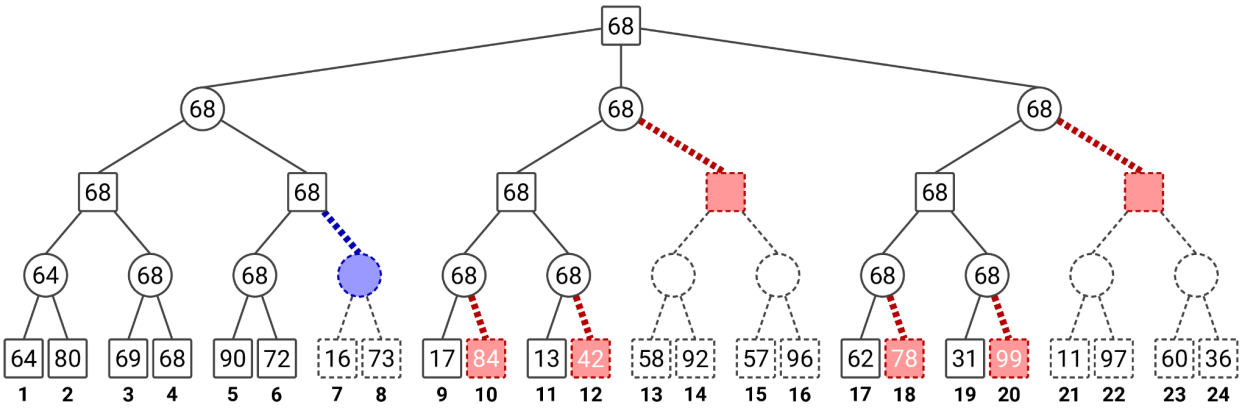
ALPHA-BETA



Alpha-Beta Trace:

Level 1 (Root) is a01, Level 2 is B01, B02, etc.

```
    VISIT         (a01,MAX,-inf,inf)
    VISIT             (b01,MIN,-inf,inf)
    VISIT                 (c01,MAX,-inf,inf)
    VISIT                     (d01,MIN,-inf,inf)
    VISIT                         (e01,MAX,-inf,inf)
    SOLVE LEAF                    (e01,MAX, 64,inf, 64)
    UPDATE BETA               (d01,MIN,-inf, 64)
    VISIT                         (e02,MAX,-inf, 64)
    SOLVE LEAF                    (e02,MAX, 80, 64, 80)
    UPDATE BETA               (d01,MIN,-inf, 64)
    SOLVE                     (d01,MIN,-inf, 64, 64)
    UPDATE ALPHA          (c01,MAX, 64,inf)
    VISIT                     (d02,MIN, 64,inf)
    VISIT                         (e03,MAX, 64,inf)
    SOLVE LEAF                    (e03,MAX, 69,inf, 69)
    UPDATE BETA               (d02,MIN, 64, 69)
    VISIT                         (e04,MAX, 64, 69)
    SOLVE LEAF                    (e04,MAX, 68, 69, 68)
    UPDATE BETA               (d02,MIN, 64, 68)
    SOLVE                     (d02,MIN, 64, 68, 68)
    UPDATE ALPHA          (c01,MAX, 68,inf)
    SOLVE                 (c01,MAX, 68,inf, 68)
    UPDATE BETA       (b01,MIN,-inf, 68)
    VISIT                 (c02,MAX,-inf, 68)
    VISIT                     (d03,MIN,-inf, 68)
    VISIT                         (e05,MAX,-inf, 68)
    SOLVE LEAF                    (e05,MAX, 90, 68, 90)
    UPDATE BETA               (d03,MIN,-inf, 68)
    VISIT                         (e06,MAX,-inf, 68)
```

```
SOLVE LEAF                    (e06,MAX, 72, 68, 72)
UPDATE BETA                (d03,MIN,-inf, 68)
SOLVE                      (d03,MIN,-inf, 68, 68)
UPDATE ALPHA            (c02,MAX, 68, 68)
PRUNE                      (d04,MIN, 68, 68)
SOLVE                   (c02,MAX, 68, 68, 68)
UPDATE BETA         (b01,MIN,-inf, 68)
SOLVE               (b01,MIN,-inf, 68, 68)
UPDATE ALPHA (a01,MAX, 68,inf)
VISIT               (b02,MIN, 68,inf)
VISIT                   (c03,MAX, 68,inf)
VISIT                      (d05,MIN, 68,inf)
VISIT                         (e09,MAX, 68,inf)
SOLVE LEAF                    (e09,MAX, 17,inf, 17)
UPDATE BETA                (d05,MIN, 68, 17)
PRUNE                         (e10,MAX, 68, 17)
SOLVE                      (d05,MIN, 68, 17, 68)
UPDATE ALPHA            (c03,MAX, 68,inf)
VISIT                      (d06,MIN, 68,inf)
VISIT                         (e11,MAX, 68,inf)
SOLVE LEAF                    (e11,MAX, 13,inf, 13)
UPDATE BETA                (d06,MIN, 68, 13)
PRUNE                         (e12,MAX, 68, 13)
SOLVE                      (d06,MIN, 68, 13, 68)
UPDATE ALPHA            (c03,MAX, 68,inf)
SOLVE                   (c03,MAX, 68,inf, 68)
UPDATE BETA         (b02,MIN, 68, 68)
PRUNE                   (c04,MAX, 68, 68)
SOLVE               (b02,MIN, 68, 68, 68)
UPDATE ALPHA (a01,MAX, 68,inf)
VISIT               (b03,MIN, 68,inf)
VISIT                   (c05,MAX, 68,inf)
VISIT                      (d09,MIN, 68,inf)
VISIT                         (e17,MAX, 68,inf)
SOLVE LEAF                    (e17,MAX, 62,inf, 62)
UPDATE BETA                (d09,MIN, 68, 62)
PRUNE                         (e18,MAX, 68, 62)
SOLVE                      (d09,MIN, 68, 62, 68)
UPDATE ALPHA            (c05,MAX, 68,inf)
VISIT                      (d10,MIN, 68,inf)
VISIT                         (e19,MAX, 68,inf)
SOLVE LEAF                    (e19,MAX, 31,inf, 31)
UPDATE BETA                (d10,MIN, 68, 31)
PRUNE                         (e20,MAX, 68, 31)
SOLVE                      (d10,MIN, 68, 31, 68)
UPDATE ALPHA            (c05,MAX, 68,inf)
SOLVE                   (c05,MAX, 68,inf, 68)
```

```
UPDATE BETA       (b03,MIN,  68,  68)
PRUNE                 (c06,MAX,  68,  68)
SOLVE             (b03,MIN,  68,  68,  68)
UPDATE ALPHA (a01,MAX,  68,inf)
SOLVE         (a01,MAX,  68,inf,  68)

EVAL       68
```

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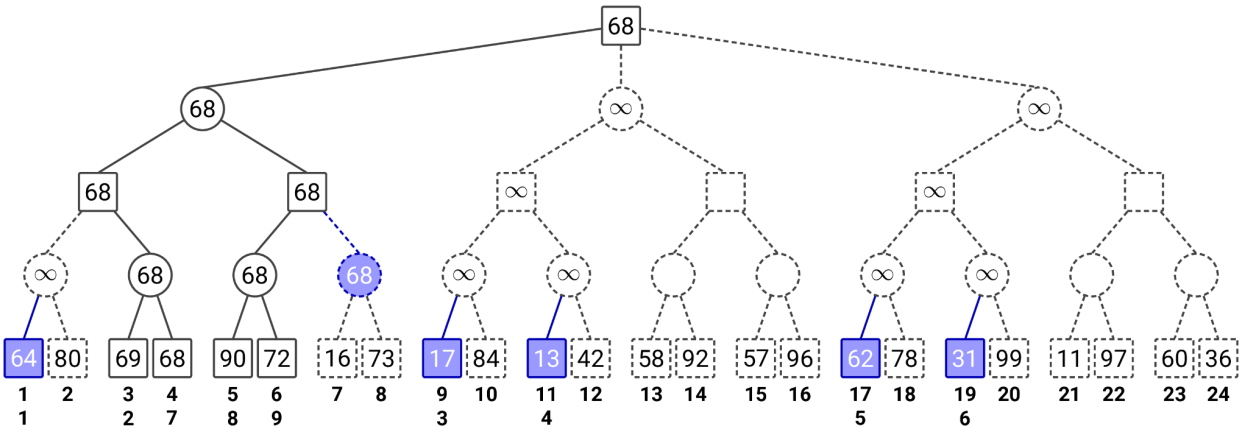
SSS*



SSS* Trace:

The trace appears to be long but if you run it on the tree, by hand, it is actually simple.

```
ADD LIVE    (a01,MAX,LIVE  ,inf,    )

QUEUE       (a01,MAX,LIVE  ,inf,    ):
            []

1.
NODE        (a01,MAX,LIVE  ,inf,    )
ADD LIVE    (b01,MIN,LIVE  ,inf,    )
ADD LIVE    (b02,MIN,LIVE  ,inf,    )
ADD LIVE    (b03,MIN,LIVE  ,inf,    )

QUEUE       (b01,MIN,LIVE  ,inf,    ):
            (b02,MIN,LIVE  ,inf,    ):
            (b03,MIN,LIVE  ,inf,    ):
            []
```

```
2.
NODE        (b01,MIN,LIVE  ,inf,   )
ADD LIVE    (c01,MAX,LIVE  ,inf,   )

QUEUE       (c01,MAX,LIVE  ,inf,   ):
            (b02,MIN,LIVE  ,inf,   ):
            (b03,MIN,LIVE  ,inf,   ):
            []

3.
NODE        (c01,MAX,LIVE  ,inf,   )
ADD LIVE    (d01,MIN,LIVE  ,inf,   )
ADD LIVE    (d02,MIN,LIVE  ,inf,   )

QUEUE       (d01,MIN,LIVE  ,inf,   ):
            (d02,MIN,LIVE  ,inf,   ):
            (b02,MIN,LIVE  ,inf,   ):
            (b03,MIN,LIVE  ,inf,   ):
            []

4.
NODE        (d01,MIN,LIVE  ,inf,   )
ADD LIVE    (e01,MAX,LIVE  ,inf, 64)

QUEUE       (e01,MAX,LIVE  ,inf, 64):
            (d02,MIN,LIVE  ,inf,   ):
            (b02,MIN,LIVE  ,inf,   ):
            (b03,MIN,LIVE  ,inf,   ):
            []

5.
LEAF        (e01,MAX,LIVE  ,inf, 64)
ADD SOLVED (e01,MAX,SOLVED, 64, 64)

QUEUE       (d02,MIN,LIVE  ,inf,   ):
            (b02,MIN,LIVE  ,inf,   ):
            (b03,MIN,LIVE  ,inf,   ):
            (e01,MAX,SOLVED, 64, 64):
            []

6.
NODE        (d02,MIN,LIVE  ,inf,   )
ADD LIVE    (e03,MAX,LIVE  ,inf, 69)

QUEUE       (e03,MAX,LIVE  ,inf, 69):
```

```
            (b02,MIN,LIVE  ,inf,   ):
            (b03,MIN,LIVE  ,inf,   ):
            (e01,MAX,SOLVED, 64, 64):
            []

7.
LEAF        (e03,MAX,LIVE  ,inf, 69)
ADD SOLVED  (e03,MAX,SOLVED, 69, 69)

QUEUE       (b02,MIN,LIVE  ,inf,   ):
            (b03,MIN,LIVE  ,inf,   ):
            (e03,MAX,SOLVED, 69, 69):
            (e01,MAX,SOLVED, 64, 64):
            []

8.
NODE        (b02,MIN,LIVE  ,inf,   )
ADD LIVE    (c03,MAX,LIVE  ,inf,   )

QUEUE       (c03,MAX,LIVE  ,inf,   ):
            (b03,MIN,LIVE  ,inf,   ):
            (e03,MAX,SOLVED, 69, 69):
            (e01,MAX,SOLVED, 64, 64):
            []

9.
NODE        (c03,MAX,LIVE  ,inf,   )
ADD LIVE    (d05,MIN,LIVE  ,inf,   )
ADD LIVE    (d06,MIN,LIVE  ,inf,   )

QUEUE       (d05,MIN,LIVE  ,inf,   ):
            (d06,MIN,LIVE  ,inf,   ):
            (b03,MIN,LIVE  ,inf,   ):
            (e03,MAX,SOLVED, 69, 69):
            (e01,MAX,SOLVED, 64, 64):
            []

10.
NODE        (d05,MIN,LIVE  ,inf,   )
ADD LIVE    (e09,MAX,LIVE  ,inf, 17)

QUEUE       (e09,MAX,LIVE  ,inf, 17):
            (d06,MIN,LIVE  ,inf,   ):
            (b03,MIN,LIVE  ,inf,   ):
            (e03,MAX,SOLVED, 69, 69):
```

```
            (e01,MAX,SOLVED, 64, 64):
            []

11.
LEAF        (e09,MAX,LIVE  ,inf, 17)
ADD SOLVED  (e09,MAX,SOLVED, 17, 17)

QUEUE       (d06,MIN,LIVE  ,inf,   ):
            (b03,MIN,LIVE  ,inf,   ):
            (e03,MAX,SOLVED, 69, 69):
            (e01,MAX,SOLVED, 64, 64):
            (e09,MAX,SOLVED, 17, 17):
            []

12.
NODE        (d06,MIN,LIVE  ,inf,   )
ADD LIVE    (e11,MAX,LIVE  ,inf, 13)

QUEUE       (e11,MAX,LIVE  ,inf, 13):
            (b03,MIN,LIVE  ,inf,   ):
            (e03,MAX,SOLVED, 69, 69):
            (e01,MAX,SOLVED, 64, 64):
            (e09,MAX,SOLVED, 17, 17):
            []

13.
LEAF        (e11,MAX,LIVE  ,inf, 13)
ADD SOLVED  (e11,MAX,SOLVED, 13, 13)

QUEUE       (b03,MIN,LIVE  ,inf,   ):
            (e03,MAX,SOLVED, 69, 69):
            (e01,MAX,SOLVED, 64, 64):
            (e09,MAX,SOLVED, 17, 17):
            (e11,MAX,SOLVED, 13, 13):
            []

14.
NODE        (b03,MIN,LIVE  ,inf,   )
ADD LIVE    (c05,MAX,LIVE  ,inf,   )

QUEUE       (c05,MAX,LIVE  ,inf,   ):
            (e03,MAX,SOLVED, 69, 69):
            (e01,MAX,SOLVED, 64, 64):
            (e09,MAX,SOLVED, 17, 17):
            (e11,MAX,SOLVED, 13, 13):
```

```
           []

15.
NODE       (c05,MAX,LIVE  ,inf,   )
ADD LIVE   (d09,MIN,LIVE  ,inf,   )
ADD LIVE   (d10,MIN,LIVE  ,inf,   )

QUEUE      (d09,MIN,LIVE  ,inf,   ):
           (d10,MIN,LIVE  ,inf,   ):
           (e03,MAX,SOLVED, 69, 69):
           (e01,MAX,SOLVED, 64, 64):
           (e09,MAX,SOLVED, 17, 17):
           (e11,MAX,SOLVED, 13, 13):
           []

16.
NODE       (d09,MIN,LIVE  ,inf,   )
ADD LIVE   (e17,MAX,LIVE  ,inf, 62)

QUEUE      (e17,MAX,LIVE  ,inf, 62):
           (d10,MIN,LIVE  ,inf,   ):
           (e03,MAX,SOLVED, 69, 69):
           (e01,MAX,SOLVED, 64, 64):
           (e09,MAX,SOLVED, 17, 17):
           (e11,MAX,SOLVED, 13, 13):
           []

17.
LEAF       (e17,MAX,LIVE  ,inf, 62)
ADD SOLVED (e17,MAX,SOLVED, 62, 62)

QUEUE      (d10,MIN,LIVE  ,inf,   ):
           (e03,MAX,SOLVED, 69, 69):
           (e01,MAX,SOLVED, 64, 64):
           (e17,MAX,SOLVED, 62, 62):
           (e09,MAX,SOLVED, 17, 17):
           (e11,MAX,SOLVED, 13, 13):
           []

18.
NODE       (d10,MIN,LIVE  ,inf,   )
ADD LIVE   (e19,MAX,LIVE  ,inf, 31)

QUEUE      (e19,MAX,LIVE  ,inf, 31):
           (e03,MAX,SOLVED, 69, 69):
```

```
            (e01,MAX,SOLVED, 64, 64):
            (e17,MAX,SOLVED, 62, 62):
            (e09,MAX,SOLVED, 17, 17):
            (e11,MAX,SOLVED, 13, 13):
            []

19.
LEAF        (e19,MAX,LIVE  ,inf, 31)
ADD SOLVED  (e19,MAX,SOLVED, 31, 31)

QUEUE       (e03,MAX,SOLVED, 69, 69):
            (e01,MAX,SOLVED, 64, 64):
            (e17,MAX,SOLVED, 62, 62):
            (e19,MAX,SOLVED, 31, 31):
            (e09,MAX,SOLVED, 17, 17):
            (e11,MAX,SOLVED, 13, 13):
            []

20.
LEAF        (e03,MAX,SOLVED, 69, 69)
ADD LIVE    (e04,MAX,LIVE  , 69, 68)

QUEUE       (e04,MAX,LIVE  , 69, 68):
            (e01,MAX,SOLVED, 64, 64):
            (e17,MAX,SOLVED, 62, 62):
            (e19,MAX,SOLVED, 31, 31):
            (e09,MAX,SOLVED, 17, 17):
            (e11,MAX,SOLVED, 13, 13):
            []

21.
LEAF        (e04,MAX,LIVE  , 69, 68)
ADD SOLVED  (e04,MAX,SOLVED, 68, 68)

QUEUE       (e04,MAX,SOLVED, 68, 68):
            (e01,MAX,SOLVED, 64, 64):
            (e17,MAX,SOLVED, 62, 62):
            (e19,MAX,SOLVED, 31, 31):
            (e09,MAX,SOLVED, 17, 17):
            (e11,MAX,SOLVED, 13, 13):
            []

22.
LEAF        (e04,MAX,SOLVED, 68, 68)
ADD SOLVED  (d02,MIN,SOLVED, 68,   )
```

```
QUEUE       (d02,MIN,SOLVED, 68,   ):
            (e01,MAX,SOLVED, 64, 64):
            (e17,MAX,SOLVED, 62, 62):
            (e19,MAX,SOLVED, 31, 31):
            (e09,MAX,SOLVED, 17, 17):
            (e11,MAX,SOLVED, 13, 13):
            []

23.
NODE        (d02,MIN,SOLVED, 68,   )
ADD SOLVED  (c01,MAX,SOLVED, 68,   )
PRUNE       (e01,MAX,SOLVED, 64, 64)

QUEUE       (c01,MAX,SOLVED, 68,   ):
            (e17,MAX,SOLVED, 62, 62):
            (e19,MAX,SOLVED, 31, 31):
            (e09,MAX,SOLVED, 17, 17):
            (e11,MAX,SOLVED, 13, 13):
            []

24.
NODE        (c01,MAX,SOLVED, 68,   )
ADD LIVE    (c02,MAX,LIVE  , 68,   )

QUEUE       (c02,MAX,LIVE  , 68,   ):
            (e17,MAX,SOLVED, 62, 62):
            (e19,MAX,SOLVED, 31, 31):
            (e09,MAX,SOLVED, 17, 17):
            (e11,MAX,SOLVED, 13, 13):
            []

25.
NODE        (c02,MAX,LIVE  , 68,   )
ADD LIVE    (d03,MIN,LIVE  , 68,   )
ADD LIVE    (d04,MIN,LIVE  , 68,   )

QUEUE       (d03,MIN,LIVE  , 68,   ):
            (d04,MIN,LIVE  , 68,   ):
            (e17,MAX,SOLVED, 62, 62):
            (e19,MAX,SOLVED, 31, 31):
            (e09,MAX,SOLVED, 17, 17):
            (e11,MAX,SOLVED, 13, 13):
            []
```

```
26.
NODE        (d03,MIN,LIVE  , 68,   )
ADD LIVE    (e05,MAX,LIVE  , 68, 90)

QUEUE       (e05,MAX,LIVE  , 68, 90):
            (d04,MIN,LIVE  , 68,   ):
            (e17,MAX,SOLVED, 62, 62):
            (e19,MAX,SOLVED, 31, 31):
            (e09,MAX,SOLVED, 17, 17):
            (e11,MAX,SOLVED, 13, 13):
            []

27.
LEAF        (e05,MAX,LIVE  , 68, 90)
ADD SOLVED  (e05,MAX,SOLVED, 68, 90)

QUEUE       (e05,MAX,SOLVED, 68, 90):
            (d04,MIN,LIVE  , 68,   ):
            (e17,MAX,SOLVED, 62, 62):
            (e19,MAX,SOLVED, 31, 31):
            (e09,MAX,SOLVED, 17, 17):
            (e11,MAX,SOLVED, 13, 13):
            []

28.
LEAF        (e05,MAX,SOLVED, 68, 90)
ADD LIVE    (e06,MAX,LIVE  , 68, 72)

QUEUE       (e06,MAX,LIVE  , 68, 72):
            (d04,MIN,LIVE  , 68,   ):
            (e17,MAX,SOLVED, 62, 62):
            (e19,MAX,SOLVED, 31, 31):
            (e09,MAX,SOLVED, 17, 17):
            (e11,MAX,SOLVED, 13, 13):
            []

29.
LEAF        (e06,MAX,LIVE  , 68, 72)
ADD SOLVED  (e06,MAX,SOLVED, 68, 72)

QUEUE       (e06,MAX,SOLVED, 68, 72):
            (d04,MIN,LIVE  , 68,   ):
            (e17,MAX,SOLVED, 62, 62):
            (e19,MAX,SOLVED, 31, 31):
            (e09,MAX,SOLVED, 17, 17):
```

```
            (e11,MAX,SOLVED, 13, 13):
            []

30.
LEAF        (e06,MAX,SOLVED, 68, 72)
ADD SOLVED  (d03,MIN,SOLVED, 68,   )

QUEUE       (d03,MIN,SOLVED, 68,   ):
            (d04,MIN,LIVE  , 68,   ):
            (e17,MAX,SOLVED, 62, 62):
            (e19,MAX,SOLVED, 31, 31):
            (e09,MAX,SOLVED, 17, 17):
            (e11,MAX,SOLVED, 13, 13):
            []

31.
NODE        (d03,MIN,SOLVED, 68,   )
ADD SOLVED  (c02,MAX,SOLVED, 68,   )
PRUNE       (d04,MIN,LIVE  , 68,   )

QUEUE       (c02,MAX,SOLVED, 68,   ):
            (e17,MAX,SOLVED, 62, 62):
            (e19,MAX,SOLVED, 31, 31):
            (e09,MAX,SOLVED, 17, 17):
            (e11,MAX,SOLVED, 13, 13):
            []

32.
NODE        (c02,MAX,SOLVED, 68,   )
ADD SOLVED  (b01,MIN,SOLVED, 68,   )

QUEUE       (b01,MIN,SOLVED, 68,   ):
            (e17,MAX,SOLVED, 62, 62):
            (e19,MAX,SOLVED, 31, 31):
            (e09,MAX,SOLVED, 17, 17):
            (e11,MAX,SOLVED, 13, 13):
            []

33.
NODE        (b01,MIN,SOLVED, 68,   )
ADD SOLVED  (a01,MAX,SOLVED, 68,   )
PRUNE       (e17,MAX,SOLVED, 62, 62)
PRUNE       (e19,MAX,SOLVED, 31, 31)
PRUNE       (e09,MAX,SOLVED, 17, 17)
PRUNE       (e11,MAX,SOLVED, 13, 13)
```

```
QUEUE       (a01,MAX,SOLVED, 68,    ):
            []

34.
NODE        (a01,MAX,SOLVED, 68,    )
GOAL        (a01,MAX,SOLVED, 68,    )

QUEUE       []

EVAL        68
```

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