COMPUTER-AIDED DESIGN (CAD), ENGINEERING

OVERVIEW

Participants have the opportunity to 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

Participants may compete in CAD, Architecture or CAD, Engineering, but not both. Participants are limited to two (2) individuals per state.

TIME LIMITS

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

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

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

D. Semifinalists will participate in a LEAP interview that will last a maximum of five (5) minutes.

☑ CAD involves two (2) separate events:

CAD, Architecture

CAD, Engineering

LEAP LEADERSHIP RESUME/INTERVIEW

An Individual LEAP Leadership Resume is required for this event and must be submitted when participants arrive at the event at the designated event time. Semifinalists will respond to interview questions related to their submitted LEAP Resume for a maximum of five (5) minutes.

ATTIRE

Competition attire, as described in the National TSA Dress Code section of this guide, 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. Participants must submit a LEAP Leadership Resume prior to receiving the design problem.

☑ CAD, Engineering problems typically begin with single mechanical objects, such as a gear index, tool box, shaft support, retaining cap, etc.

B. Each participant, with one (1) assistant (an instructor, fellow student, or adult chaperone), is allowed thirty (30) minutes 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 evaluators, teachers, fellow participants, other students or observers.

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. One (1) additional hour is spent interviewing the participants and evaluating the entries from each participant's computer monitor.

☑ Read the General Rules and Regulations section in the front of this guide for information that applies to all of TSA's competitive events.

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

I. Semifinalists will be determined and posted by the CRC.

J. Semifinalists will report at the time and place stated in the conference program to sign up for a semifinalist LEAP interview.

K. The LEAP interview will last a maximum of five (5) minutes.

It is essential that students and advisors routinely check the TSA website (www.tsaweb.org) for updated information about TSA general rules and competitive events. This information is found on the website under Competitions/Updates. When students participate in any TSA competitive event, they are responsible for knowing of updates, changes, or clarification related to that event.

REGULATIONS

☑ Participants must provide—and bring to the event site—two (2) pencils (sharpened standard #2/HB grade with an eraser, or #2 mechanical with an eraser) for this competition.

A. Participants provide their own systems, including hardware (only one [1] CPU and one [1] monitor are allowed per student), software, one (1) USB flash drive, power strip/surge protector, and reference materials. It is not necessary to bring a printer for this event. Laptop computers are recommended; computers must be capable of reading a USB flash drive.

B. A table, chair, sketching paper, and electricity will be supplied for each participant. Students are required to provide their own pencils.

C. Participants are not permitted to leave the event room without permission from the event coordinator. If a participant must use the rest room, s/he is accompanied by an escort.

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

E. Participants identify their work using only their conference identification number.

F. All USB flash drives and the work they contain become the property of TSA, Inc., and will not be returned.

G. Team members report to the event area at the time and place stated in the conference program to pick up their equipment.

H. LEAP Leadership Resume (see Forms Appendix or TSA website)/Interview — Students document, in the LEAP leadership resume (see resume template), the leadership skills that they have developed and demonstrated while working on this event. Semifinalists will respond to questions about the content of their resume as part of their LEAP interview. The LEAP Leadership Resume/Interview guidelines and other resources can be found on the TSA website.

EVALUATION

Entries are evaluated on screen according to the criteria on the official rating form. The LEAP requirements will also be evaluated. Please refer to this form for more information.

STEM INTEGRATION

This event aligns with the STEM educational standards noted below. Please refer to the STEM Integration section of this guide for more information.

Science, Technology, Engineering, Mathematics

TSA AND CAREERS

This competition connects to one or more of the career areas featured in the TSA AND CAREERS section of this guide. Use *The Career Clusters* chart and the *TSA Competitions and The Career Clusters* grid as resources for information about careers.

CAREERS RELATED TO THIS EVENT

Engineer
Automobile designer
CAD professional
Machine designer

COMPUTER-AIDED DESIGN (CAD) 3D, ENGINEERING EVENT COORDINATOR INSTRUCTIONS

PERSONNEL

A. Event coordinator

B. Evaluators, two (2) or more

C. Assistants, one (1)

D. Evaluators for semifinalist interviews; two (2) or more

MATERIALS

A. Coordinator's packet, containing:
   1. Event guidelines, one (1) copy for the coordinator and for each evaluator
   2. TSA Event Coordinator Report
   3. List of evaluators/assistants
   4. Pre-populated flash drives for evaluators
   5. Stick-on labels for entries, as needed
   6. Results envelope
   7. Envelope for LEAP Leadership Resumes
   8. LEAP Interview Judging Protocol

B. Tables and chairs for competitors and evaluators

C. One (1) ream of 8½" x 11" white copier paper

D. Statement of problem as a hard-copy sketch, fifty (50) copies.

RESPONSIBILITIES

A. Upon arrival at the conference, report to the CRC room and check the contents of the coordinator's packet. Review the event guidelines and check to see that enough evaluators/assistants have been scheduled.

B. Inspect the area(s) in which the event is being held for appropriate set-up, including room size, chairs, tables, outlets, etc. Notify the event manager of any potential problems.

C. One (1) hour before the event is to begin, meet with evaluators 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.

D. As participants arrive, check the coordinator's report and assign them to work stations.

E. Begin the event at the scheduled time. Collect LEAP Leadership Resumes. All participants and evaluators should be in the room at this time. Participants not present may be disqualified. In order to compete, participants must be on the entry list or must have approval of the CRC.

F. Allow 30 minutes for participants and their assistants (no more than one [1] per participant) to set up equipment. At the end of the 30-minute set-up time, non-participants are required to leave the event area. Review with the participants the time limits, procedures, regulations, and protocol of the event.

G. Remind participants to save their work at regular time intervals.

H. Distribute copies of the CAD problem. Answer any appropriate questions concerning the problem. Begin the event and announce the ending time.

I. During the event, the evaluators and assistants monitor and evaluate participant progress and work.

J. Announce time remaining to work at one (1) hour, thirty (30) minutes, fifteen (15) minutes, and five (5) minutes before time is called.

K. When time is called, participants stop and save their work on their hard drives and on their USB flash drives.

L. Collect the entries, checking to be sure each one is labeled with the student's conference identification number.

M. Participants remain at their computers for up to one (1) hour as evaluation of the entries is completed.

N. Evaluators independently assess the entries. Semifinalists will be determined and posted by the CRC.

O. Meet with semifinalists at the time and place stated in the conference program to allow them to sign up for a semifinalist LEAP interview time.

P. Inspect the area in which the presentations are to take place. Ensure that there is a table and seating for participants and evaluators.

Q. Meet with semifinalist evaluators to review the LEAP Judging Protocol. If questions arise that cannot be answered, speak to the event manager before the semifinalist presentations begin.

R. Conduct LEAP interviews. Interviews should be a maximum of five (5) minutes in length.

S. Evaluators determine the ranking of the ten (10) finalists and discuss and break any ties.

T. For participants who violate the rules, the decision either to deduct 20% of the total possible points or to disqualify the entry must be discussed and verified with the evaluators, event coordinator, and a CRC manager.

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

V. Review and submit the finalist results and all items/forms in the results envelope to the CRC room.

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

Participant/Team ID# _____

CAD, ENGINEERING

2017 & 2018 OFFICIAL RATING FORM — HIGH SCHOOL

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 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.

☐ **Completed LEAP Leadership Resume is present.**

☐ **ENTRY NOT EVALUATED**

Solution to problem (40 points)

CRITERIA	Minimal performance 1-4 points	Adequate performance 5-8 points	Exemplary performance 9-10 points	Record scores in the column spaces below.
Evaluators: Using minimal (1-4 points), adequate (5-8 points), or exemplary (9-10 points) performance levels as a guideline, 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.				
Design (X1)	The drawing as presented does 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.	
			SUBTOTAL (40 points)	

Layout (60 points)

CRITERIA	Minimal performance 1-4 points	Adequate performance 5-8 points	Exemplary performance 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.	

Layout (continued) (60 points)				
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 for most aspects of the drawings is correct and properly noted.	The scale selected for all aspects of the drawings is correct and properly noted.	
			SUBTOTAL (60 points)	

Engineering Application (20 points)				
CRITERIA	Minimal performance 1-4 points	Adequate performance 5-8 points	Exemplary performance 9-10 points	
Application of practices (X1)	Many, if not most, 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 appropriate application of engineering conventions in the completed design and drawings.	There is some evidence of 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.	
			SUBTOTAL (20 points)	

Software Utilization (20 points)				
CRITERIA	Minimal performance 1-4 points	Adequate performance 5-8 points	Exemplary performance 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 appears to be a general understanding and application of CAD special features.	There is complete understanding and application of the various special features of CAD.	
			SUBTOTAL (20 points)	

Rules violations (a deduction of 20% of the total possible points in the 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: _____	

Semifinalist LEAP Interview (20 points)				
CRITERIA	Minimal performance 1-4 points	Adequate performance 5-8 points	Exemplary performance 9-10 points	
LEAP Leadership Resume/Interview See Regulation H and instructions on TSA website (X2)	The individual's efforts are not clearly communicated, lack detail, and/or are unconvincing. Few, if any, attempts are made to identify and/or incorporate the LEAP Be. Know. Do. criteria.	The individual's efforts are adequately communicated, include some detail, are clear, and/or are generally convincing. Identification and/or incorporation of the LEAP Be. Know. Do. criteria is adequate.	The individual's efforts are clearly communicated, fully-detailed, and convincing. Identification and/or incorporation of the LEAP Be. Know. Do. criteria is excellent.	
			SUBTOTAL (20 points)	

(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.

Evaluator

Printed name: _____ Signature: _____