

Coins = [1, 2, 5]

Cache stores the answer
to all the previous sub-problems
(How many coins to achieve i amount)

Coin Change
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Amount = 11

0 1 2 3 4 5 6 7 8 9 10 11

Cache

0	1	1	2	2	1	2	2	3	3	2	3
0	1	1	2	2	1	2	2	3	3	2	3

← initially populated with 12, then reduced by solving the sub-problems

$$\text{cache}[1] = \min(12, \text{cache}[1-1] + 1) = \min(12, 0+1) = 1 \quad \leftarrow$$

$\text{cache}[0] = 0$

$$\text{cache}[2] = \min(12, \text{cache}[2-1] + 1) = \min(12, 1+1) = 2$$

$\text{cache}[1] = 1$

$$\min(12, \text{cache}[2-2] + 1) = \min(12, 0+1) = 1 \quad \leftarrow$$

$\text{cache}[0] = 0$

$$\text{cache}[3] = \min(12, \text{cache}[3-1] + 1) = \min(12, 1+1) = 2$$

$\text{cache}[2] = 1$

$$\min(12, \text{cache}[3-2] + 1) = \min(12, 1+1) = 2$$

$\text{cache}[1] = 1$

either \leftarrow

using a coin
+1 to denote coin used
 $\text{cache}[i - \text{coins}[j]] + 1$
finding answer to the sub-problem

$$\text{cache}[4] = \min(12, \text{cache}[4 - 1] + 1) = \min(12, 2 + 1) = 3$$

$$\text{cache}[3] = 2$$

$$\min(12, \text{cache}[4 - 2] + 1) = \min(12, 1 + 1) = 2 \leftarrow$$

$$\text{cache}[2] = 1$$

$$\text{cache}[5] = \min(12, \text{cache}[5 - 1] + 1) = \min(12, 2 + 1) = 3$$

$$\text{cache}[4] = 2$$

$$\min(12, \text{cache}[5 - 2] + 1) = \min(12, 2 + 1) = 3$$

$$\text{cache}[3] = 2$$

$$\min(12, \text{cache}[5 - 3] + 1) = \min(12, 0 + 1) = 1 \leftarrow$$

$$\text{cache}[0] = 0$$

etc.

Coin change

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