

**Instructions.** Place *each answer on a separate page*. Pay attention to the clarity of your answers, if needed, rewrite the answer. Include *the intermediate steps of the calculation* into your answer. Mark *any solution abandoned by crossing it over*, since only the worst of several alternative answers to one given problem will be credited.

1. The size of a television screen is given as the length of the diagonal in inches (1 inch = 2.54 cm). The form of the screen is given as the ratio of the width to the height of the screen. In a traditional model the ratio is 4:3, and in a modern wide-screen model 16:9. A customer replaces a 24 inch traditional model with a modern 26 inch wide-screen model. How much does the height of the screen change (decrease or increase)? How much does the area of the screen change? (Give the answers in centimetres and square centimetres with an accuracy of one decimal.)
2. The university running club consumes a large number of running shoes every year. In a given year the club bought shoes of three brands: Sneakers, Plimsolls and Tennis shoes. Sneakers cost €60, Plimsolls €65 and Tennis shoes €40 a pair. That year the club acquired 63 pairs for a total of €3620. How many pairs of each brand did the club acquire, when Plimsolls were bought twice as many pairs as Tennis shoes?
3. Consider a rectangle where the lengths of two non-parallel edges are 1 and  $a$ ,  $a > 0$ . Let us draw five circles of radius  $r$  centered at the four vertices and at the intersection of the diagonals of the rectangle. How large can the radius  $r$  be at most, if one requires that no two circles intersect (they may be tangential)?
4. In a cellar door there is a window in the form of a rhombus covered by a congruent shutter. The corners of the window  $ABCD$  correspond to those of the shutter  $A'B'C'D'$ . The edges of the rhombi as well as the shorter diagonals  $BD$  and  $B'D'$  have a length of 15 cm each. The shutter is fixed by a nail at the corner  $A'$  to the

corner  $A$  of the window. The shutter is rotated around the nail so that the corner  $B'$  of the shutter arrives at the diagonal  $AC$  of the window (Figure 1). Calculate the areas of the shutter and the part of the window thus made visible. (Give the answers in square centimetres with an accuracy of one decimal.)

5. On the top of a children's block-box there is a hole in the shape of a rightangled triangle. The legs of the triangle are 4 cm. Among the toys there is a wooden ball of diameter 2.5 cm. Can the ball go through the hole (justify by a calculation)? If not, how deep will it sink? (Give the answer in centimetres with an accuracy of two decimals.)
6. On a circle there are five equidistantly placed points. The distance between any two neighbouring points is 2. The points, but the neighbouring points, are connected by chords in accordance with Figure 2. Calculate the radius of the circle, and the area bounded by the chords and darkened in Figure 2. (Give the answers with an accuracy of two decimals.)

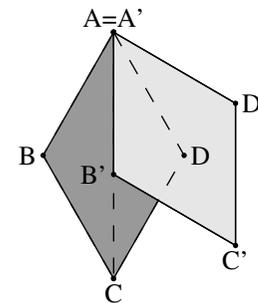


Figure 1

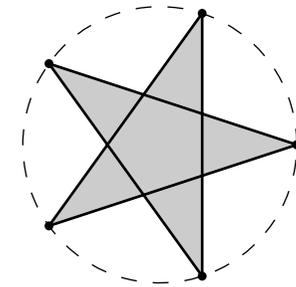


Figure 2