SCIENCE, ENGINEERING & TECHNOLOGY

DEPARTMENT: SCIENCE, ENGINEERING, & TECHNOLOGY

AREA: AEROSPACE

CURRICULUM & RESOURCES

Rockets Away	B	I
Aerospace 2: Lift-Off	B	
Aerospace 3: Reaching New Heights		I
Aerospace 4: Pilot in Command		A

GENERAL RULES – AEROSPACE

1. 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.
2. 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. The rockets must be mounted vertically. Please do not attach sideboards or backdrops to the displays. 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. Rockets must be equipped as prepared for launching, with wadding and parachute or other recovery system.
3. Rockets entered with live engines, wrong base size or sideboards will be disqualified.
4. Complete factory assembled rockets will not be accepted.
5. Judging is based upon display appearance, rocket appearance, workmanship, design or capabilities for flight, number of times launched and report. Three launches are required.
6. A report, protected in a clear plastic cover, must include:
   a. rocket specification – (include original or photo of manufacture packaging stating rocket skill level.)
   b. a flight record for each launching (weather, distance, flight height, engine used, what the rocket did in flight and recovery status). Points will not be deducted for launching, flight or recovery failures described. This includes any damage that may show on the rocket.
   c. number of launchings.
   d. flight pictures
   e. Safety (How did you choose your launch site? Document safe launch, preparations, and precautions).
   f. objectives learned
   g. conclusions
7. For self-designed rockets only, please include a digital recorded copy of one flight. In the documentation, please include a description of stability testing before the rocket was flown.
8. Displays and posters should be no larger than 28”x22”.

DEPARTMENT H – DIVISION 850 – AEROSPACE

Division	*Class*	*Pay*	*Purple*	*Blue*	*Red*	*White*
850	001-003, 009		$2.50	$2.00	$1.50	$1.00
850	004-008		$2.50	$2.00	$1.50	$1.00

LIFT OFF – UNIT 2

SF) 001 **Rocket** (SF92) – Any Skill Level Rocket with wooden fins and cardboard body tubes painted by hand or air brush**.**

SF) 002 **Aerospace Display** (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” by 22”

SF) 003 **Rocket** (SF92) – Any Skill Level Rocket with wooden fins and cardboard body tubes painted using commercial application, example commercial spray paint.

REACHING NEW HEIGHTS – UNIT 3

SF) 004 **Rocket** (SF92) – Any self-designed rocket with wooden fins and cardboard tubes.

DRONES – UNIT 5

SF) 005 **Drone Poster** (SF93) – 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".

SF) 006 **Drone Video** (SF93) – 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 be uploaded to a video streaming application and exhibitors MUST provide a hard copy QR code for viewing. Exhibitors are encouraged to test their codes or links on several devices to check for appropriate permissions. (For State Fair: Videos should be submitted to https://go.unl.edu/2023nesfset by August 15, 2023

DEPARTMENT: SCIENCE, ENGINEERING, & TECHNOLOGY

AREA: ENERGY

CURRICULUM & RESOURCES

The Power of Wind Youth Guide ❶

AREA RULES – ALTERNATIVE/RENEWABLE ENERGIES

1. **Entries which do not include required information or formatting requirements will be lowered one ribbon placing.**
2. 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.
3. Posters can by any size up to 28" x 22".

DEPARTMENT H – DIVISION 900 – ALTERNATIVE/RENEWABLE ENERGIES

Division	*Class*	*Pay*	*Purple*	*Blue*	*Red*	*White*
900	001-006		$2.50	$2.00	$1.50	$1.00
990	901-903		$2.50	$2.00	$1.50	$1.00

SF) 001 **Create and Compare Energy Resources Poster** (SF307) – Poster should explore 2 alternative/renewable energy resources. Compare and contrast the 2 resources including two of the following information: amount of energy created, costs of production, usability of the energy, pros/cons of environmental impacts, etc.

SF) 002 **Experiment Notebook** (SF305) – Notebook will explore the scientific method involving alternative/renewable energy sources. Information required. 1.) Hypothesis 2.) Research 3.) Experiment 4.) Measure 5.) Report or Redefine Hypothesis.

SF) 003 **Solar as Energy Display/Poster** (SF308) **–** Item should be the original design of the 4-Her. Include the item, or a picture if item is in excess of 6' tall or 2' X 2'. Include a notebook of why the item was designed and how it harnesses the power of the sun. Examples include solar ovens, solar panels, etc.

SF) 004 **Water as Energy Display/Poster** (SF308) – Item should be the original design of the 4-Her. Include the item, or a picture if item is in excess of 6' tall or 2' X 2'. Include a notebook of why the item was designed and how it harnesses the power of water.

SF) 005 **Wind as Energy Display/Poster** (SF308) – Item should be the original design of the 4-H'er. Include the item, or a picture if item is in excess of 6' tall or 2' X 2'. Include a notebook of why the item was designed and how it harnesses the power of wind.

SF) 006 **Other Nebraska Alternative Energy** (SF306) – Notebook should explore Nebraska an alternative energy source besides wind, water, and solar power. Include information on type of power chosen, infrastructure for distribution, what resources are needed to create this alternative resource, cost of production, and potential uses of bio-products. Examples include geothermal, biomass, ethanol, biodiesel, methane reactors, etc.

C) 901-903 **County Only Display** – Any other item completed as part of this project

DEPARTMENT: SCIENCE, ENGINEERING, & TECHNOLOGY

AREA: COMPUTERS

CURRICULUM & RESOURCES

CPU 1: Inside the Box (B)
CPU 2: Peer to Peer (I)
CPU 3: Teens Teaching Tech (A)

AREA RULES – COMPUTERS

1. **Youth can ONLY enter exhibits into ONE Computers Level.**
   a. Youth enrolled in clothing projects should continue their skill development. Once they have exhibited in a higher level, they are not eligible to exhibit in a lower level. Ex. Once you exhibit in Level 2, you are not eligible to exhibit in Level 1.
2. 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.
3. Posters can be any size up to 28" by 22".

DEPARTMENT H – DIVISION 860 – COMPUTERS

Division	*Class*	*Pay*	*Purple*	*Blue*	*Red*	*White*
860	901-904		$2.50	$2.00	$1.50	$1.00
860	001-003		$2.50	$2.00	$1.50	$1.00
860	004-009		$2.50	$2.00	$1.50	$1.00

LEVEL 1

C) 901 **Computer Hardware Poster** (SF278) – Should exemplify something learned about computer hardware in Computer Mysteries Unit 1. Poster can be any size up to 28" x 22".

C) 902 **Computer Software Poster** (SF278) – Should exemplify something learned about computer hardware in Computer Mysteries Unit 1. Poster can be any size up to 28" x 22".

LEVEL 2

SF) 001 **Computer Application Poster** (SF278) – Exhibit designed to educate yourself and others on the use of computer application/program or techniques of internet/social media safety. Examples of the computer application/program could include but are not limited to how to download digital photos from a camera and create a usable way of storing and accessing them in the future; details of how to use instant messaging programs like Skype; or how to create a social networking page (ex. "Facebook," "Snap Chat," "Instagram," "Twitter," "FaceTime," etc.). Examples of internet/social media safety include but not limited to identity theft, predator safety, internet etiquette, social networking pages precautions, etc.

SF) 002 **Produce a Computer Slideshow Presentation** (SF277) – Using presentation software create a presentation. Slideshow should include a minimum of 10 slides and no more than 25. Incorporate appropriate slide layouts, graphics, animations, and audio. Each slide should include notes for a presenter. **All county fair projects with a printout should be saved on a CD Rom to be submitted for county fair.**

C) 904 **Teach an Adult** (SF279) – The 4-H exhibitor writes a report between 1 and 3 pages describing a situation in which he or she has taught an adult(s) a computer skill. **The report should include pictures of the 4-Her working with the adult(s).**

LEVEL 3

SF) 004 **Produce an Audio/Video Computer Presentation** (SF276) – Using presentation software a 4-H exhibitor designs a multimedia computer presentation on one topic related to youth. A notebook with a printout of all the 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 uploaded to a video streaming application and exhibitors MUST provide a hard copy QR code for viewing. Exhibitors are encouraged to test their codes or links on several devices to check for appropriate permissions. (For State Fair Entries should be submitted to https://go.unl.edu/2023nesfset by August 15, 2023.)

SF) 005 **How to STEM (Science, Technology, Engineering and Math) Presentation** (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-Her, 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. Entries should be uploaded to a video streaming application and exhibitors MUST provide a hard copy QR code for viewing. Exhibitors are encouraged to test their codes or links on several devices to check for appropriate permissions. (For State Fair: Entries should be submitted to https://go.unl.edu/2023nesfset by August 15, 2023.)

SF) 006 **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 an 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. (For State Fair: Entries should be submitted to https://go.unl.edu/2023nesfset by August 15, 2023, or videos can be uploaded to a video streaming application and exhibitors MUST provide a hard copy QR code for viewing. Exhibitors are encouraged to test their codes or links on several devices to check for appropriate permissions.)

SF) 007 **3D Printing Unique Items** (SF1050) – 3D printing uses plastic or other materials to build a three-dimensional (3D) object for a digital design. Youth may use original designs or someone else's they have re-designed 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 or cookie cutter. Must include design notebook with motivation or problem statement the prototype was 3D printing will include a notebook with the following: (1) Define motivation/problem solved; (2) Software used; (3) Document purpose of material and print settings; (4) Material choice (PLA, PVA, ABS, etc.); (5) In-fill density; & (6) Moving parts.

SF) 008 **Pen Creation** (SF__) – Youth may use original designs or use a template to create their 3D item. Exhibits will be judged based on the complexity of the design and shape. **3D pen creation will include a notebook with the following**: (1) Copy of the template if used and description of any changes the youth created OR If no template used – an explanation of how the creation was built; (2) Must include paragraph of what the youth learned while creating their project (i.e. way to improve their next creation); & (3) Paragraph on how 3D pens impact Science Engineering and Technology.

SF) 009 **Marker Space/Digital Fabrication** (SF__) – 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 appropriate software used to create your finished project. Project should include a notebook with the following: (1) What motivated you to create this project; (2) Software and equipment used; (3) Directions on how to create the project; (4) Prototype of plans; (5) Cost of creating project; (6) Iterations or modifications made to original plans; & (7) Changes you would make if you remade the project.

C) 901 **Careers Interview** (SF278) – Interview someone who is working in the field of computers and research that career. Interviews can either be written or in a multimedia format (CD/DVD). Written interviews should be in a notebook. Written reports should be three to five pages, double-spaced, 12-point font, and 1" margins. Multimedia reports should be between three to five minutes in length.

DEPARTMENT: SCIENCE, ENGINEERING, & TECHNOLOGY

AREA: ELECTRICITY

CURRICULUM & RESOURCES

Electricity 1: Magic of Electricity	B		
Electricity 2: Investigating Electricity	B	I	
Electricity 3: Wired for Power		I	
Electricity 4: Entering Electronics			A

AREA RULES – ELECTICITY

1. **Youth can ONLY enter exhibits into ONE Electricity Unit.**
   a. Youth enrolled in clothing projects should continue their skill development. Once they have exhibited in a higher level, they are not eligible to exhibit in a lower level. Ex. Once you exhibit in Unit 2, you are not eligible to exhibit in Unit 1.
2. 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.
3. Display or posters can by any size up to 28" x 22" x .25". Nothing should be mounted within 3/4 inch of the top or bottom of the board or poster.
4. Fabricated board such as plywood, composition board, or particle-type lumber may be used for demonstration displays. Demonstration boards should be sanded and finished to improve their appearance. The finish on a demonstration board will be judged as a woodworking exhibit. Demonstration boards should include an overall title for the display, plus other necessary labeling.

DEPARTMENT H – DIVISION 870 – ELECTRICITY

Division	*Class*	*Pay*	*Purple*	*Blue*	*Red*	*White*
870	901-907		$2.50	$2.00	$1.50	$1.00
870	001-004		$2.50	$2.00	$1.50	$1.00
870	004-008		$2.50	$2.00	$1.50	$1.00

MAGIC OF ELECTRICITY – UNIT 1

C) 901 **Bright Lights**– Create your own flashlight using items found around your house. Flashlights should be made out of items that could be recycled or reused. No kits allowed.

C) 902 **Control the Flow**– Make a switch by creating a circuit that you can open and close.

C) 903 **Conducting Things** – Make a circuit with a switch and a light bulb that can be used to test different household items for their ability to act as an insulator or conductor. You must find five items that are conductors and five items that are insulators. Create a table that illustrates your results.

C) 904 **Is There a Fork in the Road** – Using the following items to construct one parallel and one series circuit.

INVESTIGATING ELECTRICITY – UNIT 2

C) 905 **Case of the Switching Circuit** – Build a three way switch. Write a short essay or create a poster that illustrates how three way switches function. (Investigating Electricity, p. 28)

C) 906 **Stop the Crime** (– Build an alarm and create a poster using photographs to show the step by step process you used to build your alarm. (Investigating Electricity, p. 32)

C) 907 **Electrical Poster** – Poster should exemplify one of the lessons learned in the Investigating Electricity Project.

C) 908 **Rocket Launcher** – Construct a rocket launcher out of the following materials: a plastic pencil box that is at least 4" x 8", single pole switch, normal open push button switch, 40 feet of 18 or 22 gauge stranded wire, 4 alligator clips, 2" x 6" board (6" long), 1/8" diameter metal rod, rosin core solder, soldering iron or gun, wire stripper, small crescent wrench, pliers small Phillips and straight blade screwdrivers, drill 1/8" and ¼" drill bits, rocket engine igniters, additional drill bits matched to holes for two switches. You may successfully build a rocket launcher and light two rocket igniters with your launcher. You DO NOT have to actually fire a rocket off of the launcher. Create a poster using photographs to show the step-by-step process you used to build your launcher.

WIRED FOR POWER – UNIT 3

SF) 001 **Electrical Tool/Supply Kit** (SF224) – Create an electrical supply kit to be used for basic electrical repair around the house. Include a brief description of each item and its use. Container should be appropriate to hold items.

SF) 002 **Lighting Comparison** (SF225) – Display studying the efficiency of various lighting (incandescent, fluorescent, halogen, Light Emitting Diodes, etc.). Exhibit could be a poster display or an actual item.

SF) 003 **Electrical Display/Item** (SF226) – Show an application of one of the concepts learned in the Wired for Power project. Examples include re-wiring or building a lamp, re-wiring or making a heavy duty extension cord or developing an electrical diagram of a house. Exhibit could be a poster display or an actual item.

SF) 004 **Electrical Poster** (SF227) – Poster should exemplify one of the lessons learned in the Wired for Power Project.

ELECTRONICS – UNIT 4

SF) 005 **Electrical/Electronic Part Identification** (SF228) – Display different parts used for electrical/electronic work. Exhibit should show the part (either picture or actual item) and give a brief description, including symbol of each part and its function. Display should include a minimum of 10 different parts.

SF) 006 **Electronic Display** (SF229) – Show an application of one of the concepts learned in the Electronics project. Examples include: components of an electronic device (refer to p.35 of the Electronic manual).

SF) 007 **Electronic Project** (SF230) – Exhibit an electronic item designed by the 4-H'er or from a manufactured kit that shows the electronic expertise of the 4-H'er. Examples include radio, a computer, or a volt meter.

SF) 008 **Electronic Poster** (SF231) – Poster should exemplify one of the lessons learned in the Entering Electronics Project.

DEPARTMENT: SCIENCE, ENGINEERING, & TECHNOLOGY

AREA: GEOSPATIAL

CURRICULUM & RESOURCES

Exploring Spaces, Going Places Ⓑ Ⓘ Ⓐ

AREA RULES – GEOSPATIAL

1. 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.
2. Posters can by any size up to 14" x 22"

DEPARTMENT H – DIVISION 880 – GEOSPATIAL

Division	*Class*	*Pay*	*Purple*	*Blue*	*Red*	*White*
880	001-010		$2.50	$2.00	$1.50	$1.00
880	901-903		$2.50	$2.00	$1.50	$1.00

SF) 001 **Poster** (SF299) – Create a poster communicating a GPS theme such as How GPS or GIS works, Careers that use GPS or GIS, how to use GPS, What is GIS, GPS or GIS in Agriculture, Precision Agriculture, or a geospatial topic of interest.

SF) 002 **4-H Favorite Places or Historical Site Poster** (SF272) – The 4-H exhibitor identifies a favorite place or historical site (including grave sites) in Nebraska. The exhibit should include latitude and longitude, digital picture, and local area map.

SF) 003 **GPS Notebook** (SF300) – Keep a log of at least 5 places visited using a GPS enabled device. At least one site should be from a community other than where you live. At least one site should be from a community other than where you live. For each site, record the latitude, longitude and elevation. Also include a description of the site, a paragraph explaining what was interesting about the site or finding it. Photos of each site and/or cache are optional but encouraged.

SF) 004 **Geocache** (SF301) – Assemble a themed geocache. Each geocache should be a water-tight container. It should include a logbook and pencil for finders to log their visits and may include small trinkets, geocoins, etc. for the finders to trade. Documentation should include a title, teaser description and the geographic coordinates of intended placement. Register the site at geocaching.com; include a print-out of its registry. The entry may include a photograph of the cache in its intended hiding place.

SF) 005 **Agriculture Precision Mapping** (SF302) – 4-Hers will assemble a notebook that will include a minimum of 2 digital copies of various data layers that can be used in precision agriculture to identify spatial patterns and/or correlations (printed copies of websites were applications can be purchased is acceptable) A report of how the analysis of the various data will be used to make a management decision.

SF) 006 **4-H History Map/Preserve 4-H History** (SF30) – Preserve 4-H History: Nominate a Point of Interest for the 4-H History Map Project include copy of submitted form in folder or notebook. To nominate a site for the 4-H history map please go to http://arcg.is/1bvGogV For more information about 4-H history go to http://4hhistorypreservation.com/History_ Map/ For a step by step video on nominating a point, please go to this link: http://tinyurl.com/nominate4h Write a brief description of historical significance of 4-H place or person.

SF) 007 **GIS Thematic Map** (SF302) – Using any GIS software, create a thematic. Thematic maps can utilize any subject of interest to the 4-H'er. Example map would be Amelia Earhart's or Sir Francis Drake's voyage population density maps, water usage maps or 4-H project in Nebraska. Create GIS Map using data from books, and or internet. Use reliable data, (U.S. Center or U.S. Census Bureau etc.) Map any size from 8.5" x 11" up to 36" x 24", should include Title, Base Map, Neat Line, North Arrow, and Legend. Identify the source of your information on the back of the map.

C) 901-903 **Other exhibit in GPS, GIS, or mapping.**

DEPARTMENT: SCIENCE, ENGINEERING, & TECHNOLOGY
AREA: LEGO BUILDING

CURRICULUM & RESOURCES
B I A

DEPARTMENT H – DIVISION 881 – MODEL BUILDING

AREA RULES – MODEL BUILDING
1. **Entries need to have a completed model information sheet describing what steps were taken to create and what they learned.**
2. All Legos must be displayed on a board so they may be moved easily.
3. Lego Model- An exhibit is made from a set design of plans or a model that includes directions.
4. Lego Original- An exhibit that is original creation of the exhibitor and is not made from a set design of plans or model.

Division	*Class*	*Pay*	*Purple*	*Blue*	*Red*	*White*
881	All Classes	1	$2.50	$2.00	$1.50	$1.00

C) 901 **Lego Model**– 500 pieces or less
C) 902 **Lego Model**– 501 pieces or more
C) 903 **Lego Original**– 500 pieces or less
C) 904 **Level Original**– 501 pieces or more

DEPARTMENT: SCIENCE, ENGINEERING, & TECHNOLOGY
AREA: ROBOTICS

CURRICULUM & RESOURCES

Virtual Robotics	B	I	A
Junk Drawer Robotics Level 1	B	I	A
Junk Drawer Robotics Level 2	B	I	A
Junk Drawer Robotics Level 3	B	I	A
Robotics Platforms	B	I	A

AREA RULES – ROBOTICS
1. 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.
2. Posters can by any size up to 14” x 22”.
3. Team Entries: 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.
4. Creating a video of your robot in action is recommend but is not mandatory. Present as a CD with your robot entry.

DEPARTMENT H – DIVISION 861 - ROBOTICS

Division	*Class*	*Pay*	*Purple*	*Blue*	*Red*	*White*
861	001-007		$2.50	$2.00	$1.50	$1.00
861	901-903		$2.50	$2.00	$1.50	$1.00

SF) 001 **Robotics Poster** (SF236) – Create a poster communicating a robotics theme such as “Robot or Not”, Pseudocode”. “Real World Robots”. “Careers in Robots” or “Autonomous Robotics”, “Precision Agriculture” or a robotic topic of interest.
SF) 002 **Robotics Notebook** (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, programming skill, calibration, sensor exploration, or any of the topics suggested in Class 1 or junk drawer robotics level 3 and 4.

SF) 003 **Robotics Video** (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 pseudocode and screenshots of the actual code with a written description of the icon/command functions.

SF) 004 **Robotics Careers Interview** (SF239) – Interview someone who is working in the field of robotics and research a 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. Multimedia reports should be between 3 to 5 minutes.

SF) 005 **Rotation Sensor Notebook** (SF241) – Write pseudocode which includes at least three sensor activity. Include the code written and explain what the code function is and how you would change it to improve either the function or the code.

SF) 006 **Build a Robot (may use kit)** (SF243) – Include a robot and a notebook including the pseudo codes for at least one program you have written for the robot, the robots purpose, and any challenges or changes you would make in the robot design or programming. If robot is more than 15" wide and 20" tall they may not be displayed in locked cases. We recommend that you submit the project under class SF) 003 – Robotics Video. Junk Drawer Robotics do not quality.

SF) 007 **Kit Labeled Robot (cannot be programmed)** (SF243) – 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 project the youth has constructed, a description of what it does and an explanation of how it is similar to and different from a robot. If robot is more than 15" wide and 20" tall they may not be displayed in locked cases. We recommend that you submit the project under class SF) 003 – Robotics Video.

SF) 008 **3D Printed Robotics Parts** (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.

C) 901-903 **County Only Display** – Any other item completed as part of this project

DEPARTMENT: SCIENCE, ENGINEERING, & TECHNOLOGY
AREA: ATV & SMALL ENGINE

CURRICULUM & RESOURCES
B I A

DEPARTMENT H – DIVISION 890 – ATV &SMALL ENGINE

AREA RULES – SMALL ENGINE & VEHICLE RESTORNATION

5. Contact the Extension Office prior to check in day to make arrangements for early displaying of oversized exhibits.
6. Displays need to be mounted on 1/4" board and should be no larger than 24" x 32".
7. Posters can by any size up to 14" x 22".
8. Ag Society is not responsible for damage to any small engine or vehicle.

Division	*Class*	*Pay*	*Purple*	*Blue*	*Red*	*White*
890	All Classes	1	$2.50	$2.00	$1.50	$1.00

C) 910 **ATV Safety Poster**– Poster displaying photos of yourself demonstrating safety measures necessary for ATV operation. Posters are not to exceed 14" x 22".

C) 920 **ATV Anatomy Poster**– Poster displaying ATV anatomy (parts). Posters are not to exceed 14" x 22"

C) 930 **Small Engine Display/Item Unit 1**– Show an application of one of the concepts learned in the Crank It Up manual (examples: identify the parts of a small engine, safety rules for starting a small engine, small engine repair tool identification). Exhibit may be a poster display or actual item.

C) 940 **Small Engine Display/Item Unit 2**– Show an application of one of the concepts learned in the Crank It Up manual (examples: identify the parts of a small engine, safety rules for starting a small engine, small engine repair tool identification). Exhibit may be a poster display or actual item.

C) 950 **Other Item**– Other item displaying the knowledge gained in this project.

AREA RULES – WELDING

1. 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.
2. Display or posters can by any size up to 28” x 22” x .25”. Nothing should be mounted within 3/4 inch of the top or bottom of the board or poster.
3. Fabricated board such as plywood, composition board, or particle-type lumber may be used for demonstration displays. Demonstration boards should be sanded and finished to improve their appearance. The finish on a demonstration board will be judged as a woodworking exhibit. Demonstration boards should include an overall title for the display, plus other necessary labeling.
4. Display Boards
   - On display board attach each weld on a wire loop hinge or equivalent, so the judge can look at the bottom side of the weld when necessary. Attach a wire to display board so it can be hung like a picture frame.
   - If no plans are included with welding article or welding furniture, item will be disqualified.
   - Each weld should be labeled with information stated
     i. type of welding process (stick, MIG, TIG, Oxy-Acetylene, etc.)
     ii. kind of weld
     iii. welder setting
     iv. electrode/wire/rod size
     v. electrode/wire/rod ID numbers.
5. Welding Joints
   a. All welds should be made with the same electrode/wire/rod size and number.
   b. Welds should be made only on one side of metal so penetration can be judged.
   c. Welds should be cleaned with chipping hammer and wire brush. Apply a coat of light oil (penetrating oil) to the metal to prevent rusting. Wipe off excess oil.
   d. It is suggested that all welds be of the same size and thickness as metal. These pieces, referred to as coupons, should be 1 ½” to 2” wide and 3 ½” to 4” long. A good way to get this size is to buy new cold rolled strap iron and cut to length. The extra width is needed to provide enough metal to absorb the heat from the welding process and prevent the coupons from becoming too hot before the bead is completed. Narrower coupons will become very hot, making an average welder setting too sold at the bead start, just about right in the middle and too hot at the end. The correct way to weld narrow strips is to make short beads and allow time to cool, however this project requires a full length bead.
      i. Stick welding – Suggested coupon thickness is 1/4” if using 1/8” rod. Suggested rod AC and DC straight or reverse polarity-first E-7014, second E-6013
      ii. MIG Welding – Suggested coupon thickness is 1/4” if using .035 wire and 1/8” if using .023 wire
      iii. Oxy-Acetylene – Suggested coupon thickness is 1/8”. Suggested rod – 1/8” mild steel rod
6. 2 Position Welds
   a. It is suggested that all welds be on the same size and thickness of metal. These pieces are referred to as coupons. The welds can be on one coupon that is about 4” x 4” or on individual coupons that are about 2” x 4” inch and ¼” thick. Suggested rods for this class of position welds for AC and DC straight or reverse polarity is, first E-6013, second E-7014 and E-6010 for DC reverse polarity only.
   b. Welds should be cleaned with a chipping hammer and wire brush. Apply a coat of light oil (penetrating oil) to the metal to prevent rusting. Wipe off excess oil.
7. Welding Article
   a. All welds should be cleaned and protected from rust with paint or light oil. Plans are to be complete enough that if they were given to a welding shop, the item could be made without further instructions. Bill of materials should include a cost for all items used including steel, electrodes, paint, wheels, etc.

DEPARTMENT H - DIVISION 920 – WELDING

Division	*Class*	*Pay*	*Purple*	*Blue*	*Red*	*White*
920	001-005		$2.50	$2.00	$1.50	$1.00
920	901-903		$2.50	$2.00	$1.50	$1.00

SF) 001 **Welding Joints** (SF281) – A display of one butt, one lap and one fillet weld.

SF) 002 **Position Welds** (SF281) – A display showing three beads welded in the vertical down, horizontal and overhead positions.

SF) 003 **Welding Article** (SF281) – Any shop article where welding is used in construction. 60% of the item must be completed by 4-Her and notes regarding laser welding or machine welding must be included. All plans, plan alterations, and a bill of materials must be attached to the article. Project plans with a cover. If a project is designed to be outside it is required to have an appropriate outdoor finish because the project may be displayed outside.

SF) 004 **Welding Furniture** (SF282) - any furniture with 75% welding is used in the construction. 60% of the item must be completed by 4-Her and notes regarding laser welding or machine welding must be included. All plans, plan alternations, and a bill for materials must be attached to the article. Protect plans with a cover. If a project is designed to be outside it is required to have an appropriate outdoor finish because item may be displayed outside.

SF) 005 **Plasma Cutter/Welder Design** (SF279) – Plasma cutters/welders allowed for detailed design(s) to butt cut into metal. 4Hers will create a notebook describing the design process to create the "artwork" to butt cut into the metal. This exhibit is not eligible for entry at the State Fair. In the notebook include A) photo (front and back) of the finished project. Also include detailed photographs of the project to allow judges to examine cuts. B) Instructions on how the design was created, this allows for replication of the project C) Lessons learned or improvements to the project

SF) 006 **Composite Weld Project** (SF280) – 60% of the project must be welded and 40% made from other materials such as wood, rubber, etc. All plans, plan alterations, and a bill for materials must be attached to the article. Protect plans with a cover. If a project is designed to be outside, it is required to have an appropriate outdoor finish because project may be displayed outside.

C) 901-903 **County Only Display** – Any other item completed as part of this project.

DEPARTMENT: SCIENCE, ENGINEERING, & TECHNOLOGY

AREA: WOODWORKING

CURRICULUM & RESOURCES

Woodworking Wonders 1: Measuring Up B
Woodworking Wonders 2: Making the Cut B
Woodworking Wonders 3: Nailing It Together I
Woodworking Wonders 4: Finishing Up A

AREA RULES – WOODWORKING

1. **Youth can ONLY enter exhibits into ONE Woodworking Unit.**
   a. Youth enrolled in projects should continue their skill development. Once they have exhibited in a higher level, they are not eligible to exhibit in a lower level. Ex. Once you exhibit in Unit 2, you are not eligible to exhibit in Unit 1.
2. All articles exhibited must include a plan (with drawings or sketch or blueprint) stating dimensions and other critical instructions a builder would need to know how to build the project. Plans may include narrative instructions in addition to the dimension drawings and include any alternations to the original plan. Part of the score depends on how well the project matches the plans. If the plans are modified, the changes from the original need to be noted on the plans. All plans used for making the article must be securely attached and protected by a clear plastic cover.

DEPARTMENT H – 911 – WOODWORKING

Division	*Class*	*Pay*	*Purple*	*Blue*	*Red*	*White*
911	901-908		$2.50	$2.00	$1.50	$1.00
911	001-002, 005		$2.50	$2.00	$1.50	$1.00
911	003, 004, 006, 010		$2.50	$2.00	$1.50	$1.00

MEASURING UP – UNIT I

C) 901 **Woodworking Article** (SF91) – Item made using skills learned in the Measuring Up project guide. Examples include recipe holder, stilts or other skill level appropriate item. Items should be entered with construction plans.

C) 902 **Woodworking Display** (SF91) – Display exemplifying one of the principles learned in the Measuring Up project.

C) 903 **Recycled Woodworking Article** (SF91) – Article made from recycled, reclaimed, or composite wood. Article must be sanded and sealed and utilize one or more woodworking techniques learned in the Measuring Up project. The exhibit must include the woodworking plan and a minimum one-page report of how the engineering design process was used to develop the woodworking plan.

C) 904 **Other Items: Unit I** (SF91) – Other article as shown in Woodworking Unit I manual or comparable.

MAKING THE CUT – UNIT II

C) 905 **Woodworking Article** (SF91) – Item made using skills learned in the Making the Cut project guide. Examples Include: birdhouse, foot stool, and napkin or letter holder. Items should be entered with construction plans.

C) 906 **Woodworking Display** (SF91) – Display exemplifying one of the principles learned in the Making the Cut project.

C) 907 **Recycled Woodworking Article** (SF91) – Article made from recycled, reclaimed, or composite wood. Article must be sanded and sealed and utilize one or more woodworking techniques learned in the Measuring Up project. The exhibit must include the woodworking plan and a minimum one-page report of how the engineering design process was used to develop the woodworking plan.

C) 908 **Other Items: Unit II** (SF91) – Other article as shown in Woodworking Unit II manual or comparable.

NAILING IT TOGETHER – UNIT III

SF) 001 **Woodworking Article** (SF91) – Item made using skills (joints, hinges, dowels, or a dado joining) learned in the Nailing it Together project guide. Examples include: bookcase, coffee table or end table. The item is required to be appropriately finished.

SF) 002 **Woodworking Display** (SF91) – Display exemplifying one of the principles learned in the Nailing It Together project. Examples include measuring angles, wood lamination and joint types.

SF) 003 **Recycled Woodworking Display** (SF91) – Article made from recycled, reclaimed, or composite wood. Article must be appropriately finished and/or sealed and utilize one or more woodworking techniques from page 2 of the Unit 3 manual. **The exhibit must include the woodworking plan and a minimum one-page report of how the engineering design process was used to develop the woodworking plan.**

Engineering Design Process

- State the problem (Why did you need this item?)
- Generate possible solutions (How have others solved the problem? What other alternatives or designs were considered?)
- Select a solution (How does your solution compare based on cost, availability, and functionality?)
- Build the item (What was your woodworking plan, and what processes did you use to build your item?)
- Reason for article finish (what type of finish, how did you finish or why you choose this finish?)
- Evaluate (How does your item solve the original need?)
- Present results (How would you do this better next time?)

SF) 004 **Composite Wood Project** (SF96) – 60% of the project must be wood and 40% made from other materials such as metal, rubber, resin, etc. All plans and plan alterations must be attached to the article. Protect plans with a cover. If a project is designed to be outside it is required to have an appropriate outdoor finish because the project may be displayed outside.

SF) 005 **Outdoor Wood Project made with Treated Wood** (SF97) – Treated wood projects DO NOT have to have a finished coating. All plans and plan alterations must be attached to the article. Protect plans with cover. If the project is designed to be outside. Examples include picnic tables, planters, outdoor furniture, etc.

C) 907 **Other Items: Unit III** (SF91) – Other article as shown in Woodworking Unit III manual or comparable.

FINISHING UP – UNIT IV

SF) 006 **Woodworking Article** (SF91) – Item made using skills learned in the Finishing It Up Project. Examples include dovetailing, making a pen using lathe, overlays, using a router, etc. The item is required to be appropriately finished.

SF) 007 **Woodworking Display** (SF91) – Display exemplifying one of the principles learned in the Finishing It Up Project. Examples Include: career opportunities, types of finishes or dovetailing.

SF) 008 **Recycled Woodworking Display** (SF91) – Article made from recycled, reclaimed, or composite wood. Article must be appropriately finished and/or sealed and utilize one or more woodworking techniques from page 2 of the Unit 4 manual. **The exhibit must include the woodworking plan and a minimum**

one-page report of how the design and engineering process was used to develop the woodworking plan.

Engineering Design Process

- State the problem (Why did you need this item?)
- Generate possible solutions (How have others solved the problem? What other alternatives or designs were considered?)
- Select a solution (How does your solution compare based on cost, availability, and functionality?)
- Reason for article finish (What type of finish, how did you finish or why you choose this finish?)
- Build the item (What was your woodworking plan, and what processes did you use to build your item?)
- Evaluate (How does your item solve the original need?)
- Present results (How would you do this better next time?)

C) 908 **Other Items: Unit IV** (SF91) – Other article as shown in Woodworking Unit IV manual or comparable.