CSP w/ Back-Tracking + Forward Checking

Colors: \( r, g, b \)

1. Most constrained variable (highest degree)
2. Choose values arbitrarily

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Q</th>
<th>S</th>
<th>V</th>
<th>W</th>
<th>X</th>
<th>Y</th>
</tr>
</thead>
</table>
| 1 | rgb | rgb | rgb | rgb | rgb | rgb | rgb | **set value**
| 2 | g | gb | r | gb | gb | gb | rgb |
| 3 | b | gb | r | gb | gb | rb |

*empty domain*

1. \( S \) has highest degree (5), so choose any color: \( r \) (update domains of neighbors)
2. \( N = \) \( (4) \) : \( g \)

\( \Rightarrow \) 3. Tie b/w Q+W, choose Q arbitrarily, must choose b.

4. W has empty domain so backtrack to Q.

No other values for Q.
Setting $N$ to $g$ (instead of $b$) wouldn't help.

Choosing
Setting \( N \) to \( b \) (instead of \( g \)) won’t help
choosing \( W \) instead of \( Q \) won’t help.

Notice: After assigning \( S, N \), there was already a conflict.

\[
\begin{array}{c|c|c|c|c|c|c|c}
N & Q & S & V & W & x & y \\
\hline
[\square] & b & [\square] & gb & b & gb & rb \\
\end{array}
\]

\( Q + W \) are adjacent
and both have only
blue in their domains.

What went wrong?

Checked conflicts with pairs of assigned + unassigned variables but not between pairs of unassigned variables.

i.e. after assigning \( N \), checked:

- \( N \) w/ \( W \)
- \( N \) w/ \( Q \)
- \( N \) w/ \( y \)

but not: \( Q \) w/ \( W \)!