Order 5 coins in 7 weighings

We have 5 coins, all of different weights, and a balance scale. How many weighings will it take to be able to put 5 coins in order from heaviest to lightest?

Using only weighings with one coin on each side, one can prove that the ordering can be determined with **seven** weighings.

Weigh coins A versus B, then C versus D, and then the heavier in each pair against each other. We can relabel the heaviest found as D, its original partner as C, and the loser of the "weigh-off" as B. These three weighings have led knowledge that A < B < D and C < D.

Next weigh the coin E (which has thus far not been touched) against B, and then against D if B < E, or against A if E < B. These fourth and fifth weighings tell you the exact order of D, E, B and A. For example, you might find that E < A < B < D. It does not matter which of the possibilities you find; the important facts are that you know the order and that the second lightest and the lightest are not D.

For the sixth weighing, weigh coin C against the second lightest of the other coins. In our example, we would weigh C versus A. Then the only doubt left is the relative weight of C and just one other coin. In our example, if A < C then we can complete the full ordering by weighing C versus B because we already know that C < D.

Thus the seventh weighing determines the complete order.

There are 5! = 120 permutations and 27 = 128 possible sequences of seven answers, and it is indeed possible to find a strategy which always works.

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