Additive Manufacturing

Purpose: To evaluate each contestant's preparation for employment and to recognize outstanding students for excellence and professionalism in the field of Additive Manufacturing.

Contest Location	▪ C-Hall
Eligibility	▪ Please refer to the National Technical Standards for this contest. • Schools may send one competitor or team for every 50 paid SkillsUSA members based on local competition enrolled in a program where the scope of the contest described in the SkillsUSA Technical Content Standards reflects a major component of the program. • Team of 2 (two).
Clothing	Business Casual: Polo or other collared shirt and khakis or dress pants; NO JEANS. If a school logo, contestant name, or other identifier is listed on the shirt this must be covered.
Testing	▪ Students should be prepared to take a written knowledge test. ▪ Students should also be prepared to take a SkillsUSA written knowledge test (required for all contestants).
Provided by Contestant **(Tool List)**	▪ Each team is responsible for bringing their 3D Printed model to the competition for testing. No parts will be printed at the competition. Models must adhere to the contest outlines from the proposed standards. • Provide Engineering Notebook (Engineering notebook guidelines below) • Present design to judges and answer questions • Showcase the functionality of the 3D printed component • Each participant must present hard copy of resume to the judges. Each participant must have one, these will not be collected, only verified that they have them. ▪ **Provide engineering notebook (guideline below)** • Be clearly labeled with contestant number, date and page number on each page • Begin with a problem statement • Include discovery and documentation of approach to solve the problem

	• Include sketched design concepts with critical features labeled • Critical dimensions clearly labeled in design sketch • Consideration for designing for additive manufacturing distinctly addressed (i.e., part strength, part orientation) especially including any expected risk during printing • Screenshots of the print time and material usage for all printed parts • Design decisions and alternatives are documented and evaluated thoughtfully ▪ **Presentation Criteria** • The team clearly describes their understanding of the problem to be solved. • Design Process: good design logic is used for key design choices was intentional and well-communicated • The presentation is professional and well-rehearsed • Practical evaluation • Teams may use a laptop to assist with the presentation, though not required.
Special Notes	▪ Competition will begin immediately after orientation. All competitors must check-in by 10:00 a.m. Computers and other related items may be dropped off prior to competition. ▪ Orientation and Contest area will be closed to observers until 12:00 pm. No instructors are permitted inside the contest zone. ▪ Upon arrival at orientation, students will be provided the timeslot for their competition. The first timeslot will begin at 10:30 a.m. and will run every 30 minutes until we have accommodated the number of teams there to compete. ▪ Students are to return to the competition area 30 minutes after the last timeslot (official time will be provided at the competition) to hear the top 6 teams that will be called back for the 2nd round of group judging. The top placing teams will be selected from this group of 6. ▪ **No smart watches, earbuds, and/or phones are permitted during the contest and/or in the contest** ▪ No contact with anyone outside of the contest area once the contest begins ▪ No inappropriate communication between contestants such as verbally degrading another contestant ▪ No cheating on any portion of the contest such as informing another contestant of the skills/test prior to competing.

National Technical Standards	▪ Please refer to the 2022-2023 National Technical Standards for all contests. Any and all standards included may be tested in any competition. ▪ In conjunction with National Standards, violations may result in student loss of contest
Resume	▪ All SkillsUSA Ohio State Championship Contest will require a short interview component. Students should be prepared with basic job interview skills.

SkillsUSA 2023 Additive Manufacturing State Challenge

Kinematic Assembly Models

Welcome to the "Kinematic Assembly Models" challenge!

The task at hand is to design a functional/movable assembly, also known as a gear system, or kinematic model.

Examples of this type of system are below, this should help get you started on an idea:

- **Peristaltic Pump**
- **Geneva Gear**
- **Rack and Pinion**
- **Differential**
- **Planetary Gear**
- **Bearing**

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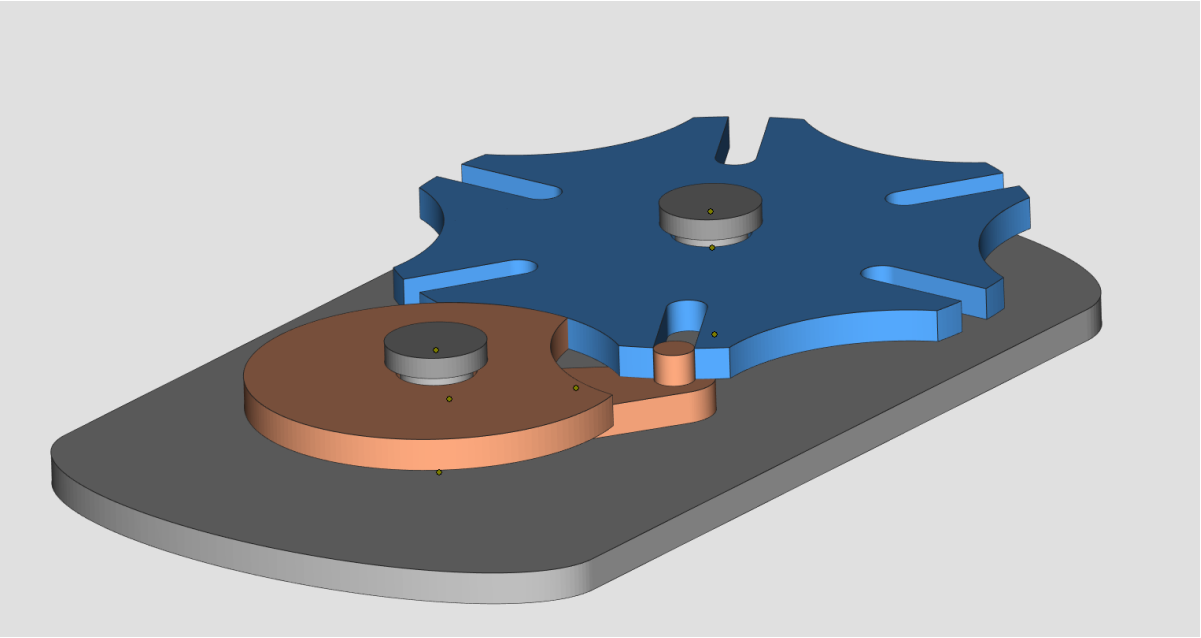

Example of a functional assembly for reference only

Competition Requirements

1. The design **must** contain at least 3 individual bodies to be printed assembled or to be assembled after printing.
2. Printed parts **must** be able to mate and stay together by design or additional hardware provided by the contestant.
3. The design **must** contain at least two printed moving parts in the assembly.
4. One printed part's motion **must** be directly driven by another printed part's motion.
5. The printed parts **must** be able to mate together as an assembly, as designed, without major post-processing.
6. The design **must** be able to rotate/move as designed and should not have excessive backlash.
7. The design **can** contain additional store-bought hardware for the final assembly; this should be provided by the contestant and brought to judging.
8. 3D Printed Design - Students **must** create a design that:
    - Is original and designed by a contestant
    - Prints all parts in less than 18 hours
    - Uses less than 60 cubic inches (1kg) of model and/or support combined for all parts

Tips for Competitors

Here are some tips to maximize the points awarded to you:

- Be sure to design using the correct tolerance between printed parts to allow motion of assembly.
- Be creative by incorporating an end-use for the design.
- Additional moving parts may add to your score but can produce more points of failure on the final assembly.
- Try leveraging design for 3D technology to reduce the additional hardware needed for final assembly.
- Use online resources (YouTube, GrabCAD Tutorials, Cornell's Kinematic Models for Design)
- Whenever intellectual property (IP) deters you from a project, try using approximate geometries to communicate the design intent
- Solve a problem that impacts multiple people
- Optional design for additive manufacturing learning resources:
- Stratasys Think Additively™ Masterclass: https://youtube.com/playlist?list=PLUYaY5EIPtNBdU-s-7l9rl05lBHHlTarI

For questions pertaining to the competition, please contact Chad Whited (cwhited@atctrain.com) or Bob Kelly (bkelly@atctrain.com).