



Red Level

1. (6 credits) How many different values of x satisfy the equation $\cos^2 x + 2 \sin^2 x = 1$, provided that $-10 < x < 10$?
2. (6 credits) In McDonald's, the middle set of 3 hamburgers, 5 milk shakes and 1 pack of French fries costs 235 rubles, and the large set of 5 hamburgers, 9 milk shakes and 1 pack of French fries costs 395 rubles. How much does the small set of 2 hamburgers, 2 milk shakes and 2 packs of French fries cost there if all prices are determined correctly and without discounts?
3. (8 credits) Alik, Borya and Vasya solved 100 problems together, and each of them solved exactly 60 problems. Let the problem solved by all of them be called 'easy' one, and let the problem solved by only one boy be called 'difficult' one (each problem is solved by at least one boy). What number is greater: the number of easy problems or the number of difficult ones, and what is the difference between the greater number and the lesser number?
4. (8 credits) The quadrilateral MOST can be inscribed in a circle. It is known that $\angle OMT = 20^\circ$, and $\angle MTS = 100^\circ$. Find the angle (in degrees) between the extensions of the sides MT and OS.
5. (10 credits) Vanya has three rectangular parallelepipeds, each having a volume of 128. The areas of the two faces of the first parallelepiped are 4 and 32, the areas of the two faces of the second parallelepiped are 16 and 64, and the areas of the two faces of the third parallelepiped are 8 and 32. What can be the maximum height of a tower constructed of these parallelepipeds?
6. (10 credits) Numbers A, BC, DD and AAE (each digit is replaced by a letter, each letter corresponds to one digit, the same letters denote the same digits) are terms of an increasing arithmetic progression. Find the digit denoted by C.
7. (10 credits). Every station of the children's railway gives tickets to every other station. All these tickets are different, the start and end stations are indicated on each ticket. Some (more than one) stations were added on this railway recently, and 46 new types of tickets had to be printed additionally. How many stations are now operating on the children's railway?
8. (12 credits) 2, 3, and 5 are roots of the polynomial $f(x) = x^4 + ax^2 + bx + c$. Find $f(1)$.
9. (15 credits) Let $x \diamond y$ be a positive number defined as a function of x and y in accordance with some rule for any two positive numbers x and y . It is known that the operation \diamond satisfies the properties $(x \cdot y) \diamond y = x(y \diamond y)$ and $(x \diamond 1) \diamond x = x \diamond 1$ for all $x, y > 0$, and $1 \diamond 1 = 1$. What is the value of $20 \diamond 17$?
10. (15 credits) Vanya plays billiards on a table shaped as an equilateral triangle ABC with a side of 40 cm. He sends the ball from the vertex A in such way that the ball stops near the side AB 10 cm from the vertex A after two reflections from the walls BC and CA. What is the length of the path covered by the ball?