

Nesting Dolls

February 2024

C++ — 1 SEC — 512 MB

Deep in the second-darkest basement of the Guild of Sorcerers lies the mighty mantelpiece of magical Matryoshkas. On this spellbinding shelf are stored nesting dolls of different sizes. The magical properties of these Matryoshka dolls allow a doll of size n to store any number of dolls with sizes smaller than n . These dolls in turn may be housing their own smaller dolls.

Traditional tradition states that there must be n nesting dolls on the mantelpiece, of unique sizes from 1 to n . A less traditional tradition states that when a set of dolls is placed inside a larger doll, an *even* number of dolls must be moved inside. This does not include any dolls that are nested inside the dolls that are to be placed inside the larger doll.

In the admirable adventure of academic advancement, the sorcerers want to know the number of unique arrangements of the n magical Matryoshkas dolls upon the mighty mantelpiece.

INPUT You will be given an integer n , giving the number of dolls to be arranged on the mantelpiece.

$$1 \leq n \leq 20,000$$

OUTPUT Output a single integer, the number of unique ways the dolls can be arranged. Your answer may be very large, so it should be given modulo 1,020,202,009.

SAMPLE For example, suppose there are 4 dolls sitting upon the mantelpiece. There are 5 unique ways of arranging these dolls, in accordance with tradition:

- None of the dolls are nested
- Dolls 1 and 2 are nested inside doll 3. Doll 4 is empty
- Dolls 1 and 2 are nested inside doll 4. Doll 3 is empty
- Dolls 1 and 3 are nested inside doll 4. Doll 2 is empty
- Dolls 2 and 3 are nested inside doll 4. Doll 1 is empty

INPUT

OUTPUT

8

1385

50

803346189

321

450179932