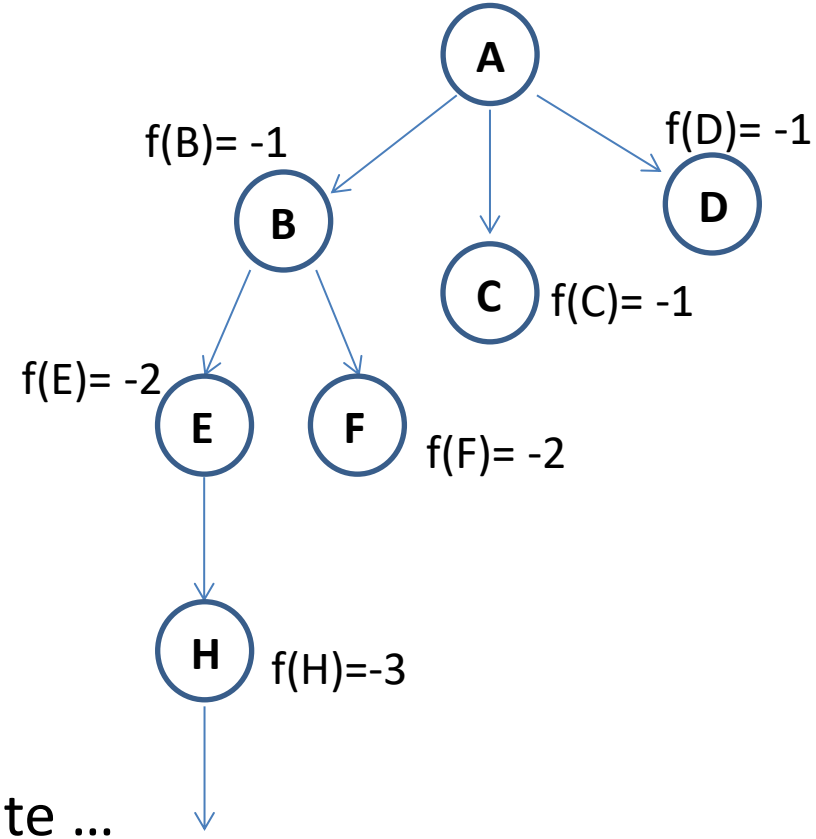
Depth-first tree search

Es un poco diferente …

No hay **CLOSED list** … esa es la razón de que sea un **tree search**
Se mantiene en su lugar una **PATH list** que almacena solo los nodos del camino actual y se eliminan cuando se hace Backtracking

Estrategia: expandir el **nodo más profundo**

Esto se consigue con **f(n)= -level(n)**

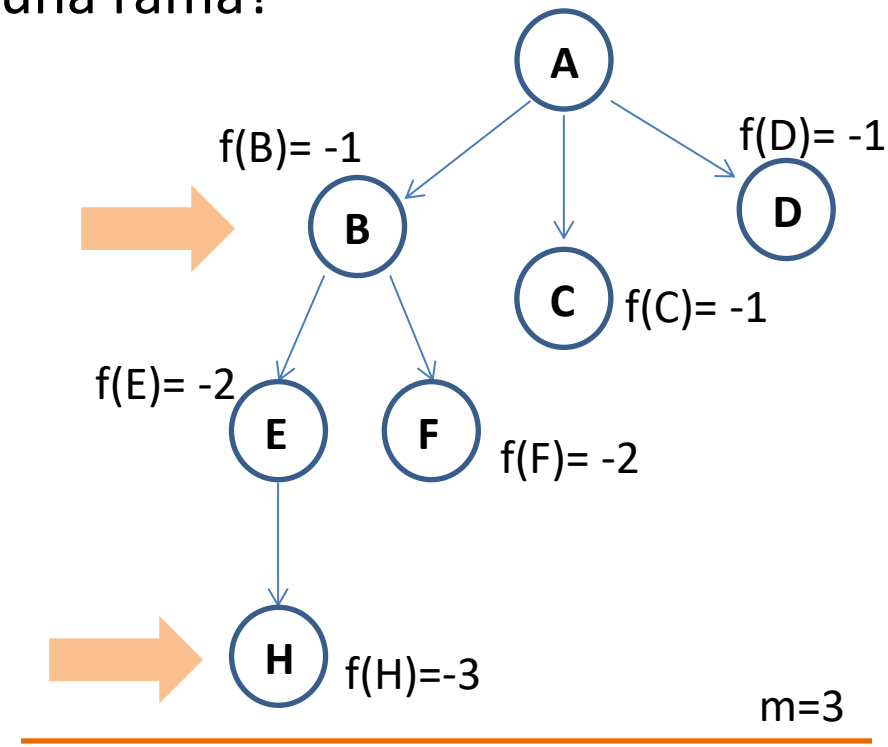


Y podemos continuar indefinidamente …

Depth-first tree search

¿Cuándo parar la expansión de una rama?

Por ejemplo: si H=B entonces H es un nodo repetido



Cuando …

1) El nodo H no tiene hijos
(no hay acciones aplicables)

2) El nodo H es un estado repetido con un nodo de OPEN o PATH

3) Establecemos un máximo límite **m** de profundidad para la expansión del árbol

En cualquiera de estos tres casos aplicamos **BACKTRACKING CRONOLÓGICO**

5. Depth-first tree search

Mantenemos una PATH list que ***almacena los nodos del camino actual***

Asignamos **m=3**

OPEN list ={A}

PATH list ={}

Expandimos el nodo **A**

5. Depth-first tree search

OPEN list ={}

PATH list ={A}

Expandimos **A**
(lo ponemos en PATH)

Si **A** es objetivo => STOP

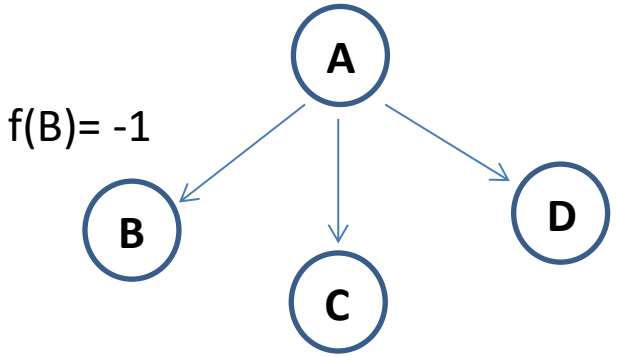
Si **nivel(A) = m** => BACKTRACKING

En cualquier otro caso, generamos los hijos

5. Depth-first tree search

OPEN list ={}

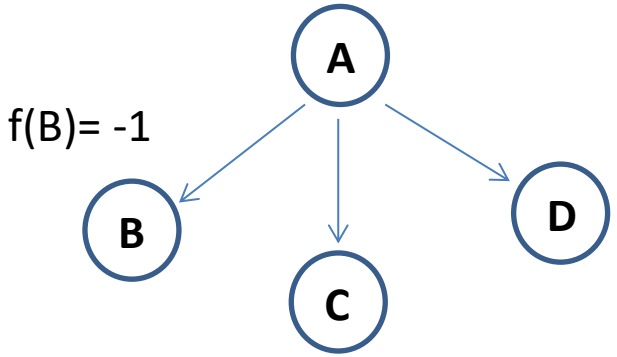
PATH list ={A}



5. Depth-first tree search

OPEN list ={B}

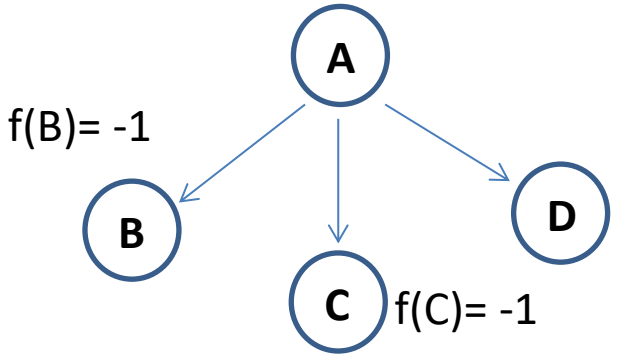
PATH list ={A}



5. Depth-first tree search

OPEN list ={B}

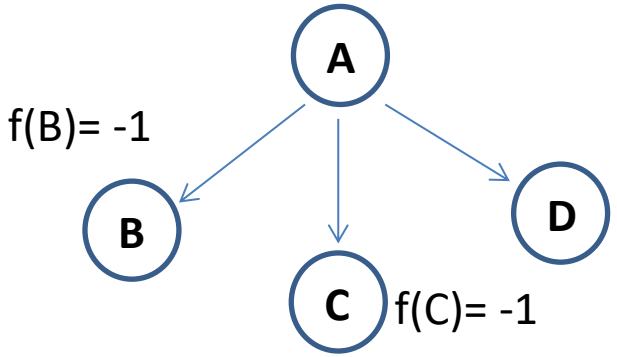
PATH list ={A}



5. Depth-first tree search

OPEN list ={B,C}

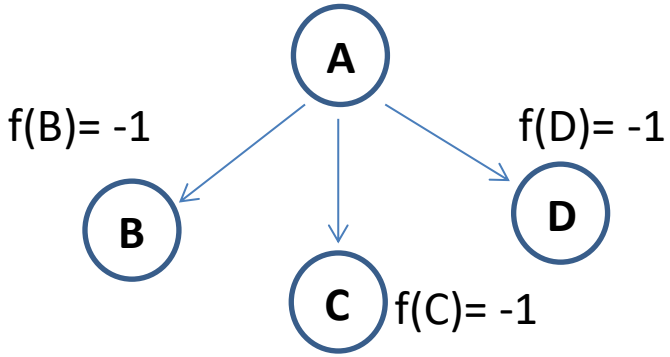
PATH list ={A}



5. Depth-first tree search

OPEN list ={B,C,D}

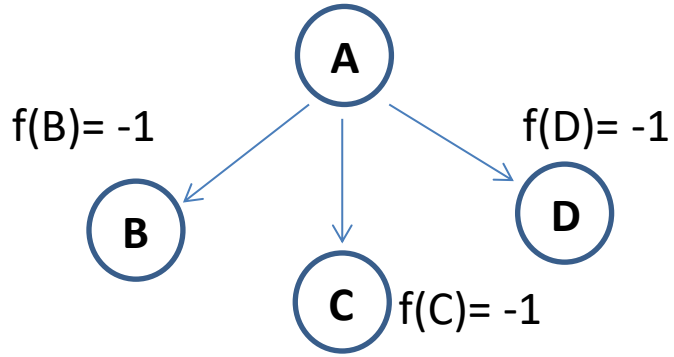
PATH list ={A}



5. Depth-first tree search

OPEN list ={C,D}

PATH list ={A,B}



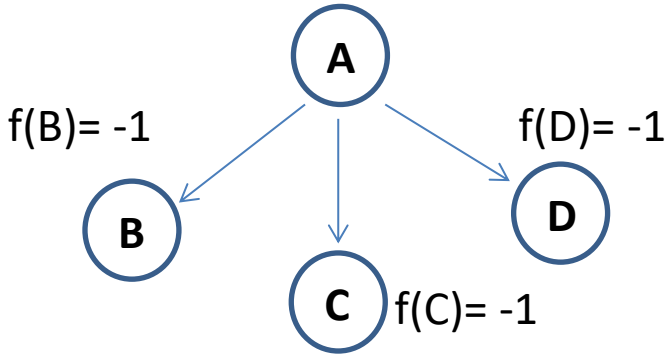
Expandimos **B**
(lo ponemos en PATH)

- Si **B** es objetivo => STOP
- Si **nivel(B) = m** => BACKTRACKING
- En cualquier otro caso, generamos los hijos

5. Depth-first tree search

OPEN list ={C,D}

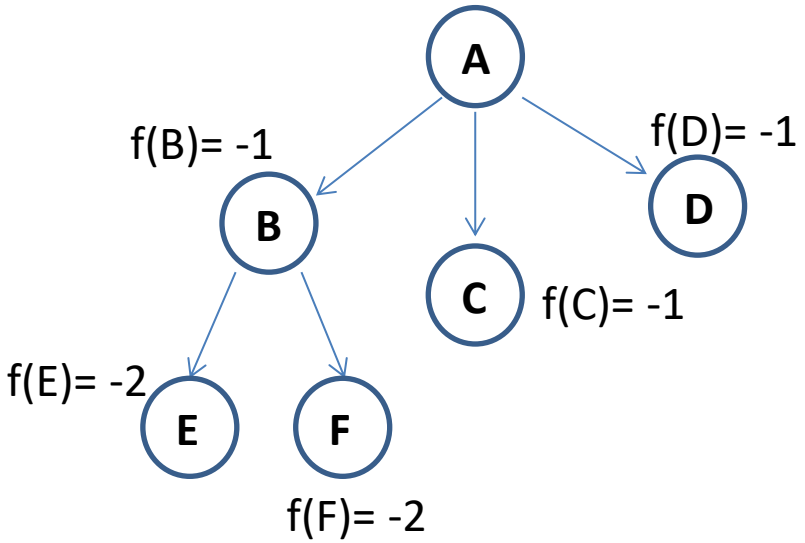
PATH list ={A,B}



5. Depth-first tree search

OPEN list ={E, F, C, D}

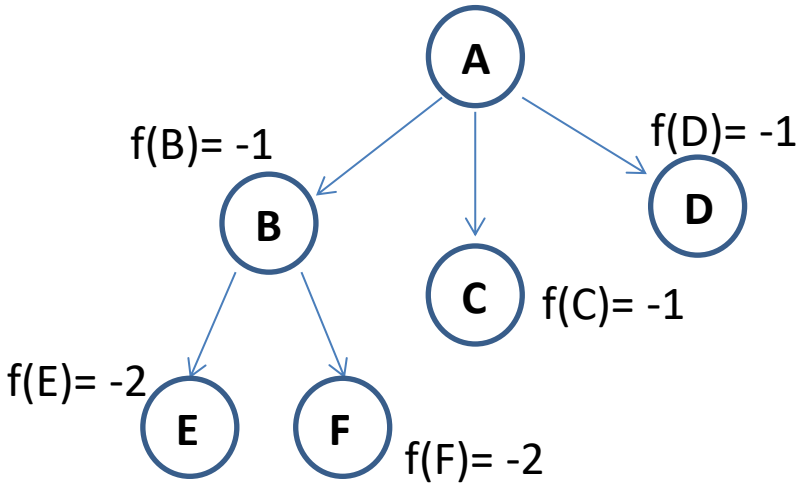
PATH list ={A,B}



5. Depth-first tree search

OPEN list ={F, C, D}

PATH list ={A,B,E}



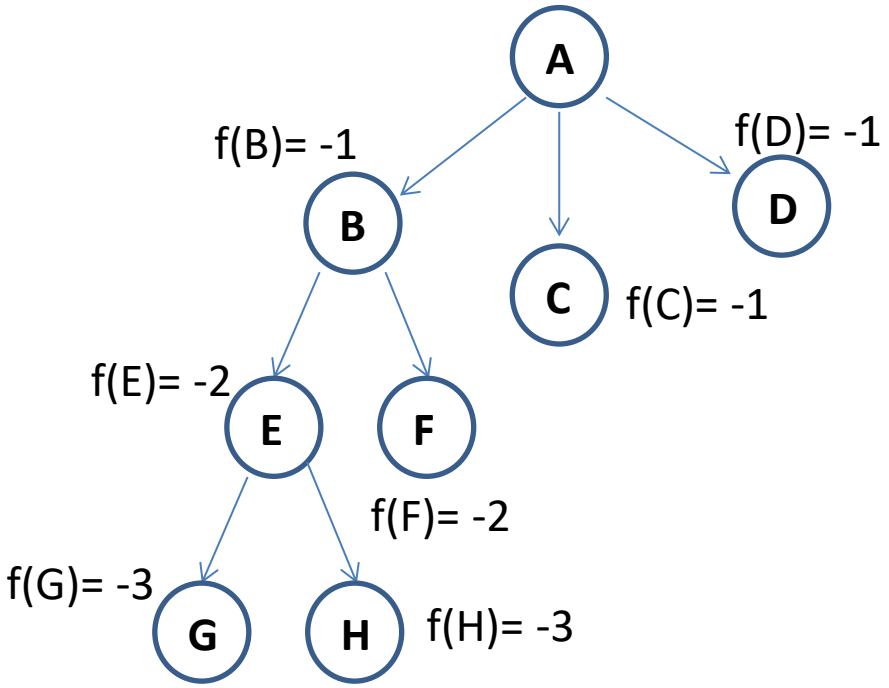
Expandimos **E**
(lo ponemos en PATH)

- Si **E** es objetivo => STOP
- Si **nivel(E) = m** => BACKTRACKING
- En cualquier otro caso, generamos los hijos

5. Depth-first tree search

OPEN list ={G, H, F, C, D}

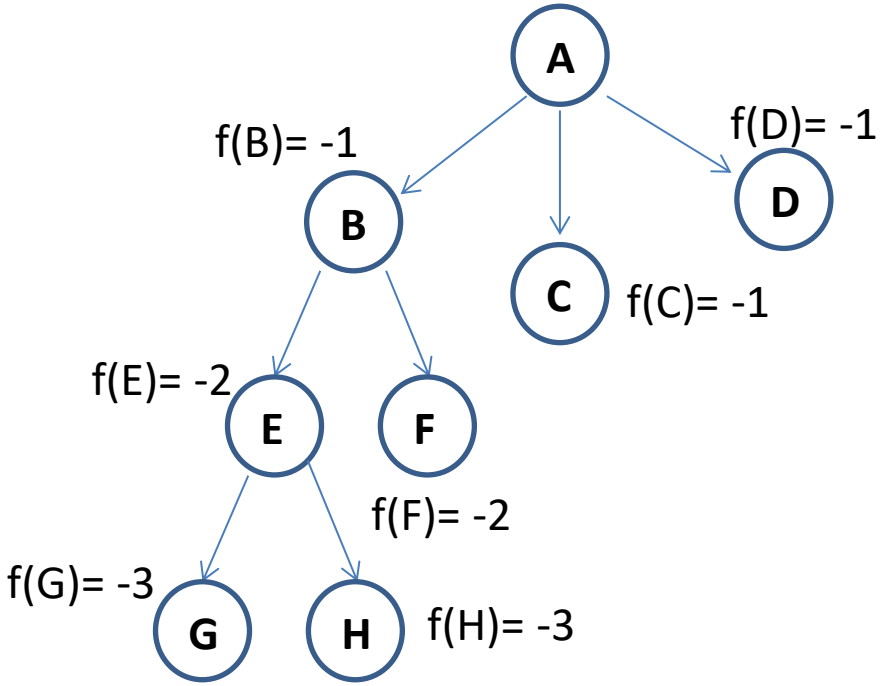
PATH list ={A,B,E}



5. Depth-first tree search

OPEN list ={H, F, C, D}

PATH list ={A,B,E,G}



Si **G** es objetivo => STOP

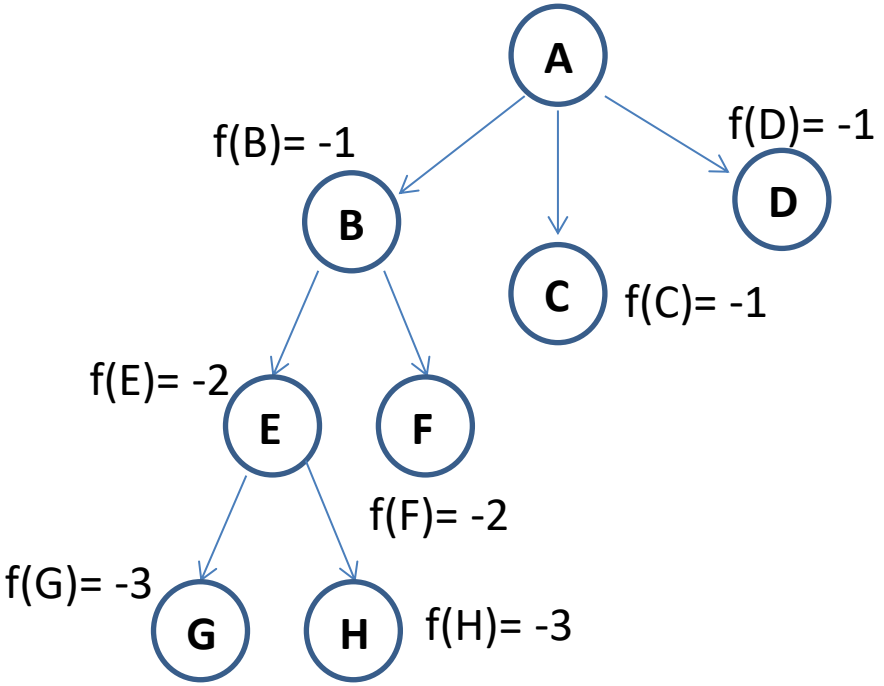
Expandimos **G**
(lo ponemos en PATH)

Si **nivel(G) = m** => BACKTRACKING

5. Depth-first tree search

OPEN list ={H, F, C, D}

PATH list ={A,B,E,G}



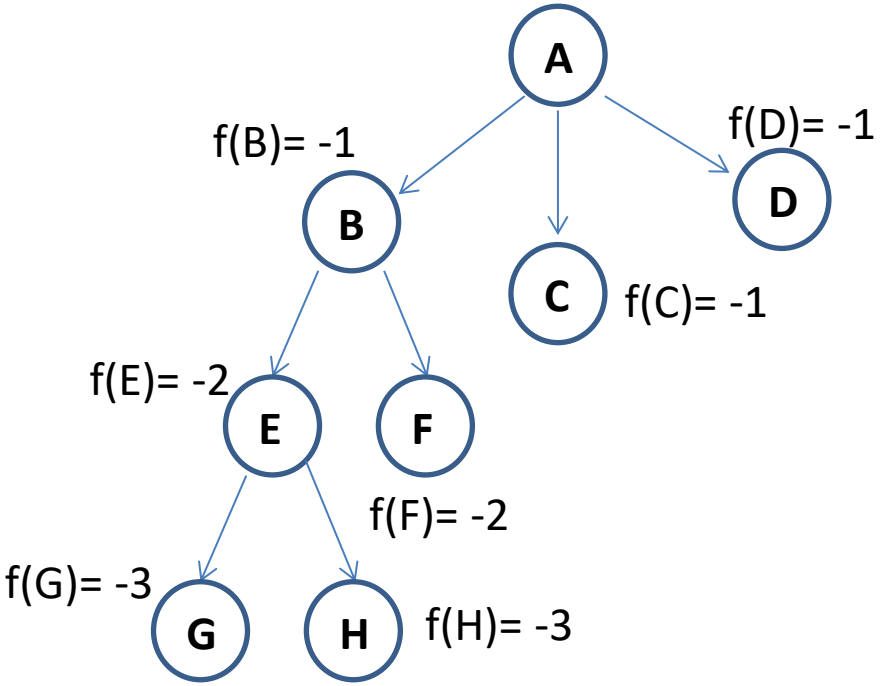
BACKTRACKING (n):

1. Eliminar **n** de la lista PATH
2. Si parent(n) tiene más hijos en OPEN => seleccionar el siguiente hijo de OPEN list
3. Si parent(n) no tiene más hijos en OPEN => BACKTRACKING (parent(n))

5. Depth-first tree search

OPEN list ={H, F, C, D}

PATH list ={A,B,E,G}

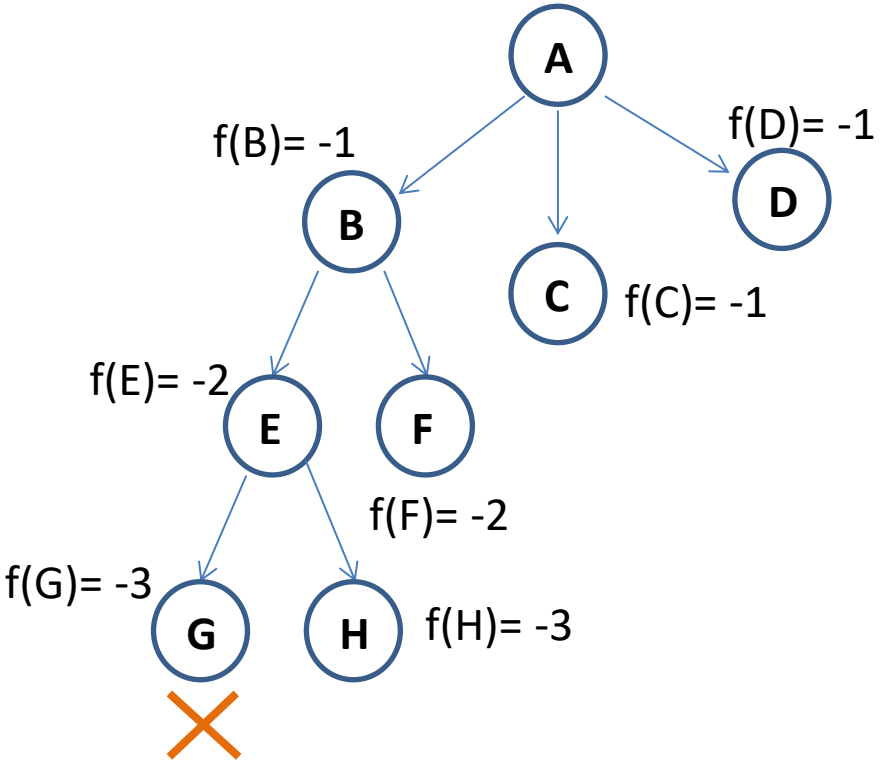


Backtracking (G)

5. Depth-first tree search

OPEN list ={H, F, C, D}

PATH list ={A,B,E}



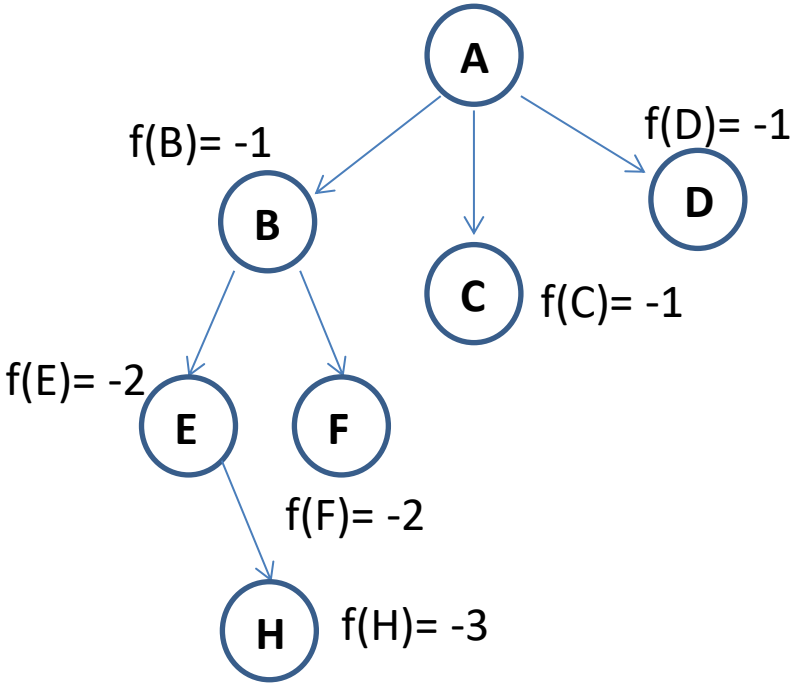
Backtracking (G) → Eliminar G de PATH

Backtracking (G) → Seleccionar el siguiente nodo de OPEN

Depth-first tree search

OPEN list ={F, C, D}

PATH list ={A,B,E,H}



Expandimos el nodo **H**
(lo ponemos en PATH)

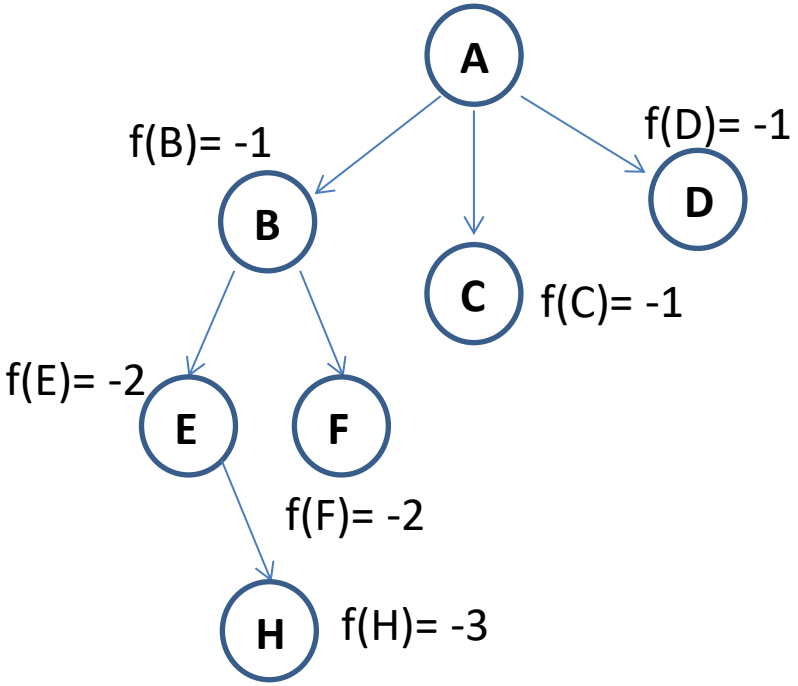
Si **H** es objetivo => STOP

Si **nivel(H) = m** => **BACKTRACKING**

5. Depth-first tree search

OPEN list ={F, C, D}

PATH list ={A,B,E,H}

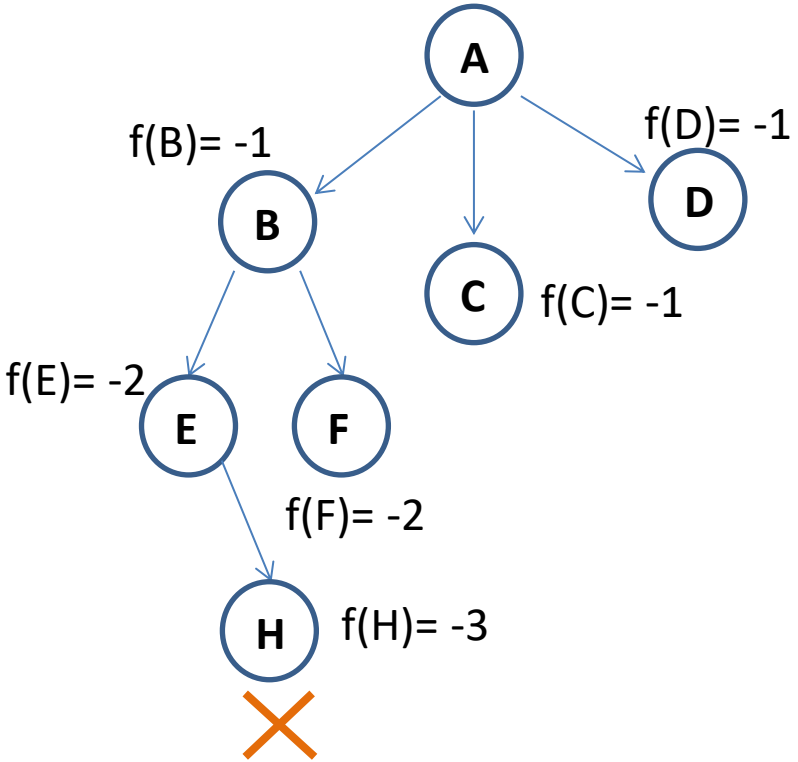


Backtracking (H)

5. Depth-first tree search

OPEN list ={F, C, D}

PATH list ={A,B,E}



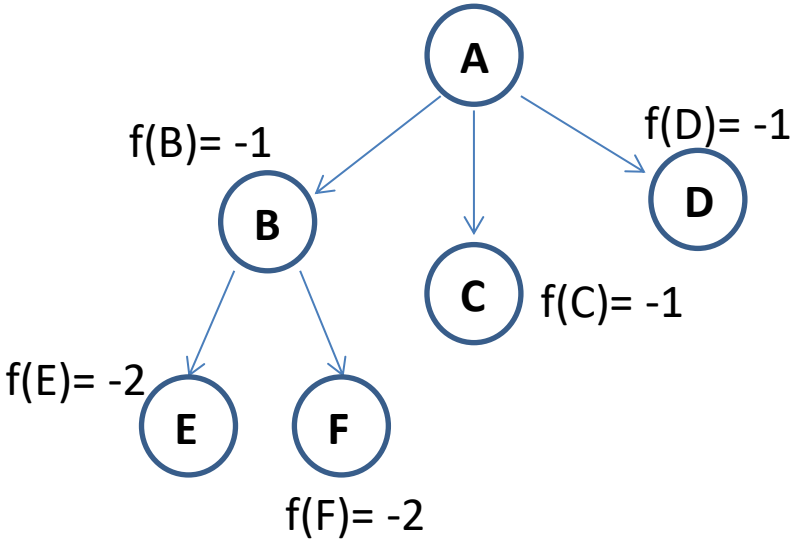
Backtracking (H) → Eliminamos H de PATH

Backtracking (H) → Backtracking (E)

5. Depth-first tree search

OPEN list ={F, C, D}

PATH list ={A,B,E}

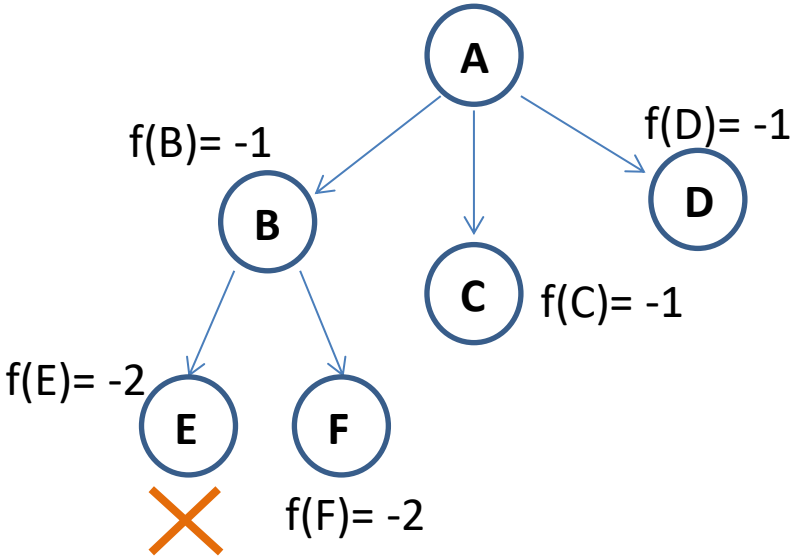


Backtracking (E)

5. Depth-first tree search

OPEN list ={F, C, D}

PATH list ={A,B}



Backtracking (E)

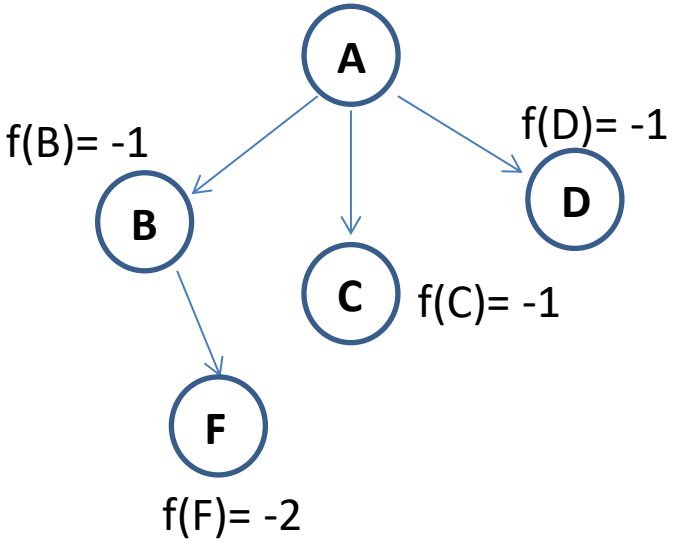
→ Eliminamos E de PATH

→ Seleccionamos el siguiente nodo de OPEN → nodo F

5. Depth-first tree search

OPEN list ={C, D}

PATH list ={A,B,F}



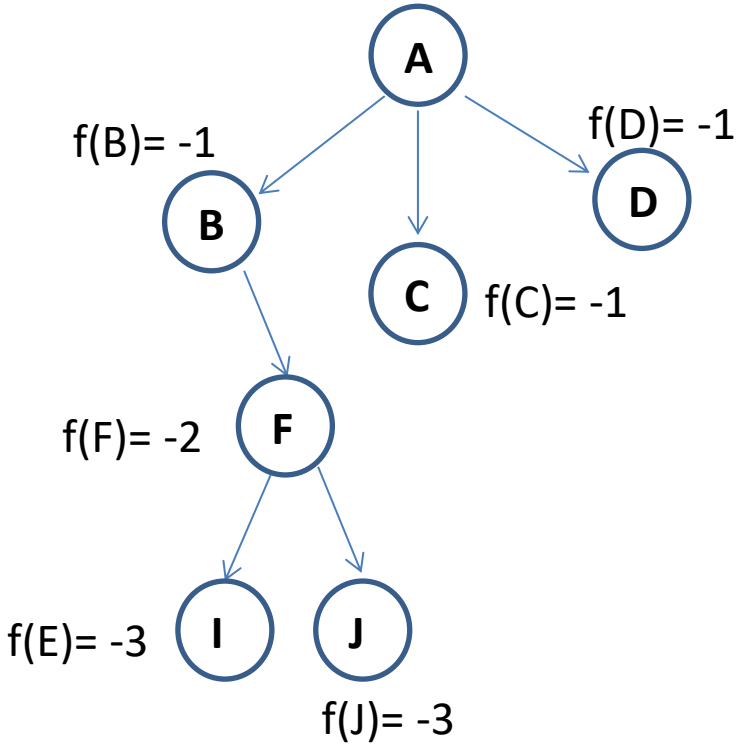
Expandimos **F**
(lo ponemos en PATH)

- Si **F** es objetivo => STOP
- Si **nivel(F) = m** => BACKTRACKING
- En cualquier otro caso, generamos los hijos

Depth-first tree search

OPEN list ={I, J, C, D}

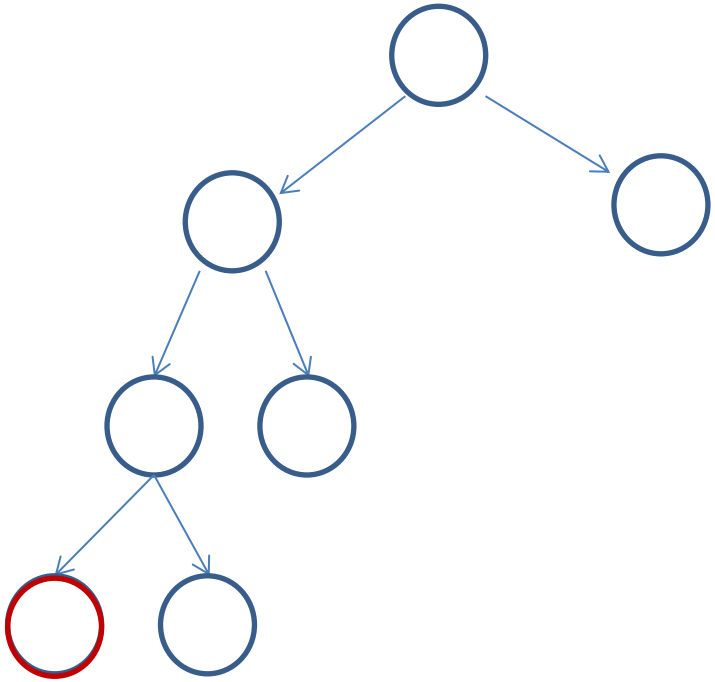
PATH list ={A,B,F}



Depth-first tree search

Espacio lineal!!

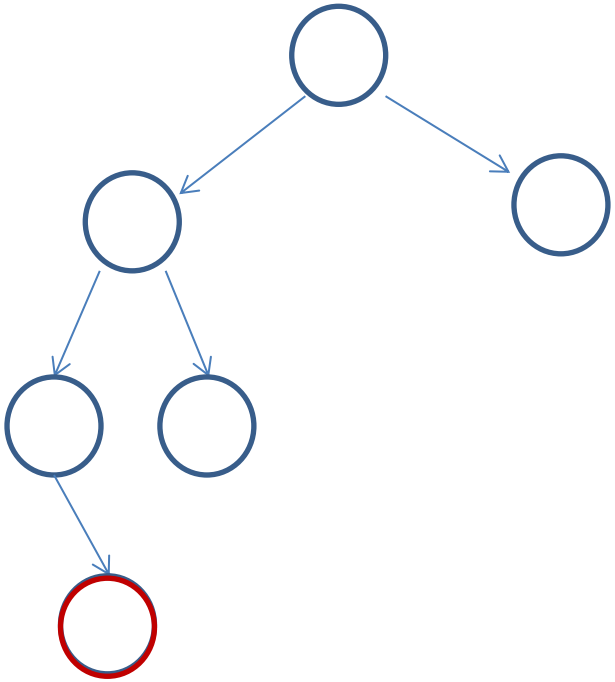
$O(b \cdot m)$



Depth-first tree search

Espacio lineal!!

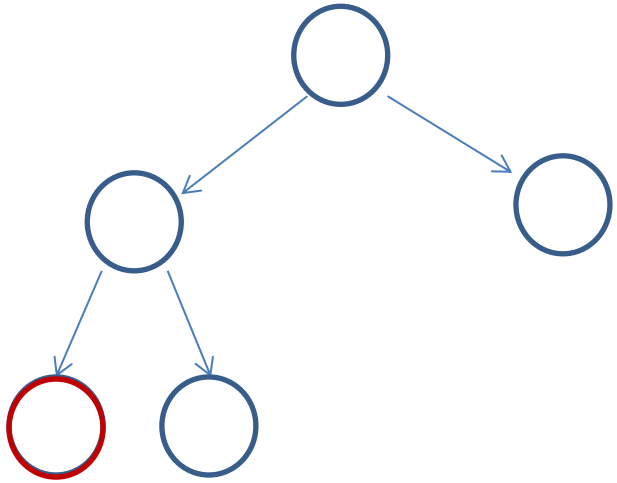
$O(b \cdot m)$



Depth-first tree search

Espacio lineal!!

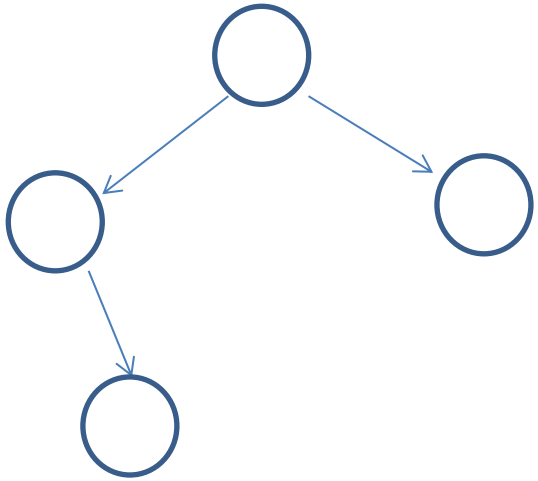
$O(b \cdot m)$



Depth-first tree search

Espacio lineal!!

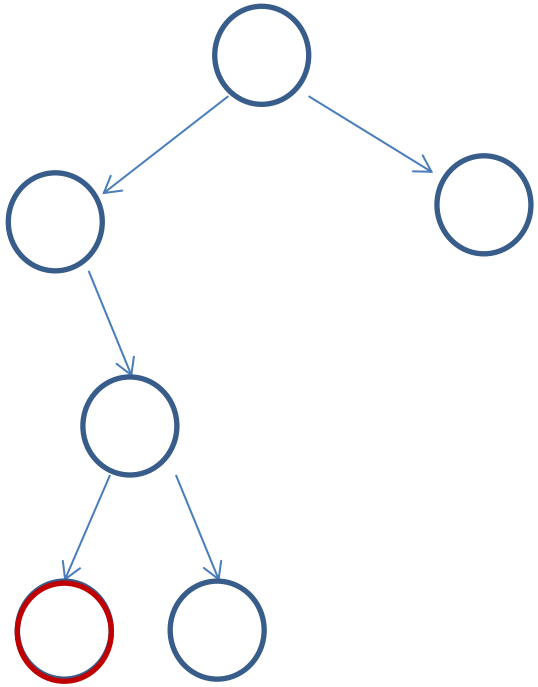
$O(b \cdot m)$



Depth-first tree search

Espacio lineal!!

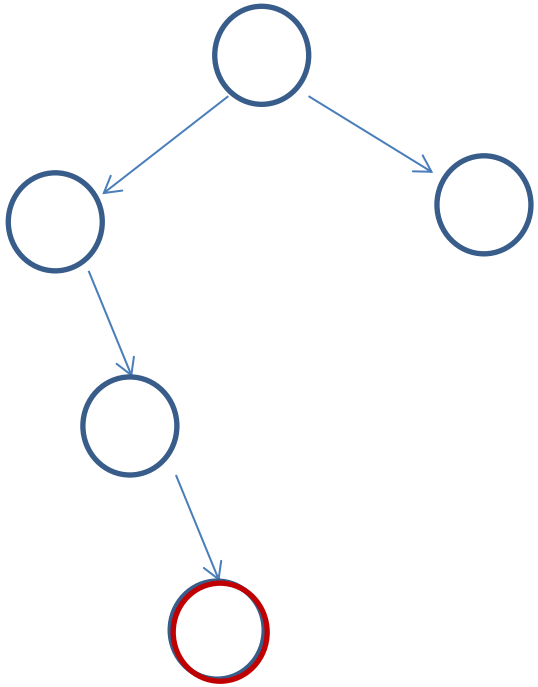
$O(b \cdot m)$



Depth-first tree search

Espacio lineal!!

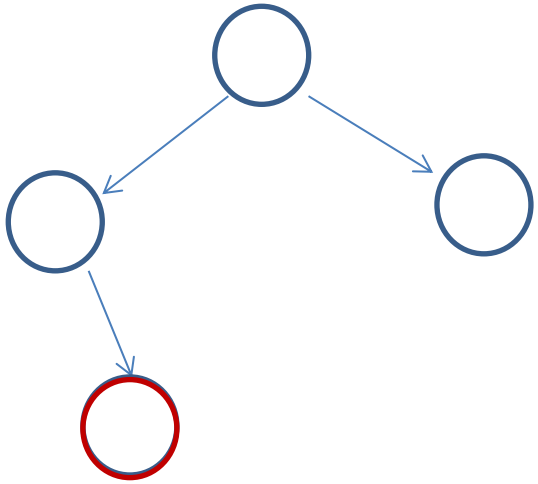
$O(b \cdot m)$



Depth-first tree search

Espacio lineal!!

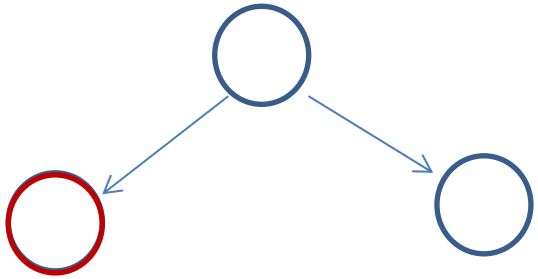
$O(b \cdot m)$



Depth-first tree search

Espacio lineal!!

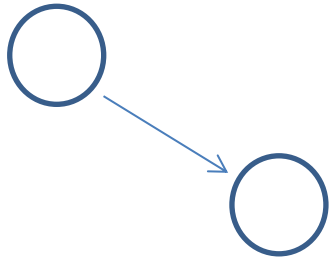
$O(b \cdot m)$



Depth-first tree search

Espacio lineal!!

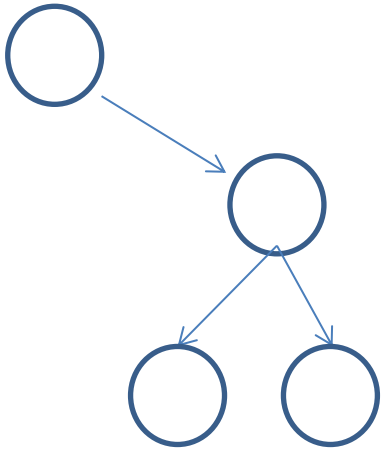
$O(b \cdot m)$



Depth-first tree search

Espacio lineal!!

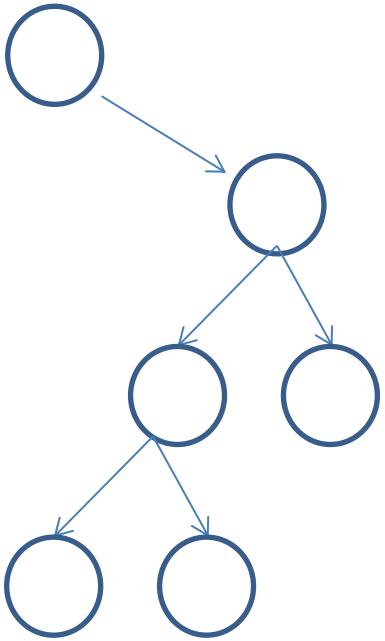
$O(b \cdot m)$



Depth-first tree search

Espacio lineal!!

$O(b \cdot m)$



Depth-first tree search

Espacio lineal!!

$O(b \cdot m)$