Divisibility Tricks

Knights and Knaves Divisibility

In the land of knights and knaves, knights always tell the truth and knaves always lie. Decide who is a knight and who is a knave.

1. Maurice says, I have two numbers X and Y that are both divisible by 7, but their sum $X + Y$ is NOT divisible by 7.

2. Nina says, I have two numbers P and Q and their difference $P\text{--}Q$ is divisible by 7 but neither P nor Q is divisible by 7.

3. Omar says, I have two numbers A and B, and they are both divisible by 9, but their difference $A\text{--}B$ is NOT divisible by 9.

4. Xavi says: I know a number X that is divisible by 4 and 3, but is NOT divisible by 4 x 3 = 12.

5. Yael says: I know a number Y that is is divisible by 4 and 6, but is NOT divisible by 4 x 6 = 24.

6. Albus says: I know a number A that is NOT divisible by 3, but twice that number IS divisible by 3.

7. Bert says, I know a number B that is even, but the number $3 \times B$ is NOT divisible by 6.

8. Cassie says, I know a number C, and $5 \times C$ is divisible by 3, but C is NOT divisible by 3.

9. Dwayne says, I know a number D and $15 \times D$ is divisible by 6. But D is NOT divisible by 6.

Guess the Missing Digit Tricks

1. Write down a 5 digit number. Underneath it, write down the number you get by reversing the digits. So if you started with 43861, your second number will be 16834. Subtract the smaller number from the bigger number. Now read your answer out to your instructor, but leave out the last digit. Your instructor will guess the last digit.

   How does this game work?

2. Write down a 3 digit number. Then write down the 3 digit number you get by reversing the digits. Put all 6 digits in a row to make a 6 digit number. So if your first 3 digit number was 472, your 6 digit number will be 472274, a "palindrome" number. Multiply your palindrome number by any 1 or 2 digit number of your choosing. Read all the digits except the last one to your instructor. Your instructor will guess the last digit.

   How does this game work?

Build a Number Games

In each of these games, you and a partner take turns building a number one digit at a time, from right to left. For example, if you are going to build a 3 digit number, you might say "2", and your partner says "5", then you say "1". The number you just built is 152.

1. You and your partner take turns building a 3 digit number. The first player wins if the number IS divisible by 5, and the second player wins if the number is NOT divisible by 5. Is there a winning strategy for either player?

2. Same game, but this time, the first player wins if the number IS divisible by 4, and the second player wins if the number IS NOT divisible by 4.

3. Same game, but this time, the first player wins if the number IS divisible by 3, and the second player wins if the number is NOT divisible by 3.

4. Same game, but the first player wins if the number IS divisible by 6, and the second player wins if the number IS NOT divisible by 6.

5. Same game, but the first player wins if the number IS divisible by 9, and the second player wins if the number IS NOT divisible by 9.

6. All the same games, but with a 4 digit number instead of a 3 digit number.