Additive Manufacturing

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

On-Site/Off-Site	• On-Site
Contest Date	• 5/5/2026
Contest Location	• Convention Center • C-Hall
Early/Normal Start Time	Contest Specific Start Time • Registration will open at 8:00 am Please report to B-Hall Show Office for Registration. • Orientation will begin at 10:00 am • Competition will begin at 10:30 am
Contest Open/Closed	• Open • Exhibit Halls do not open to observers until 12:00pm. • No instructors are permitted inside the contest zone.
Eligibility & Contest Type	• Please refer to the Program Guidelines for eligibility- **https://www.ohioskillsusa.org/resources/** • Regional Qualifier Contest (Must attend and place in the top 4 at Regionals to Qualify to Compete at State Level)
Clothing	**For Competition Day the Dress Code is:** Class F **For the Awards Ceremony the Dress Code is:** Class A or Class J • SkillsUSA Ohio Clothing Guide
Safety Equipment	• N/A
Testing	• There is no written test required for this competition.
Provided by Contestant (Tool List)	• Laptop (optional) for - presentation support Requirements:

	• 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 standards. 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, 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. Engineering Notebook Guideline: The Engineering Notebook should contain robust content, including at a minimum the following: - Be clearly labeled with contestant name(s), date, and page # on each page - Begin with a problem statement - Include discovery and documentation of approach to solve problem - Include sketched design concepts with critical features labeled - Critical dimensions clearly labeled in design sketch - Considerations for designing for additive manufacturing distinctly addressed (i.e. part strength, part orientation) especially including any expected risks during printing - Screenshots of the print time and material usage for all printed parts - Design decisions and alternatives are documented and evaluated thoughtfully
Contest Notes, Themes, & Deadlines	***No cell phones or Smart Watches!*** ***Please note that competitors will need to eat lunch outside of their presentation times.***

	• Design decisions and alternatives are documented and evaluated thoughtfully. • Computers and other related items may be dropped off prior to competition. • 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. 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: • Team demonstrates visually (videos, photos, drawings, animation, etc.) the tasks they improved, both before and after. • Teams may use a laptop to assist with the presentation, though not required. • The presentation emphasizes quantize improvements (measured and estimated) of time, quality, or cost of the improvement as well as any DFAM tactics employed. • Teams must bring their completed 3-D printed part and required documentation. 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: team demonstrates visually (videos, photos, drawings, animation, etc.) the task they improved, both before and after. • Teams may use a laptop to assist with the presentation, though not required.

	• The presentation emphasizes quantitative improvements (measured and estimated) of the time, quality, or cost of the improvement as well as any DFAM tactics employed Clothing: • Jeans (with no holes) or Khakis are accepted. • No shorts or open-toed shoes or sandals. • Students can wear tennis shoes or work boots, but laces must be tied. • Short sleeve polo, button-up shirts, and plain non-graphic T-shirts are also acceptable. • School logos on clothing must be covered with tape.
WIFI Provided?	• No
Special Notes/Rules for All Contests	• Starting in 2024, all Skilled Trade State Contests (most leadership contests already use scenarios) will begin to add a scenario-based component. • **Wi-Fi will NOT BE AVAILABLE unless listed above**. If you need WIFI access, please plan to bring a hotspot. • All safety requirements will be heavily enforced. Competitors are to follow all safety standards and OSHA Regulations. ***Contestants MUST HAVE A COPY OF THEIR EMERGENCY MEDICAL FORM IN THEIR NAME BADGE AT ALL TIMES*** **THE FOLLOWING ITEMS ARE PROHIBITED; VIOLATION OF ANY OF THE FOLLOWING MAY RESULT IN COMPETITOR DISQUALIFICATION:** • Contact with Contest Coordinators is prohibited. • Contact with Contest Coordinators outside of the SkillsUSA Ohio is strictly prohibited. • Possession of smart watches and/or phones during the contest and/or in contest. • Contact with anyone outside of the contest area once the contest begins. • Inappropriate communication between contestants such as verbally degrading another contest. • Cheating on any portion of the contest such as informing another contestant of the skills/test prior to competing. • Lack of Copy Emergency Medical Form in Name Badge.
National Technical Standards	• Please refer to the **2024-2026 National Technical Standards** for all contests. All standards included may be tested in any competition. • In conjunction with National Standards, lack of understanding of State Level competition standards (this document) may result in student loss of contest.

Resume/Interview Requirement	● All SkillsUSA Ohio State Championship Contests will require a short interview component. Students should be prepared with basic job interview skills. ● All contestants **must have a hard copy** of a one (1) page personal resume.

SkillsUSA 2026 Additive Manufacturing State Challenge

Welcome to the “Mini-Figure Catapult/Trebuchet Challenge” challenge!

The Additive Manufacturing (AM) contest evaluates students’ ability to design, prototype, validate, and communicate a functional mechanical device using **only 3D-printed components**.
Competitors must design a **catapult or trebuchet** capable of **launching a standard LEGO® minifigure** using **no added materials**, relying exclusively on the **properties of 3D-printed plastics**

Competitors create a **fully additively manufactured launcher**—catapult or trebuchet—where all energy storage and mechanical action originate from **3D-printed geometry alone**, including:

- Printed torsion beams
- Printed elastic flexures
- Printed springs or spring arms
- Printed counterweights (printed material only)
- Printed tension/flexural systems

No external rubber bands, cords, metals, or weights may be used.

Competition Requirements

Design Requirements

Each team must design a launcher that:

1. **Launches a standard LEGO® minifigure** (supplied by contest judges).
2. Stores and releases energy **using only 3D-printed material behavior**:
    - Elastic bending
    - Torsional flexure
    - Printed leaf or coil springs
    - Beam deflection
    - Printed counterweight (printed plastic only)
    - No metal, rubber, glue, magnets, or external energy inputs.
3. Operates using **a catapult or trebuchet mechanism**:
    - Catapult: energy stored in flexural or torsional arms.
    - Trebuchet: energy stored in printed counterweight or pendulum motion.
4. Has a locking trigger mechanism
5. Is safe and stable during operation.
6. Requires no fasteners—**all connections must be printed or snap-fit**.
7. May be a **single print** or **multi-component assembly** (can use multiple 3D printed material):
    - **Bonus points** for functionally integrated, single-print solutions.

Size & Print Constraints

- Fully assembled launcher must fit inside: **150 × 150 × 150 mm**
- All components must be **100% 3D-printed**
- **Any** 3D printer technology may be used:
    - FDM, SLA, DLP, PolyJet, SLS, SAF, MJF, etc.
- **Any printable material** is allowed:
    - PLA, ABS, TPU, Nylon, resin, PA11/12, etc.
- If multiple materials are used, all still must be 100% AM-produced.

Performance Requirements

During testing, each launcher must:

1. Securely hold and release the minifigure.
2. Launch the figure forward, not upward only.
3. Complete **three launches**, which are measured for:
    - Distance
    - Repeatability (all three launches must land within a 6-inch diameter of first launch.
    - Safety and stability (No part interference, damage during operation, or unsafe trajectories)

Design Considerations

4.1 Energy Storage Methods (Allowed)

Teams may use:

- Printed flexible beams (like bow limbs)
- Printed torsion rods

- Printed leaf springs
- Printed coil springs
- Printed counterweights (solid or hollow filled only with printed material)
- Printed whip-action arms

4.2 Energy Storage Methods (NOT Allowed)

- Rubber bands
- Metal or lead weights
- Ball bearings
- Strings or ropes
- Electronics
- External kinetic input beyond human-triggered release

4.3 Stability & Safety

- Broad base recommended
- Ensure center of mass remains within footprint
- Avoid high-tension prints that may crack explosively
- Ensure minifigure is not struck by structural components during firing

4.4 AM Material Behavior Tips

- FDM: stronger along filament path; avoid layer-splitting by orienting beams horizontally
- Resin: brittle; great for fine details but avoid ultra-high deflection
- SAF/SLS: excellent for small flexures; nylon is durable
- Multi-material: optimize stiffness vs elasticity

4.5 Recommended Geometries

- Arched, tapered arms for elastic bending
- Hollow counterweights (printed-only mass)
- Integrated bearings or bushing pockets
- Snap-fit axles and pivot joints
- Lattice structures for energy absorption

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