Bose Math Olympiad

Intermediate - 2021

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You have 90 minutes to try the six problems. Write down detailed answers and submit them. You must give precise reasons for your claims.

Problem 1

The arithmetic mean of four numbers is 10. If you cross out one of these numbers, then the arithmetic mean of the remaining three will increase by 1 if you delete another instead number, then the arithmetic mean of the remaining numbers will increase by 2, and if you delete only the third number, then the arithmetic average of the remaining will increase by 3. How much will the arithmetic mean of the three remaining numbers change, if you cross out the fourth number?

[Hint: Arithmetic mean is the same as average; add the numbers together and divide by the number of numbers]

Problem 2

In each of the three chests Ali Baba found gold and silver coins; total 40 gold and 40 silver coins. In the first chest there were 7 more gold coins than silver ones, in the second - 15 silver less than gold. What coins are there more in the third chest and how much? Explain the answer.

Problem 3

In each cell of a 5 × 5 square, exactly one diagonal is drawn. Vertex a cell is free if it is not the end of any of the drawn diagonals. Find the largest possible number of free vertices. [Hint: In this example 3 × 3 square, there are 4 free vertices]
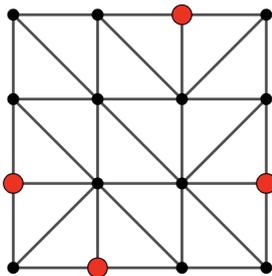
Problem 4

Ananya has 27 cubes with an edge of 1 cm. 9 of them are red and 18 of them are blue. She glued them together to create a cube with an edge length 3 cm. Is it possible to put the cubes in such a way that the surface of the cube has the same number of red squares and blue squares?

Problem 5

The train has 18 identical compartments. In some compartments, exactly half of the seats are free. Some others have exactly one third of the seats free. The rest of the compartments have all the seats occupied. The train has (in total) exactly one-ninth of all seats free. How many compartments are fully occupied?

Problem 6

Draw five points A, B, C, D and E on the plane so that you can create exactly eight triangles (no more and no less) with vertices at the points A, B, C, D and E. List the name of these triangles.