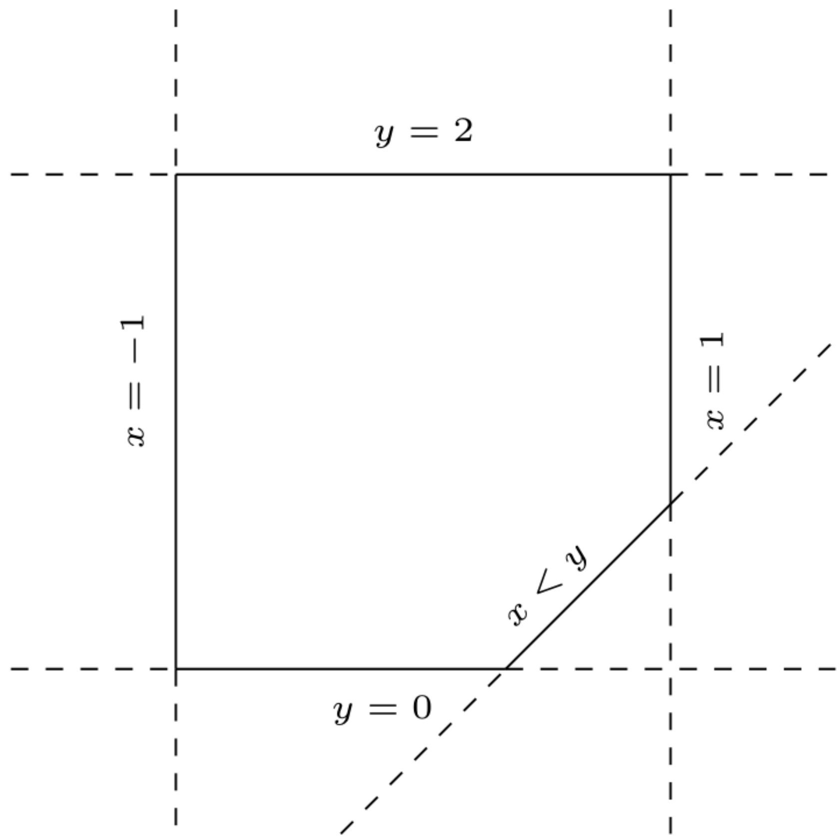
Pentagons

- Let i be the set of interval and s be the set of SUB constraints over n variables, then a Pentagon is the conjunction of all the constraints in i and s represented as a tuple (i,s)



Pentagon Abtsract Domain

- The Pentagon Domain: $\{P^p, \sqsubseteq_p, \sqcup_p, \sqcap_p, \perp_p, \top_p\}$
- $(i, s) = \perp_p \iff (i = \perp_i) \vee (s = \perp_s)$
- P is the set of all Pentagons, $P^p = P \cup \{\perp_p\}$
- $(i, s) = \top_p \iff (i = \top_i) \wedge (s = \top_s)$

Pentagon Abstract Domain

- $(i_1, s_1) \sqsubseteq_p (i_2, s_2) \iff (i_1 \sqsubseteq_i i_2) \land (\forall x, \forall y \in s_2(x)$ s.t. $y \in s_1(x) \lor sup(i_1(x)) \leq inf(i_2(x)))$
- $(i_1, s_1) \sqcup_p (i_2, s_2) = (i_1 \sqcup_i i_2, s' \cup s'' \cup s''')$, where
  - $s' = \forall x. s_1(x) \cap s_2(x)$
  - $s'' = \forall x. \{y \in s_1(x) \mid sup(i_2(x)) < inf(i_2(y))\}$
  - $s''' = \forall x. \{y \in s_2(x) \mid sup(i_1(x)) < inf(i_1(y))\}$
- $(i_1, s_1) \sqcap_p (i_2, s_2) = (i_1 \sqcap_i i_2, s_1 \sqcap_s s_2)$
- $(i_1, s_1) \bigtriangledown_p (i_2, s_2) = (i_1 \bigtriangledown_i i_2, s_1 \bigtriangledown_s s_2)$