

Tipe data

int A, B; → Nama var

```
int A, B;  
A = 5;  
B = 3;  
int C = A + 2 * B - A;
```

$$\begin{aligned}A &= 5 \\B &= 3 \\C &= \cancel{A} + 2B - \cancel{A} \\C &= 2B \\C &= 2 \cdot 3 = 6\end{aligned}$$

Tentukan berapa nilai akhir C {tuliskan jawaban dalam bentuk ANGKA saja}

```
int A,B,C;  
A = 2;  
B = 3;  
C = 5;  
A = B - A;  
C = (C - B) /A;  
  
cout<<C<<endl;
```

yg terbaik

$$\begin{aligned}A &= 3 - 2 \\A &= 1 \\C &= \frac{(C - B)}{A} \\C &= \frac{(5 - 3)}{1} = 2\end{aligned}$$

Tentukan keluaran program di atas ! {tuliskan jawaban dalam bentuk ANGKA saja}

```

int A,B,C,D;
cin>>A>>B>>C>>D;
if(A>B) {
    A = A + C;           → Boolean < true
} else if(A<B) {        & eksekusi jika true
    A = A + D;          → mod
}
cout<<(A*B+C-D) & endl;

```

$A = 1, B = 3, C = 3,$
 $D = 4$
 $A > B ? (\text{false})$
 $\rightarrow A < B ? (\text{true})$
 $\rightarrow A = 1 + 4 = 5$

Tentukan keluaran program di atas jika diberi masukan 1 3 3 4 ! {tuliskan jawaban dalam bentuk ANGKA saja}

Nilai variabel terham

$$A = 5, B = 3, C = 3, D = 4$$

$$\begin{aligned}
 \text{out} &= (5 \times 3 + 3 - 4) \bmod 7 \\
 &= 15 + (-1) \\
 &= 14 \bmod 7 \\
 &= 0
 \end{aligned}$$

```

int A,B,C,D;
cin>>A>>B>>C>>D;

bool kwek = A > B;
bool kwok = A < C;

if(kwek) {
    if(kwok) {
        cout<<"Hi"<<endl;
    }else{
        cout<<"Hello"<<endl;
    }
}else{ ✓
    if(A%B == 1){ False
        cout<<"Wow"<<endl;
    }else{
        cout<<"Wew"<<endl; ✓
    }
}

```

Tentukan keluaran program di atas jika diberi masukan:

- 1) 2 5 3 4
- 2) 2 3 1 0
- 3) 0 0 0 0
- 4) -5 2 -3 1

1) $A = 2, B = 5, C = 3, D = 4$

$\text{kwok} = A > B \quad (2 > 5) \text{ F}$

$\text{kwek} = \text{False}$

Kalau $\text{kwok} = A < C \quad (2 < 3) \text{ T}$

True $\text{kwok} = \text{True}$

$A \bmod B = 1 ? (\text{False})$
 $2 \bmod 5 = 2 ?$

Kalau

$\text{kwek} \text{ False}$

Output = Wew

Wew ✓
~~Wow~~

```

bool A = true, B = false, C = true, d = (9 % 2 == 0);
if (A || B) { -> or / atau / disj.
    if( (B && C) || D) {
        cout<<"OKE"<<endl; ✗
    }else{ ~
        cout<<"OWALAH"<<endl;
    }
}else{ -> not / Negasi
    if((A && !B) || (B && !A) ) {
        cout<<"OHH"<<endl;
    }else{
        cout<<"HEHE"<<endl;
    }
}

```

logic
comparison

A = 5 (Assignment)

A = 5 (Apakah A bernilai
5) $\begin{cases} T \\ F \end{cases}$

$!(\text{true}) = \text{false}$
 $!(\text{false}) = \text{true}$

Keluaran program di atas adalah ...

$$\begin{aligned}
 A \text{ or } B &= T \text{ or } F \xrightarrow{\quad} \begin{cases} B \text{ and } C \text{ or } D \\ F \text{ and } T \text{ or } F \end{cases} \\
 &= T \qquad\qquad\qquad \equiv F \rightarrow \text{out} = "OWALAH"
 \end{aligned}$$

$s \bmod 2 = 0 \checkmark$
 $d = \text{False}$

bil bulat

```

int A,B,C,D,E;
cin>>A>>B>>C>>D>>E;
    1 2 8 9 3
A += B; A = 1 + 2 = 3
B -= C; B = 2 - 8 = -6
C *= A; C = 8 * 3 = 24
D /= C; D = 9 / 24 = 0
E %= A; E = 3 mod 3
        = 0
if ( (A+B+C+D+E) %2 == 0 ) {
    cout<<"HO"<<endl;
} else{
    cout<<"HE"<<endl;
}

```

EX : • Double
 • Float

A = 5

① A += x

A sekarang = A sebelum + x

D = 0

A = 5 + x

② A += 1 → A ++

A = ?

A = 5 + 1

= 6

Tentukan keluaran program di atas jika diberi masukan 1 2 8 9 3!

$A = 3, B = -6, C = 24, D = 0, E = 0$ Out = "HE"

$(A+B+C+D+E)$ genap? \rightarrow (ganjil)
 False

```

int A,B,C,D,E;
cin>>A>>B>>C>>D>>E;
    1 2 8 9 3
A++; → A = 2 ( 1 + 1 )
B--; → B = 1 ( 2 - 1 )
C+=2; → C = 10
D*=3; → D = 27
--E; → E = 2
if ( (A+B+C+D+E) %2 == 0 ) {
    cout<<"HO"<<endl; ✓
} else{
    cout<<"HE"<<endl;
}

```

*Pre
Requirement*

q2 Genap ? True
Output = "HO"

Tentukan keluaran program di atas jika diberi masukan 1 2 8 9 3 !

```

int N, ret = 0;
cin>>N;
for(int i = 1; i<= N ; i++){
    if(i%3 == 0) {
        ret++;
    } else if(i%5==0)
        ret++;
}

```

u_i

$$333 + 200 - 66$$

$$= \underline{\underline{967}}$$

Banyaknya bantuan
Beda

$$i = 1, i \leq 1000, i++$$

$$u_1 \text{ s/d } u_{1000}$$

$$a = 1$$

$$i = (1, 2, 3, \dots, 1000)$$

$i+1$
 $b = 1$
dgn $b = 1$,

$$\underline{\underline{967}}$$

Jika diberi masukan 1000 tentukan nilai akhir ret setelah program dieksekusi
{tuliskan jawaban dalam bentuk ANGKA saja}

Menghitung banyaknya angka i yang habis dibagi 3 atau 5
($1 \leq i \leq N$) [$N = 1000$]

$$\text{hbs : 3} \rightarrow \left\lfloor \frac{1000}{3} \right\rfloor = 333$$

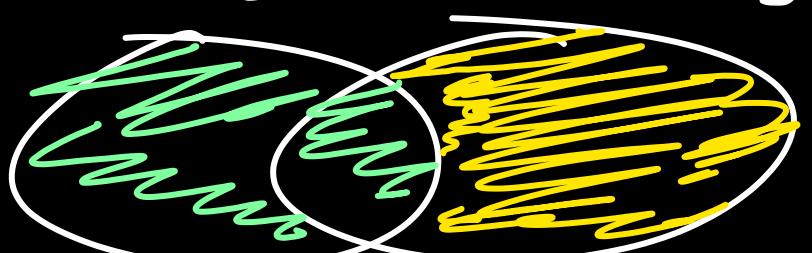
$$\text{hbs : 5} \rightarrow \left\lfloor \frac{1000}{5} \right\rfloor = 200$$

$$\text{hbs : 3 dan 5} \rightarrow \left\lfloor \frac{1000}{15} \right\rfloor = 66$$

$$|A \cup B| = |A| + |B| - |A \cap B|$$

hbs : 3

hbs : 5



$$\text{hbs : 3} \cup \text{hbs : 5}$$

```

int N, ret = 0;
cin>>N;
for(int i = 1; i<= N ; i++) {
    if(i%3 == 0) {
        ret++;
    } else if(! (i%5)) {
        ret++;
    }
    if(i%2 == 1) {
        ret++;
    }
}

```

if 1

if 2

not (i % 5)
 if (i % 5)
 ↳ selama tidak
~~False = 0~~
~~True ≠ 0~~

if (not (i % 5))

↳ selama
 Tidak true
 Selama $i \bmod 5 = \text{False}$

$i \bmod 5 = 0 \rightarrow$ Selama i
 habis dibagi
 5

Jika diberi masukan 1000 tentukan nilai akhir ret setelah program dieksekusi
 {tuliskan jawaban dalam bentuk ANGKA saja}

Banyaknya bilangan (1-1000) habis dibagi 3 atau 5 + Banyaknya bilangan ganjil (1 - 1000)

$$= 967 + 500$$

saving lepas

$$= \underline{\underline{967}}$$

```
int N, ret = 0;  
cin>>N;  
for(int i = 1; i<= N ; i++) {  
    if(i%3 == 0) {  
        ret++;  
    } else if(! (i%5) ) {  
        ret++;  
    }  
  
    if(i%2 == 1) {  
        ret++;  
    }  
}
```

Jika diberi masukan 1000 tentukan nilai akhir ret setelah program dieksekusi
{tuliskan jawaban dalam bentuk ANGKA saja}

```

int b = , c = , res = 0;
for(int a = ; a <= c*c ; a+=(2*b + c)) {
    res += a; a<=100 a+=19
}

```

$$\begin{aligned}
 a &= 1 & res &= 0 \\
 a &= 15 & res &= 1 \\
 a &= 29 & res &= 1 + 15 \\
 &\dots && \\
 &\dots &&
 \end{aligned}$$

Jika nilai $a = 1$, $b = 2$, $c = 10$ maka nilai akhir res adalah ... {Jawaban berupa angka bulat} ... {Jawaban berupa angka bulat}

$$\text{Deret} \rightarrow u_1 = a = 1, \quad u_n \leq c^2, \text{beda} = 2b + c = 2 \cdot 2 + 10 = 14$$

$$res = 0 + u_1 + u_2 + u_3 + \dots + u_n = 14$$

$$\begin{aligned}
 res &= S_n \rightarrow res = 0 + 1 + 15 + 29 + \dots + ? = 99 \\
 res &= S_8 = 900
 \end{aligned}$$

$$\begin{aligned}
 u_n &= a + (n-1)b \\
 &= 1 + (n-1)19 \\
 &= 1 + 19n - 19 \\
 &= 19n - 18
 \end{aligned}$$

$$\begin{aligned}
 u_n &\leq c^2 & n_{\max} &= 8 \\
 19n - 18 &\leq 100 & u_{n \max} &= \\
 19n &\leq 118 & 19 \cdot 8 - 18 &= 142 \\
 n &\leq 118 / 19 & n &= 8
 \end{aligned}$$

```

int A = , B = 2020, res = 0;

while(A<=B) {
    res++;
    A++;
}

cout<<res<<endl;

```

Selama $A \leq B$, res akan bertambah 1 terus , dan A bertambah 1 terus

$$\begin{array}{l}
 A = 105 \leq 2020 ? \\
 A = 106 \leq 2020 ? \\
 A = 107 \\
 \cdots \\
 A = 2020 \leq 2020
 \end{array}$$

$\text{res} = 1$
 $\text{res} = 2$
 $\text{res} = 3$
 $\text{res} = \dots ?$

Jika keluaran program di atas bernilai 105 tentukan nilai dari variable A yang memenuhi!

$$\text{res} = B - A$$

KLARIF

$$\text{res} = 2020 - 105$$

$$\begin{array}{r}
 = 1915 \\
 \hline \hline
 \end{array}$$

```
int a = , r = , res = 0;  
do{  
res += a; }while(a/=r);
```

Operasi baris C++

akan berhenti $a=0$

Jika nilai $a = 19$, $r = 5$ nilai akhir res adalah ... {Jawaban berupa angka bulat}

JAWABAN : 22

$$a = 19, r = 5, res = 0$$

$$res = 0 + 19$$

$$a = 19/5 = 3$$

$$res = 19 + 3$$

$$= 22$$

$$a = 3/5 = 0$$

$$res = \underline{\underline{22}}$$

```

int x = 0, y = 0;
while(2*x <= 2050 && y*5 <= 50625) {
    x+=2;
    y+=3;
}

```

1539

$$\begin{aligned}
 x &= \{0, 2, 4, 6, 8, \dots\} \\
 y &= \{0, 3, 6, 9, \dots\} \\
 60x &\leq 30750 \\
 x_{\max} &= 512
 \end{aligned}$$

Berapakah nilai akhir y setelah program di atas dijalankan? {jawaban berupa angka bulat}

$$\begin{aligned}
 y &= 3k \\
 &= 3 \cdot 513 = 1539
 \end{aligned}$$

Selama $2x \leq 2050$ $\frac{x}{2} + \frac{1}{2} \leq 513 \Rightarrow y \leq 50625$

$$\begin{aligned}
 x &= 2k \rightarrow k = \{0, 1, 2, 3, \dots\} \\
 y &= 3k \rightarrow k = \{0, 1, 2, 3, \dots\}
 \end{aligned}$$

$$2 \cdot (2k) \leq 2050 \quad \text{dan} \quad 5(3k) \leq 50625$$

$$4k \leq 2050 \quad \text{dan} \quad 15k \leq 50625$$

$$\cancel{4k}(4 \cdot 15) = 60$$

$$\begin{aligned}
 60k &\leq 2050 \cdot 15 \quad \text{dan} \quad 60k \leq 50625 \cdot 4 \\
 60k &\leq 30750 \quad \text{dan} \quad 60k \leq 202500
 \end{aligned}$$

```

int arr[11] = {0, 1, 1, 2, 3, 5, 7, 1, 3, 2, 5};
int x;
for(int i=0; i<11; i++) {
    x = arr[i];
    if(x%2 == 1) {
        arr[i] += 1;
    }
}
arr[0] = arr[1] + arr[2];
arr[2] = arr[3] - arr[4];

```

idx	0	1	2	3	4	5	6	7	8	9	10
val	0	1	1	2	3	5	7	1	3	2	5

$$arr[\text{index}] = \text{val}$$

$$arr[3] = 2$$

$$arr[1] = 1$$

$$arr[6] = 7$$

- - - - -

Tuliskan semua isi array arr setelah operasi di atas dijalankan!

$$arr[0] = 2 + 2$$

$$= 9$$

$$arr[2] = 2 - 4$$

$$= -2$$

$$arr = 9, 2, -2, 2, 9, 6, 8, 2, 4, 2, 6$$

$$= -2$$

```
string S = "SELAMATSUKSES";
for(int i = 0; i<13; i++){
    if(i%3 == 0){
        S[i] = 'O';
    }
}
cout<<S<<endl;
```

S[0] = "S"
S[1] = "E"
S[2] = "L"
S[3] = "A"

Berdasarkan program di atas, jika program dijalankan maka keluarannya adalah
...{tuliskan jawaban berupa string dengan huruf kapital}

S = O E L O M A O S U O S E O

```
int f(int a, int b) {  
    return (a*b) / (b-2);  
}  
  
int g(int a, int b) {  
    int ret = 0;  
    while(a<=b) {  
        b--;  
        ret++;  
    }  
    return f(a,b) + ret;  
}
```

- a. Tentukan nilai kembalian dari pemanggilan fungsi $f(9,7)$!
- b. Tentukan nilai kembalian dari pemanggilan fungsi $g(15,20)$!
- c. Tentukan nilai kembalian dari pemanggilan fungsi $(9298982, 2)$!

```

int f(int a, int b) {
    return (a*b) / (b-2);
}

int g(int a, int b) {
    int ret = 0;
    while(a<=b) { } benulang
        b--;
        ret++;
    }
    return f(a,b) + ret;
}

```

$$f(x) = 3x \xrightarrow{\text{Parameter}} \text{return value}$$

$$f(a,b) = \frac{ab}{(b-2)}$$

$b < a$ saat $b = a-1$
 $b = 20$
 $b = 19$
 \vdots
 $b = 14$

$14 - 20 = 7$ kali

- Tentukan nilai kembalian dari pemanggilan fungsi $f(9,7)$! = 12
- Tentukan nilai kembalian dari pemanggilan fungsi $g(15,20)$! = 36
- Tentukan nilai kembalian dari pemanggilan fungsi $f(9298982, 2)$! = undefined div by 0

$$\begin{aligned}
 g(a,b) &= f(a,b) \rightarrow b-a+2 \\
 &= \frac{15 \times 20}{13} + 7 = 23
 \end{aligned}$$

```
int a = 5, b = 9, c = 8, d = 15;
void gas() {
    a++;
    int temp = a;
    a = b;
    b = temp;
    temp = c;
    d = c;
    c = d;
}
int main() {
    gas();
    cout<<a<<b<<c<<d;
}
```

Tentukan keluaran program di atas!

```

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));
}

```

Jika dipanggil fungsi

~~merah(kuning(8,2), hijau(kuning(7,9), biru(9,2)))~~

Maka nilai kembalinya adalah ... {jawaban berupa angka bulat}

$$m(a, b) = a + b$$

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

$$m(5+2, 2-1) = m(6, 1)$$

$$m(7, 0) = 7$$

$$\begin{aligned} m(5, 3) &= m(6, 2) \\ &= m(7, 1) \\ &= m(8, 0) \\ &= 8 \end{aligned}$$

$$\begin{aligned} k(5, 2), k(5, 3), k(5, 4) &= m(8, 3) \\ - - - - - &= m(7, 2) \\ ? &= m(8, 2) \\ \circ m(a, b) = ab &= m(9, 0) = 9 \\ \circ m(a, b) = a/b & \end{aligned}$$

```

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;
    }
}

```

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

Untuk setiap i

$$x = 2i$$

$$x = 2i \cdot i$$

$$= 2i^2$$

- Jika subprogram di atas dijalankan ke dalam program berikut
Maka keluarannya bernilai ... {jawaban berupa angka bulat}

$$res = \sum 2i^2$$

$$res = \sum i^2$$

$$res = \sum_{i=1}^{100} i^2$$

$$\begin{aligned}
 &= 1^2 + 2^2 + 3^2 + 4^2 + \dots \\
 &\quad + 100^2
 \end{aligned}$$

berulang sebanyak i kali

$$\frac{100 \times (100+1) \times (2 \cdot 100+1)}{6}$$

```

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;
}
}

```

Jika kode program pada baris ke-3 ($i \leq 100$) diganti menjadi ($i \leq N$) lalu diberi nilai $N = 1.000.000.000.000$ apa keluarannya?

10^{15} $\frac{10^8}{10^8}$ icon P modern

* Overflow

* Running Error / TLE

$$\mathcal{O}(N^2) = (10^{15})^2$$

$$\left(\frac{n(n+1)}{2} \right)^2 = (1+2+3+\dots+n)^2$$

$$\neq (1^2+2^2+3^2+\dots+n^2)$$

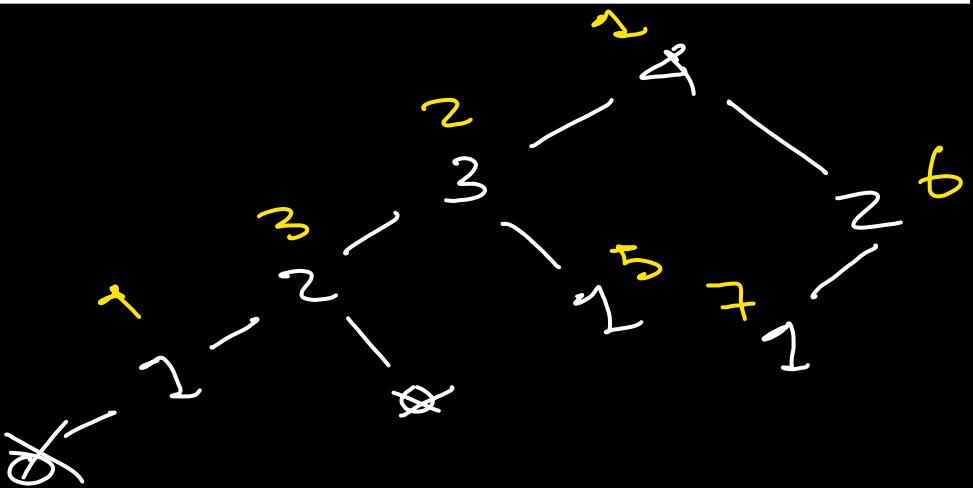
$$\frac{n(n+1)(2n+1)}{6}$$

```
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);  
}
```

- Jika dipanggil cari(10) tentukan nilai kembalinya!{jawaban berupa angka bulat}
- Evaluasi apa yang akan terjadi jika dipanggil fungsi cari(12)?

```
int cari(int x) {  
    if (x>0) {  
        cout<<x;  
        cari(x-1);  
        cari(x-2); }  
    } else {  
        return;  
    }  
}
```

Jika dipanggil cari(4) tentukan hasil yang dicetak!



Out = 4 3 2 \ \ 1 1

```
int f(int x, int y) {  
    if(y == 0) return x;  
    return f(y, x%y);  
}  
  
int g(int x, int y) {  
    return (x*y)/f(x,y);  
}
```

Tentukan nilai kembalian dari pemanggilan fungsi

- a. $f(2024, 24)$
- b. $g(6, 16)$

```
int f(int x, int y) {  
    while(x--){  
        y++;  
    }  
    return y;  
}  
  
int g(int x, int y){  
    for(int i=1;i<=y;i *=2){  
        y ++;  
    }  
    return y;  
}  
  
int h(int x, int y){  
  
    return f(x,y) + g(x,y) / y;  
}
```

Tentukan Kompleksitas dari fungsi $f(x,y)$ dan $g(x,y)$!

Evaluasi apakah ada ketidaksesuaian dalam algoritma pada pemanggilan fungsi $h(5,0)$?