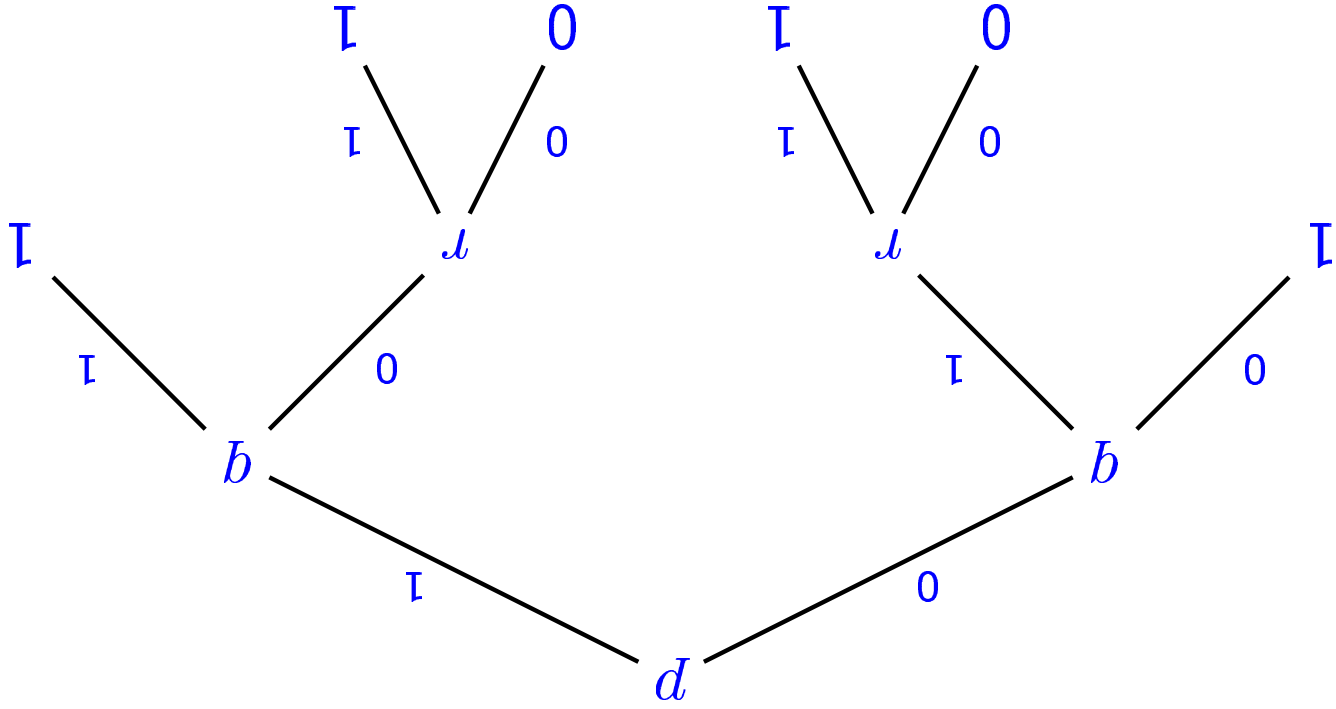


Binary decision tree



A **binary decision tree**, a tree d such that

1. the internal nodes of d are labelled by atoms;
2. the leaves of d are labelled by 0 and 1;
3. every node in d has exactly two successors, and the arcs from the node to the successors are labelled by the boolean values 0 and 1;
4. nodes on every path in d have unique labels, i.e. every two different nodes on the path are labelled by distinct atoms.

```
procedure  $\overline{bdd}(A)$   
   $\overline{\text{input}}$ : propositional formula  $A$   
   $\overline{\text{output}}$ : a binary decision tree  
   $\overline{\text{parameters}}$ : function  $\text{select-atom}$   
begin  
   $A := \text{simplify}(A)$   
  if  $A = \perp$  then  $\overline{\text{return leaf}}(0)$ ;  
  if  $A = \top$  then  $\overline{\text{return leaf}}(1)$ ;  
   $p := \text{select-atom}(A)$   
   $\overline{\text{return tree}}(\overline{bdd}(A_{\perp}^p), p, \overline{bdd}(A_{\top}^p))$   
end
```

Formula corresponding to a BDT

Let b be a BDT. For every node n in b we define inductively a propositional formula F_n as follows.

1. If n is a leaf labelled by 0 (respectively 1), then $F_n \equiv \perp$ (respectively, $F_n \equiv \top$).

2. If n is an internal node labelled by an atom p , then

$$F_n \equiv (\neg p \rightarrow F_{left(n)}) \wedge (p \rightarrow F_{right(n)}).$$

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A **binary decision diagram**, or simply **BDD** is a rooted dag d such that

1. the internal nodes of d are labelled by atoms;
2. the leaves of d are labelled by 0 and 1;
3. every node in d has exactly two successors, and the arcs from the node to the successors are labelled by the boolean values 0 and 1;
4. nodes on every path in d have unique labels, i.e. every two different nodes on the path are labelled by distinct atoms;
5. for every node n , its left and right subdags are distinct;
6. every pair of subdags of d rooted at two different nodes n_1, n_2 are distinct.