# Divisibility Tricks, Part 2

## 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.

# Divisibility Puzzles

1. Tom multiplied two two-digit numbers on the blackboard. Then he changed all the digits to letters (different digits were changed to different letters and equal digits were changed to the same letter). He got AB · CD = EEFF. Prove that Tom made a mistake somewhere.

2. Write one digit to the left and one to the right of the number 15 so that the number obtained is divisible by 15.

3. How many four-digit numbers with the two middle digits 97 are divisible by 45?

4. A is a six-digit number with digits 1, 2, 3, 4, 5, and 6 each used one time. Prove that A is not divisible by 11.