```
procedure coinrow(input C: array [1..n] of integer,
  input/output F: array [0..n] of integer)
Algoritma
  F[0] ← 0
  F[1] ← C[1]
  for i ← 2 to n do
    F[i] ← max(C[i] + F[i-2], F[i-1])
```

Pertanyaan :

(a) apa input size dari algoritma di atas → n

(b) apa operasi dasarnya ? → +

(c) hitung T(n)-ya →

(d) masuk ke dalam kelas apa kompleksitas waktu dari algoritma tersebut

↳ linear

$$C(n) \Rightarrow \sum_{i=2}^{n} 1 = 2 - n + 1$$

$$= 1 - n \in O(n)$$

Algoritma (1) :

```
int sum(Array A, int n) /* ass n>=1*/
{
  int i=0, S=0;
  while (i<n){
    S+=A[i];
    i+=2;
}
  return S;
}
```

(a) Tentukan input sizenya → n

(b) Tentukan operasi dasarnya → + S+=A[i] ; i+=2

(c) Hitung T(n) algoritma tersebut dan tentukan kelas kompleksitasnya

↳ linear O(n)

$T(0) = 0$

k = n = genap ⇒ $\frac{n}{2}$

n = ganjil ⇒ $\frac{n+1}{2}$

↳ loop

$T(n) = k \times O(n)$

$$\therefore T(n) \begin{cases} \frac{n}{2} \times O(n) \\ \frac{n+1}{2} \times O(n) \end{cases}$$

Diketahui algoritma berikut ini :

Soal-1 :

```
Function Fib(n:integer)→integer
  if n == 0
     return 0
  else if n == 1
     return 1
  else
     return Fib(n-1) + Fib(n-2)
```

Hitung T(n) dengan persamaan karakteristik dan tentukan kelas kompleksitasnya

$$Fib(n) \begin{cases} 0, & n = 0 \\ 1, & n = 1 \\ T(n-1) + T(n-2) \end{cases}$$

$$T(n) = T(n-1) + T(n-2)$$

$$T(n) - T(n-1) - T(n-2) = 0$$

$$a_0 t_n - a_1 t_{n-1} - a_2 t_{n-2}$$

$$\hookrightarrow r^2 - r - 1$$

$$r = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-(-1) \pm \sqrt{1 - 4(1 \cdot -1)}}{2} = \frac{1 + \sqrt{5}}{2}$$

$$= \frac{1 - \sqrt{5}}{2}$$

$$T(n) = C_1\left(\frac{1+\sqrt{5}}{2}\right)^n + C_2\left(\frac{1-\sqrt{5}}{2}\right)^n$$

$$T(0) = C_1\left(\frac{1+\sqrt{5}}{2}\right)^0 + C_2\left(\frac{1-\sqrt{5}}{2}\right)^0 \Rightarrow C_1 + C_2 = 0$$

$$T(1) = C_1\left(\frac{1+\sqrt{5}}{2}\right)^1 + C_2\left(\frac{1-\sqrt{5}}{2}\right)^1 \Rightarrow C_1\left(\frac{1+\sqrt{5}}{2}\right) + C_2\left(\frac{1-\sqrt{5}}{2}\right)$$

$$C_1 = -C_2$$

$$T(n) = -C_2 \frac{1+\sqrt{5}}{2} + C_2 \frac{1-\sqrt{5}}{2}$$

$$= \frac{-C_2 + C_2\sqrt{5} + C_2 + C_2\sqrt{5}}{2} = 1$$

$$= C_2\sqrt{5} = 1$$

$$= C_2 = \frac{1}{\sqrt{5}}$$

$$C_1 = -C_2$$

$$C_1 = -\frac{1}{\sqrt{5}}$$

$$T(n) = -\frac{1}{\sqrt{5}}\left(\frac{1+\sqrt{5}}{2}\right)^n + \frac{1}{\sqrt{5}}\left(\frac{1+\sqrt{5}}{2}\right)^n \in O\left(\left(\frac{1+\sqrt{5}}{2}\right)^n\right)$$

Soal 2:

```
Function Q(n:integer)
//Input: A positive integer n
if n = 1
   return 1
else
   return Q(n - 1) + 2 * n - 1
```

Pertanyaan : Hitung T(n) dengan cara subtitusi

$$m(n) = m(n-1) + 1$$
$$= m(n-2) + 2$$

$$m(n) = m(n-n) + n$$
$$= m(n-n-1) + n-1$$
$$= m(1) + n-1$$
$$= 1 + n-1 \Rightarrow n \in O(n)$$

$$m(n) \begin{cases} 0, & n=0 \\ 1, & n=1 \\ 3 + \underline{m(n-1)} \end{cases}$$

$$m(n) = m(n-1) + 3$$
$$= (m(n-2) + 3) + 3 \Rightarrow m(n-2) + 6$$
$$= (m(n-3) + 3) + 6 \Rightarrow m(n-3) + 9$$
$$m(n-4) + 12$$

$$m(n) = m(n \cdot n) + 3n$$
$$= m(n-n-1) + 3(n-1)$$
$$= m(1) + 3n - 3$$
$$= 1 + 3n - 3$$
$$= 3n - 2 \in O(n)$$