Problem:

You have seven bags of gold coins. Each bag has the same number of gold coins. One day, you find a bag of 53 coins. You decide to redistribute the number of coins you have so that all eight bags you hold have the same number of coins. You successfully manage to redistribute all the coins, and you also note that you have more than 200 coins. What is the smallest number of coins you could have had before finding the bag of 53 coins?

Response:

Let's denote the number of gold coins in each of the seven bags initially as \\(n \\). Therefore, the total number of coins before finding the bag of 53 coins is \\(7n \\). After finding the bag of 53 coins, the total number of coins becomes \\(7n + 53 \\). [score=0.98]

Since you redistribute the coins so that all eight bags have the same number of coins, the total number of coins must be divisible by 8. Therefore, \\(7n + 53 \\) must be divisible by 8. We can express this condition as:\n\\[7n + 53 \\equiv 0 \\pmod{8} \\]\n\\[7n \\equiv -53 \\pmod{8} \\]\nSince \\(-53 \\equiv -53 + 64 = 11 \\equiv 3 \\pmod{8}\\), we have:\n\\[7n \\equiv 3 \\pmod{8} \\] [score=0.81]

To solve for \\(n \\), we need the multiplicative inverse of 7 modulo 8. The multiplicative inverse of 7 modulo 8 is a number \\(x \\) such that:\n\\[7x \\equiv 1 \\pmod{8} \\]\nBy testing values, we find that \\(x = 7 \\) works because:\n\\[7 \\cdot 7 = 49 \\equiv 1 \\pmod{8} \\]\nThus, multiplying both sides of \\(7n \\equiv 3 \\pmod{8} \\) by 7, we get:\n\\[n \\equiv 21 \\pmod{8} \\]\n\\[n \\equiv 5 \\pmod{8} \\]\nSo, \\(n = 8k + 5 \\) for some integer \\(k \\). [score=0.92]

The total number of coins after finding the bag of 53 coins is \\(7n + 53 = 7(8k + 5) + 53 = 56k + 35 + 53 = 56k + 88 \\). Since the number of coins must be more than 200, we have:\n\\[56k + 88 > 200 \\]\n\\[56k > 112 \\]\n\\[k > 2 \\]\nThe smallest integer \\(k \\) that satisfies this inequality is \\(k = 3 \\). Substituting \\(k = 3 \\) into the expression for the total number of coins, we get:\n\\[56 \\cdot 3 + 88 = 168 + 88 = 256 \\] [score=0.79]

To find the number of coins before finding the bag of 53 coins, we calculate:\n\\[7n = 7 \\cdot (8 \\cdot 3 + 5) = 7 \\cdot 29 = 203 \\] [score=0.51]

Thus, the smallest number of coins you could have had before finding the bag of 53 coins is \\(\\boxed{203}\\). [score=0.68] [token num=31]