ABOUT THE ROLE OF INTERESTING ISSUES IN THE STUDY OF MATHEMATICS

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ABSTRACT

Interesting issues are highly effective in teaching mathematics. This article discusses and addresses some interesting issues.

Keywords: Mathematics, issue, problem, science, solution.

Many people think that mathematics is a very difficult science. The application of this science to many of the problems we face in our daily lives and the analysis of its solutions show that the scope of application of the science of mathematics is infinite. It is impossible to study other sciences, all the processes and techniques of nature without understanding the essence of each concept of mathematics. It is not for nothing that mathematics is taught. Therefore, interesting questions are of great importance in order to increase the interest in this science. So, in this article, we will look at the issue of counterfeit coins, which is the most popular for readers.

Issue 1. If one of the 10 bags contains counterfeit coins and a counterfeit coin weighs 4 g and the pure coin weighs 5 g, how can it be determined by weighing it once on a scale?

Solution. 1). Suppose the counterfeit coin is in the 10th bag. If we take 1, 2, 3,… .., 10 coins from each bag, the scales will show: $1 * 5 + 2 * 5 + \ldots\ldots + 9 * 5 + 10 * 4 = 265$ g.

2). Suppose the counterfeit coin is in the 9th bag. In this case, the scales: $1 * 5 + 2 * 5 + \ldots. + 9 * 4 + 10 * 5 = 266$ g.

Continuing the same process, the scales measure the following weights: 265,266,267, 268, 269, 270, 271, 272, 273, 274.

From this you can find out which bag the counterfeit coin is in. For example, if the scale shows 270 g, the counterfeit coin represents the 5th bag.

Issue 2. If the counterfeit coin in issue 1 is 3g and the pure coin is 4g, which one bag can be used to determine which bag contains counterfeit coins?

Solution. 1). Suppose a counterfeit coin is in the 10th bag. In that case 1, 2, 3,… from each bag. If we take 10 coins and put them on the scales, the scales show the following weights:

$$1 * 4 + 2 * 4 + 3 * 4 + \ldots + 9 * 4 + 10 * 3 = 210 \text{ g.}$$

2). Suppose the counterfeit coin is in the 9th bag. In this case, the scales show 1 * 4 + 2 * 4 + 3 * 4 +… + 8 * 4 + 9 * 3 + 10 * 4 = 211g.

Continuing the process, we find the following weights:

210, 211, 212, 213, 214, 215, 216, 217, 218, 219.

If, as in the above problems, we define the case where the counterfeit coin is 1 g and the pure coin is 2 g (1; 2), then we get the following sequence of numbers:

(1; 2) 100, 101, 102, 103, 104, 105, 106, 107, 108, 109.

(2; 3) 155, 156, 157, 158, 159, 160, 161, 162, 163, 164.

(3; 4) 210, 211, 212, 213, 214, 215, 216, 217, 218, 219.

(4; 5) 265, 266, 267, 268, 269, 270, 271, 272, 273, 274.

If we look at the series of numbers above, if we add 55 to the numbers in each row, we get the numbers in the next row. For this (5; 6)

We create a sequence of numbers 320, 321, 322, 323, 324, 325, 326, 327, 328, 329. In fact, let's show you how to make a sequence of these numbers.

Issue 3. If one of the 10 bags weighs 5 g and the rest of the bags weigh 6 g, how can a bag of counterfeit coins be identified by a single measurement?

Solution. Let's say the counterfeit coin is in the 10th bag. Then we take 1, 2,3, ..., 10 coins from each bag and put them on the scales: 1 * 6 + 2 * 6 + 3 * 6 +… .9 * 6 + 10 * 5 = 320 shows. If we perform the calculation as above, we actually create a sequence of numbers 320, 321, 322, 323, 324, 325, 326, 327, 328, 329.

Now, if one of the 10 bags has a counterfeit coin weighing n g and the other 9 bags have a coin weight (n + 1) g, how do you find a counterfeit bag using a single measurement?

Given that the difference between the series of numbers from the above problems is 55, we obtain the following formula according to the method of mathematical induction:

(n; n + 1) 45 + 55 n, 46 + 55 n, 47 + 55 n, 48 + 55 n, 49 + 55 n, 50 + 55 n, 51 + 55 n, 52 + 55

n, 53 + 55 n, 54 + 55 n. This formula is suitable for 10 bags. Now suppose we are given 6 bags of coins and one bag contains counterfeit coins. Require a one-time counterfeit coin bag.

We will solve this problem as before. Suppose a counterfeit coin weighs 1 g and a pure coin weighs 2 g. Let's take 1, 2, 3, 4, 5 and 6 coins in each bag. Suppose the counterfeit coin is in the 6th bag. In this case, the weight of the coins is 2 * 1 + 2 * 2 + 2 * 3 + 2 * 4 + 2 * 5 + 1 * 6 = 36g. Suppose the counterfeit coin is in the 5th bag. Then 2 * 1 + 2 * 2 + 2 * 3 + 2 * 4 + 1 * 5 + 2 * 6 = 37g. Continuing this process, we form a sequence of numbers 36, 37, 38, 39, 40, 41 for (1; 2). Now let's do the calculation for (2; 3):

ISSN 2181-2632 www.involta.uz

3 * 1 + 3 * 2 + 3 * 3 + 3 * 4 + 3 * 5 + 2 * 6 = 57,

3 * 1 + 3 * 2 + 3 * 3 + 3 * 4 + 2 * 5 + 3 * 6 = 58,

3 * 1 + 3 * 2 + 3 * 3 + 2 * 4 + 3 * 5 + 3 * 6 = 59,

3 * 1 + 3 * 2 + 2 * 3 + 3 * 4 + 3 * 5 + 3 * 6 = 60,

3 * 1 + 2 * 2 + 3 * 3 + 3 * 4 + 3 * 5 + 3 * 6 = 61,

2 * 1 + 3 * 2 + 3 * 3 + 3 * 4 + 3 * 5 + 3 * 6 = 62.

As a result, we create the following sequence of numbers 57, 58, 59, 60, 61, 62.

From (1; 2) and (2; 3) we find that the difference for the sequence of numbers is 21. In that case we form the following sequence of numbers for (3; 4): 78, 79, 80, 81, 82, 83.

Now we find the sequence of numbers for (n; n + 1):

15 + 21n, 16 + 21n, 17 + 21n, 18 + 21n, 19 + 21n, 20 + 21n.

It is also possible to limit the number of bags in the above issues and to take the difference between counterfeit and pure coins as 2 g, 3 g, etc. In these cases, as in the above, in the form of arithmetic progression, we can give the formula for (n, m). Of course, in these cases, the number of bags, the difference between counterfeit and pure coins must be small natural numbers, because if the difference in coins is large, it can be determined manually. In conclusion, a simple example can help a number of mathematical concepts be formed in the minds of students and increase their interest in science. They reflect the essence of the principle of induction in solving problems.

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ISSN 2181-2632 www.involta.uz