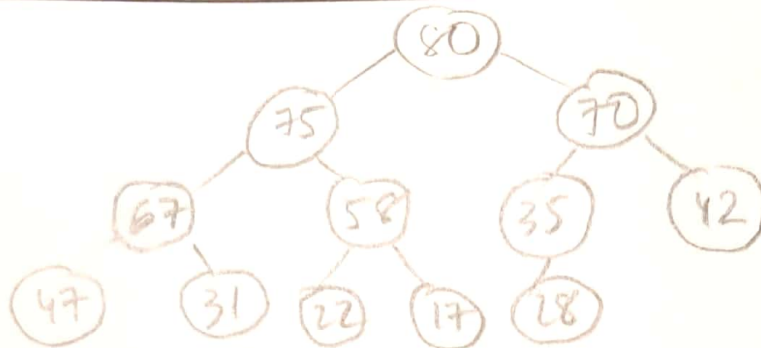4. Write down the array representations of the given 3-ary min-heap after each specified operation.

Original

| 10 | 17 | 52 | 49 | 25 | 46 | 27 | 56 | 82 | 67 | 50 | |

After removing the minimum once

| 17 | 25 | 52 | 49 | 50 | 46 | 27 | 56 | 82 | 67 | | |

After removing the minimum twice

| 25 | 27 | 52 | 49 | 50 | 46 | 67 | 56 | 82 | | | |

After inserting 35 and 53

| 25 | 27 | 35 | 49 | 50 | 46 | 67 | 56 | 82 | 52 | 53 | |

After inserting 20 and 50

| 20 | 27 | 35 | 25 | 50 | 46 | 67 | 56 | 82 | 52 | 53 | 49 |

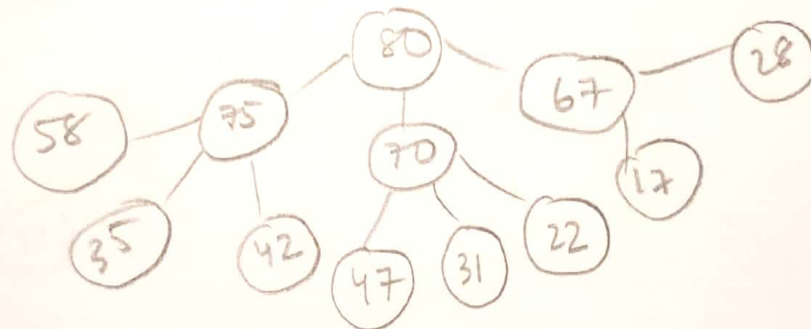**After removing the minimum 10 times**

| 67 | 82 | | | | | | | | | | |

3. Draw the tree representations of the d-ary max-heaps from the following array representation. Choose d = 2, 3, 4.

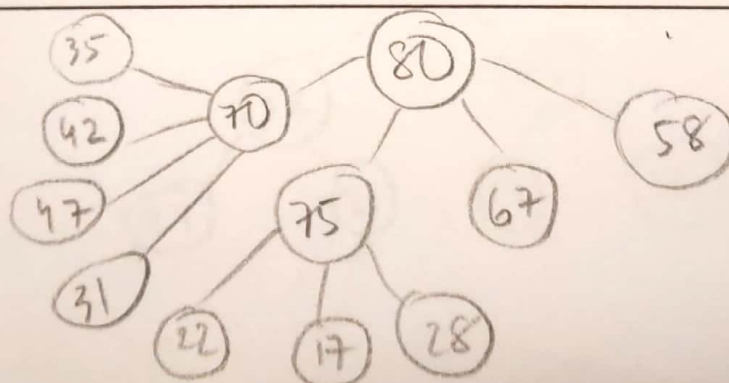Array representation: [80, 70, 75, 67, 58, 35, 42, 47, 31, 22, 17, 28]
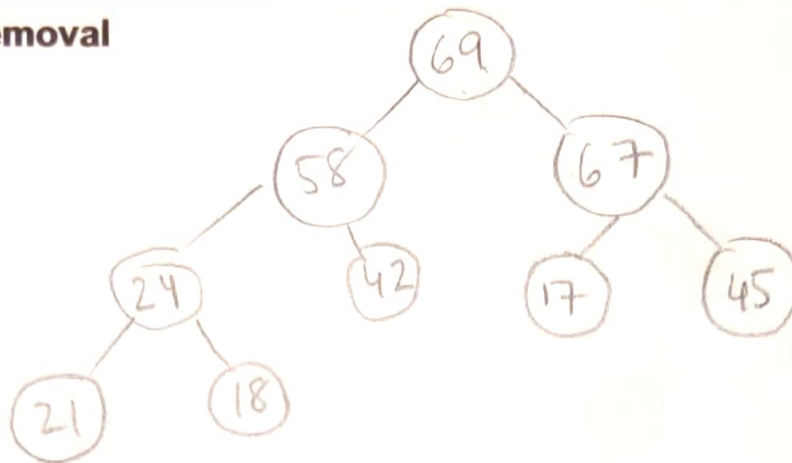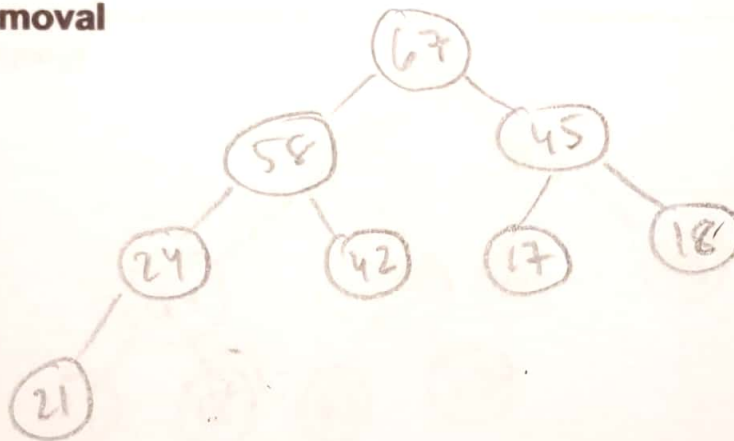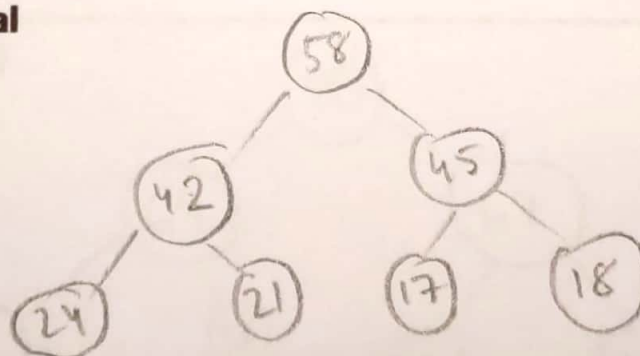
2-ary

3-ary

4-ary

After 3rd removal

```
                    69
            58              67
        24      42      17      45
    21      18
```

After 4th removal

```
                    67
            58              45
        24      42      17      18
    21
```

After 5th removal

```
                    58
            42              45
        24      21      17      18
```
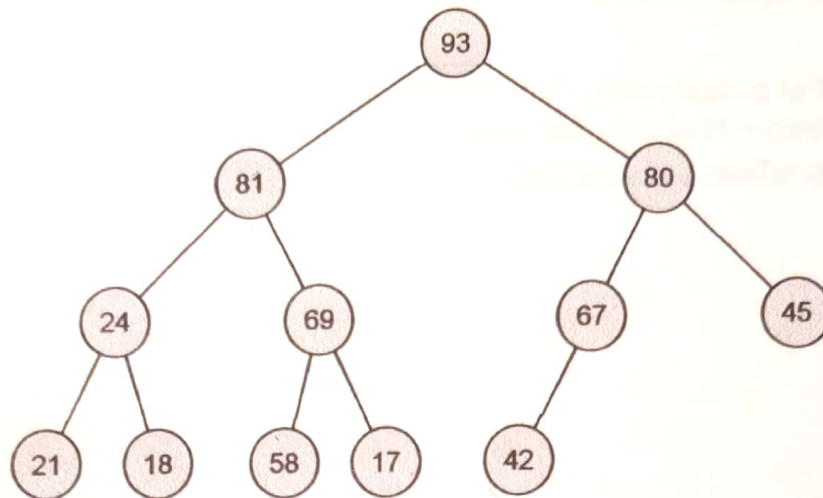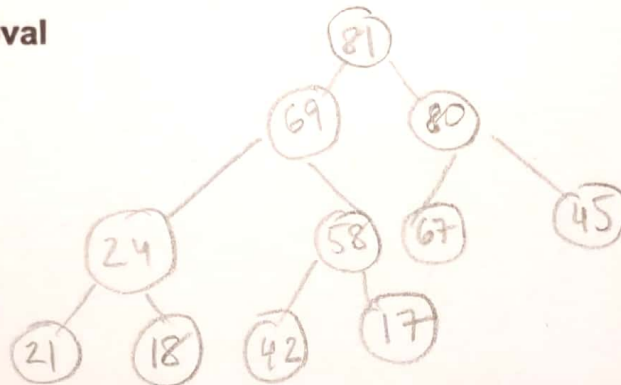
2. Remove the top element 5 times from the given heap and draw the tree representations of the heap after **each** removal.

```
                        93
            81                      80
       24        69          67          45
    21   18   58   17      42
```

After 1st removal

```
                    81
              69          80
          24      58  67      45
        21  18  42    17
```

After 2nd removal

```
                    80
           69               67
       24      58       17      45
     21    18  42
```