

## DIVISION E - MECHANICAL SCIENCES PROJECTS

### **E-1 COMPUTER SCIENCE**

1. 4-H members may stay in a unit for more than one year. The exhibit must be different each year.
2. Youth are only allowed to enter a display board exhibit or programming exhibit, but not both.  
**Beginning programming** – a program using Scratch (or other uncomplicated graphic programming language). The program should include eight different commands including looping and getting input from the keyboard and mouse.  
**Intermediate Programming** – a program using Scratch (or other uncomplicated graphic programming language) that you have downloaded from the Internet and modified. Compare the two programs and demonstrate the changes you have made to the original program; OR create an animated storybook or video game using Scratch (or other simple programming language).  
**Advanced Programming** – an original program using a higher-level programming language such as Python, Javascript, Java, C++, etc.

### **LEVEL 1-DISCOVERING COMPUTER SCIENCE & PROGRAMMING THROUGH SCRATCH**

#### **Display Board Exhibits**

- Class 1901 Computer Science Display Board Jr.  
Class 1902 Computer Science Display Board Int.  
Class 1903 Computer Science Display Board Sr.

#### **Beginning Programming**

- Class 1904 Beginning Programming Jr.  
Class 1905 Beginning Programming Int.  
Class 1906 Beginning Programming Sr.

### **LEVEL 2-DISCOVERING COMPUTER SCIENCE & PROGRAMMING THROUGH SCRATCH**

#### **Display Board Exhibits**

- Class 1907 Computer Science Display Board Int.  
Class 1908 Computer Science Display Board Sr.

#### **Intermediate Programming**

- Class 1909 Intermediate Programming Int.  
Class 1910 Intermediate Programming Sr.

### **Level 3-DISCOVERING COMPUTER SCIENCE & PROGRAMMING THROUGH SCRATCH**

#### **Display Board Exhibits**

- Class 1911 Computer Science Display Board Int.  
Class 1912 Computer Science Display Board Sr.

#### **Advanced Programming**

- Class 1913 Advanced Programming Int.  
Class 1914 Advanced Programming Sr.

All exhibits will consist of the following:

- A. One sturdy binder/notebook that contains the **Discovering Computer Science & Programming Through Scratch Student Notebook** for Level 1 and Level 2 and the **Discovering Computer Science & Programming Through Scratch Level 3: Recursion** manual for Level 3 and completed Computer Science e-Record.
- B. A completed exhibit consists of **ONE** of the following:
  1. A display board illustrating a topic learned as a part of the 4-H project. The standardized display board size of 4 ft. x 3 ft. is to be used with 4-H projects. No additional items may be included in front of the display board. All items must be attached to the display boards.
  2. **Programming Exhibit** (a printed copy of a digital presentation is required and placed in your e-record.) Electronic equipment will only be used during judging time and will not remain on display during the fair. Programs available online (such as Scratch) should include a link to the specific project you have created.
    - a. **Beginning Programming** –a program using Scratch (or other uncomplicated graphic programming language). The program should include eight different commands including looping and getting input from the keyboard and mouse.

- b. **Intermediate Programming** –a program using Scratch (or other uncomplicated graphic programming) that you have downloaded from the Internet and modified. Compare the two programs and demonstrate the changes you made to the original program; OR create an animated storybook or video game using Scratch (or other simple graphical programming language). If using Scratch, include a clone or list in the program.
- c. **Advanced Programming** –create a program using a control or event block that controls other blocks of code and that executes code with the intended outcome OR an original program using higher level programming language such as Python, Javascript, Java, C++, etc. that executes code with the intended outcome.

## COMPUTER SCIENCE AND CODING

### Display Board Exhibits

Class 1915 Computer Science and Coding Display Board Int.

Class 1916 Computer Science and Coding Display Board Sr.

### Programming Exhibits

Class 1917 Computer Science and Coding Programming Int.

Class 1918 Computer Science and Coding Programming Sr.

### Website Exhibits

Class 1919 Computer Science and Coding Website Int.

Class 1920 Computer Science and Coding Website Sr.

All exhibits will consist of the following:

- A. One sturdy binder/notebook that contains the completed Computer Science e-Record.
- B. A completed exhibit consists of **ONE** of the following:
  1. **Display Board** - A display board illustrating a topic learned as a part of the 4-H project. Use the *Everything You Need to Ace Computer Science and Coding in One Big Fat Notebook* resource for ideas. The standardized display board size of 4 ft. x 3 ft. is to be used with 4-H projects. No additional items may be included in front of the display board. All items must be attached to the display boards. (You may create a display board with information about your program or website with screen capture images illustrating what you have learned.)
  2. **Programming** - An original program using Scratch or Python using variables, conditional statements, and loops. The program should be more advanced than programs created in previous programming units.
  3. **Website** – Submit text document(s) with your HTML code/CSS for the website you designed that can be viewed on a laptop or a handheld device. Include screen capture images of your website along with the code. Use Unit 8 in the *Everything You Need to Ace Computer Science and Coding in One Big Fat Notebook* resource for information. In your e-Record story, be sure to address how you would provide cyber security for your website.

## E-2 ELECTRICITY

The standardized display board size of 4 ft. x 3 ft. is to be used with 4-H projects. No additional items may be included in front of the display board.

Note: Please make sure that all items are attached securely to the exhibit and that they are labeled with the name of the exhibitor.

### FOR ALL ELECTRICITY CLASSES

All exhibits will consist of the following e-Record information (A) along with each unit's additional requirements (B).

- A. Completed 4-H Electric project manual (at least three required activities completed; at least four Optional activities - Brain Boosters completed; at least two leadership activities completed); and the e-Record presented in a sturdy binder/notebook.

### MAGIC OF ELECTRICITY—UNIT 1

Class 2001 Magic of Electricity Unit 1 Jr.

Class 2002 Magic of Electricity Unit 1 Int.

Class 2003 Magic of Electricity Unit 1 Sr.

All exhibits will consist of the following along with the e-Record (A above):

- B. One article or display board (not both) that you have made as a part of this unit of study. (Example: homemade flashlight, simple switch, circuit with two batteries and one light bulb, compass, electromagnet, galvanometer, electric motor, etc.).

### **INVESTIGATING ELECTRICITY—UNIT 2**

Class 2004 Investigating Electricity Unit 2 Jr.

Class 2005 Investigating Electricity Unit 2 Int.

Class 2006 Investigating Electricity Unit 2 Sr.

Exhibit will consist of the following along with the e-Record (A above):

- B. One article or display board (not both) that you have made as a part of this unit of study. (Example: circuit diagrams with explanation, series circuit, parallel circuit, momentary switch, three-way switch, soldered connection, rocket launcher, burglar alarm, etc.).

### **WIRED FOR POWER—UNIT 3**

Class 2007 Wired for Power Unit 3 Jr.

Class 2008 Wired for Power Unit 3 Int.

Class 2009 Wired for Power Unit 3 Sr.

All exhibits will consist of the following along with the e-Record (A above):

- B. One article or display board (not both) that you have made as a part of this unit of study. (Example: electrical tool and supply kit, display of symbols on wires and cables and their meanings, display of light bulbs and the jobs they do best, display board on how to read an appliance name tag, chart showing the electrical usage of appliances, display board on how to replace a switch, etc.).

### **ENTERING ELECTRONICS—UNIT 4**

**(Senior Advanced)**

Class 2010 Entering Electronics Unit 4 Sr.

All exhibits will consist of the following along with the e-Record (A above):

- B. One article or display board (not both) which you made as a part of this unit of study. (Example: display of electronic parts, diode, transistor, light-emitting diode (LED), LED flasher photocell alarm, light meter, silicon-controlled rectifier (SCR) intruder alarm, 6-8-watt amplifier with integrated circuit, etc.).

### **E-3 METALWORKING**

**The following types of projects cannot be exhibited at the Colorado State Fair:** Weaponry (knives, swords, spear points, etc.), cutting tools (axes, saws, knives, machetes, etc.), sharp home or garden tools (garden hoe, shears, loppers, saws, etc.), sharp outdoor, hunting or fishing equipment (frog gig, leg trap, arrow points, hooks, fishing/meat gaff, etc.), propulsion or motorized vehicles (go carts, etc.) or any other item deemed dangerous or inappropriate by the superintendent(s).

For ideas, tips, and answers to frequently asked questions, please see the Metalwork Tip Sheet at: [Metalworking Project and Tip Sheet \(colostate.edu\)](http://MetalworkingProjectandTipSheet.colostate.edu)

### **FOR ALL METALWORKING CLASSES**

All exhibits must consist of the following e-Record information (A) along with each unit's additional requirements (B through E).

- A. A completed Metalworking e-Record presented in a sturdy binder/notebook.

### **INTRODUCTION TO METALWORK—UNIT 1**

Class 2101 Intro to Metalwork Unit 1 Jr.

Class 2102 Intro to Metalwork Unit 1 Int.

Class 2103 Intro to Metalwork Unit 1 Sr.

All exhibits will consist of the following along with the e-Record (A above):

- B. Exhibit the following:
  - a. One each: Lap, Butt and 90-degree T joints
    - i. Requirements:
  - ii. Each joint will be made of 2 separate pieces, 3” to 4” long of 1” to 2” wide flat strap metal, between 1/8” (11 gauge) and 1/4” thick
  - iii. On clean steel with no paint, oil, or other finishes
  - iv. Single pass weld on one side of each required joint
  - v. Name, County and Class number on bottom of each completed joint in permanent ink or paint
    - b. An exhibit up to 3’x3’x7’ and under **50 lbs.**
      - i. No paint, oil, or other finishes
      - ii. No grinding or smoothing of welds
    - iii. Metal only – No wood, plastic, or other building materials on the project to be judged
      - c. Photos of the exhibit project construction (placed in e-Record)
        - i. Four photos of the prep work (drafting plans, measuring, cutting, torching, bending, fitting, etc.)
        - ii. Four photos of actual welds (individual welds)
        - iii. Four photos of finish work (no painting, no oil, no seasoning, front view, side view, top view, best overall view)

### **METAL FABRICATION—UNIT 2**

Class 2104 Metal Fabrication Unit 2 Jr.

Class 2105 Metal Fabrication Unit 2 Int.

Class 2106 Metal Fabrication Unit 2 Sr.

All exhibits will consist of the following along with the e-Record (A above):

- B. Exhibit the following:
  - 1. An exhibit project up to 3’x3’x7’ and under **100 lbs.**
    - a. Paint, oil, and other finishes are allowed
    - b. Grinding of welds is allowed
    - c. Wood, plastic, or other building materials are allowed but must be less than 50% of the project materials
    - d. No moving parts – must be a static item (no hinges, wheels, slides, etc.)
    - e. No additional features (lights, electrical, water, etc.)
  - 2. Photos of the exhibit project construction (placed in e-Record)
    - a. Four photos of the prep work (drafting plans, measuring, cutting, torching, bending, fitting, etc.)
    - b. Four photos of actual welds (individual welds)
    - c. Four photos of finish work (no painting, no oil, no seasoning, front view, side view, top view, best overall view)

### **ADVANCED METAL FABRICATION—UNIT 3**

Class 2107 Advanced Metal Fabrication Unit 3 Jr.

Class 2108 Advanced Metal Fabrication Unit 3 Int.

Class 2109 Advanced Metal Fabrication Unit 3 Sr.

All exhibits will consist of the following along with the e-Record (A above):

- B. Exhibit the following:
  - 1. An exhibit project up to 3’x3’x7’ and under **150 lbs.**
    - a. Paint, oil and other finishes are allowed
    - b. Grinding of welds is allowed
    - c. Wood, plastic, or other building materials are allowed but must be less than 50% of the project materials
    - d. Moving parts allowed (hinges, wheels, slides, etc.)
    - e. Additional features allowed (lights, electrical, water, etc.)

2. Photos of the exhibit project construction (placed in e-Record)
  - a. Four photos of the prep work (drafting plans, measuring, cutting, torching, bending, fitting, etc.)
  - b. Four photos of actual welds (individual welds)
  - c. Four photos of finish work (no painting, no oil, no seasoning, front view, side view, top view, best overall view)

#### **LARGE EXHIBIT FABRICATION—UNIT 4**

Class 2110 Large Exhibit Fabrication Unit 4 Jr.

Class 2111 Large Exhibit Fabrication Unit 4 Int.

Class 2112 Large Exhibit Fabrication Unit 4 Sr.

All exhibit wills consist of the following along with the e-Record (A above):

- B. Exhibit the following:
  1. A 4' wide by 3' tall display board of your completed project with the following minimum information
    - a. Title or description of exhibit project
    - b. Left Side - Four photos minimum of the prep work (drafting plans, measuring, cutting, torching, bending, fitting, etc.)
    - c. Right Side - Four photos minimum of completed welds
      - i. No paint, oil, or other finishes on welds
      - ii. No grinding or smoothing of welds
    - d. Center - Four photos of minimum finish project (front view, side view, top view, best overall view)
    - e. All project photos must be 5"x 7" minimum
    - f. Captions for each photo
    - g. Project requirements
      - i. An exhibit project larger than 3'x3'x7' or over 150 lbs.
      - ii. Paint, oil, and other finishes are allowed
      - iii. Grinding of welds is allowed
  - C. Wood, plastic, or other building materials are allowed but must be less than 50% of the project materials.
  - D. Moving parts allowed (hinges, wheels, slides, etc.)
  - E. Additional features allowed (lights, electrical, water, etc.)

#### **E-4 MODEL ROCKETRY**

##### **Note to all units:**

Project Exhibit Rules for All Units:

1. Rocket exhibits must relate to the skill level for the unit entered. Units 1-4 should include the color picture of the rocket and skill level title from the rocket-kit package as part of its record book. All project material must be organized and secured in a sturdy binder/notebook. Unit 6 must have a copy of plans or blueprints including instructions "step by step" to build the rocket.
2. Each unit level will list what type of fins (single-piece or multi-piece) and what type of material (plastic, balsa or basswood, plywood, composite, or fiberglass) may be used for the exhibit rocket. Fins in all units must be finished with paint except for clear fins used with scale or novelty rockets. **No plastic fins for Units 1-3.**
3. Unit 4 members may build helicopter and glider recovery rocket kits.
4. Rocket design cannot include humanoid characteristics or representations (like dolls). Any toy or 3D human or animal representation can only be in the payload section of the model rocket. Any object displayed (and launched) with the rocket should be non-living.
5. Rockets are to be displayed and held **vertically** by a substantial rod (not a coat hanger rod) or wood support (like an unpainted dowel rod that fits into the motor mount cavity snugly). The base board should be heavier than the rocket and appropriate to the size of the rocket, not to exceed 12"x12"x1" thick. Only the rocket will be judged. The base, at minimum, must be sanded to eliminate splinters. Optionally, the base could be clear coated or painted with up to three colors. No triangular stands can be used for displaying the rocket.
6. Do not include live or expended engines in the rocket exhibited.

7. If the rocket is damaged in launching, it can still be judged for quality of construction along with the e-Record and pictures.
8. Display rockets cannot be used for the Rocket Fly Day competition at State Fair.
9. No launching pads should be used for displaying the rockets.
10. Launching your display rocket is not a requirement. If you are participating in Rocket Fly, make two rockets – one for exhibit and one to launch. At least one rocket should be launched as part of the project to complete the “Launch Information” section of the supplemental sheet. If you are not able to launch due to a fire ban, etc. you must have an explanation on that sheet.
11. Any decals used must be on the rocket.
12. For each rocket used during your project, including your exhibit rocket, make a copy of the Model Rocketry Information page of the e-Record. Include the following information for each rocket on a page of its own:
  - a. Exhibit manufacturer and model name
  - b. Skill level
  - c. Number of fins and fin material
  - d. Recovery system type
  - e. Where the rocket is from (i.e., stock kit)
  - f. Rocket power
  - g. Fuselage type
  - h. Engine information: engine type, engine code, label color
13. If you launched any of the rockets used in your project, provide the following information on the Model Rocketry Information page under “Rocket Launch Information”.
  - A. Number of times launched
  - B. Type of launch pad used
  - C. Kind of electrical system used
  - D. Tracking method used if applicable
  - E. Altitude achieved (optional)
  - F. Observer’s distance from rocket (observations of rocket stability, flight path, etc.; any special problems before, during and after launching)
  - G. Did you have any special problems, before, during, and after launching?
  - H. What did you do to overcome the problems you encountered? Were any modifications made?

Please read specific rules for your unit.

### **INTRODUCTION TO ROCKETRY—UNIT 1**

Class 2201 Intro to Rocketry Unit 1 Jr.

Class 2202 Intro to Rocketry Unit 1 Int.

Class 2203 Intro to Rocketry Unit 1 Sr.

All exhibits will consist of the following:

- A. Completed Model Rocketry e-Record, including the Model Rocketry Information page, presented in a sturdy binder/notebook.
- B. One rocket personally built related to work done in Unit 1. The rocket must be a Skill Level I, beginner, basic, Estes Intermediate type rocket meeting at maximum these criteria:
  1. Three to four wood fins
  2. Parachute or streamer recovery system
  3. Single-stage A3 to B6 (first flight) recommended motor size

### **BASIC MODEL ROCKETRY—UNIT 2**

Class 2204 Basic Model Rocketry Unit 2 Jr.

Class 2205 Basic Model Rocketry Unit 2 Int.

Class 2206 Basic Model Rocketry Unit 2 Sr.

All exhibits will consist of the following:

- A. Completed Model Rocketry e-Record, including the Model Rocketry Information page, presented in a sturdy binder/notebook.

B. One rocket personally built or display related to work done in Unit 2. The rocket must be a Skill Level II, intermediate, Estes Advanced type rocket meeting at maximum these criteria:

1. Three to eight wood fins, including canard fins.
2. Parachute or streamer recovery system
3. Single-stage motor (A3 up to C11 first flight recommended motor size)

### **INTERMEDIATE MODEL ROCKETRY—UNIT 3**

Class 2207 Intermediate Model Rocketry Unit 3 Jr.

Class 2208 Intermediate Model Rocketry Unit 3 Int.

Class 2209 Intermediate Model Rocketry Unit 3 Sr.

All exhibits will consist of the following:

A. Completed Model Rocketry e-Record, including the Model Rocketry Information page, with completed questions in manual pages 31-35 (Note: This manual is being updated. If page numbers change, 4-H members will be notified.) presented in a sturdy binder/notebook.

B. One rocket personally built-in unit or display related to work done in Unit 3. The rocket must be a Skill Level III (Estes Expert) type rocket meeting at maximum these criteria:

1. Any combination of balsa wood fins
2. Parachute recovery system
3. Single-stage motor (B6 up to E12 first flight recommended motor size)

### **ADVANCED MODEL ROCKETRY—UNIT 4**

#### **Finished fins of any type**

Class 2210 Advanced Model Rocketry Unit 4 Jr.

Class 2211 Advanced Model Rocketry Unit 4 Int.

Class 2212 Advanced Model Rocketry Unit 4 Sr.

All exhibits will consist of the following:

A. Completed Model Rocketry e-Record, including the Model Rocketry Information page, with completed questions in manual pages 14-18 (Note: This manual is being updated. If page numbers change, 4-H members will be notified.) presented in a sturdy binder/notebook.

B. One rocket personally built-in unit or display related to work done in Unit 4. The rocket can be from Skill Level I up to Skill Level IV (Estes Master) or that meets at maximum these criteria:

1. Any combination of balsa wood or plastic fins.
2. Parachute, helicopter, or glider recovery system
3. Single-stage motor (A3 up to E12 first flight recommended motor size)

### **DESIGNER MODEL ROCKETRY—UNIT 6**

#### **Finished fins of any type**

Class 2213 Designer Model Rocketry Unit 6 Int.

Class 2214 Designer Model Rocketry Unit 6 Sr.

All exhibits will consist of the following:

A. Completed Model Rocketry e-Record with design worksheets and completed questions in manual on pages 35-39, presented in a sturdy binder/notebook. Include a copy of the plans or blueprints on how to build the rocket. If you used any software, such as an Excel spreadsheet, include that in your binder/notebook.

B. If a rocket was launched provide the following information on the Model Rocketry page.

1. Number of times successfully launched; kind of launch pad used.
2. Kind of electrical system used.
3. Tracking method used.
4. Observer's distance from rocket; observations of rocket stability, flight path, etc.; altitude achieved and how it was determined; any special problems before, during and after launching.
5. What did you do to overcome any problems you encountered?

C. One rocket **personally designed**, built (no kits or plans) and used in unit or display related to work done.

## **E-5 ROBOTICS & ENGINEERING**

- A. In Junk Drawer Units (1-3), members are only allowed to enter a display board exhibit or a stand-alone exhibit, not both.
- B. Robotics Platforms is just a fancy way to say robotics kits or robotics materials. Some types of commercial kits or platforms include: Arduio Kits, Brushbot, Make, Hexy, Pushbutton Programmable Robotic Kit, Sparky, Cubelets, Robotic Arm Edge, Sparkfun Red Bot, Multiplo, TETRIX, CEENBot, and VEX, current and discontinued LEGO Robotics kits with programable robots including EV3, WeDo, NXT, SPIKE Prime, Mindstorm, and Boost.
- C. Youth working individually on a robotics platform should enroll in the Platform Units. Youth should advance between Units 4-6 as they feel they are progressing in their project knowledge.
- D. Youth working on a team on a robotics platform should enroll in the Team Robotics Unit. Despite being on a team, the fair exhibit is meant to be completed and entered by an individual member.
- E. For more information about various team competitive robotics opportunities, see the list from the Colorado 4-H STEM website.

### **FOR ALL ROBOTICS & ENGINEERING CLASSES**

All exhibits will consist of the following e-Record information (A) along with each unit's additional requirements (B).

- A. A sturdy binder/notebook that contains the completed 4-H Robotics e-Record.

### **JUNK DRAWER ROBOTICS & ENGINEERING—UNIT 1—GIVE ROBOTICS A HAND**

#### **Display Board Exhibits**

- Class 2301 Give Robotics a Hand Display Board Unit 1 Jr.
- Class 2302 Give Robotics a Hand Display Board Unit 1 Int.
- Class 2303 Give Robotics a Hand Display Board Unit 1 Sr.

#### **Stand Alone Exhibits**

- Class 2304 Give Robotics a Hand Stand Alone Unit 1 Jr.
- Class 2305 Give Robotics a Hand Stand Alone Unit 1 Int.
- Class 2306 Give Robotics a Hand Stand Alone Unit 1 Sr.

All exhibits will consist of the following along with the e-Record (A above):

- B. **For Display Board Exhibits:** One display board which you have made as a part of this unit of study. The standardized display board size of 4' x 3' is to be used for 4-H projects.  
**For Stand-Alone Exhibits:** One article which you have made as a part of this unit of study (Examples: marshmallow catapult, robotic arm, robotic gripper.)

### **JUNK DRAWER ROBOTICS & ENGINEERING—UNIT 2—ROBOTS ON THE MOVE**

#### **Display Boards Exhibits**

- Class 2307 Robots on the Move Display Board Unit 2 Jr.
- Class 2308 Robots on the Move Display Board Unit 2 Int.
- Class 2309 Robots on the Move Display Board Unit 2 Sr.

#### **Stand Alone Exhibits**

- Class 2310 Robots on the Move Stand Alone Unit 2 Jr.
- Cass 2311 Robots on the Move Stand Alone Unit 2 Int.
- Cass 2312 Robots on the Move Stand Alone Unit 2 Sr.

All exhibits will consist of the following along with the e-Record (A above):

- B. **For Display Board Exhibits:** One display board which you have made as a part of this unit of study. The standardized display board size of 4' x 3' is to be used for 4-H projects.  
**For Stand-Alone Exhibits:** One article which you have made as a part of this unit of study. (Examples: clipmobile, can-can robot, gear train, es-car-go, sea hunt)

### **JUNK DRAWER ROBOTICS & ENGINEERING—UNIT 3—MECHATRONICS**

#### **Display Board Exhibits**

- Class 2313 Mechatronics Display Board Unit 3 Jr.



Class 2314 Mechatronics Display Board Unit 3 Int.  
Class 2315 Mechatronics Display Board Unit 3 Sr.

#### **STAND ALONE EXHIBITS**

Class 2316 Mechatronics Stand Alone Unit 3 Jr.  
Class 2317 Mechatronics Stand Alone Unit 3 Int.  
Class 2318 Mechatronics Stand Alone Unit 3 Sr.

All exhibits will consist of the following along with the e-Record (A above):

- B. **For Display Board Exhibits:** One display board which you have made as a part of this unit of study. The standardized display board size of 4' x 3' is to be used for 4-H projects.  
**For Stand-Alone Exhibits:** One article which you have made as part of this unit of study. (Examples: forward and reverse, wall follower, breadboard, say what? build your robot.)

#### **ROBOTICS PLATFORMS—UNIT 4—BEGINNER (Display Board Only)**

##### **Display Board Exhibits**

Class 2319 Platforms—Beginner Display Board Unit 4 Jr.  
Class 2320 Platforms—Beginner Display Board Unit 4 Int.  
Class 2321 Platforms—Beginner Display Board Unit 4 Sr.

All exhibits will consist of the following along with the e-Record (A above):

- B. One display board which you have made as a part of this unit of study. The standardized display board size of 4' X 3' is to be used for 4-H projects.

#### **ROBOTICS PLATFORMS—UNIT 5—INTERMEDIATE (Display Board Only)**

Class 2322 Platforms—Intermediate Display Board Unit 5 Jr.  
Class 2323 Platforms—Intermediate Display Board Unit 5 Int.  
Class 2324 Platforms—Intermediate Display Board Unit 5 Sr.

All exhibits will consist of the following along with the e-Record (A above):

- B. One display board which you have made as a part of this unit of study. The standardized display board size of 4' X 3' is to be used for 4-H projects.

#### **ROBOTICS PLATFORMS—UNIT 6—ADVANCED (Display Board Only)**

Class 2325 Platform—Advanced Display Board Unit 6 Jr.  
Class 2326 Platform—Advanced Display Board Unit 6 Int.  
Class 2327 Platform—Advanced Display Board Unit 6 Sr.

All exhibits will consist of the following along with the e-Record (A above):

- B. One display board which you have made as a part of this unit of study. The standardized display board size of 4' X 3' is to be used for 4-H projects.

#### **TEAM ROBOTICS—UNIT 7 (Display Board Only)**

Class 2328 Team Robotics Display Board Unit 7 Jr.  
Class 2329 Team Robotics Display Board Unit 7 Int.  
Class 2330 Team Robotics Display Board Unit 7 Sr.

All exhibits will consist of the following along with the e-Record (A above):

- B. One display board which you have made as a part of this unit of study. The standardized display board size of 4' X 3' is to be used for 4-H projects.

#### **E-6 SMALL ENGINES**

##### **CRANK IT UP—UNIT 1**

Class 2401 Crank It Up Unit 1 Jr.

Class 2402 Crank It Up Unit 1 Int.  
Class 2403 Crank It Up Unit 1 Sr.

### **WARM IT UP—UNIT 2**

Class 2404 Warm It Up Unit 2 Jr.  
Class 2405 Warm It Up Unit 2 Int  
Class 2406 Warm It Up Unit 2 Sr.

### **TUNE IT UP—UNIT 3**

Class 2407 Tune It Up Unit 3 Jr.  
Class 2408 Tune It Up Unit 3 Int.  
Class 2409 Tune It Up Unit 3 Sr.

All exhibits will consist of the following:

- A. A completed Small Engines manual (page 4, at least 7 activities completed) and e-Record presented in a sturdy binder/notebook, including appropriate sections in the manual completed and other items such as diagrams, drawings, photographs, or attachments related to activities in the manual.
- B. Exhibit may be a display board or a stand-alone item (but not both) such as: air and fuel systems, the electrical systems, a diagram of the engine block, etc. A display board can be on any topic from the Small Engines manual. You may use diagrams, drawings, and photographs. Label and use captions to make your display as educational as possible. The standardized display board size of 4 ft. x 3 ft. is to be used with 4-H projects. No additional items may be included in front of the display board.

### **ADVANCED ENGINES—UNIT 4**

Class 2410 Advanced Small Engines Unit 4 Int.  
Class 2411 Advanced Small Engines Unit 4 Sr.

All exhibits will consist of the following:

Note: This unit can be used for any type of engine (tractor, car, etc.)

- A. A completed Small Engine Unit 4 e-Record with emphasis on your accomplishments in your story presented in a sturdy binder/notebook (Self-determined).
- B. Include the following information in the Small Engine Unit 4 e-Record:
  1. Written description of your project:
    - a. goals
    - b. plans
    - c. accomplishments
    - d. evaluation
- C. Exhibit may be a display board or a stand-alone item (but not both) such as: air and fuel systems, the electrical system, a diagram of the engine block, etc. A display board can be on any topic related to engines. You may use diagrams, drawings, charts and photographs. Label and use captions to make your display as educational as possible. The standardized display board size of 4 ft. x 3 ft. is to be used with 4-H projects. No additional items may be included in front of the display board.

### **E-7 WOODWORKING**

Units 1, 2, and 3 in Woodworking have very specific restrictions on the tools used in building an article to display. This is done for reasons of safety and to provide a fair comparison among projects in a unit. An exhibit that shows evidence of not following these restrictions will not be ranked in the top-ten placing. Projects for Units 1 and 2 will be a maximum size of 3 feet by 3 feet by 7 feet as they are meant to be used or displayed. The item must be stable when standing to be displayed.

Note: In making all placings, judges will consider straightness, accuracy and smoothness of saw cuts; the difficulty and preciseness of joints; the skill employed in the use of nails, screws, gluing and other hardware; freedom from tool or sandpaper marks; appropriate finish evenly applied; article attractiveness, proportions, and use of proper wood for the intended use; ability to follow instructions; quality of workmanship; and completeness of e-Record. Always use proper safety gear.

For large exhibits, like beds, please bring only the head and foot boards. No rails. **Please notify the State 4-H Office if exhibit is oversized.**

### **MEASURING UP—UNIT 1**

Class 2501 Measuring Up Unit 1 Jr.

Class 2502 Measuring Up Unit 1 Int.

Class 2503 Measuring Up Unit 1 Sr.

Note: Use hand tools only. Articles made with tools other than hand tools will not be ranked in the top-ten placing. A hand miter box is allowed. Size restriction: 3' x 3' x 7'.

### **MAKING THE CUT—UNIT 2**

Class 2504 Making the Cut Unit 2 Jr.

Class 2505 Making the Cut Unit 2 Int.

Class 2506 Making the Cut Unit 2 Sr.

Note: Allowed tools are hand tools, power hand drill, miter box (non-powered), oscillating (pad) sander and jigsaw. Articles made with power tools other than those listed will not be ranked in the top-ten placing. Size restriction: 3' x 3' x 7'.

### **NAILING IT TOGETHER—UNIT 3**

Class 2507 Nailing It Together Unit 3 Jr.

Class 2508 Nailing It Together Unit 3 Int.

Class 2509 Nailing It Together Unit 3 Sr.

Note: Allowed tools are hand tools, power hand drill, miter box, jigsaw, scroll saw, power sanders, table saw, drill press, band saw, rabbet plane, jointer, and router. Articles made with power tools other than those listed will not be ranked in the top-ten placing.

### **FINISHING UP—UNIT 4**

Class 2510 Finishing Up Unit 4 Jr.

Class 2511 Finishing Up Unit 4 Int.

Class 2512 Finishing Up Unit 4 Sr.

Note: Allowed tools are all those mentioned in Units 1-3, plus circular saw, radial arm saw, planer, wood lathe, chop saw, and other power tools needed to complete Unit 4 projects.

All exhibits will consist of the following:

- A. Completed Woodworking e-Record with the plans used for making the exhibit (tell if the plan was your own, manual, or other) presented in a sturdy binder/notebook.
- B. Include the following information on the Woodworking page:
  1. Plan source used (your own, manual or other)
  2. Kind of wood used
  3. Names of joints and fasteners used
  4. A drawing or other copy of a plan for the article exhibited:
    - a. Dimensions
    - b. list of materials used
    - c. description of any changes in the article's specifications
    - d. reason for the changes
  5. List of all articles made

The drawing or plan itself will not be judged. It is only for the judge's use in judging the article exhibited. If the drawing is missing, the exhibit will not be ranked in the top-ten placings.

- C. Any one article constructed by the exhibitor using the skills learned in the unit.