Office Hours Finds Week:
- Tuesday (3/17) 2-3
- Thursday (3/19) 11-12.
No office hours Friday 3/20.

Hasse Diagrams:

- If $x \leq y$ then $x$ appears lower.
- Segment connecting $x$ to $y$ if $x \leq y$ and $\not\exists z$ such that $x \leq z \land z \leq y$.

Diagram:

```
     c
   /   \
 a -   - b
   \   /   \
    d   
```

```
     c
   /   \
 a -   - b
   \   /   \
    d   
```

```
     c
   /   \
 a -   - b
   \   /   \
    d   
```

```
     c
   /   \
 a -   - b
   \   /   \
    d   
```

```
     c
   /   \
 a -   - b
   \   /   \
    d   
```

Turing Machine design:

Design a TM that checks whether a string over \( \Sigma = \{a, b\} \) is a palindrome.

A palindrome is the same forwards & backwards:

\[
\text{abaabba} \quad \text{abababa} \quad \text{Yes.}
\]

Note: \( a \ b \ a \ a \ a \)

Idea: head shuttles back and forth checking that first & last chars are the same.

As each pair is checked, overwritten by \(*\).

```
freed
```

\(\downarrow\)

\(\text{Read & removed a.}\)

\(\downarrow\)

\(\text{Overwrite a.}\)

\(\text{Ga-move}\)

\(\text{Gb-move.}\)

\(\downarrow\)

\(\text{Move right.}\)

\(\downarrow\)

\(\text{Detect end of string by *}.\)
Check first char - letter. Over write a.

Move back.

Detect left end at $*$. More right and start again.

<table>
<thead>
<tr>
<th>State</th>
<th>a</th>
<th>b</th>
<th>*</th>
</tr>
</thead>
<tbody>
<tr>
<td>q initialization</td>
<td>$(q_{a-initial}, \ast, R)$</td>
<td>$(q_{b-initial}, \ast, R)$</td>
<td>$(q_{c-initial}, -, -)$</td>
</tr>
<tr>
<td>$q_a$-move</td>
<td>$(q_{a-move}, a, R)$</td>
<td>$(q_{a-move}, b, R)$</td>
<td>$(q_{a-check}, \ast, L)$</td>
</tr>
<tr>
<td>$q_b$-move</td>
<td>$(q_{b-move}, a, R)$</td>
<td>$(q_{b-move}, b, R)$</td>
<td>$(q_{b-check}, \ast, L)$</td>
</tr>
<tr>
<td>$q_a$-check</td>
<td>$(q_{a-check}, \ast, L)$</td>
<td>$(q_{a-check}, -, -)$</td>
<td>$(q_{a-check}, -, -)$</td>
</tr>
<tr>
<td>$q_b$-check</td>
<td>$(q_{b-check}, -, -)$</td>
<td>$(q_{b-check}, b, L)$</td>
<td>$(q_{b-check}, -, -)$</td>
</tr>
<tr>
<td>$q_{ret}$</td>
<td>$(q_{ret}, a, L)$</td>
<td>$(q_{ret}, b, L)$</td>
<td>$(q_{ret}, \ast, R)$</td>
</tr>
</tbody>
</table>
How does it end?

\[ a_1 + a_2 \]

Let

\[ a_1 + a_2 \]

\[ a_1 \]

and

\[ a_2 \]

Read.

\[ a \]

\[ a \]

Read.

\[ a \]

\[ a \]