

# NUMBER STACK

This is a good educational toy that helps youngsters to visualize numerical values up to five. Don't be deceived by its apparent simplicity — it's not as easy to make as it looks! The secret is accurate measuring and drilling. A drill press will make the job much easier but a hand-held electric drill, or even a manual drill, is quite adequate, if you take your time and work carefully.

Two choices of wood exist here — pine or MDF board. Pine looks better, but on a small-scale project like this one is more difficult to work accurately than MDF board.

Whichever wood you choose, you will need the same size board.

## SKILL LEVEL 2

### Materials

- 1 x 500 mm x 200 mm x 22 mm  
(1 ft 6 in x 8 in x  $\frac{7}{8}$  in) piece pine or
- 1 x 500 mm x 200 mm x 12 mm  
(1 ft 6 in x 8 in x  $\frac{1}{2}$  in) MDF board
- 1 x 1500 mm x 10 mm (5 ft x  $\frac{3}{8}$  in)  
dowel rod
- Sandpaper
- Wood glue
- Varnish or
- White universal undercoat and  
Topcoat paint

### Cutting the base

1. Cut a simple 401 mm x 71 mm (1 ft 3 in x  $2\frac{3}{4}$  in) rectangle and draw pencil lines on the top surface as in diagram 1.

### Cutting the blocks

The blocks need to be cut accurately: A radial-arm saw or circular saw with a guide

fitted to the bed will ensure that the blocks are the same size and square. However, if you draw and cut the squares accurately, this can be achieved with a hand saw.

2. Cut two strips 55 mm ( $2\frac{1}{4}$  in) wide. Set your saw to cut 15 blocks, measuring 55 mm x 55 mm ( $2\frac{1}{4}$  in x  $2\frac{1}{4}$  in).

### Drilling the blocks

3. For the blocks to fit easily over the pins, it is essential that the holes are drilled exactly on the marks. Mark and drill the required number of 14 mm ( $\frac{1}{2}$  in) holes through each of the 15 blocks (diagrams 2–6).

### You will need:

- 5 of diagram 2
- 4 of diagram 3
- 3 of diagram 4
- 2 of diagram 5
- 1 of diagram 6

DIAGRAM 1

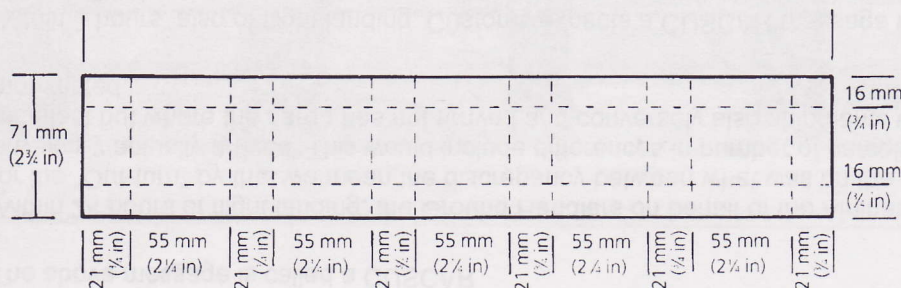


DIAGRAM 2

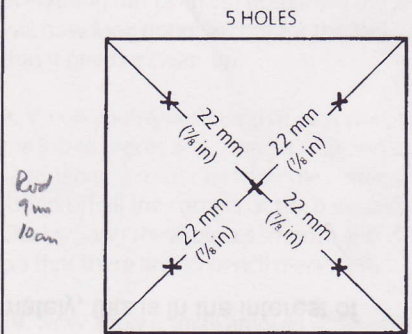


DIAGRAM 3

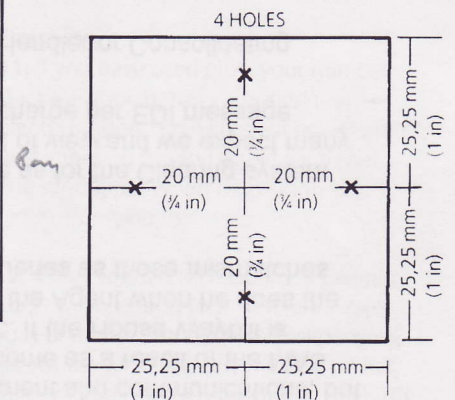


DIAGRAM 4

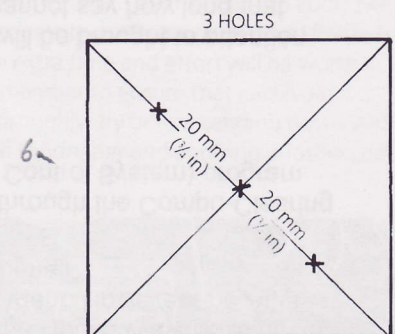


DIAGRAM 5

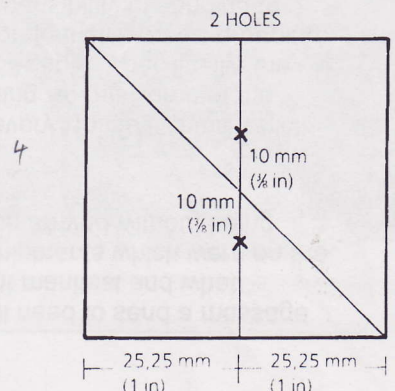
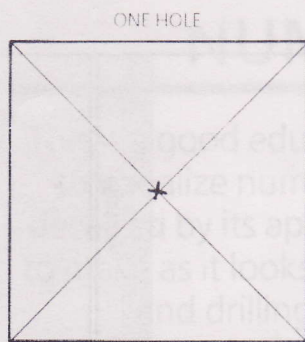




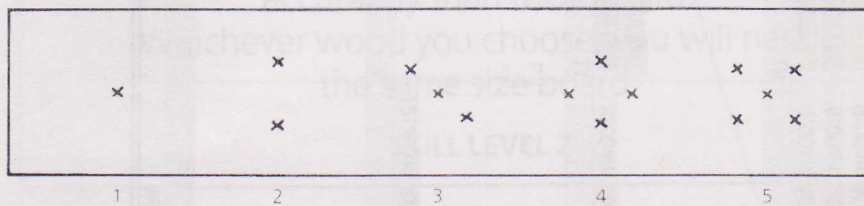
DIAGRAM 6



#### Drilling the base

4. As you did for the blocks, mark out each square on the base, one for each size, in descending order from five holes to one hole (diagram 7).

DIAGRAM 7



5. Place one of each kind of block on the base, over the appropriate number of holes to check that the holes have been drilled in the correct places. Drill a 10 mm ( $\frac{3}{8}$  in) hole, 5 mm ( $\frac{1}{4}$  in) deep, exactly on each mark. The holes must be drilled accurately.

#### Pins

6. Before cutting the dowel, accurately mark the lengths of all the pins on the

dowel to the sizes listed below, ensuring that you plan correctly before cutting — there's nothing more frustrating than having sufficient wood to start with, but cutting it out uneconomically and then not having enough for completion. If you are using pine, the first size applies. If you're using MDF board, the second size applies

- Cut 5 x 115 mm; 70 mm ( $4\frac{1}{2}$  in;  $2\frac{3}{4}$  in) lengths of dowel.
- Cut 4 x 95 mm; 58 mm ( $3\frac{3}{4}$  in;  $2\frac{1}{4}$  in) lengths of dowel.
- Cut 3 x 75 mm; 46 mm (3 in;  $1\frac{1}{2}$  in) lengths of dowel.
- Cut 2 x 55 mm; 34 mm ( $2\frac{1}{4}$  in;  $1\frac{1}{4}$  in) lengths of dowel.
- Cut 1 x 35 mm; 22 mm ( $1\frac{1}{4}$  in;  $\frac{7}{8}$  in) length of dowel.

7. Using a rasp and sandpaper, round off one end of each dowel pin.

#### Construction

8. First assemble the toy without any glue, ensuring that everything fits together well. Using a mallet, gently tap the five longest pins into the five holes, the four next in size into the four holes and so on, until all the pins are in place. Drop the

appropriate blocks over the pins. If everything has been cut accurately the job will now look good, except for the fact that it needs a clean-up.

9. When you're satisfied that all is well, take the job to pieces and, using a rasp and sandpaper, a router or a spindle cutter, round off all the corners of the base and blocks. Sand these pieces smooth and clean (so that there are no pencil marks left).

10. Now apply a small amount of wood glue to the square end of each pin and, one at a time, tap them into place. As each pin is tapped into place, use a square to check that it is square to the base in all respects.

#### Finishing

11. If you have used pine, your number stack will look better varnished than painted. Apply three coats of good varnish, remembering to sand down each coat with fine sandpaper when thoroughly dry, before applying the next coat.

12. If you've used MDF board, a painted finish will probably look better, so apply a coat of undercoat to all the components except the pins, as paint will be a bit too thick for them. When the undercoat is dry, apply the topcoat in a colour of your choice. It might be a good idea to paint each stack a different colour, which will help with identification. You may have to apply two topcoats to achieve a really good finish, but the extra time and effort will be worth it. Remember to ensure that each coat is thoroughly dry before sanding down with fine sandpaper and applying another coat.

