



Online Java Compiler IDE

For Multiple Files, Custom Library and File Read/Write, use our new - [Advanced Java IDE](#)

```

1  import java.util.*;
2  class Item {
3
4      float weight;
5      int value;
6      int idx;
7      public Item() {}
8      public Item(int value, float weight,
9                  int idx)
10     {
11         this.value = value;
12         this.weight = weight;
13         this.idx = idx;
14     }
15 }
16
17 class Node {
18
19     float ub;
20     float lb;
21     int level;
22     boolean flag;
23     float tv;
24     float tw;
25     public Node() {}
26     public Node(Node cpy)
27     {
28         this.tv = cpy.tv;
29         this.tw = cpy.tw;
30         this.ub = cpy.ub;
31         this.lb = cpy.lb;
32         this.level = cpy.level;
33         this.flag = cpy.flag;
34     }
35 }
36
37
38 class sortByC implements Comparator<Node> {
39     public int compare(Node a, Node b)
40     {
41         boolean temp = a.lb > b.lb;
42         return temp ? 1 : -1;
43     }
44 }
45
46 class sortByRatio implements Comparator<Item> {
47     public int compare(Item a, Item b)
48     {
49         boolean temp = (float)a.value
50                        / a.weight
51                        > (float)b.value
52                        / b.weight;
53         return temp ? -1 : 1;
54     }
55 }
56
57 public class knapsack {
58
59     private static int size;
60     private static float capacity;

```

```

60     private static float capacity;
61
62
63     static float upperBound(float tv, float tw,
64                             int idx, Item arr[])
65     {
66         float value = tv;
67         float weight = tw;
68         for (int i = idx; i < size; i++) {
69             if (weight + arr[i].weight
70                 <= capacity) {
71                 weight += arr[i].weight;
72                 value -= arr[i].value;
73             }
74             else {
75                 value -= (float)(capacity
76                             - weight)
77                         / arr[i].weight
78                         * arr[i].value;
79                 break;
80             }
81         }
82         return value;
83     }
84
85
86     static float lowerBound(float tv, float tw,
87                             int idx, Item arr[])
88     {
89         float value = tv;
90         float weight = tw;
91         for (int i = idx; i < size; i++) {
92             if (weight + arr[i].weight
93                 <= capacity) {
94                 weight += arr[i].weight;
95                 value -= arr[i].value;
96             }
97             else {
98                 break;
99             }
100        }
101        return value;
102    }
103
104    static void assign(Node a, float ub, float lb,
105                      int level, boolean flag,
106                      float tv, float tw)
107    {
108        a.ub = ub;
109        a.lb = lb;
110        a.level = level;
111        a.flag = flag;
112        a.tv = tv;
113        a.tw = tw;
114    }
115
116    public static void solve(Item arr[])
117    {
118
119        Arrays.sort(arr, new sortByRatio());
120
121        Node current, left, right;
122        current = new Node();
123        left = new Node();
124        right = new Node();
125
126
127        float minLB = 0, finalLB
128                    = Integer.MAX_VALUE;
129        current.tv = current.tw = current.ub
130                = current.lb = 0;

```

```

130         - current.lb = 0;
131     current.level = 0;
132     current.flag = false;
133
134
135     PriorityQueue<Node> pq
136         = new PriorityQueue<Node>(
137             new sortByC());
138
139
140     pq.add(current);
141
142
143     boolean currPath[] = new boolean[size];
144     boolean finalPath[] = new boolean[size];
145
146     while (!pq.isEmpty()) {
147         current = pq.poll();
148         if (current.ub > minLB
149             || current.ub >= finalLB) {
150
151             continue;
152         }
153
154         if (current.level != 0)
155             currPath[current.level - 1]
156                 = current.flag;
157
158         if (current.level == size) {
159             if (current.lb < finalLB) {
160
161                 for (int i = 0; i < size; i++)
162                     finalPath[arr[i].idx]
163                         = currPath[i];
164                 finalLB = current.lb;
165             }
166             continue;
167         }
168
169         int level = current.level;
170
171
172         assign(right, upperBound(current.tv,
173                                 current.tw,
174                                 level + 1, arr),
175             lowerBound(current.tv, current.tw,
176                       level + 1, arr),
177             level + 1, false,
178             current.tv, current.tw);
179
180         if (current.tw + arr[current.level].weight
181             <= capacity) {
182
183
184             left.ub = upperBound(
185                 current.tv
186                 - arr[level].value,
187                 current.tw
188                 + arr[level].weight,
189                 level + 1, arr);
190             left.lb = lowerBound(
191                 current.tv
192                 - arr[level].value,
193                 current.tw
194                 + arr[level].weight,
195                 level + 1,
196                 arr);
197             assign(left, left.ub, left.lb,
198                 level + 1, true,
199                 current.tv - arr[level].value,
200                 current.tw

```

```
200         currentLevel
201         + arr[level].weight);
202     }
203
204
205     else {
206
207         left.ub = left.lb = 1;
208     }
209
210
211     minLB = Math.min(minLB, left.lb);
212     minLB = Math.min(minLB, right.lb);
213
214     if (minLB >= left.ub)
215         pq.add(new Node(left));
216     if (minLB >= right.ub)
217         pq.add(new Node(right));
218 }
219 System.out.println("Items taken"
220     + "into the knapsack are");
221 for (int i = 0; i < size; i++) {
222     if (finalPath[i])
223         System.out.print("1 ");
224     else
225         System.out.print("0 ");
226 }
227 System.out.println("\nMaximum profit"
228     + " is " + (-finalLB));
229 }
230
231 public static void main(String args[])
232 {
233     size = 4;
234     capacity = 15;
235
236     Item arr[] = new Item[size];
237     arr[0] = new Item(11, 2, 0);
238     arr[1] = new Item(11, 4, 1);
239     arr[2] = new Item(13, 0, 2);
240     arr[3] = new Item(14, 9, 3);
241
242     solve(arr);
243 }
244 }
```

Execute Mode, Version, Inputs & Arguments

CommandLine Arguments

Stdin Inputs


Result

CPU Time: 0.10 sec(s), Memory: 35544 kilobyte(s)

compiled and executed in 0.578 sec(s)

```
Items takeninto the knapsack are
1 1 1 1
Maximum profit is 49.0
```

Note:

1. For file operations - upload files using upload button . Files will be upload to /uploads folder. You can read those files in program from /uploads folder. To write a file from your program, write files to '/myfiles' folder. Please note the uploaded files stored in the server only for the current session.
2. For detailed documentation check - [Our Documentation](#), or check our [Youtube channel](#).

Thanks for using our
Online Java Compiler IDE
to execute your program



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