

Purchasing MindStorms kits for use by teams or classes:

Let's start by breaking down the major components you will need to build a robot, because it is almost always an apples to oranges comparison out there.

1. You need an **RCX** (robot control system), sometimes called the "brick". This is the computer that operates a robot or data collection system. It runs on 9 volts (6-AA batteries or an AC adapter). It can control 3 motors ports and 3 input ports. You can attach lights to motor ports but few people use these for anything other than decoration.
2. You will need **motors**. Kits come with either 2 or 3 motors. Most robots are controlled by using two motors (a right and left) and steering is accomplished by changing the power levels to one side versus the other. You can build a robot with one motor that either only goes forward and back, or goes forward straight and backward in a turn. But not ideal. The third motor is useful for auxiliary components (arms, trigger mechanisms, or other devices not associated with driving the robot). P.S. it is a good idea to have a spare motor, when they break or get a bent axle, they can stop a whole project while you wait for a replacement.
3. You will need **LEGO® pieces**. Kits come with differing numbers of pieces. These can be the standard LEGO® bricks, Technic pieces (engineering LEGO®s), or specialty pieces. Most kits come with 700 or 800 pieces. The difference can be minor, or major depending on what you are trying to accomplish.
4. **Sensors**: Some teams and classes never get to sensors, others rely on them all the time. Each kit comes with some sensors, the numbers change on the kit. Most come with 2 **light sensors** and 2 **touch sensors**. Others add in an **angle sensor** (sometimes called a rotation sensor). I've never seen a kit with the temperature sensors, but they are available separately.
5. **The IR Tower**. Since all the programming is done on your regular computer (either a PC or Mac) you will need to download the program to the RCX. This is done with an IR tower that plugs into a USB or Serial port on your computer. Most people will want a USB IR tower so make sure you order that. If your computer is older it may not have a USB port and you will want to order the Serial IR tower.
6. **Software**. While you can program the RCX using many different software products, including C, NotQuiteC, Visual Basic, and the like. **HOWEVER**, most groups working with elementary, middle, or even high school will want to use the Iconized languages (**RoboLab** or **RIS**). You can get either one from LEGO®, however only RoboLab will work on Macs. Some kits come with the software, some with both, others with none. Pay attention to what you are ordering.

A standard purchase could include one of the following kits and pieces: (I've added the spare parts to help equalize the apples to oranges comparison)

Part #	Description	Cost	Software	Motors	Touch	Light	Rotation	LEGO Pieces
979794	Team Challenge Set with USB IR	\$ 199	No	2	2	2	0	800
991100	Team Challenge Set/USB/Robolab	\$ 226	RoboLab	2	2	2	0	800
991027	FLL Robot Set/USB	\$ 260	RoboLab/RIS	3	2	2	1	700
900076	RoboLab software	\$ 69	RoboLab	0	0	0	0	0
775225	9-volt motor w/ gear reduction	\$ 17	No	1	0	0	0	1
979891	Angle sensor	\$ 18	No	0	0	0	1	1

There are also bundles of kits available that can be used to populate a lab at a school, or you can buy the cheaper 979794 kits and then get a site license so you can put RoboLab on all of the computers at

your school (\$235). This can be a good investment and take away the hassle of figuring out who has the licensed copy and who doesn't.

Pay close attention to what is included in a kit. It can sometimes be cheaper to buy the components separately, or rather to buy 5 individual kits instead of a "class kit" that has 5 kits but costs more. Do your homework and you'll do fine.

If you are in the **FIRST LEGO League program**, then each year you will get a lot of LEGO pieces from the Field Set Up Kit. This is the table top elements (all made of LEGO) that change from year to year. So last year's pieces (often up to 1000 pieces) are available the following year to make robots. By the time a team has been around for a couple of years you will never be short of pieces, only RCXs and motors.

eBay and other second hand purchases: If you are comfortable purchasing from eBay or equivalent sources you can often save a lot of money. RCX's for instance are \$125 brand new, but you can pick up most RCX (version 1.0) for around \$60-\$70. I've bought quite a few and with the exception of one that had battery terminals that needed a good cleaning I've been happy. Can't promise you great deals and look out for sellers with bad reputations, but you can usually get what you need for less.

Big box stores. LEGO has started to offer some of these kits to big box stores and they are for sale at the same or lessor prices. Please note that some of this is at the expense of what you are getting. There are several versions of the RCX out there (for instance can it take an AC adapter). Also some will come with significantly fewer parts. This allows LEGO to mark the item down so it can then get marked up for resale and everyone is happy (except you if you get fewer pieces).

BACKORDERS: When you are trying to decide what to get give LEGO a call and make sure they can deliver what you want. That may answer the question right there ("we have xxxxxx kit, but yyyyyy is backordered for 6 weeks"). Last winter I waited for over 6 weeks for some motors I ordered but were backordered.

Invest in inventory boxes: Plano and Shimano both make nice multi-compartmented, clear plastic tackle boxes that can be picked up at big box stores or sporting goods shops (or on-line). They come in small, medium, and large sizes and I've found them to be very good at keeping pieces where they belong, particularly when traveling. The bigger boxes have room for beams, bricks, and wheels. The medium boxes are good for connectors, axles, gears, etc. And I use the small ones for the odds and ends that I've accumulated over the years. In May of 2005 you can pick up a 5 pack of Plano boxes at Dick's sporting goods for \$7.97 (5 different sizes). So invest in this and your sanity will reward you many times over. I've dropped these, and even dropped boxes with a bunch of these in them, and they've never popped open; of course there is always a first time.

Similarly a few bins picked up at a local store can serve as project boxes for teams/groups so they can keep their robot together between sessions. Most are available for \$2-3/box.

Programming on laptops: More and more schools are using laptops and many are without attached mice. Many of the features in RoboLab work so much better if you have a mouse, so consider investing in some. Make sure you get ones that are compatible with your computer AND that don't interfere with the IR tower connection. If you only have 1 USB port, and the IR tower is plugged into that, you will need a PS2 mouse or equivalent.

