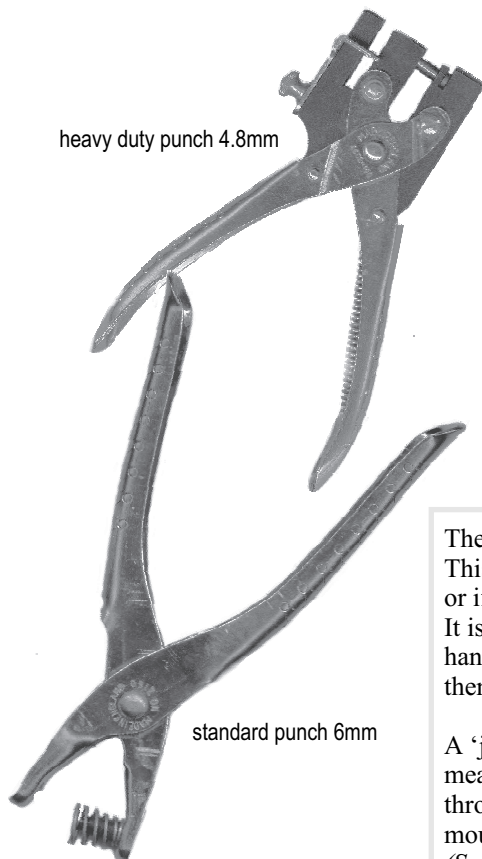


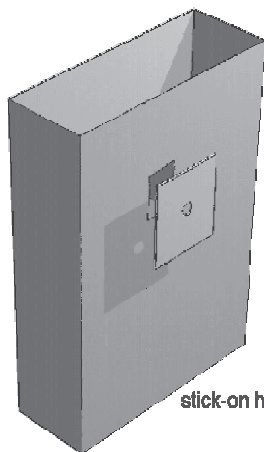
heavy duty punch 4.8mm



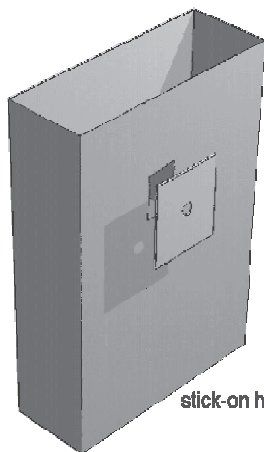
standard punch 6mm



paper drill



stick-on hole



There is not a great choice of suitable hole punches available for making holes in thick card. The two most useful are shown on the left, however they are different enough not to be interchangeable.

One thing they have in common, however, is that, regardless of catalogue descriptions, they are 'imperial measure' tools converted to metric.

The heavy duty hole punch is an excellent tool - every teacher should have access to one! It punches a tight hole that is only 4.8mm diameter. (3/16 inch!) 5mm diameter dowel will still fit into the holes - with a push. If you need a looser fit you can easily enlarge the hole with the pointed end of a pencil. This punch will punch a hole through a wooden lolly stick. Very useful for linkages etc. Unfortunately you can't use a pencil to enlarge these holes in wood - you will need either a round file or a tapered reamer. *5mm diameter paper sticks, being a little compressible, can be pushed into these undersize holes. Consider them a suitable substitute for wooden dowel.*

The standard hole punch creates a 6mm (1/4 inch) diameter hole. This means that a 5mm diameter dowel is a loose, sloppy fit. If you do need a loose fit, or if the size of the hole doesn't matter, this is the tool to use. It is quite large, so it can be difficult for children to cope with the wide gape of the handles. It's best to close the punch on the card by holding the handles near the pivot, then 'walking' the hands to the other end to gain the necessary leverage.

A 'jumbo' artstraw or 'jumbo' plastic drinking straw fits neatly into a 6mm hole. This means that you can 'sleeve' the hole with a length of straw then run a 5mm dowel axle through the straw. It also means that you can't use a straw spacer on an axle if the axle mounts are punched with a 6mm diameter hole. The spacer will slip into the hole. *(See Page 26)*

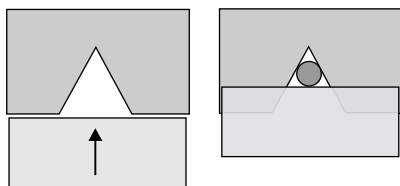
There is a smaller version of this punch that does make 5mm holes. However, it is rather small and this means that children cannot generate enough leverage to punch holes in anything thicker than copy-card.

The paper drill can be used to make a hole anywhere in a sheet of paper or thin card. You put the card on a cutting mat then press down on the 'drill', turning the drill back and forth. It's a good idea - but it doesn't work well in practice (except for paper). Different size cutters are available. We find that when you need a hole near the centre of a piece of card, that card is usually the side of a box and you can't press down on it! The tool is very useful when you are making discs that need to spin - a phenakistoscope for example *(look in the projects section)*.

A better approach, which will work for holes in the sides of ready formed boxes, is the 'stick-on' hole. If, for example, you wish to make a 5mm diameter hole in the side of a box (see left), punch the required hole in a spare piece of card. Cut out an area of box side around the site of the hole and glue the extra piece over the space. This allows you to adjust the position of the hole, especially useful if you need a matching hole in the opposite side of the box *(for windmill shaft perhaps?)*.

*When matching holes are required on opposite sides of a box structure, make a template which is an exact replica of one side. Punch the holes in the template first and use it to transfer the positions to both sides of the box (but remember not to turn it over!)*

**BUILD A HOLE any size you need**



What if you're using something for an axle, shaft or spindle, that is somewhat bigger than 6mm diameter? Maybe you are using empty felt pen barrels for example. Well, you can **build** a hole any size you like. Cut an equilateral triangle from one side of a rectangle of card *(equilateral is best but an approximation will suffice)*. Now overlap this with a second piece of card. By sliding one piece over the other you can vary the size of the triangle. Adjust to fit your axle and glue the two cards together. Now you can use this as above. The three equally spaced points of contact mean that the axle will rotate freely yet it will be positively positioned, without any side to side movement or 'play'.