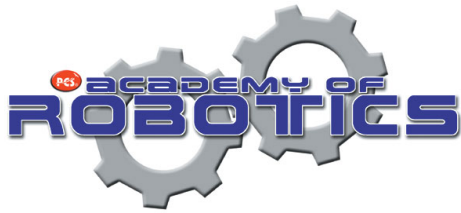


Applications of Robotics



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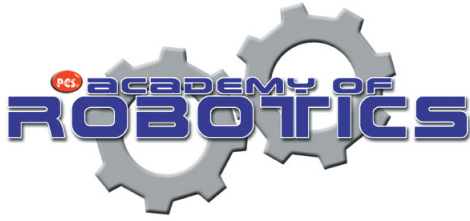
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PROGRAM OVERVIEW

The *PCS Edventures!*TM Academy of Robotics empowers students to explore the basic foundations of robotics and mechanical engineering by completing an exciting array of hands-on activities.

Academy students participate in creating physical and tangible projects. These projects and the setting of the robotics lab are relevant to real world experiences. The Academy of Robotics compels students to build models, design experiments, and solve problems in a challenging, fun atmosphere!

APPLICATIONS OF ROBOTICS

- **RO102 - Applications of Robots:**

Students continue their study into the nature of robotics, and explore different applications and uses of robots and robot arms. Students write a research paper, create automatons, build tracked and wheeled robotic vehicles, and construct extending robotic arms that incorporate trusses, and design and explore the effectiveness of pincher end effectors.

- **RO202 - Mechanical Controls:**

Students are introduced to different methods of mechanical steering and controlling robots. Students experiment with levers, linkages, pneumatics, and pivot wheel steering. Terms and activities cover new concepts and reinforce those learned in RO102.

- **RO302 - Sensors and Feedback:**

Students continue to explore the concepts of feedback by integrating and creating sensors in robotic devices. Terminology and activities cover principles central to automatic control of robots.

- **RO402 - Advanced Robotics:**

Students apply their knowledge in a series of projects that require the incorporation of sensors and programming. Students are encouraged to explore robotic projects on their own, or as part of a larger science project.



SUGGESTIONS FOR TEACHING

Each Academy of Robotics unit has the same basic components which are designed to be used in the order presented. However, as you become more comfortable with the materials, you will find that the activities can be used in any order to meet your teaching style and the students' needs. Whether in RO102 or RO402, the components of the modules in each course are Preparation, Background, Project 1, Project 2, Challenges, and a Personal Project. The last unit in every course includes a long-term group project called a Cooperative Challenge. Assessment and student portfolio building is done using the Academy of Robotics Online Assessment Website (aor.edventures.com).

Preparation: This page gives you a brief overview of the unit, itemizes the materials needed for Project 1 and Project 2, and gives preparation tips for the unit.

Background: This section provides vocabulary terms and background information of the unit. We recommend you read it before teaching. Terms can be looked up using the Term Browser accessed at the *PCS Edventures!*™ Website. "WOW" is an introductory activity provided for you to capture student interest in the topic and to demonstrate the basic principles covered in the unit.

Project 1: This project either introduces the principles and skills needed to master the topic, or it gives instructions for building a device which will be used in an experiment presented in Project 2. The three major sections to the project are the:

1. "Make sure you have:" section listing the materials;
2. "Build..." section giving the building procedures;
3. "Try this..." section providing the assessment questions and activities.

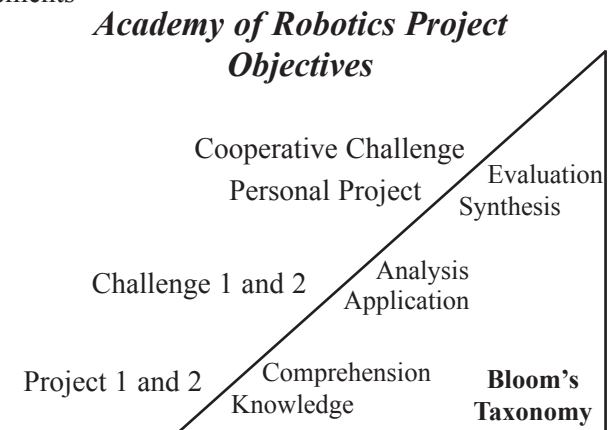
In the "Make sure you have:" section, lists of materials are presented with pictures for ease of use. The "Build..." section includes text and photographic instructions for the project. The "Try this..." section is meant to be used with the Online Assessment process within the Academy of Robotics Online Assessment Website (aor.edventures.com). Student answers should be recorded on their copy of the project page, then recorded online when convenient. The Answer Key is in the Appendix.

Project 2: This project functions just like Project 1.

Challenges: Each module includes two challenges. These are open-ended activities designed to assess the student's ability to apply the principles learned in Projects 1 and 2. Fewer instructions are given, and the student is allowed greater latitude in meeting the requirements of the challenge.

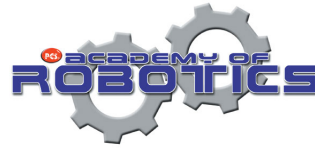
Personal Projects and Cooperative Challenges: These are synthesis activities. Students, alone or in groups, should be encouraged to reflect on the content and processes they have learned by doing the projects and challenges. Their project should demonstrate their mastery of the material.

The objectives of the components are intended to correspond with the levels of Bloom's Taxonomy shown to the right.



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RO202 - Mechanical Controls

RO 202 UNIT 5: LEVERS, LINKAGES, AND PNEUMATICS!

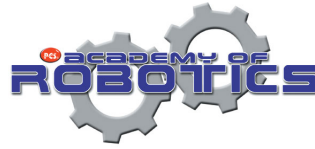
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RO402 - Advanced Robotics

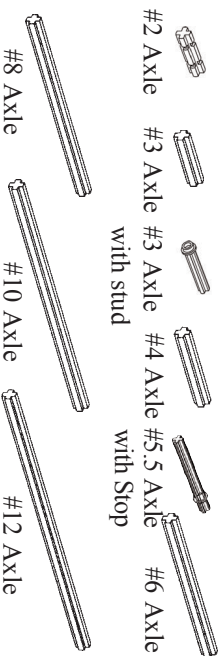
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Appendix

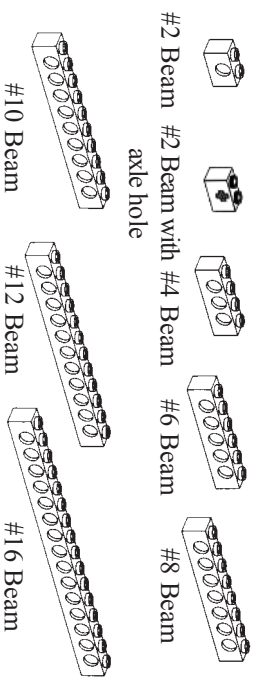
- Teacher Answer Key
- Alignment with National Science Standards
- Alignment with Project 2061 Benchmarks

AXLES



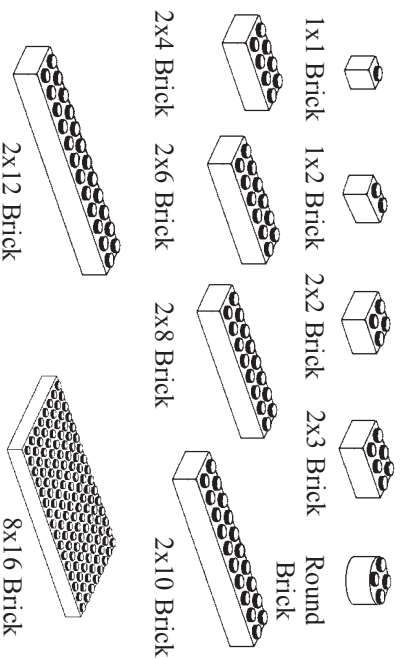
Axle lengths are determined by the number of studs long.

BEAMS



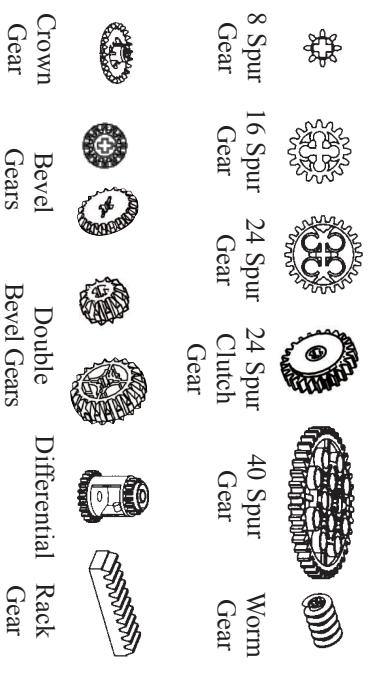
Number of studs determine length, not the number of holes.

BRICKS



Brick lengths are determined by the width x length.

GEARS



Gears are determined by their teeth, meshing, and types.

PLATES

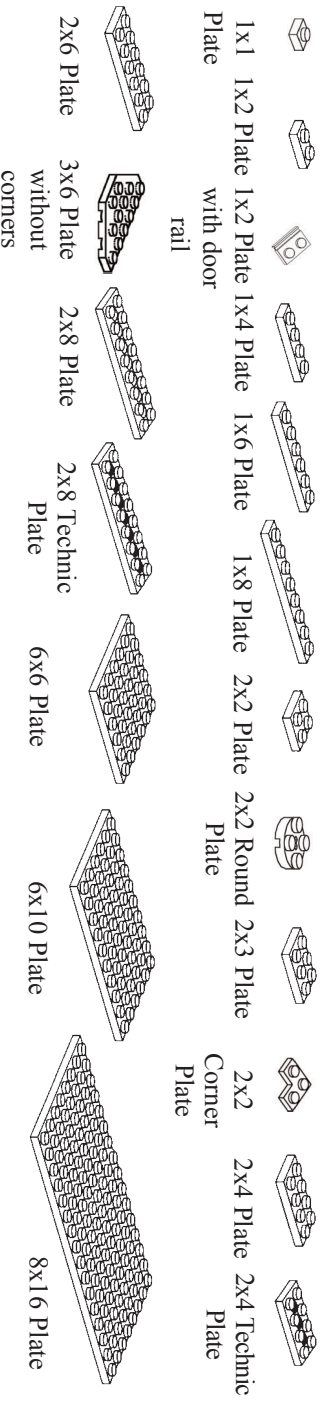


Plate sizes are determined by the width x length and are solid or with holes. Three flat plates = the thickness of a beam or brick.

MISCELLANEOUS

Axle Extender	Cam	Turntable	Long Peg with Bushing	RCX Brick	IR Tower	Belt	Bushing	Tread	Connecting Leash	Hub
Lift Arm	Motor	Connector Peg	Friction Peg	'O' Peg (3/4 Peg)	R&P Peg (Axle Joiner)	Technic Turntable Top	Technic Turntable Base	1x1 Plate with Clip	Pneumatic Valve	Pneumatic Tube
Small Pulley	Medium Pulley	Large Pulley	Offset Pulley (pulley wheel)	Pneumatic Small Pump	Pneumatic Cylinder	Round Peg Joiner	Crankshaft Center	2x3 Inverted Slope	1x2 Inverted Slope	1x2 Shallow Slope
String	Triangle	Light Sensor	Touch Sensor	1x2 Hinge	1x2 Hinge Tile	O Ring	Large Tire	Extra Large Tire	Tread Sprocket	Space Radar Dish
#1 Angle Connector	#2 Angle Connector	#3 Angle Connector	#4 Angle Connector	#5 Angle Connector	#6 Angle Connector	Large Motorcycle Wheel	Balloon Tire	Grabber Jaw	2 Fingered Arm Piece	3 Fingered Arm Piece
3 Long Axle Joiner	3L Axle Joiner	90 Degree Axle Connector	1x11.5 Bent Liftarm	1x3 Liftarm	1x5 Liftarm	1x7 Liftarm	1x10 Liftarm	1x9 Bent Liftarm	2x4 L-Shape Liftarm	3x3 L-Shape Liftarm
Connector Block 3x3x2	3x5 L-Shape Liftarm with Quarter Oval	Pole Reverser Handle	3 Long Double Peg with Holes	2x2 Plate with Axle Holes	Double Friction Peg	Connector with Axle Hole	1x1 Round Plate	Gearbox Round Plate	Boat Stud	1x1 Cone