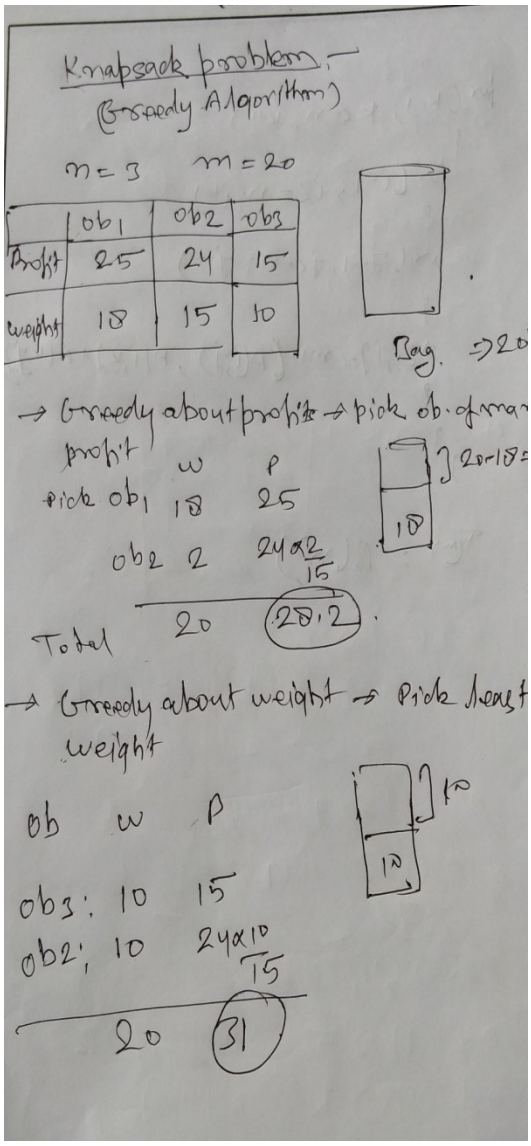


Knapsack problem :-
(Greedy Algorithm)

$n = 3 \quad m = 20$

	ob1	ob2	ob3
Profit	25	24	15
weight	18	15	10

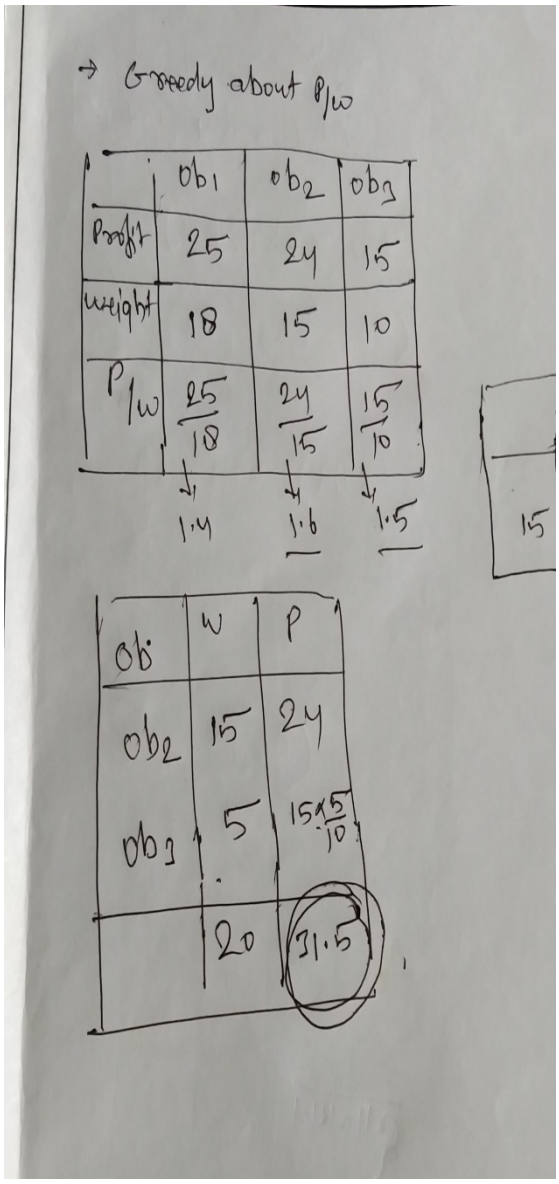
Bag $\Rightarrow 20$

→ Greedy about profit → pick ob. of max profit

	w	p
pick ob1	18	25
ob2	2	$24 \times \frac{2}{15}$
Total	20	28.2

→ Greedy about weight → Pick least weight

ob	w	p
ob3	10	15
ob2	10	$24 \times \frac{10}{15}$
	20	31



→ Greedy about p/w

	ob1	ob2	ob3
Profit	25	24	15
weight	18	15	10
p/w	$\frac{25}{18}$	$\frac{24}{15}$	$\frac{15}{10}$
	1.4	1.6	1.5

ob	w	p
ob2	15	24
ob3	5	$15 \times \frac{5}{10}$
	20	31.5

Logic

Greedy knapsack
{
for i = 1 to n
compute p_i/w_i
~~Sort objects in non~~ i
Sorts objects in non increasing order of p/w
for i = 1 to n
if ($m > 0$ && $w_i \le m$)
$m = m - w_i$
$p = p + p_i$
else
break;
if ($m > 0$)
$p = p + p_i\left(\frac{m}{w_i}\right)$;
}

Fractional Knapsack problem
(Greedy method)

n=7, m=15

object	0	1	2	3	4	5	6	7
Profit	P	10	5	15	7	6	18	3
weight	w	2	3	5	7	1	4	1
$\frac{P}{w}$		5	1.3	3	1	6	4.5	3

x $\left(x_1\ x_2\ x_3\ x_4\ x_5\ x_6\ x_7\right) = \left(1\ \frac{2}{3}\ 1\ 0\ 1\ 1\ 1\right)$

$\sum x_i w_i = 1\times 2 + \frac{2}{3}\times 3 + 1\times 5 + 0\times 7 + 1\times 1 + 1\times 4 + 1\times 1 = 15$

$\sum x_i p_i = 1\times 10 + \frac{2}{3}\times 5 + 1\times 15 + 0\times 7 + 1\times 6 + 1\times 18 + 1\times 3 = 54.6$

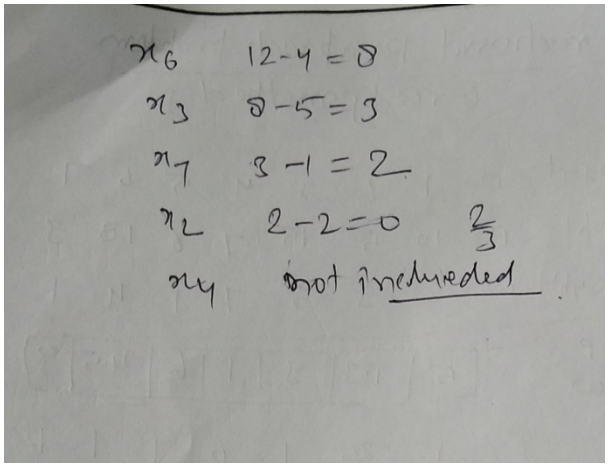
constraint $\Rightarrow \sum x_i w_i \le m$

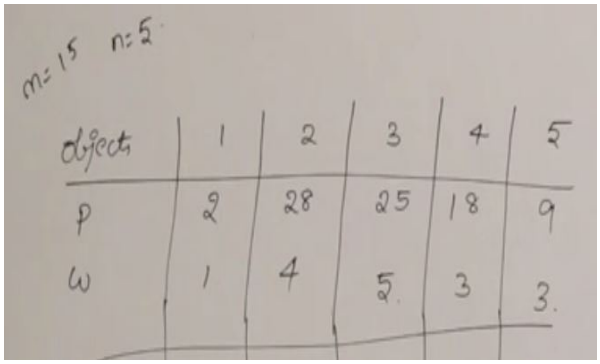
Objective $\Rightarrow \max \sum x_i p_i$

$0 \le x \le 1$

Sequence

Select	remain weight
0	15
x_5	15-1=14
x_4	14-2=12


x_6 12-4=8
x_3 8-5=3
x_7 3-1=2
x_2 2-2=0
x_4 not included


m=15 n=5
object 1 2 3 4 5
p 2 28 25 18 9
w 1 4 5 3 3