

2022-2023
SECME National Engineering Design Student
Competition

Judging Evaluation Forms



Elementary School Division



**SECME National Engineering Design Student
Competition
Judging Evaluation Forms
Elementary School Division**

Table of Contents

Written Report Evaluation Instructions (MTC/WBR)	3
Written Report Judge's Evaluation Form (MTC/WBR)	4
Mousetrap Car Judging	6
Construction and Operation Judge's Evaluation Form (MTC) – In Person	6
Construction and Operation Judge's Evaluation Form (MTC) – Virtual	7
VEX IQ Robotics Judging	8
Engineering Notebook Judge's Evaluation Instructions	8
Engineering Notebook Judge's Evaluation Form (VEX IQ Robotics)	9
Water Bottle Rocket Judging	10
Construction and Operation Judge's Evaluation Form (WBR) – In Person	10
Construction and Operation Judge's Evaluation Form (WBR) - Virtual	11
Patch Design Challenge Judge's Evaluation Instructions (WBR)	12
Patch Design Challenge (WBR) – Judge's Evaluation Form	13
The Art of Engineering Judge's Evaluation Instructions	14
The Art of Engineering Judge's Evaluation Form - Virtual	15
Essay/Vision Board Judge's Evaluation Instructions	16
SECME Vision Board Judge's Evaluation Form—Grades Pre-K-2	18
SECME Essay/Vision Board Judge's Evaluation Form-Grades 3-5	19



**SECME National Engineering Design Student
Competition
Judging Evaluation Forms
Elementary School Division**

Written Report Evaluation Instructions (MTC/WBR)

Elementary School Division

As a part of the SECME National Student Engineering Design Competition, the SECME student(s)/student team(s) is required to write a Written Report describing the design, construction, and operation of the Mousetrap Car or Water Bottle Rocket. The main body of the report should be a maximum of two pages.

EVIDENCE OF PLAGIARISM OR RE-SUBMISSION OF PREVIOUS YEARS' REPORTS WILL RESULT IN A ZERO SCORE.

Structure

1. Cover page
 - a. Title of the SECME Written Report – The title is this year's competition theme
 - b. SECME Competition Division
 - c. SECME Team Name
 - d. Each SECME student team member's name, grade
 - e. Official School District Name
 - f. SECME team's official school name, city, state, and zip
 - g. SECME School Coordinator's (or Teacher's) name and email
 - h. Date
2. Double-spaced text
3. One-inch borders at the top, bottom, and on each side
4. 12 pt. acceptable standard font, computer typed
5. The report is neat; the pages are numbered (do not number the cover page)

Content

1. Writing includes an original introduction and conclusion
2. Writing contains ideas that are fully developed, fully supported, and describe the design, construction, and operation of the vehicle
3. Writing is logical and coherent as a whole
4. Mousetrap Car must include handwritten calculations.
5. Water Bottle Rocket must include calculation exercises
6. The written report should include the completed Materials List with receipts (These should not be counted in the two-page limit).

Mechanics, Spelling, and Grammar

The written report should reflect the SECME student(s)/student team(s) professionalism and pride, free of errors.

NOTE: Unsubmitted Written Reports will receive a zero score.



**SECME National Engineering Design Student
Competition
Judging Evaluation Forms
Elementary School Division**

**Written Report Judge's Evaluation Form (MTC/WBR)
Elementary School Division**

Official School Name			
Official School District		State	
Competition Event	Mousetrap Car <input type="checkbox"/>	Water Bottle Rocket <input type="checkbox"/>	
SECME Team Name			
Student Full Name #1		Grade	
Student Full Name #2		Grade	
Student Full Name #3		Grade	
Judge's Name		Date	

STRUCTURE (0 – 10 pts)

POINTS

- Cover Page (0 – 5 pts) _____/5
 - Title of report, division, team name, each team member's name, grade, email
 - Official school name and address, official district name, SECME Coordinator/Teacher name
 - Date
- 1" margins (0 – 1 pts) _____/1
- 12 pt./Standard Font/Computer Typed (0 – 1 pt.) _____/1
- Double-spaced Text (0 – 1 pts) _____/1
- Report is neat (0 – 1 pts) _____/1
- Pages are numbered and in order (0 – 1 pt.) _____/1

STRUCTURE TOTAL (*maximum 10 pts*)

_____/10

CONTENT (0 – 60 pts)

- Writing includes an original introduction (0 – 10 pts) _____/10
- Writing includes ideas that are fully developed, supported, and describe the design, construction, and operation of the car (0 – 15 pts) _____/15
- Writing is logical and coherent as a whole (0 – 15 pts) _____/15
- Writing includes an original closing (0 – 15 pts) _____/15
- Handwritten Calculations (0 – 5 pts) _____/15

CONTENT TOTAL (*maximum 60 pts*)

_____/60



**SECME National Engineering Design Student
Competition
Judging Evaluation Forms
Elementary School Division**

MECHANICS, SPELLING & GRAMMAR (0 – 30 pts):

- Writing is free of punctuation errors (age-appropriate) (0 – 5 pts) _____ **/5**
- Writing is free of spelling errors (age-appropriate) (0 – 10 pts) _____ **/10**
- Writing has correct subject/verb agreement and is free of sentence errors, misplaced sentence parts, sentence fragments, run-ons, etc.
(age-appropriate) (0 – 15 pts) _____ **/15**

MECHANICS, SPELLING & GRAMMAR TOTAL (*maximum 30 pts*) _____ **/30**

OVERALL TOTAL (*maximum 100 pts*) _____ **/100**

SECME Materials List & receipts were included in Written Report NO YES

TOTAL COST \$ _____

Judge's Comments (please use the back page for additional space.)



**SECME National Engineering Design Student
Competition
Judging Evaluation Forms
Elementary School Division**

Mousetrap Car Judging

Construction and Operation Judge's Evaluation Form (MTC) – In Person
Elementary School Division – For Local, District, State, and Regional competitions.

Official School Name			
Official School District		State	
SECME Team Name			
Student Name #1		Grade	
Student Name #2		Grade	
Student Name #3		Grade	
Judge's Name		Date	

Calculation Formulas

$$P = \frac{D}{L} \times \frac{D}{T} \times \frac{C_H}{C} \qquad F = \frac{P}{P_H} \times 100$$

L, Length	cm
C, Cost	\$
C _H , Highest Cost	\$2.50
D ₁ , Distance	cm
T ₁ , Time	s
P ₁ , Performance	
D ₂ , Distance	cm
T ₂ , Time	s
P ₂ , Performance	
P _H , Highest Performance	

Mousetrap Car Performance Point Score:

$$\text{Final Score} = (\text{Performance Score}) \times 0.5 + (\text{Written Report}) \times 0.5$$

Final Score = _____

NOTE: The maximum mousetrap car final score is 100 pts.

Judge's Comments (please use the back page for additional space.)



**SECME National Engineering Design Student
Competition
Judging Evaluation Forms
Elementary School Division**

**Construction and Operation Judge's Evaluation Form (MTC) – Virtual
Elementary School Division – For SECME National or any virtual competitions.**

Official School Name			
Official School District		State	
SECME Team Name			
Student Name #1		Grade	
Student Name #2		Grade	
Student Name #3		Grade	
Judge's Name		Date	

Calculation Formulas

$$P = \frac{D}{L} \times \frac{D}{T} \times \frac{C_H}{C} \qquad F = \frac{P}{P_H} \times 100$$

L, Length	cm
C, Cost	\$
C _H , Highest Cost	\$2.50
D ₁ , Distance	200 cm
T ₁ , Time	30 s
P ₁ , Performance	
P _H , Highest Performance	

Mousetrap Car Performance Point Score:

$$\text{Final Score} = (\text{Performance Score}) \times 0.5 + (\text{Written Report}) \times 0.5$$

Final Score = _____

NOTE: The maximum mousetrap car final score is 100 pts.

Judge's Comments (please use the back page for additional space.)



**SECME National Engineering Design Student
Competition
Judging Evaluation Forms
Elementary School Division**

VEX IQ Robotics Judging

Engineering Notebook Judge's Evaluation Instructions

One of the VEX IQ Robotics Competition's main missions is to help SECME student teams acquire real-world life skills to benefit them in their academic and professional future. The Engineering Notebook is a way for student teams to document the engineering design process during the VEX IQ Robotics Competition. The engineering notebook gives student teams the practice of essential life skills, including project management, time management, brainstorming, and teamwork. The engineering notebook reflects the documentation of the student team's design decisions and efforts in creating a novel and innovative competitive robot. SECME student teams should start their engineering notebooks early and update them often and daily. Write handwritten notes and documentation neatly and clearly for judges to read without difficulty.

Engineering is an iterative process requiring students to recognize and define a problem, brainstorm, and work through various stages of the design process, test their designs, improve their designs, and continue the process until a solution has been produced. During this process, students will come across obstacles, encounter successes and failures, and learn many lessons. It is this process that students should document in their Engineering Notebook.

The engineering notebook is an opportunity to document everything a SECME student team does and serve as a historical guide of lessons learned and best practices that can benefit the SECME student team in future years. SECME students may document any number of things in their engineering notebooks. For example, team meeting notes, design concepts and sketches, pictures, notes from competitions, biographies of the members of their team (students, teachers, Coordinators, and mentors), observations and thoughts of team members throughout the season, team organization practices, and any other notes that a team finds useful.

Requirements

1. Cover page
 - a. Title of the Engineering Notebook – Example: SECME Engineering Design Competition: VEX IQ Robotics Engineering Notebook)
 - b. SECME Team Name
 - c. Each SECME student team member's name, grade
 - d. Official School System/District Name
 - e. SECME team's official school name, city, state, and zip
 - f. SECME School Coordinator's (or Teacher's) name and email
2. Table of Contents
3. Provide a brief description of each SECME team member and their strengths and benefits
4. Design ideas
5. SECME Team meeting notes (daily entries)
6. Construction of the robot
7. Operation
 - a. Describe how the robot has been designed to achieve the object of the VEX IQ Robotics game and general novel features
8. Problems encountered and methods to resolve them
9. Conclusion/Future Recommendations



**SECME National Engineering Design Student
Competition
Judging Evaluation Forms
Elementary School Division**

**Engineering Notebook Judge's Evaluation Form (VEX IQ Robotics)
Elementary School Division – For SECME National or any virtual competitions.**

Official School Name			
Official School District		State	
SECME Team Name			
Student Name #1		Grade	
Student Name #2		Grade	
Student Name #3		Grade	
Judge's Name		Date	

The engineering notebook should be written clearly and concisely and exhibit the complete documentation and illustration of the team's design, construction, and testing processes for their robot to achieve the object of the VEX IQ Robotics game.

EVALUATION CATEGORIES

POINTS

Layout (0 – 25 pts)

 /25

Is the engineering notebook organization easily understood?

Documentation (0 – 15 pts)

 /15

The team regularly demonstrates and illustrates frequent updates (ex., once a week, biweekly, and monthly) documenting the entire team's work.

Design Process (0 – 40 pts)

 /40

The team shows evidence of a trial-and-error design process that highlights the various phases and development of the team's robot.

Sketches/Photographs (0 - 10 pts)

 /10

Does the engineering notebook include sketches/photographs?

Replicate (0 – 10 pts)

 /10

Can the engineering notebook be used to replicate the team's robot?

TOTAL (The highest possible score is 100 pts)

 /100

Judge's Comments (please use the back page for additional space.)



**SECME National Engineering Design Student
Competition
Judging Evaluation Forms
Elementary School Division**

Water Bottle Rocket Judging

**Construction and Operation Judge's Evaluation Form (WBR) – In Person
Elementary School Division – For Local, District, State, and Regional competitions.**

Official School Name			
Official School District		State	
SECME Team Name			
Student Name #1 (Mission Captain)		Grade	
Student Name #2 (Mission Specialist)		Grade	
Student Name #3 (Mission Specialist)		Grade	
Judge's Name		Date	

WATER BOTTLE ROCKET REQUIREMENTS:

Requirement Met (check one):

Overall Height: (maximum 76 cm)	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
Fin Width Distance (from pressure vessel): (maximum 10 cm)	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
Nose Cone Tip Radius: (minimum 1.5 cm)	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
Throat Exit Clearance: (minimum 7.5 cm)	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>

SCORING:

Hangtime (s)

JUDGE #1 NAME: _____

JUDGE #2 NAME: _____

JUDGE #3 NAME: _____

AVERAGE HANGTIME (s): _____

FINAL SCORE CONSTRUCTION AND OPERATION: $\frac{\text{Average SECME team Hangtime (s)}}{\text{Maximum Hangtime (s)}} \times 100\% = \underline{\hspace{2cm}}$

$\frac{\text{Average SECME team Hangtime (s)}}{\text{Maximum Hangtime (s)}} \times 100\% = \underline{\hspace{2cm}}$

FINAL SCORE: Final Score = Hangtime Score(0.40) + Written Report(0.25) + Patch Design(0.35) = Final Score = _____pts

NOTE: The maximum final elementary Water Bottle Rocket score is **100 pts.**

Judge's Comments (please use the back page for additional space.)



**SECME National Engineering Design Student
Competition
Judging Evaluation Forms
Elementary School Division**

**Construction and Operation Judge's Evaluation Form (WBR) - Virtual
Elementary School Division – For SECME National or any virtual competitions.**

Official School Name			
Official School District		State	
SECME Rocket Team Name			
Student Name #1 (Mission Captain)		Grade	
Student Name #2 (Mission Specialist)		Grade	
Student Name #3 (Mission Specialist)		Grade	
Judge's Name		Date	

WATER BOTTLE ROCKET REQUIREMENTS:

Requirement Met (check one):

Overall Height: (maximum 76 cm)	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
Fin Width Distance (from pressure vessel): (maximum 10 cm)	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
Nose Cone Tip Radius: (minimum 1.5 cm)	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
Throat Exit Clearance: (minimum 7.5 cm)	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>

FINAL SCORE: Final Score = Written Report(0.50) + Patch Design(0.50)

Final Score = _____pts

NOTE: The maximum final elementary Water Bottle Rocket score is 100 pts.

Judge's Comments (please use the back page for additional space.)

Patch Design Challenge Judge's Evaluation Instructions (WBR)

What is a patch? A patch is a creative display that reflects the dedication and mission of the SECME student team. This symbolic picture must comply with the following patch design challenge:



NOTE: Inappropriate patch designs will be removed from the competition. The SECME team will receive a score of zero for patch design.

The Patch Design will be judged on the following criteria:

1. Paper Size Requirement (13" × 13" poster board)
2. SECME Theme: your school or ISL mascot or school motto.
3. Appearance
4. Creativity
5. Explanation of Patch



**SECME National Engineering Design Student
Competition
Judging Evaluation Forms
Elementary School Division**

**Patch Design Challenge (WBR) – Judge’s Evaluation Form
Elementary School Division**

Official School Name			
Official School District		State	
SECME Team Name			
Student Name #1 (Mission Captain)		Grade	
Student Name #2 (Mission Specialist)		Grade	
Student Name #3 (Mission Specialist)		Grade	
Judge’s Name		Date	

<u>EVALUATION CATEGORIES</u>	<u>POINTS</u>
Paper Size Requirement (0 – 5 pts)	<u> </u> /5
The correct patch size is 13" × 13".	
SECME Theme (0 – 20 pts)	<u> </u> /20
Incorporation of competition theme: your school or ISL mascot or school motto and team name	
Appearance (0 – 20 pts)	<u> </u> /20
Attractiveness and neatness of the patch	
Creativity (0 – 25 pts)	<u> </u> /25
The uniqueness of the information depicted	
Explantation of patch design (0 – 30 pts)	<u> </u> /30
A description on the back of the patch that explains each part or idea	
Total (maximum 100 pts)	<u> </u> /100

Judge’s Comments (please use the back page for additional space.)



**SECME National Engineering Design Student
Competition
Judging Evaluation Forms
Elementary School Division**

The Art of Engineering Judge's Evaluation Instructions

This competition component showcases the **ART** in the SECME student team engineering design of their vehicle.

AOE is an opportunity for SECME student teams to showcase and discuss the design approach used for their car, rocket, or robot. **The AOE competition only takes place at National Competition Finals.**

New! The AOE video presentation is a virtual only competition.

1. This video presentation showcases the **ART** in the SECME student team engineering design of their car, rocket, or robot.
2. Each SECME student team will submit a five to seven-minute video on their car, rocket, or robot from a creative, innovative, and artistic perspective.

In the video, teams will:

- Introduce their team and themselves
- Introduce their final design
- Walk through their design process
 - Brainstorming design ideas – initial sketches and ideas
 - Prototype Versions – at least two versions
 - What each prototype looked like (image or drawing)
 - What changes were made from each version
 - Final Design
 - Technical drawing and image
 - What changes were made from the last prototype
 - Why this design is your final design

Every student team member must contribute to a piece of the video to get all possible points. Be interactive and engaging in your presentation.

Dress Code. The Art of Engineering showcase's required



**SECME National Engineering Design Student
Competition
Judging Evaluation Forms
Elementary School Division**

**The Art of Engineering Judge's Evaluation Form - Virtual
Elementary School Division**

Official School Name			
Official School District		State	
Please check Competition Event	Mousetrap Car <input type="checkbox"/> VEX IQ Robotics <input type="checkbox"/> Water Bottle Rocket <input type="checkbox"/>		
SECME Team Name			
Student Full Name #1		Grade	
Student Full Name #2		Grade	
Student Full Name #3		Grade	
Judge's Name		Date	

EVALUATION CATEGORIES: (0 – 100 pts)

POINTS

Creative and Innovative (0 – 30 pts)

 /30

Is the design of the vehicle creative and innovative?

Five to seven-minute Video Presentation (0 -40 pts)

 /40

Each student member contributes to the pitch.

The team sold its car or robot design and capabilities.

Judge's overall experience and interaction with the SECME team

Design Process (0 -30 pts)

 /30

Presentation details the design process of the build

Brainstormed Initial Designs, 2 Prototype Designs (min), Final Designs

Technical Drawings and Construction Images

Total Score (maximum 100 pts)

 /100

Judge's Comments (please use the back page for additional space.)



**SECME National Engineering Design Student
Competition
Judging Evaluation Forms
Elementary School Division**

Essay/Vision Board Judge's Evaluation Instructions

SECME's essay and vision board competitions are written and illustrative representations of the of the topics below. **Essays can be written around Topics 1-4. All vision boards are created around Topic 1.** All essay/vision board submissions will require a cover page.

- Grades Pre-K-2 - students will only create vision boards around Topic 1.
- Grades 3-5 - students can choose any topic for the essay portion of the competition. Students will create vision boards around Topic 1.

Topics

1. How has participation in SECME helped you to discover my STEM dream job?
2. How has the COVID-19 pandemic shown the importance of STEM?
3. Environmental issues
 - a. Forest Fires
 - b. Global Warming
4. How is Artificial Intelligence (AI) beneficial to technology? What are the limitations of AI technologies in STEM fields?

Topics are open to all grade levels; however, some topics may require more critical thinking, explanations, and details, depending on the grade level.

Competition Requirements

Follow all instructions. Each essay and vision board entry must be prepared and submitted by an individual SECME student.

When choosing topics 2-4, answer the questions:

- A. How does or how should STEM impact these global or environmental issues?
- B. How do you see yourself contributing to the solution to these global or environmental issues?
We encourage you to use your imagination.
- C. How do you see yourself contributing to the use of AI technologies in STEM fields?

The vision board can be hand drawn or created using a computer program. For boards created by hand, teams can use materials such as magazine clippings, newspaper clippings, crayons, markers, colored pencils, colored pens, or paint. Clip art or electronic visual graphics are allowed when designing on a computer. Your vision board must be one page, and it can either be positioned in portrait or landscape.

Grades Pre-K – 2

Using topic 1, Create your vision board on paper. Next, working with your SECME Coordinator or parent/guardian, record a four-minute maximum video message explaining your vision board and how participation in SECME has helped you to choose that career path.

Submission of your vision board must include the following:

- a. Required cover page
- b. Vision Board drawing is one page in length and can be positioned either in portrait or landscape
- c. Four-minute (max) video explaining your vision board



**SECME National Engineering Design Student
Competition
Judging Evaluation Forms
Elementary School Division**

Grades 3 – 5

Choose a topic from the topic list (1-4) to write your essay.

Using Topic 1, Create your vision board. Write a paragraph or two describing your vision board.

Writing is critical, but it is a learned skill, and some students perfect it sooner than others. As an optional addition to writing, you may record a four-minute video explaining your vision board!

Submission of the essay/vision board must include the following:

1. Required cover page
2. The essay should contain 500 – 1,000 words
3. Write a one-paragraph description of your vision board (note that your description should be included in your essay, not on the vision board page)
4. Vision Board drawing is one page in length and can be positioned either in portrait or landscape
5. Four-minute (max) video explaining your vision board (optional)



**SECME National Engineering Design Student
Competition
Judging Evaluation Forms
Elementary School Division**

**SECME Vision Board Judge's Evaluation Form—Grades Pre-K-2
Elementary School Division**

Official School Name			
Official School District		State	
Student Name		Grade	
Essay Title			
<u>Check One</u>			
1. How has participation in SECME helped you to discover my STEM dream job?			
Judge's Name		Date	

ORGANIZATION

POINTS

Includes required cover page, vision board

_____/5

Paper size Requirements

_____/5

TOTAL ORGANIZATION (10 pts)

_____/10

VISION BOARD

Appearance/Effort (0 - 30 points)

_____/30

Creativity/Originality (0 - 30 points)

_____/30

Video explanation of vision board (0 - 30 points)

_____/30

TOTAL VISION BOARD (90 pts)

_____/90

TOTAL POINTS

_____/100

Judge's Comments (please use the back page for additional space.)



**SECME National Engineering Design Student
Competition
Judging Evaluation Forms
Elementary School Division**

**SECME Essay/Vision Board Judge's Evaluation Form-Grades 3-5
Elementary School Division**

Official School Name			
Official School District		State	
Student Name		Grade	
Topics 1-4	1. How has participation in SECME helped you to discover my STEM dream job? 2. How has the COVID-19 pandemic shown the importance of STEM? 3. Environmental issues a. Forest Fires b. Global Warming 4. How is Artificial Intelligence (AI) beneficial to technology? What are the limitations of AI technologies in STEM fields?		
Judge's Name		Date	

ESSAY ORGANIZATION

POINTS

Includes required cover page, essay, vision board, and vision board explanation. The essay is double-spaced, with 1"-inch margins, and in an approved 12-point font. The essay includes an introduction, body, conclusion, and bibliography

TOTAL ORGANIZATION (0 - 5 pts) _____/5

TOPIC 1: SECME EXPERIENCE

The writer explains how their SECME experience will help prepare them for a STEM career.

_____/25

The writer identifies how their SECME experience is the spark for their interest in STEM.

_____/20

The writer explains the STEM discipline or activity that captures their interest

_____/20

TOPIC 1 TOTAL (0 - 65 pts) _____/65

TOPICS 2-4 CONTENT AND FOCUS

Does the writer demonstrate a credible argument on the importance of STEM? _____/35

Does the content align with the topic chosen for the essay? _____/30

TOPICS 2-4 TOTAL (0 - 65 pts) _____/65

WRITING STYLE



**SECME National Engineering Design Student
Competition
Judging Evaluation Forms
Elementary School Division**

Writing is age-appropriate, logical, cohesive, and flows. Ideas are fully developed and supported in their bibliography. The writer's voice is strong and convincing.

TOTAL WRITING STYLE (0 - 10 pts) _____ **/10**

FORMAT, PUNCTUATION, AND MECHANICS

Writing is free of (age-appropriate) punctuation errors

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

Writing is free of (age-appropriate) spelling errors

Total Writing Style (0 - 20 pts) _____ **/20**

TOTAL ESSAY/PICTURE BOOK (0 - 100 pts) _____ **/100**

VISION BOARD AND EXPLANATION

Appearance/Effort (0 - 30 pts) _____ **/30**

Creativity/Originality (0 - 30 pts) _____ **/30**

Explanation of vision board (0 - 40 pts) _____ **/40**

TOTAL VISION BOARD (0 - 100 pts) _____ **/100**

TOTAL ESSAY/VISION BOARD (0 - 200 pts) _____ **/200**

Judge's Comments (please use the back page for additional space.)