

## Department 24 - Mechanical Projects Junior Division

Superintendents:



**Entry & Judging Day** – Tuesday of the fair

**Entry & Judging Time** – 1 p.m. - 8 p.m., Face to face judging only

**Location** – Exhibit Building

**Check Out** – Exhibits will be released between 4:30 p.m. to 6 p.m. on Sunday of the fair

### ADDITIONAL RULES OF ENTRY

- Youth eligible to exhibit in this department are those enrolled in a 4H, FFA, or other approved youth group carrying a similar supervised program in Aerospace, Mechanical Sciences, GPS & Mapping, Model Building, Robotics, LEGO, Welding or Self-Determined - STEM project areas. Project enrollment requirements are listed under each class.
- All exhibits must be the result of this year's project by the exhibitor.
- Only one exhibit may be entered under each lot number.
- All entries not entered correctly will be judged and placed in the pink ribbon group.

<b>PREMIUMS:</b>	<u>1st</u>	<u>2nd</u>	<u>3rd</u>	<u>4th</u>
	3.00	2.75	2.50	2.25

### REQUIREMENTS:

- **Kits:**
  - A 'kit' is a project where the exhibitor purchased a design and materials in pre-packaged form and assembled the pieces into a project
  - Any kits that are entered in this department must be labeled as such on a 3" x 5" index card that is attached to the entry tag, unless the lot specifically states that entry is made from a kit
- **Posters, scrapbooks and display exhibits:** Exhibitors must follow all requirements located in 'General Rules for Junior Division Exhibitors'
- **Electronic media exhibits:** Exhibitors must follow all requirements located in 'General Rules for Junior Division Exhibitors'
- **Note:** Bicycling is found under Dept. 16 - Environmental Outdoor Education

### CLASS A – AEROSPACE

Open to all exhibitors enrolled in an Aerospace project.

#### Lot Numbers:

1. Poster or display of different types of aircraft
2. Panorama display, include airplane or rocket in authentic 3D setting
3. Poster or display on basic parts of model airplane with their functions described
4. Model airplane, not made to fly
5. Model airplane, made to fly
6. Model airplane, with remote control
7. Drinking straw rocket
8. Single stage model rocket (2 or 4 fins) parts labeled and function described
9. Multi-stage model rocket (2 or 3 fins) parts labeled and function described
10. Rocket that has been fired - include photo of launch, and report on recent distance, launch success, failure, accuracy of distance
11. Homemade box kite

12. Homemade diamond kite
13. Nagasaki Hata fighter kite
14. Paper glider with controls or feather wing glider
15. Model of a flight simulator identifying gauges and functions
16. Poster or display about safety precautions with model airplanes, model rockets or remote control airplanes
17. Poster or display on how weather affects flying
18. Poster or display identifying parts and functions of model airplanes
19. Poster or display identifying parts and functions of model remote control airplane
20. Poster or display identifying parts and functions of helicopters
21. Poster or display identifying parts and functions of model rocket
22. Poster or display or display of different types of navigation methods

## **CLASS B – MECHANICAL SCIENCES**

**Open to all exhibitors enrolled in a Mechanical Sciences project.**

### **Lot Numbers:**

#### **Small Engines:**

1. Poster or display showing external parts of a lawn mower
2. Poster or display on safety when starting a small engine
3. Panel exhibit showing types of starters, actual parts may be used, 2-cycle or 4-cycle
4. Poster or display on correct tools needed to repair or maintain small engines
5. Panel exhibit showing different types of oil and their functions
6. Panel exhibit showing types of air cleaners. Explain how each works and maintenance required for each
7. Poster or display of parts of a spark plug, label parts and explain use of spark plug
8. Poster or display on safety for small engines
9. Poster, display or scrapbook showing comparison of different brands of lawn mowers, snowblowers, chain saws, etc.
10. Poster or display explaining different types of engines and examples of what they are used for
11. Panel exhibit of internal engine parts with identification and function, 2-cycle or 4-cycle
12. Poster or display of specialty tools used for maintenance and repair of small engines, identify and state function of each tool
13. Poster or display explaining the compression ratio of diesel and gasoline engines
14. Panel exhibit of carburetor parts with explanation of parts and parts labeled
15. Poster or display showing the steps to ready your small engine for storage
16. Poster or display showing worn or faulty engine parts with a statement as to cause or prevention
17. Panel exhibit of small engine parts with identification of parts
18. Poster or display explaining special Diagnostic Tools used to maintain or repair small engines, identify and state function of each tool
19. Panel exhibit explaining fuel and air systems of small engines, actual parts may be used, 2-cycle or 4-cycle
20. Panel exhibit explaining the electrical system of a small engine, actual parts may be used, 2-cycle or 4-cycle
21. Panel exhibit showing most frequently replaced internal engine parts with cause and preventive measure, 2-cycle or 4-cycle
22. Poster or display showing steps to sharpen lawn mower blades
23. Construct a go-cart, log splitter or another piece of equipment, with explanation on a 3" x 5" index card of why you selected that engine type
24. Cutaway view diagram of a four-cycle engine
25. Scrapbook of costs and investments made to start your own small engine business
26. Any other exhibit on small engines, 2-cycle or 4-cycle

**Tractors:**

27. Diagram of an instrument panel of a tractor
28. Poster or display explaining maintenance of a tractor
29. Poster or display explaining what makes the engine run
30. Poster or display outlining safety precautions dealing with tractors
31. Poster or display explaining battery service and functions
32. Poster or display explaining lubrication
33. Diagram of a cooling system
34. Poster or display outlining safety precautions
35. Poster or display relating to care of tires
36. Poster or display showing potential hazards on the highway
37. Poster or display of PTO and hydraulic controls
38. Diagram of braking systems
39. Poster or display of records and ownership cost
40. Poster or display relating to winter care
41. Any other tractor project not listed

**CLASS C – GPS & MAPPING**

**Open to all exhibitors enrolled in a GPS & Mapping project.**

**Lot Numbers:**

1. Poster or display about essential geographical data on my house
2. Poster or display of types of geographical tools
3. Poster or display of uses of geographical tools
4. Poster or display about coordinate-grid reference systems
5. Poster or display of different types and uses of maps
6. Map of my neighborhood with list of features
7. Map with selected route
8. Poster or display on differences between geographic and geospatial data
9. Poster or display on differences between population and road maps
10. Poster or display of pros and cons of geographic and geospatial tools
11. Poster or display on comparison of thematic and general purpose maps
12. My thematic map
13. My general purpose map
14. Brochure or infographic document about my favorite place
15. Map of my favorite place
16. Poster or display on why some G2 data is hard to collect
17. Poster or display on types of G2 data about my community
18. Poster or display on how to solve a community problem using G2 data
19. Map of my community with several data layers
20. My map gallery, include a minimum of three (3) maps
21. Poster or display on your sustainable development project
22. Completed Geospatial "Setting Out" activities (BU8358)
23. Completed Geospatial "On the Trail" activities (BU8358)
24. Completed Geospatial "Reaching for Your Destination" activities (BU8358)
25. Any other geospatial related project not listed

**CLASS D – MODEL BUILDING**

**Open to all exhibitors enrolled in a Model Building project.**

## **REQUIREMENTS:**

- Lot numbers 6-8 can be made from a kit or an original design
- Lot numbers 6-8 cannot exceed measurements of 3' x 3'

### **Lot Numbers:**

#### **Scale Models (vehicle, boat, machinery, etc.):**

1. Small homemade model, not from kit
2. Small model, made from kit, with explanation of parts
3. Model, made from kit, remote control
4. Any similar model not listed
5. Poster or display about basic parts of any model

#### **Scale Models (farm, building, landscape, etc.):**

6. Farm model
7. Building model
8. Railroad model
9. Any similar model not listed

## **CLASS E – ROBOTICS**

**Open to all exhibitors enrolled in a Robotics project.**

### **Lot Numbers:**

1. Basic LEGO tankbot that I designed and built
2. Robot that I designed and built
3. Compound gear train
4. Robotic gripper that I built
5. Poster or display on types of gears
6. Poster or display on differences among machines, computers, & robots
7. Poster or display on parts of an RCX (robot's brain)
8. Report: how gear ratio affects distance traveled
9. Report: how pulley size affects distance traveled
10. Report: how gear ratio affects travel speed
11. Program: tankbot goes forward for 4 seconds
12. Program: tankbot turns left 3 different ways
13. Program: tankbot navigates a maze
14. Program: tankbot travels around square race track
15. Program: tankbot stops, using a touch sensor
16. Program: tankbot stops, using a light sensor
17. Program: tankbot goes forward for 4 seconds without using wait-for icon
18. Program: tankbot follows a path
19. Program: tankbot follows a path for a length of time
20. Program: tankbot stops, using both touch & light sensors
21. Program: tankbot completes challenge course
22. Program: robot goes forward & backward
23. Program: robot determines distance, using rotational sensor
24. Program: robot controls turns, using rotational sensor
25. Program: robot goes forward then backward, using containers (variables)
26. Program: robot grips soda can and returns to starting point
27. Program: robot does multiple tasks at same time
28. Program: robot travels around square race track, using subroutines
29. Program: robot navigates a maze, using Sub-VI's
30. Program: robot follows a line, using loops
31. Completed member guide (BU8364)

32. Completed member guide (BU8365)
33. Any other robotic related project not listed

## **CLASS F – LEGO**

**Open to all exhibitors enrolled in a LEGO project.**

**Note:** Programmed LEGO Robots should be entered in Department 24, Class E

### **Lot Numbers:**

1. LEGO vehicle from kit, size limit 14" x 22"
2. LEGO structure from kit, size limit 14" x 22"
3. LEGO non-motorized robot from kit, size limit 14" x 22"
4. LEGO mechanical item from kit with motor, must move, size limit 14" x 22"
5. LEGO other Lego model not listed above from kit, size limit 14" x 22"
6. LEGO animal, no kit, size limit 14" x 22"
7. LEGO vehicle, no kit, size limit 14" x 22"
8. LEGO structure, no kit, size limit 14" x 22"
9. LEGO non-motorized robot, no kit, size limit 14" x 22"
10. Any other LEGO model not listed above, no kit, size limit 14" x 22"
11. K'Nex vehicle, size limit 14" x 22"
12. K'Nex animal, size limit 14" x 22"
13. K'nex robot, size limit 14" x 22"
14. K'nex mechanical item w/motor, must move, size limit 14" x 22"
15. K'nex any other not listed above, size limit 14" x 22"
16. Scrapbook about your LEGO project. Include items like specific goals you want to achieve, a photo record of your LEGO projects, etc.

## **CLASS G – WELDING**

**Open to all exhibitors enrolled in a Welding project.**

### **Lot Numbers:**

1. Poster or display showing different types of welding equipment
2. Poster or display showing different types of safety gear needed
3. Sample demonstrating 3 beads welded side-by-side
4. Sample showing 2 plates tacked together in a square groove butt joint
5. Sample showing 2 plates in a T-joint
6. Welded article for use in farm or home
7. Welded article for use outdoors
8. Repaired article
9. Any other welding related project not listed

## **CLASS H - SELF-DETERMINED - STEM**

**Open to all exhibitors enrolled in an Aerospace, Mechanical Sciences, GPS & Mapping, Model Building, Robotics, LEGO, Welding or Self-Determined - STEM project.**

Self-determined project exhibits are records of projects not listed in the premium list or an expansion of a traditional project beyond limits of the project or in greater depth than the project outlines.

**REQUIREMENTS:** Posters, scrapbooks and displays must conform to all requirements listed in 'General Rules for Junior Division Exhibitors'

**Lot Numbers:**

1. A poster promoting your self-determined project
2. An article made during current year with a 3" x 5" index card attached identifying resources. The article should be of reasonable size to exhibit in the Expo building
3. A collection made during current year with a 3" x 5" index card identifying work done
4. A scrapbook with story or essay, drawings, and photos of project work done during the current enrollment year
5. Any other self-determined project not listed above