

Tools of the Trade

Experiment: Utility Belt

Sometimes a hero needs a few tools to help them save the day. Here are some simple gadgets you can make and keep on a utility belt ... just in case!

COMPASS MATERIALS

- Metal sewing needle
- Magnet
- Paper clip
- Cork
- Utility knife
- Pliers
- Duct tape
- Bowl
- Water
- Marker or pen



COMPASS INSTRUCTIONS

The first step is to magnetize the sewing needle. Rub a magnet on the needle in one direction only (not back and forth) multiple times. A strong magnet will magnetize the needle more quickly. Test to see if the needle is magnetized by touching it to a non-magnetic steel surface, like a paper clip. It should stick slightly. Set the needle aside.

Use a utility knife to carefully cut a cork so you have a disc that is about one-quarter to one-half inch thick. Get an adult to help with this next step. Use the pliers to carefully push the needle through the cork disc; the needle should bisect the widest part of the cork. Cover the sharp tip of the needle with a tiny piece of duct tape.

Fill a bowl with water. Place the cork-and-needle compass into the water so it floats. The needle should move and point to the north. If you bring a magnet near the bowl of water, the compass will move towards the magnet.

WHAT'S HAPPENING?

A compass works because its needle is magnetic and responds to the Earth's magnetic pole. All magnets have a north pole and a south pole, and opposite poles are attracted to each other. The Earth is a magnet, too. When you have a magnetized piece of metal that can easily move around (like the compass), it will point to the Earth's north pole.

Some types of metal, like iron, can be turned into a magnet. When a strong magnet is rubbed on a piece of iron, tiny magnetic domains in the atom's electrons align to the magnetic field of the strong magnet. Those particles will stay aligned and create a weak magnetic field. This turns the iron into a permanent magnet. The magnetic domains can lose their alignment if the material is heated or struck with a strong force like a hammer.



STETHOSCOPE MATERIALS

- 10-inch round balloon
- Scissors
- Funnel with a 4-inch opening
- Paper towel tube
- Tape
- Craft supplies

STETHOSCOPE INSTRUCTIONS

Cut the neck off the balloon and keep the rest. Stretch the balloon tightly over the open end of the funnel and tape the balloon in place. Place the opposite end of the funnel into one end of a paper towel tube and tape it in place. Decorate the tube if you'd like.

To use the stethoscope, place the funnel end on someone's chest and the open tube against your ear. You should be able to hear their breathing and heartbeat. What else can you hear?

WHAT'S HAPPENING?

Sound travels as sound waves through solids, liquids and air. When a sound wave hits the stretched-out balloon on the end of the stethoscope, it makes the balloon vibrate. Those vibrations redirect the sound so it travels down the tube and into your ear.



SAVE THE DAY!

It's time for the final chapter of your superhero saga! Record a short video clip showing you using your tools to capture a foe or save the day. Share it with us at summerbrain@msichicago.org or facebook.com/msichicago.

LEARN MORE

Simple machines—such as a lever, pulley, screw and more—make work easier. Explore how they function in MSI's Simple Machines online game at msichicago.org/simple-machines.

RECOMMENDED READING

Nick and Tesla Series,
by Steve Hockensmith

Monkey With a Tool Belt,
by Chris Monroe