

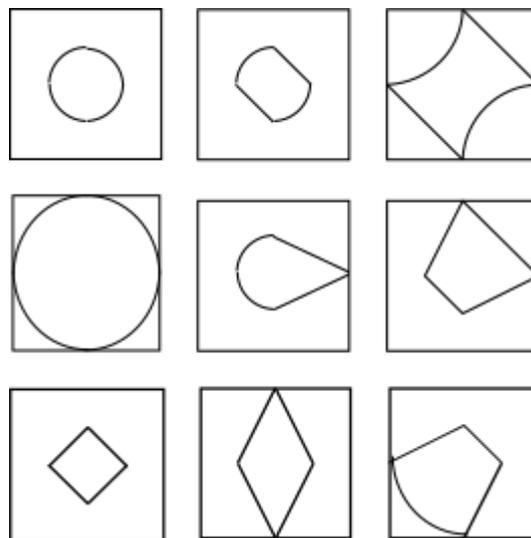
Drawing Dice

Materials

Large (5x5x5 cm) wooden or plastic cubic dice with custom designs on their faces and instructions.

Brief description

This material consists of four equal dice with simple designs on their faces that can be used to make many geometric shapes:



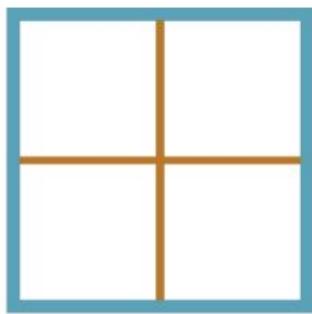
The instructions

The instructions can be printed on A4-sized or A3-sized laminated paper, cardboard, or PVC.

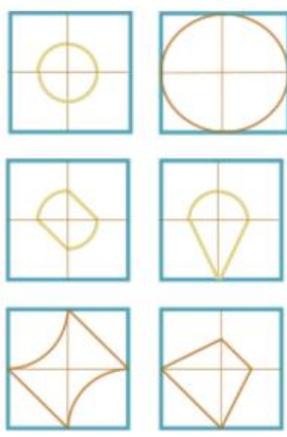


Drawing Dice

Place the 4 cubes on the grid to get different shapes.





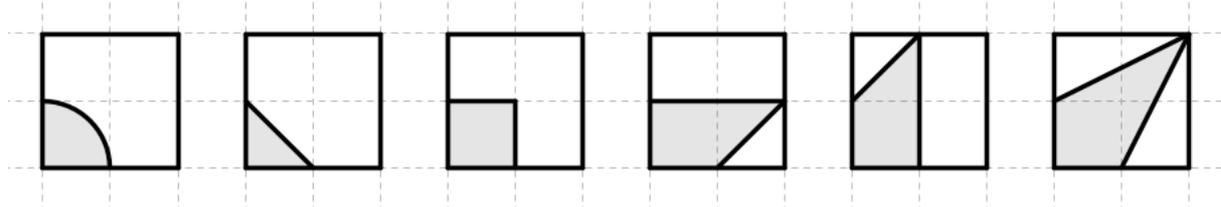


We recommend thought-provoking questions and challenges rather than a detailed step-by-step procedure:

- Could you make all these figures?
- Which is the smallest figure? And the largest one?
- What are the areas of these figures? How do you know?
- Could you create other geometric shapes? Do they have a name?
- How many shapes could be created with these dice? How do you know?

The dice - Basic version

On the first design we chose faces with dark areas. The four dice were equal and had these corner-based 6 designs on their faces:



The designs can be printed, textured or engraved, depending on the building material/method, but it is important to make the dark area stand out, so it is clear which part belongs to the figure (the dark one) and which one should be considered negative space (the light one).

The final version doesn't include these dark areas and uses only the contour. These are the definitive designs:

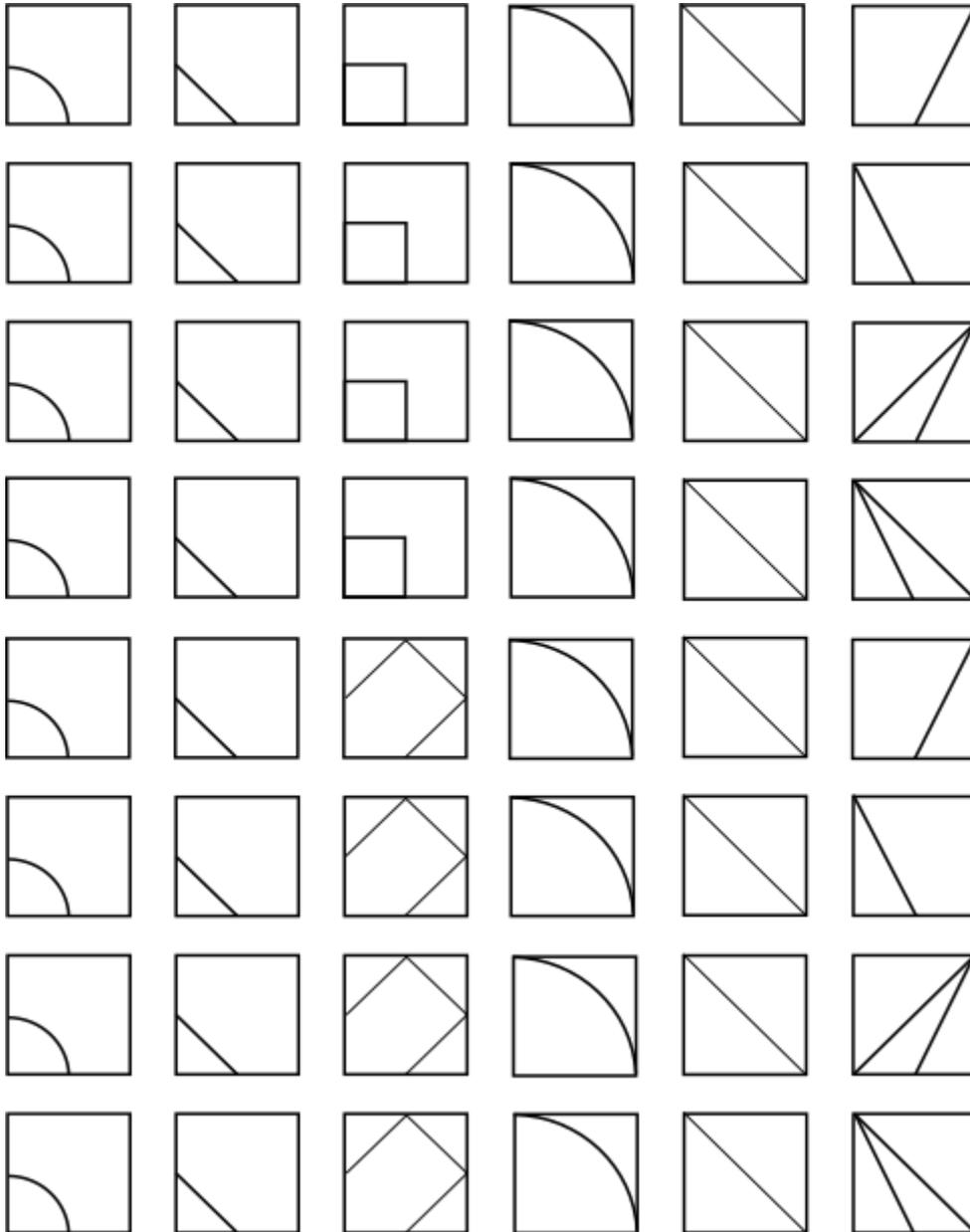


It is advisable to make them large enough (5x5x5 cm or more), so they are easy to manipulate. It is also possible to embed magnets inside the dice, so they align themselves and remain in position.

As much as it is advisable to smooth the edges of the dice, it should be avoided to round their corners to avoid distracting discontinuities when placing them together.

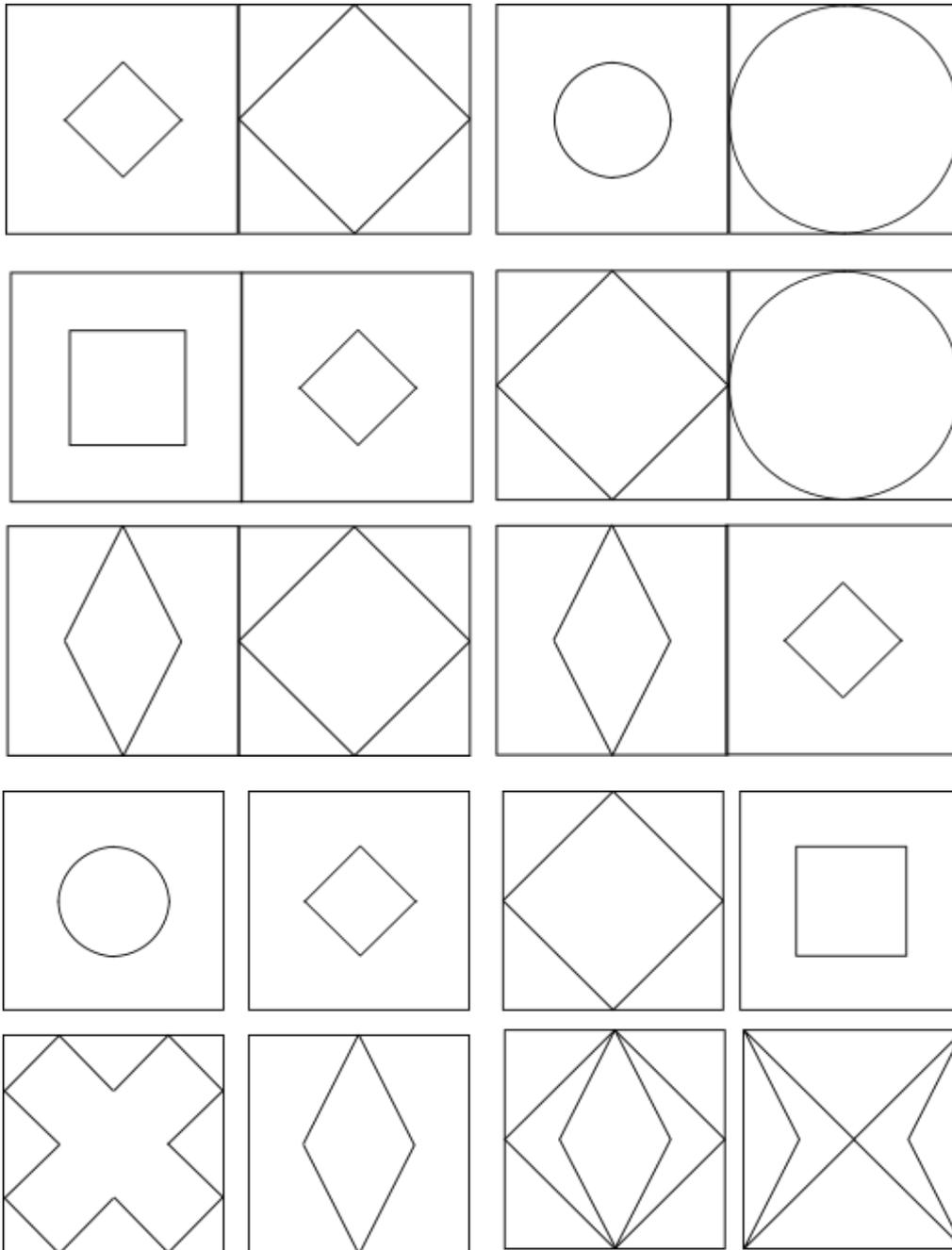
The dice - Advanced version

The following design includes eight slightly different dice (one per row):



This “advanced version” is designed to be more difficult, and to provide challenges of the form: “Build two (or more) figures simultaneously and compare their area”.

Pairs of figures that are side by side can be build simultaneously:



These “challenges” can be printed next to the instructions or on a separate set of cards. In either case, the challenges can be drawn at 1:1 scale to make them easier.

The instructions for this advanced version would be slightly different:

- Could you make these pairs of figures simultaneously?

- What relationships do you find between their shapes and areas?
- Could you create other pairs of figures that are related to each other?

For 3D Printers

In the 3D printer version, the dice would be designed with hidden compartments where small neodymium magnets could be placed (optionally).

Competences

- Using a square grid to compute angles, lengths and areas without using measuring tools.
- Computing the area of simple 2D shapes.
- Notion of area conservation and area decomposition.
- Mental arithmetic: products and additions.
- Combinatorial problems regarding the combination of dice faces.
- The notion of change of scale and proportionality of lengths and areas.