VOLUME

Because the world would be empty without me!

From Polygons to Pyramids, the shapes that rule our lives.

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An interactive interdisciplinary approach to geometric shapes, area and volume.

Unit Title:
Volume...Because the world would be empty without me.
Or, From Polygons, to Pyramids: The shapes that rule our lives.

OVERVIEW

I. CONTENT:
The ability to discern and calculate area and volume has practical applications covering scientific, economic, and aesthetic endeavors.

II. PROCESS:
Utilizing small groups students will analyze shapes and apply the math to practical situations and science.

III. PRODUCT:
Students will be able to calculate both volume and area and be able to apply its use to economic scientific processes.

Unit Overview: Alignment with National/State/District Pupil Performance Standards

Benchmark 1: M.B. 1-1: Students will be able to recognize and formulate mathematical problems from within and outside of the field of mathematics.

Benchmark 2: M.E. 1-1: Students will be able to apply mathematical skills and processes to global issues.

Benchmark 3: M.A.2-1: Students will be able to estimate and measure various dimensions to a specified degree of accuracy.

Benchmark 4: M.B 1-2: Students will be able to describe how mathematics can be used in knowing how to prepare for careers.

ISEARCH INDEPENDENT RESEARCH PROJECTS FOR GIFTED AND TALENTED STUDENTS

1. PARADOXES:
If the search for greater land area is equated with power, why is it that some of the most powerful countries in history have been small? Create an annotated bibliography explaining this paradox.

2. ATTRIBUTES:
Re-search volcanoes around the world and their similar and different attributes. Create a photographic essay displaying your research.

3. ANALOGIES:
Compare Stonehenge and a pyramid. Create pop-up book showing the similarities and differences.

4. DISCREPANCIES:
Investigate the myth of the Bermuda Triangle. Create a poster presentation displaying the results of your investigation. Include graphs, charts, and statistics.

5. PROVOCATIVE QUESTIONS:
How did such an early and primitive culture create something so sophisticated, like the pyramids that we cannot duplicate today? Create a filmstrip explaining your theories.

6. EXAMPLES OF CHANGE:

Demonstrate that minerals are the result of change. Put together a mineral collection with examples of the different changes minerals undergo.

7. EXAMPLES OF HABIT:
Research ideas that have contradicted church doctrine, but have been accepted by science. Create a series of postage stamps which illustrates these ideas.

8. ORGANIZED RANDOM SEARCH:
Develop a civilization as it would exist on another planet, keeping in mind requirements for life and the conditions on that planet. Create an exhibit of your civilization.

9. SKILLS OF SEARCH:
Choose an area of mathematics and trace its progression through time, and create a timeline.

10. TOLERANCE FOR AMBIGUITY:
Research the similarities between the Egyptian Pyramids and the pyramids found in Central and South America, as well as other artifacts found in Central and South America that appear to have an African origin. This suggests that Africans migrated to Central and South America much earlier than the Europeans. Create a web page describing your findings and with links to pertinent web sites.

11. INTUITIVE EXPRESSION:
Write a play of inquisition of Galileo. Both sides must convey emotions. (For example: fear, sadness, happiness, anger)

12. ADJUSTMENT TO DEVELOPMENT:
Research the events that occurred before, after, and during the eruption of Mt. St. Helens, and create a cartoon strip of what scientists learned from this event.

13. STUDY CREATIVE PEOPLE AND PROCESS:
Research the architecture of the Globe theatre and the reasoning behind its design. Build a scale model of the theatre. Include your architectural plans.

14. EVALUATE SITUATIONS:
What is the basis of the English system of measurement? Why didn't the USA converted to the Metric system of measurement with the rest of the world? Research the pros and cons of converting to the metric system, and script a press conference.

15. CREATIVE READING SKILL:
Read Alice in Quantumland: and Allegory of Quantum Physics by Robert Gilmore. Write and teach a lesson on quantum physics.

16. CREATIVE LISTENING SKILL:
Take a piece of music and express it as geographic shapes.

17. CREATIVE WRITING SKILL:
Create a geometry poem book.

18. VISUALIZATION SKILL:
Correlate various geometric shapes to emotions through a music video.

STATE STANDARD #M.A.2-1 STUDENTS WILL BE ABLE TO estimate and measure various dimensions to a specified degree of accuracy.

ESSENTIAL QUESTION: How does the Universal Theme of Producing, Exchanging and Distributing create mastery learning of essential concepts in this unit?

1. PRODUCING, EXCHANGING, AND DISTRIBUTING [ECONOMICS]

KNOWLEDGE:
Anticipatory Set: Video clip--Bob Villa's This Old House where Norm is measuring and cutting.
Students will: List 10 uses of linear measurement by carpenters, architects, construction workers, etc.
COMPREHENSION: Distinguish between linear measurements and area measurements.

APPLICATION:
Anticipatory Set: Video Clip--Money Pit
Students will: Calculate the amount of paint needed to paint a house or room. Students will produce a project cube.
Multicultural and/or ESL and/or Bilingual Link: How do other cultures cover their walls? What systems of measurement do they use?
Mathematics/Science Link and/or Humanities Link: Book excerpt: Flatland
School-to-Career/Tech Prep Link: Discuss careers in architecture, construction, painting.

HIGHER ORDER THINKING SKILLS (H.O.T.S.):
Anticipatory Set: Video Clip: My Life as a House
Students will: Compare the amount of paint needed for two houses of different architectural types, such as Victoria vs. Tudor.

INDIVIDUAL JOURNAL ASSIGNMENT:
Write about the process of measuring and calculating area.

HOMELINK:
Design a plan to remodel their bedroom. Plans will include a measurement of the amount of paint needed.

STATE STANDARD # M.A.2-1 STUDENTS WILL BE ABLE TO estimate and measure various dimensions to a specified degree of accuracy.

ESSENTIAL QUESTION: How does the Universal Theme of Transportation create mastery learning of essential concepts in this unit?

2. TRANSPORTATION

KNOWLEDGE:
Anticipatory Set: Video Clip--Shindler's List clip where people are loaded into train car.
Students will: Discuss the transportation of goods efficiently and economically. For example: packaging, shapes and sizes of transportation containers.

COMPREHENSION:
Compare and contrast shapes of shipping containers (for example, fuel trucks vs. semi trucks).

APPLICATION:
Anticipatory Set: Video Clip: Every Which Way but Loose
Students will: Design a system to ship an item assigned by the teacher. Students will construct a physical model of their shipping method.
Multicultural and/or ESL and/or Bilingual Link: Research different modes of transportation in different countries. Include the different methods of transportation within Alaska.

Mathematics/Science Link and/or Humanities Link: Discuss life on the Oregon Trail and traveling in a covered wagon. Discuss the methods used to transport food and goods across the Great Plains and Rocky Mountains.
School-to-Career/Tech Prep Link: Song: Money for Nothing by Dire Straits. Research a career in the shipping industry.

HIGHER ORDER THINKING SKILLS (H.O.T.S.):
Anticipatory set: Video Clip: Cast Away (Fed Ex trucks being loaded in Red Square).
Students will: Determine the most efficient modes of transportation given certain operating costs, time constraints, budget, and shapes and sizes of modes of shipment. Students will create an advertisement brochure for their shipping method.

INDIVIDUAL JOURNAL ASSIGNMENT:
Reflect on what it would have been like to travel in a covered wagon on the Oregon Trail.

HOMELINK:
Ask a relative how they moved their belongings the last time they moved residences.

STATE STANDARD #M.B 1-1 STUDENTS WILL BE ABLE TO recognize and formulate mathematical problems from within and outside the field of mathematics.

ESSENTIAL QUESTION: How does the Universal Theme of Communication create mastery learning of essential concepts in this unit?

3. COMMUNICATIONS

KNOWLEDGE:
Anticipatory Set: Video Clip Contact showing Radio Telescopes
Students will: Discuss why radio telescopes and satellite dishes are the shapes that they are.

COMPREHENSION:
Discuss why the aperture of an optical telescope can be smaller than the diameter of the dish of a radio telescope.

APPLICATION:
Anticipatory Set: Video Clip--Real Genius (showing satellites taking position)
Students will: Discuss why satellites in Alaska are pointed at such low angles. Students will demonstrate using a globe of the Earth.
Multicultural and/or ESL and/or Bilingual Link: Discuss the different countries that have shows on cable from the USA and how American programs are broadcast to other countries.
Mathematics/Science Link and/or Humanities Link: Read excerpt from War of the Worlds.
School-to-Career/Tech Prep Link: Students will design their own radio programs, including demonstrations of how they will communicate to their listening audiences.

HIGHER ORDER THINKING SKILLS (H.O.T.S.):
Anticipatory set: Excerpt from short story Maelstrom II by Arthur C. Clark
Students will: Write a science fiction short story using a form of communication not discussed earlier in the lesson. Method of communication equipment must be a different shape. Students must explain why their communication system would work.

INDIVIDUAL JOURNAL ASSIGNMENT:
Reflect on what your life would be like if there were no cell phones, internet, television, or telephone.

HOMELINK:

List all the appliances that requires communication technology.

STATE STANDARD #M.B 1-1 STUDENTS WILL BE ABLE TO recognize and formulate mathematical problems from within and outside the field of mathematics.

ESSENTIAL QUESTION: How does the Universal Theme of Protecting and Conserving create mastery learning of essential concepts in this unit?

4. PROTECTING AND CONSERVING

KNOWLEDGE:
Anticipatory Set: Video Clip--Seinfeld episode where Kramer is recycling cans for deposit.
Student's will: learn how to measure the volume of a sphere, a cone and a cylinder.

COMPREHENSION:
Measure the volume of the garbage can in the classroom. Students will then measure the volume of trash produced within classroom for one week.

APPLICATION:
Anticipatory Set: Play game "Pass the Trash"
Students will: Discuss the amount of trash produced by school. Students will then calculate the volume of trash that could be reduced by recycling. Students will create a sculpture out of the materials found in the trash that could have been recycled.
Multicultural and/or ESL and/or Bilingual Link: Debate whether or not third world countries should be allowed to pollute as much as the industrial nations as they attempt to become industrial nations themselves.
Mathematics/Science Link and/or Humanities Link: Sara Cynthia Sylvia Stout Would Not Take the Garbage Out by Shel Silverstein.
School-to-Career/Tech Prep Link: Invite spokesperson from local recycling center and landfill to speak the class.

HIGHER ORDER THINKING SKILLS (H.O.T.S.):
Anticipatory set: Read excerpt from book Ishmael by Daniel Quinn.
Students will: Debate cost-effectiveness of recycling in Alaska.

INDIVIDUAL JOURNAL ASSIGNMENT:
Create a bumper sticker slogan for recycling other than "Reduce, Reuse, Recycle."

HOMELINK:
Students evaluate the recyclable items found in trash at home. Students will create a recycling program for their own homes.

STATE STANDARD #M.B 1-1 STUDENTS WILL BE ABLE TO recognize and formulate mathematical problems from within and outside the field of mathematics.

ESSENTIAL QUESTION: How does the Universal Theme of Providing Education create mastery learning of essential concepts in this unit?

5. PROVIDING EDUCATION

KNOWLEDGE:
Providing Education with Shapes.
Anticipatory Set: View a display of items in nature (fruit, cones, nuts, sea shells).

Students will: Shapes are repetitive and regular in our world. Brainstorm what shapes teach us about nature.

COMPREHENSION:
Give at least three examples of repetitive and regular shapes in nature.

APPLICATION:
Anticipatory Set: Song "Particle Man" by They Might Be Giants.
Students will: Build a plaster of paris model of a geometric shape in nature.
Multicultural and/or ESL and/or Bilingual Link: Use origami to create animals out of paper.
Mathematics/Science Link and/or Humanities Link: Explore the mathematical link between Fibonacci numbers and nature.
School-to-Career/Tech Prep Link: Field trip to Alaska Volcano Observatory.

HIGHER ORDER THINKING SKILLS (H.O.T.S.):
Anticipatory set: Show video clip of volcanic eruptions on Hawaii, the Mt. St. Helen's eruption, pictures of Mt. Spur, Yellowstone, Krakatoa, Iceland, Devil's Tower. Include video clip of Dante's Peak showing volcanic eruption.
Students will: Explain how Geologists use the different shapes of volcanoes to determine the type and composition of the volcano. Students will create a diorama showing the different types of volcanoes and types of eruptions that are produced from each.

INDIVIDUAL JOURNAL ASSIGNMENT:
Imagine what it would be like to be on the side of a volcano as it is erupting. Describe what you see, hear, feel, taste, and smell.

HOMELINK:
Interview a family member who remembers the 1992 eruption of Mt. Spur.

STATE STANDARD # MA3-4 STUDENTS WILL BE ABLE TO Select, convert and apply an equivalent representation of a number for a specified situation.

ESSENTIAL QUESTION: How does the Universal Theme of Making and Using Tools and/or Technology create mastery learning of essential concepts in this unit?

6. MAKING AND USING TOOLS AND/OR TECHNOLOGY

KNOWLEDGE:
Anticipatory Set: Listen to song "King Tut" performed by Steve Martin. Video clip: Stonehenge from movie Spinal Tap.
Students will: List the basic shapes, patterns and tools used to construct the pyramids and Stonehenge.

COMPREHENSION:
Compare all the shapes and patterns that were used to create Stonehenge and the Egyptian Pyramids.

APPLICATION:
Compute the volume of several different pyramids.
Anticipatory Set: Read the poem Ozymandius by P. B. Shelley.
Students will: Students are given a specific amount of sugar cubes from which they are to build a scale model of both a three-sided and a four-sided pyramid. Then calculate the volume of their pyramid.
Multicultural and/or ESL and/or Bilingual Link: Compare pyramids found in different countries. Discuss theories about migration of Africans to Central/Southern America before the arrival of Europeans (Columbus, etc.).

Mathematics/Science Link and/or Humanities Link: Compare the mass of the Great Pyramid of Giza assuming the bricks are made of concrete, steel, or fiberglass.
School-to-Career/Tech Prep Link: Have an engineer come in to speak about construction using various shapes.

HIGHER ORDER THINKING SKILLS (H.O.T.S.):
Anticipatory set: Video Clip--Gallipoli (climbing the Pyramids)
Students will: Compare and contrast the efficiency of constructing a pyramid using modern tools versus the tools used by the ancient Egyptians. Students will perform a skit which illustrates the differences in the two approaches to constructing pyramids.

INDIVIDUAL JOURNAL ASSIGNMENT:
Write a one page diary entry written in first person from the viewpoint of a slave worker who helped to build the pyramids. Diary entry should describe a day in the life of a slave worker.

HOMELINK:
Be a slave to another family member for a day.

STATE STANDARD #M.B 1-2 STUDENTS WILL BE ABLE TO describe how mathematics can be used in knowing how to prepare for careers.

ESSENTIAL QUESTION: How does the Universal Theme of Providing Recreation create mastery learning of essential concepts in this unit?

7. PROVIDING RECREATION

KNOWLEDGE:
Anticipatory Set: Sports/recreational clips
Students will: List all of the shapes involved in various recreational pursuits.

COMPREHENSION:
Infer why the same shapes occur in different sports.

APPLICATION:
Anticipatory Set: Students will throw darts at a board. Make a kite out of basic supplies.
Students will: Calculate the probability of hitting the bulls eye of a dart board. Make a chart which displays the estimated and actual results of the dart-throwing activity.
Multicultural and/or ESL and/or Bilingual Link: Compare and contrast the rules of Canadian and American football.
Mathematics/Science Link and/or Humanities Link: Perform the skit "Who's on First" by Abbott and Costello. Discuss the importance of recreation for family cohesiveness.
School-to-Career/Tech Prep Link: Research salaries of professional athletes.

HIGHER ORDER THINKING SKILLS (H.O.T.S.):
Anticipatory set: Clip from Mad Max Beyond Thunderdome
Students will: Compare and contrast the game of football if the shape of the football field was circular.

INDIVIDUAL JOURNAL ASSIGNMENT:
Describe your personal experiences with recreational sports.

HOMELINK:
Survey your family to discover their favorite sports.

STATE STANDARD #ME 1-1 STUDENTS WILL BE ABLE TO apply mathematical skills and processes to global issues.

ESSENTIAL QUESTION: How does the Universal Theme of Organizing and Governing create mastery learning of essential concepts in this unit?

8. ORGANIZING AND GOVERNING

KNOWLEDGE:
Anticipatory Set: Video Clip--Monty Python and the Holy Grail ("I'm Being Oppressed!")
Students will: Understand the uses of area in politics and war. Example--Native Americans and the Reservations.

COMPREHENSION:
Defend Seward's Purchase of Alaska.

APPLICATION:
Anticipatory Set: Video Clip--Prelude to War (1942)
Students will: Write a fiction story describing a US takeover of another country. Story should include reasons why they chose that country to conquer.
Multicultural and/or ESL and/or Bilingual Link: Explain how the Native American's loss of land led to the breakdown of their culture.
Mathematics/Science Link and/or Humanities Link: Invite a guest speaker from the Alaska Native Heritage Center to talk to the class about Native American Culture and beliefs about land ownership ("We belong to the land, the land does not belong to us"). Example: Sam Lamebull.
School-to-Career/Tech Prep Link: Invite a cartographer to the classroom.

HIGHER ORDER THINKING SKILLS (H.O.T.S.):
Anticipatory set: Video Clips--Education of Little Tree and Dances with Wolves.
Students will: Research and summarize how the loss of land area affects a culture. Draw a political cartoon portraying the effects the loss of land area had on the Native Americans.

INDIVIDUAL JOURNAL ASSIGNMENT:
Reflect on the connection between Manifest Destiny and the loss of Native American culture. Include your own personal opinions.

HOMELINK:
Play the game Risk with your family or friends.

STATE STANDARD #M.E.1-1 STUDENTS WILL BE ABLE TO apply mathematical skills and processes to global issues. .

ESSENTIAL QUESTION: How does the Universal Theme of Moral, Ethical and Spiritual Behavior create mastery learning of essential concepts in this unit?

9. MORAL, ETHICAL AND SPIRITUAL BEHAVIOR

KNOWLEDGE:
Anticipatory Set: View pictures of geocentric and heliocentric models of the solar system.
Students will: Compare and contrast the geocentric and heliocentric models of the solar system, and the geometric basis for these two models.

COMPREHENSION:
Explain the two theories and evidence used to support both.

APPLICATION:
Anticipatory Set: Carl Sagan clip from Cosmos about Galileo.
Students will: Role-play an interview with Galileo, including his major contributions to the support of the heliocentric model of the solar system and the reaction of the public to his observations.
Multicultural and/or ESL and/or Bilingual Link: Research other astronomical conceptions from other cultures.
Mathematics/Science Link and/or Humanities Link: Read excerpt from A Brief History of Time by Stephen Hawkings.
School-to-Career/Tech Prep Link: Explore how to become the Pope.

HIGHER ORDER THINKING SKILLS (H.O.T.S.):
Anticipatory set: Read Copernicus' proof for the Heliocentric model of the solar system.
Students will: Write an editorial essay from the point of view of Copernicus and Galileo.

INDIVIDUAL JOURNAL ASSIGNMENT:
Reflect on what life would be like if Science hadn't changed our view of the Solar System.

HOMELINK:
Discuss with your family how they reconcile their views of Science and religion.

STATE STANDARD #M.B 1-1 STUDENTS WILL BE ABLE TO recognize and formulate mathematical problems from within and outside the field of mathematics.

ESSENTIAL QUESTION: How does the Universal Theme of Aesthetic Needs create mastery learning of essential concepts in this unit?

10. AESTHETIC NEEDS

KNOWLEDGE:
Anticipatory Set: View various paintings and artwork that use the Golden Rectangles. Examples "Bathers" by George Seurat, and "Composition with Yellow" by Mondrian.
Students will: Draw three Golden Rectangles of varying sizes, and locate the Golden Rectangles in the paintings above.

COMPREHENSION:
Take a field trip around the school building to locate examples of the Golden Rectangle.

APPLICATION:
Anticipatory Set: Slide show of the Parthenon in Athens, Greece, the United Nations Building in New York.
Students will: Each student will draw a building using the Golden Rectangle and contribute the art work to a class mural.
Multicultural and/or ESL and/or Bilingual Link: View artwork from different cultures and check for the use of the Golden Rectangle.
Mathematics/Science Link and/or Humanities Link: Why do you think the Greeks wanted to use the Golden Ratio to design the bodies and faces of statues of their gods and heroes?

HIGHER ORDER THINKING SKILLS (H.O.T.S.):
Anticipatory set: View artwork by Picasso.
Students will: Discuss why artwork by Picasso is disconcerting to people.

INDIVIDUAL JOURNAL ASSIGNMENT:
Compare the Renaissance idea of ideal beauty to modern day ideas of ideal beauty.

HOMELINK:
Discuss with your family how American ideas of beauty have changed over time.

STATE STANDARD #M.A. 1 STUDENTS WILL BE ABLE TO estimate and measure various dimensions to specified degree of accuracy.

11. AREA

KNOWLEDGE:
Anticipatory Set: Demonstration of Area on Geometer's Sketchpad (computer program).
Students will: Be able to calculate the area of geometric figures.

COMPREHENSION:
Guided practice of solving problems taken from Geometry textbook.

APPLICATION:
Anticipatory Set: Read book Math Curse by Jon Scieszke and Lane Smith.
Students will: Students are broken into groups and assigned geometric figures. Groups then teach the rest of the class how to calculate the area of their figure.
Multicultural and/or ESL and/or Bilingual Link: Discuss why the ancient Greeks first calculated area.
Mathematics/Science Link and/or Humanities Link: Read excerpt from Flatterlands.
School-to-Career/Tech Prep Link: Discuss careers in mathematics.

HIGHER ORDER THINKING SKILLS (H.O.T.S.):
Anticipatory set: Review formulas and test-taking skills.
Students will: Take an essay exam explaining in writing the process of calculating area for common geometric figures.

INDIVIDUAL JOURNAL ASSIGNMENT:
Reflect on ways you'll be able to use area in your everyday life.

HOMELINK:
Calculate the area of your house in square footage.

STATE STANDARD # MA 5-2 STUDENTS WILL BE ABLE TO Create two-dimensional representations of three-dimensional objects.

12. Volume of Geometric Figures.

KNOWLEDGE:
Anticipatory Set: Demonstration of Volume using Geometer's Sketchpad (computer program).
Students will: Explain the processes and equations used to calculate volume of various geometric figures.

COMPREHENSION:
Guided practice of solving problems taken from Geometry textbook.

APPLICATION:
Anticipatory Set: Video Clip from Diehard 3 (Measuring volume).
Students will: go to the computer lab and use Geometer's Sketchpad to create and calculate volume of geometric figures. Students will build a model using geometric figures (cones, pyramids, etc.) and find the volume of their model.
Multicultural and/or ESL and/or Bilingual Link: Learn the names of the different geometric shapes in Spanish.

Mathematics/Science Link and/or Humanities Link: Drawing three-dimensional objects.
School-to-Career/Tech Prep Link: Invite an architect in to talk to class about uses of volume and area in architecture.

HIGHER ORDER THINKING SKILLS (H.O.T.S.):
Anticipatory set: Review formulas and test-taking skills.
Students will: Take a quiz on volumes of figures. Quiz will include an essay portion where students explain in writing how to calculate volume.

INDIVIDUAL JOURNAL ASSIGNMENT:
Students will write about the importance of volume in everyday life.

HOMELINK:
Students will calculate the volume of air in their house.

STATE STANDARD #MB 1-1STUDENTS WILL BE ABLE TO recognize and formulate mathematical problems from within and outside the field of mathematics.

13. International Space Station

KNOWLEDGE:
Anticipatory Set: Video Clip--2001: Space Odyssey
Students will: Discuss the requirements necessary for humans to live extended periods of time in space (food, waste, water, air, recreation, health, cost, politics, power, communication).

COMPREHENSION:
Research and estimate the volume of food and water needed to support the astronauts in the space station. How many shuttle launches will this require, and what is the cost to keep the space station habitable?

APPLICATION:
Anticipatory Set: Video Clip--TLC special The International Space Station.
Students will: Write a newspaper story about what it takes to support astronauts on the space station.
Multicultural and/or ESL and/or Bilingual Link: Discuss what modules the different countries are contributing to the space station.
Mathematics/Science Link and/or Humanities Link:
School-to-Career/Tech Prep Link: Discuss careers in space technology with NASA, ESA, and private corporations.

HIGHER ORDER THINKING SKILLS (H.O.T.S.):
Anticipatory set: Read short story Cold Equations by Tom Godwin.
Students will: Put together a poster presentation explaining who they would choose to be on their team, the supplies they would take, and the training they would undergo for a 2 week stay on the space station. Poster will include reasoning behind their decisions, and supplies and teammates must be able to satisfy all necessary life support systems.

INDIVIDUAL JOURNAL ASSIGNMENT:
Write about the two other people you would want to accompany you for your stay in the International Space Station. Explain your choice of teammates and what possible issues may arrive.

HOMELINK:
Ask your older family members where they were when the first man walked on the moon and/or when the Challenger shuttle exploded.

STATE STANDARD # SA-3 STUDENTS WILL BE ABLE TO understand models describing the composition, age, and size of our universe, galaxy, and solar system and understand that the universe is constantly change.

14. Solar System

KNOWLEDGE:
Anticipatory Set: Song-- Third Rock from the Sun by Joe Diffe
Students will: List and describe the nine planets and their basic properties, and compare the size of the planets to the size of the sun.

COMPREHENSION:
List planets in order by volume.

APPLICATION:
Anticipatory Set: Video Clip--Muppets in Space, Poem: The Edge of the World by Shel Silverstein.
Students will: Students will construct a scale model of the solar system.
Multicultural and/or ESL and/or Bilingual Link: Discuss the mythology of the planets and how different cultures have viewed them over time.
Mathematics/Science Link and/or Humanities Link: Read book Ender's Game by Orson Scott Card.
School-to-Career/Tech Prep Link: Discuss careers in planetary geology.

HIGHER ORDER THINKING SKILLS (H.O.T.S.):
Anticipatory set: Play song "Why does the Sun Shine?" by They Might Be Giants.
Students will: Compare our sun to other stars visible from Earth (Rigel, Betelgeuse, Antares, Aldebaran). Compare the volume and size of different types of stars and stars at different stages in their life cycle (white dwarf, black hole, neutron star, etc.). Create a bulletin board displaying this information.

INDIVIDUAL JOURNAL ASSIGNMENT:
Create an Astronomy Joke Book.

HOMELINK:
Use a sky calendar to locate the planets in the sky with your family.

STATE STANDARD #SA-6 STUDENTS WILL BE ABLE TO understand that forces of nature cause different types of motion and describe the relationship between these forces and motion.

15. Kepler's Laws of Planetary Motion

KNOWLEDGE:
Anticipatory Set: Video Clip--Contact (beginning of movie--tour of solar system).
Students will: Discuss the motions of the planets in their orbit around the sun.

COMPREHENSION:
Explain Kepler's laws and what they describe.

APPLICATION:
Anticipatory Set: Video--Carl Sagan's Cosmos of Kepler's Laws
Students will: Write a rap or a song that explains Kepler's Laws of Planetary Motion.
Multicultural and/or ESL and/or Bilingual Link: Research and make a recipe that Kepler would have eaten for dinner.
Mathematics/Science Link and/or Humanities Link: Read literature from early 1600s, the same time Kepler was working on his laws (Shakespeare, John Donne, etc.)

School-to-Career/Tech Prep Link: Discuss the validity of Astrology and the motions of the planets within the zodiac constellations.

HIGHER ORDER THINKING SKILLS (H.O.T.S.):
Anticipatory set: PowerPoint Slideshow of pictures of each planet and compare how far each planet gets in one year.
Students will: Complete lab on Kepler's laws of Planetary motion. Students will calculate areas swept out by different planets, and prove the validity of the laws.

INDIVIDUAL JOURNAL ASSIGNMENT:
Explain Kepler's Laws in your own words.

HOMELINK:
Explain Kepler's Laws to your family members.

STATE STANDARD # SA-2 STUDENTS WILL BE ABLE TO understand the physical, chemical, and nuclear changes and interactions that result in observable changes in the properties of matter.

16. Chemistry: Shapes of Carbon Allotropes

KNOWLEDGE:
Anticipatory Set: Video Clip--Diamond mine in Congo
Students will: Identify, define, and explain four allotropes of carbon.

COMPREHENSION:
Give examples of uses of the various carbon allotropes.

APPLICATION:
Anticipatory Set: Song--Marilyn Monroe "Diamonds are a Girl's Best Friend"
Students will: Students will show why the different allotropes are strong. Students will create a play or a dance demonstrating the strength of the different allotropes.
Multicultural and/or ESL and/or Bilingual Link: Discuss how countries are exploited for their diamonds.
Mathematics/Science Link and/or Humanities Link: What has diamond mining done to the economies of South Africa?
School-to-Career/Tech Prep Link: Have a Jeweler and Gemologist come in to talk to class.

HIGHER ORDER THINKING SKILLS (H.O.T.S.):
Anticipatory set: Video Clip--Diamond Mining in James Bond, A View to a Kill.
Students will: Research why different types of Carbon are stable in different environments. From the research write a law about carbon.

INDIVIDUAL JOURNAL ASSIGNMENT:
Explain why many cultures romanticize diamonds.

HOMELINK:
Find the carbon in your home.

STATE STANDARD # SA-1 STUDENTS WILL BE ABLE TO Understand models describing the nature of molecules, atoms, and subatomic particles and the relation of the models to the structure and behavior of matter.

17. Minerals: Their Shape

KNOWLEDGE:
Anticipatory Set: Video Clip--Smithsonian Gem Collection.
Students will: List the various shapes of minerals.

COMPREHENSION:
Students will organize minerals into different groups based on their crystal structure.

APPLICATION:
Anticipatory Set: Video Clip--Star Trek TV Show with crystal entity.
Students will: Make papier mache models of the six different crystal systems.
Multicultural and/or ESL and/or Bilingual Link: Study the importance of jewelry across the different cultures.
Mathematics/Science Link and/or Humanities Link: Read excerpt from Agatha Christie's Mystery of the Blue Train. Research history of the Hope Diamond. Read excerpt from John McPhee's Rising from the Plains.
School-to-Career/Tech Prep Link: Have a geologist come to talk to the class about careers in geology.

HIGHER ORDER THINKING SKILLS (H.O.T.S.):
Anticipatory set: Show pictures of gems from Smithsonian web page.
Students will: Students will create a museum exhibit of different minerals with the same crystal structure.

INDIVIDUAL JOURNAL ASSIGNMENT:
If you can't grow it, it comes from a mine. Write about how minerals are a part of your daily life.

HOMELINK:
Research what minerals are mined in Alaska.

MORAL/ETHICAL/SPIRITUAL REASONING AND DILEMMAS

TEN ETHICAL DILEMMAS

1. Producing, Exchanging, and Distributing [Economics]
ESSENTIAL QUESTION: How does the Human Activity of Producing, Exchanging and Distributing create moral/ethical dilemmas?
DILEMMA: You own a house painting company. You submit a low bid for a job painting a private residence. You win the job. Do you use a lower quality paint than what you stated in the bid to make a larger profit, or do you use the high quality paint as stated in the bid? The client will never find out which quality of paint you used.

2. Transportation
ESSENTIAL QUESTION: How does the Human Activity of Transportation create moral/ethical dilemmas?
DILEMMA: You are the president of an oil company, and you must purchase a new fleet of tanker ships to transport oil. A double-hulled ship is safer than a single-hulled ship, but much more expensive. Do you purchase single- or double-hulled ships for your fleet?

3. Communications
ESSENTIAL QUESTION: How does the Human Activity of Communications create moral/ethical dilemmas?
DILEMMA: You order a basic satellite cable TV package for your new home. When services begin you notice that there are many more channels than you know are included in the basic package. The extra

channels are very good and you enjoy watching them. Do you call the satellite company and inform them of their mistake?

4. Protecting and Conserving
ESSENTIAL QUESTION: How does the Human Activity of Protecting and Conserving create moral/ethical dilemmas?
DILEMMA: You are eating lunch in the hallway at school. You notice your friends throw their garbage on the floor when there is a garbage can 4 feet away. What do you do?

5. Providing Education
ESSENTIAL QUESTION: How does the Human Activity of Providing Education create moral/ethical dilemmas?
DILEMMA: Mt. Rainier is erupting. You are fleeing the area when you see a family with small children who need help. If you do not stop you will escape safely, but if you do stop to help there is a chance you and the family may not survive. What do you do?

6. Making and Using Tools and/or Technology
ESSENTIAL QUESTION: How does the Human Activity of Making and Using Tools and/or Technology create moral/ethical dilemmas?
DILEMMA: You are on vacation to the pyramids in Egypt. On a tour of the pyramids you discover a small and probably valuable artifact. Do you keep it for yourself, or do you turn it over to local museum?

7. Providing Recreation
ESSENTIAL QUESTION: How does the Human Activity of Providing Recreation create moral/ethical dilemmas?
DILEMMA: Your friend is an athlete and used an illegal performance enhancing drug to win a competition, thereby earning a college scholarship. Without this scholarship your friend cannot attend college. Do you turn him in?

8. Organizing and Governing
ESSENTIAL QUESTION: How does the Human Activity of Organizing and Governing create moral/ethical dilemmas?
DILEMMA: You are a politician in 1883 and recently signed a treaty with the Native Americans giving them their sacred land. Afterwards, gold was discovered within the boundary of their reservation. A large mining company has approached you and has offered you a large sum of money for gold mining rights to the Native American's sacred land. You have the power to make this decision. What do you do?

9. Moral, Ethical and Spiritual Behavior
ESSENTIAL QUESTION: How does the Human Activity of Moral, Ethical and Spiritual Behavior create moral/ethical dilemmas?
DILEMMA: You are a member of the Catholic Church when Galileo publishes his evidence that the sun is the center of the solar system. This goes against the beliefs of the church, but you agree with Galileo's findings. If you stand up for Galileo you will be ostracized. What do you do?

10. Aesthetic Needs
ESSENTIAL QUESTION: How does the Human Activity of Aesthetic Needs create moral/ethical dilemmas?
DILEMMA: Your best friend is very skinny, and you've suspected that she has had an eating disorder for some time. She just confided in you that she is bulimic and begged you not to tell anyone. You are worried about her health. Do you tell someone?

PRODUCTIVE THINKING SKILLS
DIVERGENT/CREATIVE THINKING

1. BRAINSTORM MODEL

A. BRAINSTORM ALL OF THE _____:

AHA #1. Surfaces that you paint.
AHA #2. Ways of moving large objects.
AHA #3. Different means of communication.
AHA #4. Things you can recycle.
AHA #5. Natural objects based on a triangle.
AHA #6. Modern tools that would be used to build a pyramid.
AHA #7. Sports with a ball.

B. BRAINSTORM AS MANY_____AS YOU CAN THINK OF.

AHA #8. World conflicts.
AHA #9. Outdated scientific theories.
AHA #10. Art movements.
AHA #11. Shapes in two-dimensions.
AHA #12. Shapes in three-dimensions.
AHA #13. Movies about space travel.
AHA #14. Heavenly bodies.

C. HOW MANY WAYS CAN YOU COME UP WITH TO_____?

AHA #15. describe motion.
AHA #16. use of diamonds.
AHA #17. classify organisms.
How many ways can you use a water bottle?

2. VIEWPOINT MODEL (Human or Animate) (Use Cultural Literacy Terms)

A. HOW WOULD____LOOK TO A(N) _____?

AHA #1. a paintbrush/house
AHA #2. crate/Dumbo
AHA #3. radio telescope/Galileo
AHA #4. tree/piece of paper
AHA #5. wave/seashell
AHA #6. pyramids/skyscraper
AHA #7. golf club/golf ball
AHA #8. Alaska/Rhode Island

B. WHAT WOULD A ___ MEAN FROM THE VIEWPOINT OF A(N)_____?

AHA #9. Earth/Sun
AHA #10. Dome/Ancient Greek
AHA #11. Cube/Square
AHA #12. Sphere/Borg (Star Trek)
AHA #13. International Space Station/J.F. Kennedy
AHA #14. Mercury/Pluto
AHA #15. 5th Dimension/Kepler
AHA #16. Diamond/Mine
AHA #17. Diamond/Alien

C. HOW WOULD Galileo VIEW THIS?
(Use one person from history here)

1. Radio Telescope
2. Cell Phone
3. Hooters
4. Internet
5. Computers
6. International Space Station

3. INVOLVEMENT MODEL (Personification/Inanimate object brought to life)

A. HOW WOULD YOU FEEL IF YOU WERE_____?

AHA #1. triangle
AHA #2. Fed-Ex package
AHA #3. radio wave
AHA #4. soda can in hallway
AHA #5. paper folded into a swan
AHA #6. block at bottom of pyramid
AHA #7. professional football player

B. IF YOU WERE A_____, WHAT WOULD YOU (SEE, TASTE, SMELL, FEEL, etc.)?

AHA #8. covered wagon
AHA #9. book on list of condemned books
AHA #10. golden rectangle in Picasso painting
AHA #11. square
AHA #12. milk jug
AHA #13. outside international space station
AHA #14. Venus

C. YOU ARE A_____ . DESCRIBE HOW IT FEELS.

AHA #15. satellite
AHA #16. kimberlite pipe (diamond mine)
AHA #17. crystal on a freaky hippie

4. CONSCIOUS SELF DECEIT MODEL

A. SUPPOSE_____. WHAT_____.

AHA #1. you didn't have a ruler, how would you determine length?
AHA #2. What would airline seats look like if our knees bent the other way?
AHA #3. there were no cell phones or computers, what in your life would be different?
AHA #4. there was no recycling, what would our planet look like in 50 years?
AHA #5. circles and squares were reverse, what would happen?
AHA #6. ancient egyptians had left their building plans, what would they say?
AHA #7. baseball field on the moon, what would a game be like?
AHA #8. Native Americans had won the war of the west, what would be different?
AHA #9. the Earth was the center of the solar system, what would it be like?

B. YOU CAN _____, what _____?

AHA #10. speak to the dead/does Picasso think about beauty?
AHA #11. had all the land in the world/would you do?
AHA #12. change from 3-D to 2-D/what would you do?
AHA #13. colonize a planet/planet would you colonize?
AHA #14. travel throughout space/where would you go?
AHA #15. stop time once, when would you stop it?
AHA #16. make diamonds out of wood/what would you do?
AHA #17. break chemical bonds/what bonds would you break?
Suppose everyone recycled, what would our planet look like?

5. FORCED ASSOCIATION MODEL (Use cultural literacy terms here)

A. HOW IS_____LIKE

AHA #1. square/painting a house
AHA #2. airline traffic patters/chaos
AHA #3. satellite dish/light bulb
AHA #4. trash/art

AHA #5. volcanoes/pyramids
AHA #6. lever/pyramid
AHA #7. baseball/democracy

B. GET IDEAS FROM _____TO IMPROVE _____.
AHA #8. wolves/government
AHA #9. heliocentric model/religion
AHA #10. ratios/appearance of rooms
AHA #11. ants/democracy
AHA #12. bees/packaging
AHA #13. extremophile bacteria/living in space
AHA #14. Jupiter/Meteorology

C. I ONLY KNOW ABOUT_____. EXPLAIN_____TO ME.
AHA #15. bible/Kepler's Laws
AHA #16. tinker toys/carbon structure
AHA #17. spaghetti/gems
I only know about spheres, teach me about cubes.
I only know about one-dimension, explain area to me.

6. REORGANIZATION/SYNECTICS MODEL

A. WHAT WOULD HAPPEN IF_____?
AHA #1. there was no external surface?
AHA #2. volume couldn't be filled?
AHA #3. could communicate with extraterrestrials?
AHA #4. you could recycle everything?
AHA #5. you could see inside a volcano?
AHA #6. houses were all pyramids?
AHA #7. teachers made more than professional football players?

B. SUPPOSE_____(HAPPENED) WHAT WOULD BE THE CONSEQUENCES?
AHA #8. the first settlers had been defeated
AHA #9. that the Catholics had accepted Galileo
AHA #10. Michaelangelo had been friends with Picasso
AHA #11. area was infinite
AHA #12. volume was equal to area
AHA #13. we can live in zero pressure
AHA #14. our sun was a white dwarf

C. WHAT WOULD HAPPEN IF THERE WERE NO_____ ?
AHA #15. other planets
AHA #16. allotropes of carbon besides diamond
AHA #17. regular crystal shapes
dogs
mores against nudity
shoes
bathrooms

CULTURAL LITERACY

1. Dates:

2900-1600 B.C. and 3100-2300 B.C. (Stonehenge--conflicting reports). 3200 B.C. (Age of the Pyramids of Giza). 1564-1642 (Galileo Galilei), 1473-1543 (Copernicus), 384-322 B.C. (Aristotle), 150 B.C. (Ptolemy), 1618 (Kepler's Laws of Planetary Motion).

2. Names:
Strato Volcano, Composite Volcano, Shield Volcano, Cinder Cone, Geocentric, Heliocentric, Universe, Golden Ratio, Golden Rectangle, 1.618, Radioactive Dating, Recycle, The Great Pyramids, Viscosity, Tephra Cone, Carbon, Diamond, Nano tube, Graphite, Crystallography.

3. Proper Names:
King Tut, Stonehenge, England, Catholic, Protestant, Copernicus, Galileo, Ptolemy, Vincent VanGogh, George Seurat, Egypt, Giza, Aristotle, Tycho Brahe, Seward, International Space Station, MIR, Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, Pluto, Johannes Kepler, Buckminster Fuller.

4. Ideas:
Models of the solar system and universe over time, slavery and the building of the pyramids (Herodotus estimated 100,000 people, but Herodotus visited the site 2700 years after they were built. Modern Egyptologists estimate 20,000 slaves), geocentric and heliocentric models of the solar system, manifest destiny, recycling, space exploration.

5. Phrases
Copernicus' proof for heliocentric solar system, Galileo and the inquisition, Seward's Folly, Kepler's Laws, Golden Rectangle.

RESOURCES

I. Bibliography B Teacher/Professional Books and Resources

Geometry, McDougal Littell
The Dictionary of Cultural Literacy E.D. Hirsch, Jr., Joseph F. Kett, James Trefil
The Book of Video Lists Tom Wiener
The Literature Teacher's Book of Lists Judie L.H. Strouf
The Timetables of Science Alexander Hellemans and Bryan Bunch
The Green Book of Songs by Subject Jeff Green
VideoHound's Golden Movie Retriever Visible Ink Press
The Reader's Catalog Geoffrey O'Brien
The MacMillan Visual Dictionary MacMillan Publishing Company
The Timetables of History Bernard Grun
Brief History of Time, Stephen Hawkings
The Handy History Answer Book edited by Rebecca Nelson
The Handy Science Answer Book compiled by the Science and Technology Department of Carnegie Library of Pittsburgh
Astronomy, a self-teaching guide by Dinah L. Moche
Laboratory Manual in Physical Geology edited by Richard M. Busch
Geology, an introduction to Physical Geology by Stanley Chernicoff and Ramesh Venkatakrishnan
Essentials of Geology by Frederick Lutgens and Edward Tarbuck
The Timetables of Technology Bryan Bunch and Alexander Hellemans
The Joy of Mathematics Theoni Pappas
Art of Painting, Sculpture, and Architecture Frederick Hartt
Paper and Scissors, Polygons and More Linda Silvey/Loretta Taylor, Dale Seymour Publications
Pop-up Greeting Cards Origamic Architecture Masa Hiro Chatani
Fractal Cuts Diego Uribe
Tangrams: 330 puzzles Ronald C. Read
Thought Provokers Doug Rohrer
Learning Activities from the History of Mathematics Frank J. Swetz
Multicultural Science and Math Connections Beatrice Lumpkin/Dorothy Strong
The Math Teacher's Book of Lists Judith A. Muschla/Gary Robert Muschla
Curriculum and Evaluation Standards for Sc___Uhool Mathematics NCTM
Algebra in the Real World LeRoy C. Dalton, Dale Seymour Publications
Project MATHEMATICS! California Institute of Technology, NCTM

When are we ever gonna have to use this? Hal Saunders, Dale Seymour Publications
The I Hate Mathematics! Book Marilyn Burns
Learning Activities from the History of Mathematics Frank J. Swetz
Creative Constructions Dale Seymour and Reuben Schadler
Geometric Design Dale Seymour
Geometry Problems: One Step Beyond Reuben Schadler
Math Projects: Organization, Implementation, and Assessment Katie DeMeulemeester
Activities from the Mathematics Teacher Evan M. Maletsky and Christian R. Hirsch, NCTM
Classic Math: History Topics for the Classroom Art Johnson, Dale Seymour Publications

II. Bibliography - Student Books on loan from Media Center for classroom use as anticipatory sets, to read in class and/or as I-Search Projects
The Penguin Dictionary of Curious and Interesting Geometry by David Wells
Geometry for Dummies by Phd Arnone
The Great Atlas of Stars compiled by Serge Brunei
Explore the World of Man-Made Wonders by Adams/Biesty
Math Curse by J. Scieszka and L. Smith
A Mathematical Mystery Tour by A.K. Dewdney
The Colossal book of Mathematics: Classic Puzzles, Paradoxes, and Problems by Martin Gardner
An Introduction to the Philosophy of Science by Martin Gardner
The Rockhounds Handbook by James R. Mitchell
Gemstones of the World by Walter Schumann
Love is the Earth - Mineralogical Pictorial: Treasures of the Earth by A. Melody
A BeginnerÕs Guide to Constructing the Universe, the mathematical archetypes of nature, art, and science by Michael S. Schneider
The Number Devil a mathematical adventure by Hans M. Enzensberger

III. Educational Films/Videos
Bob Villas This Old House Episode showing measuring and cutting
TLC/Discovery program on the International Space Station
The Bermuda Triangle "Unsolved Mysteries"
Gemstones, Smithsonian Museum production
The Standard Deviants: Geometry, part I
Planning Proofs in Geometry by Jim Noggle
The Standard Deviants - Astronomy parts 1 and2
Astronomy - Changes in Human Outlook from Ptolemy to Einstein
Sacred Living Geometry:The Environmental Theories of Viktor Schauberger
The Great Minds of Scienced: Astronomy
Rocks and Minerals
Tell Me Why: Gems, Metals, and Minerals

IV. Commercial Films/Videos
The Money Pit
Dante's Peak
Education of Little Tree
Diehard 3
My Life as a House
Monty Python and the Holy Grail
"Cleopatra"
Schindler’s List
Every which way but Loose
Cast Away (Fed Ex trucks being loaded in Red Square)
Contact (showing radio telescopes)
Real Genius (showing satellites taking position)
Dances with Wolves

Seinfeld episode where Kramer is recycling cans for deposit
Mad Max Beyond Thunderdome

V. Literature/Language Arts (on reserve in Media Center for interest reading
Fiction
Maelstrom II by Arthur C. Clark
War of the Worlds
Ishmael by Daniel Quinn
The Annotated Flatland: A Romance of Many Dimensions by Edwin Abbott
The Dot and the Line: A Romance in Lower Mathematics by Norton Juster
Flatland: A Romance of Many Dimensions by Edwin A. Abbott
Flatterland: Like Flatland, Only More so by Ian Stewart
Fault Line by Sarah Andrews
Grandfather Tang's Story a tale told with tangrams by Ann Tompert
Red Moon by David S. Michaels
Tensleep by Sarah Andrews
The Parrot's Theorem by Denis Guedj
An Eye for Gold by Sarah Andrews
Jurassic Park by Michael Creighton
As She Climbed Across the Table by Jonathan Lethem
Angelmass by Timothy Zahn
Tales of the Shimmering Sky: Ten Global Folktales with Activities by Susan Milord and Joann E. Kitchel
Orion the Skateboard Kid by Juanita S. Raymond and Leland F. Raymond

Nonfiction
Voyages Through Universe by Andrew Fraknoi
The Great Atlas of Stars compiled by Serge Brunei
Astronomy Today by Eric Chaisson and Steve McMillan
Alaska: a History of the 49th State by Claus-M. Naske
Practical Skywatching by Robert Burnham, Alan Dyer, et. al.
Cosmos, by Carl Sagan
The Fabric of the Heavens by Stephen Toulmin and June Goodfield
The Architecture of Matter by Stephen Toulmin and June Goodfield
The Death of Nature, women, Ecology and the Scientific Revolution by Carolyn Merchant
Mathematics and Democracy, The Case for Quantitative Literacy edited by Lynn Arthur Steen
The Cambridge Illustrated History of Astronomy edited by Michael A. Hoskin
The History and Practice of Ancient Astronomy___n by James Evans
Shapes (My World) Alvin Granowsky
The Astronomy Book by Jonathan Henry
Penrose Tiles to Trapdoor Ciphers: And the Return of Dr. Matrix (Maa Spectrum) by Martin Gardner
Science, Good, Bad, and Bogus by Martin Gardner
The Stone of Heaven: Unearthing the Secret History of Imperial Green Jade by Adrian Levy and Cathy Scott-Clark
Books by John McPhee (geology)

Poetry
Maternity by Robert Service
Ozymandius by Shelly
Finding Time by JoAnne Growney
Geometry by Rita Dove
Starfish by Robert P. Tristam
Landscape VI from ÒSix Significant LandscapesÓ by Wallace Stevens
Sara Cynthia Sylvia Stout Would Not Take the Garbage Out by Shel Silverstein.
The Edge of the World by Shel Silverstein.
Drama (stage productions)

Captain Tellus and the Crystal Folk - a Science Fiction Operetta by Gerry Howe
Space Junk by Les Ellison

Art Works
"Composition with Yellow" 1936 Mondrian
"Bathers" George Seurat
Various works from Picasso, Caldor, Mondrian

Music
Numena and Geometry by Robert Rich
Geometry by Ivo Perelman
The Geometry of Night by SETI
King Tut by Steve Martin
Cleopatra by Pam Tillis
Money for Nothing by Dire Straits
"Circle Game" Jonie Mitchell
"Particle Man" by They Might Be Giants
Any music by Weird Al Yankovich or Huey Lewis (both excellent math students in school)

VI. Resource People/Mentors
Structural engineer
Municipal recycling coordinator
Cartographer

VII. Field Trips
Alaska Volcano Observatory
Alaska Native Heritage Center
Recycling Center

VIII. Other Material (CD-ROM, Laser Disc, Internet sites, etc.)
Risk (the game) Milton Bradley
Poker game ÒPass the TrashÓ
Geometer's Sketch Pad
CD-Rom Geodisk
http://www.bsu.edu/teachers/academy/gems/welcome.html
(Hooker Hall of Geology, Gems, and Minerals at the Smithsonian National Museum of Natural History in Washington, D.C.)

http://www.webmineral.com/
Mineralogy Database - includes mineral tables by crystallography, chemical composition, physical and optical properties of mineral species.

http://csm.jmu.edu/minerals/
James Madison University Mineral Museum- a collection of mineral specimens from around the world, including an extensive micro-mount collection. Site features numerous high-quality photos.

http://www.ics.uci.edu/~eppstein/geom.html
Geometry in Action: explore various areas in which ideas from discrete and computational geometry meet real world applications.