

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. Three (3) hours are allowed for participants to develop drawing(s).
- C. Two (2) hours is allotted for the interview and final evaluation. Interviews will be limited to two (2) minutes per participant.

ATTIRE

TSA competition attire is required for this event.

PROCEDURE

- A. Participants review the TSA Honor Statement for Competitive Events found in the General Rules and listed in the individual competitive event rules.
- B. Participants bring their own computer systems (see Regulation A) to the event area at the time and place stated in the conference program.
- C. 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.
- D. Participants are given a design problem to solve in a three (3) hour work session.
- E. Participants work independently, without assistance from judges, teachers, or fellow participants.

- F. Participants are advised to save their work on their hard drives every fifteen (15) minutes.
- G. At the end of the session, participants save their work on their hard drives and on a USB flash drive.
- H. Judges circulate to evaluate the progress the participants.
- I. If a participant finishes their solution, they may notify the event coordinator and leave the event room, but they must return to their station at the end time of the event for their interview. Failure to do so will result in scoring no points for the interview.
- J. At the completion of the three (3) hour time to develop drawings students will participate in a two (2) minute interview about their project. Participants shall reserve two (2) additional hours for the final evaluation process.
- K. Participants report to the event area at the time and place stated by in the conference program to pick up their equipment.
- L. 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; preference is that software is downloaded; if the software is online, National TSA will not provide access to the Internet or guarantee hot spots will work in the competition space

3. one (1) USB flash drive; used only to back-up the entry; the USB will be returned at the completion of judging
 4. power strip/surge protector
 5. reference materials (can only be hard copy; no internet is provided)
- B. A table, chair, sketching paper, and electricity is supplied for each participant.
- C. Participants are required to provide their own pencils.
- D. Participants are not permitted to share solutions to problems, reference materials, hardware, or software.
- E. 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.

TSA HONOR STATEMENT

All work must be created and completed by individual competitors or teams. Plagiarism, the use of Generative Artificial Intelligence (GenAI) software, copyright violation, cheating, and falsification of information are prohibited. Participants may NOT use any generative artificial intelligence (GenAI) tools (e.g. ChatGPT, Google Gemini, GitHub Copilot, etc.). Any attempt to gain an unfair advantage will not be tolerated. Competitors at any level of TSA competition understand and agree to abide by the TSA Honor Statement.

If it is determined that a student violated the TSA Honor Statement, a rules violation of twenty percent (20%) will be incurred.

STEM INTEGRATION

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

LEADERSHIP AND 21ST CENTURY SKILLS

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, and 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

CAD, ENGINEERING

2025 & 2026 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
- ☐ CAD Software
- ☐ ENTRY NOT EVALUATED

SOLUTION TO PROBLEM (70 points)				Record scores in the column spaces below.
CRITERIA	Minimal performance	Adequate performance	Exemplary performance	
	1-4 points	5-8 points	9-10 points	
Accuracy (X2)	The solution demonstrates a poor understanding of the geometry; All solution elements are accurate and precise, effectively modeling the problem assigned.	The solution demonstrates an some understanding of the geometry; All solution elements are accurate and precise, effectively modeling the problem assigned.	The solution demonstrates an exemplary understanding of the geometry; All solution elements are accurate and precise, effectively modeling the problem assigned.	
Completeness (X1)	The solution models little of the problem assigned.	The solution models most of the problem assigned.	The solution models all portions of the problem assigned.	
CAD Tools & Functions (X2)	The solution demonstrates a poor degree of competency with CAD tools and features.	The solution demonstrates a some degree of competency with CAD tools and features.	The solution demonstrates a high degree of competency with CAD tools and features.	
CAD Features (X1)	The solution demonstrates a poor understanding and application of various special features of CAD.	The solution demonstrates a moderate understanding and application of various special features of CAD.	The solution demonstrates a complete understanding and application of various special features of CAD.	
Model Efficiency (X1)	The solution reflects an poor usage of features, with some sketches, features and tools being unnecessary.	The solution reflects an average usage of features, with some sketches, features and tools being unnecessary.	The solution reflects an economy of features, using only necessary sketches, features, and tools.	
SOLUTION TO PROBLEM SUBTOTAL (70 points)				

LAYOUT (40 points)				Record scores in the column spaces below.
CRITERIA	Minimal performance	Adequate performance	Exemplary performance	
	1-4 points	5-8 points	9-10 points	
Title Block (X1)	The title block and other identifying information for the solution is incomplete.	The title block and other identifying information for the solution is mostly complete.	The title block and other identifying information for the solution is complete with all necessary information.	
Views (X1)	The solution utilizes few correct views and placement with no section or auxiliary views.	The solution utilizes most of correct views and placement with any section and auxiliary views.	The solution utilizes the correct views and placement with any necessary section and auxiliary views.	
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 (40 points)				

ENGINEERING APPLICATION (20 points)				Record scores in the column spaces below.
CRITERIA	Minimal performance	Adequate performance	Exemplary performance	
	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)				

INTERVIEW (30 points)				Record scores in the column spaces below.
CRITERIA	Minimal performance	Adequate performance	Exemplary performance	
	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 an understanding and application of CAD special features.	There is a general understanding and application of CAD special features.	There is a complete understanding and application of the various special features of CAD.	
Articulation (X1)	Communication of the solution is unclear, unorganized, and or illogical; leadership and/or 21 st century skills are not evident.	Communication of the solution is somewhat logical and clear; leadership and/or 21 st century skills are somewhat evident.	Communication of the solution is clear, concise, and logical; leadership and/or 21 st century skills are clearly evident.	
INTERVIEW SUBTOTAL (30 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 (160 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
- B. Tables and chairs for competitors and judges
- C. One (1) ream of 8½" x 11" white copier paper
- D. Stopwatch
- E. Statement of problem as a hard-copy sketch for each participant, pages as needed
- F. Statement of problem as a hard-copy sketch for each judge, 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.
- F. Ensure the judges have access to the online judging system.

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. Record the order participants finish their solution. Participants may leave the room once finished, but must report back to their station at the end of the event time for their interview.
- M. Announce the time remaining to work at one (1) hour, thirty (30) minutes, fifteen (15) minutes, and five (5) minutes before time is called.
- N. When time is called, participants stop and save their work on their hard drives and on their USB flash drives.
- O. Participants remain at their computers for up to two (2) hours as judges circulate to evaluate the entries.
- P. Conduct the interviews as the submissions are reviewed. Interviews should be a maximum of two (2) minutes in length.

Q. 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.

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