EPro8 Challenge

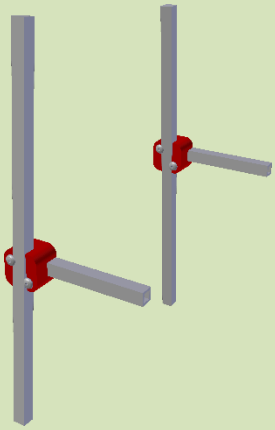
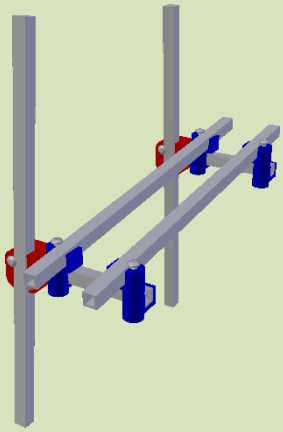
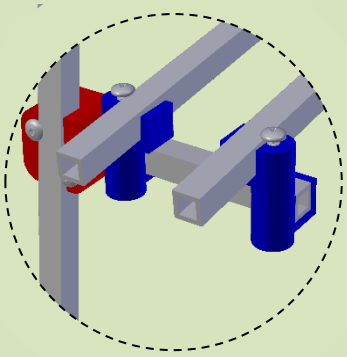
Engineer Problem Solve Innovate

Ball Sorting

aka The Marble Run

You have finished a great PE session but now your teacher wants you to sort all the balls into different containers.

But it would be more fun to build a ball sorting contraption.

Frame / Track	
Criteria	Construct a frame approximately 700mm tall and 1.3m long. A 400mm long track is mounted on the frame. All of the balls can roll down the track.
Hint	To build a marble run style track as follows:  Extend two rods from the frame.  Attach two tracks to the extensions using blue joiners.  The joiners that the track sits in are upside down with the bolt on the outside of the track and the bolt pointing down. This arrangement means the balls can roll over the joiners easily.

Golf Ball (Small)	
Criteria	The balls roll down a second 400mm long ramp. If the diameter of the ball is less that 55mm it falls into a container labelled “Golf Balls”. Any other balls need to keep rolling down the ramp.

Softball (Big)	
Criteria	The balls roll down a third 400mm long ramp. If the diameter of the ball is more than 75mm it continues to the end of the track and drops into a container labelled “Softball”. If the diameter of a ball is less than 75mm it falls onto another track below and starts rolling on that track.
Hint	It is easy to sort a smaller ball. To sort a larger ball then let any smaller balls drop and then catch them on another track below. The larger ball will stay on the original track and be directed to a container.

Petanque Ball (Heavy)	
Criteria	The balls roll down a fourth 400mm long ramp. If the ball weighs more than 200g then ball falls into a container labelled “Petanque Ball”. Any other balls fall into a container labelled “Tennis Ball”.
Hint	A seesaw with a 200g weight on one end will tip if an object heavier than 200g is on the other end.

Shuttlecock (Doesn’t Roll)	
Criteria	If a shuttlecock is placed on the first ramp it won’t roll. An arm is attached to an axle. A crank handle makes the arm rotate. If the ball isn’t round then it won’t roll down the ramp. The operator turns the crank handle. This rotates the arm which directs the ball into a container labelled “Shuttlecock”. Any other balls need to keep rolling down the ramp.

Motorised Shuttlecock Arm	
Criteria	Use the online electronics simulator, code **BLSR.** If a shuttlecock is placed on the first ramp it won't roll. An arm is connected to a motor. When a button is pressed a motor turns and the arm rotates. This pushes the shuttlecock into a container labelled "Shuttlecock".
Criteria	When a button is pressed an ON/OFF box is turned on. This turns on a motor and the arm rotates. This pushes the shuttlecock into a container labelled "Shuttlecock". A limit switch detects when the shuttlecock has landed in the container and turns the motor off.

Automated Shuttlecock Arm	
Criteria	If a shuttlecock is placed on the first ramp it won't roll. A laser beam detects when an object is at the top of the first ramp. If it is at the top of the first ramp for more than 5 seconds then the motorised arm pushes the ball into a container labelled "Shuttlecock". Any other ball needs to keep rolling down the ramp.
Hint	Use a switch to keep the laser beam on all the time. If the laser beam is broken for more than five seconds then the ball must not be round. Use a TIME DELAY to determine this.

After you have attempted this challenge watch the tutorial to see our solution at www.EPro8Challenge.co.nz/Tutorial and enter the Challenge Code **BLSR**.