

MATH 6A/D: HOMEWORK 27
3D GEOMETRY
DEADLINE: FRIDAY, MAY 7TH, 2021

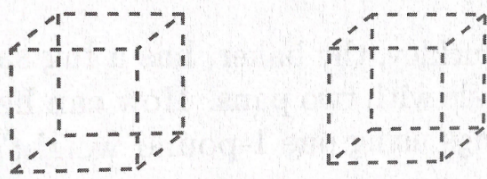
In our last class we discussed in detail two construction problems (see our classroom Jamboard in Google Classroom). To practice a bit more I decided to include a couple of them in this homework as well. Remember that to solve a construction problem means to provide a drawing, describe the steps of your recipe and explain why the recipe works.

Also, we talked a lot about one of the easiest three-dimensional (3D) shapes, a 3D cube, how to draw it on a piece of paper, cube nets and cross sections of a cube. You can find a couple of links you can use to "play" with nets and cross sections in the instructions for this homework in Google Classroom.

HOMEWORK

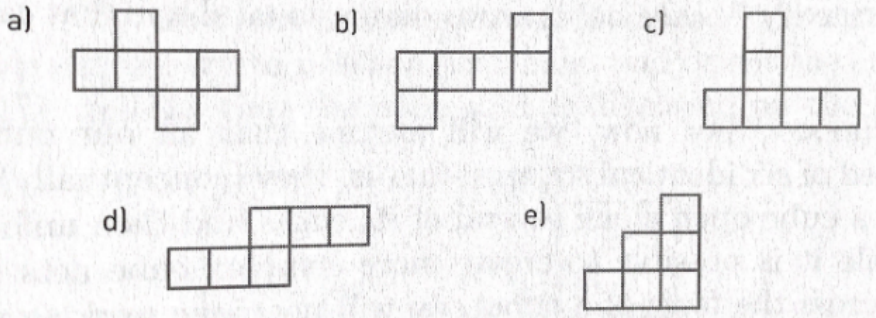
When in the problems below, we say that some *length are given*, assume that there is an interval of a given length already drawn on the paper and you can set up your compass to draw circles of this radius. All constructions below are to be done using ruler and compass only! Notice that you are asked to explain why your recipe works. Please do not skip this part and do your best to explain it.

1. Construct a rhombus with one side a and diagonal d . Provide a recipe and explain why it works.
2. Construct a regular dodecagon. Provide a recipe and explain why it works.
3. Complete each of the two identical cube templates below into a different view of a cube.

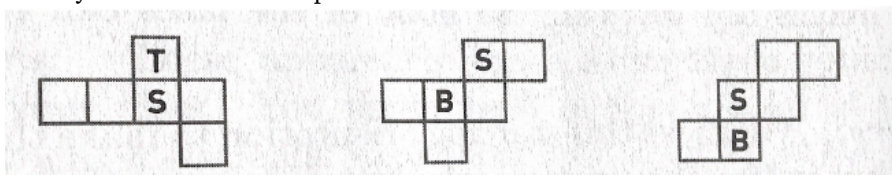


For the first sketch, position a model of a cube so that you can see the front, right and top faces of it. For the second sketch, position the cube so that you can see the front, left and bottom faces of it.

4. Which of the following 2D shapes are cube nets (that is, can be folded into cubes)? To solve this problem you are welcome to cut out these shapes and try to fold them into cubes.

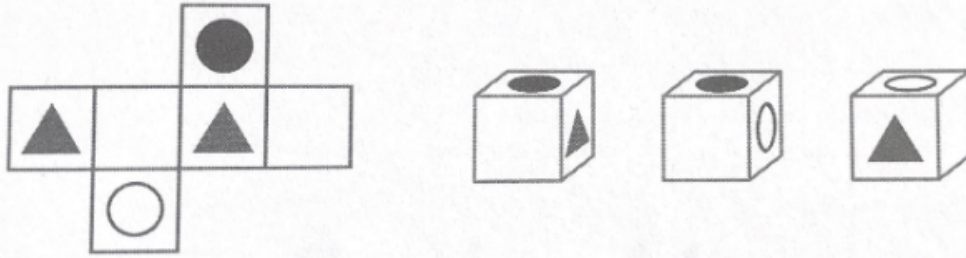


5. Michelle made several 3D paper models of the cube from cutouts. On each assembled cube, she labeled the faces with letters: T for the top, B for the bottom, and S for all the side faces. Next, Michelle unfolded the cutouts to store them. Later Michelle's younger sister, Sophie, erased some of the letters. Here is what they looked like at that point:

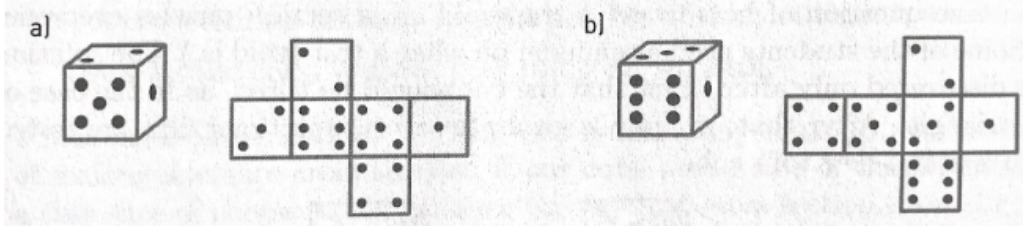


Please restore the missing letters.

6. Which of the cubes below could have been folded from the cube net sketched on the left?



7. In the figure you can see two dice and their 2D nets.

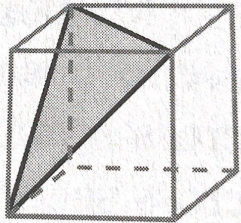


Which number is on the:

- Bottom face of each die?
- Rear (hidden) face of each die?
- Left (hidden) face of each die?

8. A cube has been placed on the table. A lamp is hanging directly above this cube. The cube is balanced on one vertex, with the opposite vertex pointing up. What does the shadow of this cube look like?

9. The triangle in the figure has its vertices at the corners of the cube. Find the angles of this triangle.



10. Suppose you cut a solid vertical cylinder with a plane (remember my huge knife?;) Draw all possible types of cross sections that you can generate.

