

We all got too excited when we learned $(A + B)^2 = A^2 + 2AB + B^2$. After solving this problem, maybe you could get even more excited because you will have to calculate $(A + B)^N$, where $(0 \leq N \leq 1000)$.

Follow the rules below when giving the answer:

- 1. Consecutive terms must be separated by a '+' character.
- 2. At the i-th term, A must be raised to $N - i$ and B must be raised to i ($0 \leq i \leq N$).
- 3. Binomial coefficients must not be printed, print their prime factorization instead.
- 4. Use '^' for exponentiation and 'x' for multiplication in step 3.
- 5. Avoid the use of number 1 when possible.

See sample output for clarification.

Input

Input starts with an integer T, representing the number of test cases ($1 \leq T \leq 15$). T lines follow, each one consisting of an integer N, ($0 \leq N \leq 1000$).

Output

For each test case, print $(A + B)^N$, on a single line.

Example

Input:

6
0
1
2
3
4
5

Output:

1
A+B
 $A^2+2 \times AB+B^2$
 $A^3+3 \times A^2B+3 \times AB^2+B^3$
 $A^4+2^2 \times A^3B+2 \times 3 \times A^2B^2+2^2 \times AB^3+B^4$
 $A^5+5 \times A^4B+2 \times 5 \times A^3B^2+2 \times 5 \times A^2B^3+5 \times AB^4+B^5$