

WESO Coaches Manual 2005-01-2

Edited by Tim Chupp
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Aerodynamics (Grades 2,3)

Event Supervisor: Ron Vayda (dilligaf@cass.net)

Number of Participants: 1 or 2 **Approximate Time:** 60 minutes

Each team will build two paper airplanes and launch each toward a target at least five meters but not more than twelve meters away.

Two sheets of plain white paper (copier paper), approximately five centimeters of masking tape and a pair of scissors will be supplied to each team. Airplanes must be folded. Crumpled wads of paper do NOT qualify.

Planes flown in competition MUST be made on site, during the allotted time, using only the materials provided.

Planes will be hand launched from behind a line on the floor at the specified target, on the floor, at least five meters but not more than twelve meters away.

If the team has two participants, each must launch one flight. If the team has only one participant, he/she must build two airplanes and launch each (once).

Scoring

Scoring is based on two flights: one with each airplane. After each flight, the distance will be measured from the center of the target to the NOSE of the airplane. The sum of the distances for the two flights will become the school's score. The lowest score is awarded first place, etc. In case of any ties, there will be a "fly off" with two flights until each place is uniquely awarded.

Animal, Vegetable, or Mineral (Grade 2 only)

Event Supervisor: TBA

Number of Participants: 1 or 2 Approximate Time: 30 minutes

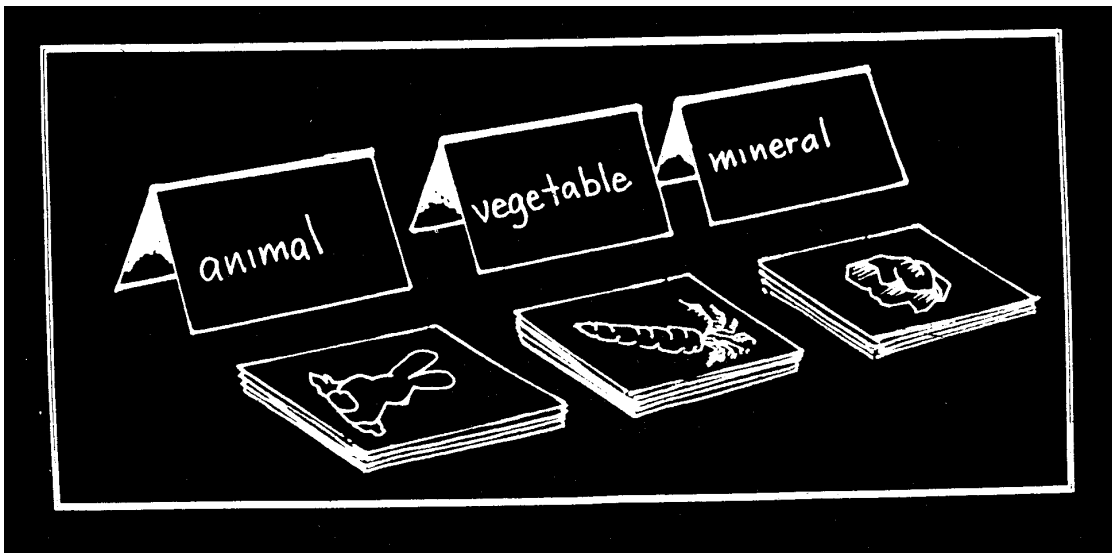
The objective is to test the ability of the student to classify objects in the correct category- animal, vegetable (plant), or mineral.

The contestant/s will classify pictures, models, or real objects into one of the these three categories- animal, vegetable (plant), or mineral. There will be a total of 25 stations and at a given signal the student will move from one station to the next.

Each team will be required to write a short paragraph on the back of their answer sheet, stating the requirements for determining whether any given substance is animal, vegetable (plant), or mineral. The paragraph will be used in the scoring only in the case of ties.

Scoring

The winner will have the highest number of correct responses. In the case of ties the event supervisor will select the best descriptive paragraph to determine the winner. Content, grammar, punctuation, and spelling will be taken into consideration.



Barge Building (Grade 2 only)

Event supervisors: Jack Mengel: (sjmengel@msn.com) Steve Dobbins: (dmd4@msn.com)

Participants: 1 or 2 **Approximate time:** 30 minutes

The object of this event is to construct a barge as a team using aluminum foil that can support a cargo of the largest number of pennies without getting them wet.

A team will be two students. They will have 20 minutes to construct the barge.

Each team will be given 5 minutes to load their barges. Teams must predict the number of pieces of cargo that the barge will hold. The barge must then be loaded until it sinks.

SINKING OCCURS WHEN WATER ENTERS THE BARGE.

Preparation:

Practice, as a team, building barges. The team will do this until the team designs a barge they feel will hold the most amount. Practice making the barge and placing different material on it. Be creative in the materials used.

The score will be determined by the following formula: $\text{Score} = (10C - |D|)$,

Where C = Amount of cargo held (number of pieces)

|D| = Absolute value of the difference between predicted amount and C.

No Bones About It (Grades 2,3,4,5)

Event Supervisor: Meegan Schneider (saschneider@peoplepc.com)

Number of participants: 1 or 2 Approximate Time: 30 minutes

Description: The student(s) will identify bones and pictures of bones at different stations throughout the room. They will also be required to answer questions found on cards at the stations pertaining to bones, for example diseases of the bones. Only the SCIENTIFIC NAMES of bones will be accepted as correct!

The Competition:

1. Stations will be set up in the room with provided bones and pictures of bones (HUMAN & ANIMALS)
2. The two participants will move from station to station with all the other teams only on direct command of the testing official.
3. There will be one (1) minute at each station.
4. The team will be asked to record answers to the questions found at various station on the provided answer sheet.

Scoring: There will be 25 stations, with 2 questions per station. Each question will be worth 2 points, for a total of 100 points. The team with the highest point total will be the winner. In case of a tie the team with the answers spelled correctly will be placed ABOVE the team with in incorrect spelling.

Preparation

The following web site is great:

<http://www.bio.psu.edu/faculty/strauss/anatomy/skel/skeletal.htm>

Circuit Wizardry (Grades 4,5)

Event Supervisor: Timothy Chupp – chupp@umich.edu

Number of participants: 1 or 2 **Estimated time:** 50 minutes

Description

Circuit Wizardry for 4th and 5th graders consists of three parts:

1. Identification and description of circuit elements
2. Understanding of basic circuit function
3. Building a simple circuit

The 4th grade group will have a more basic set of circuit elements and functions than the 5th grade group.

The event will be separated into three intervals with 10 minutes for parts 1. and 2. and 30 minutes including supervisor review for part 3.

A team will consist of one to three students.

Part 1: Identification and description of circuit elements:

Each team will receive three cards, each with a circuit component attached and two questions to be answered. The first question is what is it (e.g. Resistor, transistor, capacitor, etc.) The second question will be on it's function.

Part 2: Understanding of basic circuit function

A simple circuit will be presented in schematic form to each team. The team must provide a brief description of the circuit's function.

Part 3: Building a simple circuit

Teams will be asked to build a circuit that performs a simple function on a breadboard. Each team will briefly review the circuit and their strategy with the event supervisors. A circuit diagram may be drawn, which will be used in the event of a tie score.

Electronic components and concepts covered:

4th grade: Battery, SPST switch, SPDT switch, Light bulb, Resistor, Potentiometer, Capacitor, Light Emitting Diode (LED), Photodiode

5th grade: All 4th grade components PLUS voltage and current measurement, Ohm's law, parallel and series resistors/light bulbs

Circuit examples:

4th grade: circuit with on-off switch that switches between bright and dim light bulb

5th grade: set up and measure voltages across light bulbs in series and parallel

Preparation


It will not be necessary to memorize part numbers, resistor color codes, etc.


Students should learn to recognize by sight and by circuit symbol each of the components listed.

Students should deeply understand how each element works and be able to provide a water-flow analogy where appropriate (e.g. a battery is like a pump, a capacitor is like a bucket, etc.) Fifth graders should learn how to use a meter to measure voltage and current.

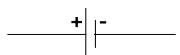
Students should play with, design, and make lots of circuits using clip leads and basic circuit elements. Purchase Radio (327 Hoover in Ann Arbor; 734-668-8696) can provide a \$10 kit with the appropriate circuit elements for practice. A multimeter (about \$8 at Purchase Radio) is useful for the 5th grade.


Circuits Elements



Resistor:  limits current produces a voltage drop, and dissipates power
A light bulb acts as a resistor

Potentiometer  a variable resistor; used as a voltage divider

Capacitor  stores energy and charge

Battery  provides energy and a voltage (potential difference)

Diode  allows current to flow only one way (from + to -)

Switch SPST  open- no current flows; closed – current flows
SPDT 

ESTIMANIA/MEASUREMENT (Grades 2,3,4,5)

Event Supervisor: Susan Fedewa: fedewa@bus.umich.edu

Number of Participants: 1 to 3 Approximate Time: 30 minutes

Description:

Students will be asked to estimate the answers to approximately ten questions requiring an estimate between zero and one million.

The Competition:

1. The question will follow the following format:
 - a. How many pennies in the jar?
 - b. If I am increasing a recipe by 2, how much flour would I need?
2. Calculators **will** be allowed, students should bring their own.

Scoring:

1-10% away from answer=5 points
11-20% away from answer=4points
21-30% away from answer=3 points
31-40% away from answer=2 points
41%-65% away from answer=1 point
66%-100% away from answer or no answer 0 point

The team with the most points wins. In case of ties, time needed to estimate the 10 problems would determine the winner.

To Prepare:

Students should use a variety of equipment to help them with their estimations (rulers, cups (various sizes), spoons, etc.). Practice estimating how many pennies, marbles, or M& M candies in various sizes of jars. How many inches or centimeters are in a yard, meter or mile. What is the different or what equals a teaspoon, tablespoon, pint, quart, gallon or other type of measurement. **Most important, Have Fun!!!**

Map Reading (Grades 2,3,4,5)

Supervisor: Michael Kenny (kenny@provide.net) Ph: 734-663-0278 (before 8:00 pm)

Number of Participants: 1 or 2 per team (2 preferred) **Approximate Time:** 20 minutes

Rules

Individual contestants will be given two-part questions which can be answered by using various kinds of maps.

1. Each contestant will be given a question and answer sheet. Various kinds of maps—such as topographic, political, oceanographic and road maps---will be posted around the room.
2. For each question, the contestant will be asked:
 - A. Which is the best map to use in answering the question?
 - B. What is the specific answer to the question?
3. At the end of 20 minutes, the question and answer sheet will be collected from the contestants who have not turned in their responses.

Scoring:

1. Each of the two responses to each question will be evaluated with equal weight given to each response. The contestant attaining the highest score will be declared winner.
2. In the event of a tie, the contestant with the most correct responses to the specific questions (not type of map) will be declared the winner.

General Description

In a standard classroom, several maps and a globe will be mounted on walls and laid out on tables. The student teams will enter the room and have about 20 minutes to answer a series of questions that can be answered by reading the maps.

The students need to be familiar with many different kinds of maps because their first task when reading a question is deciding what map is best for answering it. For example, a question will not say, "Using the Michigan road map, find the distance from Grand Rapids to Lansing." Instead, it might say something like, "How many miles is it from Grand Rapids,

Michigan, to Lansing, Michigan, on Interstate 96?" The student would need to first think that a map of Michigan is needed, and that it should show roads. Then they need to find the cities either from memory/familiarity or, even better, from using the index.

Another typical question might be something like, "What park is at the west end of Smith Street. in Jonestown?" The student will need to figure out which map shows the streets of Jonestown. The student will then need to use the index to find Smith Street, and then use knowledge of directions and perhaps the north arrow to figure out which end is west. She/he then writes the name of the park that is seen on the map.

A successful Map Reading team will be familiar with different types of maps and the different ways that maps can be used to gather geographic information. The student participants will need to have a conceptual understanding of how maps represent selected parts of the real world at different scales. For example, Detroit could be a small dot on one map, and another map might show the city as a patch of color with a tangle of road lines. The students will need to have a variety of map reading skills, such as understanding a map legend and measuring real world distances. The students will need to have a basic cartographic vocabulary so that they understand the questions and can concentrate on getting the correct answers from the maps.

They should be encouraged to be thorough, neat, and careful with spelling, although spelling & grammar errors will not count against their score.

Below is a sample of the maps used in the 2003 WESO map reading event:

- U.S. Geological Survey 7.5 minute, 1:24,000 topographic map: Bright Angel Point, Arizona (part of Grand Canyon National Park)
- National Geographic physical map of Africa
- Michelin world political map
- National Geographic physical map of the Arctic Ocean floor
- Bike routes on Slickrock Trail near Moab, Utah

Mystery Architecture (Grades 2,3,4,5)

Event supervisor: Rajaram Subramanian: (rsubrama1008@yahoo.com)

K. Venkatesh Pradaa (kprasadaa@yahoo.com)

Participants: 1 or 2 Estimated time: 20 minutes

This is a TEAM EVENT. There are two members to a team. As a team they must construct with the materials found in a bag given to them, a tower as high as possible. This tower must support a tennis ball at the top of the tower.

The team will have 20 minutes to construct the tower. It must be free standing. The height of the tower and the width of its base will be measured as precisely as possible. NO building materials are to extend above the top of the tennis ball.

Preparation:

Handouts will be available at the coaches workshop for architecture and some basic principals of building.

Go over the handouts with your students. Practice constructing towers with different materials. Learn from each construction and apply this towards each new tower.

Materials to practice with:

Styrofoam cups, straws, masking tape, paper clips, pin, paper, tongue depressors, be creative in the materials you try.

PASTA BRIDGE (Grades 3, 4, 5)

Event Supervisors: Jack Mengel (jmengel@ford.com), Steve Dobbins (dmd4@msn.com)

Number of Participants: 1 or 2 **Approximate Time:** 50 minutes

Description:

Using only the materials given, build a bridge to span a specified distance and support a cup (in the middle of the bridge) with as many small weights as possible.

Materials:

Bridge supports (two 3" pieces of scrap 2"X4" that are spaced about 4"-5" apart)

Weights (washers, marbles, pennies, anything that we have in large quantities)

Small paper cup to hold weights

Spaghetti

Modeling clay

Competition:

1) Students must build a bridge to span the distance between the two blocks.

2) The clay may be used to stabilize the bridge at the supports or to join shorter pieces of pasta.

3) Students place the cup at the center of the span and begin to add weights.

Scoring:

The bridge that holds the greatest number of weights wins.

Possible problems for us to solve and/or think about:

Designing a bridge to hold more weights.

Using less spaghetti.

Using less clay.

Different kinds of pastas.

Moving the supports further apart.

Adding the weight of the completed bridge to the scoring formula.

Pentathlon (Grades 2, 3, 4, 5; 2nd grade is not scored)

Event supervisor: Linda Zummer (mczum@msn.com)

Number of participants: 5, at least 2 boys and at least 2 girls

Estimated time: 15 minutes

Five physical skills are interspersed with science questions in an obstacle course that will be run in a relay race style where each student passes an object (usually BREAKABLE) to the next student.

The physical activity could include:

- crossing a balance beam
- dribbling a basketball
- throwing a Frisbee with accuracy
- Hopping on one foot.

Between each physical activity, the student must read and answer a multiple choice science question.

3rd Grade Science Topics

Environments – Teaches about feeding relationships in these communities:

- a) Terrarium Community.
- b) Pond Community
- c) Human Community

For example, in the terrarium community, you grow plants (producers) in a terrarium and then add crickets (plant eaters) and then anoles (animal eaters).

Astronomy

Weather

4th Grade Science Topics

Animal Behavior

Light

Rocks and Minerals

5th Grade Science Topics

Matter

Motion of Objects

Magnetism and Electricity

Sample 3rd Grade Questions:

1. Zebras and lions probably enjoy this type of environment:
 - a. Swamp
 - b. Rainforests
 - c. Marsh
 - d. Grasslands

2. Choose the FALSE fact about the sun.
 - a. The sun is really a star
 - b. The sun is burning gasses
 - c. All planets orbit the sun
 - d. The sun is really a planet

3. The Earth appears to split during one of these:
 - a. Tornado
 - b. Hurricane
 - c. Earthquake
 - d. Volcano

Answers: 1d, 2d, 3c

Sample 4th Grade Questions:

1. Ducks do this when they fly south each winter.
 - a. Hibernate
 - b. Migrate
 - c. Mimicry
 - d. Mate

2. The sky looks blue because
 - a. The sky reflects the blue water.
 - b. The sun is yellow and the sky shows the complementary color to yellow.
 - c. As the sun moves away from the earth the wavelength of light is shifted to blue.
 - d. The atmosphere refracts the light and blue has the shortest visible wave length

3. The three classifications for rocks are:
 - a. Sand, silt, and clay
 - b. Larry, Curly, and Moe

- c. Igneous, metamorphic, and sedimentary
- d. Stone, brick, and mortar

Answers: 1b, 2d, 3b

Sample 5th Grade Questions:

1. Identify the list of non-conductors:
 - a. Copper, aluminum, steel
 - b. Rubber, wood, plastic
 - c. Water, iron, brass
 - d. Silver, human body, gold

2. How many states of matter are there?
 - a. Two
 - b. Three
 - c. Four
 - d. Five

3. The scientist who invented the laws of motion was:
 - a. Einstein
 - b. Archimedes
 - c. Copernicus
 - d. Newton

Answers: 1c, 2c, 3d

Good skills to practice:

- Speed is critical to this event, so it would be helpful to have the students practice reading questions quickly.
- Physical skills such as balancing an egg on a spoon, or dribbling a basketball would also be useful to practice.

Internet Sources for questions and information:

There are excellent guides for all three grades on the internet at these URL's:

http://eaton.k12.mi.us/~corecurr/sci_pdf/3sci.pdf

http://eaton.k12.mi.us/~corecurr/sci_pdf/4sci.pdf

http://eaton.k12.mi.us/~corecurr/sci_pdf/5sci.pdf

These include quick hands on lessons (such as making a flip book about the life cycle of a butterfly) as well as sample multiple choice questions.

These questions and answers say third grade, but they cover topics for all of our grades:

http://www.salem.k12.va.us/south/soljeopardy/Science3/question_answer.htm#Animal%20Habitats

Sample MEAP tests:

<http://www.meritaward.state.mi.us/mma/released.htm>

Elementary Science from the year 2000:

<http://www.meritaward.state.mi.us/mma/releases/5scire100.pdf>

Third Grade Science Jeopardy:

<http://www.salem.k12.va.us/south/soljeopardy/Science3/3rdscience.htm>

Third grade quiz about rocks:

<http://www.fi.edu/fellows/fellow1/oct98/quiz/index.html>

Fourth grade science sample test:

<http://electron-net.eztest.eppg.com/ISBE/2003/grade4science/index.html>

Grade 4 Earth Science Links:

<http://www.rusd.k12.ca.us/4teachers/science/ScienceWeb/fourth/earth4.html>

Grade 5 Science Curriculum Links:

<http://www.rusd.k12.ca.us/4teachers/science/ScienceWeb/fifth/fifth.html>

If you have a sample question that you don't know the answer to, Ask Jeeves might be useful:

<http://ask.com>

Useful books:

What Your Third Grader Needs to Know by Jr. E. D. Hirsh
What Your Fourth Grader Needs to Know by Jr. E. D. Hirsh
What Your Fifth Grader Needs to Know by Jr. E. D. Hirsh
Science: Family Flip Quiz by Miles Kelly Staff

POTIONS (Grades 4,5)

Event Supervisor: Svetlana Gladysheva, segladys@umich.edu

Participants: 1 or 2 **Estimated time:** 25 minutes

A team has **25 minutes** to follow the instruction sheet to make the “potion”. The potion is then handed to the judges who test it and give their score, based on the measurable property of the “potion” (most likely pH or volume).

Students are expected to know:

Safety rules:

- Do not experiment on your own – always have an adult nearby
- Read and follow all directions for your activity, use materials carefully
- Read all warning labels on all materials being used
- Wear protective clothing (labcoats, gloves) and eye protection
- When finished, clean up and dispose of materials properly
- Wash your hands after the activity
- Never taste or directly smell any reagents, keep materials away from your eyes
- Never use any of lab containers for food storage
- Never eat or drink while conducting an experiment
- Never horse around chemicals

Basic Chemistry facts covering the following (list might vary slightly, I’ll e-mail the changes if any) at the level comparable to how it is explained at <http://www.chem4kids.com/map.html>:

- States of matter (or phases): solids, liquids, gases
- Transitions between phases: melting/freezing, evaporation/condensation
- Mixtures
- Solutions
- Structure of matter: Molecules, Atoms, Electrons
- Basic Elements: Hydrogen, Oxygen, Nitrogen, Carbon, Aluminum, Sodium, Copper, Chlorine, Phosphorus, Sulfur, Helium, Argon
- Chemical Reactions and equilibrium

- Acids and Bases, pH scale

Basic Chemistry Skills:

- Crush chunky solids into powders using mortar and pestle
- Weight out powders using electronic and/or spring scale
- Measure liquid volumes using measuring cylinders
- Pour liquids into narrow-mouthed containers (with and without using a funnel (practice with water)).
- Use a dropper to operate with small amounts of liquid
- Filter solutions using funnel and paper filters or cotton balls
- Use votive candle as heat source (light it with a match, blow off when done) to, for example, melt powder in the metal spoon or evaporate small amount of liquid from a metal spoon (without getting burned)
- Estimate pH of liquids with cabbage juice or pH indicator paper or empirically (if I put a drop of this liquid on a bit of baking soda and it fizzes – it is an acid!)
- Identify powders by examining their physical or chemical properties (for example, starch from salt from baking soda)
- Identify liquids by examining their physical or chemical properties (viscosity, pH, color)

Useful Websites (these are not examples of potions but rather activities that are good for getting familiar with chemistry techniques and basic facts):

<http://www.uen.org/Lessonplan/preview?LPid=2176>

(how to identify powders and liquids)

<http://www.uen.org/Lessonplan/preview.cgi?LPid=631>

changes in matter

<http://www.uen.org/Lessonplan/preview.cgi?LPid=11258>

<http://www.uen.org/Lessonplan/preview.cgi?LPid=11238>

<http://www.uen.org/Lessonplan/preview.cgi?LPid=2683>

<http://www.uen.org/Lessonplan/preview.cgi?LPid=2685>

<http://www.uen.org/Lessonplan/preview.cgi?LPid=2687>

<http://www.uen.org/Lessonplan/preview.cgi?LPid=2688>

<http://www.uen.org/Lessonplan/preview.cgi?LPid=2689>

<http://www.uen.org/Lessonplan/preview.cgi?LPid=2686>

also, whatever you can find on the web that is appropriate for upper elementary school student.

Water Rockets (Grades 3,4,5)

Event supervisor: Jeff Gearhart (jeffg@ecocenter.org)

Number of Participants: 1 to 3 **Estimated time:** To be discovered

Description: Students will build a rocket out of a 2 liter plastic pop bottle. Alterations maybe made to the rocket to help it stay aloft. The rocket which stays in the air for the longest duration, will be considered the winner.

The Competition: The participants will bring to the competition only one rocket made from a plastic 2-liter pop bottle(s) and an optional repair kit. All parts on the rocket, or in the kit, **MUST** be on the materials list below. No commercially made rocket equipment sharp components, or metal parts (see material list) will be allowed. Any part not on the list must be removed or the rocket will be disqualified.

1. The school name and team number must be clearly marked on the rocket body and on the repair kit.
2. A straw needs to be attached vertically to the side of the bottle, in order to keep the rocket launch vertically. No rocket will be allowed to launch without a launch lug (straw).
3. The participants will add their desired amount of water into their rocket before each launch. To aid in consistency the water level line will be clearly marked on the rocket prior to check-in. The water will be taken from a source provided by the judges. **ONLY** plain tap water may be put inside of the bottle. Carbonated water, soap, oil, etc, will not be allowed.
4. Two launches will be allowed, using the best time for the score. Alterations or repairs may be made between launches **BY THE OLYMPIANS ONLY!!!** Coaching from the sidelines will not be allowed.
5. All energy to launch the rocket must come from the water/air pressure provided by the pump. No other source of potential or kinetic energy will be permitted.
6. All rockets will be launched at a pressure of 75psi. While practicing please do not exceed this psi and only the coaches should pressurize the rocket. Everyone within 10 meters of a pressurized rocket must wear safety goggles.
7. The participants will not be allowed to hold their rocket during pressurization. In case of high winds the judge will launch the rocket as quickly as possible. However, once the rocket has been pressurized it **MUST** be launched. It will be the judges' decision whether the launch should be an official one due to weather conditions.
8. The full-assembled rocket must not exceed 56 cm Tall and 28 cm wide.
9. All parts of the rocket must remain joined together throughout the entire launch. The total length of a fully extended rocket will not exceed 3 meters. If the nose cone becomes unattached then that particular launch is **DISQUALIFIED**.

Check-In: Each rocket and repair kit must be checked-in prior to launching by at least one student member of the team. Olympian(s) will wait while their rocket is being inspected. Those rockets not meeting the above criteria must be repaired or they will be disqualified.

Scoring: Scores will be determined for the rocket by taking three times. The high and the low times will be discarded and the “middle” time will be the time used for the launch. One event supervisor, and two spotters will be the official times for this event. The watches will be started simultaneously to the launch and stopped when any part of the rocket touches the ground, or any object in contact with the ground (trees, bushes, etc). The longest duration aloft in the air wins. Ties will be broken by the 2nd flight time.

Materials List:

Fabric, cardboard, plastic, elastic (only as a shock cord), glue (hot or super glue melts bottle), paint (tempera will flake off), permanent marker, styrofoam, Baby/talcum powder (for parachute), 2 liter pop bottle(s), fishing line, contact paper, string, tape, wood, clay, paper. A fishing snap swivel will be allowed for the nosecone for parachute changing.

Write It, Build It (Grades 3,4,5)

Event Supervisor: Ron Vayda - dilligaf@cass.net

Number of participants: 2 to 4 Estimated time: 45 minutes

Participants will be designated either a writing team or a building team. The writing team, consisting of one or two participants will be given an object constructed of common pieces (lego, blocks, etc.). The writing team's job is to write a description of the object's construction that will be passed to the building team. The building team will then construct an object, based on the description, from a collection of common pieces.

The object will become progressively more complex for higher grades.

The writing team will have up to 25 minutes. They will be timed. The least amount of time used to complete the description will be used as the tie breaker.

The building team will be in a separate room where they are not able to see the object.

After the writing team has completed the directions they will be allowed to leave, and the building team will be given the directions written by their teammates. The building team has 20 minutes to construct the item using the description provided by their teammates
NO DIAGRAMS ALLOWED AND NO VERBAL OR OTHER COMMUNICATION ALLOWED.

Preparation:

Have an item built by the coach and have the students practice writing down the description and the students reading the description and building the item.

Scoring:

One point for each piece of material placed in the proper location.