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by [Micro Admin](#)

*I'm working through algoexpert.io coding challenges and I'm having trouble undersatnding the suggested solution to one of the questions titled **Non-Constructible Change***

*Here's the challenge question:*



*Given an array of positive integers representing the values of coins in your possession, write a function that returns the minimum amount of change (the minimum sum of money) that you **cannot** create. The given coins can have any positive integer value and aren't necessarily unique (i.e., you can have multiple coins of the same value).*

*For example, if you're given coins = [1, 2, 5], the minimum amount of change that you can't create is 4. If you're given no coins, the minimum amount of change that you can't create is 1.*



```
coins = coins.sort((a, b) => a - b); // O(nlogn) time operation
let change = 0;

for (coin of coins) {
  if (coin > change + 1) return change + 1;
  change += coin;
}

return change + 1;
}
```

*My problem*



*I am not completely sure how did the author of the solution come up with the intuition that*

if the current coin is greater than ``change + 1``, the smallest impossible change is equal to ``change + 1``

*I can see how it tracks, and indeed the algorithm passes all tests, but I'd like to know more about a process I could use to devise this rule.*

*Thank you for taking the time to read the question!*



## Answer

This one took me a while too, but this was how I made sense of it:

Assume you've proven you can make 1-8 cents.

You go to the next iteration and want to know if you can make 9 cents. So you iterate to the next new coin in the sorted list.



if newCoin < 9:

- You know for a fact that you can make 9 cents.
- Example if the new coin is 5: Use that new coin and subtract it from the total you're trying to make.  $9 - 5 = 4$ . Then however way you made 4 previously just do that again. (You've already proven you can make 1-8 cents)

if newCoin == 9:

---



if newCoin > 9:

- You know for a fact that you CANNOT make 9 cents
- This is because **you can't use the new coin**. For example, a 10 cent coin is useless to you when you're trying to make 9 cents since it's too big (can't make 9)
- **You're also screwed if you don't use the new coin** because if you add up all the coins you've seen so far, you've only been able to make 8 (can't make 9)

And that's where the change + 1 comes from. (your variable change = 8)

if the current coin is greater than ``change + 1``, the smallest impossible change is equal to ``change + 1``.



## Attribution

Source : [Link](#) , Question Author : [Daniel Kaczmarczyk](#) , Answer Author : [Jack Windensky](#)

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