

DIVISION C - MECHANICAL SCIENCES

C-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 or a stand-alone exhibit, not all.

Beginning programming – simple program using Scratch (or other simple graphic programming language). The program should include 8 different commands including looping and getting input from the keyboard and mouse.

Intermediate programming – a program using Scratch (or other simple 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, C++, etc. Project will be evaluated on the quality of information completed in the manual and e-Record (25 percent) and quality of exhibit (75 percent).

Discovering Computer Science & Programming Through Scratch – Level 1

Class

Display Board Exhibits

1. Computer Science – Junior
2. Computer Science – Intermediate
3. Computer Science – Senior

Beginning Programming

4. Beginning Programming - Junior
5. Beginning Programming – Intermediate
6. Beginning Programming – Senior

Stand-Alone Exhibits

7. Computer Science - Junior
8. Computer Science – Intermediate
9. Computer Science – Senior

Discovering Computer Science & Programming Through Scratch – Level 2

Class

Display Board Exhibits

10. Computer Science – Intermediate
11. Computer Science – Senior

Intermediate Programming

12. Intermediate Programming – Intermediate
13. Intermediate Programming – Senior

Stand-Alone Exhibits

14. Computer Science – Intermediate
15. Computer Science – Senior

Discovering Computer Science & Programming Through Scratch – Level 3

Class

Display Board Exhibits

16. Computer Science – Intermediate
17. Computer Science – Senior

Advanced Programming

18. Advanced Programming – Intermediate
19. Advanced Programming – Senior

Stand-Alone Exhibits

20. Computer Science – Intermediate
21. Computer Science – Senior

Computers in the 21st Century

Display Board Exhibits

22. Computers 21st Century – Intermediate
23. Computers 21st Century – Senior

Stand-Alone Exhibits

24. Computers 21st Century – Intermediate
25. Computers 21st Century – Senior

Exhibits will consist of the following:

A. One sturdy binder/notebook that contains the Discovering Computer Science & Programming Through Scratch manuals for that unit and completed 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' X 3' is to be used for 4-H projects. No additional items may be included in front of display board. All items must be attached to display board.

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.
- Beginning Programming** – a simple program using Scratch (or other simple graphic programming language). The program should include 8 different commands including looping and getting input from the keyboard and mouse.
- Intermediate Programming** – a program using Scratch (or other simple 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 graphic programming language).
- Advanced Programming** – an original program using higher level programming language such as Python, Javascript, C++, etc.
3. A stand-alone exhibit demonstrating a skill learned or an item developed. For example, a Makey Makey keyboard or a microcontroller project. All stand-alone projects are subject to risks of display at county and state fair if eligible.

C-2 Electricity

Project will be evaluated on the quality of information completed in the manual and e-Record (25 percent) and quality of exhibit (75 percent).

NOTE: Please make sure that all items are attached securely to the exhibit and that they are labeled with the name of the exhibitor. Judges will judge entire electricity project for a cash award given by K.C. Electric Assn. - 1st-\$100, 2nd-\$75 and 3rd-\$50.

Class

1. Unit 1 - Magic of Electricity - Junior
2. Unit 1 - Magic of Electricity - Intermediate
3. Unit 1 - Magic of Electricity - Senior

Exhibit will consist of the following:

- 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 e-Record presented in a sturdy binder/notebook.
- B. One article or display board (not both) which 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.). The standardized display board size of 4' X 3' is to be used for 4-H projects. No additional items may be included in front of display board.
- C. Label each separate part with your name and county.

4. Unit 2 - Investigating Electricity - Junior
5. Unit 2 - Investigating Electricity - Intermediate
6. Unit 2 - Investigating Electricity - Senior

Exhibit will consist of the following:

- 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 e-Record presented in a sturdy binder/notebook.
- B. One article or display board (not both) which 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.). The standardized display board size of 4' X 3' is to be used for 4-H projects. No additional items may be included in front of display board.
- C. Label each separate part with your name and county.

7. Unit 3 - Wired For Power - Junior
8. Unit 3 - Wired For Power - Intermediate
9. Unit 3 - Wired For Power - Senior

Exhibit will consist of the following:

- 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 e-Record presented in a sturdy binder/notebook.
- B. One article or display board (not both) which 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.) The standardized display board size of 4' X 3' is to be used for 4-H projects. No additional items may be included in front of display board.
- C. Label each separate part with your name and county.

10. Unit 4 - Entering Electronics - Senior Advanced

Exhibit will consist of the following:

- 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 e-Record presented in a sturdy binder/notebook.
- 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.) The standardized display board size of 4' X 3' is to be used for 4-H projects. No additional items may be included in front of display board.

C. Label each separate part with your name and county.

C-3 Small Engines

Project will be evaluated on the quality of information completed in the manual and e-Record (25 percent) and quality of exhibit (75 percent).

Class

1. Unit 1 - Crank It Up - Junior
2. Unit 1 - Crank It Up - Intermediate
3. Unit 1 - Crank It Up - Senior

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' X 3' is to be used for 4-H projects. No additional items may be included in front of display board.

C. Label each item with name and county.

4. Unit 2 - Warm It Up - Junior
5. Unit 2 - Warm It Up - Intermediate
6. Unit 2 - Warm It Up - Senior

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' X 3' is to be used for 4-H projects. No additional items may be included in front of display board.

C. Label each item with name and county.

7. Unit 3 - Tune It Up - Junior
8. Unit 3 - Tune It Up - Intermediate
9. Unit 3 - Tune It Up - Senior

Exhibits will consist of the following:

A. A completed Small Engines manual (page 4 – at least 7 activities completed) and e-Record 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 pictures or any records you kept to provide evidence of your accomplishments and what you learned. Label and use captions to make your display as educational as possible. The standardized display board size of 4' X 3' is to be used for 4-H projects. No additional items may be included in front of display board.

C. Label each item with name and county.

10. Unit 4 - Advanced Small Engines - Junior
11. Unit 4 - Advanced Small Engines - Intermediate
12. Unit 4 - Advanced Small Engines – Senior

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

Exhibits will consist of the following:

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 systems, 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' X 3' is to be used for 4-H projects. No additional items may be included in front of display board.

D. Label each item with name and county.

C-4 Model Rocketry

NOTE: 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 their 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. Fins must be balsa wood (balsa and basswood) and finished with paint in classes indicated. **No plastic fins for Units 1-3.**
3. Fins of plastic or other materials must be exhibited in Units 4 and 6.
4. Unit 4 members may build helicopter and glider recovery rocket kits.
5. Rockets are to be displayed and held **vertically** by a substantial rod or support no taller than the rocket on a stationary base appropriate to the size of the rocket, not to exceed 12" x 12" x 1" thick. Only the rocket will be judged. Do not decorate the base. No triangular stands can be used for displaying the rocket.
6. Do not include live or expended engines in the rocket exhibited.
7. If rocket is damaged in launching, it can still be judged for quality of construction, 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 2 rockets – one for exhibit and one to launch.
11. Project will be evaluated on the quality of information completed in the manual and e-Record (25 percent) and quality of exhibit (75 percent).

Class

Balsa Fins Only

1. Unit 1 - Introduction to Rocketry - Junior
2. Unit 1 - Introduction to Rocketry - Intermediate
3. Unit 1 - Introduction to Rocketry - Senior

Exhibit will consist of the following:

- A. Completed Model Rocketry e-Record presented in a sturdy binder/notebook.
- B. On the Model Rocketry page enter the rockets you built in this unit. Include the following information:
 1. Model name; skill level; from a stock kit, modified kit or self-designed-and-built.
 2. Power: single-stage, multi-stage: cluster.
 3. Fuselage: single-tube or glider rear-engine or glider front-engine or glider-canard.
 4. Engine information: engine code, label color, and type of recovery system.
- C. If the rocket was launched provide the following information on the Model Rocket 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 patch, etc.; any special problems before, during and after launching
 5. What did you do to overcome the problems you encountered?
- D. One rocket personally built, or display related to work done at Skill Level I (Estes Intermediate) or that meets at maximum these criteria:
 1. Three to four balsa wood fins
 2. Parachute recover system
 3. Single-stage motor (A3 to B6 first flight recommended motor size)
- E. Label each item with name and county.

Balsa Fins Only

4. Unit 2 - Basic Model Rocketry - Junior
5. Unit 2 - Basic Model Rocketry - Intermediate
6. Unit 2 - Basic Model Rocketry - Senior

Exhibit will consist of the following:

- A. Completed Model Rocketry e-Record presented in a sturdy binder/notebook.
- B. On the Model Rocketry page enter the rockets you built in this unit. Include the following information:
 1. Model name; skill level; from a stock kit, modified kit or self-designed-and-built.
 2. Power: single-stage, multi-stage: cluster.
 3. Fuselage: single-tube or glider rear-engine or glider front-engine or glider-canard.
 4. Engine information: engine code, label color, and type of recovery system.
- C. If the rocket was launched provide the following information on the Model Rocket 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.; angle achieved and altitude achieved; any special problems before, during and after launching
 5. What did you do to overcome the problems you encountered?
- D. One rocket personally built, or display related to work done at Skill Level II (Estes Advanced) or that meets at maximum these criteria:
1. Three to eight balsa wood fins, including canard fins
 2. Parachute recovery system
 3. Single-stage motor (A3 up to C11 first flight recommended motor size)
- E. Label each item with name and county.

Balsa Fins Only

7. Unit 3 - Intermediate Model Rocketry - Junior
8. Unit 3 - Intermediate Model Rocketry - Intermediate
9. Unit 3 - Intermediate Model Rocketry - Senior

Exhibit will consist of the following:

- A. Completed Model Rocketry e-Record with completed questions in manual pages 31-35 presented in a sturdy binder/notebook.
- B. On the Model Rocketry page enter the rockets you built in this unit. Include the following information:
 1. Model name; skill level; from a stock kit, modified kit or self-designed-and-built.
 2. Power: single-stage, multi-stage: cluster.
 3. Fuselage: single-tube or glider rear-engine or glider front-engine or glider-canard.
 4. Engine information: engine code, label color, and type of recovery system.
- C. If the rocket was launched provide the following information on the Model Rocket 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.; any special problems before, during and after launching
 5. What did you do to overcome the problems you encountered?
- D. One rocket personally built-in unit or display related to work done at Skill Level III (Estes Expert) or that meets at maximum these criteria:
 1. Any combination of balsa wood fins
 2. Parachute recovery system
 3. Single-stage motor (B6 up to E11 first flight recommended motor size)
- E. Label each item with name and county.

Finished fins of any type

10. Unit 4 - Advanced Model Rocketry - Junior
11. Unit 4 - Advanced Model Rocketry - Intermediate
12. Unit 4 - Advanced Model Rocketry - Senior

Exhibit will consist of the following:

- A. Completed Model Rocketry e-Record with completed questions in manual pages 14-18 presented in a sturdy binder/notebook.
- B. On the Model Rocketry page enter the rockets you built in this unit. Include the following information:
 1. Model name; skill level; from a stock kit, modified kit or self-designed-and- built.
 2. Power: single-stage, multi-stage: cluster.
 3. Fuselage: single-tube or glider rear-engine or glider front-engine or glider-canard.
 4. Engine information: engine code, label color, and type of recovery system.
- C. If the rocket was launched provide the following information on the Model Rocket 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; altitude achieved and how it was determined; any special problems before, during and after launching
 5. What did you do to overcome the problems you encountered?
- D. One rocket personally built-in unit or display related to work done 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).
- E. Label each item with name and county.

Finished fins of any type

13. Unit 6 - Designer Model Rocketry - Junior
14. Unit 6 - Designer Model Rocketry - Intermediate
15. Unit 6 - Designer Model Rocketry - Senior

Exhibit 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 the problems you encountered?
- C. One rocket personally designed, built (no kits or plans) and used in unit or display related to work done.
- D. Label each item with name and county.

C-5 Robotics & Engineering

1. In Junk Drawer Units (1-3), youth are only allowed to enter a display board exhibit or a stand-alone exhibit, NOT both.
2. Robotics Platforms is just a fancy way to say robotics kits or robotics materials. Some types of commercial kits or platform include: Arduino Kits, EV3, Brushbot, Make, Hexy, Pushbutton Programmable Robotic Kit, Sparky, Cubelets, Robotic Arm Edge, Sparkfun Red Bot, WeDo, Multiplo, NXT, TETRIX, CEENBot and VEX.
3. 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.
4. 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.
5. For more information about various team competitive robotics opportunities, see this list from the Colorado 4-H STEM website.
6. Project will be evaluated on the quality of information completed in the manual and e-Record (25 percent) and quality of exhibit (75 percent).

Class

Display Board Exhibits

1. Junk Drawer Robotics Unit 1 - Give Robotics a Hand - Junior
2. Junk Drawer Robotics Unit 1 - Give Robotics a Hand - Intermediate
3. Junk Drawer Robotics Unit 1 - Give Robotics a Hand – Senior

Stand-Alone Exhibits

4. Junk Drawer Robotics Unit 1 - Give Robotics a Hand - Junior
5. Junk Drawer Robotics Unit 1 - Give Robotics a Hand - Intermediate
6. Junk Drawer Robotics Unit 1 - Give Robotics a Hand – Senior

Exhibit will consist of the following:

- A. A sturdy binder/notebook that contains the completed 4-H Robotics e-Record
- B. **For Display Board Exhibits:** One display board which you have made as a part of this unit of study. The standardize display board size 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 (Example: marshmallow catapult, robotic arm, robotic gripper)

Display Board Exhibits

7. Junk Drawer Robotics Unit 2 - Robots on the Move - Junior
8. Junk Drawer Robotics Unit 2 - Robots on the Move - Intermediate
9. Junk Drawer Robotics Unit 2 - Robots on the Move – Senior

Stand-Alone Exhibits

10. Junk Drawer Robotics Unit 2 - Robots on the Move - Junior
11. Junk Drawer Robotics Unit 2 - Robots on the Move - Intermediate
12. Junk Drawer Robotics Unit 2 - Robots on the Move – Senior

Exhibit will consist of the following:

- A. A sturdy binder/notebook that contains the completed 4-H Robotics e-Record
- B. **For Display Board Exhibits:** One display board which you have made as a part of this unit of study. The standardize display board size 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. (Example: clipmobile, can-can robot, gear train, es-car-go, sea hunt)

Display Board Exhibits

13. Junk Drawer Robotics Unit 3 - Mechatronics - Junior
14. Junk Drawer Robotics Unit 3 - Mechatronics - Intermediate
15. Junk Drawer Robotics Unit 3 - Mechatronics – Senior

Stand-Alone Exhibits

16. Junk Drawer Robotics Unit 3 - Mechatronics - Junior
17. Junk Drawer Robotics Unit 3 - Mechatronics - Intermediate
18. Junk Drawer Robotics Unit 3 - Mechatronics – Senior

Exhibit will consist of the following:

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

B. **For Display Boards:** One display board which you have made as a part of this unit of study. The standardize display board size 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. (Example: forward and reverse, wall follower, breadboard, say what? build your robot)

19. Robotics Platforms Unit 4 – Beginner - Junior
20. Robotics Platforms Unit 4 – Beginner - Intermediate
21. Robotics Platforms Unit 4 – Beginner – Senior

Exhibit will consist of the following:

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

B. Display Board ONLY:

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

22. Robotics Platforms Unit 5 – Intermediate – Junior
23. Robotics Platforms Unit 5 – Intermediate – Intermediate
24. Robotics Platforms Unit 5 – Intermediate - Senior

Exhibit will consist of the following:

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

B. Display Board ONLY:

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

25. Robotics Platforms Unit 6 – Advanced – Junior
26. Robotics Platforms Unit 6 – Advanced – Intermediate
27. Robotics Platforms Unit 6 – Advanced - Senior

Exhibit will consist of the following:

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

B. Display Board ONLY:

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

- 28 Team Robotics Unit 7 – Junior
29. Team Robotics Unit 7 – Intermediate
30. Team Robotics Unit 7 – Senior

Exhibit will consist of the following:

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

B. Display Board ONLY:

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

C-6 Metalworking (formerly Welding)

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:

<https://co4h.colostate.edu/projects/pages/Metalworking-PT.pdf>.

Project will be evaluated on the quality of information completed in the manual and e-Record (25 percent) and quality of exhibit (75 percent).

Class

1. Intro to Metalwork Unit 1 – Junior
2. Intro to Metalwork Unit 1 – Intermediate
3. Intro to Metalwork Unit 1 – Senior

Exhibit will consist of the following:

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

B. Exhibit the following:

1. One each: Lap, Butt and 90-degree T Joints

Requirements:

- a. Each joint will be made of two separate pieces, 3" to 4" long of 1" or 2" wide flat strap metal, between 1/8" (11 gauge) and 1/4" in thickness
- b. On clean steel with no paint, oil or other finishes
- c. Single pass weld on one side of joint only
- d. Name and county on bottom of each completed joint in permanent ink or paint.

2. An exhibit up to 3'x3'x7', under 50 lbs.

- a. No paint, oil, or other finishes
- b. No grinding or smoothing of welds
- c. Metal only – No wood, plastic, or other building materials on the project to be judged.

3. 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)

4. Metal Fabrication Unit 2 – Junior

5. Metal Fabrication Unit 2 – Intermediate

6. Metal Fabrication Unit 2 – Senior

Exhibit will consist of the following:

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

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)

7. Advanced Metal Fabrication Unit 3 – Junior

8. Advanced Metal Fabrication Unit 3 – Intermediate

9. Advanced Metal Fabrication Unit 3 – Senior

Exhibit will consist of the following:

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

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 are 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

overall

view)

10. Large Exhibit Fabrication Unit 4 – Junior

11. Large Exhibit Fabrication Unit 4 – Intermediate

12. Large Exhibit Fabrication Unit 4 – Senior

Exhibit will consist of the following:

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

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
 1. No paint, oil, or other finishes on welds
 2. 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"X7" minimum
 - f. Captions for each photo
 - g. Project requirements
 1. An exhibit project larger than 3'X3'X7' or over 150 lbs.
 2. Paint, oil and other finishes are allowed
 3. Grinding of welds is allowed
 4. Wood, plastic, or other building materials are allowed but must be less than 50% of the project materials
 5. Moving parts are allowed (hinges, wheels, slides, etc.)
 6. Additional Features are allowed (lights, electrical, water, etc.)

Champion Mechanical Science \$5.00

Reserve Champion Mechanical Science \$2.50