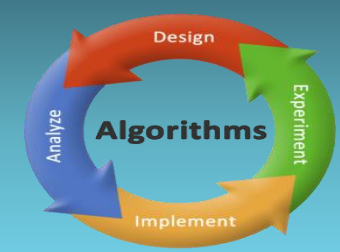
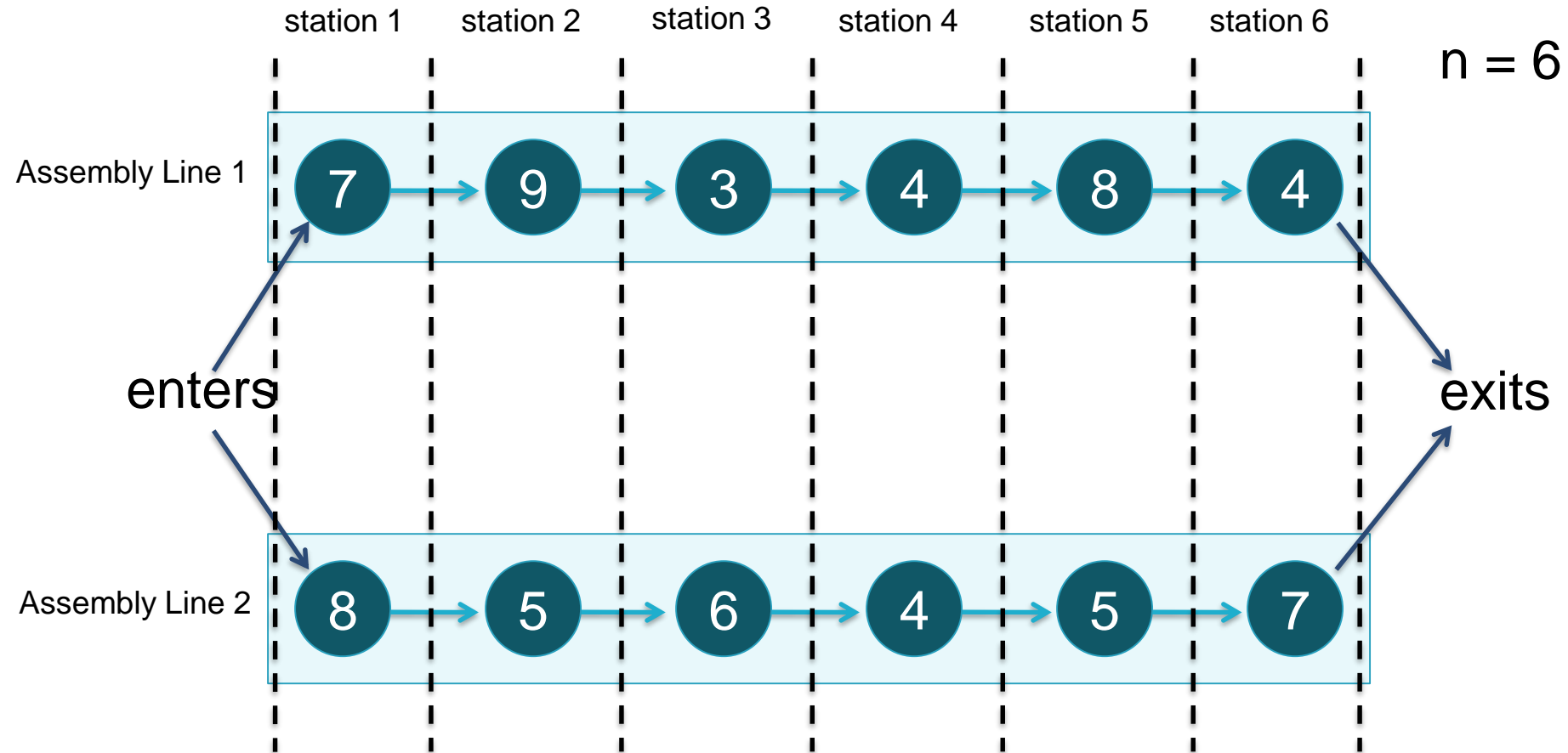


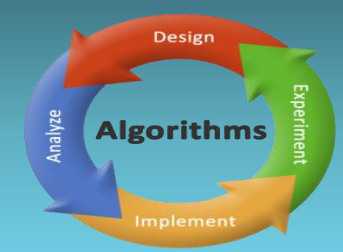
برنامه‌نویسی پویا

Assembly-Line Scheduling 1

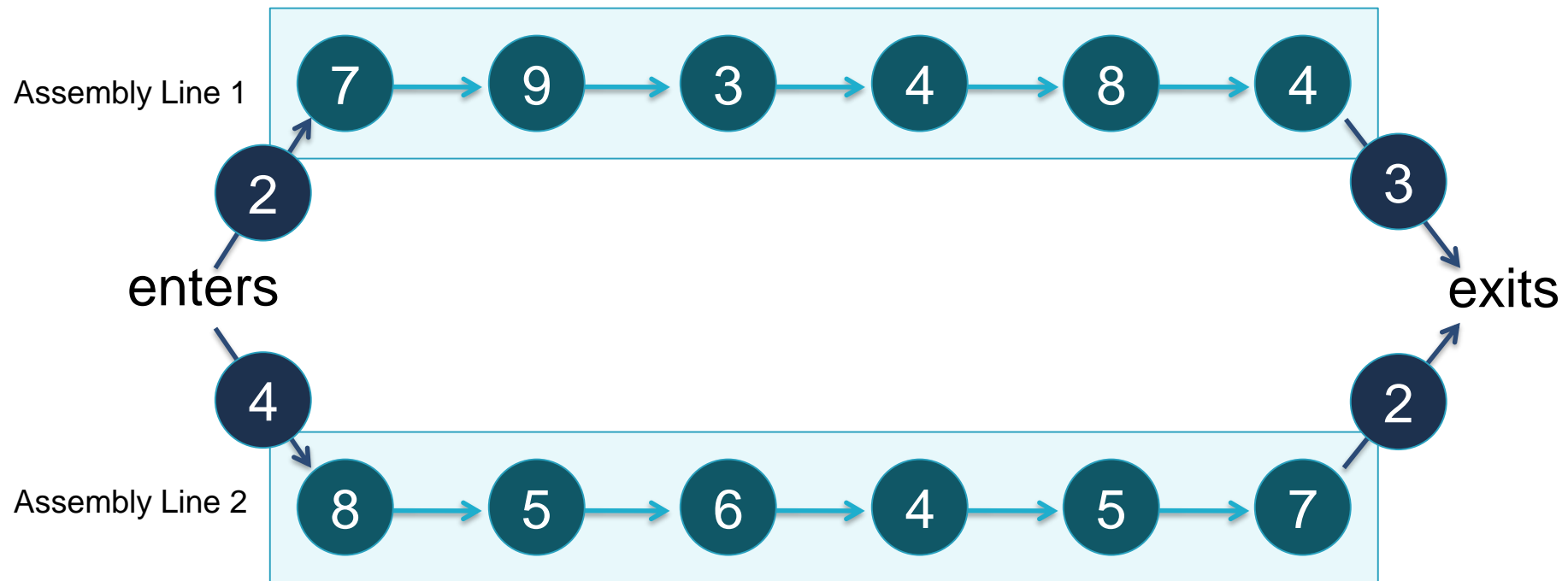


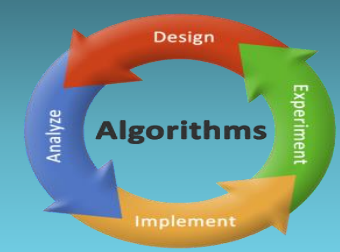
Assembly-Line Scheduling



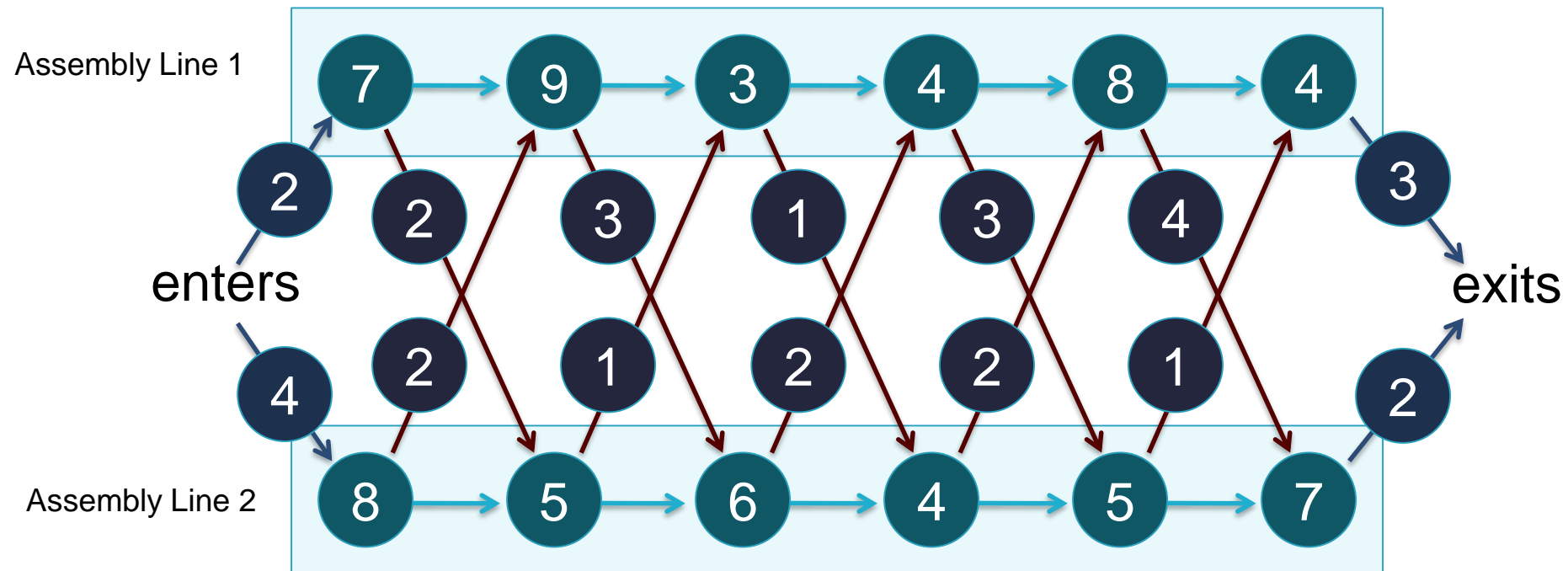


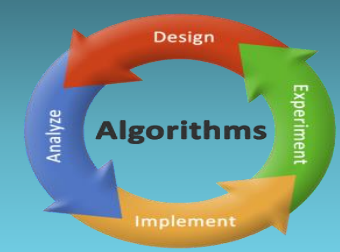
Assembly-Line Scheduling



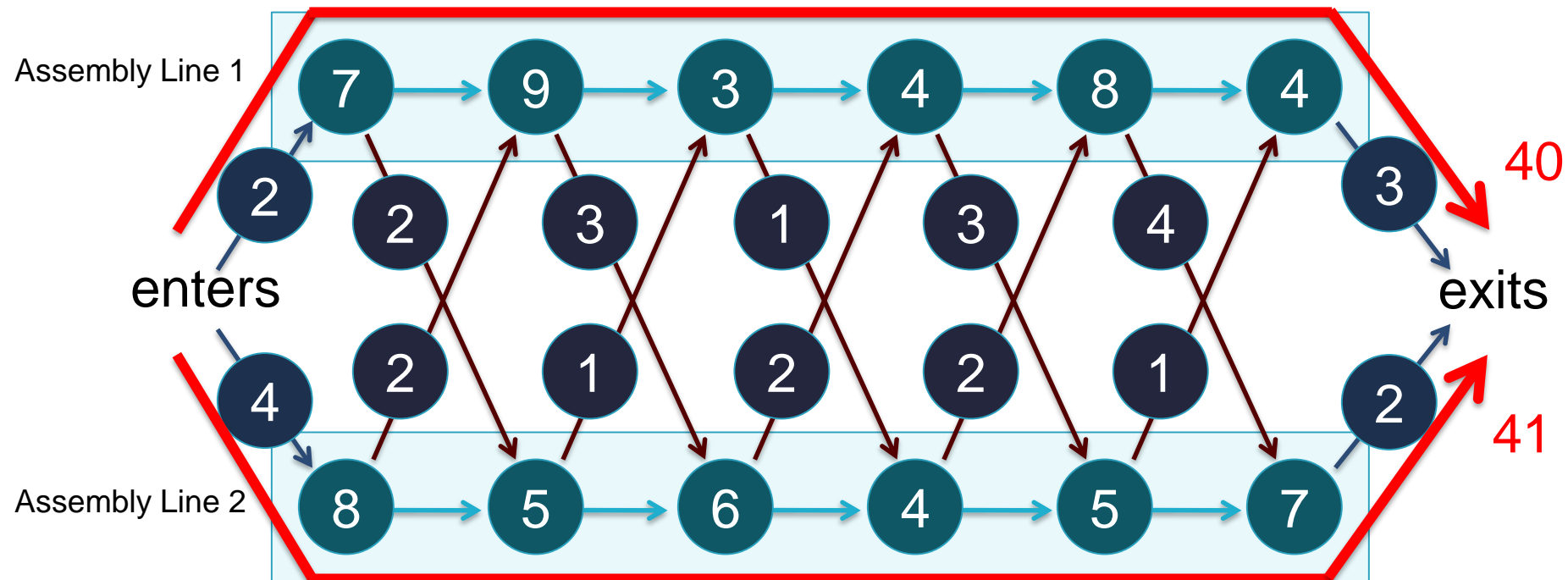


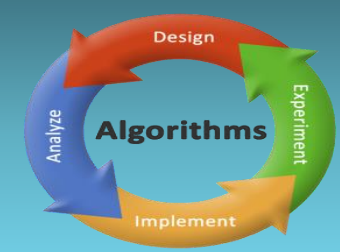
Assembly-Line Scheduling



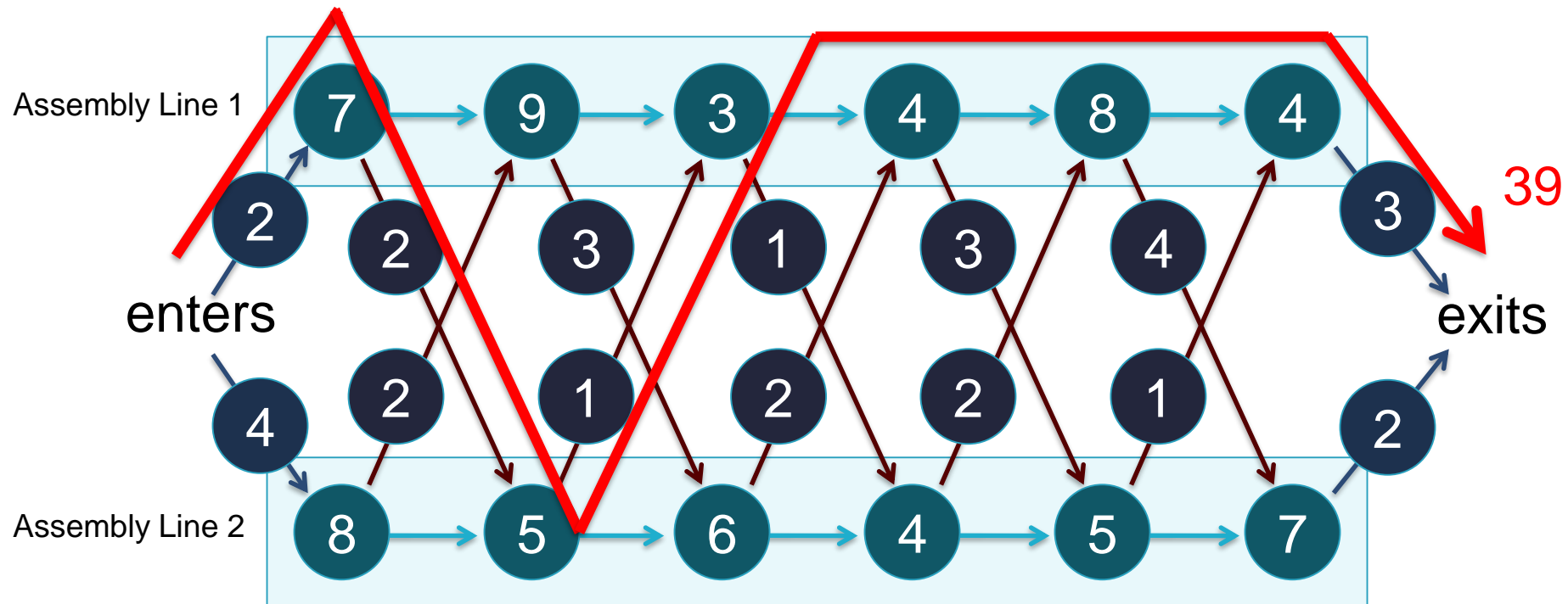


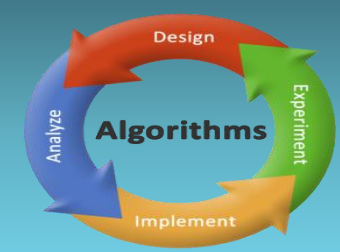
Assembly-Line Scheduling





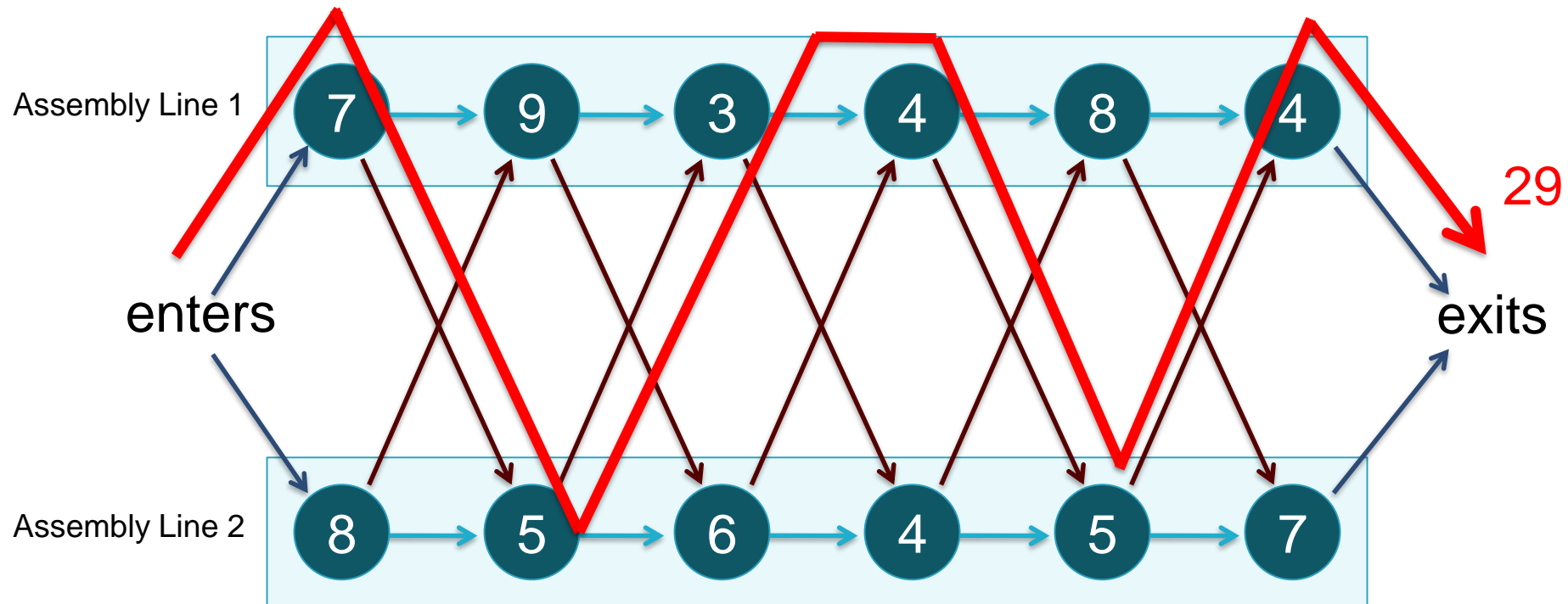
Assembly-Line Scheduling

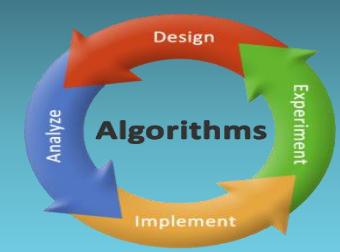




Assembly-Line Scheduling

اگر جابجایی بین خطوط هزینه‌ای نداشت...





نمادهای مورد استفاده

خطوط تولید : خط ۱: $i = 1$ و خط ۲: $i = 2$

زمان مورد نیاز برای هر ایستگاه j در خط i : $a_{i,j}$

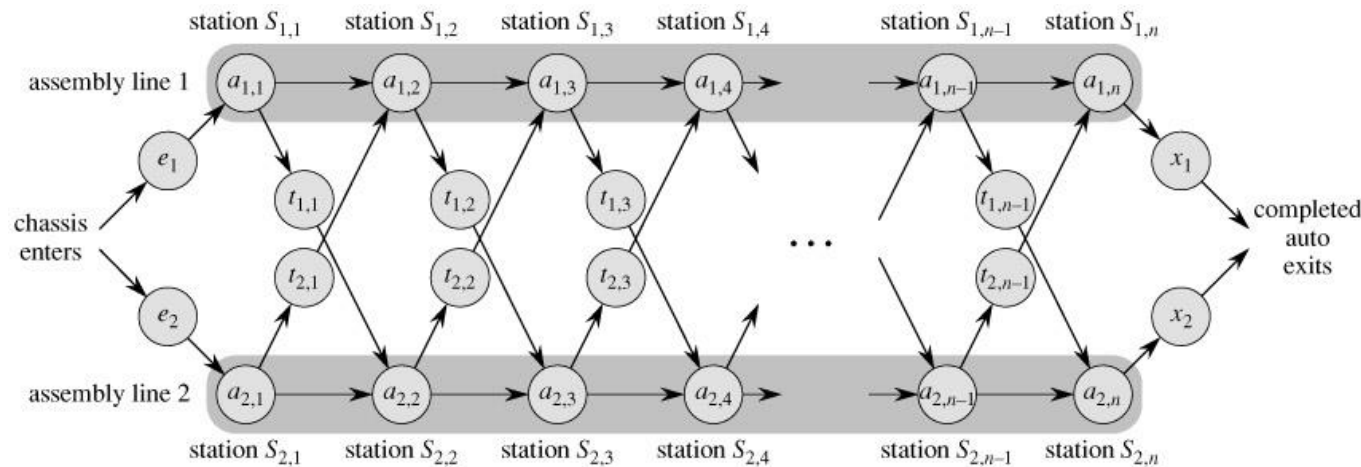
زمان مورد نیاز برای جابه‌جایی بین دو خط (آمدن از ایستگاه j در خط i): $t_{i,j}$ (فقط می‌توان به ایستگاه بعدی در خط دیگر رفت)

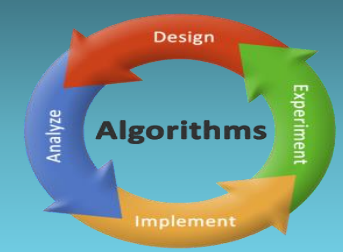
زمان مورد نیاز برای ورود به خط تولید i : e_i

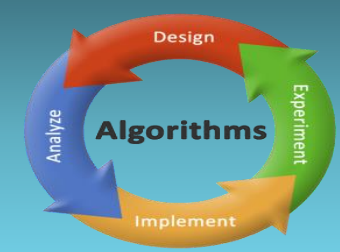
زمان مورد نیاز برای خروج از خط تولید i : x_i

بهترین زمان رسیدن به ایستگاه j در خط i : $f_i(j)$

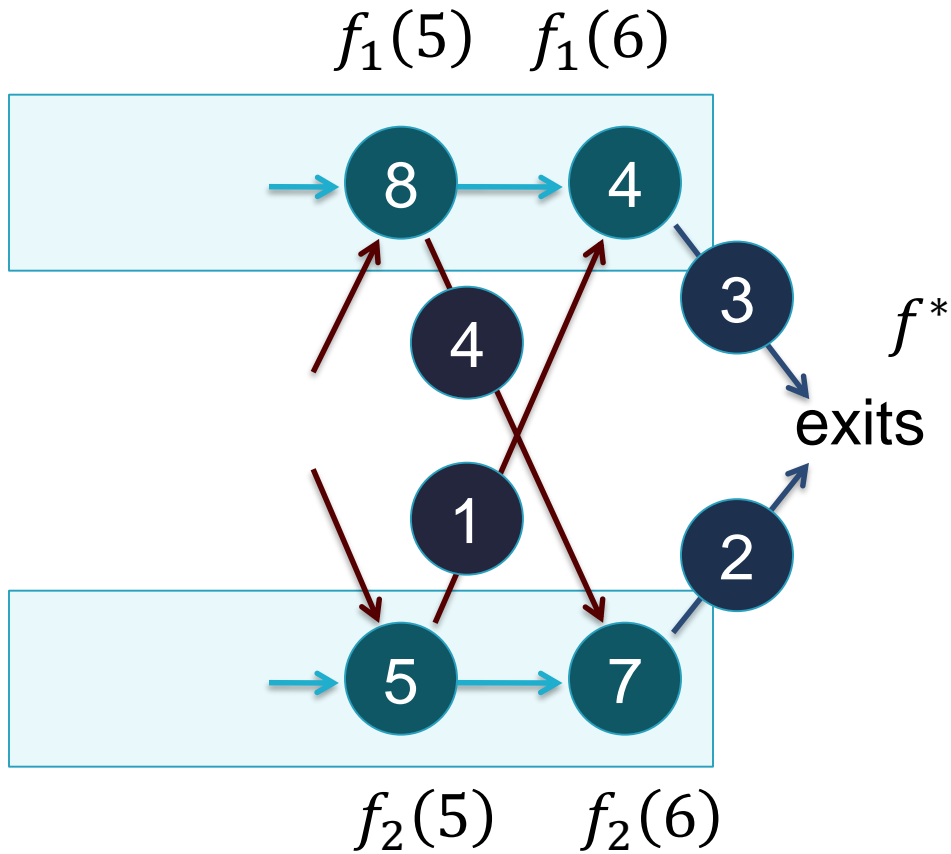
بهترین زمان کل: f^*







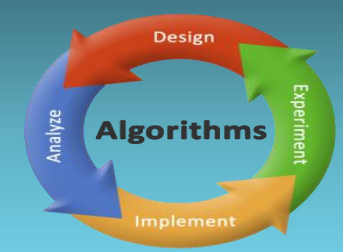
گام اول: نوشتن رابطه بازگشتی



$$f^* = \min(f_1(6) + 3, f_2(6) + 2)$$

$$f_1(6) = \min(\underline{f_1(5)} + 4, \underline{f_2(5)} + 1 + 4)$$

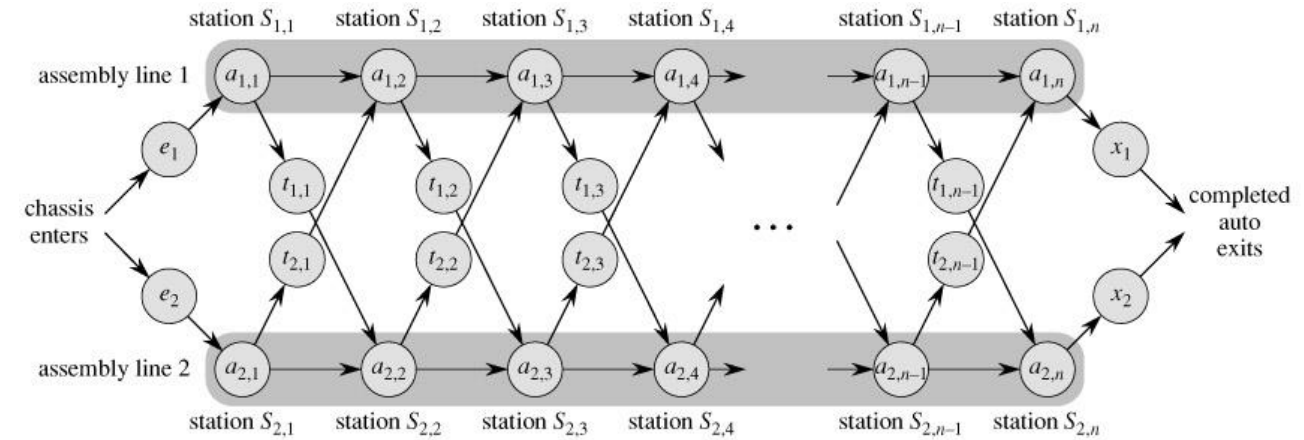
$$f_2(6) = \min(\underline{f_1(5)} + 4 + 7, \underline{f_2(5)} + 7)$$

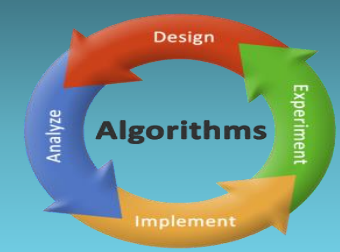


$$f^* = \min(f_1(n) + x_1, f_2(n) + x_2)$$

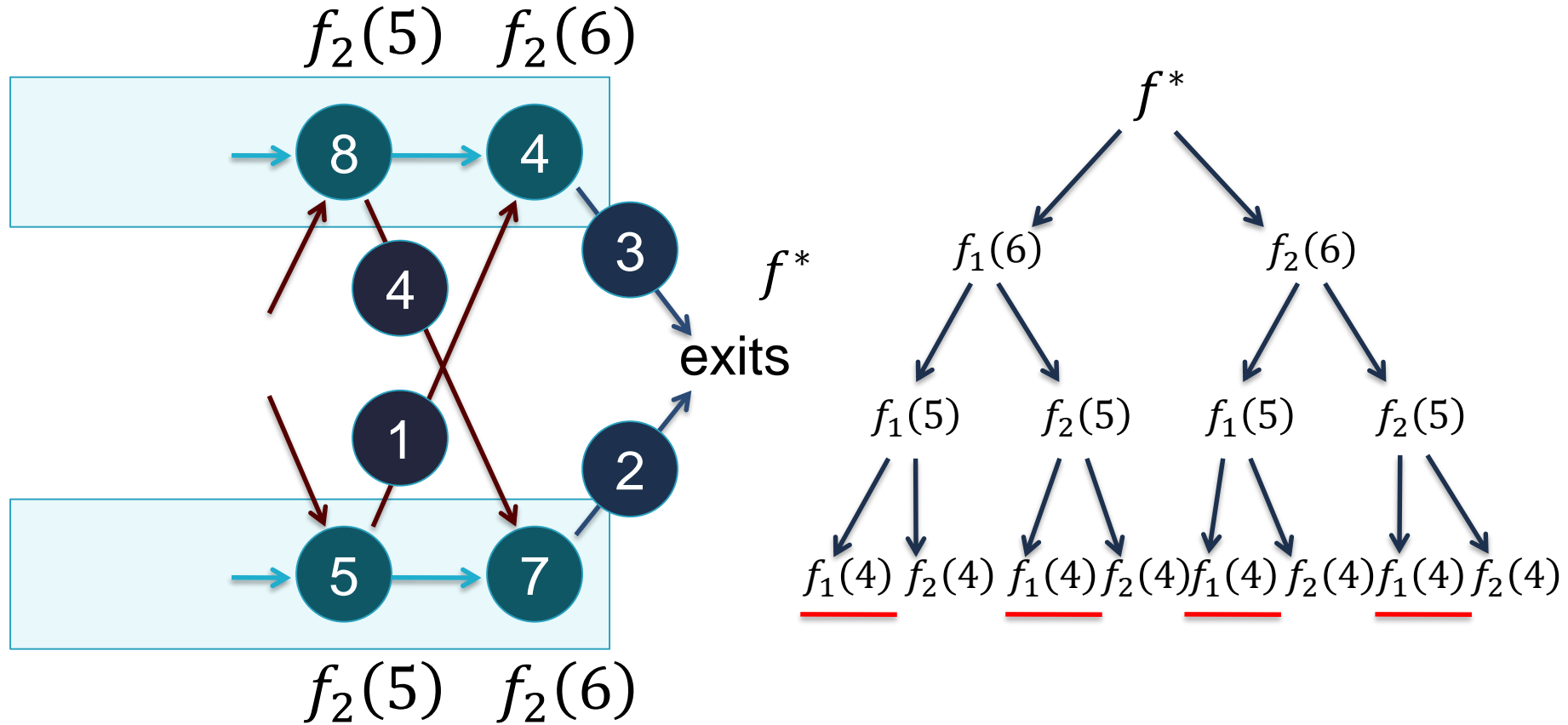
$$f_1(j) \begin{cases} e_1 + a_{1,1} & j = 1; \\ \min(f_1(j-1) + a_{1,j}, f_2(j-1) + t_{2,j-1} + a_{1,j}) & j > 1; \end{cases}$$

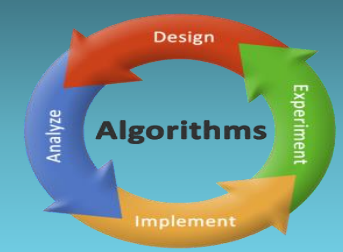
$$f_2(j) \begin{cases} e_2 + a_{2,1} & j = 1; \\ \min(f_2(j-1) + a_{2,j}, f_1(j-1) + t_{1,j-1} + a_{2,j}) & j > 1; \end{cases}$$

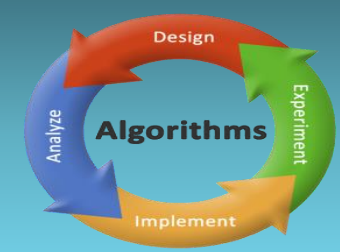




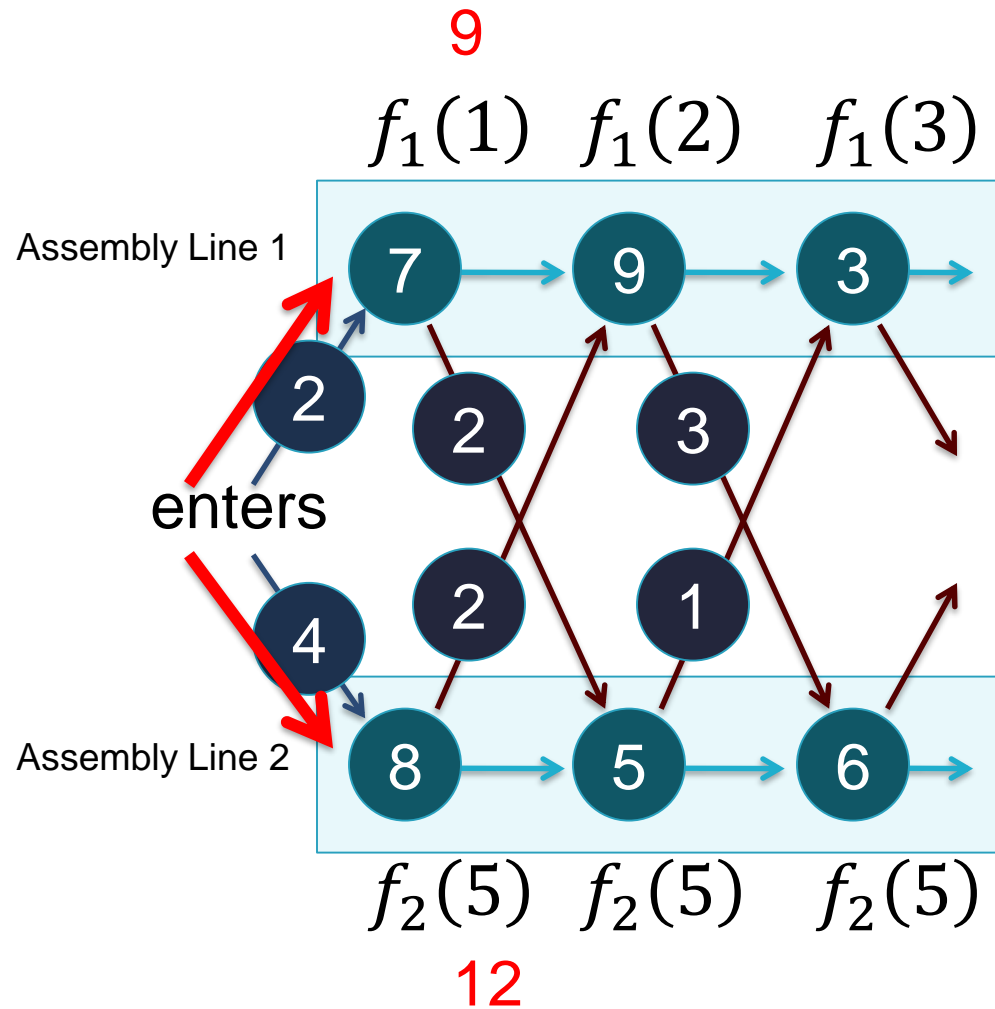
گام دوم بررسی وجود تکرار در زیر مسائل (Overlapping Subprograms)





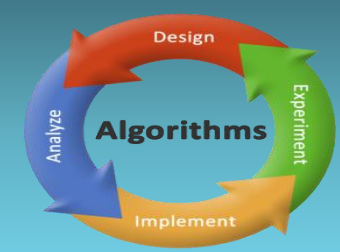


گام چهارم: یافتن روال DP

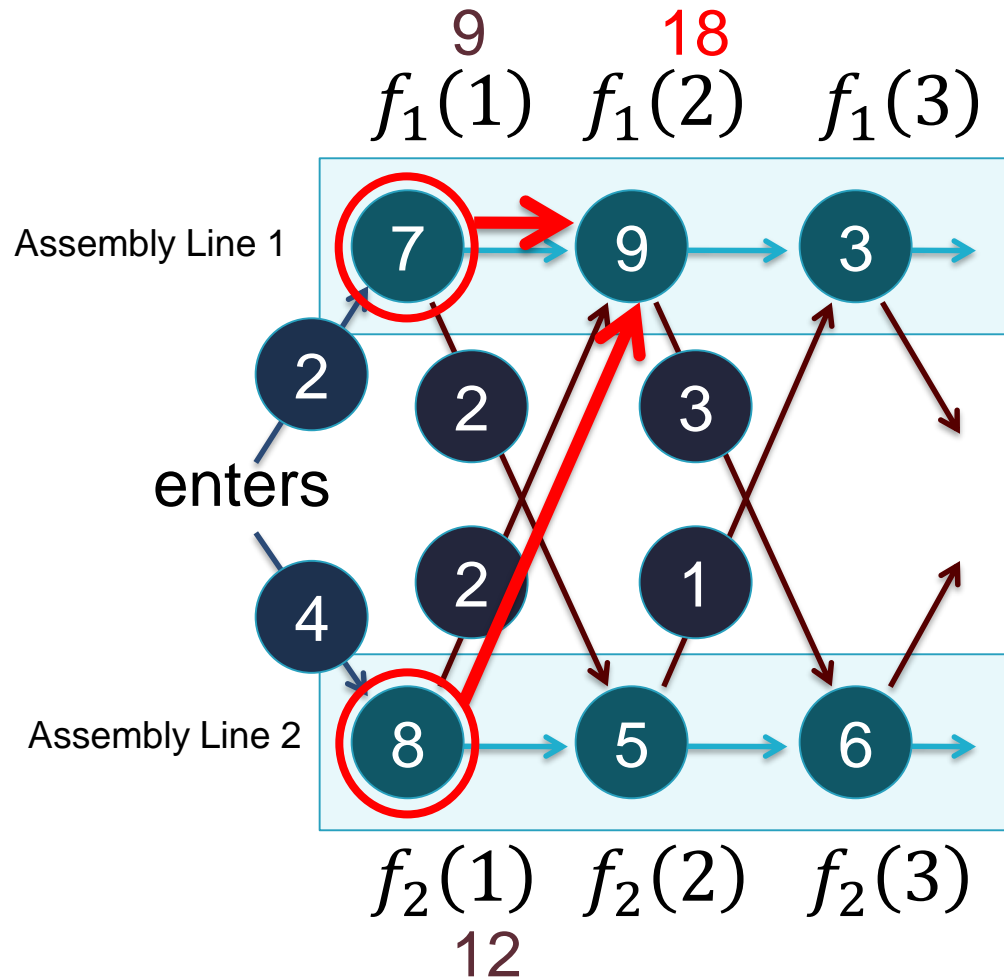


$$f_1(1) = 9$$

$$f_2(1) = 12$$



روال DP

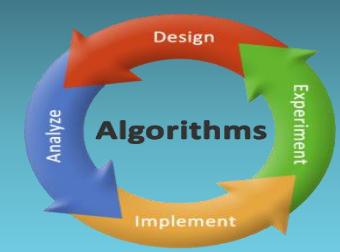


$$f_1(1) = 9$$

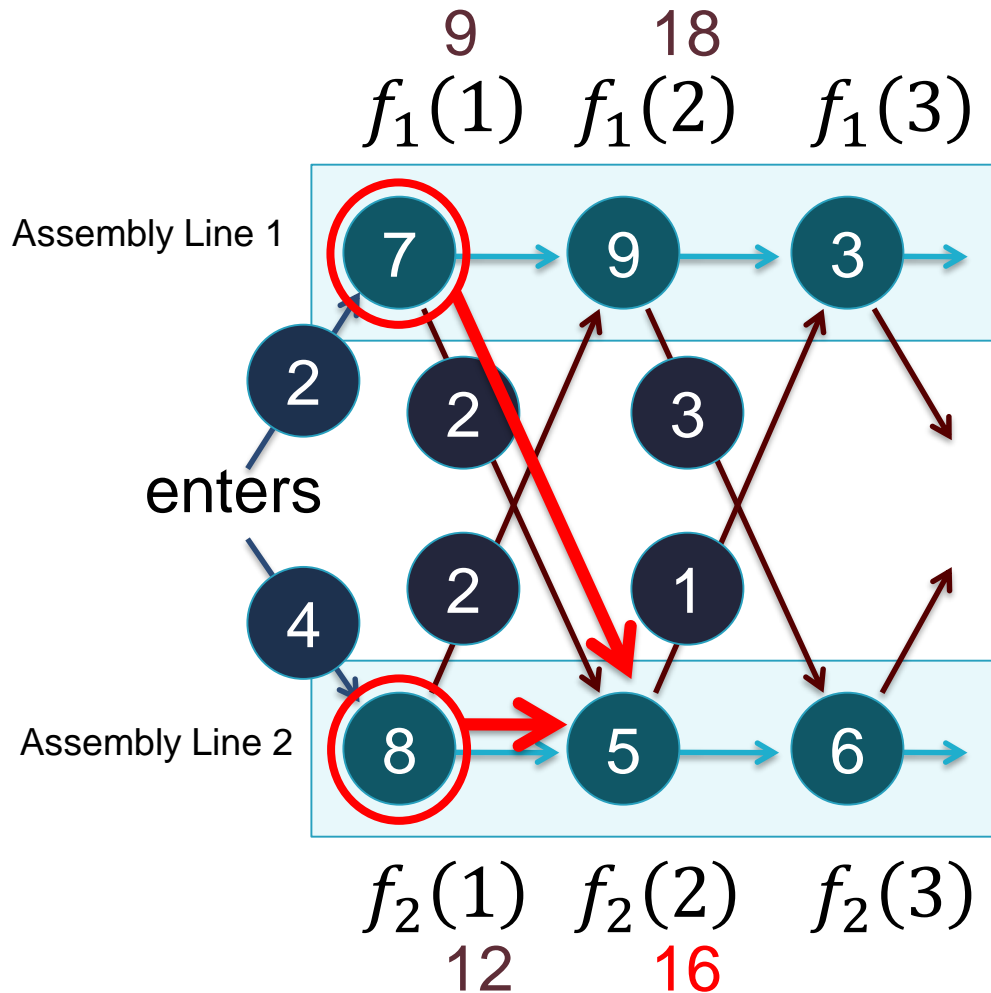
$$f_2(1) = 12$$

$$f_1(2) = \min(f_1(1) + 9, f_2(1) + 2 + 9)$$

$$l_1(2) = 1$$



روال DP

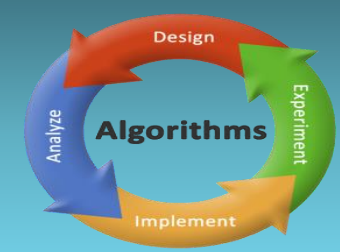


$$f_1(1) = 9$$

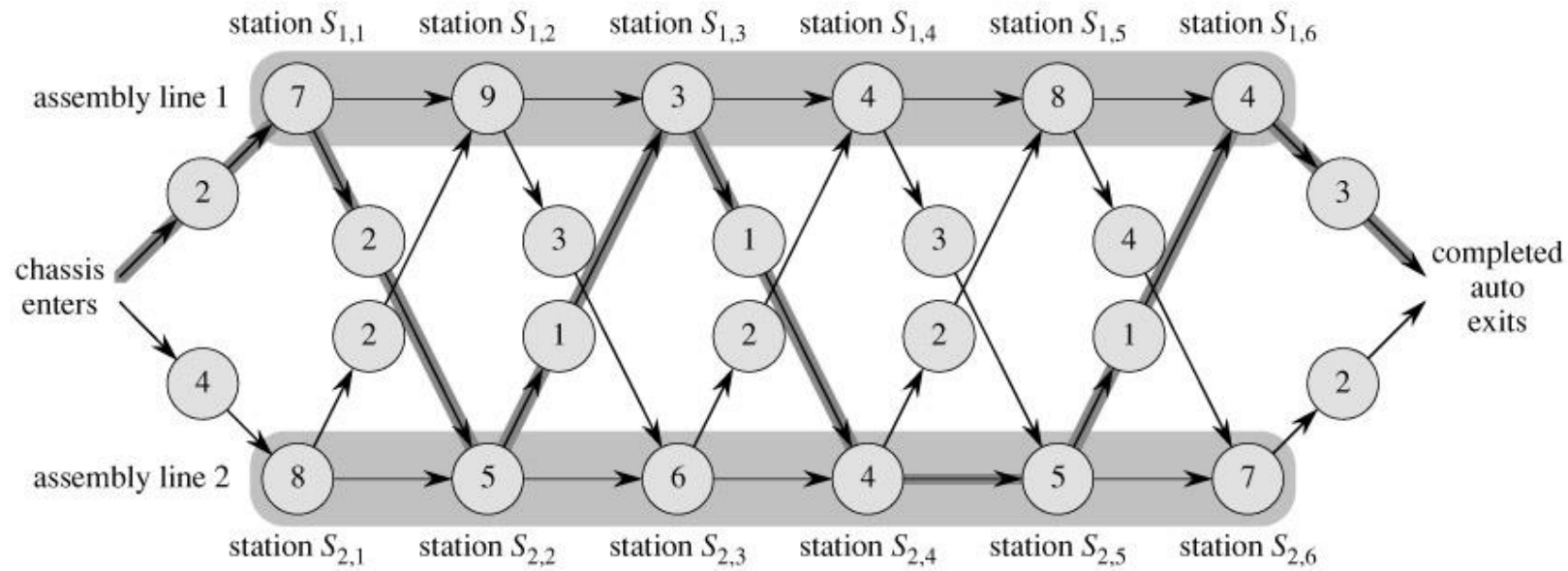
$$f_2(1) = 12$$

$$f_2(2) = \min(f_1(1) + 2 + 5 + f_2(1) + 5)$$

$$l_2(2) = 1$$



روال DP



(a)

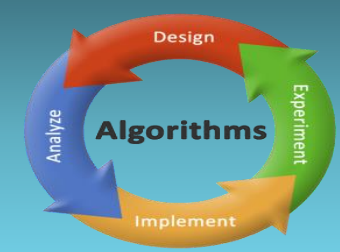
j	1	2	3	4	5	6
$f_1[j]$	9	18	20	24	32	35
$f_2[j]$	12	16	22	25	30	37

$f^* = 38$

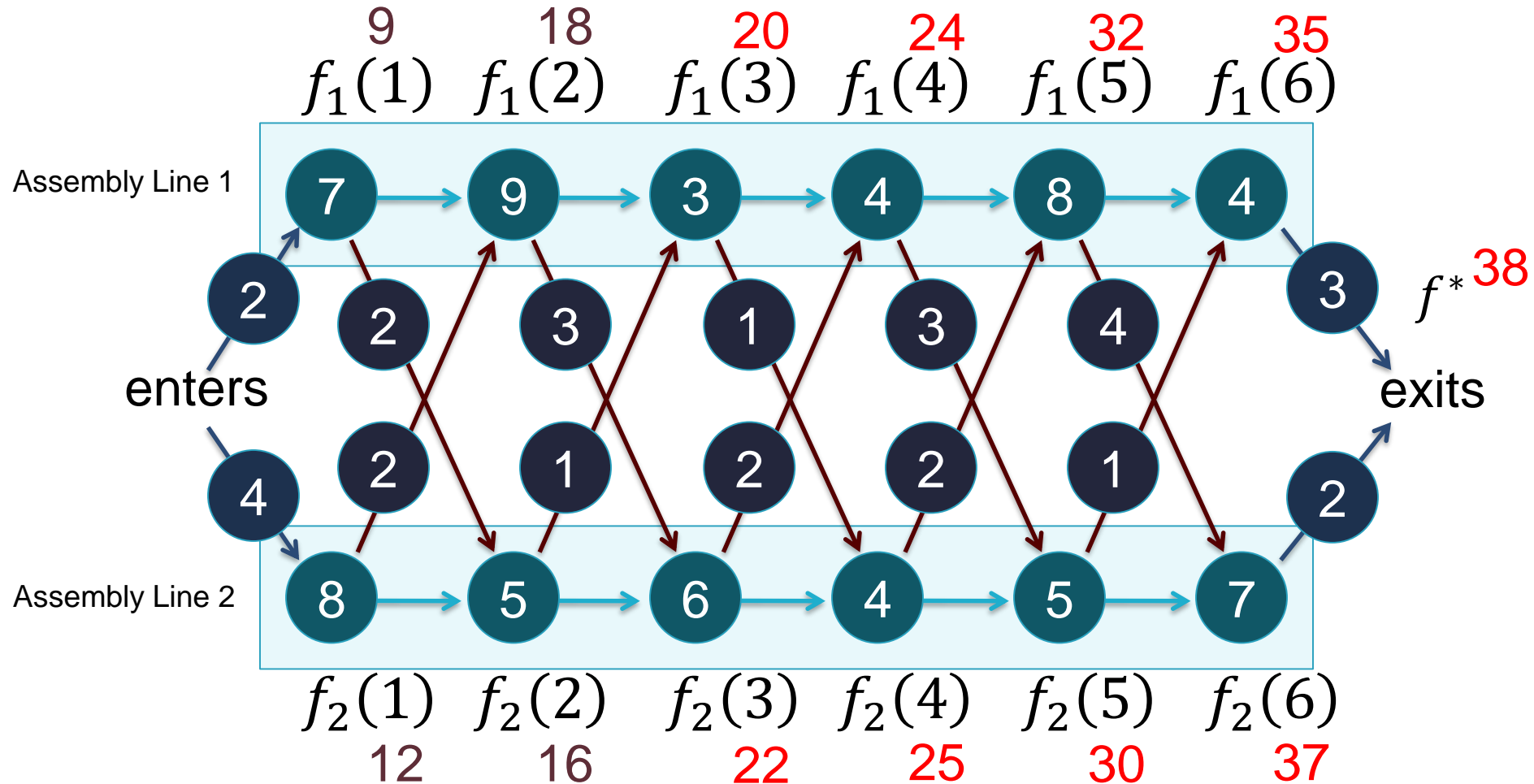
j	2	3	4	5	6
$l_1[j]$	1	2	1	1	2
$l_2[j]$	1	2	1	2	2

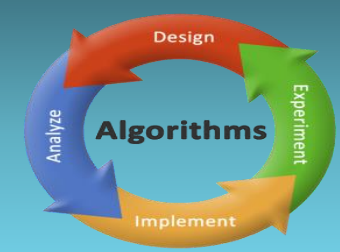
$l^* = 1$

(b)



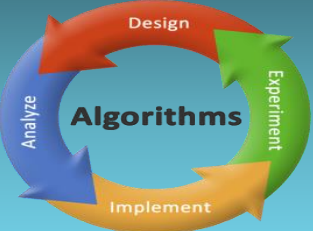
روال DP



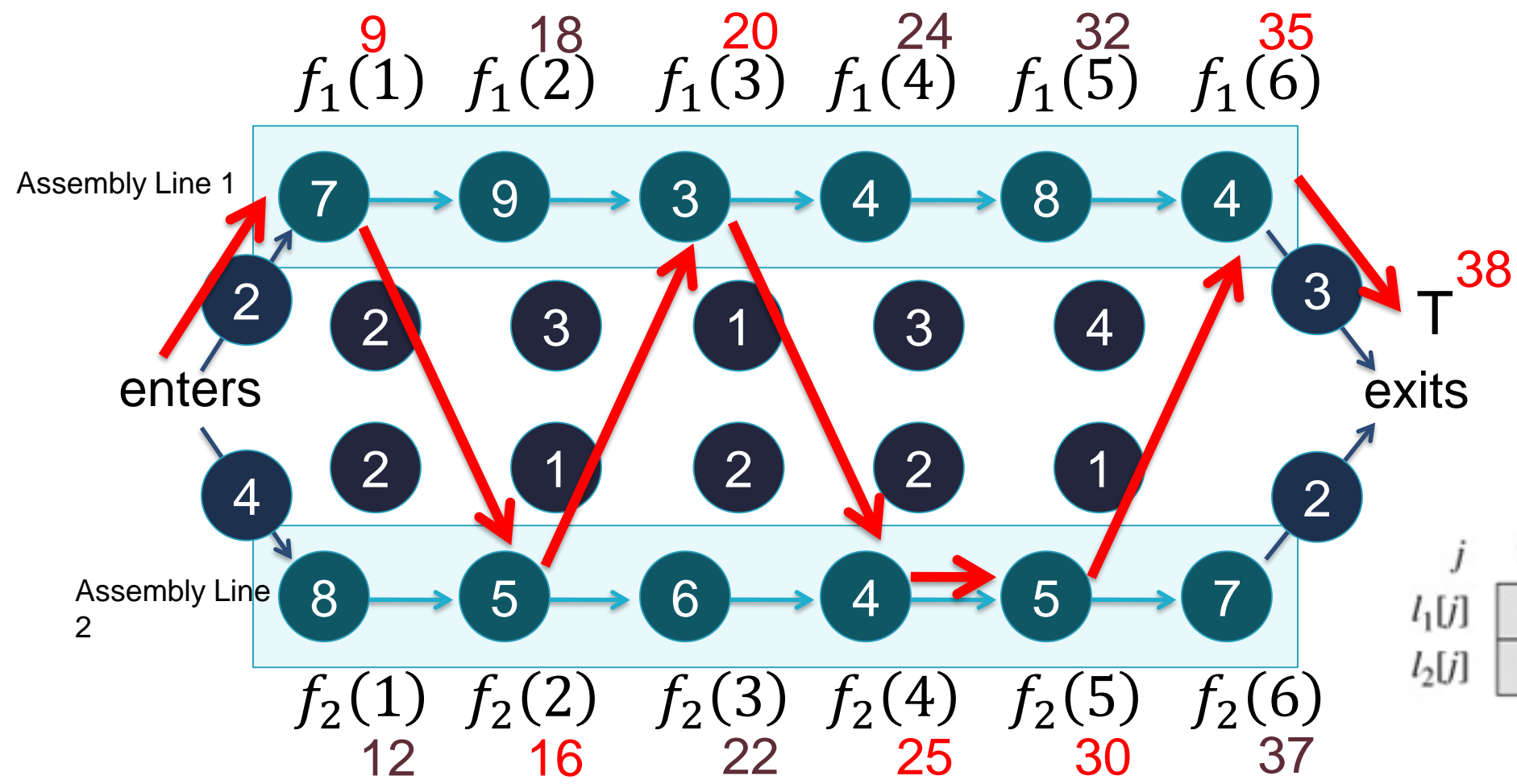


FASTEST-WAY(a, t, e, x, n)

```
1.  $f_1[1] \leftarrow e_1 + a_{1,1}$ 
2.  $f_2[1] \leftarrow e_2 + a_{2,1}$ 
3. for  $j \leftarrow 2$  to  $n$ 
4.     do if  $f_1[j - 1] + a_{1,j} \leq f_2[j - 1] + t_{2, j-1} + a_{1, j}$ 
5.         then  $f_1[j] \leftarrow f_1[j - 1] + a_{1, j}$ 
6.              $l_1[j] \leftarrow 1$ 
7.         else  $f_1[j] \leftarrow f_2[j - 1] + t_{2, j-1} + a_{1, j}$ 
8.              $l_1[j] \leftarrow 2$ 
9.     if  $f_2[j - 1] + a_{2, j} \leq f_1[j - 1] + t_{1, j-1} + a_{2, j}$ 
10.    then  $f_2[j] \leftarrow f_2[j - 1] + a_{2, j}$ 
11.         $l_2[j] \leftarrow 2$ 
12.    else  $f_2[j] \leftarrow f_1[j - 1] + t_{1, j-1} + a_{2, j}$ 
13.         $l_2[j] \leftarrow 1$ 
14. if  $f_1[n] + x_1 \leq f_2[n] + x_2$ 
15.     then  $f^* = f_1[n] + x_1$ 
16.          $l^* = 1$ 
17.     else  $f^* = f_2[n] + x_2$ 
18.          $l^* = 2$ 
```

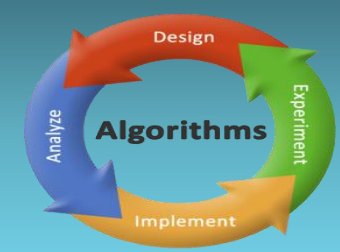


حل نهایی و پرکردن جدول



j	2	3	4	5	6
$l_1[j]$	1	2	1	1	2
$l_2[j]$	1	2	1	2	2

$l^* = 1$

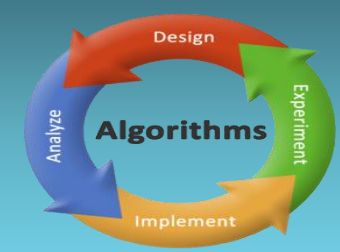


PRINT-STATIONS(1, n)

j	2	3	4	5	6
$l_1[j]$	1	2	1	1	2
$l_2[j]$	1	2	1	2	2

$l^* = 1$

1. $i \leftarrow l^*$
2. print "line " i ", station " n
3. for $j \leftarrow n$ downto 2
4. do $i \leftarrow l[i, j]$
5. print "line " i ", station " j - 1



j	1	2	3	4	5	6
$f_1[j]$	9	18	20	24	32	35
$f_2[j]$	12	16	22	25	30	37

$f^* = 38$

j	2	3	4	5	6
$l_1[j]$	1	2	1	1	2
$l_2[j]$	1	2	1	2	2

$l^* = 1$