

SIGLOGO PENDOWN

Lego sizes and units- here is an aid to understanding how they fit together

Lego pieces are expressed with three numbers: width, length and height. The standard Lego brick shown here would be described as a 2 wide x 4 long x 1 high *(See Figure 1)*

Another lego piece is a plate. An important tip to remember is that if you stack three plates you get the height of one standard brick. *(See figure 2)*

The next lego piece is a beam which is a 1 x 7 x 1 brick with holes. The holes allow axles to pass through and they also allow beams to be connected to each other with pegs. The technique of crossing beams is extremely important to making stable robot structures.

To make effective use of crossing beams you need to remember every five bricks in height the holes of the cross-beam matches up. Also, three plates match the height of a brick, the most compact design is to use increments of two plates and a brick, this gives you a multiple of five. *(See figure .7)*

Placing Gears

Creating a robot without gears is neither practical nor efficient use of the power and torque that are available from the motor, lego gears are expressed by their number of teeth. The left one is the smallest gear an eight-tooth while the right is a 40-tooth gear, the largest Lego gear. *(See Figure 4)*

This is the highest ratio you can create with a two-gear combination 8 to 40 to 1:5.

What do you do if you need a higher gear ratio than this? You use a multi-stage reduction called a geartrain. *(See Figure 5)*

In figure 5 the first set of gears is a 1 to 3 gear ratio. This gear ratio is then transferred to a second 1 to 3 gear ratio, the resulting ratio is $1/3$ of $1/3$ which is $1/9$ or 1 to 9.

Geartrains give you incredible power, but for the power you trade velocity, remember, by adding multiple reduction stages each additional one adds more friction. Because of this you should set your final gear ratio using as few stages as possible.

Fitting Gears

The eight-tooth gear has a radius of .5 studs. The 24-tooth gear has a radius of 1.5 studs. The 40-tooth gear has a radius of 2.5 studs. Therefore an eight-tooth to a 24-tooth is two studs: the eight-tooth to 40-tooth is three studs and a 24-tooth to 40-tooth equals four studs.

(See Figure 6) Getting gears to combine well is important and you need to experiment with them until you feel at ease with bracing layers and gear placement.

Hope you are able to join us for some pre-conference activities with Lego robotics.



Figure 1

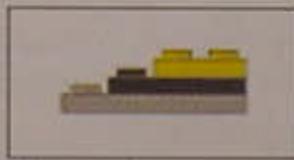


Figure 2

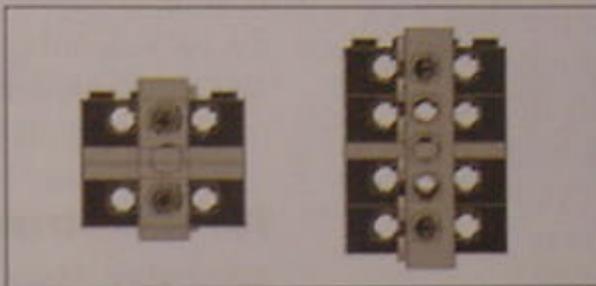


Figure 3



Figure 4

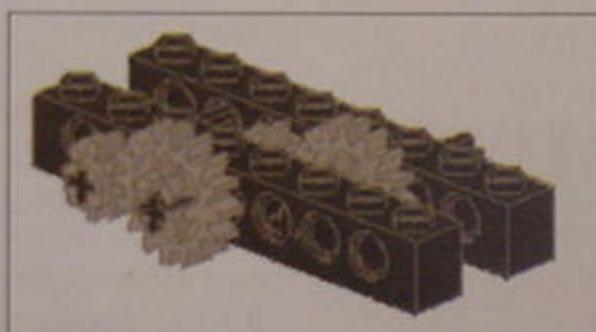


Figure 5



Figure 6