COMPUTER-AIDED DESIGN (CAD) FOUNDATIONS

OVERVIEW

Applying leadership and 21st century skills, participants demonstrate their understanding of CAD fundamentals as they create a two-dimensional (2D) graphic representation of an engineering part or object. For example, participants may be given an isometric drawing and would be expected to generate the required 2D views, complete with dimensions.

ELIGIBILITY

Two (2) individuals per state may participate.

TIME LIMITS

A. Thirty (30) minutes to set-up.

B. Two (2) hours to develop the drawing(s).

C. One (1) hour for final evaluation process.

ATTIRE

TSA competition attire is required.

PROCEDURE

PRE-CONFERENCE

A. Participants review the TSA Honor Statement for Competitive Events found in the General Rules and listed in the individual competitive event rules.

PRELIMINARY ROUND

A. Participants bring their own computer systems 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 thirty (30) minutes to set up and test 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 during a two (2)-hour work session.

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

E. At the end of the session, participants save their work on their hard drives and back up saved work on a USB flash drive.

F. At the end of the session, participants will submit their final projects as a .PDF file on the USB flash drive. All USB flash drives become the property of TSA and will not be returned

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 awards 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 hardware:

1. Only one (1) computer and one (1) monitor are allowed per student. Laptop computers are recommended.
2. Computers must be equipped with a USB port.
3. Software needed for the challenge; preference is that the software is downloaded; however, if the software is online, National TSA will not provide access to the internet. Students may opt to provide their own hotspots, but National TSA WILL NOT guarantee reception quality or functionality.
4. One blank USB flash drive labeled with the registered student identification number, for submission.
5. Power strip/surge protector and 20' extension cord (optional and not provided by TSA)

6. Reference materials, which must be printed resources; no online resources will be allowed.
7. Pencils

B. Participants are provided with sketching paper and electricity.

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

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

E. Participants are not permitted to:

1. Leave the event room without permission from the event coordinator. If a participant must use the restroom he/she is accompanied by an escort.
2. Share solutions to problems, reference materials, hardware, or software.

F. Breakdown of equipment is permitted only after the work of all participants has been evaluated.

EVALUATION

A. A PDF of the design solutions submitted on a USB. Participants must be able to save their drawing as a PDF without assistance.

B. In the event of a tie, the participant's completion time for the problem will be used as the tiebreaker.

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 has connections to the STEM areas of Science, Technology, Engineering, and Mathematics.

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

Participant/Team ID# _____

CAD FOUNDATIONS

2026 & 2027 OFFICIAL RATING FORM

MIDDLE 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
☐ USB drive is present
☐ CAD Software is present
☐ ENTRY NOT EVALUATED

LAYOUT (70 points)				
CRITERIA	Minimal performance	Adequate performance	Exemplary performance	Record scores in the column spaces below.
	1-4 points	5-8 points	9-10 points	
Geometry and Drawing Orientation (X2)	The correct views, constructive geometry, and orientation have not been selected or used throughout the drawing process and final layout.	Most of the views, constructive geometry, and orientation selected and used are correct and in the proper layout.	All of the views, constructive geometry, and orientation that have been selected and used are correct and in the proper layout.	
Line Conventions (X2)	Proper line types have not been used throughout the drawing process.	Most of the proper line conventions have been used, with one or two mistakes.	All of the correct line types are used in the correct locations.	
Dimensioning (X2)	Many of the necessary dimensions are missing or placed incorrectly.	Most of the required dimensions are included and placed correctly.	All of the necessary dimensions are included and correctly placed; this includes hole & thread notes (if applicable).	
Title Block (X1)	The title block is missing or is missing scale, title of drawing, student ID, or date.	The title block is present, but is missing either scale, title of drawing, student ID, or date.	The title block is present and contains all required elements: scale, title of drawing, student ID, and date.	
			LAYOUT SUBTOTAL (70 points)	

SOFTWARE UTILIZATION (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	
Application of Drawing Knowledge (X1)	There is little evidence that the student is able to read and interpret mechanical drawings.	There is some evidence that the student is able to read and interpret mechanical drawings.	There is overwhelming evidence that the student can read and interpret mechanical drawings.	
Use of CAD Features and Functions (X2)	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.	
			SOFTWARE UTILIZATION SUBTOTAL (30 points)	

Rules violations (a deduction of 20% of the total possible points in the semifinalist sections above) must be initialed by the evaluator, 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** (100 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) FOUNDATIONS 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. One (1) ream of 8½" x 11" white copier paper
C. Statement of problem as a hard-copy sketch; copies, as needed
D. Tables and chairs for event coordinator, judges, and participants
E. Access to AC electricity for each member.

RESPONSIBILITIES

AT THE CONFERENCE

A. Attend the mandatory event 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 and assistants 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. Check the registration list and assign participants to work stations.
B. Late entries are considered on a case-by-case basis and only when the lateness is caused by events beyond the participant's control.
C. In order to compete, participants must be on the entry list or must have approval of the CRC.
D. All participants and judges should be in the room at this time. Participants not present may be disqualified.
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 the time limits, procedures, regulations, and protocol of the event with the participants.
H. Distribute copies of the CAD problem.
I. Remind participants to save their work at regular time intervals.
J. Answer any appropriate questions concerning the CAD problem.
K. Begin the event and announce the ending time.
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, save their work on their hard drives, and back-up on their USB flash drives.
N. Each entry must include the student's identification number.
O. Participants are required to remain in the area while their entries are being judged, but may be asked to leave the room while judges discuss entries.
P. Record the time that each participants finished the CAD challenge. In the event of a tie, the participant's completion time for the problem will be used as the tiebreaker.
Q. Judges circulate and evaluate entries as they are completed.

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

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

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

S. Breakdown of equipment is permitted only after the work of ALL participants has been evaluated.

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