

Cookie Monster

The Cookie Monster is presented with some jars with various numbers of cookies. He's very excited, because he is going to eat all the cookies as fast as he can! However, there are some rules about how to eat the cookies. He only gets to take cookies once per minute. First he has to choose a number of cookies, and then he chooses some of the jars that have at least that many cookies, and takes that number of cookies out of each of them. For instance, if he had jars with 1, 2, 3, and 5 cookies, he might choose to take 2 cookies, and then choose the jars with 2 and 5. Then, he eats those cookies, and the jars now have 1, 0, 3, and 3 cookies.

Cookie Monster is always very motivated to eat the cookies as quickly as possible.

1. If he starts with those 1, 2, 3, and 5 cookie jars, can he eat all the cookies in 3 minutes?
2. If he has two jars, how can you tell whether he'll be done in 1 minute, 2 minutes, or more than 2? Remember he eats them all as fast as possible!
3. How long does it take if he has three jars with 5, 6, and 11 cookies?
4. If he has three jars, how can you tell whether he'll be done in 1 minute, 2 minutes, 3 minutes, or more than 3?
5. How long does it take for four jars, with 3, 6, 10, and 15 cookies?
6. Can you change just one jar by just one cookie and help the monster eat them faster? How?
7. How long does it take for seven jars with 1, 2, 3, 4, 5, 6, and 7 cookies?
8. How long does it take for 100 jars with 1, 2, 3, ..., and 100 cookies?
9. How long does it take for 8 jars with 1, 2, 3, 5, 8, 13, 21, and 34 cookies?
10. How long does it take for 7 jars with 1, 2, 4, 7, 13, 24, and 44 cookies? Can you see the pattern here? What if you kept going with that pattern?
11. Make your own Cookie Monster puzzles: Find ways of making it tricky to figure out the fastest way to eat them all.
12. Play the Cookie Monster game: take turns following the rule, and whoever gets to eat the very last cookie is the winner. Can you tell which player is going to win? Even with just two jars this game gets very interesting!