

Engineer: _____ Date: _____

Partner(s): _____ Class: _____

Prosthetic Leg



Jude is a transfemoral (above the knee) amputee who wants to walk on his own again. Make a prosthetic leg for him that he can put on and take off as he pleases.

Challenge

Make a prosthetic leg that is in line with the existing opposite leg for the figure you are given. The leg should have a socket that allows it to be put on and taken off with ease. Its knee should bend; students may also try to make its ankle roll for full range of motion.

Materials

The materials that you will use to create your prosthetic leg are the following:

- 8.5" tall Hardwood Mannequin
- Crayola Model Magic™
- Krazy Glue
- 2 Ring Terminals
- Nut
- Washer
- Bolt
- Latex Glove
- Rubber Band
- Ruler/ Tape Measure
- Scissors
- Engineering Paper
- Bead
- Metal Rod 3mm in Diameter

Skills Learned

Fitting, Measurement, Scale, Planning, Joints, Building

Safety

When using Krazy glue, do not touch the glue with your hands. If you must hold pieces together as the glue dries, use something between your hands and the glue (i.e. gloves, rag, etc.).

Procedure

- Connect two ring terminals using a bolt, a washer, and a nut. Make sure the fit is tight but that the joint moves smoothly. This is your knee.
- The most important part of your leg will be its socket. Your socket must fit snugly so that it will stay in place on the leg but not so snugly that it can not be removed when necessary. To make the perfect socket:
 - Cut off the pinkie of your latex glove, and fit it over the amputee's leg.
 - Pull it tightly and secure it using a rubber band. The rubber band should be high enough that it will not interfere with your mold without being so high that it cuts into the hip.
 - Cut the tip off just large enough that your knot from the end of the leg sticks out.
 - Using Krazy glue, attach the end of the ring terminal to the latex, making the knot sit inside. The glue should stick only to the latex and not to the leg. This is important.
 - When the glue has dried, begin putting on the Model Magic™ all around the leg and ring terminal to give a good transition from thigh to knee.
 - As it dries, Krazy glue the ring terminal to the Model Magic™.
 - Leave your socket to dry on the mannequin.
 - When it is dry (next class period to be sure), fold the top of the latex glove over the sides and remove the socket by tugging on the glove.
 - Try putting it on and taking it off to make sure you have a good fit.
- Measure the length that you will need cut for the lower leg, and make sure to consider the length that will fit into your ring terminal, and how much space you will need under it for the ankle and foot to fit. For this you should draw a diagram to scale on the engineering paper provided IN PENCIL. When you are confident in your measurement, submit it to your instructor who will cut the rod for you (by the next class period).
- When you have your rod to work with, cover one end very thinly with Model Magic™, Put some Krazy glue into the ring, and insert the rod into the ring. Let the glue dry.
- Have Jude step into some left over Model Magic™ or clay to get the size and shape of his foot. Make a foot for his new leg using this mold. To the top of the foot, for an ankle, connect a bead that will fit around the end of Jude's lower leg.
- Make sure your new foot will fit onto Jude's leg and that both sides are even. When the foot is dry, glue the end of your rod into the bead, and make sure that the bead is strongly attached to the foot (this may need some glue). When the glue has dried, you will be done!

Extensions

1. Make your prosthetic function as a normal leg does (i.e. no hyperextension, no movements that are impossible for or would cause injury to humans).

Sample Projects

