

ROCKETRY and STEM

Dept. RO

4-H members must be currently enrolled in the Kansas 4-H STEM project to exhibit in this department. Exhibits must have been completed during the current 4-H year.

ASTRONOMY

1. Each exhibitor may enter one exhibit per class.

2. 4-H members enrolled in 4-H STEM-Astronomy for updated County and State Fair guidelines please contact the extension office.

5500 - Telescope made from kit.

5501 - Telescope made from original design.

Champion and Reserve Champion for each class.

Grand Champion and Reserve Champion Astronomy

COMPUTERS

1. Each exhibitor may enter one exhibit per class.

2. 4-H members enrolled in 4-H STEM-Computers for updated County and State Fair guidelines please contact the extension office.

Division A - Computer Systems

5590 - Computer program, application, app, script, or coded system that is new and unique (not merely a file run in a program, such as a 'word document' or a picture drawn in 'Microsoft Paint')

5591 - Computer presentation (power point, web page/site, animated graphics, etc.)

5592 - Single computer system (web server, database server, etc.)

5593 - Networked system consisting of two or more computers

5594 - Chip system - a small (4"x4"x4") programmed physical device that accomplishes a specific task.

ROBOTICS

1. Each exhibitor may enter one robot per class.

2. 4-H members enrolled in 4-H STEM-Robotics for updated County and State Fair guidelines please contact the extension office.

JR Division—7 and 8-year-old

5505 - Robot made from a commercial (purchased) kit.

5506 - Robot designed and constructed by exhibitor. The robot must not be a mere modification of an existing robot kit or plan.

5507 - Programmable robot made from a commercial (purchased) kit.

5519 - Robot designed and constructed by exhibitor or from a commercial kit, that is operated by a remote-controlled device

5543 - Junk Drawer Robotics-based curriculum robot

Intermediate Division - 9 to 13 years old

5509 - Robot made from a commercial (purchased) kit.

5510 - Robot designed by exhibitor. The robot must not be a mere modification of an existing robot kit or plan.

5511 - Programmable robot made from a commercial (purchased) kit.

5546 - Robot designed and constructed by exhibitor or from a commercial kit that is operated by a remote-controlled device.

5544 - Junk Drawer Robotics-based curriculum robot.

Senior Division- 14 years and up

5513 - Robot made from a commercial (purchased) kit

5514 - Robot designed by exhibitor. The robot must not be a mere modification of an existing robot kit or plan.

5515 - Programmable robot made from a commercial (purchased) kit.

5547 - Robot designed and constructed by exhibitor or from a commercial kit that is operated by a remote-controlled device.

5545 - Junk Drawer Robotics-based curriculum robot

Team Robotics Project

5517 - Robot designed and constructed by two or more 4-H Robotics project members. The robot must not be a mere modification of an existing robot kit or plan. The robot may be a programmable type that is made from a commercial (purchased) kit. This division is designed to encourage teamwork and cooperation among fellow 4-H Robotics members. As with many high-tech projects today, no one person designs and builds a robot alone. It takes the brainstorming, planning, problem solving, and cooperation of an entire team to complete a given robotics project.

ROCKETRY

The Kansas 4-H STEM Rocketry program is designed to allow 4-H members to explore aerospace through rockets of various sizes. Kansas 4-H has adopted the National Association of Rocketry's rules, regulations, and safety guidelines.

Exhibit Information for ALL rocketry categories:

1. Consultation/interview judging will be held Thursday.
2. All revisions of all forms previously released for the STEM division either undated or dated prior to current year are void for use and new forms must be obtained and used that are dated by the State 4-H Office for the current year. Use of old forms will result in the loss of one ribbon placing for exhibits.
3. Relevant documents may be obtained from County Extension Offices or from www.STEM4KScom
4. NAR refers to the National Association of Rocketry and its governing board.
5. Tripoli refers to the Tripoli Rocketry Association and governing board.
6. All NAR documents, with the exception of the "pink book," referenced herein can be found [at http://www.nar.org](http://www.nar.org).
7. If a fire burn ban is in effect for any county in Kansas, exhibitors in any Kansas County are not required to launch their rocket(s). All requirements for the launching of rockets for the state fair and the documenting of the launching are suspended for the duration of the ban.

Exhibit Definitions for ALL rocketry categories:

1. 4-H members enrolled in Rocketry for updated County and State Fair definitions please contact the extension office.

Exhibit Rules for ALL rocketry categories:

Purpose: These rules apply to how rockets are to be displayed at the fair and what those displays should and should not contain. These rules apply to all rockets displayed in the STEM division.

1. 4-H members enrolled in Rocketry for updated County and State Fair exhibit rules please contact the extension office.

Construction Rules for All Rockets

Purpose: These rules apply to the construction of all rockets displayed in the STEM division.

1. 4-H members enrolled in Rocketry for updated County and State Fair guidelines for construction rules please contact the extension office.

Model Rocketry Guidelines (ages 9 and up):

Purpose: Model rockets are generally small-to-medium sized rockets that can be purchased at hobby stores that an individual(s) builds from parts similar to those found in model rocket kits.

1. 4-H members enrolled in Rocketry for updated County and State Fair guidelines for ages 9 and up please contact the extension office.

Original Design Rocket Guidelines (ages 11 and up):

Purpose: To allow for youth to develop their own rockets (model, mid and high powered) in a safe manner that displays maximum craftsmanship.

1. 4-H members enrolled in Rocketry for updated County and State Fair guidelines for ages 11 and up please contact the extension office.

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Division JR - Exhibitors 7 and 8 years old

2601 - Rockets made from a kit, **without** pre-assembled fin units. Include plans.

2602 - Rocket made from "beginner's kit." Include plans. Rockets in this class may have pre-assembled fin units. (This class is for first and second year 4-H members to explore the rocketry project.)

Division A - Exhibitors 9 through 13 years old

5520 - Rocket made from kit. Include plans.

5537 - Scale Model Rocket made from kit. Include plans.

Division B - Exhibitors 11 through 13 years old (9-10-year-old may not enter in this class)

5521 - Rocket designed by exhibitor: not merely a modification of an existing kit. Include original plans.

5538 - Scale Model Rocket designed by exhibitor: not merely a modification of an existing kit. Include original plans and stability testing.

Division C - Exhibitors 14 years and older

5525 - Rocket made from kit. Include plans.

5526 - Rocket designed by exhibitor: not merely a modification of an existing kit. Include original plans.

5539 - Scale Model Rocket made from kit. Include plans.

5540 - Scale Model Rocket designed by exhibitor: not merely a modification of an existing kit. Include original plans and stability testing.

Division D - Exhibitors 11 years and older

This class is designed to encourage teamwork among individuals and clubs to work on a rocket from the initial design to the finished product.

5530 - Rocket designed by 2 or more exhibitors: not merely a modification of an existing kit. Include original plans.

Mid or High-power Rocketry (2x'D' to 'G') Engine Guidelines:

Purpose: To allow for improved safety and judging of rockets that meet the requirements of 4-H mid-power rockets.

1. 4-H members enrolled in Rocketry for updated County and State Fair guidelines for Mid or High-power Engines please contact the extension office.

Division E—Exhibitors 14 years and older

5536 - Mid or high-power rocket made from kit or original design.

STEM AG MECHANICS

The Ag Mechanics project is starting with an emphasis on welding and smithing, it will expand as the project area grows. This project allows youth to explore areas of ag mechanics and metallurgy from repairing or repurposing items to the fabrication of new items. The intent is for this program start with foundational areas, some of which youth may already have, and allow them to continue to build on this knowledge becoming more experienced.

Rules

1. 4-H members must be currently enrolled in the Kansas 4-H STEM Ag Mechanics (welding) project to exhibit in this division.
2. Each exhibitor may enter one exhibit per class. Exhibits must have been constructed or repaired during the current 4-H year. The exhibit must have been selected at the county level for entry at the State Fair. Counties or districts should select only top blue or purple ribbon Ag Mechanics exhibits which meet State Fair guidelines.
3. Wheeled exhibits must utilize a braking mechanism which prevents the exhibit from freely rolling while on display.
4. Exhibitors are responsible for providing sufficient braking or "chocks" for trailer exhibits to ensure that the exhibits do not move once positioned. If using a wheel "chocking" mechanism, the two individual blocks should be connected together as a pair of chocks, so they do not become separated. At least one pair of chocks should be placed on each side of the trailer to prevent movement.
5. For trailer exhibits the tongue of the trailer should have a locking mechanism (e.g. padlock) to prevent the trailer from being moved by unauthorized individuals while being displayed. A key for the locking mechanism should be left with the superintendent and labeled with the exhibitor's name, county, and phone number.
6. Each exhibit must be free-standing or sufficiently supported by an exhibitor supplied support system that is moveable and is part of the total demission's and weight of the exhibit as described previously. Exhibit boards should have a portable and moveable base. No exhibits may be staked to the ground for display.
7. Top heavy items should be braced or placed in a stand sufficient to prevent it from toppling over while on display.

8. Exhibits may not be bound, affixed, attached to the State Fair buildings, except by the superintendent, State Fair Staff, or State Fair Extension Staff.
9. Painting or spot painting is not allowed on projects after arrival on fairgrounds. If wet paint is detected by judges or superintendents one ribbon placing will be deducted.
10. Repair projects having adequate original finish need not be repainted.
11. Cutting surfaces, such as blades, are to have a protective covering over them to prevent injury. The covering should be easily removed and reinstalled for judging. Foam "pool noodles" and multiple layers of cardboard are acceptable.
12. Display cases for small exhibits are acceptable and must be easily opened so the item can be removed and examined as part of judging.
13. Exhibits that include weaponry of any kind will be disqualified. Weaponry is defined as any instrument, possession, or creation, physical and/or electrical that is intended to be used to inflict damage and/or harm to individuals, animal life, and/or property.
14. Trailers may be displayed outside.
15. If the exhibit is powered by flammable liquids (gas, propane, kerosene, etc.) the fuel tank and lines should be drained and allowed to dry, to avoid spills and potential fires.
16. Electric powered (battery, corded, solar, or alternative energy) should have a primary shutoff or disconnect switch.
17. If a safety violation is noted by the judges, superintendent, or other staff, the exhibitor's exhibit, at the judges' discretion, will receive a deduction in ribbon placement or a participation ribbon.
18. The exhibitor's name(s) and county or district must be tagged or labeled in a prominent location on the display.
19. Each exhibit must include an Ag Mechanics information packet. Entry of just a packet without an accompanying exhibit is not a sufficient exhibit.
20. Each exhibitor is required to complete the "4-H STEM Ag Mechanics Exhibit Information Form" which is available through your local K-State Research and Extension office or at www.STEM4KS.com. This form must be attached to the outside of a 10" x 13" manila envelope. Do not tie the envelope to the exhibit. All revisions of all forms previously released for the STEM division dated prior to current year are void for use and new forms must be obtained and used that are dated by the State 4-H Office for the current year.
21. Each exhibit information packet should include the following items:
 - a. Bill of materials for the project with associated costs, scrap items used may be listed as having a \$0.00 cost.
 - b. 1 to 5 pages of photos showing work on the exhibit, preferably from a beginning state to final or completed state.
 - c. If appropriate schematics or working drawings relating to the creation or repair, this is not required for display boards.
 - d. If appropriate operating instructions.
22. Additionally, exhibitors may create an optional video (not required) about their project showing its operation and the work they have done. This allows judges to get a better understanding of the exhibit and allows the youth the opportunity to fully demonstrate their exhibit. The video should be no longer than 8 minutes and should be placed on a USB drive. These videos may also be considered for inclusion in a running video loop in the STEM area at the state fair after review by judges, superintendent(s), and extension staff. Adult guardians must complete the video release included with the exhibit form. If the release is not completed the video will not be included in the video loop on display in the STEM area at the Kansas State Fair.
 - a. **For the Barton County Fair with consultation judging, it is recommended that the video elements be waived in favor of talking with the exhibitor.**
23. Ag Mechanics exhibits may be checked out for use in a Kansas State Fair 4-H demonstration or 4-H illustrated talk with prior permission. For permission, check with the superintendent or Shane Potter. The exhibit must be returned to display immediately after the demonstration/illustrated talk, or the exhibit will be disqualified.

Eligibility – Each exhibitor may enter one exhibit per class. Exhibits must have been constructed or repaired during the current 4-H year. The exhibit must have been selected at the county level for entry at the State Fair. Counties or districts should select only top blue or purple ribbon Ag Mechanics exhibits which meet State Fair guidelines.

Scoresheets, Forms, and Contest Study Materials:

- [4-H STEM Ag Mechanics Exhibit Information Form](#)
- www.STEM4KS.com

Classes

Introductory – Level 1 (about 1 - 3 years' experience)

This level is designed for youth with little to no exposure in the project area so that they can gain an understanding of basic principles and methods in the given area.

5550 Welding Display Board. A 3' x 3' display board with different pieces of metal attached illustrating different types of welds, each weld being labeled.

5551 Level 1 Welding Ag Repair. Repair of ag equipment with welding.

5552 Level 1 Welding Ag Fabrication. Creation of new ag equipment with welding.

5553 Level 1 Welding General Repair. Repair of non-ag equipment with welding.

5554 Level 1 Welding General Fabrication. Creation of non-ag equipment with welding.

5555 Level 1 Welding Artistic Fabrication. Creation of artistic or interpretive pieces with welding.

5556 Level 1 Brazing Repair.

5557 Level 1 Brazing Fabrication.

5558 Smithing Display Board. A 3' x 3' display board with different pieces of forged metal attached illustrating different forms, each form being labeled.

5559 Level 1 Smithing. A design forged with at least **one** formed element (twists or spirals for example).

Experienced – Level 2 (about 4 - 6 years' experience)

This level is designed for youth some experience in the project area allowing them to expand on common principles and methods in the given area.

5560 Level 2 Welding Ag Repair. Repair of ag equipment with welding.

5561 Level 2 Welding Ag Fabrication. Creation of new ag equipment with welding.

5562 Level 2 Welding General Repair. Repair of non-ag equipment with welding.

5563 Level 2 Welding General Fabrication. Creation of non-ag equipment with welding.

5564 Level 2 Welding Artistic Fabrication. Creation of artistic or interpretive pieces with welding.

5565 Level 2 Brazing Repair.

5566 Level 2 Brazing Fabrication.

5567 Level 2 Smithing. A design forged with at least **two** different formed elements (twists and spirals for example).

Advanced – Level 3 (about 7 - 9 years' experience)

This level is designed for youth with vast experience in the project area allowing them to master common principles and methods and expand on advanced techniques in the given area.

5570 Level 3 Welding Ag Repair. Repair of ag equipment with welding.

5571 Level 3 Welding Ag Fabrication. Creation of new ag equipment with welding.

5572 Level 3 Welding General Repair. Repair of non-ag equipment with welding.

5573 Level 3 Welding General Fabrication. Creation of non-ag equipment with welding.

5574 Level 3 Welding Artistic Fabrication. Creation of artistic or interpretive pieces with welding.

5575 Level 3 Brazing Repair.

5576 Level 3 Brazing Fabrication.

5577 Level 3 Smithing. A design forged with at least three different formed elements (twists, spirals and bulbs for example).

Master – Level 4 (10 or more years' experience)

This level is designed for youth substantial experience in the project area allowing them to master advanced techniques in the given area.

5580 Level 4 Welding Ag Repair. Repair of ag equipment with welding.

5581 Level 4 Welding Ag Fabrication. Creation of new ag equipment with welding.

5582 Level 4 Welding General Repair. Repair of non-ag equipment with welding.

5583 Level 4 Welding General Fabrication. Creation of non-ag equipment with welding.

5584 Level 4 Welding Artistic Fabrication. Creation of artistic or interpretive pieces with welding.

5585 Level 4 Brazing Repair.

5586 Level 4 Brazing Fabrication.

5587 Level 4 Smithing. A design forged with at least **four** different elements (twists, spirals and bulbs for example.)

Resources

Project Area – [STEM Ag Mechanics](#)

UNMANNED AERIAL SYSTEMS

Purpose: The 4-H unmanned aerial systems or UAS project explores the world from above the trees and discovers new frontiers with UAS's. UAS's are commonly known as Unmanned Aerial Vehicles (UAV's) or drones. Members explore uses and applications of unmanned aerial systems including how UAS's: link to other projects such as geology, robotics, electronics, crop science and many more. Each exhibitor may enter one exhibit per class.

1. 4-H members enrolled in 4-H STEM Unmanned Aerial Systems for updated County and State Fair guidelines for ages 11 and up please contact the extension office.

Junior Division A - 7 and 8 years old

5700 - Unmanned Aerial System "designed and constructed by exhibitor" that is operated by a remote-controlled device.

Intermediate Division - 9-13 years old

5701 - Unmanned Aerial System "designed and constructed by exhibitor" that is operated by a remote-controlled device. The UAS must not be a mere modification of an existing kit or plan. You may not exhibit a UAS that is purchased off the shelf in this class.

5702 - "Practical application" of an Unmanned Aerial System constructed from a commercial (purchased) kit. This includes the UAS, plus one or more of the following a video, notebook, poster, display board, etc. This class is separate from educational exhibits. A tangible use would be mapping Russian olive trees, eroded soils, and bindweed in fields, etc. There are also many other non-agricultural UAS uses that would be appropriate for this class.

Division B - Senior. 14 years and older

5706 - Unmanned Aerial Systems designed and constructed by exhibitor that is operated by a remote-controlled device. The UAS must not be a mere modification of an existing kit or plan. You may not exhibit a UAS that is purchased off the shelf in this class.

5707 - Practical application of an Unmanned Aerial System constructed from a commercial (purchased) kit. This includes the UAS, plus one or more of the following a video, notebook, poster, display board, etc. This class is separate from educational exhibits. A tangible use would be mapping Russian olive trees, eroded soils, and bindweed in fields, etc. There are also many other non-agricultural UAS uses that would be appropriate for this class.

ARCHITECTURAL BLOCK CONSTRUCTION

Purpose: To allow 4-Hers to start with an emphasis on using architectural blocks ("Legos") to construct dioramas. It allows youth to explore architectural design in a three-dimensional space. The intent of this program is to start with foundational ideas of architecture and to continue building on this knowledge.

1. Each exhibitor may enter one exhibit per class.
2. 4-H members enrolled in 4-H STEM-ABC for updated County and State Fair guidelines please contact the extension office.

Intermediate – (age 9-13)

5710 – Interlocking brick diorama built from scratch

Senior – (age 14-18)

5711 – Advanced interlocking brick diorama built from scratch

Junior – (age 7-8)

5712 – Interlocking brick diorama built from scratch to introduce basic brick building concepts

STEM EDUCATIONAL EXHIBITS

POSTERS, NOTEBOOKS AND DISPLAY BOARDS

Purpose: To allow 4-Hers to explore STEM outside the bounds of traditional projects for rockets, robotics, astronomy, computers and unmanned aerial systems. All posters, notebooks and display boards are listed in this section and have been removed from the individual sections to save space.

1. The General Exhibit rules for ALL categories apply.
2. 4-H members enrolled in Rocketry and STEM for updated County and State Fair guidelines for posters, notebooks and display boards please contact the extension office.

STEM - Junior Division - 7-8 years old

5728 - Educational Display

5729 - Educational Notebook

5730 - Educational Poster

STEM- Intermediate Division - 9-10 years old

5731 - Educational Display

5732 - Educational Notebook

5733 - Educational Poster

STEM - Senior Division - 14 years and older

5736 - Educational Display

5737 - Educational Notebook

5738 - Educational Poster

5773 - Junior Computer Notebook