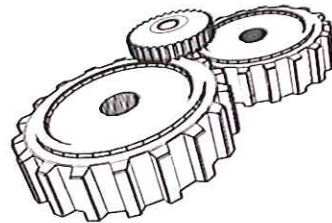


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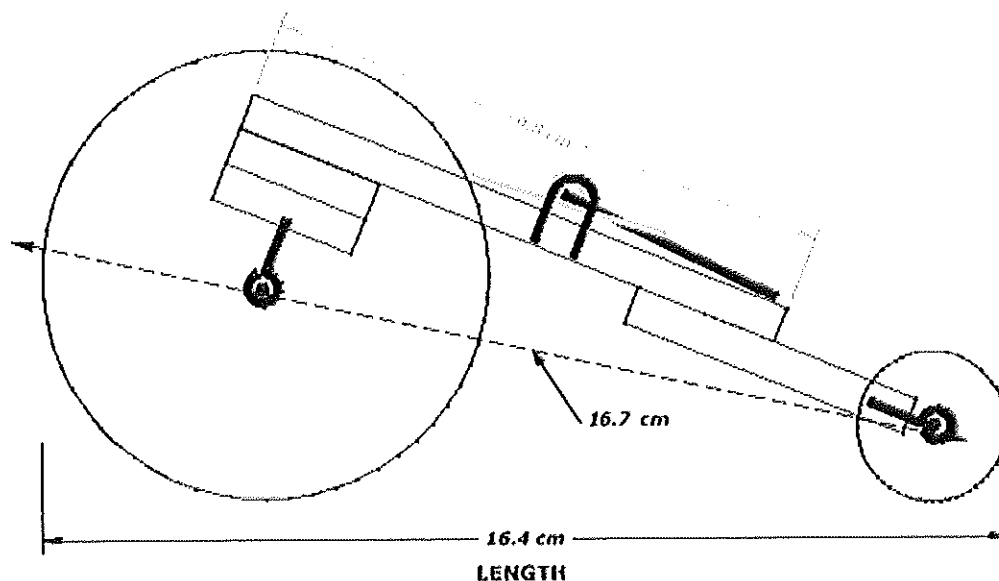
M-DCPS
Competition Booklet
2017



(Adapted from the National SECME
Competition Guidelines August 2016)

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Measurement of "L," the Mousetrap Car's Longest Dimension
(From the farthest point at the front of the car to farthest point at the rear of the car)



"L" is the car's length (measured in centimeters) from the farthest point at the front of the car to the farthest point at the rear of the car while the car is at a resting state and the spring unwound. If the bail has been straightened and protrudes past the front or rear of the car, the measurement will be taken from the end of the bail to the other end of the car.

L (for this example) = 16.4 cm

| | |
|-----------------------|--|
| Technical Report: | |
| Design Drawing: | |
| Best Performance Run: | |

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SECME ENGINEERING DESIGN: MOUSETRAP CAR
WRITTEN REPORT REQUIREMENTS (Elementary School)

As a part of the Design Competition, the team is required to write a Written Report describing the design, construction, and operation of the Mousetrap Car. The main body of the report should be a maximum of 1-2 pages.

STRUCTURE: (0-25 points)

1. Cover page
 - a. Title of the Written Report (SECME: Mousetrap Car Technical Report)
 - b. Team Name
 - c. Each team member's name, grade and complete home address
 - d. Team's school name
 - e. School System/District name
 - f. School Coordinator's name
 - g. Date (date of competition)
2. Double-spaced text
3. 8½" X 11" white paper with one-inch borders at the top, bottom, and on each side
4. 12 pt. standard Font, computer typed
5. Report is neat and thorough; pages are numbered and in order

CONTENT: (0-50 points)

- A. Writing includes an original, age-appropriate introduction
- B. Writing includes ideas that are fully developed, fully supported, and describe the design, construction and operation of the car
- C. Writing is logical and coherent as a whole
- D. Writing includes an original, age-appropriate close

MECHANICS, SPELLING & GRAMMAR: (0-25 points)

Written Report reflects the team's pride by being submitted as error-free as possible

- a) Writing is free of (age-appropriate) punctuation errors
- b) Writing is free of (age-appropriate) sentence errors (misplaced sentence parts, subject/verb agreement, sentence fragments, run-ons, etc.)
- c) Writing is free of (age-appropriate) spelling errors

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HOW TO BUILD THE WATER ROCKET

Note: These build instructions are basic suggestions and is **NOT** the only (or necessarily the best) way to design you rocket

Materials and Tools Needed:

1. Pressure Vessel (Clear 2-Liter Bottle)
****Note: Be certain that your clear, 2-liter bottle is free of scratches, nicks, dents, and discoloration.**
2. Adhesive, ****Caution: Hot Glue Guns weaken walls of Pressure Vessel.**
3. Foam mounting tape (approximately 1/16 thick, 2-sided adhesive)
4. Carpet tape (thin 2-sided adhesive)
5. Clear packing tape is **HIGHLY RECOMMENDED FOR CONSTRUCTING ROCKETS**
6. Use adhesive to bond fins, nose cone, and other allowed materials onto the water rocket
7. Cutting utensils (Scissors, Hacksaw Blade, Utility Knife, etc.)
8. Markers, spray paint, stickers, etc. for decoration of the rocket (No water color paint).
9. Safety First: Children should be supervised **at all times** while constructing their Water Rockets
10. For Fin Construction:
Balsa and Bass Wood, Plastic, Foam Board, 1/4" to 1/2" thick Styrofoam, Plastic Plates, and/or PE (2L) Bottle Material

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EXAMPLE PATCH DESIGN



Explanation of Patch

The propelled rocket represents the school system, supported by the educators and students, following a path towards excellence. The radiant five 8-point stars symbolize the enrichment of Science, Engineering, Communication, and Mathematics, whereas, the seven 4-point stars represent for the seven Universities that founded SECME. The three distinct contrails steaming behind the rocket, symbolize the support offered through SECME, Universities, and Industry partners. The ring before the rocket depicts the student's path through the SECME program, returning full circle to support the efforts of the program. As we have entered the new millennium, the sun over the horizon symbolizes of the induction of the new Water Rocket Design Competition into the SECME Programs. Accuracy, the focus of the contest, is represented by the target created by the outer ring, deep space, and the earth. The border is supported on the left and right by symbols, respectively, for water and compressed air, which are the fluids used to propel the rockets.

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Construction and Operation Requirements (ALL):

1. The pressure vessel must be ONE (1) clear plastic, 2-liter bottle (i.e., **NO** colored/tinted bottles allowed for the pressure vessel), See Diagram 1.
2. Water and air pressure will be the sole source of propellant.
3. **Do not use the following materials to construct your rocket...!!!**

| | |
|-------------------------|--------------------------------|
| <u>a. Metal</u> | <u>d. Spikes</u> |
| <u>b. Glass</u> | <u>e. Antennas of any kind</u> |
| <u>c. Hard plastics</u> | <u>f. Rocks</u> |

These materials are dangerous and could cause harm to the operator and those present in the presence of the water rocket launch.

NOTE: * USE OF THESE MATERIALS WILL AUTOMATICALLY DISQUALIFY THE TEAM FROM THE COMPETITION ***.**

4. On the bottom of the rocket, *leave 7.5 cm from the throat of the exit plane clear of any coverings* (paint, markings, drawings, etc.), see Diagram 1.
5. The maximum total height of the rocket is **76.0 cm**. See Diagram 1.
6. The nose-cone tip must have a minimum radius of **1.5 cm**. See Diagram 2.
7. The fins may extend to the throat exit plane. See Diagram 2.
Note: **No forward-swept types of fins are allowed to be used on the rocket.
8. The maximum fin-width distance from the bottle is **10.0 cm** (or **16.5 cm** from the center of the bottle axis), see Diagram 3.
9. The use of parachutes is NOT allowed.

PATCH DESIGN CRITERIA (ALL):

What is a Patch?

A Patch is a creative display that reflects the dedication and mission of the team. This symbolic picture must comply with the following rules:

1. Each entry is to be prepared and submitted by the SECME School Teams who will be participating in the Water Rocket Design Competition.
2. Patch designs must be submitted on 13" X 13" poster board.
3. All entries must contain the team name and follow the theme of this year's SECME competition.
4. A short (less than 1-page) explanation of the symbols of the patch must be included on the back of the patch (**Refer to example on next page**)
5. All teams participating in the Water Rocket Competition must be prepared to display their patch prior to the launch of their rocket.
6. Patches must be hand-made original work.
7. Only Ink pens, pencils, markers, or paint may be used.

****NOTE: Any Patch Design deemed inappropriate will be pulled from the competition.**

THE PATCH DESIGN WILL BE JUDGED ON:

- I. PAPER SIZE REQUIREMENT (0 – 10 points): Correct patch size is 13"x13"
- II. SECME THEME (0 – 15 points): Incorporation of SECME's competition theme (and team name)
- III. APPEARANCE (0 – 20 points): Attractiveness and neatness of the patch
- IV. CREATIVITY (0 – 25 points) Uniqueness of the information depicted
- V. EXPLANATION OF PATCH (0 – 30 points) Description which explains each part or idea of the patch (on the back of the patch)
- Total: (0 – 100 points)**



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WATER-ROCKET VEHICLE COMPETITION

While promoting Space Propulsion Awareness, the Water Rocket Competition serves to familiarize students with the basic principles of rocketry, design engineering, and manufacturing engineering. Students will design and manufacture a water rocket using a 2-Liter bottle as the pressure vessel. The rocket must be capable of launching from the SECME Water Rocket Launcher given specific launch criteria. Additionally, each team will develop a patch design, technical report, and technical drawing. The team's complete success will not solely be judged on rocket performance, but the combined effort of the team.
The Mission: *The mission is to design a Water Rocket Vehicle capable of staying aloft for the longest amount of time (measured in seconds).*

MISSION SUCCESS and Safe Flying! *** Remember you will never be a winner unless you try and if you try your best, you have already made it to the bullseye :-) ***

Design and Contest Rules (ALL):

- Each design team must consist of three (3) students.
- Technical Paper (Middle and High School ONLY), Patch Design, and Completed Entry Form must be submitted to the District Office no later than Wednesday, December 14, 2016**
- At check-in the day prior to the competition the following must be submitted:
 - ✓ Pre-registered completed entry form
 - ✓ Technical Drawing (Middle and High School ONLY)
 - ✓ Operating Rocket (meeting specifications)

****Note:** At this time each entry must pass a visual inspection and height requirement in order to be eligible to compete. Entries that fail inspection will be given ONE opportunity to make modifications to pass inspection, prior to the beginning of the water rocket launching competition.

An overall winner will be judged, upon the following criteria (based on 100%):

MIDDLE AND HIGH SCHOOLS

| | |
|----------------------------|--------------------------|
| Hang time of Rocket 45% | Technical Report 25% |
| Patch Design 15% | Technical Drawing 15% |

ELEMENTARY SCHOOLS

| | |
|----------------------------|---------------------|
| Hang time of Rocket 70% | Patch Design 30% |
|----------------------------|---------------------|

Final Hang time Score Calculation

$$\text{Final Score} = \left(\frac{\text{team hangtime}}{\text{max hangtime}} \right) \times 100$$

Important Definitions:

HANG TIME ...is defined as the time from when the rocket leaves the launch pad until the time it reaches the ground or strikes an object.

This measurement will be taken using a stopwatch by at two or three qualified judges; the average of the judges' times will be used as the final "hang time".

Max hang time... maximum hang time recorded during the competition

The objective of the contest is for each team to launch a rocket propelled by water and air and for it to stay aloft for the maximum amount of time (measured in seconds). The launch angle, which can be adjusted from approximately **90 degrees (90°)**, will be kept the SAME for all rockets launching during a particular competition. Each rocket will be launched using **12 ounces** of water and at **70 psi** of air pressure.

Middle/High: The maximum final Middle/High school Water Rocketry score should be between 0-100.

- Maximum hang time score: $(1) \times 100 = 100 \times 45\% = 45$
 - Max patch design score: $100 \times 15\% = 15$
 - Max technical report score: $100 \times 25\% = 25$
 - Max technical drawing score: $100 \times 15\% = 15$
- Maximum final score for four parts: $45 + 15 + 25 + 15 = 100$ (final scores should range from 0-100).
Final scores more than 100 will be disregarded.

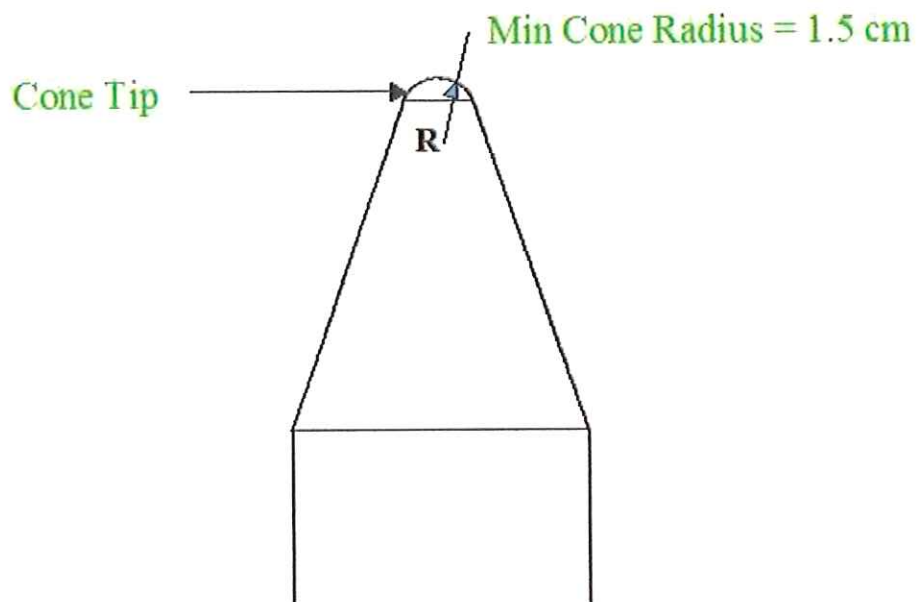
Elementary: The maximum final elementary Water Rocketry score should be between 0-100.

- Maximum hang time score: $(1) \times 100 = 100 \times 70\% = 70$
 - Max patch design score: $100 \times 30\% = 30$
- Maximum final score for both parts: $70 + 30 = 100$ (final scores should range from 0-100).

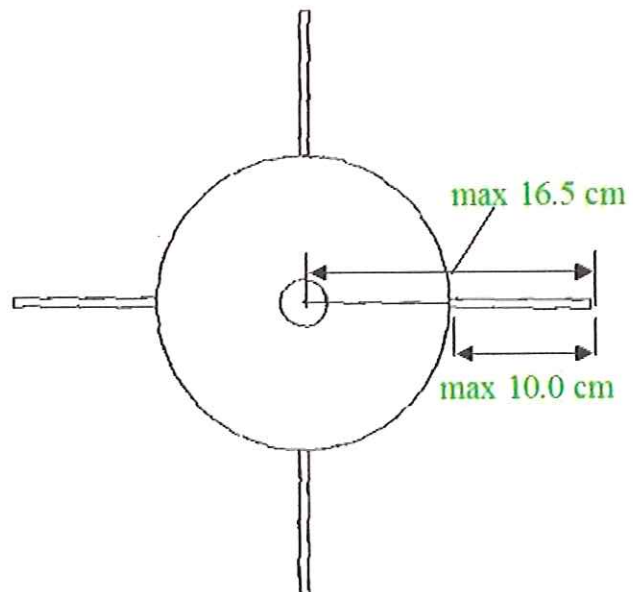
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NOSE CONE DIAGRAM



NOSE CONE DIAGRAM



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ROCKET IDENTIFICATION DIAGRAMS

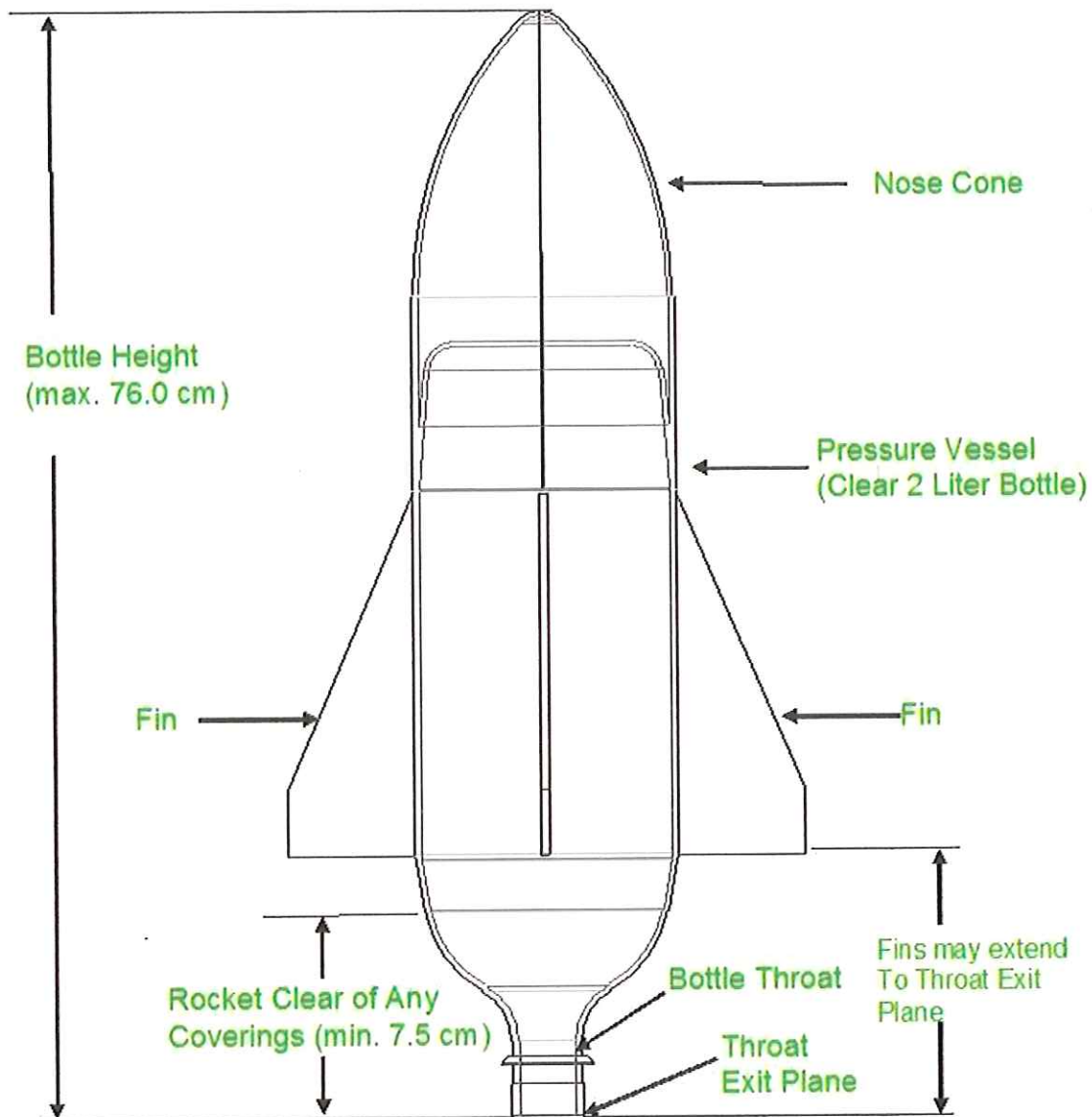


Diagram 1

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GUIDELINES FOR TESTING

ELEMENTARY:

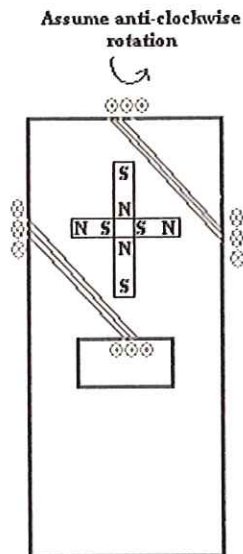
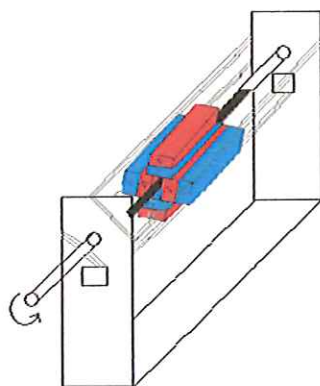
- Rotor will be turned by a standard electric drill at a set speed of approximately 200 rpm.
- Judging will be based on the maximum peak voltage output for duration of 10 seconds.
- The rotor is to stick out at least 2cm for the judges to attach the electric drill.
- The students must have an adult help them with the drill portion; when testing their design.
- The students are to construct a generator powered by wind.

MIDDLE:

- Wind source used shall be from a shop/home vacuum.
- Students will operate the vacuum themselves.
- Judging will be based upon maximum peak voltage output for duration of 30 seconds.
- The students are to construct a generator powered by water.

SENIOR:

- Water source used shall be from a 1 gallon container & a funnel with a flow rate of 2 gal/min
- Students to place the funnel apparatus and pour the water themselves.
- Judging will be based upon maximum peak voltage output for duration of 30 seconds.
- Water shall not come in contact with the generator structure. Students shall build a shielding device to prevent water from contacting the generator structure.



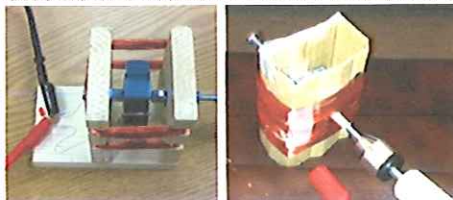
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FPL GENERATOR BUILD

(ELEM/MIDDLE/SENIOR)

An exposition event at the Miami-Dade District SECME Olympiad



The generator building competition will prepare the students for STEM programs by challenging them to understand the following:

- Basic forms of energy, including electrical, mechanical, and conversions from one form to another.
- The basic magnetic theory
- The relationship between magnetic and electric fields.
- The flow of electrical circuits.
- The law of electromagnetic induction (Faraday's Law).

Team Entry: Minimum of 2 and a maximum of 4 team members.

COMPONENTS-

Design:

- Construct a generator and measure the voltage output
- The voltage must be generated using electromagnetic induction (no static electricity, photovoltaic, etc)
- The design should produce a continuous voltage, not a single spike.

Communication:

- Team will be interviewed by judges (written and oral)
- Team shall provide a drawings with a one page abstract
- Technical Report (Future Competitions)

Generator Output: (Voltage output x 200)

- The highest voltage achieved in a timed duration (10 seconds for elementary or 30 seconds for middle & high school) will be recorded towards final score.

Team Interview: Max 100 points

- Application of technical principles (40pts) – Written test
- Knowledge of design (20pts)
- Demonstrate knowledge of Ohms Law (20pts)
- Creativity (20pts)

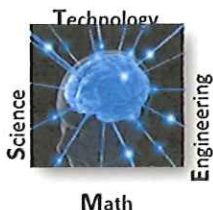
Design Drawing plus 1 page abstract: Max 100 points

REQUIREMENTS-

- Maximum Dimensions: 30 cm X 30 cm X 30 cm
- No batteries or external voltage source can be used.
- No generator kits allowed
- All items must be hand assembled
- Generator must be able to run for continuously for a duration of time- 10 seconds (elementary) or 30 Seconds (middle & high school)
- Materials such as wood, cardboard, plastic, etc. can be used for the base of the generator. Long nails, screws, pencils, etc. can be used for the rotor.
- 500' Maximum of #28AWG Magnetic Wire
- Magnets:
 - Elementary and Middle school must use option (a)
 - High school may choose either (a) or (b)
 - (a) Maximum 4: Ceramic Bar Magnets (3/8" x 7/8 x 1-7/8")
 - (b) Maximum 12: Neodymium Disc Magnets (3/16" x 1/4")

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SECME: STEM Superheroes!



ESSAY COMPETITION RULES (ELEM/MIDDLE/SENIOR)

SECME Student WebQuest and 2016-17 Essay Competition Guidelines

Due: Wednesday, December 14, 2016

Email: djaber@dadeschools.net AND hardcopy with registration

INTRODUCTION:

What makes you smile, gets you excited, makes you want to "do" something? What SECME activities that involve Science, Technology, Engineering, or Math do you find to be fun? Why are they fun? How can you make a living doing what you love to do? What kinds of careers use Science, Technology, Engineering, and Math? What level of education do you need to prepare you for these careers? This SECME competition will give you the opportunity to explore this year's SECME National Student Competition theme "**SECME: STEM Superheroes!**"

COMPETITION TASK:

All exploration requires going to where you have never gone before. This competition asks you to embark on a personal exploration and use your SECME experiences to guide you as you carefully research, plan, and deliver a well-written essay that reflects you have searched and discovered your own answers as to what STEMulates you in the areas of Science, Technology, Engineering, and Math. Be prepared to have *fortitude* while you gather your information, *resolve* as you structure your essay, and *diligence* as you make your essay the best it can be.

PROCESS:

Be prepared to use technology to travel to places around the world and beyond.

Be prepared to broaden your world of possibilities.

Be prepared to think about your future in different ways.

Be prepared to explain how your personal journey of discovery has helped you.

Your exploration will be divided into five phases and your essay will be proof that your journey was successful.

Phase 1: Interest Inventory

Phase 2: Career Search

Phase 3: Education Search

Phase 4: Persuasion

Phase 5: Essay Checklist, Form Completion, and Submission

Be prepared to be vigilant in following *all* instructions. Only those entries that have been attentive to the SECME Essay Competition Guidelines will be considered for awards. Each essay entry is to be prepared and submitted by an individual student (not a team).

WHAT DO YOU NEED? A willingness to discover, access to the Internet, a *Planning and Building Journal* to write down all the information you find, and your imagination! Are you ready?

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SECME WebQuest and 2016-17 Student Essay Phase 5: Essay Checklist, Form Completion, and Submission

**It's all about YOU!
(and Science, Technology, Engineering, and Mathematics...)**

Congratulations! You have reached the end of your WebQuest and have finished the hard work of composing an essay that will persuade the judges that you have learned a great deal from your mission.

Before you submit your essay, be sure you carefully follow the instructions:

1. Go through the *Essay Checklist* and look over the copy of *Judges' Evaluation Rubric*. Make sure your essay is the best it can be in all of the areas the judges will be assessing and that you've followed all the guidelines – **YOUR ESSAY SHOULD REFLECT THE PRIDE YOU HAVE IN WHAT YOU HAVE LEARNED AND WRITTEN!**
2. Make sure all the information is correct on the **required cover page that is to be included** when your essay is submitted.
3. Have your teacher submit your essay!

Good Luck with the judges – but you are already a winner because you've successfully completed a journey of personal exploration that you will remember for a lifetime!

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SECME WebQuest and 2016-17 Student Essay Phase 4: Persuasion

It's all about YOU!
(and Science, Technology, Engineering, and Math...)

You've done a lot of work. Time to put it all together and use your new knowledge to persuade the SECME Essay Competition Judges that you have figured out your destination! In Phase 4, you will need to be diligent. You've gathered a good bit of research, and now you need to decide how you can use it. The competition judges want you to help them understand:

- what STEMulates your mind in Science, Technology, Engineering, and Math
- what your research has shown you might be a career you want to pursue
- and what your research has shown you might just be the right university to make that happen!

Don't make the mistake of thinking that this phase of your journey will be easy. You will want to take your time and write several drafts before you submit your essay to the judges. Don't make the mistake of thinking that this phase of your journey will be easy. You will want to take your time and write several drafts before you submit your essay to the judges.

It's ok to ask for help after you write your drafts. However, YOU need to make sure that your essay is in YOUR words! The judges want to feel like YOU are talking to them, not a parent or a teacher or a friend...YOU! Others can make sure that your final copy is corrected so that it doesn't have errors, but they should NOT express your feelings for you – they are YOUR ideas and reactions to what you have discovered during your exploration. And don't forget to let the judges know if you were surprised by any information you found in your research – they will be interested to learn that your journey was a success. *A successful personal exploration will be one in which you learned something about yourself – about what gets you excited and ready to go for your goals.* You should NOT have known all of that before you started!! So, it's time to think, write, re-write, edit and then move on to Phase 5! Go ahead!

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SECME WebQuest and 2016-17 Student Essay Phase 3: Education Search
It's all about YOU!
(and Science, Technology, Engineering, and Math...)

Your *Journal* should be pretty full of information now...

Look back at your notes from Phase 1 and Phase 2 of your exploration. Do you have some ideas about what you like to do and about some careers that just might be fun for you to pursue? SO, NOW WHAT? Time to explore how to get prepared for a STEMulating career! HOW? You need to think about what kind of education you are going to need. In this phase of your journey, you are going to visit universities across the country... prepare to be surprised about how different they are! Take careful notes in your Journal.

1. It's back to the SECME Website (www.secme.org) homepage's link. Hover your mouse over "More" and select "Member Universities." If you click on the "Founding Universities" button in the upper right corner, you find the names of the six Deans and their universities that first met in 1975 to create SECME to encourage students like you to go to college and get degrees that would lead to STEMulating careers. That was **40 years ago!** Can you imagine how many SECME students have been STEMulated over the past 39 years because these Founders of SECME wanted kids to explore STEMulating lives?

2. Now go back one page to see the "SECME University Council Member Institutions." You will find **42 universities** that have engineering programs that support SECME! That's A LOT of university engineering programs that are just waiting for you to get to know them!

- ☐ Get a map of the United States. Take time and click on the different university links. Find their locations on the map. What university is closest to you? What university is the farthest away?
- ☐ Most of the university engineering programs have interesting information and really fun summer programs. Explore the sites and see what you can find!
- ☐ What university engineering schools look like a place you could see yourself in the future?

There's tons of information at your fingertips – Enjoy! Don't forget to take good notes! You're almost ready to start your essay!

2017 DISTRICT SECME FESTIVAL AND OLYMPIAD COMPETITION RULES

SECME: STEM Superheroes!

SECME WebQuest and 2016-17 Student Essay Phase 2: Career Search

It's all about YOU!

(and Science, Technology, Engineering, and Math...) ...)

On this next leg of your exploration, it's time to find out what career just might be STEMulating for you! Let yourself be surprised by what you might find that you never even knew was a "job." The links below are just a beginning. Ask for help to find other good Internet sites. And don't forget to use your *Journal* to log all the places you go! You never know when you might want to check your *Journal* as you move through the next phases of your personal journey.

1. First visit the SECME Website (www.secme.org). On the green menu bar across the top, hover your mouse over "More" and click on "Gov & Industry Partners." When you click on this link, you will see the seven (7) corporations that are major SECME sponsors. Click on each one to visit their Websites – have fun looking at all the cool things they do!
2. Plan to take a few days for this next step in your exploration: Go back to the green menu bar at the top of the website and hover your mouse over "More." This time, click on "Other Alliance Partnerships." There are many industries and government agencies that help to support your SECME program in many different ways. Find one that is familiar, click on its link, and explore its website. Then find one that you have never heard of before and explore it, too. Take a few days to explore all the links...you will be STEMulated by all the opportunities and information out there just waiting to be discovered!
3. Now that you have new information about many different industries and government agencies that are STEMulating, visit some websites that tell you about different careers in Science, Technology, Engineering, and Math. There are several listed below you can go to, but don't stop there! Get some help to find other information. And, of course, don't forget to use your *Journal* to keep a record of all the interesting information you discover!

<http://www.aboriginalaccess.ca/adults/types-of-engineering>

<http://www.egfi-k12.org/>

<http://www.egfi-k12.org/#!/cards/mechanical>

<http://www.egfi-k12.org/#!/cards/computer>

<http://teachers.egfi-k12.org/resource-engineering-scholarships/>

<http://www.stem-works.com/>

<http://www.coolmath.com/careers.htm>

<http://www.ams.org/ams/what-mathdegree.pdf>

<http://www.maa.org/careers/>

http://www.pbs.org/safarchive/5_cool/53_career.html

<http://library.thinkquest.org/J0113274/index.htm>

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SECME: STEM Superheroes!

SECME WebQuest and 2016-17 Student Essay Phase 1: Interest Inventory

It's all about YOU!

(and Science, Technology, Engineering, and Math...)

What STEMulates your imagination? What SECME experiences are fun?

Do you enjoy working with a team to build mousetrap cars? Balsawood bridges? Water bottle rockets?

Do you enjoy creating the engineering drawing that shows the design that was used?

Do you like the challenge of figuring out ways to build a "better" car or bridge or water bottle rocket?

Do you like to do research on interesting science, technology, engineering, and math topics? Do you like to plan big projects?

Do you love the roar of engines? Does forensic science excite you? Maybe you love computers or robotics. Ask yourself "What am I so excited about and would love to have a career doing every day; wake up thinking about it and go to sleep thinking about it, and never getting bored with it?" Whatever your answer is, that is your "passion" and that passion will help drive you to become successful at it.

1. Get out your *Planning and Building Journal* and answer these questions for yourself. Take some time! Don't worry about going fast. Really search your memories and write down your thoughts...

2. Now, talk to your friends, your teachers, your relatives – ask them what they think you enjoy and write down their answers in your Journal (you might be surprised by what they say!).

3. Then do some Internet research. Below are some interesting links, but you are not limited to just these! Ask your teacher for help finding other sites to visit. Don't have the Internet at home? No problem! Go to your local public library – and be sure to tell the librarian that you are doing research and ask for help!

Take your time and have fun! Don't forget to use your *Journal* to write down information – use as many pages as you want. You never know what you might need for the next phases of your exploration...

<http://www.texascaresonline.com/>

<http://www.discovere.org/discover-engineering>

<http://www.greatachievements.org/>

<http://stemcareer.com/>

<http://www.onetonline.org/find/stem?t=0>

<http://www.wisegeek.com/science.htm>
