Simple Example
Simple Example

2

1

4

3

x=1
Simple Example
Simple Example
Simple Example

\[ x = 1 \]
Simple Algorithm

- For each edge $ab$ in the current polygon proceed from $a$ to $b$ (CCW)
  - if inside $\Rightarrow$ inside
    - add the second vertex $b$ into the output list
  - if inside $\Rightarrow$ outside
    - add the intersection with boundary $(c)$ into the output list
  - if outside $\Rightarrow$ outside
    - add NOTHING
  - if outside $\Rightarrow$ inside
    - add both the intersection $(c)$ and $b$ into the output list
Different Cases
Different Cases
Technical Details

- “Point inside the clip edge”?
- To the left of the edge
- Oriented edge
- Looking along the oriented clip edge
- How do we determine this?
  - cross-product
  - dot-product
  - line-line intersection
Oriented Boundary

\[ x = 1 \]
Simple Example

- Polygon 1234
- 12 ⇒ (output) 5
- 23 ⇒ (output) nothing
- 34 ⇒ (output) 64
- 41 ⇒ (output) 1
- Now, the new polygon is 1564
- Do the same process against the bottom boundary
- Do the same process against the right boundary
- Do the same process against the top boundary
- Finally, the polygon is 1564
Complicated Example
Left Boundary

- Polygon 12345 against left boundary (oriented edge)

- 12 $\Rightarrow$ 2
- 23 $\Rightarrow$ 3'
- 34 $\Rightarrow$ 4’4
- 45 $\Rightarrow$ 5
- 51 $\Rightarrow$ 1

- New polygon is 123’4’45 (after clipping against the left boundary)
New Polygon
Bottom Boundary

- Polygon 123'4'45 against bottom boundary (oriented edge)
- 12 ⇒ 2
- 23' ⇒ 3'
- 3'4' ⇒ 4'
- 4'4 ⇒ 4''
- 45 ⇒ 5'5
- 51 ⇒ 1

- New polygon is 123'4'4"5'5
  (after clipping against the bottom boundary)
Bottom Boundary
Right Boundary

- Polygon 123’4’4”5’5 against right boundary (oriented edge)

- 12 ⇒ 2
- 23’ ⇒ 3’
- 3’4’ ⇒ 4’
- 4’4” ⇒ 4”
- 4”5’ ⇒ 5”
- 5’5 ⇒
- 51 ⇒ 1’1

- New polygon is 123’4’4”5”1’ (after clipping against the right boundary)
Right Boundary
Top Boundary

- Polygon 123’4’4”5”1’ against top boundary (oriented edge)

- 12 ⇒ 2

- 23’ ⇒ 3’

- 3’4’ ⇒ 4’

- 4’4” ⇒ 4”

- 4”5” ⇒ 5”

- 5”1’ ⇒ 1’

- 1’1 ⇒ 1

- New polygon is 123’4’4”5”1’ (after clipping against the top boundary)

- NO CHANGE!
Top Boundary
Special Cases
Polygon Clipping

- Special case
  “concave polygon”

- How to remove the extra edges
  see Page 242

- Polygon clipping against polygon
Clipping against Polygon