COMPUTER-AIDED DESIGN (CAD), ENGINEERING

OVERVIEW

Applying leadership and 21st century skills, participants use complex computer graphic skills, tools, and processes to develop three (3)-dimensional representations of engineering subjects such as a machine part, tool, device, or manufactured product.

ELIGIBILITY

Two (2) individuals per state may participate.

Participants may compete in either CAD, Architecture or CAD, Engineering, but not both events.

TIME LIMITS

A. Thirty (30) minutes are allowed for set-up time.

B. Four (4) hours are allowed for participants to develop drawing(s).

C. One (1) hour is allotted for the final evaluation.

ATTIRE

TSA competition attire is required for this event.

PROCEDURE

A. Participants bring their own computer systems (see Regulation A) to the event area at the time and place stated in the conference program.

B. Each participant, with one (1) assistant (an instructor, fellow student, or adult chaperone), is allowed to set up and test the equipment. At the end of the thirty (30) minute set-up period, assistants are required to leave the area.

C. Participants are given a design problem to solve in a four (4)-hour work session.

D. Participants work independently, without assistance from judges, teachers, or fellow participants.

E. Participants are advised to save their work on their hard drives every fifteen (15) minutes.

F. At the end of the session, participants save their work on their hard drives and on a USB flash drive.

G. Judges circulate to evaluate the entries and ask questions of the participants.

H. Participants shall reserve one (1) additional hour for the final evaluation process.

I. Participants report to the event area at the time and place stated by in the conference program to pick up their equipment.

J. The top ten (10) finalists are announced during the award ceremony.

REGULATIONS AND REQUIREMENTS

Students will work to develop their leadership and 21st century skills in the process of preparing for and participating in this TSA competitive event. The development and application of those skills must be evident in their submission, demonstration, and/or communication pertaining to the entry.

A. Participants provide their own computer systems including:

   1. computer hardware (only one [1] CPU and one [1] monitor), capable of reading a USB flash drive; laptops are recommended
   2. software needed for the challenge, downloaded
   3. one (1) USB flash drive; used only to back-up the entry
   4. power strip/surge protector
   5. reference materials

B. A table, chair, sketching paper, and electricity is supplied for each participant.

C. Participants are required to provide their own pencils.

D. Using leadership and/or 21st century skills, participants design a solution to the challenge within a four (4) hour limited time frame.

E. Participants are not permitted to share solutions to problems, reference materials, hardware, or software.

F. Participants identify their work using only their student identification number.

EVALUATION

A. The design solution (evaluated on screen according to the criteria on the official rating form)

B. The interview

Refer to the official rating form for more information.

STEM INTEGRATION

This event aligns with the STEM (Science, Technology, Engineering, and Mathematics) educational standards.

LEADERSHIP AND 21ST CENTURY SKILL DEVELOPMENT

This event provides opportunity for students to build and develop leadership and 21st century skills including but not limited to:

- Communication
- Collaboration/Social Skills
- Initiative
- Problem Solving/Risk Taking
- Critical Thinking
- Perseverance/Grit
- Creativity
- Relationship Building/Teamwork
- Dependability/Integrity
- Flexibility/Adaptability

CAREERS RELATED TO THIS EVENT

This competition has connections to one (1) or more of the careers below:

- Engineer
- Automobile designer
- CAD professional
- Machine designer

Participant/Team ID# _____

CAD, ENGINEERING

2021 & 2022 OFFICIAL RATING FORM

HIGH SCHOOL

Judges: Using minimal (1-4 points), adequate (5-8 points), or exemplary (9-10 points) performance levels as a guideline in the rating form, record the scores earned for the event criteria in the column spaces to the right. The X1 or X2 notation in the criteria column is a multiplier factor for determining the points earned. (Example: an "adequate" score of 7 for an X1 criterion = 7 points; an "adequate" score of 7 for an X2 criterion = 14 points.) A score of zero (0) is acceptable if the minimal performance for any criterion is not met.

Go/No Go Specifications

- Before judging the entry, ensure that the items below are present; indicate presence with a check mark in the box.
- If an item is missing, leave the box next to the item blank and place a check mark in the box labeled ENTRY NOT EVALUATED.
- If a check mark is placed in the ENTRY NOT EVALUATED box, the entry is not to be judged.

☐ Computer hardware is present
☐ ENTRY NOT EVALUATED

SOLUTION TO PROBLEM (50 points)				
CRITERIA	Minimal performance	Adequate performance	Exemplary performance	Record scores in the column spaces below.
	1-4 points	5-8 points	9-10 points	
Design (X1)	The layout and design of the drawing as presented do not create an effective model for the problem assigned.	The layout and design of the drawing as presented are somewhat effective in modeling the problem assigned.	The layout and design of the drawing completely and effectively model the problem assigned.	
Functionality (X1)	The design as drawn lacks order of direction and is impractical.	The design is somewhat practical in directional flow and overall organization.	The design is completely effective, practical, and functional.	
Originality (X1)	The design drawing provides no quality of newness or deviation from tradition.	The design drawing shows some attempt to be creative and less non-traditional.	The design drawing provides a unique and creative quality of newness that departs from tradition.	
Aesthetics (X1)	The design is unappealing and fails to capture the observer's attention.	The design is somewhat pleasing and appealing and attempts to capture the observer's attention.	The design as drawn is pleasing and appealing and effectively draws attention to its appearance/beauty.	
Articulation (X1)	Communication of the solution is unclear, unorganized, and or illogical; leadership and/or 21st century skills are not evident.	Communication of the solution is somewhat logical and clear; leadership and/or 21st century skills are somewhat evident.	Communication of the solution is clear, concise, and logical; leadership and/or 21st century skills are clearly evident.	
			SOLUTION TO PROBLEM SUBTOTAL (50 points)	

LAYOUT (60 points)				
CRITERIA	Minimal performance	Adequate performance	Exemplary performance	Record scores in the column spaces below.
	1-4 points	5-8 points	9-10 points	
Correct Geometry (X2)	The correct views and orientation have not been selected or used throughout the drawing process and final layout.	Most of the views and orientation selected and used are correct and in the proper layout format.	All of the views and orientation that have been selected and used are correct and in the proper layout.	
Detailing (X1)	Many of the details are missing or placed incorrectly.	Most of the details are included and are correctly placed.	All necessary details are included and are placed correctly.	
Lettering (X1)	The choice of font style, size, color, and application is inappropriate for the drawing assignment.	The choice of font style, size, color, and application is appropriate, with few inconsistencies/variations.	The choice of appropriate font style, size, color, and application is clearly evident and applied consistently.	
Dimensioning (X1)	Many of the necessary dimensions are missing and/or placed incorrectly.	Most of the required dimensions are included and placed correctly.	All of the necessary dimensions are included and correctly placed.	
Scale (X1)	The scale selected for the drawings is incorrect and not properly noted.	The scale selected is generally correct and properly noted for most drawings.	The scale selected for all aspects of the drawings is correct and properly noted.	
			LAYOUT SUBTOTAL (60 points)	

ENGINEERING APPLICATION (20 points)				
CRITERIA	Minimal performance	Adequate performance	Exemplary performance	Record scores in the column spaces below.
	1-4 points	5-8 points	9-10 points	
Application of Practices (X1)	Many of the engineering practices selected and used are incorrectly applied.	Most of the engineering practices selected and used are correctly applied.	All of the engineering practices selected and used are correctly and appropriately applied.	
Appropriate Use of Conventions (X1)	There is little or no evidence of an effective application of engineering conventions in the completed design and drawings.	There is some evidence of an effective application of engineering conventions in the completed design and drawings.	There is clear evidence of an effective and knowledgeable application of engineering conventions in the completed design and drawings.	
			ENGINEERING APPLICATION SUBTOTAL (20 points)	

SOFTWARE UTILIZATION (20 points)				
CRITERIA	Minimal performance	Adequate performance	Exemplary performance	Record scores in the column spaces below.
	1-4 points	5-8 points	9-10 points	
CAD Functions (X1)	There is little evidence of an understanding and application of CAD functions.	There is evidence of a general understanding and effective application of CAD functions.	A complete and effective understanding and application of CAD functions is evident.	
CAD Features (X1)	There is little evidence of understanding and application of CAD special features.	There is a general understanding and application of CAD special features.	There is complete understanding and application of the various special features of CAD.	
			SOFTWARE UTILIZATION SUBTOTAL (20 points)	

Rules violations (a deduction of 20% of the total possible points for the above sections) must be initialed by the judge, coordinator, and manager of the event. Record the deduction in the space to the right. Indicate the rule violated: _____	
To arrive at the TOTAL score, add any subtotals and subtract rules violation points, as necessary. **TOTAL (150 points)**	

Comments:

I certify these results to be true and accurate to the best of my knowledge.

JUDGE

Printed name: _____ Signature: _____

COMPUTER-AIDED DESIGN (CAD), ENGINEERING EVENT COORDINATOR INSTRUCTIONS

PERSONNEL

A. Event coordinator
B. Judges, two (2) or more
C. Assistants, one (1)

MATERIALS

A. Coordinator's packet, containing:
    1. Event guidelines, one (1) copy for the coordinator and for each judge
    2. TSA Event Coordinator Report
    3. List of judges/assistants
    4. Results envelope
B. Tables and chairs for competitors and judges
C. One (1) ream of 8½" x 11" white copier paper
D. Statement of problem as a hard-copy sketch, pages as needed.

RESPONSIBILITIES

AT THE CONFERENCE

A. Attend the mandatory coordinator's meeting at the designated time and location.
B. Report to the CRC room and check the contents of the coordinator's packet.
C. Review the event guidelines and check to see that enough personnel have been scheduled.
D. Inspect the area(s) in which the event is to be held for appropriate set-up, including room size, chairs, tables, outlets, etc. Notify the event manager of any potential problems.
E. At least one (1) hour before the event is to begin, meet with judges to review time limits, procedures, regulations, evaluation, and all other details related to the event. If questions arise that cannot be answered, speak to the event manager before the event begins.

ON-SITE CHALLENGE

A. As participants arrive, check the coordinator's report and assign participants to work stations.
B. All participants and judges should be in the room at this time.
C. Late entries are considered on a case-by-case basis and only when the delay is caused by events beyond participant control.
D. In order to compete, participants must be on the entry list or must have approval of the CRC.
E. Allow thirty (30) minutes for participants and their assistants (no more than one [1] per participant) to set up equipment.
F. At the end of the thirty (30)-minute set-up time, non-participants are required to leave the event area.
G. Review with the participants the time limits, procedures, regulations, and protocol of the event.
H. Remind participants to save their work at regular time intervals.
I. Distribute copies of the CAD problem. Answer any appropriate questions concerning the problem.
J. Begin the event and announce the ending time.
K. During the event, the judges and assistants monitor and evaluate participant progress and work.
L. Announce the time remaining to work at one (1) hour, thirty (30) minutes, fifteen (15) minutes, and five (5) minutes before time is called.
M. When time is called, participants stop and save their work on their hard drives and on their USB flash drives.
N. Participants remain at their computers for up to one (1) hour as judges circulate to evaluate the entries.
O. Conduct the interviews as the submissions are reviewed. Interviews should be a maximum of five (5) minutes in length.

P. Decisions about rules violations must be discussed and verified with the judges, event coordinator, and CRC manager to determine either:

   1. To deduct twenty percent (20%) of the total possible points in this round or
   2. To disqualify the entry

   The event coordinator, judges, and CRC manager must initial either of these actions on the rating form.

Q. Judges determine the ten (10) finalists and discuss and break any ties.

R. Submit the finalist results and all related forms in the results envelope to the CRC room.

S. If necessary, manage security and the removal of materials from the area.