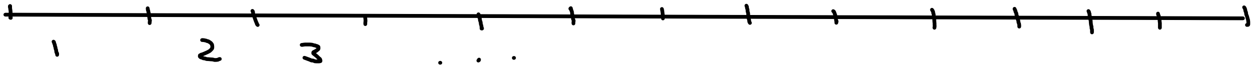
9\4\13

Single machine problem with replacement.



Demand $d_1, d_2, \dots, d_n$

Max. inventory H

P = cost of new machine

Cost of production is $c_s(x)$ for machine aged s.

$f_r(i,s)$ = min. cost in $r, r+1, \ldots, n$ starting with inventory i and machine aged s.

$$= \min \begin{cases} \text{Keep} & \min\limits_{x} \left(c_s(x) + f_{r+1}(i + x - d_r, s+1) \right) \\ \text{Replace} & P + \min\limits_{x} \left(c_0(x) + f_{r+1}(i + x - d_r, 1) \right) \end{cases}$$

Knapsack Problem

Item j has weight w_j and value p_j. $j = 1, 2, \ldots, n$.

Knapsack can hold W.

$f_r(w)$ = max. value from items $1, 2, \ldots, r$ placed in knapsack of size w

$$f_r(w) = \max_{\substack{0 \le x_r \le \frac{w}{w_r} \\ x_r \text{ integer}}} \left(p_r x_r + f_{r-1}(w - w_r x_r) \right)$$

$$= \max \begin{cases} x_r = 0 & f_{r-1}(w) \\ x_r \ge 1 & p_r + f_r(w - w_r) \end{cases}$$

$n = 4,$

$W = 9$

j	1	2	3	4
w_j	1	3	5	7
p_j	2	7	15	22

$n=4$, $W=9$

j	1	2	3	4
w_j	1	3	5	7
p_j	2	7	15	22

W	f_1	b_1	f_2	b_2	f_3	b_3	f_4	b_4
0	0	0	0	0	0	0	0	0
1	2	1	2	0	2	0	2	0
2	4	1	4	0	4	0	4	0
3	6	1	7	1	7	0	7	0
4	8	1	9	1	9	0	9	0
5	10	1	11	1	15	1	15	0
6	12	1	14	1	17	1	17	0
7	14	1	16	1	19	1	22	1
8	16	1	18	1	22	1	24	1
9	18	1	21	1	24	1	26	1