

The algorithm can be implemented using a stack data structure. Each entry has the following attributes.

- ID
- Place
- Type
- Processed
- TrueLabel: Represents the label to jump to, if the expression is evaluated to true.
- FalseLabel: Represents the false label to jump to, if the expression is evaluated to false.
- NextLabel: Represents the label that is the start of the next statement.
- BeginLabel: Represents the beginning of a while loop.
- Code

```
while(a > b){
    while(c > d){
        t = 1 + 3 * e;
        t = 2;
    }
}
t = 3;
```

Stack Progression

ID	Place	Type	Processed	TrueLabel	FalseLabel	NextLabel	BeginLabel	Code
0	a	nd	0	-	-	-	-	-
1	b	nd	0	-	-	-	-	-

Next action: Reduction of “a > b” to “exp”

ID	Place	Type	Processed	TrueLabel	FalseLabel	NextLabel	BeginLabel	Code
0	a	nd	1	-	-	-	-	-
1	b	nd	1	-	-	-	-	-
2	a > b	nd	0	T0	T1	-	-	if(a > b) goto \$2.TrueLabel; goto \$2.FalseLabel;

Next action: Shift exp in rule “while(exp) block”

ID	Place	Type	Processed	TrueLabel	FalseLabel	NextLabel	BeginLabel	Code
0	a	nd	1	-	-	-	-	-
1	b	nd	1	-	-	-	-	-
2	a > b	exp	0	T0	T1	-	-	if(a > b) goto \$2.TrueLabel; goto \$2.FalseLabel;

ID	Place	Type	Processed	TrueLabel	FalseLabel	NextLabel	BeginLabel	Code
0	a	nd	1	-	-	-	-	-
1	b	nd	1	-	-	-	-	-
2	a > b	exp	0	T0	T1	-	-	if(a > b) goto \$2.TrueLabel; goto \$2.FalseLabel;
3	c	nd	1	-	-	-	-	-
4	d	nd	1	-	-	-	-	-
5	c > d	exp	0	T2	T3	-	-	if(c > d) goto \$5.TrueLabel; goto \$5.FalseLabel;

ID	Place	Type	Processed	TrueLabel	FalseLabel	NextLabel	BeginLabel	Code
0	a	nd	1	-	-	-	-	-
1	b	nd	1	-	-	-	-	-
2	a > b	exp	0	T0	T1	-	-	if(a > b) goto \$2.TrueLabel; goto \$2.FalseLabel;
3	c	nd	1	-	-	-	-	-
4	d	nd	1	-	-	-	-	-
5	c > d	exp	0	T2	T3	-	-	if(c > d) goto \$5.TrueLabel; goto \$5.FalseLabel;
6	t	nd	0	-	-	-	-	-
7	1	nd	0	-	-	-	-	-
8	3	nd	0	-	-	-	-	-
9	e	nd	0	-	-	-	-	-

ID	Place	Type	Processed	TrueLabel	FalseLabel	NextLabel	BeginLabel	Code
0	a	nd	1	-	-	-	-	-
1	b	nd	1	-	-	-	-	-
2	a > b	exp	0	T0	T1	-	-	if(a > b) goto \$2.TrueLabel; goto \$2.FalseLabel;
3	c	nd	1	-	-	-	-	-
4	d	nd	1	-	-	-	-	-
5	c > d	exp	0	T2	T3	-	-	if(c > d) goto \$5.TrueLabel; goto \$5.FalseLabel;
6	t	nd	0	-	-	-	-	-
7	1	nd	0	-	-	-	-	-
8	3	nd	1	-	-	-	-	-
9	e	nd	1	-	-	-	-	-
10	T4	nd	0	-	-	-	-	T4 = 3 * e

ID	Place	Type	Processed	TrueLabel	FalseLabel	NextLabel	BeginLabel	Code
0	a	nd	1	-	-	-	-	-
1	b	nd	1	-	-	-	-	-
2	a > b	exp	0	T0	T1	-	-	if(a > b) goto \$2.TrueLabel; goto \$2.FalseLabel;
3	c	nd	1	-	-	-	-	-
4	d	nd	1	-	-	-	-	-
5	c > d	exp	0	T2	T3	-	-	if(c > d) goto \$5.TrueLabel; goto \$5.FalseLabel;
6	t	nd	1	-	-	-	-	-
7	1	nd	1	-	-	-	-	-
8	3	nd	1	-	-	-	-	-
9	e	nd	1	-	-	-	-	-
10	T4	nd	1	-	-	-	-	T4 = 3 * e
11	T5	nd	1	-	-	-	-	T4 = 3 * e T5 = 1 + T4
12	t = T5	nd	0	-	-	-	-	T4 = 3 * e T5 = 1 + T4 t = T5

ID	Place	Type	Processed	TrueLabel	FalseLabel	NextLabel	BeginLabel	Code
0	a	nd	1	-	-	-	-	-
1	b	nd	1	-	-	-	-	-
2	a > b	exp	0	T0	T1	-	-	if(a > b) goto \$2.TrueLabel; goto \$2.FalseLabel;
3	c	nd	1	-	-	-	-	-
4	d	nd	1	-	-	-	-	-
5	c > d	exp	0	T2	T3	-	-	if(c > d) goto \$5.TrueLabel; goto \$5.FalseLabel;
6	t	nd	1	-	-	-	-	-
7	1	nd	1	-	-	-	-	-
8	3	nd	1	-	-	-	-	-
9	e	nd	1	-	-	-	-	-
10	T4	nd	1	-	-	-	-	T4 = 3 * e
11	T5	nd	1	-	-	-	-	T4 = 3 * e T5 = 1 + T4
12	t = T5	nd	0	-	-	-	-	T4 = 3 * e T5 = 1 + T4 t = T5
13	t	nd	1	-	-	-	-	-
14	2	nd	1	-	-	-	-	-
15	t = 2	nd	0	-	-	-	-	t = 2

ID	Place	Type	Processed	TrueLabel	FalseLabel	NextLabel	BeginLabel	Code
0	a	nd	1	-	-	-	-	-
1	b	nd	1	-	-	-	-	-
2	a > b	exp	0	T0	T1	-	-	if(a > b) goto \$2.TrueLabel; goto \$2.FalseLabel;
3	c	nd	1	-	-	-	-	-
4	d	nd	1	-	-	-	-	-
5	c > d	exp	0	T2	T3	-	-	if(c > d) goto \$5.TrueLabel; goto \$5.FalseLabel;
6	t	nd	1	-	-	-	-	-
7	1	nd	1	-	-	-	-	-
8	3	nd	1	-	-	-	-	-
9	e	nd	1	-	-	-	-	-
10	T4	nd	1	-	-	-	-	T4 = 3 * e;
11	T5	nd	1	-	-	-	-	T4 = 3 * e; T5 = 1 + T4;
12	t = T5	nd	1	-	-	-	-	T4 = 3 * e; T5 = 1 + T4; t = T5;
13	t	nd	1	-	-	-	-	-
14	2	nd	1	-	-	-	-	-
15	t = 2	nd	1	-	-	-	-	t = 2;
16	s1	block	0	-	-	T6	-	T4 = 3 * e; T5 = 1 + T4; t = T5; t = 2;

ID	Place	Type	Processed	TrueLabel	FalseLabel	NextLabel	BeginLabel	Code
0	a	nd	1	-	-	-	-	-
1	b	nd	1	-	-	-	-	-
2	a > b	exp	0	T0	T1	-	-	if(a > b) goto \$2.TrueLabel; goto \$2.FalseLabel;
3	c	nd	1	-	-	-	-	-
4	d	nd	1	-	-	-	-	-
5	c > d	exp	1	L1	T6	-	-	if(c > d) goto \$5.TrueLabel; goto \$5.FalseLabel;
6	t	nd	1	-	-	-	-	-
7	1	nd	1	-	-	-	-	-
8	3	nd	1	-	-	-	-	-
9	e	nd	1	-	-	-	-	-
10	T4	nd	1	-	-	-	-	T4 = 3 * e;
11	T5	nd	1	-	-	-	-	T4 = 3 * e; T5 = 1 + T4;
12	t = T5	nd	1	-	-	-	-	T4 = 3 * e; T5 = 1 + T4; t = T5;
13	t	nd	1	-	-	-	-	-
14	2	nd	1	-	-	-	-	-
15	t = 2	nd	1	-	-	-	-	t = 2;
16	s1	block	1	-	-	-	-	T4 = 3 * e; T5 = 1 + T4; t = T5; t = 2;
17	while1	nd	0	-	-	T6	L0	\$17.BeginLabel : if(c > d) goto \$5.TrueLabel; goto \$5.FalseLabel; \$5.TrueLabel : T4 = 3 * e; T5 = 1 + T4; t = T5; t = 2; goto \$17.BeginLabel;

ID	Place	Type	Processed	TrueLabel	FalseLabel	NextLabel	BeginLabel	Code
0	a	nd	1	-	-	-	-	-
1	b	nd	1	-	-	-	-	-
2	a > b	exp	0	T0	T1	-	-	if(a > b) goto \$2.TrueLabel; goto \$2.FalseLabel;
3	c	nd	1	-	-	-	-	-
4	d	nd	1	-	-	-	-	-
5	c > d	exp	1	L1	T6	-	-	if(c > d) goto \$5.TrueLabel; goto \$5.FalseLabel;
6	t	nd	1	-	-	-	-	-
7	1	nd	1	-	-	-	-	-
8	3	nd	1	-	-	-	-	-
9	e	nd	1	-	-	-	-	-
10	T4	nd	1	-	-	-	-	T4 = 3 * e;
11	T5	nd	1	-	-	-	-	T4 = 3 * e; T5 = 1 + T4;
12	t = T5	nd	1	-	-	-	-	T4 = 3 * e; T5 = 1 + T4; t = T5;
13	t	nd	1	-	-	-	-	-
14	2	nd	1	-	-	-	-	-
15	t = 2	nd	1	-	-	-	-	t = 2;
16	s1	block	1	-	-	-	-	T4 = 3 * e; T5 = 1 + T4; t = T5; t = 2;
17	while1	nd	1	-	-	T6	L0	\$17.BeginLabel : if(c > d) goto \$5.TrueLabel; goto \$5.FalseLabel; \$5.TrueLabel : T4 = 3 * e; T5 = 1 + T4; t = T5; t = 2; goto \$17.BeginLabel;
18	s2	block	0	-	-	T6	-	\$17.BeginLabel : if(c > d) goto \$5.TrueLabel; goto \$5.FalseLabel; \$5.TrueLabel : T4 = 3 * e; T5 = 1 + T4; t = T5; t = 2; goto \$17.BeginLabel;

ID	Place	Type	Processed	TrueLabel	FalseLabel	NextLabel	BeginLabel	Code
0	a	nd	1	-	-	-	-	-
1	b	nd	1	-	-	-	-	-
2	a > b	exp	1	L3	T7	-	-	if(a > b) goto \$2.TrueLabel; goto \$2.FalseLabel;
3	c	nd	1	-	-	-	-	-
4	d	nd	1	-	-	-	-	-
5	c > d	exp	1	L1	T6	-	-	if(c > d) goto \$5.TrueLabel; goto \$5.FalseLabel;
6	t	nd	1	-	-	-	-	-
7	1	nd	1	-	-	-	-	-
8	3	nd	1	-	-	-	-	-
9	e	nd	1	-	-	-	-	-
10	T4	nd	1	-	-	-	-	T4 = 3 * e;
11	T5	nd	1	-	-	-	-	T4 = 3 * e; T5 = 1 + T4;
12	t = T5	nd	1	-	-	-	-	T4 = 3 * e; T5 = 1 + T4; t = T5;
13	t	nd	1	-	-	-	-	-
14	2	nd	1	-	-	-	-	-
15	t = 2	nd	1	-	-	-	-	t = 2;
16	s1	block	1	-	-	-	-	T4 = 3 * e; T5 = 1 + T4; t = T5; t = 2;
17	while1	nd	1	-	-	T6	L0	\$17.BeginLabel : if(c > d) goto \$5.TrueLabel; goto \$5.FalseLabel; \$5.TrueLabel : T4 = 3 * e; T5 = 1 + T4; t = T5; t = 2; goto \$17.BeginLabel;
18	s2	block	1	-	-	T6	-	\$17.BeginLabel : if(c > d) goto \$5.TrueLabel; goto \$5.FalseLabel; \$5.TrueLabel : T4 = 3 * e; T5 = 1 + T4; t = T5; t = 2; goto \$17.BeginLabel;
19	while2	nd	0	-	-	T7	L2	\$19.BeginLabel : if(a > b) goto \$2.TrueLabel; goto \$2.FalseLabel; \$2.TrueLabel : \$17.BeginLabel : if(c > d) goto \$5.TrueLabel; goto \$5.FalseLabel; \$5.TrueLabel : T4 = 3 * e; T5 = 1 + T4; t = T5; t = 2; goto \$17.BeginLabel; \$18.NextLabel : goto \$19.BeginLabel;

ID	Place	Type	Processed	TrueLabel	FalseLabel	NextLabel	BeginLabel	Code
0	a	nd	1	-	-	-	-	-
1	b	nd	1	-	-	-	-	-
2	a > b	exp	1	L3	T7	-	-	if(a > b) goto \$2.TrueLabel; goto \$2.FalseLabel;
3	c	nd	1	-	-	-	-	-
4	d	nd	1	-	-	-	-	-
5	c > d	exp	1	L1	T6	-	-	if(c > d) goto \$5.TrueLabel; goto \$5.FalseLabel;
6	t	nd	1	-	-	-	-	-
7	1	nd	1	-	-	-	-	-
8	3	nd	1	-	-	-	-	-
9	e	nd	1	-	-	-	-	-
10	T4	nd	1	-	-	-	-	T4 = 3 * e;
11	T5	nd	1	-	-	-	-	T4 = 3 * e; T5 = 1 + T4;
12	t = T5	nd	1	-	-	-	-	T4 = 3 * e; T5 = 1 + T4; t = T5;
13	t	nd	1	-	-	-	-	-
14	2	nd	1	-	-	-	-	-
15	t = 2	nd	1	-	-	-	-	t = 2;
16	s1	block	1	-	-	-	-	T4 = 3 * e; T5 = 1 + T4; t = T5; t = 2;
17	while1	nd	1	-	-	T6	L0	\$17.BeginLabel : if(c > d) goto \$5.TrueLabel; goto \$5.FalseLabel; \$5.TrueLabel : T4 = 3 * e; T5 = 1 + T4; t = T5; t = 2; goto \$17.BeginLabel;
18	s2	block	1	-	-	T6	-	\$17.BeginLabel : if(c > d) goto \$5.TrueLabel; goto \$5.FalseLabel; \$5.TrueLabel : T4 = 3 * e; T5 = 1 + T4; t = T5; t = 2; goto \$17.BeginLabel;
19	while2	nd	0	-	-	T7	L2	\$19.BeginLabel : if(a > b) goto \$2.TrueLabel; goto \$2.FalseLabel; \$2.TrueLabel : \$17.BeginLabel : if(c > d) goto \$5.TrueLabel; goto \$5.FalseLabel; \$5.TrueLabel : T4 = 3 * e; T5 = 1 + T4; t = T5; t = 2; goto \$17.BeginLabel; \$18.NextLabel : goto \$19.BeginLabel;
20	t	nd	1	-	-	-	-	-
21	3	nd	1	-	-	-	-	-
22	t = 3	nd	0	-	-	-	-	t = 3;

ID	Place	Type	Processed	TrueLabel	FalseLabel	NextLabel	BeginLabel	Code
0	a	nd	1	-	-	-	-	-
1	b	nd	1	-	-	-	-	-
2	a > b	exp	1	L3	T7	-	-	if(a > b) goto \$2.TrueLabel; goto \$2.FalseLabel;
3	c	nd	1	-	-	-	-	-
4	d	nd	1	-	-	-	-	-
5	c > d	exp	1	L1	T6	-	-	if(c > d) goto \$5.TrueLabel; goto \$5.FalseLabel;
6	t	nd	1	-	-	-	-	-
7	1	nd	1	-	-	-	-	-
8	3	nd	1	-	-	-	-	-
9	e	nd	1	-	-	-	-	-
10	T4	nd	1	-	-	-	-	T4 = 3 * e;
11	T5	nd	1	-	-	-	-	T4 = 3 * e; T5 = 1 + T4;
12	t = T5	nd	1	-	-	-	-	T4 = 3 * e; T5 = 1 + T4; t = T5;
13	t	nd	1	-	-	-	-	-
14	2	nd	1	-	-	-	-	-
15	t = 2	nd	1	-	-	-	-	t = 2;
16	s1	block	1	-	-	-	-	T4 = 3 * e; T5 = 1 + T4; t = T5; t = 2;
17	while1	nd	1	-	-	T6	L0	\$17.BeginLabel : if(c > d) goto \$5.TrueLabel; goto \$5.FalseLabel; \$5.TrueLabel : T4 = 3 * e; T5 = 1 + T4; t = T5; t = 2; goto \$17.BeginLabel;
18	s2	block	1	-	-	T6	-	\$17.BeginLabel : if(c > d) goto \$5.TrueLabel; goto \$5.FalseLabel; \$5.TrueLabel : T4 = 3 * e; T5 = 1 + T4; t = T5; t = 2; goto \$17.BeginLabel;
19	while2	nd	1	-	-	T7	L2	\$19.BeginLabel : if(a > b) goto \$2.TrueLabel; goto \$2.FalseLabel; \$2.TrueLabel : \$17.BeginLabel : if(c > d) goto \$5.TrueLabel; goto \$5.FalseLabel; \$5.TrueLabel : T4 = 3 * e; T5 = 1 + T4; t = T5; t = 2; goto \$17.BeginLabel; \$18.NextLabel : goto \$19.BeginLabel;
20	t	nd	1	-	-	-	-	-
21	3	nd	1	-	-	-	-	-
22	t = 3	nd	1	-	-	-	-	t = 3;
23	Program	Program	0	-	-	-	-	\$19.BeginLabel : if(a > b) goto \$2.TrueLabel; goto \$2.FalseLabel; \$2.TrueLabel : \$17.BeginLabel : if(c > d) goto \$5.TrueLabel; goto \$5.FalseLabel; \$5.TrueLabel : T4 = 3 * e; T5 = 1 + T4; t = T5; t = 2; goto \$17.BeginLabel; \$18.NextLabel : goto \$19.BeginLabel; \$19.NextLabel : t = 3

ID	Place	Type	Processed	TrueLabel	FalseLabel	NextLabel	BeginLabel	Code
0	a	nd	1	-	-	-	-	-
1	b	nd	1	-	-	-	-	-
2	a > b	exp	1	L3	L4	-	-	if(a > b) goto \$2.TrueLabel; goto \$2.FalseLabel;
3	c	nd	1	-	-	-	-	-
4	d	nd	1	-	-	-	-	-
5	c > d	exp	1	L1	L5	-	-	if(c > d) goto \$5.TrueLabel; goto \$5.FalseLabel;
6	t	nd	1	-	-	-	-	-
7	1	nd	1	-	-	-	-	-
8	3	nd	1	-	-	-	-	-
9	e	nd	1	-	-	-	-	-
10	T4	nd	1	-	-	-	-	T4 = 3 * e;
11	T5	nd	1	-	-	-	-	T4 = 3 * e; T5 = 1 + T4;
12	t = T5	nd	1	-	-	-	-	T4 = 3 * e; T5 = 1 + T4; t = T5;
13	t	nd	1	-	-	-	-	-
14	2	nd	1	-	-	-	-	-
15	t = 2	nd	1	-	-	-	-	t = 2;
16	s1	block	1	-	-	-	-	T4 = 3 * e; T5 = 1 + T4; t = T5; t = 2;
17	while1	nd	1	-	-	L5	L0	\$17.BeginLabel : if(c > d) goto \$5.TrueLabel; goto \$5.FalseLabel; \$5.TrueLabel : T4 = 3 * e; T5 = 1 + T4; t = T5; t = 2; goto \$17.BeginLabel;
18	s2	block	1	-	-	L5	-	\$17.BeginLabel : if(c > d) goto \$5.TrueLabel; goto \$5.FalseLabel; \$5.TrueLabel : T4 = 3 * e; T5 = 1 + T4; t = T5; t = 2; goto \$17.BeginLabel;
19	while2	nd	1	-	-	L4	L2	\$19.BeginLabel : if(a > b) goto \$2.TrueLabel; goto \$2.FalseLabel; \$2.TrueLabel : \$17.BeginLabel : if(c > d) goto \$5.TrueLabel; goto \$5.FalseLabel; \$5.TrueLabel : T4 = 3 * e; T5 = 1 + T4; t = T5; t = 2; goto \$17.BeginLabel; \$18.NextLabel : goto \$19.BeginLabel;
20	t	nd	1	-	-	-	-	-
21	3	nd	1	-	-	-	-	-
22	t = 3	nd	1	-	-	-	-	t = 3;
23	Program	Program	0	-	-	-	-	\$19.BeginLabel : if(a > b) goto \$2.TrueLabel; goto \$2.FalseLabel; \$2.TrueLabel : \$17.BeginLabel : if(c > d) goto \$5.TrueLabel; goto \$5.FalseLabel; \$5.TrueLabel : T4 = 3 * e; T5 = 1 + T4; t = T5; t = 2; goto \$17.BeginLabel; \$18.NextLabel : goto \$19.BeginLabel; \$19.NextLabel : t = 3;


```
L2 : if(a > b) goto L3;  
goto L4;  
L3 : L0 : if(c > d) goto L1;  
goto L5;  
L1 : T4 = 3 * e;  
T5 = 1 + T4;  
t = T5;  
t = 2;  
goto L0;  
L5 : goto L2;  
L4 : t = 3;
```