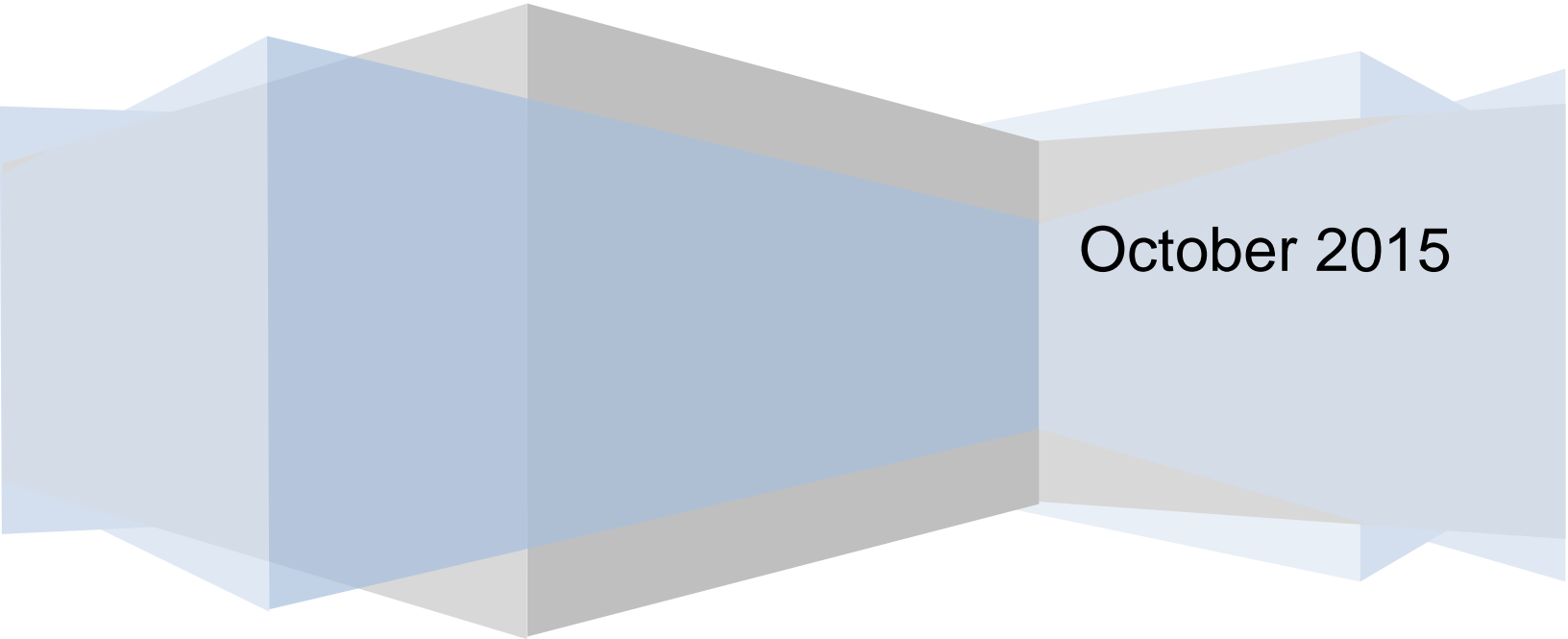


The University of Texas at Austin

# Cube and its magic

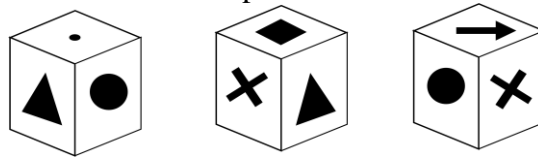
attachment

Natasa Dragovic



October 2015

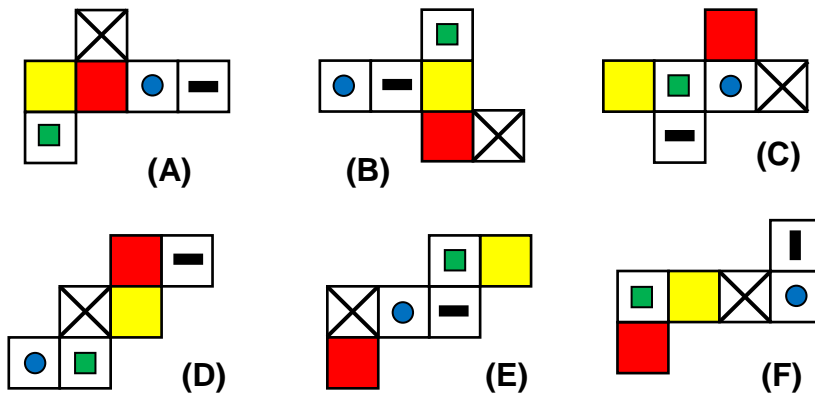
**Problem 1:** A cube has six different symbols drawn over its six faces. The symbols are dot, circle, triangle, square, cross and arrow. Three different positions of the cube are shown in figures.



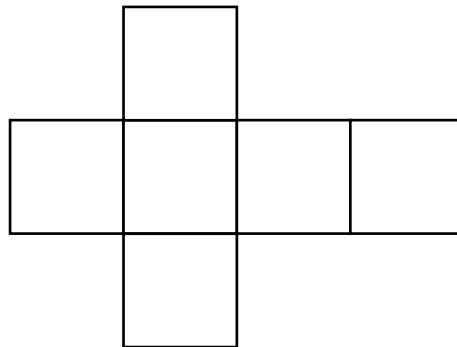
Which symbol is opposite the dot?

**Problem 4:** On cube faces are written numbers from 1 to 6. Cube is thrown twice. First time, the sum of numbers from the four side faces was 12, second time 15. What number is written opposite of face that has number 3 written on it?

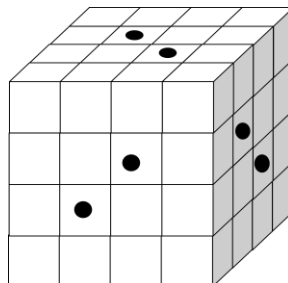
**Problem 8:** For two cubes, three nets were made and they were mixed together (fig. A-F). Find nets of each of the cube's.



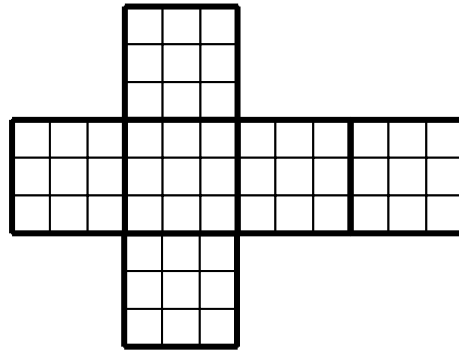
**Problem 15:** We have a cube with edge length 2. Show how to glue on it 10 squares with edge length 1 so that no two squares touch (do not share edge or part of it). You cannot bend the squares.



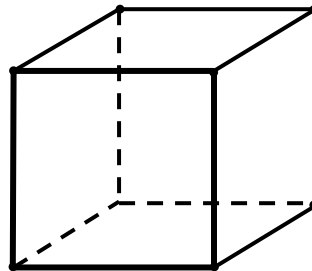
**Problem 16:** Big cube is glued from small wooden cubes. It was cut through on 6 places, all parallel to the edges (fig.). How many small cubes are left unharmed?



**Problem 20:** On the surface of the Rubik's cube, can you draw a closed path, such that it goes through each square exactly one time (path does not go through the vertices of the squares)?



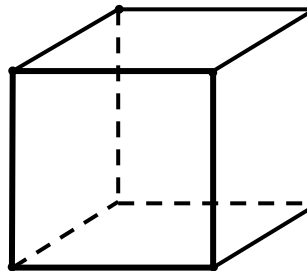
**Problem 21:** Number the 8 vertices of the cube with numbers (1, 2, 3, 4, 5, 6, 7, 8), so that the sum of each six of its faces were equal.



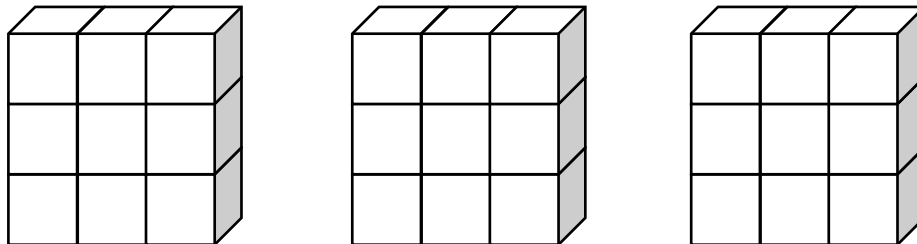
**Problem 22:** Number each edge, such that sum of number on edges that share a vertex are equal if the numbers are:

a) 1, 2, ..., 12;

b) -6, -5, ..., -1, 1, 2, ..., 6?



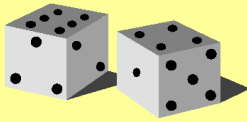
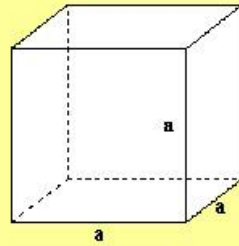
**Problem 23:** Put together a cube  $3 \times 3 \times 3$  from the red, yellow and green cubes  $1 \times 1 \times 1$  so that in each segment of size  $3 \times 1 \times 1$  there are cubes of all 3 colors.



**Problem 24:** You are given 27 cubes of equal size: 9 red, 9 blue and 9 white ones. From these cubes can we put together a cube so that each column of three cubes contains exactly two colors? (We look at columns that are parallel to the edges of the cube, so we look at 27 columns)



These are cube models.

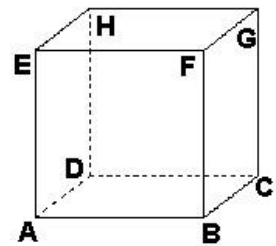


Cube is a cuboid whose all sides are equal.



1.

- a) How many faces does a cube have? \_\_\_\_\_
- b) What is the shape of a face of the cube? \_\_\_\_\_
- c) How many edges does a cube have? \_\_\_\_\_
- d) How many vertices does a cube have? \_\_\_\_\_



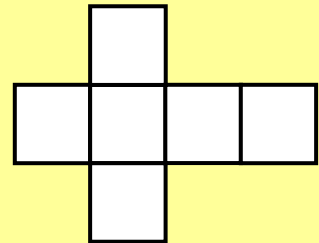
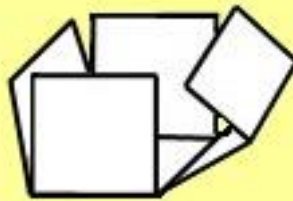
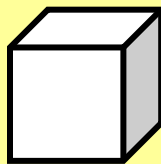
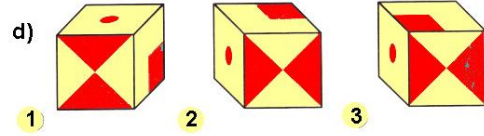
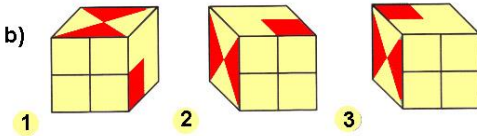
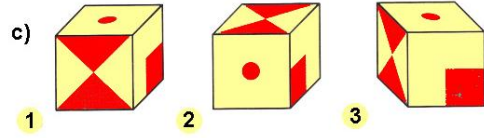
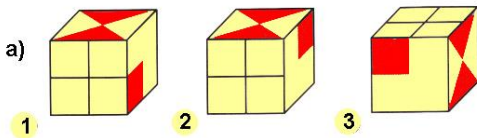
In the picture, the faces of a cube are: ABCD, \_\_\_\_\_

Edges of the cube in the picture are lines: AB, \_\_\_\_\_

Vertices in the picture are: A, \_\_\_\_\_

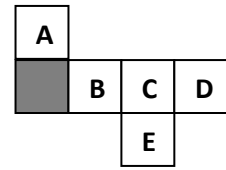
2.

In each row, connect the cubes which are equal.



A net of the cube contains 6 equal squares.

**3.** A net of the cube is shown in the image. Compose the cub in your imagination. Figure out which side is the top one, if the bottom one is gray.

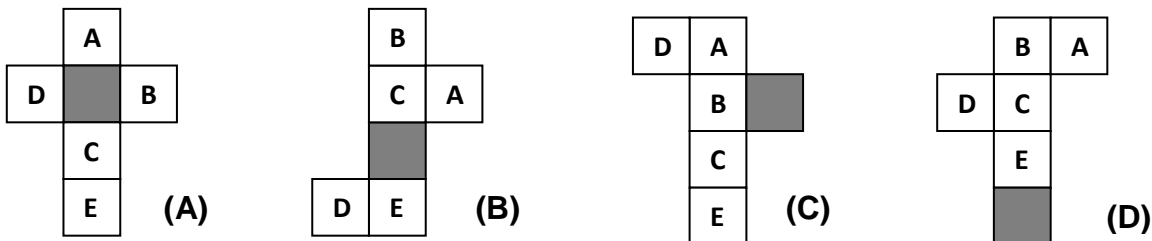


1. A                      2. B                      3. C                      4. D                      5. E

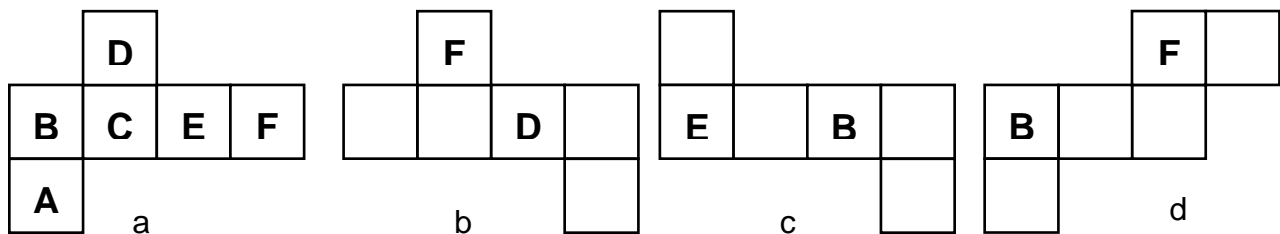
**4.** A net is a two-dimensional figure that can be folded into a three-dimensional object. Which of the nets below will form a cube? For the figures that are nets, label the top side with the letter (T), and then with letter (B) the bottom and with letter (S) the side faces.

a)	b)	c)	d)
e)	f)	g)	h)

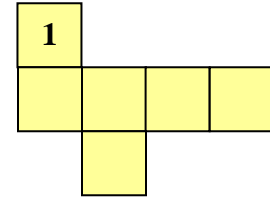
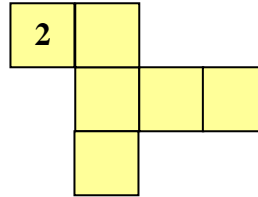
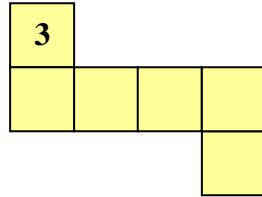
**5.** In your mind compose the cub. For each cube figure out which side is the top if the bottom is gray.



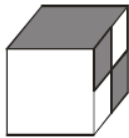
**6.** A cube made of paper is glued. Letters are written on the faces of the cube. In figure (a) you see one version of the net of this cube with the letters. Fill in the letters on the other nets (figures (b-d)).



**7.** We are given a cube, on whose faces numbers 1, 2, 3, 4, 5, 6 are written in a way that the sum of each of the two opposite faces is 7. Next to the cube, nets are drawn with one of the numbers. Determine the rest of the numbers.



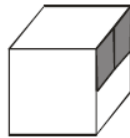
**8.** Take the net of the object given on the right, cut and fold it to get a cube. Which of the cubes presented below do we get?



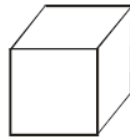
A)



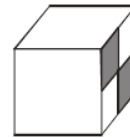
B)



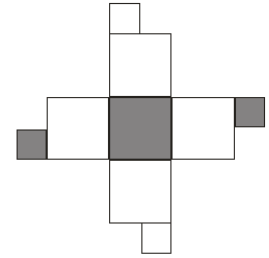
C)



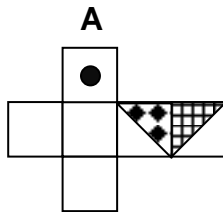
D)



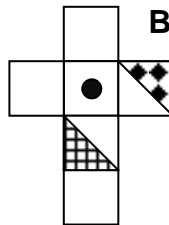
E)



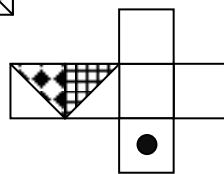
**9.** Which of the patterns when folded will make the cube shown?



A

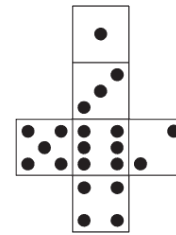


B



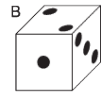
C

**10.** Which of the cubes shown could be made from the net?



A

C

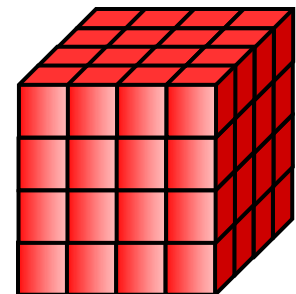


B

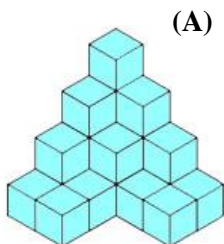
D

**11.** Wooden cube was painted in red and then it was cut like in the image. Write how many small cubes will have:

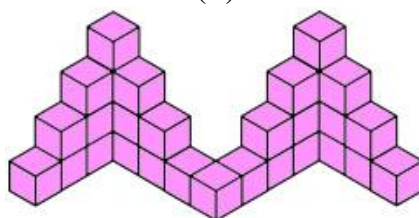
- 1) 3 red faces \_\_\_\_\_
- 2) 2 red faces \_\_\_\_\_
- 3) 1 red face \_\_\_\_\_
- 4) No red faces \_\_\_\_\_



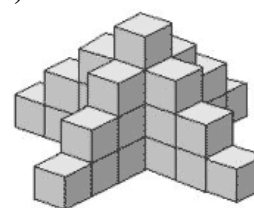
**12.** How many cubes were used in constructing the towers?



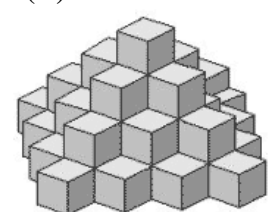
(A)



(B)

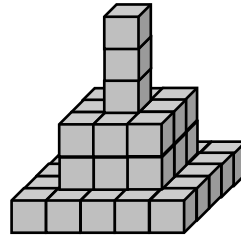
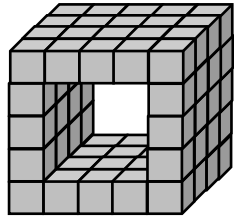


(C)



(D)

**13.** John made a tunnel out of cubes. Then he dissembled the tunnel and made a pyramid. How many cubes were left unused?



A) 34

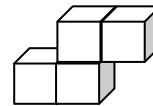
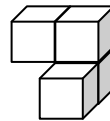
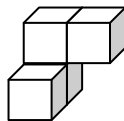
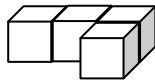
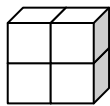
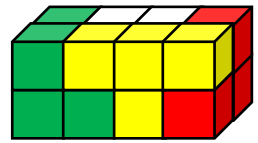
B) 29

C) 22

D) 18

E) 15

**14.** Cuboid is made out of 4 segments. Each part is made out of 4 same colored cubes (see image). What is the shape of the white part?



A)

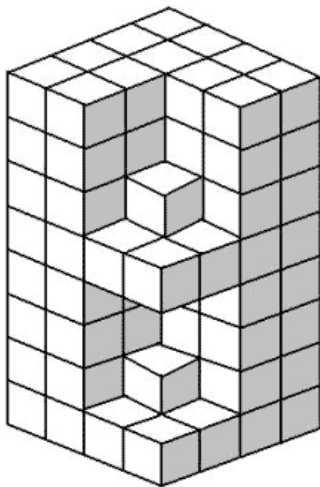
B)

C)

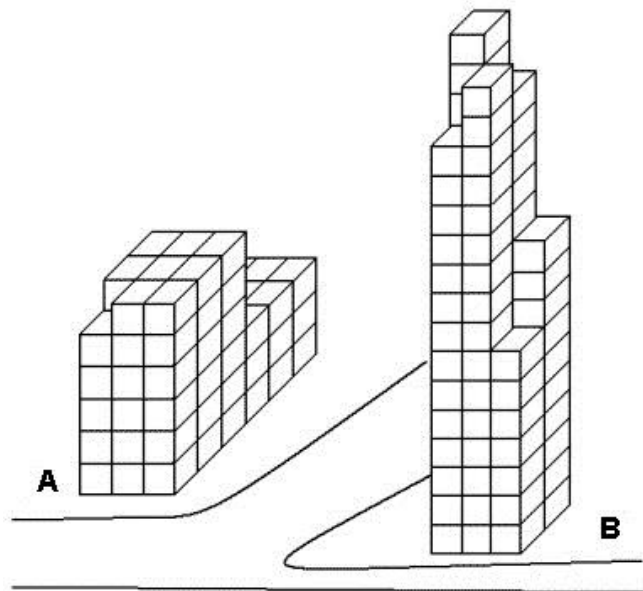
D)

E)

**15.** How many cubes does it take to make such a figure?

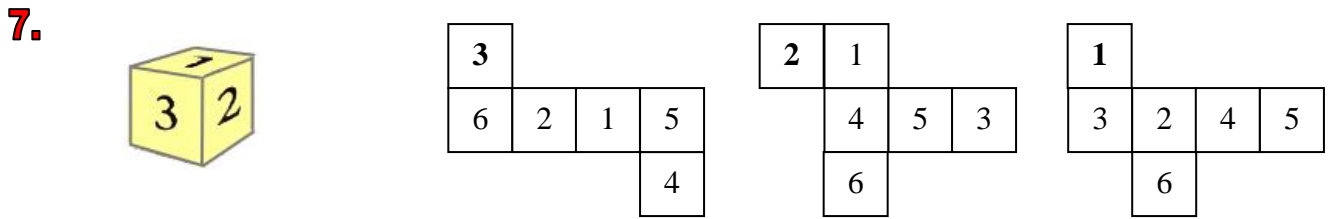
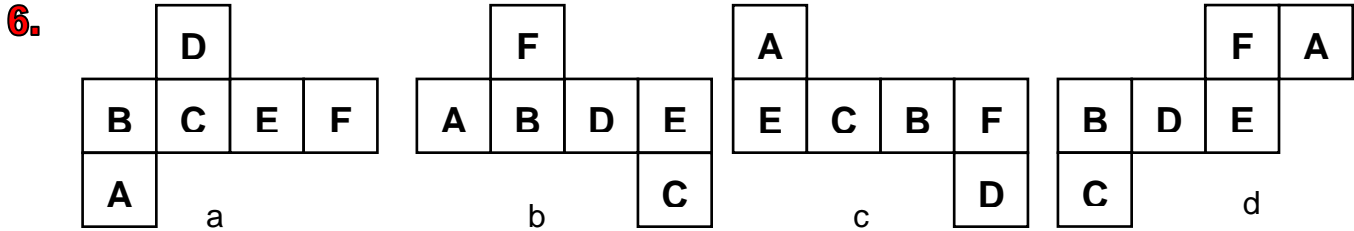


**16.** On these architectural models, each cube represents a separate apartment. The architect that will win the project is the one that has more apartments in the model. Which model will win?



# Answer

**3.** 3. C      **5.** (A) E      (B) B      (C) D      (D) C



**8.** C      **9.** C      **10.** B      **11.** 1) 8, 2) 24, 3) 24, 4) 8.

**12.** A) 22, B) 33, C) 28, D) 44.      **13.** D) 18      **14.** E)      **15.** 106

**16.** Model A will win- since there are 80 apartments in that building while in building B there are only 79.