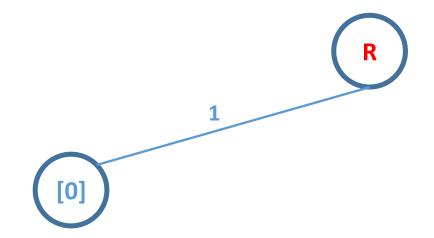
Beam Search Algorithm

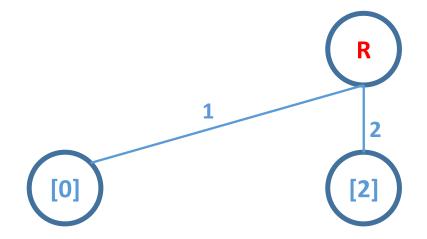


[[0], 1]



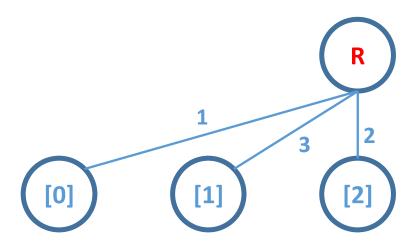
Tier 0

```
[[0], 1]
[[2], 2]
```



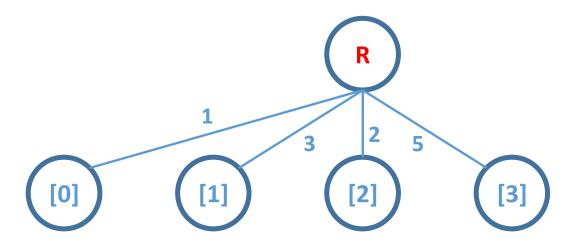
Tier 0

```
[[0], 1]
[[2], 2]
[[1], 3]
```



Tier 0

```
[[0], 1]
[[2], 2]
[[1], 3]
[[3], 5]
```



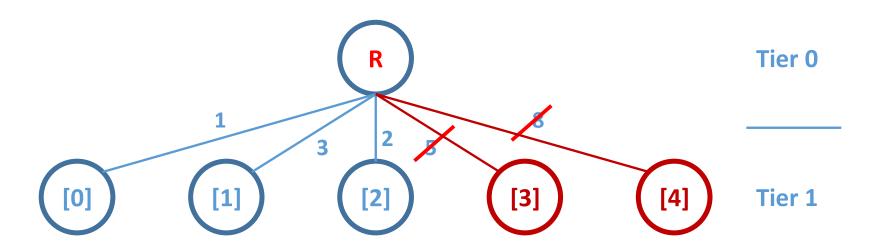
Tier 0

```
[[0], 1]
[[2], 2]
[[1], 3]
[[3], 5]
[[4], 8]

R

Tier 0
```

```
Paths pruned after tier 0:
[[3], 5]
[[4], 8]
Paths kept after tier 0:
[[0], 1]
[[2], 2]
[[1], 3]
```



```
Paths pruned after tier 0:
[[3], 5]
[[4], 8]
Paths kept after tier 0:
[[0], 1]
                                                                                                                              Tier 0
[[2], 2]
[[1], 3]
                                                                            3
[[0, 0], 5]
                                                                                                  [3]
                                                [0]
                                                                 [1]
                                                                                  [2]
                                                                                                                               Tier 1
                                                                                                                              Tier 2
```

```
Paths pruned after tier 0:
[[3], 5]
[[4], 8]
Paths kept after tier 0:
[[0], 1]
                                                                                                                              Tier 0
[[2], 2]
[[1], 3]
                                                                            3
[[0, 0], 5]
[[2, 0], 6]
                                                                                  [2]
                                                                                                  [3]
                                                                                                                               Tier 1
                                                                                                                              Tier 2
```

```
Paths pruned after tier 0:
[[3], 5]
[[4], 8]
Paths kept after tier 0:
[[0], 1]
                                                                                                                               Tier 0
[[2], 2]
[[1], 3]
                                                                             3
[[0, 0], 5]
[[2, 0], 6]
[[0, 3], 7]
                                                                                  [2]
                                                                                                   [3]
                                                [0]
                                                                                                                                Tier 1
                                                                 [1]
                                                                                                                               Tier 2
```

```
Paths pruned after tier 0:
[[3], 5]
[[4], 8]
Paths kept after tier 0:
[[0], 1]
                                                                                                                                Tier 0
[[2], 2]
[[1], 3]
                                                                             3
[[0, 0], 5]
[[2, 0], 6]
[[0, 3], 7]
                                                                                  [2]
                                                                                                   [3]
                                                                                                                                Tier 1
                                                                 [1]
[[1, 0], 7]
                                                                                                                                Tier 2
```

```
Paths pruned after tier 0:
[[3], 5]
[[4], 8]
Paths kept after tier 0:
[[0], 1]
                                                                                                                                Tier 0
[[2], 2]
[[1], 3]
                                                                             3
[[0, 0], 5]
[[2, 0], 6]
[[0, 3], 7]
                                                                                   [2]
                                                                                                    [3]
                                                                                                                                Tier 1
                                                                  [1]
[[1, 0], 7]
[[0, 1], 8]
                                                                                                                                Tier 2
```

```
Paths pruned after tier 0:
[[3], 5]
[[4], 8]
Paths kept after tier 0:
[[0], 1]
                                                                                                                                 Tier 0
[[2], 2]
[[1], 3]
                                                                              3
[[0, 0], 5]
[[2, 0], 6]
[[0, 3], 7]
                                                                                                    [3]
                                                                                   [2]
                                                                                                                                 Tier 1
                                                                  [1]
[[1, 0], 7]
[[0, 1], 8]
[[0, 4], 8]
                                                                                                                                 Tier 2
                                                                                                    [4]
```

```
Paths pruned after tier 0:
[[3], 5]
[[4], 8]
Paths kept after tier 0:
[[0], 1]
                                                                                                                                 Tier 0
[[2], 2]
[[1], 3]
                                                                              3
[[0, 0], 5]
[[2, 0], 6]
[[0, 3], 7]
                                                                                                    [3]
                                                                                   [2]
                                                                                                                                 Tier 1
                                                                  [1]
[[1, 0], 7]
[[0, 1], 8]
[[0, 4], 8]
[[2, 3], 8]
                                                                                                                                 Tier 2
                                                                                                     [4]
```

```
Paths pruned after tier 0:
[[3], 5]
[[4], 8]
Paths kept after tier 0:
[[0], 1]
                                                                                                                                 Tier 0
[[2], 2]
[[1], 3]
                                                                              3
[[0, 0], 5]
[[2, 0], 6]
[[0, 3], 7]
                                                                                                    [3]
                                                 [0]
                                                                                   [2]
                                                                                                                                 Tier 1
[[1, 0], 7]
[[0, 1], 8]
[[0, 4], 8]
[[2, 3], 8]
[[2, 1], 9]
                                                                                                                                 Tier 2
                                                                                                     [4]
```

```
Paths pruned after tier 0:
[[3], 5]
[[4], 8]
Paths kept after tier 0:
[[0], 1]
                                                                                                                                 Tier 0
[[2], 2]
[[1], 3]
                                                                              3
[[0, 0], 5]
[[2, 0], 6]
[[0, 3], 7]
                                                                                                     [3]
                                                                                    [2]
                                                                                                                                  Tier 1
[[1, 0], 7]
[[0, 1], 8]
[[0, 4], 8]
[[2, 3], 8]
[[2, 1], 9]
[[2, 4], 9]
                                                                                                                                 Tier 2
                                                                                    [3]
                                                                                                     [4]
```

```
Paths pruned after tier 0:
[[3], 5]
[[4], 8]
Paths kept after tier 0:
[[0], 1]
                                                                                                                                  Tier 0
[[2], 2]
[[1], 3]
                                                                               3
[[0, 0], 5]
[[2, 0], 6]
[[0, 3], 7]
                                                                                                     [3]
                                                 [0]
                                                                                    [2]
                                                                                                                                  Tier 1
                                                                   [1]
[[1, 0], 7]
[[0, 1], 8]
[[0, 4], 8]
[[2, 3], 8]
[[2, 1], 9]
[[2, 4], 9]
[[1, 3], 9]
                                                                                                                                  Tier 2
                                                                                                     [4]
```

```
Paths pruned after tier 0:
[[3], 5]
[[4], 8]
Paths kept after tier 0:
[[0], 1]
                                                                                                                                  Tier 0
[[2], 2]
[[1], 3]
                                                                               3
[[0, 0], 5]
[[2, 0], 6]
[[0, 3], 7]
                                                                                                     [3]
                                                                                    [2]
                                                                                                                                  Tier 1
                                                                   [1]
[[1, 0], 7]
[[0, 1], 8]
[[0, 4], 8]
[[2, 3], 8]
[[2, 1], 9]
[[2, 4], 9]
[[1, 3], 9]
[[0, 2], 10]
                                                              10
                                                                                                                                  Tier 2
                                                                                                     [4]
```

```
Paths pruned after tier 0:
[[3], 5]
[[4], 8]
Paths kept after tier 0:
[[0], 1]
                                                                                                                                   Tier 0
[[2], 2]
[[1], 3]
                                                                               3
[[0, 0], 5]
[[2, 0], 6]
[[0, 3], 7]
                                                                                                      [3]
                                                                                     [2]
                                                                                                                                   Tier 1
                                                                   [1]
[[1, 0], 7]
[[0, 1], 8]
[[0, 4], 8]
[[2, 3], 8]
[[2, 1], 9]
[[2, 4], 9]
[[1, 3], 9]
[[0, 2], 10]
[[1, 1], 10]
                                                                                                                                   Tier 2
                                                                                     [3]
                                                                                                      [4]
```

```
Paths pruned after tier 0:
[[3], 5]
[[4], 8]
Paths kept after tier 0:
[[0], 1]
                                                                                                                                   Tier 0
[[2], 2]
[[1], 3]
                                                                               3
[[0, 0], 5]
[[2, 0], 6]
[[0, 3], 7]
                                                                                                      [3]
                                                                                     [2]
                                                                                                                                   Tier 1
                                                                   [1]
[[1, 0], 7]
[[0, 1], 8]
[[0, 4], 8]
                                                                                 10
[[2, 3], 8]
[[2, 1], 9]
[[2, 4], 9]
[[1, 3], 9]
[[0, 2], 10]
[[1, 1], 10]
                                                                                                                                   Tier 2
[[1, 4], 10]
                                                                                     [3]
                                                                                                      [4]
```

```
Paths pruned after tier 0:
[[3], 5]
[[4], 8]
Paths kept after tier 0:
[[0], 1]
                                                                                                                                   Tier 0
[[2], 2]
[[1], 3]
                                                                               3
[[0, 0], 5]
[[2, 0], 6]
[[0, 3], 7]
                                                                                                      [3]
                                                                                     [2]
                                                                                                                                   Tier 1
                                                                   [1]
[[1, 0], 7]
[[0, 1], 8]
[[0, 4], 8]
[[2, 3], 8]
[[2, 1], 9]
[[2, 4], 9]
[[1, 3], 9]
[[0, 2], 10]
                                                               10
[[1, 1], 10]
                                                                          11
                                                                                                                                   Tier 2
[[1, 4], 10]
                               [0]
                                                                                                      [4]
[[2, 2], 11]
```

```
Paths pruned after tier 0:
[[3], 5]
[[4], 8]
Paths kept after tier 0:
[[0], 1]
                                                                                                                                   Tier 0
[[2], 2]
[[1], 3]
                                                                               3
[[0, 0], 5]
[[2, 0], 6]
[[0, 3], 7]
                                                                                                      [3]
                                                                                     [2]
                                                                                                                                   Tier 1
                                                                   [1]
[[1, 0], 7]
[[0, 1], 8]
[[0, 4], 8]
[[2, 3], 8]
[[2, 1], 9]
[[2, 4], 9]
[[1, 3], 9]
[[0, 2], 10]
                                                                     12
                                                               10
[[1, 1], 10]
                                                                                                                                  Tier 2
[[1, 4], 10]
                               [0]
                                                                   [2]
                                                                                                      [4]
[[2, 2], 11]
[[1, 2], 12]
```

[[0, 3], 7]

```
Paths pruned after tier 0:
[[3], 5]
[[4], 8]
Paths kept after tier 0:
[[0], 1]
                                                                                                                                  Tier 0
[[2], 2]
[[1], 3]
                                                                               3
Paths pruned after tier 1:
[[1, 0], 7]
[[0, 1], 8]
                                                 [0]
                                                                                    [2]
                                                                                                     [3]
                                                                                                                                   Tier 1
[[0, 4], 8]
[[2, 3], 8]
[[1, 4], 10]
[[2, 2], 11]
                                                                                                                                  Tier 2
[[1, 2], 12]
                                                                                                      [4]
The best 'beta' paths:
[[0, 0], 5]
[[2, 0], 6]
```