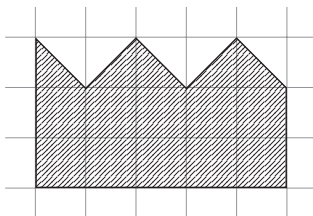## Mathematics competition

For each problem the recommended grades are specified in the parentheses (a student is allowed to solve the problems for older grades; if a student solves a problem intended for younger grades, the solution will be ignored).

1. (6–7) Sharik the Dog and Matroskin the Cat had milked their cow and got 10 liters of milk. They poured the milk into two buckets and carried the milk back home. In a while, Sharik became tired and poured some milk from his bucket into Matroskin's one. As a result, Sharik has 3 times less milk than before and Matroskin has 3 times more milk than before. How much milk does Matroskin carry now?
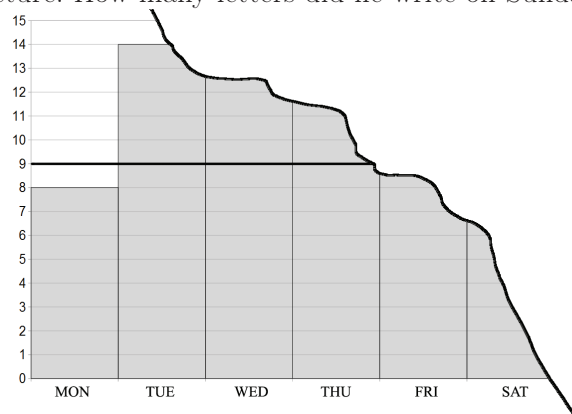
2. (6–7) Replace the letters with digits (all the digits should be different) for the equality to hold:

$$\mathbf{A : B : C + D : E : F + G : H : I = 1.}$$

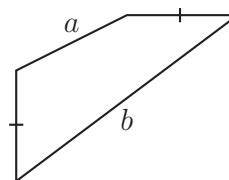**3.** (6–8) Cut the figure in the picture into two equal parts.

4. (8–9) For a whole week, the Fairy with turquoise hair was trying to teach Pinocchio to write. She draw a diagram showing how many letters Pinocchio had written in each of 7 days. The line on the diagram indicates the average number of letters (it equals 9). Pinocchio tore off a piece of the diagram as it is shown in the picture. How many letters did he write on Sunday?

5. (8–9) A sports club holds a tennis championship. If a sportsman loses a game, he leaves the competition (there are no draws in tennis). A pair of competitors for a game is determined by lot. The first game is judged by a guest referee. Every next game should be refereed by a member of the club who does not participate in it and didn't referee any of the games earlier. Is it possible that at some moment there won't be anyone to referee the next game?

6. (9–11) In a convex quadrilateral two opposite sides are equal and perpendicular, and the two others are equal to a and b. Find the area of the quadrilateral.

7. (10–11) 2016 non-zero numbers are given. For each pair of the numbers their product was calculated. Prove that at least one third of all products are positive.

8. (10–11) It's easy to paste over the surface of a cube with 6 rhombuses, i.e. with 6 squares which match the faces. Is it possible to paste over the surface of the cube (without any gaps or overlaps) with less than 6 rhombuses (not necessarily congruent)?