

October Problem #1

Prove the following assertion:

For every positive integer n , 3 is a factor of $2^n - (-1)^n$.

October Problem #2

(This problem modified from one provided by the Mathematical Association of America.)

- (i) How many *three-digit* numbers are composed of three distinct digits (with no leading 0s), such that **one digit is the average of the other two**?

Examples: 435 (4 is the average of 3 and 5)
630 (3 is the average of 6 and 0)

- (ii) How many such three-digit numbers are possible if we allow repeated digits?
- (iii) How many *four-digit* numbers are composed of four distinct digits (no leading 0s), such that **one digit is the average of the other three**?