Science, Engineering & Technology

Only one entry per class. $\underline{S}_{\underline{F}}$ Classes only are State Fair eligible.
All static exhibits must have received a purple ribbon at the county fair to advance to the State Fair.
Large static items eligible for state fair will be the responsibility of the family to get to the Nebraska State Fair.

SET AEROSPACE
Rockets/Drones
Division 850

This category gives 4-H'ers a chance to display the rockets and drones they have created. Through participation in this category 4-H'ers will show judges what they learned about and how they adapted their exhibit throughout this project. Involvement in SET Aerospace gives participants a first-hand experience in modern technology.
Entry level rockets, made with PLASTIC FINS and PLASTIC BODY TUBES, are COUNTY ONLY projects.
Scoresheets, forms, contest study materials, and additional resources can be found at https://go.unl.edu/ne4haerospace.

Rules

A. The name and county of each exhibitor should appear separately on the back of each board, poster or article and on the front cover of the notebooks so owner of the exhibit may be identified if the entry tag is separated from the exhibit.
B. Rockets must be supported substantially to protect the rocket from breakage. Rockets are to be mounted on a base that has dimensions equal or less than 12" x 12" and the base should be 3/4" thick. No metal bases. If the rocket fins extend beyond the edges of the required base (12" x 12"), then construct a base that is large enough to protect the fins. The base size is dictated by the size of the rocket fins.
C. The rockets must be mounted vertically. Please do not attach side boards or backdrops to the display. In addition, a used engine or length of dowel pin is to be glued and/or screwed into the board and extended up into the rockets engine mount to give added stability.
D. Rockets must be equipped as prepared for launching, with wadding and parachute or other recovery system. Rockets entered with live engines, wrong base size or sideboards will be disqualified.
E. A report, protected in clear plastic cover, must include: 1) rocket specification (include original or photo of manufacture packaging stating rocket skill level), 2) a flight record for each launching (weather, distance, flight height), 3) number of launchings, 4) flight pictures, 5) safety (how did you choose your launch site? Document safe launch, preparations, and precautions), 6) objectives learned and 7) conclusions.
F. The flight record should describe engine used, what rocket did in flight and recovery success. Points will not be deducted for launching, flight or recovery failures described. This includes any damage that may show on the rocket. Complete factory assembled rockets will not be accepted.
G. Judging is based upon display appearance, rocket appearance, workmanship, design or capabilities for flight, number of times launched, and report. Three launches are required to earn the maximum launch points given on the score sheets. For scoring for the State Fair, only actual launches count, misfires will not count towards one of the required three launches.
    1. For self-designed rockets only, please include digital recorded copy of one flight. In the documentation please include a description of stability testing before the rocket was flown.

2. Skill level of project is not determined by number of years in project. Skill level is determined by the level listed on the manufacturing packaging.
3. 4-H Rocket project levels are not intended to correspond to National Association of rocketry model rocket difficulty ratings or levels.

H. **High power rockets (HPR) is similar to model rocketry with differences that include the propulsion power and weight of the model. They use motors in ranges over "G" power and/or weigh more than laws and regulations allow for unrestricted model rockets. These rockets are NOT appropriate for 4-H projects and will be disqualified**.

I. Posters can be any size up to 28" by 22" when ready for display. Example: tri fold poster boards are not 28" by 22" when fully open for display.

Counties are allowed a maximum of four entries for all rocketry in State Fair Competition. State Fair Premier 4-H Science Awards is available in this area.

Aerospace/Rockets

Aerospace 1 – See Clover Kid projects

Youth enrolled in Aerospace 2, 3, or 4 may exhibit in any class within this division.

S F Class 1 **Rocket:** (Scoresheet SF92) Any Skill Level 2 rocket with wooden fins and cardboard body tubes painted by hand or air brush.

S F Class 2 **Aerospace Display:** (Scoresheet SF93) Poster or display board that displays or exemplifies one of the principles learned in the Lift Off Project. Examples include: display of rocket parts and purpose, explains the parts of a NASA rocket or shuttle, interview of someone in the aerospace field, or kite terminology. Include notebook containing terminology (definition), and what was learned. Display can be any size up to 28" x 22".

S F Class 3 **Rocket:** (Scoresheet SF92) Any Skill Level rocket with wooden fins and cardboard body tubes painted using commercial application example commercial spray paint.

Self –Designed Rocket

Youth enrolled in Aerospace 2, 3, or 4 may exhibit in any class within this division.

S F Class 4 **Rocket:** Any self-designed rocket with wooden fins and cardboard body tubes.

DRONES

Youth enrolled in Aerospace 2, 3, or 4 may exhibit in any class within this division.

S F Class 5 **Drone Poster**: Exhibit must be designed to educate yourself and others on one or more of the following topics: drone technologies, uses of drones, the different types of drones, types of training needed to operate drones, and the laws and regulations users must follow. Posters can be any size up to 28" by 22".

S F Class 6 **Drone Video**; Exhibit must demonstrate how the drone interacts with the outside world. Examples include: field scouting, surveying damage from natural disasters, drones used in commercial applications and settings, and drones used for structural engineering. Video should not exceed 5 minutes. Videos should also be uploaded to a video streaming application and exhibitors must provide a hard copy QR code for viewing

SET COMPUTERS

Division 860

This category gives 4-H'ers a chance to display their knowledge of computers. Through participation in this category 4-H'ers will develop presentations that show judges their knowledge

in the different aspects of computer science. Involvement in SET Computers gives participants a first-hand experience in modern technology.
Scoresheets, forms, contest study materials, and additional resources can be found at http://go.unl.edu/ne4hcomputers.
Rules

A. The name and county of each exhibitor should appear separately on the back of each board, poster or article and on the front cover of the notebooks so owner of the exhibit may be identified if the entry tag is separated from the exhibit.
B. Demonstration boards should include an overall title for the display, plus other necessary labeling.
C. Reports should be written using the scientific method whenever possible (Background, the Question or hypothesis, what you plan to do and what you did, Method used and observations, Results: what you learned.) All reports should be computer generated and enclosed in a clear plastic cover. The reports should be attached securely to the display.
D. Please refer to the State Fair General Rules for the policy regarding firearms, items with a blade, and other related items.
E. State Fair Premier 4-H Science Award is available in this area.
F. Please refer to the General Rules for the policy regarding use of copywritten images.
G. Team Entries: To qualify for entry at the Nebraska State Fair team materials entered in Class 8 – Digital Fabrication must clearly the work of a team instead of an individual must have at least 50% of all team members enrolled in 4-H. Additionally, all enrolled 4-H members on the team should complete and attach an entry tag to the materials. A supplemental page documenting the individual contributions to the project should be included. The entry will be judged as a team, with all team members receiving the same ribbon placing.

BOOTING UP– UNIT 1

On a 3" x 5" card state the purpose of the program, computer it was designed to run on, and new skills learned. All projects may be interview judged. Computer posters will be mounted on a 14" x 22" poster either in a vertical or horizontal arrangement. Computer poster should be based on a computer theme, such as “How a Computer Works”, “How to Use a Computer” or “Computers in Action”. Other topics created by computer graphic programs can be exhibited in Division 151 - Posters. Judging criteria for computers projects include design, use of fonts, graphics, tools like columns, tables, macros, etc.

Class 11 **Computer Art Poster** (black/white or color) - Exhibit should be created on at least 8 ½" x 11" paper using a commercially available graphics software package and a single color printer/plotter.
Class 12 **Games** - For example word searches, mazes, hangman, anagrams, etc.
Class 13 **Original Graphics Poster** - Exhibit should be on an 8 ½" x 11" poster using original graphics developed by the 4-Her.
Class 14 **Simple Spreadsheet Application** - Personal finances, simple budget, etc. Exhibit should consist of printed input and output and a 3" x 5" card explaining the purpose of the spreadsheet and what software was used.
Class 15 **Simple database application** - Mailing List, etc. Exhibit should consist of a database and what software was used.
Class 16 **Simple macro(s) application within a commercial software package** - Exhibit should consist of printed input and output and a 3" x 5" card explaining purpose of the macro(s), why the macro(s) would be implemented and what software was used.
Class 17 **Greeting Cards/Banners** - Exhibit should be created using a commercially available software package.

COMPUTER MYSTERIES – UNIT 2

S F Class 1 **Computer Application Notebook** – (Scoresheet SF277) 4-H exhibitor should use computer application to create a graphic notebook utilizing computer technology. 4-H'er may create any of the following: greeting card (5 different cards such as a birthday, wedding, anniversary, sympathy, get well or other); a business card (3 cards for 3 different individuals and businesses); menu (minimum of 2 pages including short description of foods and pricing); book layout (I-book); promotional flyer (3 flyers promoting 3 different events); newsletter (minimum 2 pages); or other: examples such as precision farming or family business logo etc. This exhibit consists of a notebook (8.5x11 inches) which should include a (1) a detailed report describing: (a) the task to be completed, (b) the computer application software required to complete the task, (c) specific features of the computer application software necessary for completing the task (2) print out of your project. Project may be in color or black and white.

S F Class 2 **Produce a Computer Slideshow Presentation –** (Scoresheet SF276) Using presentation software a 4-H exhibitor designs a multimedia computer presentation on one topic related to youth . All slide shows for state fair should be emailed to Amy Timmerman atimmerman2@unl.edu before August 15. Files must be saved in a PC compatible format with county name and last name of participant before emailing OR the slide show may be shared through a share link or QR code which is included in the notebook. A notebook with a printout of all slides should be submitted. Slideshow should include a minimum of 10 slides and no more than 25. Incorporate appropriate slide layouts, graphics, animations, and audio (music or voice and transition sounds do not count). Each slide should include notes for a presenter. All slideshows must be up loaded.

COMPUTER MYSTERIES – UNIT 3

S F Class 3 **Produce an Audio/Video Computer Presentation** – (Scoresheet SF276) Using presentation software a 4-H exhibitor designs a multimedia computer presentation on one topic related to youth. All presentations for state fair should be emailed to Amy Timmerman atimmerman2@unl.edu before August 15. OR the presentation can also be uploaded to a video streaming application and exhibitors must provide a hard copy QR code for viewing. The presentation must be able to be played and viewed on a PC using Windows Media Player, Real Player, iTunes or QuickTime Player. A notebook with a printout of all the slides should be submitted. The presentation should be at least 2 minutes in length and no more than 5 minutes in length, appropriate graphics, sound and either a video clip, animation or voice over and/or original video clip.

S F Class 4 **How to STEM (Science, Technology, Engineering and Math) Presentation** – (Scoresheet SF276) Youth design a fully automated 2 to 5 minute 4-H "how to" video. Submissions should incorporate a picture or video of the 4-H'er, as well as their name (first name only), age (as of January 1 of the current year), years in 4-H, and their personal interests or hobbies. Videos should be designed for web viewing or may be uploaded to a video streaming application and exhibitors can provide a hard copy QR code for public viewing. Any of the following formats will be accepted: .mpeg, .rm, .wmv, .mp4, .ov, .ppt, or .avi.

S F Class 5 **Create a Web Site/Blog or App** – (SF275) Design a simple Web site/blog or app for providing information about a topic related to youth using either software programs such as HTML editor like Microsoft's FrontPage or Macromedia's Dreamweaver, and image editor like Irfan View or GIMP OR online using a WIKI such as Google Sites. If the Web site, Blog or App isn't live include all files comprising the Web Site, Blog or

App should be submitted on a flash drive in a plastic case along with the explanation of why the site was created or may be shared through a hard copy share link or QR code for viewing. If developed using a WIKI or other online tool, include a link to the website in the explanation of why the site was created.

S F Class 6 **3D Printing** – (Scoresheet SF1050)
3D printing uses plastic or other materials to build a three-dimensional (3D) object from a digital design (including 3D Pen Creation). Youth may use original designs or someone else's they have redesigned in a unique way. Exhibits will be judged based on the motivation and/or problem identified. For example, 3D objects printed as part of the design process for robot or other engineering project. Must include design notebook that addresses the following questions:

- What was the motivation for your design or the problem you were solving with your design? ie. is your item a functional or decorative piece?
- Please include a picture of original design, citation of designer/website OR if design is completely original (you created it using CAD software), then state that it's original. If item was not completely original, indicate what you did to the original design to modify it to better meet the design problem stated in #1 above. Its design was modified multiple times, please indicate what change was made with each modification, and what prompted the need for the change. I.e. I printed it and the design was too fragile, so I resliced the print to make thicker external walls, or to have a denser infill.
- Define your process for designing/printing. What software and/or hardware was used (indicate type of 3D printer or if item was created with 3D pen)?
- What materials were selected for your project?
- If your final design has any moving parts, define how you determined appropriate allowance in your design.

Identify any changes that you would make to improve your design.

S F Class 7 **Maker Space/Digital Fabrication** – (Scoresheet SF1051) This project is a computer generated projected created using a laser cutter, vinyl cutter, heat press or CNC router. Vector or 3D based software such as corel draw or Fusion 360 would be an example of an appropriate software used to create your finished project. Project should include a notebook with the following: a)What motivated you to create this project. b)Software and equipment used. c)Directions on how to create the project. d)Prototype of plans. e)Cost of creating project, f)Iterations or modifications made to original plans. g)Changes you would make if you remade the project.
Team Entry Option: To qualify for entry at the Nebraska State Fair team materials entered in H860007 – Maker Space/Digital Fabrication must clearly be the work of a team instead of an individual and must have at least 50% of all team members enrolled in 4-H. Additionally, all enrolled 4-H members on the team should complete and attach an entry tag to the materials. A supplemental page documenting the individual contributions to the project should be included. The entry will be judged as a team, with all team members receiving the same ribbon placing.

SET ROBOTICS
Division 861

This category involves the many different aspects of Robotics. Participants will learn more about how robots are designed and developed as well as the mechanical and electronic elements of robots. Involvements in SET Robotics gives participants a first-hand experience in modern technology.

All static exhibits must have received a purple ribbon at the county fair to advance to the State Fair.

Scoresheets, forms, contest study materials, and additional resources can be found at http://go.unl.edu/ne4hrobotics.

Rules

A. The name and county of each exhibitor should appear separately on the back of each board, poster or article and on the front cover of the notebooks so the owner of the exhibit may be identified if the entry tag is separated from the exhibit.
B. Reports should be written using the scientific method whenever possible (Background, the Question or hypothesis, what you plan to do and what you did, Method used and observations, Results: what you learned. All reports should be computer generated and enclosed in a clear plastic cover. The reports should be attached securely to the display.
C. Posters can be any size up to 28" by 22" when ready for display. Example: tri fold poster boards are not 28" by 22" when fully open for display.

Youth enrolled in Virtual Robotics, Junk Drawer Robotics (Levels 1, 2, or 3), Robotics Platforms may exhibit in any class within this division.

Team Entries: To qualify for entry at the Nebraska State Fair team materials entered in robotics classes that are clearly the work of a team instead of an individual must have at least 50% of all team members enrolled in 4-H. Additionally all enrolled 4-H members on the team should complete and attach an entry tag to the materials. A supplemental page documenting the individual contributions to the project should be included. The entry will be judged as a team, with all team members receiving the same ribbon placing.

Creating a video of your robot in action would be helpful for the judges but is not mandatory. Present as a CD Rom with your robot entry. Videos should be uploaded to a video streaming application and exhibitors should provide a hard copy QR code for viewing.

SF Class 1 **Robotics Poster** – (Scoresheet SF236) Create a poster (28" X 22") communicating a robotics theme such as "Robot or Not", "Pseudocode", "Real World Robots", Careers in Robots" "Autonomous Robotics", "Precision Agriculture" or a robotic topic of interest to the 4-H'er.

SF Class 2 **Robotics Notebook** – (Scoresheet SF237) Explore a robotics topic in-depth and present your findings in a notebook. Documentation should include any designs, research, notes, pseudocode, data tables or other evidence of the 4-H'ers learning experience. The notebook should contain at least three pages. Topics could include a programming challenge, a programming skill, calibration, sensor exploration, any of the topics suggested in Class 1.

SF Class 4 **Robotics/Careers Interview** – (Scoresheet SF239) Interview someone who is working in the field of robotics and research the career in robotics. Interviews can either be written or in a multimedia format (CD/DVD). Written interviews should be in a notebook. Written reports should be 3 to 5 pages, double spaced, 12 point font, and 1" margins. Multimedia reports should be between 3 to 5 minutes in length.

SF Class 5 **Robotics Sensor Notebook** – (Scoresheet SF241) Write pseudo code which includes at least one sensor activity. Include the code written and explain the code function.

SF Class 7 **Kit Labeled Robot (cannot be programmed) and Notebook** – This class is intended for explorations of robotic components such as arms or vehicles OR educational kits marketed as robots that do not have the ability to be programmed to "sense, plan and act." The exhibit should include a notebook with the robot the youth has constructed. Included in the notebook should be (1) a description of what the robot does, (2) pictures of programs the robot can perform, (3) why they chose to build this particular form, and (4) how they problem solved any issues they might have had during building

and programming. A picture story of assembly is recommended. If robot is more than 15" inches wide and 20" inches tall they may not be displayed in locked cases.

S F Class 8 **3D Printed Robotics Parts** – (Scoresheet SF244) This class is intended for youth to create parts through 3D printing, that help create their robot or aid the robot in completing a coded function. Project should include notebook describing the process used to create the project, describe the success of your designed piece (did it work), intended use of the product and the modifications made to the item.

ROBOTICS SHOWCASE

S F Class 3 **Robotics Video** – (Scoresheet SF238) This class should be displayed in a notebook. The notebook should include a video clip on a CD/DVD that demonstrates the robot performing the programmed function. Include your pseudo code and screenshots of the actual code with a written description of the icon/command functions. All videos for state fair should be emailed to Amy Timmerman atimmerman2@unl.edu before August 15. Files must be saved in a PC compatible format with county name and last name of participant before emailing.