

## Problem

Show that 12 is not pseudoprime because it fails some Fermat test.

## Step-by-step solution

### Step 1 of 2

A number is said to be pseudoprime if the number passes Fermat test. This means the number should be prime related to all the numbers that are less than the given number.

Fermat primality test is a test used for checking whether the number is prime or not. A number is said to be prime if the number satisfies following condition:

$$p^{n-1} \equiv 1 \pmod{n}$$

where  $p \geq 1$  and  $n > p$

The equation given above can be written as:

$$p^{n-1} - 1 = nk$$

where  $k$  is an positive integer.

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### Step 2 of 2

Fermat test for 12 is given below:

$$4^{12-1} - 1 = 12k$$

$$4^{11} - 1 = 12k$$

$$4194304 - 1 = 12k$$

$$4194303 = 12k$$

When 4194303 is divided with 12k, this will provide remainder 3. So, 12 fails Fermat test. So, 12 is not pseudoprime.

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