MOUSETRAP CAR COMPETITION

GUIDELINES FOR 2010 – 2011 SECME ENGINEERING DESIGN COMPETITION (MOUSETRAP CAR: CONSTRUCTION AND OPERATION)

ENGINEERING DESIGN COMPETITION REQUIREMENTS:

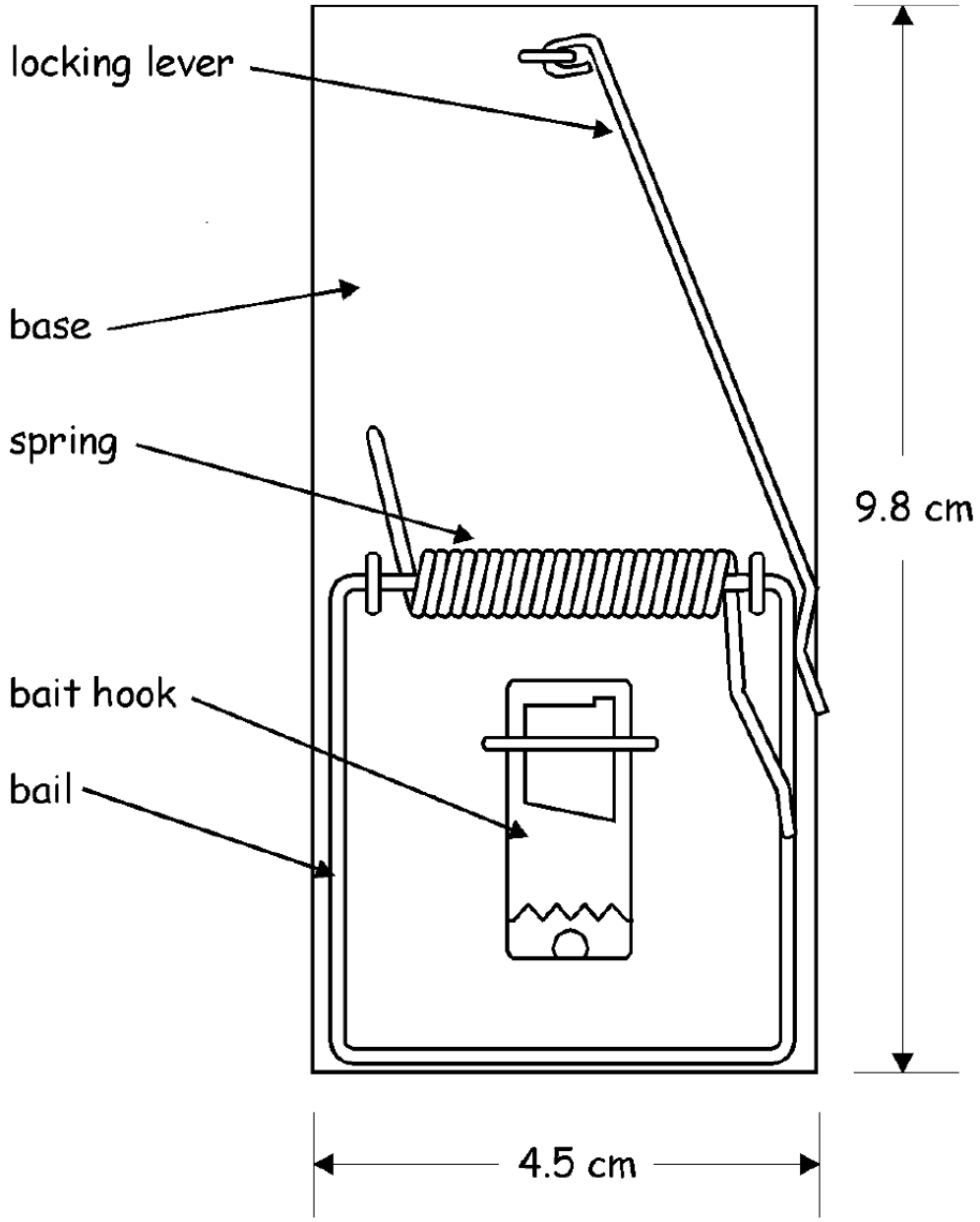
(Any entry not meeting the following requirements will be disqualified.)

1. The Engineering Design Competition **requires participation in each of these three areas**:
    a. Mousetrap Car Construction and Run
    b. Design Drawing of Mousetrap Car (***not required for elementary)***
    c. Technical Report on Mousetrap Car
2. This is a **team competition** and should reflect the coordinated efforts of all members. **Three (3) students must be on each team**.
3. Each team member is expected to be able to serve as a spokesperson and be fully involved with all aspects of the entry.
4. **A standard mousetrap**--usually about 4.5 X 10 centimeters and weighing about 25 grams—**must be used to build the car**.
5. Components of the mousetrap are: base (on which other components are mounted), spring, bail, locking lever, and bait hook (see component sketch on next page).
6. The mousetrap spring must be the sole source of power. **(You may NOT use rubber bands, CO2 boosters, or any other agent or element for extra power).**
7. **In design and construction of the car, the original mousetrap spring and wood base MUST remain intact**. These two components may **NOT** be cut or altered in any way—physically, chemically, or thermally. Only the locking lever and bait holder may be removed from the base, if desired. **The bail may be straightened but NOT cut (shortened), added on to, or reinforced. It must remain as a component of the completed car**.
8. The spring must be visible and/or accessible to the judges for inspection.
9. The car must have a minimum of three wheels and can be made as long or short as desired as long as requirement #7 above is met.
10. Cars will be tested on a smooth flat surface. **Distance is measured from the starting line to the farthest point of travel, utilizing a straight line to connect the two points.**
11. **There will be two runs for each car; the better run will be used for final scoring of the mousetrap car's performance.**
12. **Elementary Performance Score**
    The Performance score for the car run is:

$$F = \frac{D}{D_L} \; X \; 100$$

where:
D.. Distance is measured from the starting point to the stopping point of travel, utilizing a straight line to connect the two points (measure in centimeters)
D_L...is the highest Performance score at the competition site.
F....is the final Performance score (to be combined with score from the Written Report).

Reference Sketch of Original Mousetrap with Component Identifications



Middle and Senior High School Performance Score:

13. Two formulas are used to calculate the Performance score for the car run:

$$N = \left(\frac{w}{W}\right) X \left(\frac{D}{L}\right)^2 \quad \text{and} \quad F = \frac{N}{N_L} \; X \; 100$$

where:

N....is the score.

To ensure that cars actually perform and not just be small and light,
N=0 if D is LESS than 300 centimeters (for elementary and middle school teams)
N=0 if D is LESS than 600 centimeters (for high school teams)

w....is the mass of the original mousetrap (always taken as 25 grams). NOTE: At all competitions, this standard value will be used in calculating the Performance score.

W....is the total mass of the completed car in grams.

D....is distance measured in a straight line from the starting point to the stopping point in centimeters. D=2,500 if the car travels 2,500 centimeters or more.

L....is the car's longest measurement along one of the three basic dimensions—length, width, or height—in centimeters, measured with the bail extended or retracted, whichever is greater.* **Please refer to MOUSETRAP CAR DRAWING EXAMPLE for more information on how to measure L**.

N_L...is the highest Performance score at the competition site.

F....is the final Performance score (to be combined with scores for the Design Drawing, and Technical Report).

**Judges will measure "L" (see illustration on following page) and "W" prior to the mousetrap car Performance runs. These measurements, together with "D" (determined by the car's run), are used to calculate "N" in the formula above.*

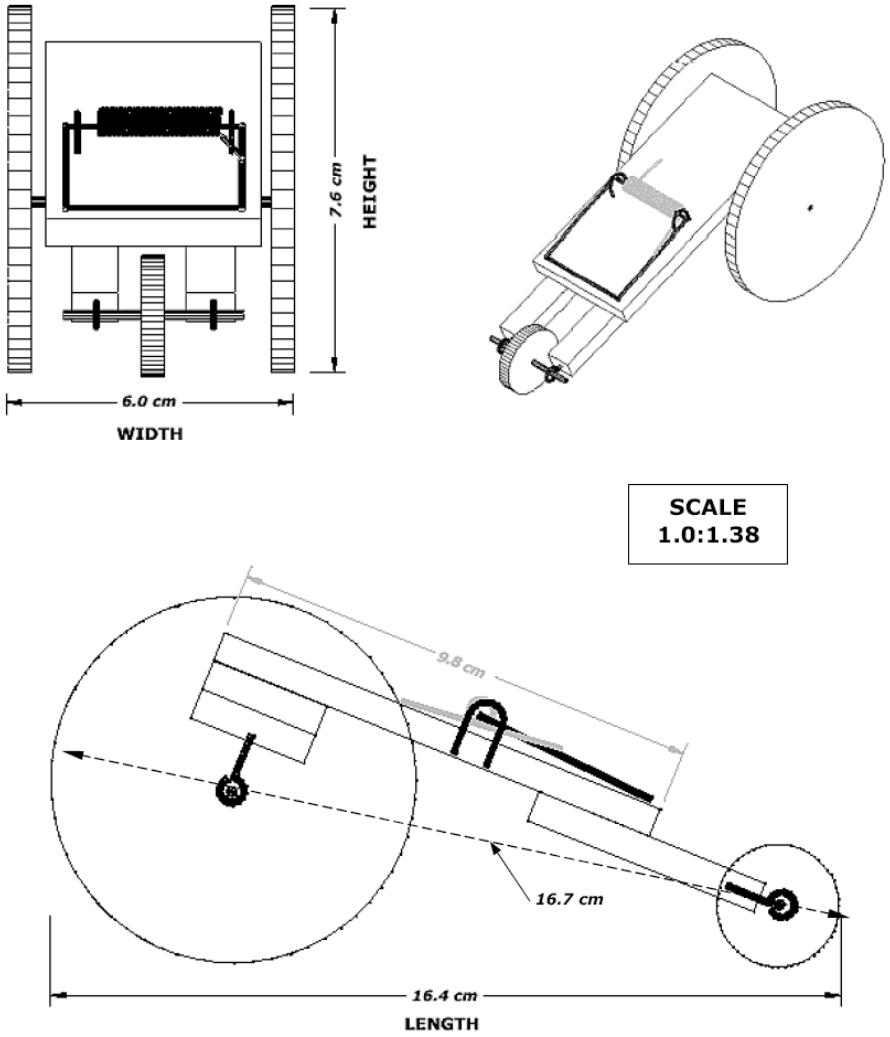
14. Overall Team Score in competition is sum of: 1) Performance (car run) as calculated above (max. 100 points); 2) Design Drawing (max. 50 points); and 3) Technical Report (max. 50 points). **Thus the maximum total is 200 points**.

15. See pages that follow for guidelines and evaluation sheets on each component of the Engineering Design (Mousetrap Car) Competition.

***NOTE:**

Measurement of "L," the Mousetrap Car's Longest Dimension
In Any Direction—Length, Width, or Height

Measurement of "L," the Mousetrap Car's Longest Dimension
In Any Direction—Length, Width, or Height



"L" is the car's longest measurement along one of the three basic dimensions—length, width, or height—in centimeters, measured with the bail extended or retracted, whichever is greater. The length of the car is defined as the distance from the farthest point at the rear of the car to the farthest point at the front. Likewise, the width of the car is defined as the distance from the farthest point on one side to the furthest point on the other. The height of the car is defined as the distance from the travel surface to the highest point of the car.

L (for this example) = 16.4 cm

Please Check: Elementary School ___
Team Name: _____ School Name: _____

District: Miami-Dade City/State_____

Student Name_____ Grade _____ Age _____

Student Name_____ Grade _____ Age _____

Student Name_____ Grade _____ Age _____

Judge's Name:_____ Date:_____

Distance:

First Run_____ Second Run_____

Longest Distance _____

$$F = \frac{D}{D_L} \; X \; 100$$

Mousetrap Car Performance Point Score: F= _____

(Note: F....is the final Performance score (to be combined with score from the Written Report).

Overall Team Score in competition is sum of:

1) Performance (car run) as calculated above (max. 100 points);
2) Written Report (max. 50 points)

Performance (F) score _____
Report Score: _____

Overall Team Score: _____

Thus the maximum total is 150 points

2011 SECME ENGINEERING DESIGN COMPETITION: MOUSETRAP CAR CONSTRUCTION AND OPERATION

MIDDLE and SENIOR High School ONLY

(Evaluation Sheet)

Please Check: Middle School ___ High School___

Team Name: _____ School Name: _____

District: Miami-Dade City/State_____

Student Name_____ Grade _____ Age _____

Student Name_____ Grade _____ Age _____

Student Name_____ Grade _____ Age _____

Judge's Name:_____ Date:_____

Distance:

First Run_____ Second Run_____

$$N = \left(\frac{w}{W}\right) X \left(\frac{D}{L}\right)^2 \quad \text{and} \quad F = \frac{N}{N_L} \; X \; 100$$

w = 25 Grams

W = _____ [Measured weight, in grams]

L = _____ [Longest dimension—length, width, or height—in centimeters]

D = _____ [Maximum D=2,500 if measured distance is more than 2,500 cm]

N = _____ [N=0, if D is LESS than 300 centimeters for elementary and middle school teams if D is LESS than 600 centimeters for high school teams]

N_L = _____ [Highest Performance score at competition site]

Mousetrap Car Performance Point Score: F=_____

(Note: F is combined with scores for Design Drawing, and Technical Report to arrive at Overall Team Score in competition.)

2011 SECME ENGINEERING DESIGN COMPETITION GUIDELINES: MOUSETRAP CAR DRAWING

<not required for elementary>

As a part of the Engineering Design Competition, each team is required to prepare a scaled drawing depicting the car that they have designed and built

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MOUSETRAP CAR DRAWING REQUIREMENTS AND GUIDELINES: (Any entry not meeting the following requirements will be automatically disqualified.)

1. The Mousetrap Car Drawing entry is required to illustrate the actual mousetrap car built by the team (photographs and computer generated drawings will NOT be allowed).

2. The size of the engineering paper is required to be the standard 18" X 24" (plain, non-grid, (17-pound vellum) sheet. (Allowing for the required 1" border on all sides, the actual drawing is to cover an exposed area of 16" X 22" of the paper.) **NO MOUNTING, NO FRAMES ALLOWED. BUT DRAWING MAY BE LAMINATED FOR PROTECTION IF DESIRED**.

3. All dimensions are required to be illustrated on the drawing.

4. The scale and the units are required to be indicated on the drawing.

5. The team's Mousetrap Car Drawing is required to show front, side, and top views.

6. All parts of the car are required to be labeled.

7. Ink pens, pencils or markers may be used.

8. A title **legend** is to be drawn in the bottom left corner of the drawing inside the 1" border with the following information is required:

   Team name
   School Name
   Team Members' Names and Grade Levels
   School Coordinator's Name
   Date of Competition

AT ALL COMPETITIONS, THE MOUSETRAP CAR DRAWING WILL BE JUDGED ON:

RESEMBLANCE (Between the actual mousetrap car and drawing)
SCALE
NAMING/LABELING (Of all of the parts used)
APPEARANCE/NEATNESS

2011 SECME ENGINEERING DESIGN COMPETITION GUIDELINES: MOUSETRAP CAR DRAWING
<Not Required For Elementary>
(Evaluation Sheet)

Please Check: Middle School ___ High School___

Team Name: _____ School Name_____

City/State: _____

Student Name_____ Grade ____ Age ____

Student Name_____ Grade ____ Age ____

Student Name_____ Grade ____ Age ____

Judge's Name:_____ Date: _____

Requirements Check: 18" x 24" Engineering Paper____ 1" Border (All Sides) ____

17lb Vellum Paper____ Title legend with required information____

If requirement checks are NOT met: Five (5) points from each of the 4 areas above will be deducted from the total score in this category. Maximum number of points for the Engineering Design Competition Mousetrap Car Drawing is 50.

The maximum number of points for the Engineering Design Competition Mousetrap Car Drawing is 50. Please score each of the following four categories:

EVALUATION CATEGORIES		POINTS
I.	RESEMBLANCE _____ The accuracy to which the Mousetrap Car Drawing Illustrates the actual Mousetrap Car designed and built by the team. (1-15 points)	_____
II.	SCALE The proportions in the Drawing correctly relate to and represent the team's actual Mousetrap Car. (1-15 points)	_____
III.	NAMING/LABELING _____ The correctness of the names/labels of all of the parts in the Drawing of the Mousetrap Car. (1-10 points)	_____
IV.	APPEARANCE/NEATNESS _____ The quality of the visual presentation of the Mousetrap Car Drawing entry (1-10 points)	_____
	Requirement check points deducted	_____
TOTAL (The highest possible score is 50)		_____

2011 SECME ENGINEERING DESIGN COMPETITION GUIDELINES: MOUSETRAP CAR WRITTEN TECHNICAL REPORT

(ELEMENTARY SCHOOL DIVISION)

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

REQUIREMENTS:

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 address
   d. Team's school name and complete address
   e. School System/District name
   f. School Coordinator's name
   g. Date (date of competition)

2. Double-spaced Text

3. One-inch borders at the top, bottom, and on each side / 8½" X 11" white paper

4. 12 pt. /Standard Font / Computer printed/typed document

5. Report is neat and thorough and pages are numbered and in order

Essay Organization (35 possible points)

a. Writing includes an original, age-appropriate introduction
b. Writing includes ideas that are fully developed and 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

Punctuation, Mechanics, Spelling and Grammar (15 possible 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

2011 SECME ENGINEERING DESIGN COMPETITION GUIDELINES: MOUSETRAP CAR WRITTEN TECHNICAL REPORT

Middle and Senior High School

As a part of the Design Competition, the team is required to write a Technical Report describing the design, construction, and operation of the Mousetrap Car. The Technical Report should be a computer printed/typed document, **double-spaced**, on 8½" X 11" white paper with one-inch borders at the top, bottom, and on each side.

Use 12 pt. type in a standard legible text font. **The main body of the report -- 4. Introduction, 5. Design Construction, 6. Construction Procedure, and 7. Operation of the Mousetrap Car—should be a maximum of 5 pages total.** Drawings, sketches, and tables may be included in an Appendix if desired but this is optional and not required. (Entries not meeting these requirements will automatically be disqualified).

TECHNICAL REPORT REQUIREMENTS AND GUIDELINES: (Any entry submitted without a cover page containing all of the required information will automatically be disqualified).

1. COVER PAGE (Required to contain): a. Title of the Technical Report
   b. Name, addresses, and grades of team members
   c. Team's school name and address
   d. School System name
   e. School Coordinator's name
   f. Date of Competition

2. ABSTRACT — One-half to one-page summary of Technical Report.

3. CONTENTS — One page

4. INTRODUCTION

5. DESIGN

6. CONSTRUCTION PROCEDURE

7. OPERATION OF THE MOUSETRAP CAR

8. CONCLUSION/RECOMMENDATIONS

9. ACKNOWLEDGMENTS (Optional)

10. APPENDIX (The Appendix may contain sketches, tables, and charts.)

AT ALL COMPETITIONS, THE MOUSETRAP CAR TECHNICAL REPORT WILL BE JUDGED ON:

Content
Mechanics
Requirements

MOUSETRAP CAR ENGINEERING DESIGN TECHNICAL REPORT BREAKDOWN

Content (1 – 36 pts)

Cover Page:
a) Title (SECME: Mousetrap Car Technical Report)
b) Names, addresses, and grades of team members
c) School Name & Address
d) School System/District
e) School Coordinator's Name
f) Date (date of competition)

Abstract:
a) Includes the essential points of the purpose, methods, scope, results, conclusions, and recommendations
b) Short—1 paragraph to 1 about 1 page in length (should be10% or less of the total report)
c) This is your chance to convince the readers that they should continue reading in a clear and concise way

Page of Contents:
Indicate on which pages the parts of the report can be located in a professional manner

Introduction:
Introduce the problem to be solved, your hypothesis, and how you planned to resolve the problem through design while dealing with any restrictions.

Design:
a) Discuss the experimental process by which you altered your car.
b) Reference the data tables from the appendix to defend the conclusions which cause you to change your design.

Construction Procedure:
a) List Materials
b) Clearly describe the procedures that someone with little knowledge of your car would follow to recreate it.

Operation:
Explain the process by which the car is prepared in order for it to run. Be explicit about the steps taken.

Conclusion:
a) State whether your hypothesis was defended or rejected and why.
b) Discuss the results of your final design and why it is superior to prior designs.
c) Explain how future cars can further be improved and possibly a future hypothesis.

Acknowledgements: Optional

Appendix:
a) Must include all data tables from experimentation
b) Must include sketches of the car (top view, profile, and undercarriage view)
c) May include a chart comparing the various trials

Mechanics (1 – 14 pts)

1) Correct punctuation, capitalization, and spelling
2) Use of past tense and passive voice
3) Sentences are complete with appropriate coordination and subordination
4) Report flows logically from one idea to the next with minimal fragmentation

Requirements

1) Required Components
   a. Cover Page
   b. Abstract
   c. Contents
   d. Introduction
   e. Design
   f. Construction Procedures
   g. Operation
   h. Conclusion
   i. Appendix
2) Double-spaced Text
3) 1" borders on 8 ½ x 11 white paper
4) 12 pt. in Standard Font / Computer Typed
5) Report is neat and thorough and pages are numbered and in order

2011 SECME ENGINEERING DESIGN COMPETITION GUIDELINES: MOUSETRAP CAR WRITTEN TECHNICAL REPORT
Middle and Senior High School
(Evaluation Sheet)

Please Check: Middle School ___ High School___

Team Name: _____ School Name: _____

City/State_____

Each: Student Name _____ Grade_____ Age_____

Student Name_____ Grade_____ Age_____

Student Name_____ Grade_____ Age_____

Judge's Name: _____ Date: _____

If requirement checks are NOT met: Zero points for the Technical Report

Requirements Check:
____Required components ___12 pt. Type/Standard Font/Computer Typed
____1" Borders on 8 ½ x 11 white paper ___ Double-spaced Text

EVALUATION CATEGORIES	POINTS
CONTENT (0 – 36 points)	
i. Abstract (0 – 5 points)	_____
ii. Page of Contents (0 – 2 pts)	_____
iii. Introduction (0 – 5 pts)	_____
iv. Design (0 – 9 pts)	_____
v. Construction Procedures (0 – 4 pts)	_____
vi. Operation (0 – 3 pts)	_____
vii. Conclusion (0 – 5 pts)	_____
viii. Appendix (0 – 3 pts)	_____
MECHANICS (0 – 14 points)	
i. Correct punctuation, capitalization, and spelling are evident throughout report	_____
ii. Correct use of past tense and passive voice	_____
iii. Sentences are complete with appropriate coordination and subordination	_____
iv. Report flows logically from one idea to the next with minimal fragmentation	_____
TOTAL (The highest possible score is 50 points)	_____
Requirement check points deducted	_____

**NOTE: DECISION OF THE JUDGES IS FINAL

2011 SECME ENGINEERING DESIGN COMPETITION GUIDELINES: MOUSETRAP CAR WRITTEN TECHNICAL REPORT
ELEMENTARY SCHOOLS ONLY
(Evaluation Sheet)

Please Check: Elementary School ___
Team Name: _____ School Name: _____

City/State_____

Each: Student Name _____ Grade_____ Age_____

Student Name_____ Grade_____ Age_____

Student Name_____ Grade_____ Age_____

Judge's Name: _____ Date: _____

If requirement checks are NOT met: Zero points for the Technical Report

Requirements Check:
____Required components ___12 pt. Type/Standard Font/Computer Typed
____1" Borders on 8 ½ x 11 white paper ___ Double-spaced Text
____Report is neat and thorough and pages are numbered and in order

EVALUATION CATEGORIES	POINTS
Essay Organization (35 possible points)	
Writing includes an original, age-appropriate introduction (0-9 pts) i.	_____
Writing includes ideas that are fully developed and fully supported and describe the design, construction and operation of the car (0-8 pts)	_____
Writing is logical and coherent as a whole (0-9 pts)	_____
Writing includes an original, age-appropriate close (0-9 pts)	_____
Punctuation, Mechanics, Spelling and Grammar (15 possible points)	
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 (The highest possible score is 50 points)	_____
Requirement check points deducted	_____

**NOTE: DECISION OF THE JUDGES IS FINAL