# Number Theory Round

30 minutes | 15 problems

1. In Super Mario Bros., Mario collects coins valued consecutively from 1 to 15. However, he accidentally skips one coin, and the sum of the collected coins equals 110. Which coin did Mario skip?

2. In the popular Roblox game Shrimp Game, there is a section where there are two columns of glass, each with 5 glass panels. In each row of 2 glass panels, one will shatter and the other won't. What is the probability of crossing successfully without breaking a single panel?

3. When finding the mean amount of power ups you collect in 3 rounds of a Mario Kart race, you find that it is the same number as the mode. If the mean number of powerups collected is 5, what is the median number of powerups collected?

4. How many distinctive seven letter combinations can be made from the word AMONGUS?

5. While bored in class, you decided to visit the website Google Snake. On your first four runs, you collect 7, 21, 12, and 8 apples. In order to average 12 by the fifth run, what is the lowest possible score you can get?

6. In Fortnite, you own 5 gliders, 10 skins, and 8 emotes. How many combinations of equipping a glider, a skin, and emoting once in a game are there?

7. In Among Us, you have unlocked 6 blue-tinted jumpsuits, 8 orange-tinted jumpsuits, and 2 green-tinted jumpsuits. After unlocking more green-tinted jumpsuits, you notice that there is now a 44% that a jumpsuit randomly selected is green. How many *more* green jumpsuits did you collect?

8. While playing Pac-Man during Math Club (you slacker), you notice that you've collected 21504 points. Peering over your shoulder, your math coach decides to make this a learning lesson. "How many possible positive factors of 21504 exist?" They ask. How should you respond?

9. When traveling across the Clash Royale arena (it's a massive arena), Hog Rider notices that he's traveled 12921 miles (a palindrome, as it reads the same from left to right). Five hours later, when traveling at a steady rate, Hog Rider notices again that he has traveled to the next highest palindrome from his very start. How far had Hog Rider traveled at hour four?

10. Steve is mining for iron in Minecraft, and the number of iron ingots he finds is always divisible by 45. After a long mining session, Steve accumulates an even, 3 digit number where the digits add to 18. How many iron ingots does he find?

11. In Among Us, a group of players in a circle pass around a stack of "task cards" among themselves. After a player receives one task card, they pass the remaining cards in the stack to the player to their right. There are 78 task cards, and Impostor takes both the first and last card during the meeting. What is the sum of the 3 amounts of players that can be at the table such that the Impostor ends up with both the first and last card in the stack?

12. You spend all night playing video games on Monday night to Tuesday morning. On Tuesday, you risk falling asleep in class. The chance that you fall asleep is 10 percent larger than the chance of you falling asleep in the previous class. If you attend 5 classes in a day and have a 10% chance of falling asleep in your first class, what is the chance you do not fall asleep in any classes, to the nearest whole percent?

13. Pacman is incredibly good at problem solving, as seen through his ability to navigate away from danger through obstacles. One day, he is prompted by a math question and uses these skills to get it correct. What is Pac Man's answer to finding the number of positive integers less than 30 that have an odd amount of positive integer divisors?

14. You enjoy collecting figurines of your favorite Mario Kart characters. If 13 Bowser figurines can fit in a display case and 5 Baby Mario figures can fit in a display case, if you have an integer $N$ amount of display cases you can display an equal amount of Bowser and Baby Mario figurines. What is the least possible value of $N$?

15. Sonic the Hedgehog can collect a square number of coins between each checkpoint, which is always larger than one. The amount of coins he collects between each checkpoint can vary and the number of checkpoints he reaches can also vary. In a game, experience points are gained by multiplying the number of coins he collects between checkpoints of the game. What is the difference between the most amount of coins Sonic the Hedgehog can collect in a game and the least amount of coins he can collect in a game if he collects 2025 experience points in a game?