C. You Are Given a WASD-string...

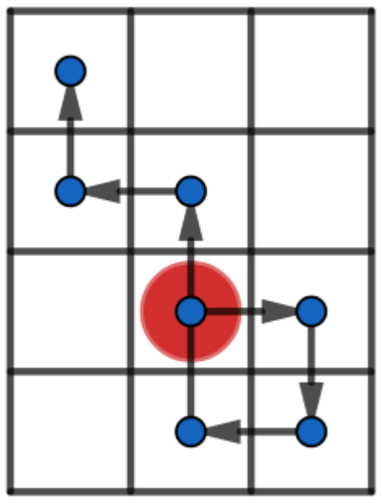
time limit per test: 2 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

You have a string s — a sequence of commands for your toy robot. The robot is placed in some cell of a **rectangular** grid. He can perform four commands:

- 'W' — move one cell up;
- 'S' — move one cell down;
- 'A' — move one cell left;
- 'D' — move one cell right.

Let $Grid(s)$ be the grid of minimum possible area such that there is a position in the grid where you can place the robot in such a way that it will not fall from the grid while running the sequence of commands s. For example, if $s = \text{DSAWWAW}$ then $Grid(s)$ is the 4×3 grid:

1. you can place the robot in the cell $(3, 2)$;
2. the robot performs the command 'D' and moves to $(3, 3)$;
3. the robot performs the command 'S' and moves to $(4, 3)$;
4. the robot performs the command 'A' and moves to $(4, 2)$;
5. the robot performs the command 'W' and moves to $(3, 2)$;
6. the robot performs the command 'W' and moves to $(2, 2)$;
7. the robot performs the command 'A' and moves to $(2, 1)$;
8. the robot performs the command 'W' and moves to $(1, 1)$.



You have 4 extra letters: one 'W', one 'A', one 'S', one 'D'. You'd like to insert **at most one of these letters** in any position of sequence s to minimize the area of $Grid(s)$.

What is the minimum area of $Grid(s)$ you can achieve?

Input

The first line contains one integer T ($1 \le T \le 1000$) — the number of queries.

Next T lines contain queries: one per line. This line contains single string s ($1 \le |s| \le 2 \cdot 10^5$, $s_i \in \{\text{W}, \text{A}, \text{S}, \text{D}\}$) — the sequence of commands.

It's guaranteed that the total length of s over all queries doesn't exceed $2 \cdot 10^5$.

Output

Print T integers: one per query. For each query print the minimum area of $Grid(s)$ you can achieve.

Example

input

```
3
DSAWWAW
D
WA
```

output

```
8
2
4
```

Note

In the first query you have to get string $\text{DSAWW}\underline{D}\text{AW}$.

In second and third queries you can not decrease the area of $Grid(s)$.