Greedy- Fractional-knapsack (w, v, W)

```
1. for i = 0 to n.                    }
2.     do x[i] = 0                    }  initialization.
3.        weight = 0                  }
4.        value = 0.                  }
5. while weight < W.
6.     do i = best remaining item
7.        if weight + w[i] ≤ W
8.           then x[i] = 1.
9.                weight = weight + w[i]
10.               value = value + v[i]
11.       else x[i] = (W - weight) / w[i]
12.            weight = weight + w[i] * x[i]
13.            value = value + v[i] * x[i].
14. return value.
```

eg. $n = 3$,

$W = 50$

$(v_1, v_2, v_3) = (60, 100, 120)$

$(w_1, w_2, w_3) = (10, 20, 30)$

Apply Greedy Strategy,

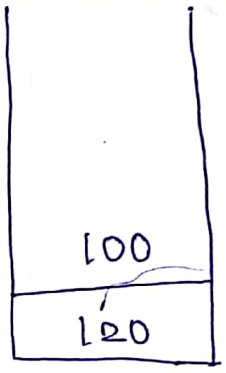
1) decreasing values.
2) Increasing weights
3) decreasing order of v_i/w_i

Item	weight	val.
1	10	60
2	20	100
3	30	120.

case:1 decreasing values.

$W = 50$.

Item	weight	value
3	30	120
2	20	100
1	10	60

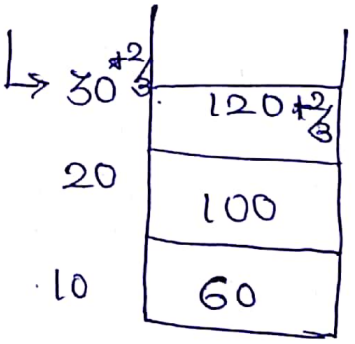


So, $\sum v_i = 120 + 100 = 220$

case:2 Increasing Weights.

apply fraction.

Item	weight	value
1	10	60
2	20	100
3	30	120.



$\Rightarrow$ $40 * 2 \Rightarrow 80$.

$60 + 100 + 80 = 240$

find out fractional. $x_i = (W - w)/w$ entered.

$w = 30$.

$v = 120$.

$x_i = (50 - 30)/30$

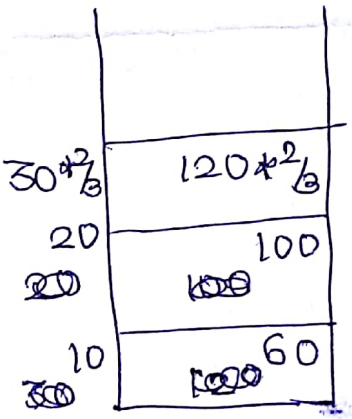
$x_i = 20/30 = 2/3$.

case:3 decreasing order of v_i/w_i.

Item	weight	val	v_i/w_i
1	10	60	$60/10 = 6$
2	20	100	$100/20 = 5$
3.	30	120.	$\frac{120}{30} = 4$

So,

$60 + 100 + 80 = 240$



case-3 is best.

Items.

Wt- (5, 10, 20, 30, 40)

value (30, 20, 100, 90, 160)

W = 60 (Knapsack capacity).

(1) decreasing value. → 260

(2) Increasing weights → 225.

(3) decreasing order of v_i/w_i → 270

5/6.

$x_i = [W - w_i / w_i]$ entered

$= 60 - 30/30$

$= 25/30 = 5/6.$