers *or* 2,106.1 miles	6,371 kilometers *or* 3,958.8 miles

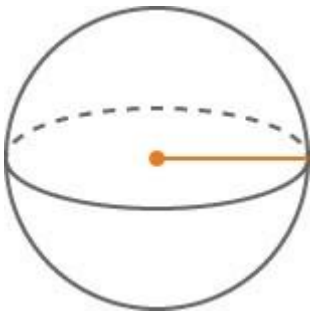


Polar Radius

Half the diameter of the planet from pole to pole

About half (53.1%) that of Earth

Mars:	**Earth:**
3,376.2 kilometers *or* 2,098 miles	6,356.8 kilometers *or* 3,950 miles

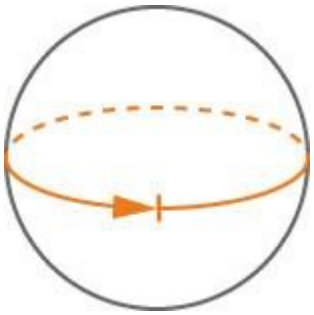


Equatorial Radius

Half the diameter of the planet at its equator

About half (53.2%) that of Earth

Mars:	**Earth:**
3,396.2 kilometers *or* 2,110 miles	6,378.1 kilometers *or* 3,963 miles



Equatorial Circumference

A measurement of the distance around the equator of Mars

About half (53.2%) that of Earth

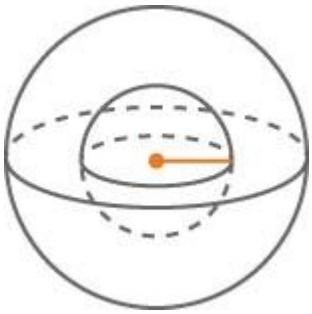
Mars:	**Earth:**
21,339 kilometers *or* 13,259 miles	40,075 kilometers *or* 24,901 miles

Radius of the Core

The distance from the planet's center to the outer boundary of the core

About half (50%) that of Earth

Earth:
Total core: ~3,400 kilometers *or*



Mars:
Total core:
1,700 kilometers
or
1,056 miles

2,113 miles

"Solid" inner core: ~1,220 kilometers
or
758 miles

Liquid outer core: ~2,266 kilometers
or
1,408 miles

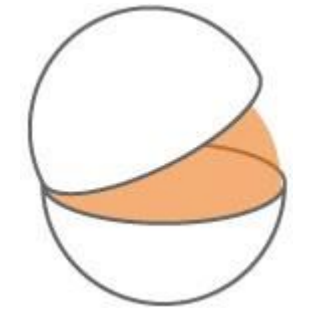
Surface Area

The sum of the areas of all shapes that cover the surface of the planet

About 28% that of Earth

Mars:	**Earth:**
144,371,391 square kilometers (1.4437×10^8 km^2) *or* 55,742,106 square miles	510,064,472 square kilometers (5.1006×10^8 km^2) *or* 196,936,994 square miles

Bulk



Volume

The quantity of three-dimensional space that a planet contains

About 15.1% that of Earth

Mars:	**Earth:**
163,115,609,799 cubic kilometers (1.63116×10^{11} km^3)	1,083,206,916,846 cubic kilometers (1.0832×10^{12} km^3)

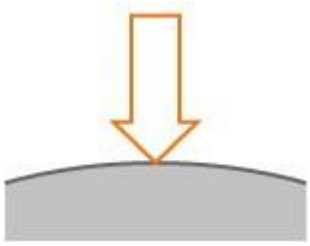
Mass

A measurement of the amount of matter Mars contains

About 11% that of Earth

Mars:	**Earth:**
641,693,000,000,000,000,000,000 kilograms (6.4169×10^{23} kg)	5,972,190,000,000,000,000,000,000 kilograms (5.9722×10^{24} kg)

Gravity and More

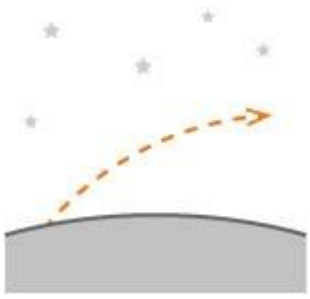


Surface Gravity

The gravitational acceleration experienced at a planet's surface

About 38% that of Earth

Mars:	Earth:
3.71 meters per second squared	9.80665 meters per second squared
or	*or*
12.2 feet per second squared	32.174 feet per second squared



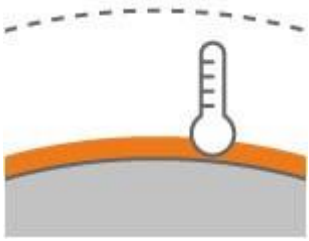
Escape Velocity

The speed an object needs to break free from the gravitational attraction of a planet, moon, or other body without further propulsion

About 45% that of Earth

Mars:	Earth:
18,108 kilometers per hour (5.03 km/second)	40,284 kilometers per hour (11.19 km/second)
or	*or*
11,252 miles per hour	25,030 miles per hour

Temperature

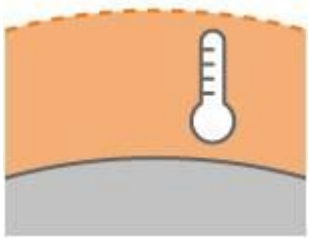


Temperature of the Surface (Typical Minimum/Maximum)

How hot or cold the surface varies between day and night and among seasons

Mars is colder than Earth because it is farther from the Sun.

Mars:	Earth:
-190 to 86° Fahrenheit	-126 to 136° Fahrenheit
-120 to 30° Celsius	-88 to 58° Celsius
150 to 303 Kelvin	185 to 331 Kelvin



Average Temperature of the Atmosphere

Measurement of how hot or cool the atmosphere is at different altitudes (heights relative to the surface)

Mars:	Earth:
-81° Fahrenheit	59° Fahrenheit
-63° Celsius	15° Celsius
210 Kelvin	288 Kelvin

Composition of the Planet

The chemical materials that make up a planet

Mars' composition is similar to Earth's

Mars:

Crust and Surface : mostly iron-rich basaltic rock similar to Earth's thin crust

Mantle: Silicate rock

Core: probably an iron, nickel, and sulfur core, but whether it is hot liquid or cooled metal is not known

Earth:

Crust and Surface: iron magnesium silicate igneous rocks, like basalt

Mantle: Silicate rock rich in magnesium and iron

Core: Iron-nickel alloy

Composition of the Atmosphere

The chemical materials that make up the layers of gases surrounding a planet or moon, which are held in place by the object's gravity

Mars' atmosphere is 100 times less dense than Earth's

Mars:

Main Gases:

96% Carbon Dioxide (CO_2)*

1.93% Argon (Ar)**

1.89% Nitrogen (N_2)

0.145% Oxygen (O_2)

<0.01% Carbon Monoxide (CO)

Earth:

Main Gases:

78.09% Nitrogen (N_2)

20.95% Oxygen (O_2)

0.93% Argon (Ar)

0.039% Carbon Dioxide (CO_2)

Both planets also have other gases in very small amounts (trace gases).

Did you know...?

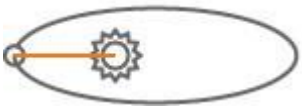
**Carbon dioxide is used for carbonation in beverages. Frozen carbon dioxide is "dry ice."*

***Argon is used to make blue "neon lights."*

1.405 times that of Earth

Perihelion

The closest distance between the Sun and Mars as the Red Planet travels in its orbit around the Sun



Mars:	Earth:
206,655,215	23 hours, 56 minutes (23.934 hours)
kilometers	kilometers
2.06655 x 10^8 km	1.47098 x 10^8 km
or	*or*
128,409,598 miles	91,402,640 miles
or	*or*
1.381 AU	0.9833 AU*

An AU is an astronomical unit. In simple terms, 1 AU is the average distance between the Sun and Earth.

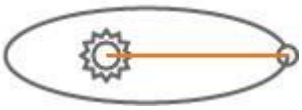
**The reason that the perihelion of Earth is less than 1 AU is that this is a measure of its closest distance from the Sun (its minimum distance). 1 AU is the average between the minimum and maximum distances.*

Did you know...?

1.639 times that of Earth

Aphelion

The farthest distance between the Sun and Mars as the Red Planet travels in its orbit around the Sun



Mars:	Earth:
249,232,432 kilometers	152,098,233 kilometers
2.49232 x 10^8 km	1.52098 x 10^8 km
or	*or*
154,865,853 miles	94,509,460 miles
or	*or*
1.666 AU	1.017 AU

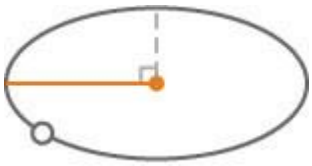
An AU is an astronomical unit. In simple terms, 1 AU is the average distance between the Sun and Earth.

Orbit

About 1.5 times that of Earth

Orbit Size Around Sun (semi-major axis)

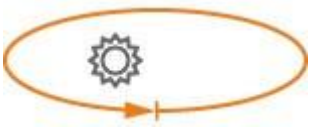
One half of the longest diameter of an orbital ellipse (radius of the orbit at the orbit's two most distant points)



Mars:	Earth:
227,943,824 kilometers	149,598,262 kilometers
2.2794382 x 10^8 km	1.4959826 x 10^8 km
or	*or*
141,637,725 miles	92,956,050 miles
or	*or*
1.523662 AU	1.000 AU

An AU is an astronomical unit. In simple terms, 1 AU is the average distance between the Sun and Earth.

Circumference of Orbit



The distance Mars travels in its orbit around the Sun.

About 1.5 times that of Earth

Mars:	**Earth:**
1,429,085,052 kilometers	939,887,974 kilometers
(1.429 x 10^9) km	(9.399 x 10^8) km
or	*or*
887,992,283 miles	584,019,311 miles

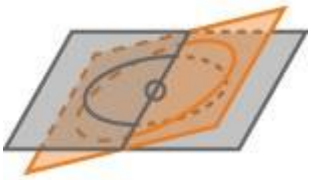
Orbital Eccentricity

A measurement of how much Mars' orbit around the Sun differs from a perfect circle; 0 = a perfect circle, and values between 0 and 1 represent an elliptical (oval) orbit

Mars' orbit is about 5.6 times more eliptical than that of Earth, which is nearly a perfect circle

Mars:	**Earth:**
0.0933941	0.01671123

Orbit Inclination



The angle an orbit is "tilted" relative to a reference plane

Earth's orbital plane is almost flat, but Mars' has a slight tilt

Mars:	**Earth:**
1.85 degrees	0.00005 degrees

0 degrees (reference plane for describing the position of bodies in the solar system)

The ecliptic is the plane of Earth's orbit around the Sun

Day

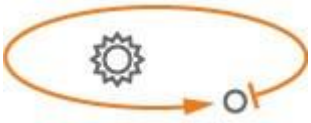
Average Length of Day (Sidereal Rotation Period)

The time it takes for a planet or other body to make one rotation (one spin on its axis)

About 37 minutes longer than an Earth day

Mars:	**Earth:**
24 hours, 37 minutes	23 hours, 56 minutes
(24.623 hours)	(23.934 hours)
1.029 Earth days	

Year



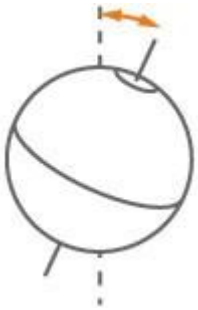
Length of Year (Sidereal Period or Revolution)

The time it takes for a planet or other body to make a full orbit of the Sun (or outside of our solar system, its primary star)

About twice as long as an Earth year

Mars:	Earth:
about 687 Earth days	365.25 Days

Tilt / Seasons



Axial Tilt (Obliquity)

The angle between Mars' orbital plane and its spin axis

Very similar to Earth's - only a 2-degree difference

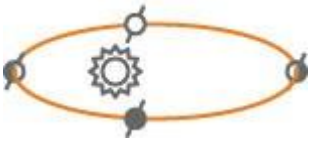
Mars:	Earth:
25.2°	23.5°

Change in Axial Tilt

Variations in the angle of tilt

The tilt of Mars changes more dramatically over time

Unlike Earth, substantial changes in the obliquity (or tilt) of Mars occur on timescales of hundreds of thousands to millions of years and result in long-term climate change



Seasons

Changes in the amount of sunlight reaching different latitudes due to the varying orientation of the axial tilt as the planet orbits the Sun

Mars' year is almost twice as long as Earth's so its seasons are longer too

4 seasons, roughly twice as long as those on Earth, but with more variation given Mars' eccentric orbit and the fact its orbital speed varies more as result (fastest when at perihelion; slowest at aphelion)

Season (Northern Hemisphere)	Length of Season on Earth	Length of Season on Mars
Spring	93	194
Summer	93	178
Autumn	90	142
Winter	89	154

Day 4: Primary Source Analysis
Social Studies

Name _____ Date _____

Lewis & Clark Written Primary Source Activity

One of the major objectives of the Corps of Discovery expedition was to take a census of the fauna and flora in the Louisiana Territory. Other major objectives were to map the territory and to befriend the American Indians who lived there.

President Jefferson encouraged Lewis and Clark to keep detailed journals of what they saw and experienced on their journey. In addition, they were encouraged to return home with animal, plant, and mineral specimens.

Here are several journal entries for you to read and discuss.

Capt. Lewis, March 5, 1806 The Crow raven and Large Blackbird are the same as those of our country only that the crow is here much smaller yet it's note is the same. I observe no difference either between the hawks of this coast and those of the Atlantic. I have observed the large brown hawk, the small or sparrow hawk, and the hawk of an intermediate size with a long tail and blewish coloured wings remarkably swift in flight and very firce. sometimes called in the U'States the hen hawk. these birds seem to be common to every part of this country and the hawks crows & ravens build their nests in great numbers along the high and inaccessable clifts of the Columbia river and it's S.E. branch where we passed along them.

Capt. Lewis, May 28, 1806 since my arrival here I have killed several birds of the corvus genus of a kind found only in the rocky mountains and their neighbourhood. I first met with this bird above the three forks of the Missouri and saw them on the hights of the rocky Mountains but never before had an opportunity of examining them closely. the small corvus discribed at Fort Clatsop is a different species, tho' untill now I had taken it to be the same, this is much larger and has a loud squawling not something like the mewing of a cat. the beak of this bird is 1d 1/2 inches long, is proportionably large, black and of the form which characterizes this genus. the upper exceeds the under chap a little. the head and neck are also proportionably large. the eye full and reather prominent, the iris dark brown and puple black. it is about the size and somewhat the form of the Jaybird tho reather rounder or more full in the body. the tail is four and a half inches in length, composed of 12 feathers nearly of the same length. the head neck and body of this bird are of a dove colour. the wings are black except the extremities of six large f[e]athers occupying the middle joint of the wing which are white. the under disk of the wing is not the shining or gr[l]ossy black which marks its upper surface. the two feathers for half their width the balance are of pure white. the feet and legs are black and imbricated with wide scales. the nails are black and remarkably long and sharp, also much curved. it has four toes on each foot of which one is

Name _____ Date _____

in the rear and three in front. the toes are long particularly that in the rear. This bird feeds on the seed of the pine and also on insects. it resides in the rocky mountains at all seasons of the year, and in many parts is the only bird to be found.

Question and Activity:

1. What do these two preceding passages reveal about the observational skills of Meriwether Lewis?

2. The longer passage describes a bird now known as Clark's Nutcracker. Based on Lewis's description, draw a picture of this bird.

Day 4: Primary Source Analysis
Social Studies

Name _____ Date _____

Capt. Clark, December 7, 1804 a very cold day wind from the NW. the Big White Grand Chief of the Ist Village, came and informed us that a large Drove of Buffalows was near and his people was waiting for us to join them in a chase Capt Lewis took 15 men & went out joined the Indians, who were at the time he got up, Killing the Buffalow on Horseback with arrows which they done with great dexterity, his part killed 10 Buffalow, five of which we got to the fort by the assistance of a horse in addition to what the men Packed on their backs. one cow was killed on the ice after drawing her out of a vacancey in the ice in which She had fallen, and Butchered her at the fort. those we did not get in was taken by the Indians under a Custom which is established amongst them i.e. any person seeing a buffalow lying without an arrow Sticking in him, or some purticular mark takes possession, many times (as I am told) a hunter who kills maney Buffalow in a chase only Gets a part of one . . . the river Closed opposit the fort last night 1 1/2 inches thick, The Thermometer Stood this Morning at I d. below 0. three men frost bit badly to day.

Writing Activities:

1. Using the preceding entry, expand on the description, imagining that you were a member of the Corps writing a letter home to your family.

2. Based on the preceding passage, describe the relationship between the Corps and the local American Indians. Also, describe how the American Indians felt about the buffalo.

Day 4: Primary Source Analysis
Social Studies

Name _____ Date _____

Capt. Lewis, May 29, 1805--Last night we were all allarmed by a large buffaloe Bull, which swam over from the opposite shore and coming along side of the white perogue, climbed over it to land, he then allarmed ran up the bank in full speed directly towards the fires and was within 18 inches of the heads of some of the men who lay sleeping before the centinel could allarm him or make him change his course, still more alarmed, he now took his direction immediately towards our lodge, passing between 4 fires and within a few inches of the heads of one range of the men as they yet lay sleeping, when he came near the tent, my dog saved us by causing him to change his course a second time, which he did by turning a little to the right, and was quickly out of sight, leaving us by this time all in an uproar with our guns in o[u]r hands, enquiring of each other the ca[u]se of the alarm, after which after a few moments was explained by the centinel; we were happy to find no one hirt.

Creative Writing Activity:

The preceding passage describes one of the many unpredictable dangers the Corps of Discovery faced on their journey. Imagine you were in your tent that night. Write your version of this experience.

Day 5: Tone, Mood, and Theme

English Language Arts

- Apply the concept of tone, mood, and theme to President Jefferson's address to Lewis in 1803.
- Complete the questions at the conclusion of Jefferson's letter.

Tone, Mood, and Theme
Transcript: Jefferson's Instructions for Meriwether Lewis
Thomas Jefferson and Early Western Explorers
Transcribed and Edited by Gerard W. Gawalt, Manuscript Division, Library of Congress. June 20 1803
To: Captain Meriwether Lewis esq. Capt. of the 1st. regimt, of Infantry of the United States
Full Transcript Available at https://www.loc.gov/exhibits/lewisandclark/transcript57.html

[ante June 20 1803]
To <Captain> Meriwether Lewis esq. Capt. of the 1st. regimt, of Infantry of the US. of A.

Your situation as Secretary of the President of the US has made you acquainted with the objects of my confidential message of Jan. 18. 1803 to the legislature; you have seen the act they passed, which they expressed in general terms, was meant to sanction these objects, and you are appointed to carry them into execution.

(5) Instruments for ascertaining by ***celestial*** observations, the geography of the country through which you will pass, have been already provided. Light articles for barter and presents among the Indians, arms for your attendants, say from 10. to 12. men, boats, tents, & other travelling apparatus with ammunition, medicine, surgical instruments and provisions you will have prepared with such aids as the Secretary at War can yield in his department; & from him also you will receive authority to (10) engage among our troops, by voluntary agreement, the number of attendants above mentioned, over whom you, as their commanding officer, are invested with all the powers the laws give in such a case.

The object of your mission is to explore the Missouri river, & such principal stream of it as by it's course and communication with the waters of the Pacific ocean whether the Columbia, Oregon, Colorado or any other river may offer the most direct & practicable water communication across this (15) continent for the purposes of commerce.

Beginning at the mouth of the Missouri, you will take careful observations of latitude & longitude at all remarkable points on the river, & especially at the mouth of rivers, at rapids, at islands, & other places & objects distinguished by such durable natural marks & characters of a durable nature kind as that they may with certainty be recognized hereafter.

(20) The course of the river between these points of observation may be supplied by the compass, the log-line & by time, corrected by the observations themselves. The variations of the compass too, in different places should be noticed.

The interesting points of the portage between the heads of the Missouri, & of the water offering the best communication with the Pacific ocean, should also be fixed by observation, & the course of that (25) water to the ocean, in the same manner as that of the Missouri.

Your observations are to be taken with great pains & accuracy, to be entered distinctly & **intelligibly** for others…fix the latitude and longitude of the places at which they were taken, and are to be rendered to the war office for the purpose of having the calculations made concurrently by proper persons within the US. several copies of these as well as of your other notes should be made at (30) leisure times, & put into the care of the most trust-worthy of your attendants, to guard by multiplying them against the accidental losses to which they will be exposed. A further guard would be that one these copies be on the paper of the birch, as less liable to injury from damp than common paper.

The commerce which may be carried on with the people inhabiting the line your will pursue, renders a (35) knowledge of those people important. You will therefore **endeavor** to make yourself acquainted with as far as a **diligent** pursuit of your journey shall admit, with the names of the nations & their numbers; the extent & limits of their possessions; their relations with other tribes of nations; their language, traditions, monuments; their ordinary occupations in agriculture, fishing, hunting, war, arts & the implements for these; their food, clothing, & domestic accommodations; the diseases prevalent (40) among them, & the remedies they use; moral & physical circumstances which distinguish them from the tribes we know; peculiarities in their laws, customs & dispositions; and articles of commerce they may need or furnish & to what extent.

Other objects worthy of notice will be the soil & face of the country, it's growth & vegetable productions, especially those not of the US. the animals of the country generally, & especially those (45) not known in the US. the remains & accounts of any which may be deemed rare or extinct; the mineral productions of every kind; but more particularly metals; limestone, pit-coal, & salt-petre; salines & mineral waters, noting the temperature of the last & such circumstances as may indicate their character; volcanic appearances; climate, as characterized by the thermometer, by the proportion of rainy, cloudy, & clear days, by lightening, hail, snow, ice, by the access & recess of (50) frost, by the winds prevailing at different seasons, the dates at which particular plants put forth or lose their flower, or leaf, times of appearance of particular birds, reptiles or insects.

Although' your route will be along the channel of the Missouri, yet you will endeavor to inform yourself, by enquiry, of the character & extent of the country watered by it's branches & especially on it's Southern side, the North river or Rio Bravo which runs into the gulph of Mexico, and the North (55) river, or Rio Colorado which runs into the gulph of California, are understood to be the principal streams heading opposite to the waters of the Missouri, and running Southwardly. Whether the dividing grounds between the Missouri & them are mountains or flat lands, what are their distance from the Missouri, the character of the intermediate country, & the people inhabiting it, are worthy of particular enquiry.

(60) The Northern waters of the Missouri are less to be enquired after, because they have been ascertained to a considerable degree, & are still in a course of ascertainment by English traders, and travellers. But if you can learn anything certain of the most Northern source of the Mississippi, & of it's position relatively to the lake of the woods, it will be interesting to us.
Two copies of your notes at least & as many more as leisure will admit, should be made & confided to (65) the care of the most trusty individuals of your attendants.

In all your intercourse with the natives, treat them in the most friendly & **conciliatory** manner which their own conduct will admit; allay all jealousies as to the object of your journey, satisfy them of it's innocence, make them acquainted with the position, extent character, peaceable & commercial dispositions of the US. of our wish to be neighborly, friendly, & useful to them.

(70) If a few of their influential chiefs within practicable distance, wish to visit us, arrange such a visit with them, and furnish them with authority to call on our officers, on their entering the US. to have them conveyed to this place at the public expense.

If any of them should wish to have some of their young people brought up with us, & taught such arts as may be useful to them, we will receive, instruct & take care of them. Such a mission whether of (75) influential chiefs or of young people would give some security to your own party.

Carry with you some matter of the kinepox; inform those of them with whom you may be, of it's efficacy as a preservative from the smallpox; & instruct & encourage them in the use of it. This may be especially done wherever you winter.

As it is impossible for us to foresee in what manner you will be received by those people, whether (80) with hospitality or hostility, so is it impossible to prescribe the exact degree of perseverance with which you are to pursue your journey. We value too much the lives of citizens to offer them to probable destruction. Your numbers will be sufficient to secure you against the unauthorized opposition of individuals or of small parties: but if a superior force authorized, or not authorized by a nation, should be arrayed against your further passage, and inflexibly determined to arrest it, you (85) must decline it's farther pursuit, and return.

In the loss of yourselves, we should lose also the information you will have acquired. By returning safely with that, you may enable us to renew the essay with better calculated means. To your own discretion therefore must be left the degree of danger you risk, and the point at which you should decline, only saying we wish you to err on the side of your safety, and to bring back your party safe (90) even if it be with less information.

Should you reach the Pacific Ocean inform yourself of the circumstances which may decide whether the furs of those parts may not be collected as advantageously at the head of the Missouri …
On your arrival on that coast endeavor to learn if there by any port within your reach frequented by the sea-vessels of any nation, & to send two of your trusty people back by sea, in such way as they (95) shall judge shall appear practicable, with a copy of your notes: and should you be of opinion that the return of your party by the way they went will be eminently dangerous, then ship the whole, & return by sea, by the way either of cape Horn, or the cape of good Hope, as you shall be able. As you will be without money, clothes or provisions, you must endeavor to use the credit of the U.S. to obtain them, for which purpose open letters of credit shall be furnished you, authorizing you to draw upon (100) the Executive of the U.S. or any of it's officers…

Should you find it safe to return by the way you go, after sending two of your party round by sea, or with your whole party, if no conveyance by sea can be found, do so; making such observations on your return, as may serve to supply, correct or confirm those made on your outward journey.

On re-entering the U.S. and reaching a place of safety, discharge any of your attendants who may (105) desire & deserve it, procuring for them immediate payment of all arrears of pay & clothing which may have incurred since their departure, and assure them that they shall be recommended to the liberality of the legislature for the grant of a soldier's portion of land each, as proposed in my message to Congress; & repair yourself with your papers to the seat of government ….

To provide, on the accident of your death, against **anarchy**, **dispersion**, & the consequent danger to (110) your party, and total failure of the enterprise, you are hereby authorized, by any instrument signed & written in your own hand, to name the person among them who shall succeed to the

command on your decease, and by like instruments to change the nomination from time to time as further experience of the characters accompanying you shall point out superior fitness…

Given under my hand at the city of Washington this 20th day of June 1803.
Th. J. Pr. U.S. of A.

Directions: Read Jefferson's Letter and complete the following questions.

1. What **tone** does Jefferson set throughout the letter?

2. Consider your answer to the first question. Provide one line of evidence as to why you made this selection.

3. What is the potential **theme** of Jefferson's letter to the Corps of Discovery?

4. Provide two pieces of evidence from the text (sentences/quotes) that support your choice of a theme:

   A.

   B.

Day 5: Slope of a Line

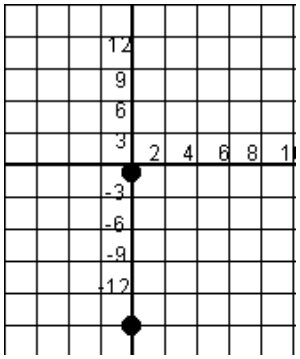
Math

Complete this sheet on Calculating the slope of the hills of Mars for the Curiosity Rover.

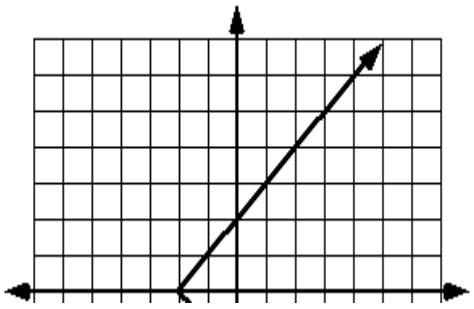
Slope of a line

Materials:

- Calculator
- Pencil



In Math, the slope of a line describes how steep the line is. You can find that but using 2 points (also called ordered pairs) on a graph. For example, on this graph, the ordered pairs would be (0,-1) for the top point and (0,-15) for the bottom point. When we write the ordered pair, we always write it (x,y).



In order to find the slope of a line, we take the change in the y-values over the change in the x-values. That means we would write it like this:

$(y_2 - y_1) / (x_2 - x_1) = \text{slope}$

On the graph to the right, what would the ordered pair be (assuming each block is 1)?

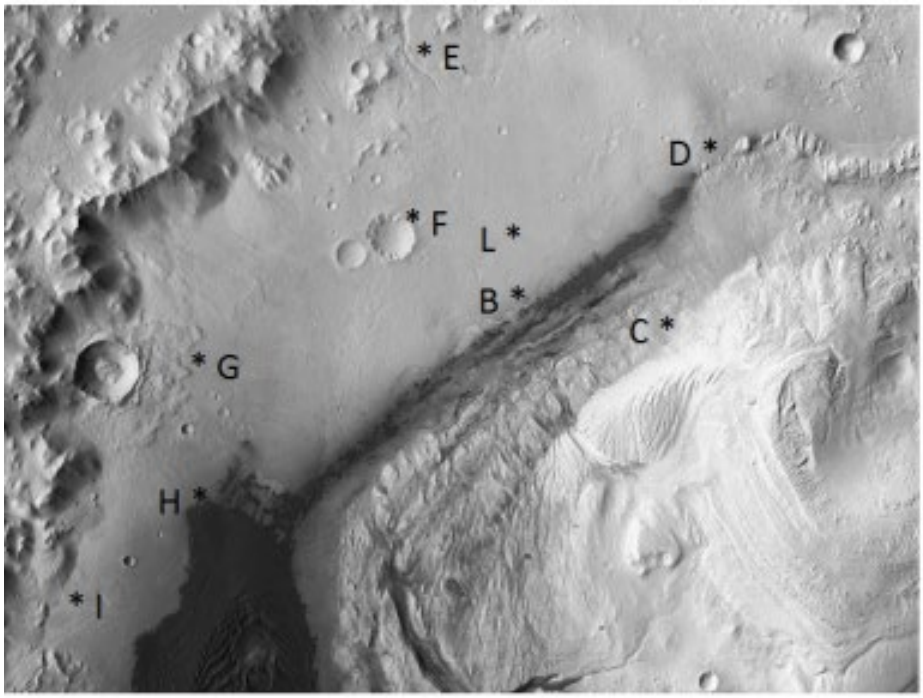
If you said (-2,0) and (5,7), then you would be correct. Now, what would be the slope of that line?

$(y_2 - y_1) / (x_2 - x_1) = \text{slope}$

$(7 - 0) / (5 - -2) =$

$(7) / (7) =$ **Slope = 1**

Important: If the slope of a line is NEGATIVE, that means the numerical value, when you calculate it, will be negative!



The table below gives the coordinates for the locations to be visited by the Curiosity Rover shown in the figure above. The X and Y coordinates are given in kilometers and the Y coordinate is the elevation about the lowest point. All x coordinates are measured the distance from the landing area. You will need to find slope using the formula slope = (change in y) / (change in x). You will need 2 points and find the difference in Y (subtract one from the other) and do the same for the x values of those points.

Label	Name	(X,Y)	Label	Name	(X,Y)
L	*Landing Area*	*(0,25)*	F	Crater Wall	(18,23)
B	Layered Wall	(50,35)	G	Mudslide	(62,30)
C	Alluvial Fan	(40,102)	H	Dark Sands	(87,12)
D	Summit Access	(45,40)	I	Mystery Valley	(105,0)
E	River Bed	(47,58)			

***Always use the Landing Area as the 1st ordered pair.*

Problem 1 – Curiosity needs to travel to the highest point but can not go above a slope of 1. Prove that it either can or can not go from the Landing area to the highest point directly.

Problem 2 – Which places have a slope going downward? Name those places.

Problem 3 – Calculate the slope for each location from the Landing Area.

Name	*Slope*	Name	*Slope*
Landing Area		Crater Wall	
Layered Wall		Mudslide	
Alluvial Fan		Dark Sands	
Summit Access		Mystery Valley	
River Bed			

Space Math adapted from http://spacemath.gsfc.nasa.gov

Day 5: Comparing and Contrasting Earth & Mars Part 2

Science

- Using the chart from Day 4 Science, finish collecting data for the chart to compare the Earth & Mars.

- Summarize whether or not you believe humans could live on Mars and why in your science journal, use examples from your chart to justify your claim.

- Keep your Planet Chart for Day 6 Science!

Day 5: Cold War and the Space Race

Social Studies

1. Analyze the origin of the Space race
2. Examine the Cold War Space Race terms:
3. Read the background information sheet on the Cold War and Space Race:
4. Write a journal entry answering the following: *after reading Document B, how might Sputnik have changed America's perception of the Soviet Union?*

Cold War Space Race Terms

- **arms race**—a race between hostile nations to accumulate or develop weapons broadly; a competition between nations for superiority in the development and accumulation of weapons, especially between the United States and the former Soviet Union during the Cold War
- **duck and cover**—a measure that was widely practiced as part of air-raid drills in the United States during the Cold War in which civilians would kneel and face the floor below a desk or other inside space and cover their heads with their hands; preparing in this way was supposed to provide personal protection against the effects of a nuclear explosion, although in reality this would have done little against the heat, force, or radiation from such an attack
- **hydrogen bomb**—a nuclear bomb in which energy is released from the fusion of hydrogen atoms; its enormous explosive power results from an uncontrolled, self-sustaining chain reaction; also called a thermonuclear bomb
- **national security**—a country's ability to protect itself from the threat of violence or attack
- **nuclear blast**—the initial high-speed destructive wave of compressed air resulting from the rapid release of energy of a nuclear explosion
- **propaganda**—information or media that deliberately attempts to influence people's thoughts, opinions, and actions with a specific purpose or goal in mind
- **satellite**—in space technology, a manufactured object or vehicle designed to orbit Earth or another celestial body; satellites typically collect or communicate information Sputnik—the name given to a series of Earth-orbiting satellites launched by the Soviet Union beginning in 1957; Sputnik 1 was the first human-made object put into Earth's orbit; the Russian word sputnik translates as "a traveling companion"

Sputnik's Launch Begins the Space Race | Chasing the Moon
Background Reading

At the end of World War II, competing visions for the postwar world emerged. The Soviet Union pictured a spread of revolutions in the Russian model that would one day produce a Communist utopia. The United States believed in democracy, with private enterprise at the core of capitalist economies. With their worldviews at odds, U.S.–Soviet cooperation, which was key to the Allied victory in the war, devolved into combative rhetoric. The Cold War, a state of political hostility and

military tension between the U.S.-led Western bloc and the Soviet-led Eastern bloc, would span nearly 50 years.

During the Cold War, the two superpowers competed in several arenas. Each side sought to prove its superiority not only in politics and economics but also in athletics and scientific research. For example, success in the Olympic Games offered a way for one country to score literal and figurative points against the other. Competition also spurred technological advancements. The era introduced jet planes, chemical and biological weapons, long-range missiles, and spy satellites. Inventions with non-military uses included microwave ovens, GPS, supercomputers, and ARPANET—a network that would become the basis of the Internet.

The United States had used its atomic bomb on Hiroshima and Nagasaki in 1945. When the Soviet Union had test-detonated its own atomic bomb in 1949, a new competition began. The “arms race” was dedicated to the buildup of nuclear weapons, especially those that could be propelled into enemy territory. As military rocket technology improved, the superpowers adjusted their sights on reaching—and ultimately controlling—space. The “space race” was a race to be the first: first to launch a satellite, first to orbit Earth, first to send a person into space, and first to land on the Moon.

To the public, the space program was a purely scientific and intellectual effort. But both U.S. president Dwight Eisenhower and Soviet leader Nikita Khrushchev recognized its potential strategic value. An Earth-orbiting satellite could observe anything on the ground, including military movements and weapons stockpiles. Moreover, a satellite would be safe from attack—unlike a spy plane, which could be shot down from the sky. Both nations worked hard to build their satellites and be the first to launch. By 1957, the United States, which had recently endured both the Great Depression and the Second World War, had a burgeoning middle class.

As social changes were beginning to transform the country into a more egalitarian society, confidence was high and many Americans were optimistic about the future. In October of that year, however, the Soviet Union sent Sputnik into orbit. By doing so, the Soviets had won the first leg of the space race. While President Eisenhower, a Republican, played down the significance of the event, the Democratic Senate majority leader, Lyndon B. Johnson, sensed a political opportunity for the Democrats. Johnson played up the security implications of the Soviets winning the space race.

This contributed to John F. Kennedy’s election as president in 1960. During the election campaign, the Kennedy–Johnson ticket emphasized the Republican administration’s role in creating a “space gap” (in addition to a “missile gap”). Following the election, with a new national priority given to scientific research, Johnson would lead the American space program—first as Kennedy’s vice president and later as president.

Reprinted from PBS LearningMedia: Sputnik’s Launch Begins the Space Race |Chasing the Moon
https://www.pbslearningmedia.org/resource/amex31ctm-soc-sputnikspacerace/sputniks-launch-begins-the-space-race/

Document B

Source: Robert D. Launius. (n.d.). Sputnik and the Origins of the Space Age. In *NASA History Division*. Retrieved September 2, 2009, from http://history.nasa.gov/sputnik/sputorig.html.

On that same evening of 4 October, Senate Majority Leader Lyndon B. Johnson ...heard the announcement of Sputnik 1's launch on the radio...Johnson's mind kept returning to the heavens as he pondered the Soviet triumph. He recollected, “Now, somehow, in some new way, the sky seemed almost alien. I also remember the profound shock of realizing that it might be possible for another nation to achieve technological superiority over this great country of ours.”

...One of Johnson's aides, George E. Reedy, summarized the feelings of many Americans: “the simple fact is that we can no longer consider the Russians to be behind us in technology. It took them four years to catch up to our atomic bomb and nine months to catch up to our hydrogen bomb. Now we are trying to catch up to their satellite.”

Full source is: https://www.nasa.gov/pdf/466719main_AP_ED_Hist_RacetoSpace_09-17-09.pdf

Day 6: Comparing Themes Across Texts

English Language Arts

- Analyze the primary source quotes of Apollo 1 astronauts prior to their tragic deaths. Attempt to find a common theme that relates to the previous themes
- Additional Resource
  Video: Apollo 1 Mission Results in Space Changes https://bit.ly/2DXV9gs

The Apollo 1 Mission

Videos of Quotes from the Apollo 1 Astronauts: https://ctm.americanexperience.org

Directions: Consider the words of the following NASA astronauts who were scheduled to lift off in Apollo 1 on February 21, 1967.

- Virgil "Gus" Grissom: **There's always** a possibility that you can have a **catastrophic failure**, of course. This can happen on any flight. It can happen on the last one as well as the first one. You just plan as best you can to take care of all these eventualities, and you get a well-trained crew, and you go fly.
- Ed White: "I think you have to understand the feeling that a pilot has, that a test pilot has, that I look forward a great deal to making the first flight. There's a great deal of pride involved in making a first flight." (The New York Times, January 29, 1967, p. 48.)
- Roger Chaffee: "Oh, I don't like to say anything scary about it. Um, there's a lot of unknowns of course and a lot of problems that could develop, might develop. And they'll have to be solved and that's what we're there for."
- During a test launch approximately a month before their scheduled launch into space, these men suffered a tragic death when they were locked inside of their command module when a fire broke out aboard the ship.

In reading their quotes, what **theme** again presents itself?

1. How is this similar to the theme(s), if at all, that you selected previously for Jefferson and Kennedy's speeches? Explain.

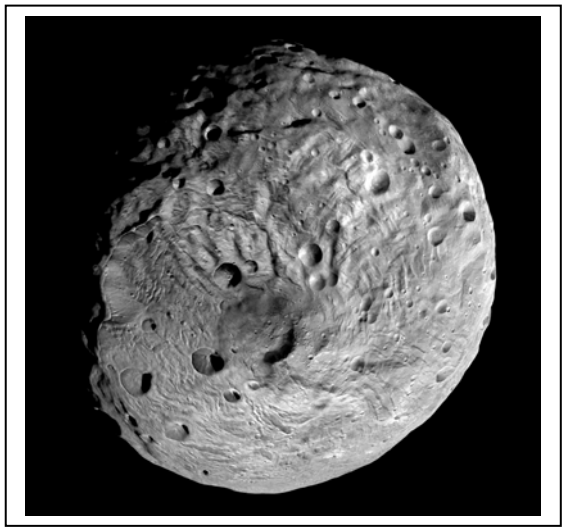
Day 6: Volume of Sphere

Math

Comparing the Volume of various space objects

Materials:

- Calculator



On July 15, 2011 the NASA spacecraft Dawn went into orbit around the asteroid Vesta (photo on the right). Vesta is the second largest asteroid in the Asteroid Belt. Its diameter is 530 kilometers. The diameter of the moon is 1,730 kilometers.

The equation for volume of sphere is = $4/3*\pi r^3$

Problem 1 - Assuming that it is shaped like a sphere, what is the volume of Vesta in cubic kilometers?

Problem 2 - About how many asteroids like Vesta could you fit inside our moon?

Problem 3 - If the Earth has a diameter of 12,756 km, what is the volume of Earth? What about Mars with a diameter of 6794 km?

Day 6: Characteristics of Mars

Science

Materials:

- Paper, colored pencils, markers, crayons, or any other materials to design an alien.
- Your Planet Chart from Day 4 and 5 Science

Using the information you have collected, create an alien from Mars. Plan out and start to design you alien and what they look like.

Alien Project

Imagine that you have arrived on another planet. You look around and see signs of life. What would you expect the alien to look like? As organisms, our characteristics are based on our planet. For example, we breathe oxygen because it is present on our planet. However, on another planet we would not be able to breathe. Another example is that our eyes are a certain size because of how close we are to the sun. If we were in an area of little or no light, we might either have very large eyes (to let in more light) or no eyes at all! Organisms change to meet their environment. The same goes with aliens.

What to do:

In this activity, you are going to be constructing an alien from a planet of your choice. When designing the alien, you need to consider facts about the planet for your alien. Most likely, it will not look like an alien from the movies.

Here are some things to consider when creating your alien:

- What does it eat?
- What does it breathe?
- Does it need a mouth?
- Does it need fur or something to keep warm?
- How does it move around the planet?
- Does it blend into the planet (camouflage) ?

You should draw your alien and label the parts of the alien that you considered when creating your alien. If you give the alien teeth, explain what it eats that it needs teeth. If it doesn't eat, maybe there is no mouth and you could explain that as well. Do not base facts on the name of the planet as that is irrelevant to life forms. For example, don't make an alien from Mars a warrior because Mars is the god of war. That is not important to your alien for survival.

Requirements:

You alien should have:

- Color
- At least 8 parts labeled as to why you designed it the way you did.
- A name
- The name of the planet

Additional Resources

Life on Mars? http://ow.ly/V5cO50AWDRd

Curiosity Rover Hits Paydirt on Mars | NASA Planetary Sciences http://ow.ly/J0Fc50AWDSZ

Mars | Crash Course Astronomy http://ow.ly/eOy050AWDUr

Day 6: Cold War, the Space Race, and Exploration

Social Studies

- Describe America's response to Sputnik in the larger view of the Space Race and Cold War.

- Read "Sputnik' Impact on America (see attached): www.pbs.org/wgbh/nova/article/sputnik-impact-on-america/

- If possible, view Civil Defense film titled "Duck and Cover" that displays the reality of the tension between the Soviet Union and the United States: www.loc.gov/item/mbrs01836081/

- If possible, view the short clip on Sputnik's Launch from PBS: https://bit.ly/3ar6FwX

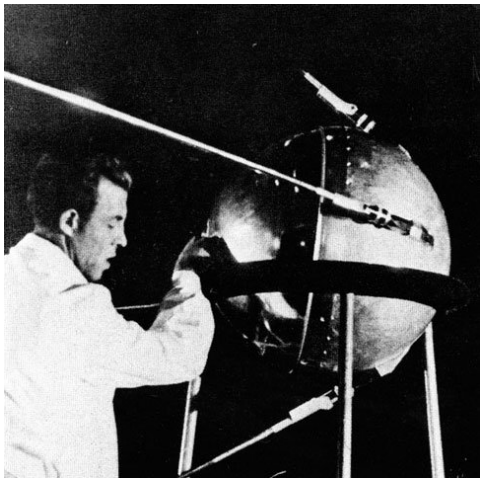
- Complete the attached Sputnik Impact Sheet.

Sputnik's Impact on America

https://www.pbs.org/wgbh/nova/article/sputnik-impact-on-america/
Never before had so small and so harmless an object created such consternation.
—Daniel J. Boorstin, The Americans: The Democratic Experience

"Listen now," said the NBC radio network announcer on the night of October 4, 1957, "for the sound that forevermore separates the old from the new." Next came the chirping in the key of A-flat from outer space that the Associated Press called the "deep beep-beep." Emanating from a simple transmitter aboard the Soviet Sputnik satellite, the chirp lasted three-tenths of a second, followed by a three-tenths-of-a-second pause. This was repeated over and over again until it passed out of hearing range of the United States.

BY PAUL DICKSON TUESDAY, NOVEMBER 6, 2007 NOVA



Sergei Korolev, the engineer behind the 184-pound Soviet Sputnik satellite, was not credited by name until after his death. Courtesy of NASA

The mouse that roared

The satellite was silver in color, about the size of a beach ball, and weighed a mere 184 pounds. Yet for all its simplicity, small size, and inability to do more than orbit the Earth and transmit meaningless radio blips, the impact of Sputnik on the United States and the world was enormous and unprecedented. The vast majority of people living today, at the beginning of the 21st century, were born after Sputnik was launched and may be unaware of the degree to which it helped shape life as we know it.

Now is an especially good time to take a fresh and focused look at the event whose impact looms even larger with the passing of time. In the last decade an incredible amount of once-secret material has been declassified and made public. Scholars and writers both inside and outside government have coaxed key Cold War documents out of hiding. Collectively, this material has given new dimensions and twists to almost every aspect of the events leading up to and following the launch of Sputnik.

For example, one recently released document reveals evidence of a long-forgotten pre-Sputnik "olive branch" extended by Russian scientists, who asked their American counterparts to supply a piece of

scientific equipment for a planned launch. By most indications, this piece of equipment was meant for the third Sputnik.

It was as if this orderly march into the future was a part of America's destiny.

It is not widely known even now that one of the reasons President Dwight D. Eisenhower and those around him did not react with alarm over Sputnik going into space ahead of an American satellite was that Eisenhower welcomed the launch to help establish the principle of "freedom of space" [the idea that outer space belonged to everyone, thereby allowing satellite flights over foreign countries].

At the time of the Sputnik "crisis," the White House, Central Intelligence Agency, Air Force, and a few highly select and trustworthy defense contractors were creating a spy satellite that was so secret that only a few dozen people knew of it. Even its name, CORONA, was deemed secret for many years. Instead of being concerned with winning the first round of the space race, Eisenhower and his National Security Council were much more interested in launching surveillance satellites that could tell American intelligence where every Soviet missile was located.

Although he couldn't publicly admit it without risking national security, President Dwight D. Eisenhower was not greatly surprised by the launch of Sputnik. Courtesy Library of Congress

Heard 'round the world

For many of us born before the 1950s, the fascination and astonishment engendered by the launch of Sputnik remain fresh in our minds. Like many of my generation, I can recall exactly where I was when I heard about Sputnik's launch. I was 18 years old, a college freshman at Wesleyan University in Middletown, Connecticut. A friend stopped me in the middle of the campus to say that he had heard about it on the radio. Instinctively, we both looked up.

Within hours I would actually hear its signal rebroadcast on network radio. Before the weekend was over, I got to hear it directly on a shortwave radio as it passed overhead.

Not only could you hear Sputnik, but, depending on where you were, it was possible to see it with the naked eye on certain days in the early morning or the late evening when the sun was still close enough to the horizon to illuminate it. While standing in the middle of the college football field a week or so after the launch, I first saw the satellite scooting across a dark evening sky orbiting the Earth at a speed of 18,000 miles per hour. Watching Sputnik traverse the sky was seeing history happen with my own eyes. To me, it was as if Sputnik was the starter's pistol in an exciting new race. I was electrified, delirious, as I witnessed the beginning of the Space Age.

The 1939 "World of Tomorrow" World's Fair in Flushing Meadows, New York promoted belief in science and technology and had a powerful influence on a generation of Americans. © Bettmann/CORBIS

A new world

Prior to Sputnik, popular interest in science and technology had been on the rise since as early as the 1939 "World of Tomorrow" World's Fair in Flushing Meadows, New York. I attended the fair, albeit in utero, as I was born three days after my parents' last visit. But they saved many artifacts of the fair for me, including an official guidebook, which fascinated me as a kid and jump-started my interest in all sorts of things, particularly space travel.

That guidebook turned out to be a preview of the future. Exhibits like Ford's "Road of Tomorrow," General Motors' "Futurama," and the multisponsored "Town of Tomorrow" were more than fanciful prototypes; many of their imagined advances made their way into everyday life within a couple of decades. The fair's centerpiece was "Democracity," and it heralded wartime dreams and postwar realities: superhighways, ranch-style houses, rec rooms, workshops for "do-it-yourselfers," and booming suburbs (known as "satellites" in the Democracity display) replete with prefab houses, two-car garages, and stereophonic sound. Something called "television" was actually demonstrated at the RCA exhibit.

The fair's Transportation Pavilion was devoted to space exploration. There was a rocketport, a moonport, and a rocketship shot from a "rocketgun." In one lavish demonstration you could simulate blastoff on a trip to Venus. Once there, you could stroll a primeval jungle inhabited by immense Venusian beasts and a colony of Martians. The fair promised a day when sleek vehicles would take passengers to the planets as easily as they could fly from New York to Chicago. It was as if this orderly march into the future was a part of America's destiny.

As it turned out, the real "world of tomorrow" was delayed because of World War II, but its vision was carried intact into the late 1940s and early 1950s, when it began to be realized. Americans who had struggled through the Great Depression and the war embraced the promise of a burgeoning middle class having goods, services, and comforts that formerly had been the province of European royalty. The average family's car had more pure horsepower than existed in all the stables of Buckingham Palace a generation earlier.

> *"No event since Pearl Harbor set off such repercussions in public life."*

By 1957, a new world was at hand for the United States. The country was creating an interstate highway system; the suburbs were growing; families with two cars and color televisions were becoming the norm. The highest peacetime federal budget in history ($71.8 billion) was in place, and it was the first year in which more than 1,000 computers would be built, bought, and shipped. There were advances in public health, although none more stunning than Dr. Jonas Salk's discovery of a vaccine against polio, the scourge of an entire generation of children.

At the same time, social changes were beginning to transform the United States. A great struggle to achieve a more egalitarian society was beginning. The first civil rights legislation since Reconstruction had been enacted in Congress on September 9, less than a month before Sputnik's launch. The Arkansas National Guard was in Little Rock, Arkansas, enforcing the right of blacks to go to school with whites. Culturally as well, the country was moving to a different beat. Rock 'n' roll had come onto the scene, and Elvis Presley owned the summer of 1957 with his two-sided monster hit record of "Don't Be Cruel" and "Hound Dog."

The Army's Wernher von Braun, seen here with a model rocket, was prevented from making America's first attempt to put a satellite in orbit and was forced to defer to a team from the Naval Research Laboratory. When the Navy's Vanguard failed, von Braun put America in space with Explorer in January, 1958. © Bettmann/CORBIS

A Crisis of Confidence

Just when Americans were feeling self-confident and optimistic about the future, along came the crude, kerosene-powered Sputnik launch. The space race was under way, and the Soviets had won the first leg—the United States was agog and unnerved.

"No event since Pearl Harbor set off such repercussions in public life," wrote historian Walter A. McDougall in The Heavens and the Earth—A Political History of the Space Age. Simon Ramo, space pioneer and cofounder of Thompson Ramo Woolridge, later known as TRW, Inc., wrote in The Business of Science that "the American response to the accomplishment of the Soviet Union was comparable to the reaction I could remember to Lindbergh's landing in France, the Japanese bombing of Pearl Harbor, and Franklin D. Roosevelt's death."

There was a sudden crisis of confidence in American technology, values, politics, and the military. Science, technology, and engineering were totally reworked and massively funded in the shadow of

Sputnik. The Russian satellite essentially forced the United States to place a new national priority on research science, which led to the development of microelectronics—the technology used in today's laptop, personal, and handheld computers. Many essential technologies of modern life, including the Internet, owe their early development to the accelerated pace of applied research triggered by Sputnik.

On another level, Sputnik affected national attitudes toward conspicuous consumption as well, symbolically killing off the market for the Edsel automobile and the decadent automotive tail fin. It was argued that the engineering talents of the nation were being wasted on frivolities. Americans, wrote historian Samuel Flagg Bemis from the vantage point of 1962, "had been experiencing the world crisis from soft seats of comfort, debauched by [the] mass media..., pandering for selfish profit to the lowest level of our easy appetites, fed full of toys and gewgaws, our power, our manpower softened in will and body in a climate of amusement."

While Eisenhower opposed sending men to the moon, John Kennedy made it a national priority. Here, Kennedy views the Saturn launch system with von Braun (center) and NASA Deputy Administrator Robert Seamans. Courtesy NASA-HQ-GRIN

Spur for spacemen

Sputnik also changed people's lives in ways that filtered into modern popular culture. Sputnik was the instrument that gave Stephen King the "dread" that fuels his novels, caused the prolific Isaac Asimov to begin calling himself a science writer rather than a science fiction writer, inspired Ross Perot to create an electronics dynasty, and led others to become cosmonauts and astronauts.

NASA astronaut Franklin R. Chang-Díaz is a case in point. He was born on April 5, 1950, in San José, Costa Rica. On a trip to Venezuela in October 1957, the seven-year-old was told by his mother to look skyward to see the Russian satellite crossing the night sky. Although the young Franklin could not spot Sputnik, he became so infatuated with the fact that human influence had moved into space that he decided then and there that this was his future. Once the American manned space program was under way, he wrote to Wernher von Braun, director of the George C. Marshall Space Flight Center, to find out how he might apply to become an astronaut. In the form letter that came back, he was advised to get a scientific or engineering degree and learn to fly. He also was told that he would have to become an American citizen. The United States, after all, was in a race with the Soviet Union.

At 18 he came to the United States from Costa Rica; he received a bachelor of science degree in mechanical engineering from the University of Connecticut in 1973 and a doctorate in physics from the Massachusetts Institute of Technology in 1977. Along the way he became a U.S. citizen and then in 1981 an astronaut. Chang-Díaz hopes to go to Mars eventually.

On May 25, 1961, President Kennedy tells Congress of his intention for the nation to achieve the goal, "before this decade is out, of landing a man on the Moon...." Courtesy NASA

The space race begins

Politically, Sputnik created a perception of American weakness, complacency, and a "missile gap," which led to bitter accusations, resignations of key military figures, and contributed to the election of John F. Kennedy, who emphasized the space gap and the role of the Eisenhower-Nixon administration in creating it. But although the Sputnik episode publicly depicted Eisenhower as passive and unconcerned, he was fiercely dedicated to averting nuclear war at a time when the threat was very real. His concern for national security took precedence over any concerns about beating the Russians into Earth orbit.

Without Sputnik, it is all but certain that there would not have been a race to the moon.

When Kennedy as president decided to put Americans on the moon, he did so with the belief that voters who had been kids at the time of Sputnik were more willing than their parents to pay the high price of going into space.

Diplomatically, Sputnik helped realign the United States and Great Britain as allies. For a decade, ties between the two nations had weakened partly due to the 1946 Atomic Energy Act, which had deprived the United Kingdom of American nuclear secrets, and partly because of the strong position that the United States had taken against the British and French during the Suez Crisis, which had been prompted by Egypt's seizure of the Suez Canal in July 1956. Now with the common threat of Soviet power implied by Sputnik, NATO was strengthened, guaranteeing the placement of American nuclear arms in Europe. The satellite touched off a superpower competition that may well have acted as a surrogate contest for universal power—perhaps even a stand-in for nuclear world war.

NASA chief historian Roger D. Launius wrote on the 40th anniversary of the launch: "To a remarkable degree, the Soviet announcement changed the course of the Cold War.... Two generations after the event, words do not easily convey the American reaction to the Soviet satellite." Without Sputnik, it is all but certain that there would not have been a race to the moon, which became the centerpiece contest of the Cold War.

By 1968, when this photograph was taken, Wernher von Braun had been director of the Marshall Space Flight Center, developer of the Saturn rockets that got us to the moon, for eight years. A Saturn IB stands at the ready in the background. Courtesy NASA

To the moon

From the outset, wrangling among the branches of the military over control of the rockets that would take the United States into space threatened the success of the American space program even before Sputnik. Eisenhower was at odds with his generals over the program, and each branch of the service had its own aspirations of going into space. The main event pitted the Army's von Braun and his Rocket Team in Huntsville, Alabama against a team from the Naval Research Laboratory. The Army had the mighty Jupiter C rocket and its own Orbiter or Deal satellite (later to become Explorer) pitted against the Navy's experimental Viking rocket and Vanguard satellite.

The most powerful early rockets were developed as weapons—first as German V-2 technology from World War II and ultimately as intercontinental ballistic missiles. The space program seemed destined for civilian control just as the power of the atomic bomb had been taken from the military a decade earlier. The National Aeronautics and Space Administration began in 1958 as a reaction to Sputnik and as a means for turning missiles into launch vehicles for America's civilian space efforts.

President Eisenhower opposed sending men to the moon, but his successor, John F. Kennedy, made a lunar landing a national priority. Receiving virtual carte blanche in budget requests, NASA won the race for the United States, but victory was by no means an easy feat.

National insecurity, wounded national pride, infighting, political grandstanding, clandestine plots, and ruthless media frenzy were but a few of the things the United States had to overcome to bounce back from the blow dealt to the nation by Sputnik.

Editor's Notes

This feature originally appeared on the site for the NOVA program Sputnik Declassified.

Sputnik's Impact on America Responses

Directions:

1. Read "Sputnik' Impact on America: (www.pbs.org/wgbh/nova/article/sputnik-impact-on-america/)
2. If possible, view Civil Defense film titled "Duck and Cover" that displays the reality of the tension between the Soviet Union and the United States: www.loc.gov/item/mbrs01836081/

Complete the following discussion questions regarding what you read and/or viewed in the article and the Duck and Cover video:

1. How did U.S. government officials react to the news of Sputnik in 1957?

2. How did everyday people react?

3. How did the "space race" escalate the Cold War between the United States and the Soviet Union? How was "space" linked to the fear of nuclear war?

Consider the following table of NASA and Defense (Military) spending after the launch of Sputnik. What was the American initial and long term response to the news based on the information presented in "Document I"?

Document I

Source: Office of Management and Budget, US Federal Government, chart created by Beth Scully.

Chart of Federal Spending 1958-1970

Year	NASA % of Budget	Defense % of Budget
1958	0.10%	56.80%
1959	0.20%	53.20%
1960	0.50%	52.20%
1961	0.90%	50.80%
1962	1.40%	49.00%
1963	2.80%	48.00%
1964	4.30%	46.20%
1965	5.30%	42.80%
1966	5.50%	43.20%
1967	3.10%	45.40%
1968	2.40%	46.00%
1969	2.10%	44.90%
1970	1.70%	41.80%

https://www.nasa.gov/pdf/466719main_AP_ED_Hist_RacetoSpace_09-17-09.pdf

Response:

Day 7: Text Dependent Analysis and Theme

English Language Arts

- Now that you've read three primary sources, we are going to add in one more, President Reagan's national address following the explosion of the Space Shuttle Challenger. Using this new speech, you will write a text-dependent analysis that demonstrates your ability to link common themes together in a cohesive writing piece.
- Note: You do not have to complete the full TDA. However, you should use the planning area to describe how you might complete it to identify a common theme in all documents.
- Sketch out a possible response to the prompt. Note: you do not have to write the essay unless directed by your teacher(s).
    - TDA Prompt: Identify a common theme
    - Selection 1 (Kennedy)
    - Selection 2 (Jefferson)
    - Selection 3 (Reagan)

Day 7: Text Dependent Analysis and Theme English Language Arts

Name: _____ Period: _____ Score: _____/40

TEXT-DEPENDENT ANALYSIS QUESTION

E08.E.1.1
Within the selected sources, the authors each develop a theme to convey a central idea. Write an essay in which you identify a common theme set forth across each of the works. Within your response, use evidence from the multiple texts to support what you have identified as the common theme.

Writer's Checklist

PLAN before you write.
- Make sure you read the question carefully.
- Make sure you have read the entire passage carefully.
- Think about how the question relates to the passage.
- Organize your ideas on scratch paper. Use a thought map, outline, or other graphic organizer to plan your essay.

FOCUS while you write.
- Analyze the information from the passage as you write your essay.
- Make sure you use evidence from the passage to support your response.
- Use precise language, a variety of sentence types, and transitions in your essay.
- Organize your paper with an introduction, body, and conclusion.

PROOFREAD after you write.
- I wrote my final essay on the provided pages.
- I stayed focused on answering the question.
- I used evidence from the passage to support my response.
- I corrected errors in capitalization, spelling, sentence formation, punctuation, and word choice.

PLANNING AREA

Within the selected sources, the authors each develop a theme to convey a central idea. Write an essay in which you identify a common theme set forth across each of the works. Within your response, use evidence from the multiple texts to support what you have identified as the common theme.

Text Source 1: *John F. Kennedy Moonshot Speech*

TEXT OF PRESIDENT JOHN KENNEDY'S RICE STADIUM MOON SPEECH

President Pitzer, Mr. Vice President, Governor, Congressman Thomas, Senator Wiley, and Congressman Miller, Mr. Webb, Mr. Bell, scientists, distinguished guests, and ladies and gentlemen:

I appreciate your president having made me an honorary visiting professor, and I will assure you that my first lecture will be very brief.

I am delighted to be here, and I'm particularly delighted to be here on this occasion.

We meet at a college noted for knowledge, in a city noted for progress, in a State noted for strength, and we stand in need of all three, for we meet in an hour of change and challenge, in a decade of hope and fear, in an age of both knowledge and ignorance. The greater our knowledge increases, the greater our ignorance unfolds.

Despite the striking fact that most of the scientists that the world has ever known are alive and working today, despite the fact that this Nation[1]s own scientific manpower is doubling every 12 years in a rate of growth more than three times that of our population as a whole, despite that, the vast stretches of the unknown and the unanswered and the unfinished still far outstrip our collective comprehension.

No man can fully grasp how far and how fast we have come, but condense, if you will, the 50,000 years of man[1]s recorded history in a time span of but a half-century. Stated in these terms, we know very little about the first 40 years, except at the end of them advanced man had learned to use the skins of animals to cover them. Then about 10 years ago, under this standard, man emerged from his caves to construct other kinds of shelter. Only five years ago man learned to write and use a cart with wheels. Christianity began less than two years ago. The printing press came this year, and then less than two months ago, during this whole 50-year span of human history, the steam engine provided a new source of power.

Newton explored the meaning of gravity. Last month electric lights and telephones and automobiles and airplanes became available. Only last week did we develop penicillin and television and nuclear power, and now if America's new spacecraft succeeds in reaching Venus, we will have literally reached the stars before midnight tonight.

This is a breathtaking pace, and such a pace cannot help but create new ills as it dispels old, new ignorance, new problems, new dangers. Surely the opening vistas of space promise high costs and hardships, as well as high reward.

So it is not surprising that some would have us stay where we are a little longer to rest, to wait. But this city of Houston, this State of Texas, this country of the United States was not built by those who waited and rested and wished to look behind them. This country was conquered by those who moved forward--and so will space.

William Bradford, speaking in 1630 of the founding of the Plymouth Bay Colony, said that all great and honorable actions are accompanied with great difficulties, and both must be enterprised and overcome with answerable courage.

If this capsule history of our progress teaches us anything, it is that man, in his quest for knowledge and progress, is determined and cannot be deterred. The exploration of space will go ahead, whether we join in it or not, and it is one of the great adventures of all time, and no nation which expects to be the leader of other nations can expect to stay behind in the race for space.

Those who came before us made certain that this country rode the first waves of the industrial revolutions, the first waves of modern invention, and the first wave of nuclear power, and this generation does not intend to founder in the backwash of the coming age of space. We mean to be a part of it--we mean to lead it. For the eyes of the world now look into space, to the moon and to the planets beyond, and we have vowed that we shall not see it governed by a hostile flag of conquest, but by a banner of freedom and peace. We have vowed that we shall not see space filled with weapons of mass destruction, but with instruments of knowledge and understanding.

Yet the vows of this Nation can only be fulfilled if we in this Nation are first, and, therefore, we intend to be first. In short, our leadership in science and in industry, our hopes for peace and security, our obligations to ourselves as well as others, all require us to make this effort, to solve these mysteries, to solve them for the good of all men, and to become the world's leading space-faring nation.

We set sail on this new sea because there is new knowledge to be gained, and new rights to be won, and they must be won and used for the progress of all people. For space science, like nuclear science and all technology, has no conscience of its own. Whether it will become a force for good or ill depends on man, and only if the United States occupies a position of pre-eminence can we help decide whether this new ocean will be a sea of peace or a new terrifying theater of war. I do not say the we should or will go unprotected against the hostile misuse of space any more than we go unprotected against the hostile use of land or sea, but I do say that space can be explored and mastered without feeding the fires of war, without repeating the mistakes that man has made in extending his writ around this globe of ours.

There is no strife, no prejudice, no national conflict in outer space as yet. Its hazards are hostile to us all. Its conquest deserves the best of all mankind, and its opportunity for peaceful cooperation many never come again. But why, some say, the moon? Why choose this as our goal? And they may well ask why climb the highest mountain? Why, 35 years ago, fly the Atlantic? Why does Rice play Texas?

We choose to go to the moon. We choose to go to the moon in this decade and do the other things, not because they are easy, but because they are hard, because that goal will serve to organize and measure the best of our energies and skills, because that challenge is one that we are willing to accept, one we are unwilling to postpone, and one which we intend to win, and the others, too.

It is for these reasons that I regard the decision last year to shift our efforts in space from low to high gear as among the most important decisions that will be made during my incumbency in the office of the Presidency.

In the last 24 hours we have seen facilities now being created for the greatest and most complex exploration in man's history. We have felt the ground shake and the air shattered by the testing of a Saturn C-1 booster rocket, many times as powerful as the Atlas which launched John Glenn, generating power equivalent to 10,000 automobiles with their accelerators on the floor. We have seen the site where the F-1 rocket engines, each one as powerful as all eight engines of the Saturn combined, will be clustered together to make the advanced Saturn missile, assembled in a new building to be built at Cape Canaveral as tall as a 48 story structure, as wide as a city block, and as long as two lengths of this field.

Within these last 19 months at least 45 satellites have circled the earth. Some 40 of them were "made in the United States of America" and they were far more sophisticated and supplied far more knowledge to the people of the world than those of the Soviet Union.

The Mariner spacecraft now on its way to Venus is the most intricate instrument in the history of space science. The accuracy of that shot is comparable to firing a missile from Cape Canaveral and dropping it in this stadium between the the 40-yard lines.

Transit satellites are helping our ships at sea to steer a safer course. Tiros satellites have given us unprecedented warnings of hurricanes and storms, and will do the same for forest fires and icebergs.

We have had our failures, but so have others, even if they do not admit them. And they may be less public.

To be sure, we are behind, and will be behind for some time in manned flight. But we do not intend to stay behind, and in this decade, we shall make up and move ahead.

The growth of our science and education will be enriched by new knowledge of our universe and environment, by new techniques of learning and mapping and observation, by new tools and computers for industry, medicine, the home as well as the school. Technical institutions, such as Rice, will reap the harvest of these gains.

And finally, the space effort itself, while still in its infancy, has already created a great number of new companies, and tens of thousands of new jobs. Space and related industries are generating new demands in investment and skilled personnel, and this city and this State, and this region, will share greatly in this growth. What was once the furthest outpost on the old frontier of the West will be the furthest outpost on the new frontier of science and space. Houston, your City of Houston, with its Manned Spacecraft Center, will become the heart of a large scientific and engineering community. During the next 5 years the National Aeronautics and Space Administration expects to double the number of scientists and engineers in this area, to increase its outlays for salaries and expenses to $60 million a year; to invest some $200 million in plant and laboratory facilities; and to direct or contract for new space efforts over $1 billion from this Center in this City.

To be sure, all this costs us all a good deal of money. This year[1]s space budget is three times what it was in January 1961, and it is greater than the space budget of the previous eight years combined. That budget now stands at $5,400 million a year--a staggering sum, though somewhat less than we pay for cigarettes and cigars every year. Space expenditures will soon rise some more, from 40 cents per person per week to more than 50 cents a week for every man, woman and child in the United Stated, for we have given this program a high national priority--even though I realize that this is in some measure an act of faith and vision, for we do not now know what benefits await us.

But if I were to say, my fellow citizens, that we shall send to the moon, 240,000 miles away from the control station in Houston, a giant rocket more than 300 feet tall, the length of this football field, made of new metal alloys, some of which have not yet been invented, capable of standing heat and stresses several times more than have ever been experienced, fitted together with a precision better than the finest watch, carrying all the equipment needed for propulsion, guidance, control, communications, food and survival, on an untried mission, to an unknown celestial body, and then return it safely to earth, re-entering the atmosphere at speeds of over 25,000 miles per hour, causing heat about half that of the temperature of the sun--almost as hot as it is here today--and do all this, and do it right, and do it first before this decade is out--then we must be bold.

I'm the one who is doing all the work, so we just want you to stay cool for a minute. [laughter]

However, I think we're going to do it, and I think that we must pay what needs to be paid. I don't think we ought to waste any money, but I think we ought to do the job. And this will be done in the decade of the sixties. It may be done while some of you are still here at school at this college and university. It will be done during the term of office of some of the people who sit here on this platform. But it will be done. And it will be done before the end of this decade.

I am delighted that this university is playing a part in putting a man on the moon as part of a great national effort of the United States of America.

Many years ago the great British explorer George Mallory, who was to die on Mount Everest, was asked why did he want to climb it. He said, "Because it is there."

Well, space is there, and we're going to climb it, and the moon and the planets are there, and new hopes for knowledge and peace are there. And, therefore, as we set sail we ask God's blessing on the most hazardous and dangerous and greatest adventure on which man has ever embarked.

Text Source 2: *Jefferson's Letter to Lewis (1803)*

Transcript: Jefferson's Instructions for Meriwether Lewis

Thomas Jefferson and Early Western Explorers

Transcribed and Edited by Gerard W. Gawalt, Manuscript Division, Library of Congress. June 20 1803

To: Captain Meriwether Lewis esq. Capt. of the 1st. regimt, of Infantry of the United States

Full Transcript Available at https://www.loc.gov/exhibits/lewisandclark/transcript57.html

[ante June 20 1803]
To <Captain> Meriwether Lewis esq. Capt. of the 1st. regimt, of Infantry of the US. of A.

Your situation as Secretary of the President of the US has made you acquainted with the objects of my confidential message of Jan. 18. 1803 to the legislature; you have seen the act they passed, which they expressed in general terms, was meant to sanction these objects, and you are appointed to carry them into execution.

(5) Instruments for ascertaining by ***celestial*** observations, the geography of the country through which you will pass, have been already provided. Light articles for barter and presents among the Indians, arms for your attendants, say from 10. to 12. men, boats, tents, & other travelling apparatus with ammunition, medicine, surgical instruments and provisions you will have prepared with such aids as the Secretary at War can yield in his department; & from him also you will receive authority to (10) engage among our troops, by voluntary agreement, the number of attendants above mentioned, over whom you, as their commanding officer, are invested with all the powers the laws give in such a case.

The object of your mission is to explore the Missouri river, & such principal stream of it as by it's course and communication with the waters of the Pacific ocean whether the Columbia, Oregon, Colorado or any other river may offer the most direct & practicable water communication across this (15) continent for the purposes of commerce.

Beginning at the mouth of the Missouri, you will take careful observations of latitude & longitude at all remarkable points on the river, & especially at the mouth of rivers, at rapids, at islands, & other places & objects distinguished by such durable natural marks & characters of a durable nature kind as that they may with certainty be recognized hereafter.

(20) The course of the river between these points of observation may be supplied by the compass, the log-line & by time, corrected by the observations themselves. The variations of the compass too, in different places should be noticed.

The interesting points of the portage between the heads of the Missouri, & of the water offering the best communication with the Pacific ocean, should also be fixed by observation, & the course of that (25) water to the ocean, in the same manner as that of the Missouri.

Your observations are to be taken with great pains & accuracy, to be entered distinctly & **intelligibly** for others…fix the latitude and longitude of the places at which they were taken, and are to be rendered to the war office for the purpose of having the calculations made concurrently by proper persons within the US. several copies of these as well as of your other notes should be made at
(30) leisure times, & put into the care of the most trust-worthy of your attendants, to guard by multiplying them against the accidental losses to which they will be exposed. A further guard would be that one these copies be on the paper of the birch, as less liable to injury from damp than

common paper.

The commerce which may be carried on with the people inhabiting the line your will pursue, renders a (35) knowledge of those people important. You will therefore **endeavor** to make yourself acquainted with as far as a **diligent** pursuit of your journey shall admit, with the names of the nations & their numbers; the extent & limits of their possessions; their relations with other tribes of nations; their language, traditions, monuments; their ordinary occupations in agriculture, fishing, hunting, war, arts & the implements for these; their food, clothing, & domestic accommodations; the diseases prevalent (40) among them, & the remedies they use; moral & physical circumstances which distinguish them from the tribes we know; peculiarities in their laws, customs & dispositions; and articles of commerce they may need or furnish & to what extent.

Other objects worthy of notice will be the soil & face of the country, it's growth & vegetable productions, especially those not of the US. the animals of the country generally, & especially those (45) not known in the US. the remains & accounts of any which may be deemed rare or extinct; the mineral productions of every kind; but more particularly metals; limestone, pit-coal, & salt-petre; salines & mineral waters, noting the temperature of the last & such circumstances as may indicate their character; volcanic appearances; climate, as characterized by the thermometer, by the proportion of rainy, cloudy, & clear days, by lightening, hail, snow, ice, by the access & recess of (50) frost, by the winds prevailing at different seasons, the dates at which particular plants put forth or lose their flower, or leaf, times of appearance of particular birds, reptiles or insects.

Although' your route will be along the channel of the Missouri, yet you will endeavor to inform yourself, by enquiry, of the character & extent of the country watered by it's branches & especially on it's Southern side, the North river or Rio Bravo which runs into the gulph of Mexico, and the North (55) river, or Rio Colorado which runs into the gulph of California, are understood to be the principal streams heading opposite to the waters of the Missouri, and running Southwardly. Whether the dividing grounds between the Missouri & them are mountains or flat lands, what are their distance from the Missouri, the character of the intermediate country, & the people inhabiting it, are worthy of particular enquiry.

(60) The Northern waters of the Missouri are less to be enquired after, because they have been ascertained to a considerable degree, & are still in a course of ascertainment by English traders, and travellers. But if you can learn anything certain of the most Northern source of the Mississippi, & of it's position relatively to the lake of the woods, it will be interesting to us.
Two copies of your notes at least & as many more as leisure will admit, should be made & confided to (65) the care of the most trusty individuals of your attendants.

In all your intercourse with the natives, treat them in the most friendly & **conciliatory** manner which their own conduct will admit; allay all jealousies as to the object of your journey, satisfy them of it's innocence, make them acquainted with the position, extent character, peaceable & commercial dispositions of the US. of our wish to be neighborly, friendly, & useful to them.

(70) If a few of their influential chiefs within practicable distance, wish to visit us, arrange such a visit with them, and furnish them with authority to call on our officers, on their entering the US. to have them conveyed to this place at the public expense.

If any of them should wish to have some of their young people brought up with us, & taught such arts as may be useful to them, we will receive, instruct & take care of them. Such a mission whether of (75) influential chiefs or of young people would give some security to your own party.

Carry with you some matter of the kinepox; inform those of them with whom you may be, of it's efficacy as a preservative from the smallpox; & instruct & encourage them in the use of it. This may be especially done wherever you winter.

As it is impossible for us to foresee in what manner you will be received by those people, whether (80) with hospitality or hostility, so is it impossible to prescribe the exact degree of perseverance with which you are to pursue your journey. We value too much the lives of citizens to offer them to probable destruction. Your numbers will be sufficient to secure you against the unauthorized opposition of individuals or of small parties: but if a superior force authorized, or not authorized by a nation, should be arrayed against your further passage, and inflexibly determined to arrest it, you (85) must decline it's farther pursuit, and return.

In the loss of yourselves, we should lose also the information you will have acquired. By returning safely with that, you may enable us to renew the essay with better calculated means. To your own discretion therefore must be left the degree of danger you risk, and the point at which you should decline, only saying we wish you to err on the side of your safety, and to bring back your party safe (90) even if it be with less information.

Should you reach the Pacific Ocean inform yourself of the circumstances which may decide whether the furs of those parts may not be collected as advantageously at the head of the Missouri …
On your arrival on that coast endeavor to learn if there by any port within your reach frequented by the sea-vessels of any nation, & to send two of your trusty people back by sea, in such way as they (95) shall judge shall appear practicable, with a copy of your notes: and should you be of opinion that the return of your party by the way they went will be eminently dangerous, then ship the whole, & return by sea, by the way either of cape Horn, or the cape of good Hope, as you shall be able. As you will be without money, clothes or provisions, you must endeavor to use the credit of the U.S. to obtain them, for which purpose open letters of credit shall be furnished you, authorizing you to draw upon (100) the Executive of the U.S. or any of it's officers…

Should you find it safe to return by the way you go, after sending two of your party round by sea, or with your whole party, if no conveyance by sea can be found, do so; making such observations on your return, as may serve to supply, correct or confirm those made on your outward journey.

On re-entering the U.S. and reaching a place of safety, discharge any of your attendants who may (105) desire & deserve it, procuring for them immediate payment of all arrears of pay & clothing which may have incurred since their departure, and assure them that they shall be recommended to the liberality of the legislature for the grant of a soldier's portion of land each, as proposed in my message to Congress; & repair yourself with your papers to the seat of government ….

To provide, on the accident of your death, against **anarchy**, **dispersion**, & the consequent danger to (110) your party, and total failure of the enterprise, you are hereby authorized, by any instrument signed & written in your own hand, to name the person among them who shall succeed to the command on your decease, and by like instruments to change the nomination from time to time as further experience of the characters accompanying you shall point out superior fitness…

Given under my hand at the city of Washington this 20th day of June 1803.
Th. J. Pr. U.S. of A.

Text Source 3: Address to the Nation on the Challenger Accident
President Reagan

January 28, 1986

"Ladies and Gentlemen, I'd planned to speak to you tonight to report on the state of the Union, but the events of earlier today have led me to change those plans. Today is a day for mourning and remembering. Nancy and I are pained to the core by the tragedy of the shuttle Challenger. We know we share this pain with all of the people of our country. This is truly a national loss.

Nineteen years ago, almost to the day, we lost three astronauts in a terrible accident on the ground. But we've never lost an astronaut in flight; we've never had a tragedy like this. And perhaps we've forgotten the courage it took for the crew of the shuttle. But they, the Challenger Seven, were aware of the dangers, overcame them and did their jobs brilliantly. We mourn seven heroes: Michael Smith, Dick Scobee, Judith Resnik, Ronald McNair, Ellison Onizuka, Gregory Jarvis, and Christa McAuliffe. We mourn their loss as a nation together.

[To] the families of the seven: we cannot bear, as you do, the full impact of this tragedy. But we feel the loss, and we're thinking about you so very much. Your loved ones were daring and brave, and they had that special grace, that special spirit that says, "Give me a challenge, and I'll meet it with joy." They had a hunger to explore the universe and discover its truths. They wished to serve, and they did. They served all of us. We've grown used to wonders in this century. It's hard to dazzle us. But for 25 years the United States space program has been doing just that. We've grown used to the idea of space, and perhaps we forget that we've only just begun. We're still pioneers. They, the members of the Challenger crew, were pioneers.

And I want to say something to the schoolchildren of America who were watching the live coverage of the shuttle's takeoff. I know it is hard to understand, but sometimes painful things like this happen. It's all part of the process of exploration and discovery. It's all part of taking a chance and expanding man's horizons. The future doesn't belong to the fainthearted; it belongs to the brave. The Challenger crew was pulling us into the future, and we'll continue to follow them.

I've always had great faith in and respect for our space program, and what happened today does nothing to diminish it. We don't hide our space program. We don't keep secrets and cover things up. We do it all up front and in public. That's the way freedom is, and we wouldn't change it for a minute. We'll continue our quest in space. There will be more shuttle flights and more shuttle crews and, yes, more

volunteers, more civilians, more teachers in space. Nothing ends here; our hopes and our journeys continue. I want to add that I wish I could talk to every man and woman who works for NASA or who worked on this mission and tell them: ' Your dedication and professionalism have moved an impressed us for decades. And we know of your anguish. We share it.'

There' s a coincidence today. On this day 390 years ago, the great explorer Sir Francis Drake died aboard ship off the coast of Panama. In his lifetime the great frontiers were the oceans, and an historian later said, 'He lived by the sea, died on it, and was buried in it.' Well today we can say of the Challenger crew: Their dedication was, like Drake's, complete.

The crew of the space shuttle Challenger honored us by the manner in which they lived their lives. We will never forget them, nor the last time we saw them, this morning, as they prepared for their journey and waved goodbye and 'slipped the surly bonds of Earth' to 'touch the face of God. Thank you."

Day 7: Calculating Volume
Math

Using a calculator, Calculate the volume of each planet and fill out the chart

Planet	*Diameter (km)*	*Your Work*	*Volume*
Mercury	4879 km		
Venus	12,104 km		
The Moon	3475 km		
Jupiter	142,984 km		
Saturn	120,536 km		
Uranus	51,118 km		
Neptune	49,528 km		

Don't forget the first column is in diameter, not radius!!!!

Formula for Volume:

$V = 4/3*\pi r^3$

WQED education

Day 7: Characteristics of Mars Part 2

Science

Alien Project

Materials:

- Paper, colored pencils, markers, crayons, or any other materials to design an alien.
- Your Planet Chart from Day 4 and 5 Science

1. Finish and label your alien. Color it and give it a name (if you haven't already).

2. Be sure to label the parts of your alien to show why you made it the way you did. For example, if you gave it teeth, you should have an arrow pointing to the teeth saying "Teeth to chew the iron rocks on the surface for food".

Day 7: Space Race, Cold War, and the Moon

Social Studies

- Analyze the contributions of those who brought us to the Moon.
- Read the article about the Women Who Brought us the Moon.
- Complete a journal entry highlighting the contributions of one of the women to detail her contributions the nation's space program.
- Additional Interactive Online Resource: Chasing the Moon: https://ctm.americanexperience.org

The Women Who Brought Us the Moon

https://www.pbs.org/wgbh/americanexperience/features/chasing-moon-women-who-brought-us-moon/
By Nathalia Holt

A diverse and potent force in space exploration, women at NASA who served as human computers were ultimately responsible for sending astronauts to the moon.

Computers at the Jet Propulsion Laboratory, including Janez Lawson and Barbara Paulson. Credit: NASA/JPL

In 1965, Poppy Northcutt was the only female engineer at NASA's Houston Mission Control. As she gazed at the men around her she thought to herself, ***I'm as smart as they are***. Although she belonged among them, it was undeniably difficult to be the only woman in what sometimes felt like the domain of men.

As isolated as Northcutt felt in the historic control center, she was one of thousands of women who began their careers at NASA as computers. It was a job created before the advent of electronic machines, when human aptitude was required to perform all the mathematical calculations needed for experiments. Women have historically filled these positions, as exemplified by the groups of female computers who worked at the **Harvard Observatory** and the **Royal Observatory Greenwich** in the late 1800s. At NASA, these women came from all over the world, working at centers across the United States, and comprising a diverse and potent force in space exploration. Their calculations would ultimately be responsible for sending astronauts to the moon.

Unlike Northcutt, **Sue Finley** noticed the ubiquitous presence of female employees when she started work at the Jet Propulsion Laboratory in Pasadena, CA. Not only was her supervisor a woman, but all of her coworkers in the computing section were as well. It was January 31, 1958, and the country was on the precipice of historic achievement. That evening the laboratory would finally catch up with Sputnik 1 and 2, the world's first satellites, launched by the Soviet Union in October and November of 1957. In mission control that night, it was one woman, **Barbara Paulson**, who tracked Explorer 1, America's first satellite, as it left Earth's atmosphere and entered space. When Paulson declared that the satellite had made it into Earth's orbit, the room erupted in celebration. Although it would be another six months before NASA was officially formed, for those at the Jet Propulsion Laboratory the moon was already in their sights.

Helen Ling at the Jet Propulsion Laboratory in Pasadena, CA. Credit: NASA/JPL

Finley began adapting their designs and trajectories in order to launch robotic lunar missions. Her team was focused on sending the first camera to the moon as part of the **Ranger** series of missions, from 1961-1965, whose goal was to obtain close up images of the lunar surface and select a landing site for Apollo. Next, they would send uncrewed spacecraft as part of the **Surveyor**, from 1966-1968, which gathered further data on temperature and surface substrate to aid in Apollo planning. In addition, Finley was part of the team designing an array of large radio antennas that they called the **Deep Space Network**, which would form a massive tracking and communications system.

The women working at the Jet Propulsion Laboratory in the 1960s were all highly trained mathematicians, and many possessed advanced degrees. **Helen Ling** was born in China and experienced a tumultuous childhood formed under the pressures of WWII. Coming to the United States for college, she earned her master's degree in mathematics before leading the computing section in a managerial role for over three decades. There was also **Janez Lawson**, the first African American hired in a technical position at the laboratory. She held a bachelor's degree in chemical engineering from UCLA and by modern qualifications would be hired today as an engineer. However, in the 1950s, her gender and race impeded her employment and she was brought in as a computer.

The most extensive group of **African American computers** in the United States was based at the Langley Memorial Aeronautic laboratory in Hampton, Virginia. While employees of different racial backgrounds worked beside one another at many NASA centers, for those employees working in the Jim Crow South, segregation remained in effect. African American women were initially grouped in a section labeled the "**West Area Computers**." This separation meant that not only would they be paid far less than their white counterparts, but also that all working quarters, lunch areas and bathrooms were segregated by race.

Katherine Johnson at the Langley Memorial Aeronautical Laboratory in Hampton, VA. Credit: NASA

In a system designed to repress their advancement, the African American women became indispensable. "A Trojan horse of segregation opening the door to integration," Margot Lee Shetterly wrote in **Hidden Figures**, her 2016 nonfiction book documenting the groundbreaking female African American computers at Langley and adapted into a feature film of the same name. In the book, Shetterly focuses her narrative on three human computers turned engineers: **Katherine Johnson**, who was awarded the Presidential Medal of Freedom in 2015, **Dorothy Vaughan** and **Mary Jackson**. While their careers spanned decades, their contributions to early human spaceflight are most frequently lauded.

It was John Glenn himself, one of the original astronauts known as the Mercury Seven, who asked for Katherine Johnson. "**Have the girl check the numbers**," he said prior to his Friendship 7 launch. "If she says the numbers are good…I'm ready to go." Johnson not only checked the numbers, she also designed the trajectory for his record breaking 1962 orbit around the Earth. Next, her mathematics would take on new importance as she bent her trajectories beyond the Earth's gravitational pull, all the way out to the moon.

In 1962, when President John F. Kennedy said, "**We choose to go the moon in this decade, and do other things, not because they are easy, but because they are hard**," he was speaking to the heart of NASA operations across the country. At the Cleveland Flight Propulsion Laboratory in Ohio, the group of female computers was focused on developing rockets powerful enough to break the chains of gravity and function in the vacuum of space. To accomplish this, NASA needed **multistage**, or stacked, rockets, with the lower part of the rocket providing plenty of thrust, before falling off, back towards Earth, and the upper part of the rocket designed to give the final boost necessary to send astronauts to the moon. Chief among the female programmers at the laboratory in Ohio was **Annie Easley**, an African American woman with her bachelor's degree in mathematics from Cleveland State University.

Annie Easley at the Lewis Research Center in Cleveland, OH. Credit: NASA

Like Northcutt in Houston, Finley in California, and Johnson in Virginia, Easley started as a computer. By the mid-1960s, however, the world of human computers was in a vast state of upheaval, both in the development of electronic computers at IBM, now more powerful and flexible in their programming, and in the shifting perceptions instigated by the women's movement in the United States. As part of this social and technological revolution, female computers such as Easley were no longer calculating by hand, but were now responsible for writing the space agency's earliest computer programs. Easley was programming the Centaur rocket engines, whose technology would be incorporated into the upper stage rocketry that would form a critical component for Apollo.

Jeanette Scissum at the Marshall Space Flight Center in Hunstville, AL. Credit: NASA

Rockets might be able to get astronauts to the moon, but they still needed to find a place to land. At the Marshall Space Flight Center in Huntsville, Alabama, a laboratory under the direction of the controversial Nazi turned American rocket scientist **Wernher von Braun**, the team was tackling this challenge. Like at other NASA centers across the country, the flight center team was comprised of a talented group of female mathematicians, including **Jeanette Scissum**, an African American scientist who joined the center as an entry-level mathematician in 1964. Scissum was developing a computer program capable of selecting landing locations for the Apollo lunar module. It was her work, and that of her team, that ultimately selected a flat region at the Sea of Tranquility for Apollo 11.

JoAnn Morgan at the Kennedy Space Center in Merritt Island, FL. Credit: NASA

At Cape Kennedy in Florida, the pieces of Apollo 11 were being assembled. Born from the calculations of female hands across the country, the multiple staged rockets were hoisted by cranes in the final assembly area before the payload, containing the lunar, service and command modules, was fitted on top. Waiting in anticipation was **JoAnn Morgan**, a twenty-eight year old instrumentation controller who had worked at Cape Kennedy since NASA's inception in 1958.

Like Poppy Northcutt in Houston, Morgan was accustomed to being the only woman in the control room in Cape Kennedy. While she had worked on all the previous Apollo launches, Apollo 11 would mark the first time she was allowed to sit at the console. The opportunity to be in command of the guidance computers for Apollo 11 was undeniably exciting. Yet she worried about the attention she would receive. She knew media photographers would be documenting their progress and she didn't want to stick out in the crowd of men. A previous Apollo mission had taught her how inappropriate journalists could be, when a cameraman making his way down her row had said to one of her colleagues, "**I wish you could let her go out and put on some lipstick**."

Morgan was not thinking of lipstick on the morning of July 16, 1969, when Apollo 11 launched from Cape Kennedy. Thirty minutes prior to blastoff, she and her colleagues were locked into the firing room, a standard precaution during an Apollo launch. The Florida sky was a flawless blue as the rocket bolted out of sight, entering Earth's orbit twelve minutes later, as expected. What happened next, however, was not planned.

Margaret Hamilton at the Draper Laboratory in Cambridge, MA. Credit: Courtesy of MIT Museum

Four days later, on July 20, the Eagle, the Apollo lunar module, began its descent towards the lunar surface. Just minutes from landing, the computers onboard overloaded. "**Give us a readout on that 1202 program alarm**," said Neil Armstrong, sitting next to Buzz Aldrin in the small cabin. The astronauts had no inkling what action had tripped their alarm. The flight controllers at Houston Mission Control were racing to understand the problem. They determined that the computers were burdened from trying to complete too many functions at once. In Houston they made a critical decision: instead of aborting the mission, they placed their trust in the Apollo onboard software written by **Margaret Hamilton**, director of Apollo flight computer programming, and her team at the Draper laboratory at MIT. Ultimately, MIT's code saved the day, overriding all other functions in order to make landing the priority. "**If the computer hadn't recognized this problem and taken recovery action, I doubt if Apollo 11 would have been the successful Moon landing it was**," Hamilton would later write.

Six and a half hours after the Eagle made its fraught landing, Neil Armstrong, with the eyes of the world watching, made his historic first step on the lunar surface. "That's one small step for man, one giant leap for mankind," Armstrong would famously say as he descended from the Eagle's ladder. Yet the moment was not made by men alone. Instead, it was the work of thousands of men and women, of all different races, nationalities and backgrounds, who were working together to bring about one of humanity's greatest achievements.

For the women of NASA, their work was in many ways just beginning. The decades that followed would be filled with new explorations as they returned spacecraft not only to the moon, but also to the edges of our solar system. For some pioneering female engineers, new missions still lie ahead.

Sue Finley, who started in 1958, before NASA's formation, is still working for the space agency today. At age 83 and with a career spanning six decades, she is **NASA's longest serving female employee**. She has witnessed a dizzying array of changes, both technologically and socially. Her work has sent rovers to Mars; sent ships to every planet of our solar system; yielded new data and

stunning images of Jupiter, Saturn, and Pluto; and even launched spacecraft all the way into interstellar space. Yet few outside her laboratory are aware of the pivotal role Finley has played in space exploration. It is only in the past few years that her contributions, and those of her fellow female colleagues at NASA, have begun to receive the acknowledgement they deserve. On the anniversary of Apollo 11, as we recognize the men whose accomplishments have long been lauded, it's worth remembering the many women who brought us the moon.

Sources

"Women in Space." MAKERS. (Video)
"Women Computers." Astronomical Photographic Plate Collection. Harvard College Observatory.
"The Royal Observatory Greenwich: a Brief History"
Nathalia Holt, "The Woman Who Helped Us Hear Juno." Popular Science.
"Meet The 'Rocket Girls,' The Women Who Charted The Course To Space." NPR.
"Ranger to the Moon (1961 - 1965)." NASA Space Science Data Coordinated Archive.
"Surveyor to the Moon (1966 - 1968)." NASA Space Science Data Coordinated Archive.
"Deep Space Network." NASA Jet Propulsion Laboratory.
Naomi Shavin, "NASA's "Rocket Girls" Are No Longer Forgotten History." Smithsonian.
Nathalia Holt, "How Sexism Held Back Space Exploration." The Atlantic.
Elizabeth Howell, "The Story of NASA's Real 'Hidden Figures.'" Scientific American.
Sarah McLennan and Mary Gainer, "When the Computer Wore a Skirt: Langley's Computers, 1935–1970." NASA History Program Office News & Notes, Vol. 29, No. 1, First Quarter 2012.
Margot Lee Shetterly, *Hidden Figures*. Harper Collins. 2016.
"Katherine Johnson, NASA Mathematician." MAKERS. (Video)
Margot Lee Shetterly, "Dorothy Vaughan Biography." NASA.
Margot Lee Shetterly, "Mary Jackson Biography." NASA.
Robert Z. Pearlman, "'Hidden Figures': When Did John Glenn Ask for 'the Girl' to Check the Numbers?" Space.com.
John F. Kennedy, Speech. September 12, 1962. Rice Stadium. Software, Robotics, and Simulation Division. NASA.
"Multi-Stage Rocket." NASA Glenn Research Center Explorers Posts. NASA.
Anne K. Mills. "Annie Easley, Computer Scientist." NASA.
"Biography of Wernher Von Braun." NASA.
Lee Mohon (ed.), "Jeanette A. Scissum, Scientist and Mathematician at NASA Marshall." NASA.
"Biography of JoAnn H. Morgan." NASA.
David Kamp, "Tracking Down JoAnn Morgan, a Semi-Hidden Figure of U.S. Space History." Vanity Fair.
Jason Davis, "NASA releases 19,000 hours of audio from historic Apollo 11 mission." NBC News.
Nicholas P. Russo, "Margaret Hamilton Awarded Presidential Medal of Freedom." NASA.
"In Their Own Words: Margaret Hamilton's 'Computer Got Loaded.'" Hack the Moon.
Lacey Russell, "NASA engineer, 81, has worked at agency longer than any woman." CNN.

Published June 3, 2019.

Day 8 & Day 9: Theme, Speech Writing

English Language Arts

- We learned a great deal about themes in primary sources and applied them accordingly. Now, it is your time to apply a theme of risk for continued exploration as you write a speech to the nation to explain why or why we should not go to Mars.
- Write a brief speech to address the nation as if you were the President of the United States detailing a new mission to Mars. At the conclusion of your mini-speech, write down what tone you are expressing as well as the theme that you want to convey to the American public.
- Additional Resource on Mars Exploration:
  In Search of Life on Mars and Jupiter's Moon
  https://bit.ly/2XZnLwT

Note: you will have two days to complete this task (Day 8 is Day 1 and Day 9 is Day 2)

Day 8: Surface Area

Math

Finding Surface Area of a Sphere

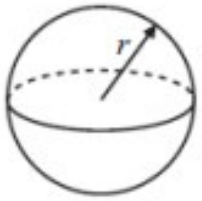
Determine the depth of the water on the surface of Mars by using the surface area formula to determine how much water would be available on the Surface of Mars if the ice caps were to melt.

Materials:

- Calculator

Surface area is defined as a measure of the area on the surface of an object. However, spheres are not like typical objects. Because of that, they need to use a formula specifically for a sphere. The formula for finding the surface area of a sphere is:

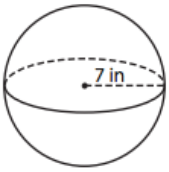
$$A = 4\pi r^2$$



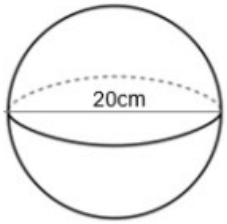
In this formula, r = the radius of a circle (or half of the diameter of a circle). Remember that pi can also be represented with the numerical value of 3.14.

Practice:
In this example, calculate the surface area of the sphere. Use 3.14 for pi.

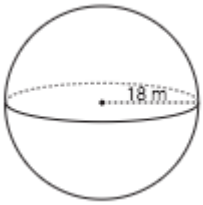
$A = 4\pi r^2$
$= 4*(3.14)(7)^2$
$= 4*(3.14)(49)$
$A = \boldsymbol{615.44\ in^2}$



Try a few examples on your own.



Surface Area = _____



Surface Area = _____

An orange has a radius of 3 inches. What is the surface area of the orange?

Exploring the North Pole of Mars from Orbit

It has been known for nearly 100 years that Mars has two polar caps, which change in size with the martian seasons. Both the North and South Polar Caps contain frozen water in different amounts. The photo above was taken by NASA's Mars Reconnaissance Orbiter and shows the details in the 1,200-km wide North Polar Ice Cap in the summer showing the deposits of frozen water ice.

Scientists estimate that, if the Polar Ice Caps were completely melted, they would produce 2.5 million cubic kilometers of liquid water covering the surface of Mars.

Problem 1 – Mars is in the geometric shape of a sphere with a radius of 3,400 km. If the formula for the surface area of a sphere is $S = 4 \pi R^2$, what is the surface area of Mars?

Problem 2 – The volume of a shell of water covering the surface of Mars to a *depth of h kilometers* is given by V = h x A where *A is the surface area* of Mars in square kilometers. If the volume of the melted water ice from the polar caps is 2.5 million km^3, what will the depth of the water be in meters if it completely covered the surface of Mars? Use the answer you calculated in Problem 1 to help you solve for the depth (h).

Day 8: Mars Colony

Science

Mars Colony: Living on another planet

Plan how to solve various problems of power, water, food, temperature, heat, living space, oxygen, and survival on Mars.

Materials:

- Paper
- Your Planet Chart from Day 4 Science

Congratulations! You have been chosen to be one of the first humans to travel to and live on Mars. This is quite an accomplishment! However, there is one small problem; there is nothing there at the moment. You, along with a team of other astronauts, will be designing a colony to live on Mars when you get there. You will need to design blueprints for your colony and how you will survive. The goal is for you to go to Mars, live there for 6 months, and build a long-lasting colony that other humans can eventually come to and live in permanently.

<u>Things to consider:</u>

- Where will you get energy?
- What will you live in?
- If you are building things, how will you get them there (you only have 1 trip)?
- What will you eat?
- How will you get around?
- What will you drink?
- How many buildings will there be?
- How will you build them?
- What resources on Mars can you use?

<u>What you need to complete:</u>

- Draw a set of blueprints (or a diagram) illustrating your colony.
- You need to label the parts in your colony (building types, purposes, etc.).
- You will need to have a written explanation of how you will get food, water, shelter, and energy.
- Explain how big your buildings will be.
- Explain any resources that Mars can offer to help your colony survive.

Additional Resource:

A One-Way Trip to Mars? http://ow.ly/MZyX50AWFop

WQED education

Day 8: Space History, Exploration

Social Studies

- Determine the phrase that you would recommend be uttered when a human steps foot on Mars while analyzing the events of Apollo 11.

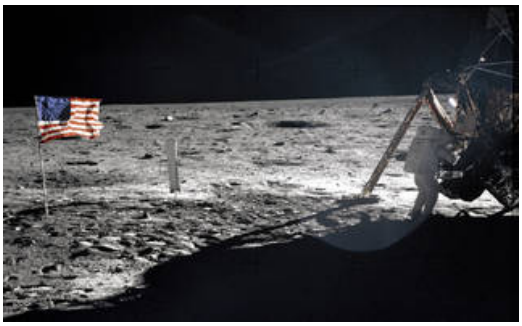
- Read the following article (attached), and, if possible, view the linked video within the article: www.nasa.gov/mission_pages/apollo/apollo11.html

- As Neil Armstrong set foot on the Moon, he stated, that's "one small step for man, one giant leap for mankind." Considering that, take time to ponder what phrase should be proclaimed by the first human to set foot on Mars.

- Write your phrase to be declared once the world reaches Mars with a human aboard.

July 20, 1969: One Giant Leap For Mankind

July 1969. It's a little over eight years since the flights of Gagarin and Shepard, followed quickly by President Kennedy's challenge to put a man on the moon before the decade is out.



Apollo 11 Commander Neil Armstrong working at an equipment storage area on the lunar module. This is one of the few photos that show Armstrong during the moonwalk. ***Credits: NASA***

Smoke and flames signal the opening of a historic journey as the Saturn V clears the launch pad. ***Credits: NASA***

Buzz Aldrin climbs down the Eagle's ladder to the surface. ***Credits: NASA***


Crater 308 stands out in sharp relief in this photo from lunar orbit. ***Credits: NASA***

It is only seven months since NASA's made a bold decision to send Apollo 8 all the way to the moon on the first manned flight of the massive Saturn V rocket.

Now, on the morning of July 16, Apollo 11 astronauts Neil Armstrong, Buzz Aldrin and Michael Collins sit atop another Saturn V at Launch Complex 39A at the Kennedy Space Center. The three-stage 363-foot rocket will use its 7.5 million pounds of thrust to propel them into space and into history.

At 9:32 a.m. EDT, the engines fire and Apollo 11 clears the tower. About 12 minutes later, the crew is in Earth orbit.

After one and a half orbits, Apollo 11 gets a "go" for what mission controllers call "Translunar Injection" - in other words, it's time to head for the moon. Three days later the crew is in lunar orbit. A day after that, Armstrong and Aldrin climb into the lunar module *Eagle* and begin the descent, while Collins orbits in the command module *Columbia*.

Collins later writes that *Eagle* is "the weirdest looking contraption I have ever seen in the sky," but it will prove its worth.

When it comes time to set *Eagle* down in the Sea of Tranquility, Armstrong improvises, manually piloting the ship past an area littered with boulders. During the final seconds of descent, *Eagle's* computer is sounding alarms.

It turns out to be a simple case of the computer trying to do too many things at once, but as Aldrin will later point out, "unfortunately it came up when we did not want to be trying to solve these particular problems."

When the lunar module lands at 4:17 p.m EDT, only 30 seconds of fuel remain. Armstrong radios "Houston, Tranquility Base here. The Eagle has landed." Mission control erupts in celebration as the

tension breaks, and a controller tells the crew "You got a bunch of guys about to turn blue, we're breathing again."

Armstrong will later confirm that landing was his biggest concern, saying "the unknowns were rampant," and "there were just a thousand things to worry about."

At 10:56 p.m. EDT Armstrong is ready to plant the first human foot on another world. With more than half a billion people watching on television, he climbs down the ladder and proclaims: "That's one small step for a man, one giant leap for mankind."

Aldrin joins him shortly, and offers a simple but powerful description of the lunar surface: "magnificent desolation." They explore the surface for two and a half hours, collecting samples and taking photographs.

They leave behind an American flag, a patch honoring the fallen Apollo 1 crew, and a plaque on one of *Eagle's* legs. It reads, "Here men from the planet Earth first set foot upon the moon. July 1969 A.D. We came in peace for all mankind."

Armstrong and Aldrin blast off and dock with Collins in *Columbia*. Collins later says that "for the first time," he "really felt that we were going to carry this thing off."

The crew splashes down off Hawaii on July 24. Kennedy's challenge has been met. Men from Earth have walked on the moon and returned safely home.

In an interview years later, Armstrong praises the "hundreds of thousands" of people behind the project. "Every guy that's setting up the tests, cranking the torque wrench, and so on, is saying, man or woman, 'If anything goes wrong here, it's not going to be my fault.'"

In a post-flight press conference, Armstrong calls the flight "a beginning of a new age," while Collins talks about future journeys to Mars.

Over the next three and a half years, 10 astronauts will follow in their footsteps. Gene Cernan, commander of the last Apollo mission leaves the lunar surface with these words: "We leave as we came and, God willing, as we shall return, with peace, and hope for all mankind."

Last Updated: July 15, 2019
Editor: NASA Administrator

Day 9: Pythagorean Theorem

Math

The Pythagorean Theorem

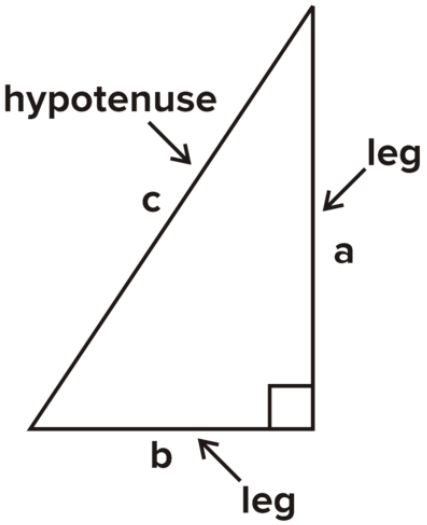
Materials:

- Calculator
- Pencil/paper

The Pythagorean theorem is a very important equation that is widely used in many aspects of the world today. We can use it to find the length of a side or to find that a corner is actually a right angle, or 90 degrees.

The equation is a simple one and one that you might have heard before. The equation is

$a^2 + b^2 = c^2$ where the letters "a" and "b" represent the legs of the triangle. These are the sides that connect to form a right angle (as shown in the picture). The hypotenuse is the side opposite the right angle and is represented by the letter "c".



To determine if a triangle is a right triangle, the equation must be true. If it is, then the triangle has a right angle.

For example, let's see if this triangle has a right angle. Here are the measurements:

a = 3, b = 4, c = 6

If we plug in the numbers into the equation, it should look like this:

$$a^2 + b^2 = c^2 \quad 32 + 42 = 62$$

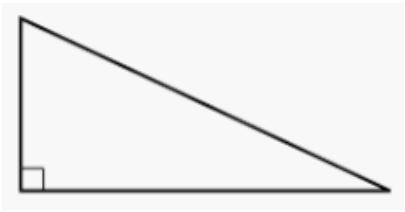
Then, square each number and solve:

$$9 + 16 = 36 \quad 25 = 36$$

Is this a right triangle? No, it is not. 25 does **NOT** equal 36.

Now, let's try some other examples. Solve for the missing side.

1.



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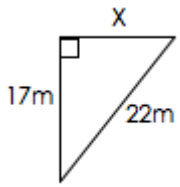

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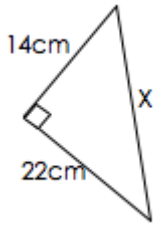


Are the following right triangles?

4. a = 5, b = 6, c = 7

5. a = 6, b = 8, c = 10

6. a = 11, b = 15, c = 23

7. a = 10, b = 20, c = 40

8. If a truck bed is 6ft. long and 4 feet wide, what is the longest piece of wood that you could fit into the truck bed (with the tailgate up) if you put it in diagonally?

Day 9: Mars Colony Part 2

Science

Materials:

- Paper

1. Finish your research and begin to design/build your colony.

2. Design a colony (map). Create structures, a layout, and other things to help you successfully survive on the planet. Begin a draft of the written explanation.

3. How many structures will there be? How many people will be able to live there? What things will you need in your colony to survive?

Day 9: Bill of Rights, Constitution

Social Studies

- Determine what rights you would want to be guaranteed on Mars based on the current United States Constitution.
- Copy of the Bill of Rights: www.archives.gov/founding-docs/bill-of-rights-transcript
- After reviewing the 10 rights listed in the Bill of Rights, determine what modifications should be made.
- Develop any recommendations or changes to the document based on a new possible government system on a new planet.

The Bill of Rights: A Transcription

Note: The following text is a transcription of the enrolled original of the Joint Resolution of Congress proposing the Bill of Rights, which is on permanent display in the Rotunda at the National Archives Museum. The spelling and punctuation reflects the original.

On September 25, 1789, the First Congress of the United States proposed 12 amendments to the Constitution. The 1789 Joint Resolution of Congress proposing the amendments is on display in the Rotunda in the National Archives Museum. Ten of the proposed 12 amendments were ratified by three-fourths of the state legislatures on December 15, 1791. The ratified Articles (Articles 3–12) constitute the first 10 amendments of the Constitution, or the U.S. Bill of Rights. In 1992, 203 years after it was proposed, Article 2 was ratified as the 27th Amendment to the Constitution. Article 1 was never ratified.

Transcription of the 1789 Joint Resolution of Congress Proposing 12 Amendments to the U.S. Constitution

Congress of the United States begun and held at the City of New-York, on Wednesday the fourth of March, one thousand seven hundred and eighty nine.

THE Conventions of a number of the States, having at the time of their adopting the Constitution, expressed a desire, in order to prevent misconstruction or abuse of its powers, that further declaratory and restrictive clauses should be added: And as extending the ground of public confidence in the Government, will best ensure the beneficent ends of its institution.

RESOLVED by the Senate and House of Representatives of the United States of America, in Congress assembled, two thirds of both Houses concurring, that the following Articles be proposed to the Legislatures of the several States, as amendments to the Constitution of the United States, all, or

any of which Articles, when ratified by three fourths of the said Legislatures, to be valid to all intents and purposes, as part of the said Constitution; viz.

ARTICLES in addition to, and Amendment of the Constitution of the United States of America, proposed by Congress, and ratified by the Legislatures of the several States, pursuant to the fifth Article of the original Constitution.

Article the first... After the first enumeration required by the first article of the Constitution, there shall be one Representative for every thirty thousand, until the number shall amount to one hundred, after which the proportion shall be so regulated by Congress, that there shall be not less than one hundred Representatives, nor less than one Representative for every forty thousand persons, until the number of Representatives shall amount to two hundred; after which the proportion shall be so regulated by Congress, that there shall not be less than two hundred Representatives, nor more than one Representative for every fifty thousand persons.

Article the second... No law, varying the compensation for the services of the Senators and Representatives, shall take effect, until an election of Representatives shall have intervened.

Article the third... Congress shall make no law respecting an establishment of religion, or prohibiting the free exercise thereof; or abridging the freedom of speech, or of the press; or the right of the people peaceably to assemble, and to petition the Government for a redress of grievances.

Article the fourth... A well regulated Militia, being necessary to the security of a free State, the right of the people to keep and bear Arms, shall not be infringed.

Article the fifth... No Soldier shall, in time of peace be quartered in any house, without the consent of the Owner, nor in time of war, but in a manner to be prescribed by law.

Article the sixth... The right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures, shall not be violated, and no Warrants shall issue, but upon probable cause, supported by Oath or affirmation, and particularly describing the place to be searched, and the persons or things to be seized.

Article the seventh... No person shall be held to answer for a capital, or otherwise infamous crime, unless on a presentment or indictment of a Grand Jury, except in cases arising in the land or naval forces, or in the Militia, when in actual service in time of War or public danger; nor shall any person be subject for the same offence to be twice put in jeopardy of life or limb; nor shall be compelled in any criminal case to be a witness against himself, nor be deprived of life, liberty, or property, without due process of law; nor shall private property be taken for public use, without just compensation.

Article the eighth... In all criminal prosecutions, the accused shall enjoy the right to a speedy and public trial, by an impartial jury of the State and district wherein the crime shall have been committed, which district shall have been previously ascertained by law, and to be informed of the nature and cause of the accusation; to be confronted with the witnesses against him; to have compulsory process for obtaining witnesses in his favor, and to have the Assistance of Counsel for his defence.

Article the ninth... In suits at common law, where the value in controversy shall exceed twenty dollars, the right of trial by jury shall be preserved, and no fact tried by a jury, shall be otherwise re-examined in any Court of the United States, than according to the rules of the common law.

Article the tenth... Excessive bail shall not be required, nor excessive fines imposed, nor cruel and unusual punishments inflicted.

Article the eleventh... The enumeration in the Constitution, of certain rights, shall not be construed to deny or disparage others retained by the people.

Article the twelfth... The powers not delegated to the United States by the Constitution, nor prohibited by it to the States, are reserved to the States respectively, or to the people.

ATTEST,

Frederick Augustus Muhlenberg, Speaker of the House of Representatives
John Adams, Vice-President of the United States, and President of the Senate
John Beckley, Clerk of the House of Representatives.
Sam. A Otis Secretary of the Senate

The U.S. Bill of Rights

The Preamble to The Bill of Rights

Congress of the United States
begun and held at the City of New-York, on
Wednesday the fourth of March, one thousand seven hundred and eighty nine.

THE Conventions of a number of the States, having at the time of their adopting the Constitution, expressed a desire, in order to prevent misconstruction or abuse of its powers, that further declaratory and restrictive clauses should be added: And as extending the ground of public confidence in the Government, will best ensure the beneficent ends of its institution.

RESOLVED by the Senate and House of Representatives of the United States of America, in Congress assembled, two thirds of both Houses concurring, that the following Articles be proposed to the Legislatures of the several States, as amendments to the Constitution of the United States, all, or any of which Articles, when ratified by three fourths of the said Legislatures, to be valid to all intents and purposes, as part of the said Constitution; viz.

ARTICLES in addition to, and Amendment of the Constitution of the United States of America, proposed by Congress, and ratified by the Legislatures of the several States, pursuant to the fifth Article of the original Constitution.

Note: The following text is a transcription of the first ten amendments to the Constitution in their original form. These amendments were ratified December 15, 1791, and form what is known as the "Bill of Rights."

Amendment I

Congress shall make no law respecting an establishment of religion, or prohibiting the free exercise thereof; or abridging the freedom of speech, or of the press; or the right of the people peaceably to assemble, and to petition the Government for a redress of grievances.

Amendment II

A well regulated Militia, being necessary to the security of a free State, the right of the people to keep and bear Arms, shall not be infringed.

Amendment III

No Soldier shall, in time of peace be quartered in any house, without the consent of the Owner, nor in time of war, but in a manner to be prescribed by law.

Amendment IV

The right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures, shall not be violated, and no Warrants shall issue, but upon

probable cause, supported by Oath or affirmation, and particularly describing the place to be searched, and the persons or things to be seized.

Amendment V

No person shall be held to answer for a capital, or otherwise infamous crime, unless on a presentment or indictment of a Grand Jury, except in cases arising in the land or naval forces, or in the Militia, when in actual service in time of War or public danger; nor shall any person be subject for the same offence to be twice put in jeopardy of life or limb; nor shall be compelled in any criminal case to be a witness against himself, nor be deprived of life, liberty, or property, without due process of law; nor shall private property be taken for public use, without just compensation.

Amendment VI

In all criminal prosecutions, the accused shall enjoy the right to a speedy and public trial, by an impartial jury of the State and district wherein the crime shall have been committed, which district shall have been previously ascertained by law, and to be informed of the nature and cause of the accusation; to be confronted with the witnesses against him; to have compulsory process for obtaining witnesses in his favor, and to have the Assistance of Counsel for his defence.

Amendment VII

In Suits at common law, where the value in controversy shall exceed twenty dollars, the right of trial by jury shall be preserved, and no fact tried by a jury, shall be otherwise re-examined in any Court of the United States, than according to the rules of the common law.

Amendment VIII

Excessive bail shall not be required, nor excessive fines imposed, nor cruel and unusual punishments inflicted.

Amendment IX

The enumeration in the Constitution, of certain rights, shall not be construed to deny or disparage others retained by the people.

Amendment X

The powers not delegated to the United States by the Constitution, nor prohibited by it to the States, are reserved to the States respectively, or to the people.

Note: The capitalization and punctuation in this version is from the enrolled original of the Joint Resolution of Congress proposing the Bill of Rights, which is on permanent display in the Rotunda of the National Archives Building, Washington, D.C.

Day 10: Writing about the First Humans on Mars

English Language Arts

- Within a journal entry, write what characteristics are needed for those on the first human flight to Mars. Second, include criteria that should be utilized by any space program to select the explorers to Mars. Essentially, answer the following question: Who should be going to Mars? Why? How could it be reflective of the world's diverse populations?

- Additional online resource:
  The First Humans on Mars | PBS Space Time https://bit.ly/3aoFqmY

- Complete a journal entry (2-3 paragraphs) explaining who should be going to Mars on the first human mission.

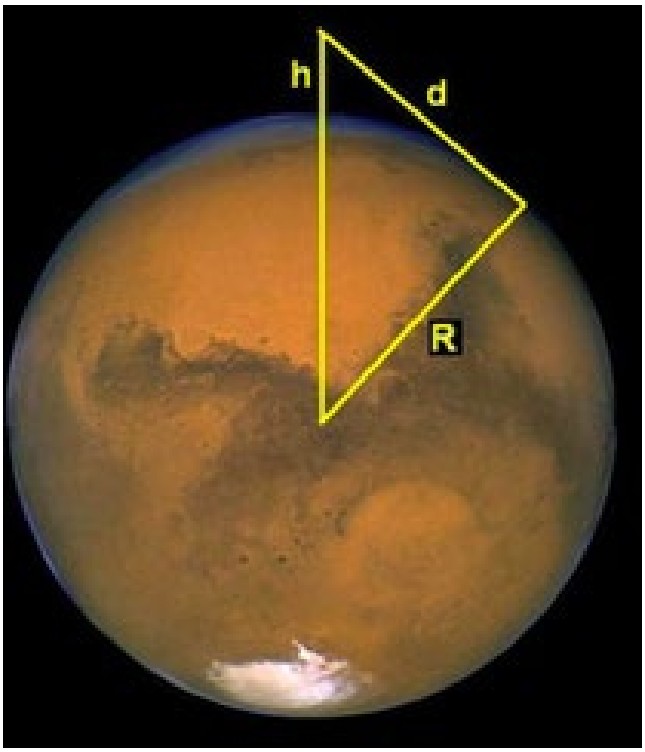
Day 10: Pythagorean Theorem Part 2

Math

The Distance to the Horizon on Mars

Materials:

- Calculator



Suppose you are a camera perched on the top of the Curiosity Rover, or you are an astronaut walking on the surface of Mars, who wants to remain within eyesight of Home Base.

An important quantity in exploring a planet is the distance to the horizon. This will depend on the radius of the planet and the height of the observer's eyeballs above the ground.

To figure this out, we can use the Pythagorean Theorem ($a^2 + b^2 = c^2$) to help us determine the distance on the horizon. The diagram does have a right angle in the t.

Problem 1 - The radius of the planet is given by R. The height above the surface is given by h (not the entire line). Using the figure above, what is the total length of the hypotenuse. Hint: you need to add 2 letters together. You are not solving for a number, simply writing the letters that make up the hypotenuse.

Problem 2 - Use the figure above, and the Pythagorean Theorem to derive the formula for the distance to the horizon (d). Assume that the triangle is a right triangle. Plug in the values from problem 1 into the equation and prepare to solve it.

$$a^2 + b^2 = c^2$$

a =

b = distance (unknown)

c =

Continue onto next page

Problem 3 - For a typical human height of 2 meters, what is the horizon distance on:
(Convert this first to meters or a person's height to km!)

Earth (R=6,378 km)

Mars (R=3,340 km)

Day 10: Mars Colony Part 3

Science

Materials:

- Paper (your map)

1. Finish your colony.

2. You should have a map, building labels, and an explanation of how to overcome elements to survive.

Day 10: Preamble of the Declaration of Independence

Social Studies

- Analyze the Preamble to the Declaration of Independence written in 1776.
- Read the opening paragraph of the United States Declaration of Independence. The ideals set forth in this document have defined our nation for our entire existence in terms of our aspirations. However, consider the modifications that you would now make to this document in a Declaration of Life on Mars. How would you modify this text for 2020 and beyond?
- Full Preamble Text: www.archives.gov/founding-docs/declaration-transcript (also attached)
- Detail how you would create a Declaration of Life on Mars by modifying key lines of the Declaration of Independence document.

Modifying the Declaration of Independence for Life on Mars

Full text of the Preamble and Declaration www.archives.gov/founding-docs/declaration-transcript

Directions: The ideals set forth in this document have defined our nation for our entire existence in terms of our aspirations. Specifically, the line, "We hold these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable Rights, that among these are Life, Liberty and the pursuit of Happiness" is often selected as the most prominent line of the document. However, consider the modifications that you would now make to this document in a Declaration of Life on Mars. How would you modify this Preamble for 2020 and beyond?

Your Task: How would you modify the following line for the Declaration of Independence to define a potential colonization of Mars? Explain

Written in 1776: "We hold these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable Rights, that among these are Life, Liberty and the pursuit of Happiness"

Written for 2020 and beyond:

_____

_____

_____

Why did I make these changes?

Declaration of Independence: A Transcription

Note: The following text is a transcription of the Stone Engraving of the parchment Declaration of Independence (the document on display in the Rotunda at the National Archives Museum.) The spelling and punctuation reflects the original.

In Congress, July 4, 1776

The unanimous Declaration of the thirteen united States of America, When in the Course of human events, it becomes necessary for one people to dissolve the political bands which have connected them with another, and to assume among the powers of the earth, the separate and equal station to which the Laws of Nature and of Nature's God entitle them, a decent respect to the opinions of mankind requires that they should declare the causes which impel them to the separation.

We hold these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable Rights, that among these are Life, Liberty and the pursuit of Happiness.--That to secure these rights, Governments are instituted among Men, deriving their just powers from the consent of the governed, --That whenever any Form of Government becomes destructive of these ends, it is the Right of the People to alter or to abolish it, and to institute new Government, laying its foundation on such principles and organizing its powers in such form, as to them shall seem most likely to effect their Safety and Happiness. Prudence, indeed, will dictate that Governments long established should not be changed for light and transient causes; and accordingly all experience hath shewn, that mankind are more disposed to suffer, while evils are sufferable, than to right themselves by abolishing the forms to which they are accustomed. But when a long train of

abuses and usurpations, pursuing invariably the same Object evinces a design to reduce them under absolute Despotism, it is their right, it is their duty, to throw off such Government, and to provide new Guards for their future security.--Such has been the patient sufferance of these Colonies; and such is now the necessity which constrains them to alter their former Systems of Government. The history of the present King of Great Britain is a history of repeated injuries and usurpations, all having in direct object the establishment of an absolute Tyranny over these States. To prove this, let Facts be submitted to a candid world.

He has refused his Assent to Laws, the most wholesome and necessary for the public good.

He has forbidden his Governors to pass Laws of immediate and pressing importance, unless suspended in their operation till his Assent should be obtained; and when so suspended, he has utterly neglected to attend to them.

He has refused to pass other Laws for the accommodation of large districts of people, unless those people would relinquish the right of Representation in the Legislature, a right inestimable to them and formidable to tyrants only.

He has called together legislative bodies at places unusual, uncomfortable, and distant from the depository of their public Records, for the sole purpose of fatiguing them into compliance with his measures.

He has dissolved Representative Houses repeatedly, for opposing with manly firmness his invasions on the rights of the people.

He has refused for a long time, after such dissolutions, to cause others to be elected; whereby the Legislative powers, incapable of Annihilation, have returned to the People at large for their exercise; the State remaining in the mean time exposed to all the dangers of invasion from without, and convulsions within.

He has endeavoured to prevent the population of these States; for that purpose obstructing the Laws for Naturalization of Foreigners; refusing to pass others to encourage their migrations hither, and raising the conditions of new Appropriations of Lands.

He has obstructed the Administration of Justice, by refusing his Assent to Laws for establishing Judiciary powers.

He has made Judges dependent on his Will alone, for the tenure of their offices, and the amount and payment of their salaries.

He has erected a multitude of New Offices, and sent hither swarms of Officers to harrass our people, and eat out their substance.

He has kept among us, in times of peace, Standing Armies without the Consent of our legislatures.

He has affected to render the Military independent of and superior to the Civil power.

He has combined with others to subject us to a jurisdiction foreign to our constitution, and unacknowledged by our laws; giving his Assent to their Acts of pretended Legislation:

For Quartering large bodies of armed troops among us:

For protecting them, by a mock Trial, from punishment for any Murders which they should commit on the Inhabitants of these States:

For cutting off our Trade with all parts of the world:

For imposing Taxes on us without our Consent:

For depriving us in many cases, of the benefits of Trial by Jury:

For transporting us beyond Seas to be tried for pretended offences

For abolishing the free System of English Laws in a neighbouring Province, establishing therein an Arbitrary government, and enlarging its Boundaries so as to render it at once an example and fit instrument for introducing the same absolute rule into these Colonies:

For taking away our Charters, abolishing our most valuable Laws, and altering fundamentally the Forms of our Governments:

For suspending our own Legislatures, and declaring themselves invested with power to legislate for us in all cases whatsoever.

He has abdicated Government here, by declaring us out of his Protection and waging War against us.

He has plundered our seas, ravaged our Coasts, burnt our towns, and destroyed the lives of our people.

He is at this time transporting large Armies of foreign Mercenaries to compleat the works of death, desolation and tyranny, already begun with circumstances of Cruelty & perfidy scarcely paralleled in the most barbarous ages, and totally unworthy the Head of a civilized nation.

He has constrained our fellow Citizens taken Captive on the high Seas to bear Arms against their Country, to become the executioners of their friends and Brethren, or to fall themselves by their Hands.

He has excited domestic insurrections amongst us, and has endeavoured to bring on the inhabitants of our frontiers, the merciless Indian Savages, whose known rule of warfare, is an undistinguished destruction of all ages, sexes and conditions.

In every stage of these Oppressions We have Petitioned for Redress in the most humble terms: Our repeated Petitions have been answered only by repeated injury. A Prince whose character is thus marked by every act which may define a Tyrant, is unfit to be the ruler of a free people.

Nor have We been wanting in attentions to our Brittish brethren. We have warned them from time to time of attempts by their legislature to extend an unwarrantable jurisdiction over us. We have reminded them of the circumstances of our emigration and settlement here. We have appealed to their native justice and magnanimity, and we have conjured them by the ties of our common kindred to disavow these usurpations, which, would inevitably interrupt our connections and correspondence. They too have been deaf to the voice of justice and of consanguinity. We must, therefore, acquiesce in the necessity, which denounces our Separation, and hold them, as we hold the rest of mankind, Enemies in War, in Peace Friends.

We, therefore, the Representatives of the united States of America, in General Congress, Assembled, appealing to the Supreme Judge of the world for the rectitude of our intentions, do, in the Name, and by Authority of the good People of these Colonies, solemnly publish and declare, That these United Colonies are, and of Right ought to be Free and Independent States; that they are Absolved from all Allegiance to the British Crown, and that all political connection between them and the State of Great Britain, is and ought to be totally dissolved; and that as Free and Independent States, they have full Power to levy War, conclude Peace, contract Alliances, establish Commerce, and to do all other Acts and Things which Independent States may of right do. And for the support of this Declaration, with a firm reliance on the protection of divine Providence, we mutually pledge to each other our Lives, our Fortunes and our sacred Honor.