

Counting and Combinations

Suppose a set S has 10 elements, how many subsets of S have an odd number of elements?

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Your latest cheapo cell phone keyboard only includes the uppercase alphabet (26 characters total). How many 12-character strings can you type that start with **ST** and contain no more than three total T's?

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We will say that a positive integer n is **modest** if every prime factor of n is less than 10 (i.e., 2, 3, 5 or 7). Let M be the set of all modest integers.

We will say that a positive integer n is **cube-free** if there is no integer $k > 1$ such that $k^3 \mid n$. Let C be the set of all cube-free integers.

What is $|C \cap M|$? That is, how many cube-free modest integers are there)?