

# lets say miner A and B solved at same time, and C is then continuing chain A so he cant choose same?

If Miner A and Miner B both solve a block at the same time, and Miner C then continues mining on top of chain A, **Miner C can absolutely include the same transactions that were in A and B—except for those already confirmed in the block he is building on.**

Here's how it works in detail:

## 1. Two Blocks Mined Simultaneously (A and B)

- Suppose the blockchain splits into two branches because Miner A and Miner B each find a valid block at the same height.
- Both blocks (let's call them Block A and Block B) are broadcast to the network.
- Some nodes receive Block A first and build on it, others receive Block B first and build on that. This is a temporary fork <sup>[1]</sup> <sup>[2]</sup>.

## 2. What Happens to Transactions in A and B?

- Both Block A and Block B likely contain many of the same high-fee transactions from the mempool, but they may also have some unique transactions.
- Once a transaction is included in either Block A or Block B, it is considered **confirmed on that branch** and is removed from the mempool of nodes following that branch.

## 3. Miner C Builds on Top of Chain A

- Miner C chooses to mine on top of Block A (the tip of chain A).
- **Miner C cannot include transactions that were already confirmed in Block A**—those are now part of the blockchain he is extending.
- Miner C can, however, include:
  - Transactions that were only in Block B (and not in Block A), if they are still unconfirmed on chain A.
  - Any other unconfirmed transactions still in the mempool.

**In other words:**

- **If a transaction was in both A and B, and C is building on A, it is already confirmed and cannot be included again.**

- If a transaction was only in B, and not in A, it is still unconfirmed on chain A and can be included by C.

#### 4. Example

- **Mempool before fork:** TX1, TX2, TX3, TX4, TX5
- **Block A includes:** TX1, TX2, TX3
- **Block B includes:** TX1, TX2, TX4
- **Miner C builds on Block A:**
  - TX1, TX2, TX3 are already confirmed.
  - TX4 and TX5 are still unconfirmed on chain A.
  - Miner C's block can include TX4 and TX5 (and any new transactions).

#### 5. Fork Resolution

- Eventually, one branch will become longer (say, chain A).
- The network will then discard the other branch (chain B).
- Any transactions that were only in Block B and not in Block A (like TX4 in our example) will return to the mempool and can be included in future blocks<sup>[1] [2] [3]</sup>.

#### 6. Key Points

- **Miners cannot include transactions already confirmed in the block they are building on.**
- **They can include any transactions that are still unconfirmed on their branch, including transactions that were in the competing block of a fork.**
- This mechanism ensures that no transaction is confirmed twice, and all valid transactions eventually get confirmed as forks are resolved.

"As the blockchain is being built, it's perfectly normal for two blocks to be mined at the same time. In this situation, nodes will consider the first block they receive as part of their blockchain, but also keep the second block they receive just in case. ... This disagreement is resolved when the next block is mined. The next block will be built on top of one of these blocks, creating a new longest chain of blocks, and as a rule nodes will always adopt the longest known chain of blocks as their active blockchain." <sup>[1]</sup>

"Blocks that are off the longest chain are eventually abandoned. They are no longer extended, their contents (transactions colored in red) are ignored, and the miners that created them receive no reward." <sup>[2]</sup>

#### Summary:

Miner C can include any transaction that is still unconfirmed on the branch he is mining on—including transactions from the losing block of a fork—but not transactions already confirmed in the block he is extending.

1. <https://learnmeabitcoin.com/technical/blockchain/>
2. <https://dl.acm.org/doi/fullHtml/10.1145/3155112.3168362>
3. <https://bitcoin.stackexchange.com/questions/60194/what-happens-to-the-mining-reward-if-the-blocks-gets-replaced>