

Algoritmitika I

By Abdan Hafidz

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Perhatikan Potongan Program di bawah ini!

```
int f(int x, int y, int z) {  
    int a = x + y;  
    int b = y + z;  
    int c = x + z;  
    return a + b - c;  
}
```

1. Tentukan berapa hasil pemanggilan $f(2,9,11)$
2. Diketahui pemanggilan fungsi $f(5,y,2) = 6$
tentukan nilai y yang memenuhi!

$$\begin{array}{rccc} & \textcolor{red}{x} & \textcolor{red}{y} & \textcolor{red}{z} \\ f(2, 9, 11) & & & \\ \textcolor{blue}{a} & = x + y \leftrightarrow 2 + 9 & = 11 \\ \textcolor{blue}{b} & = y + z \leftrightarrow 9 + 11 & = 20 \\ \textcolor{blue}{c} & = x + z \leftrightarrow 2 + 11 & = 13 \end{array}$$

$$\underline{a = 11}, \underline{b = 20}, \underline{c = 13}$$

$$\begin{aligned} f(2, 9, 11) &= 11 + 20 - 13 \\ &= 11 + 7 \\ &= 18 \end{aligned}$$

Subsitusi Nilai =

Perhatikan Potongan Program di bawah ini!

```
int f(int x, int y, int z) {  
    int a = x + y;  
    int b = y + z;  
    int c = x + z;  
    return a + b - c;  
}
```

1. Tentukan berapa hasil pemanggilan $f(2,9,11)$
2. Diketahui pemanggilan fungsi $f(5,y,2) = 6$ tentukan nilai y yang memenuhi!

} $f(5,y,2)$

$$f(5,y,2) = 2y = 6$$

$$2y = 6$$

$$y = \underline{\underline{3}}$$

Persamaaan, substitusi br

$$f(x,y,z) = \underline{\underline{a}} + \underline{\underline{b}} - \underline{\underline{c}}$$

$$\underline{\underline{a}} = x + y$$

$$\underline{\underline{b}} = y + z$$

$$\underline{\underline{c}} = x + z$$

$$\therefore \underline{\underline{a}} + \underline{\underline{b}} - \underline{\underline{c}}$$

$$(x+y) + (y+z) - (x+z)$$

$$\cancel{x} + y + \cancel{y+z} - \cancel{x} - \cancel{z}$$

$$= 2y$$

$$f(x,y,z) = 2y$$

Perhatikan Potongan Program di bawah ini!

```
int g(int x, int y) {  
    int a = x;  
    int b = a + y;  
  
    x = x + 1; → update value  
    y = y + 1;  
  
    a = a + x;  
    b = a + b;  
  
    return a + b  
}
```

Tentukan berapa hasil pemanggilan g(2000,25)!

$$g(2000, 25) = 2001 + 6026 \\ = 10027$$

Increment

Solusi

$$\cancel{a = a + x} \rightarrow a - a = x \rightarrow x = 0$$

$$\underline{x = 2000}, \quad y = 25$$

$$a = x, \quad b = a + y$$

$$a = 2000, \quad b = 2000 + 25 = 2025$$

$$\underline{x'} = x + 1 = 2000 + 1 \\ = \underline{2001}$$

$$y' = y + 1 = 25 + 1 \\ = 26$$

$$a' = a + x' = 2000 + 2001$$

$$b' = a' + b = 2001 + 2025 \\ = 6026$$

$$q = q + 1 \rightarrow q' = q + 1$$

$$q += 1$$

$$\boxed{\square} \stackrel{+}{=} \triangle \rightarrow \boxed{\square} = \boxed{\square} \stackrel{+}{=} \triangle \quad (\text{increment})$$

*

\therefore

-

$$\boxed{\square} \stackrel{+}{=} 1 \rightarrow \boxed{\square} \stackrel{+}{=}$$

*

$$a = 5$$

$$a++ \rightarrow q += 5 \rightarrow q' = 5 + 1$$

$$a_{\text{avg}} = 6$$

Perhatikan Potongan Program di bawah ini!

```
int a,b;  
void h() {  
    a++;  
    b++;  
    a+=b;  
    b-=a;  
    a*=2;  
    b/=a;  
    a%=3;  
}
```

$$\begin{aligned} & a = 21 \\ & b = 1 \\ & \underline{a = 25} \checkmark \\ & b = -21 \\ & \underline{q = 50} \checkmark \\ & b = -21 / 50 = 0 \\ & a = 50 \bmod 3 = 2 \end{aligned}$$

$$q = 20, b = 3$$

answer

$$\underline{a = 2}, \underline{b = 0}$$

Jika mula – mula nilai a = 20, dan b = 3, tentukan nilai akhir a dan b setelah prosedur h () dijalankan!

$$\left\lfloor \frac{-21}{50} \right\rfloor = \left\lfloor \begin{matrix} -0.42 \\ -1 \quad 0 \end{matrix} \right\rfloor = 0$$

Perhatikan Potongan Program di bawah ini!

```
int dar(double x, double y) {  
    return x / y;  
}  
  
int der(double x, double y) {  
    return dar(x, y) * y;  
}  
  
int dor(double x, double y, int z) {  
    return dar(x * z, y * z);  
}
```

$$\lfloor 0,5 \rfloor = \sigma$$

1 *ans* *sewah* 0

Tentukan kembalian fungsi jika dipanggil $\text{dar}(27.354929893, 8.298399)$!

double x = 0,25 → int x = 0
↓
decimal
double y = x Cint double → int
y = 0 0,25 = 0

Perhatikan Potongan Program di bawah ini!

```
int dar(double x, double y) {  
    return(x / y);  
}  
  
int der(double x, double y) {  
    return dar(x, y) * y (int);  
}  
  
int dor(double x, double y, int z) {  
    return dar(x * z, y * z);  
}
```

der(x, y)

↓

dar (x,y) * y (int)

$\frac{x}{y}$

der (x,y) = $\left[\frac{x}{y} \right] * y \text{ (int)}$

Tentukan kembalian fungsi jika dipanggil der(27.354929893, 8.298399)!

$$\left[\frac{3}{2.9} \right] = [1, \dots] = 1$$
$$\lfloor 2.9 \rfloor = 2$$

$$\left(\frac{3}{2.9} \right) * 2 \cdot 1 \text{ (int)}$$
$$3x$$

$$\left[\begin{smallmatrix} 3 \\ 2.9 \end{smallmatrix} \right] * \left[\begin{smallmatrix} 2.9 \\ \frac{27.35 \dots}{8.2983\dots} \end{smallmatrix} \right] = 1 * 2$$

= 2

$\left[\begin{smallmatrix} x \\ \frac{x}{y} \end{smallmatrix} \right] \neq \left[\begin{smallmatrix} x \\ y \end{smallmatrix} \right]$

$$\left[\begin{smallmatrix} 3, \dots \\ 8.2983 \end{smallmatrix} \right] = 3$$

$$= 8$$

$\left. \begin{array}{l} \text{der} = 3 * 8 \\ = 24 \end{array} \right\}$

Perhatikan Potongan Program di bawah ini!

```
int dar(double x, double y) {  
    return x / y;  
}  
  
int der(double x, double y) {  
    return dar(x, y) * y (int);  
}  
  
int dor(double x, double y, int z) {  
    return dar(x * z, y * z);  
}
```

$$= \frac{x}{y} \cdot z$$

$$\text{dar}(36, y, z) = 9$$

$$\left\lfloor \frac{36 \cdot z}{y \cdot z} \right\rfloor = 9$$

$$\left\lfloor \frac{36}{y} \right\rfloor = 9$$

bil bulat

Jika hasil pemanggilan fungsi $dor(36, y, z) = 9$ tentukan nilai y yang memenuhi

$$\left\lfloor \frac{36}{3 \cdot 9} \right\rfloor = 9$$

Perhatikan Potongan Program di bawah ini!

```
int dar(double x, double y) {  
    return x / y;  
}  
  
int der(double x, double y) {  
    return dar(x, y) * y (int);  
}  
  
int dor(double x, double y, int z) {  
    return dar(x * z, y * z);  
}
```

$$\frac{36z}{yz} = 9$$

$$1 \leq z \leq 1000$$

$$Y = 4$$

$$\frac{36z^1}{4z^1}$$

Jika hasil pemanggilan fungsi dor(36, y, z) = 9 untuk y dan z bilangan bulat , serta $1 \leq z \leq 1000$ ada berapa banyak pasangan y dan z yang memenuhi?

$$\begin{aligned} &\text{↓ 1000 pasang} & z = \{1 - 1000\} \\ &y=4, z = \{1, \dots, 1000\} \rightarrow 1 * 1000 = \underline{\underline{1000}} \end{aligned}$$

Perhatikan Potongan Program di bawah ini!

```
int kwak(int x, int y){  
    if(x % y == 0) return 1;  
    return 0;  
}
```

$x = \text{keuparan } y$

= 36

Tentukan berapa hasil pemanggilan $\text{kwak}(100000, 1) + \text{kwak}(100000, 2) + \text{kwak}(100000, 3) + \dots + \text{kwak}(\underline{100000}, \underline{100000})$

1 ≤ y ≤ 100.000

$y \leq x$

1 * Sebanyak kasus ketika $x \bmod y = 0$

ada berapa
menyatakan

banyak faktor
dari x , ($y \leq x$)

Banyak Faktor (x) = $\varphi(x)$

$$\varphi(10^5) = (5+1)(5+1) = \underline{\underline{36}}$$

$$10^5 = (2 \cdot 5)^5 \\ = 2^{\textcircled{5} e_1} \cdot 5^{\textcircled{5} e_2}$$

$$\varphi(x) = (e_1 + 1)(e_2 + 1) \dots (e_i + 1)$$

Perhatikan Potongan Program di bawah ini!

```
int aduk(int x, int y) {  
    while(x > 0) {  
        y++;  
        x--;  
    }  
}
```

n y +
sebanyak ?

$$\underline{19.10} - \underline{20.10}$$

Tengahyan x

Tentukan berapa hasil pemanggilan aduk(20, 2024)!

aduk(20, 20) → kurangi x sampai 0

x -- } Sampai x = 0
x -- :
:

y + ? sebanyak 20 kali
x kali

$$\underline{x = 20}$$

sampai 0

$$\text{hasil} = y + 1x = y + x$$

$$\begin{aligned} \text{aduk}(x, y) &= x + y \\ &= 20 + 2024 \end{aligned}$$

$$20 - 1 + \boxed{?} = 0$$

=

$$= 2044$$

Perhatikan Potongan Program di bawah ini!

```
int campur(int x, int y) {
    int ret = 0;           13
    for(int i = 1; i<=x; i++) { i+=1
        ret+=i;
    }
    for(int j = 1; j<=y; j++) { j+=1
        ret-=j;
    }
    return ret;
}
```

$$x = 13, y = 15$$

$$\begin{aligned} \text{ret} &= (1+2+3+\dots+13) - 1-2-3 \\ &\quad \dots - 15 \\ &= (1+2+3+\dots+15) - (1+2+3+\dots+15) \end{aligned}$$

Tentukan berapa hasil pemanggilan campur(13, 15)!

for 1 → $i = 1$
 $i = 2$
 ⋮
 $i = 13$

for 2 → $j = 1$
 ⋮
 $j = 15$

$$\text{ret} = \overbrace{(1+2+3+4+\dots+13)}^x - (1+2+3+\dots+15)$$

$$x = (1+2+3+4+\dots+13) = x$$

$$x + 14 + 15 = (1+2+3+4+\dots+13) + 14 + 15 = x + 29$$

$$\begin{aligned}\text{ret} &= x - (x + 29) \\ &= x - x - 29 \\ &= -29 \\ &=\end{aligned}$$

Perhatikan Potongan Program di bawah ini!

```
int tumpah(int x, int y) {
    int ret = 0;
    for(int i = 1; i<=x; i++) {
        for(int j = 1; j<=y; j++) {
            ret++; → ret +1
        }
    }
    return ret;
}
```

$$\begin{aligned}1 \leq i \leq 13 \\1 \leq j \leq 15 \\1 + 1 + 1 + \dots + 1\end{aligned}$$

j

Tentukan berapa hasil pemanggilan campur(13, 15)!

$$\begin{aligned}\text{Setiap } i &\text{ ada } 13 \text{ } j \\ \text{Setiap } j &\text{ ada } 15 \text{ } i \\ j &= 13 * 15 \\ &= \underline{\underline{195}}\end{aligned}$$

$$\begin{aligned}1 \leq j \leq 15 \\j \text{ sebanyak } 15\end{aligned}$$

Perhatikan Potongan Program di bawah ini!

```
int a,b,c;  
cin>>a>>b>>c;  
int x = 3,y = 2,z = 1;  
a = a + x;  
b = b + y;  
c = c + z;  
  
cout<<a+b+c<<endl;
```

Jika keluaran yang dihasilkan sama dengan 12 tentukan ada berapa banyak triplet masukan berupa bilangan bulat non-negative $\langle a, b, c \rangle$ yang mungkin diinput pada program sehingga keluarannya sesuai!


```
int merah(int a,int b){  
    if(b == 0) return a;  
    return merah(a+1,b-1);  
}  
int biru(int a, int b){  
    if(b == 0) return a;  
    return biru(a-1,b-1);  
}  
int kuning(int a, int b){  
    if(b == 1) return a;  
    return (a+kuning(a,b-1));  
}  
int hijau(int a, int b){  
    if(a - b == 0) return 1;  
    return (1+hijau(a-b,b));  
}
```

M(a,b)
B(a,b)
K(a,b)
H(a,b)

```

int merah(int a, int b){
    if(b == 0) return a;
    return merah(a+1, b-1);
}
int biru(int a, int b){
    if(b == 0) return a;
    return biru(a-1, b-1);
}
int kuning(int a, int b){
    if(b == 1) return a;
    return (a+kuning(a, b-1));
}
int hijau(int a, int b){
    if(a - b == 0) return 1;
    return (1+hijau(a-b, b));
}

```

$M(a, b)$ ← tambah a dengan 1
kurangi b dengan 1

$$M(9,5) = N(10,4) = M(11,3)$$

$$N(11,3) = M(12,2) = M(13,1)$$

$$M(13,1) = M(\cancel{14,0}) = 14$$

$a + 1$ sebanyak
Pengurangan $\underline{b - 1}$ → sebanyak n

$$M(a,b) = \underline{\underline{a+b}}$$

$$a+1 * n$$

$$a+1 * b = a+b \quad b - b = 0$$

$$\underline{b - 1 * n} = 0$$

$$\cancel{b - n} = 0 \rightarrow n = b$$

```

int merah(int a, int b){
    if(b == 0) return a;
    return merah(a+1,b-1);
}
int biru(int a, int b){
    if(b == 0) return a;
    return biru(a-1,b-1);
}
int kuning(int a, int b){
    if(b == 1) return a;
    return (a+kuning(a,b-1));
}
int hijau(int a, int b){
    if(a - b == 0) return 1;
    return (1+hijau(a-b,b));
}

```

$$B(a,b) = a - b$$

$B(a,b)$ = $a - b$
 Sebanyak pengurangan $b-1$

$$a - b$$

$B(a,b)$ = $\underline{\underline{a - b}}$

```

int merah(int a, int b){
    if(b == 0) return a;
    return merah(a+1, b-1);
}
int biru(int a, int b){
    if(b == 0) return a;
    return biru(a-1, b-1);
}
int kuning(int a, int b){
    if(b == 1) return a;
    return a + kuning(a, b-1);
}
int hijau(int a, int b){
    if(a - b == 0) return 1;
    return (1+hijau(a-b, b));
}

```

$$\begin{aligned}
 k(12, 3) &= 12 + k(12, 3-1) \\
 &\quad 12 + k(12, 2) \\
 k(12, 2) &= 12 + k(12, 2-1) \\
 &\quad 12 + k(12, 1) \\
 k(12, 1) &= 12 \quad h(a, b) = \frac{a}{b}
 \end{aligned}$$

$$\begin{aligned}
 k(12, 1) &= 12 \\
 k(12, 2) &= 12 + 12
 \end{aligned}$$

$$\begin{aligned}
 a - b &\quad k(12, 6) \\
 b - b - b &\quad k(15, 3) \quad k(12, 3) = 12 + 12 + 12 \\
 5x &\quad 15 - 3 - 3 - 3 - 3 \\
 a - b * n &\quad k(a, b) = a + a + a + \dots + a \\
 a &\quad = a * n \rightarrow n = a/b
 \end{aligned}$$

Sebanyak b

```

int main() {
    int res = 0, x;
    for(int i = 1; i<=100; i++) {
        for(int j = 1; j<=i; j++) {
            x = merah(i, j) + biru(i, j);
            res += hijau(x, 2);
        }
    }
    cout<<res<<endl;
}

```

$$i=1 \rightarrow j=1 \rightarrow \text{Res}+1$$

$$i=2 \rightarrow j=1 \quad j=2 \\ \text{Res}+2 \quad \text{Res}+2$$

$$\begin{aligned} \text{Res} &= 1+1+2+2+3+3+\dots \\ &= 1^2+2^2+3^2+\dots+100^2 \end{aligned}$$

$$\underbrace{i+i+i+\dots}_{\text{sebanyak } i} = i \times i = i^2$$

$$\begin{aligned} x &= i+j+i-j \\ &= i+i+j-j \\ &= 2i \end{aligned}$$

$$\text{Res} += \frac{2i}{2}$$

$$\text{Res} += i$$

$$\text{Res} = i \text{ sebanyak } j$$

$$\begin{aligned} \text{Res} &= 1+2+2+3+3+3+\dots \\ &\quad -100+100+10+\dots \end{aligned}$$

```

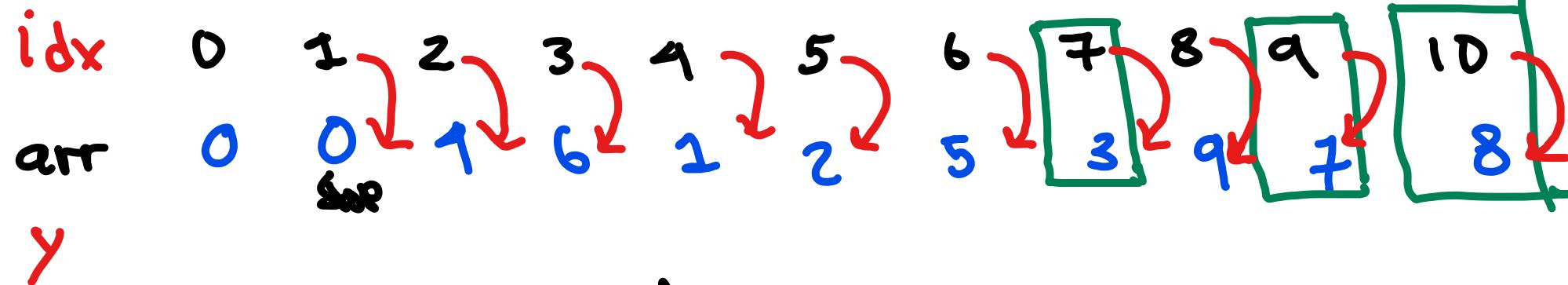
int arr[11] = {0, 0, 4, 6, 1, 2, 5, 3, 9, 7, 8};
int cari(int x, int y=0) {
    if(x == 0) return y;
    return cari(arr[x], y+1);
}

```

cari(10)

$\text{idx} = \text{unitan} - 1$
 $\text{Max idx} = n - 1$

$$\begin{aligned}
 \text{c}(10) &= \text{c}(\text{arr}[10], 1) \\
 &= \text{c}(\underline{0}, 1)
 \end{aligned}$$



10 Kau pindah

$$\text{c}(10, 1) = \text{c}(\text{arr}[8], 2) = \text{c}(9, 2)$$