Facebook Hacker Cup 2018 Qualification Round

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Interception

30 points

Download Input

Consider an N-degree polynomial, expressed as follows:

$\mathbf{P}_N * x^N + \mathbf{P}_{N-1} * x^{N-1} + ... + \mathbf{P}_1 * x^1 + \mathbf{P}_0 * x^0$

You'd like to find all of the polynomial's x-intercepts — in other words, all distinct real values of x for which the expression evaluates to 0.

Unfortunately, the order of operations has been reversed: Addition (**+**) now has the highest precedence, followed by multiplication (*****), followed by exponentiation (**^**). In other words, an expression like $a^b + c * d$ should be evaluated as $a^{((b+c)*d)}$. For our purposes, exponentiation is right-associative (in other words, $a^{b^c} = a^{(b^c)}$), and $0^0 = 1$. The unary negation operator still has the highest precedence, so the expression $-2^{-3} * -1 + -2$ evaluates to $-2^{(-3 * (-1 + -2))} = -2^9 = -512$.

Input

Input begins with an integer **T**, the number of polynomials. For each polynomial, there is first a line containing the integer **N**, the degree of the polynomial. Then, **N**+1 lines follow. The *i*th of these lines contains the integer $\mathbf{P}_{i-1}$.

Output

For the *i*th polynomial, print a line containing "Case #*i*: **K**", where **K** is the number of distinct real values of **x** for which the polynomial evaluates to 0. Then print **K** lines, each containing such a value of **x**, in increasing order.

Absolute and relative errors of up to 10^{-6} will be ignored the x-intercepts you output. However, **K** must be exactly correct.

Constraints

$1 \le \mathbf{T} \le 200$
$0 \le \mathbf{N} \le 50$
$-50 \le \mathbf{P}_i \le 50$
$\mathbf{P}_N \ne 0$

Explanation of Sample

In the first case, the polynomial is $1 * x^1 + 1 * x^0$. With the order of operations reversed, this is evaluated as $(1 * x)^{(((1 + 1) * x)^0)}$, which is equal to 0 only when x = 0.

In the second case, the polynomial does not evaluate to 0 for any real value x.

Example input · Download

```
2
1
1
1
4
9
0
-6
2
-2
```

Example output · Download

```
Case #1: 1
0.0
Case #2: 0
```