

# Logika Matematika

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Proposisi

Benar (1)

Salah (0)

Boolean

$$1 + 1 = 2$$

C<sub>prop</sub>osi<sub>ti</sub>)

$$2 - 1 = 3$$

(<sub>prop</sub>osi<sub>ti</sub>)

"Besok hari Sabtu" (bukan prop)  
"Jika hari ini hari Jumat, besok Sabtu" (prop)

Prop

is Jumbo

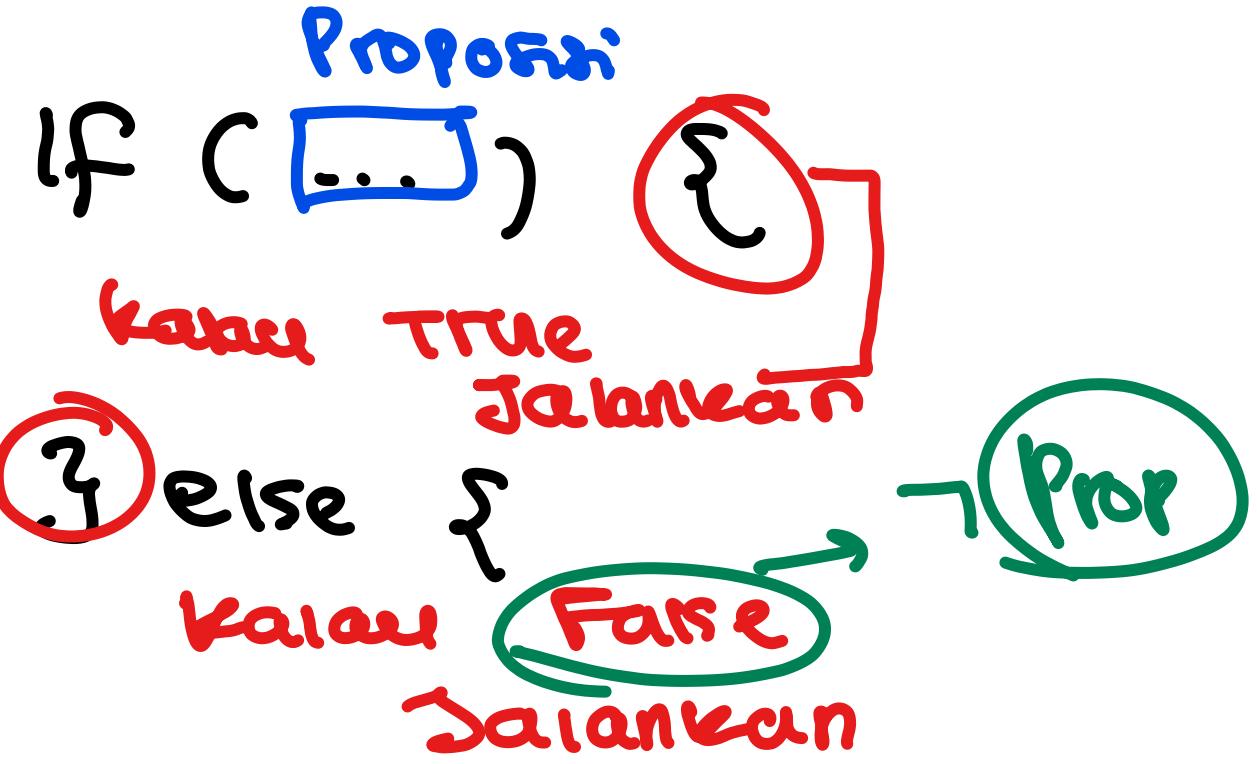
$\neg(\text{true}) = \text{False}$

$\neg(\text{False}) = \text{True}$

$\neg(\text{Lapar}) = \text{Tdk Lapar}$

$\neg(>) \equiv \leq$

$\neg(<) \equiv \geq$



$\leq 2$        $x = 2$       False

If ( $x > 2$ ) {

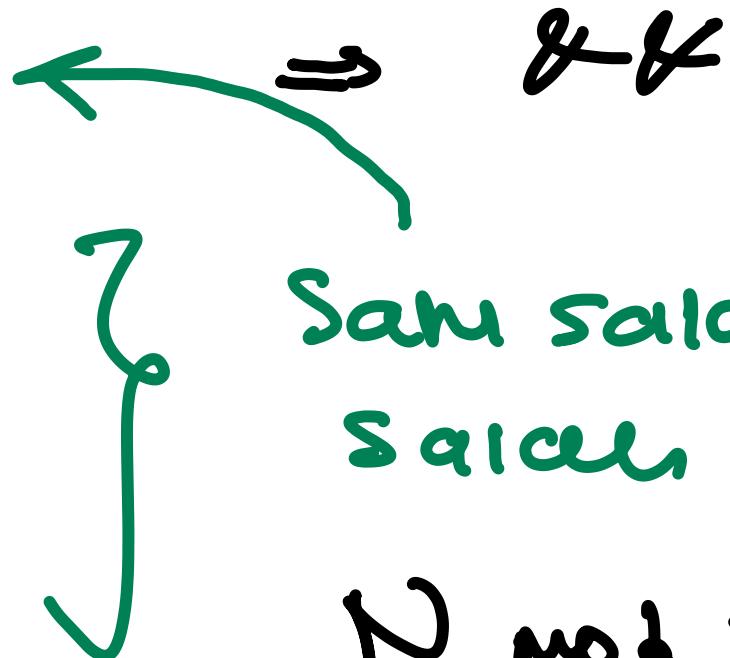
Cout << "Ldn  
z"  
} else {  
...  
}

$\text{Prop} = \text{Prop}_1 \text{ OPR } \text{Prop}_2 \text{ OPR } \text{Prop}_3 \text{ ... OPR } \text{Prop}_N$

$\text{Prop} = P \text{ and } q$

\* Kongjungi (AND)  $\Rightarrow \wedge$

P	q	P and q
1	1	1
1	0	0
0	1	0
0	0	0



$N \bmod x \equiv 0$   
 $x | N \rightarrow N \text{ kelipatan } x$

Tentukan nilai hasil dari ekspresi boolean berikut

Prop = (P AND Q) AND (Q AND R) AND (S AND T) AND (U AND V) AND (V AND W) AND ...

P = FALSE

PROP = FALSE

\* Disjungsi (OR)  $\Rightarrow$  (||)

P	q
1	1
1	0
0	0

P or q
1
1

same benar  
sama benar

A = Keipatan 2

$$A = \{2, 4, \underline{6}, 8, \dots\}$$

$$B = \{3, \underline{6}, 9, 12, \dots\}$$

$$A \cap B = \{6, 12, 18, \dots\}$$

B = Keipatan 3

$\exists I \rightarrow A = \text{TRUE}, B = \text{FALSE}$

$\exists 3 \rightarrow A = \text{False}, B = \text{TRUE}$

$6 \rightarrow A = \text{TRUE}, B = \text{TRUE}$

$$\begin{matrix} \downarrow \\ 2 | A \Leftrightarrow 3 | A \end{matrix}$$

$$\text{KPK}(2, 3) = 6$$

$$\neg(A \vee B) = \neg A \wedge \neg B$$

\* Disjungsiif Eksklusif (XOR)  $\Rightarrow (\wedge)$

P	q
1	0
0	1
1	1
0	0

P XOR q

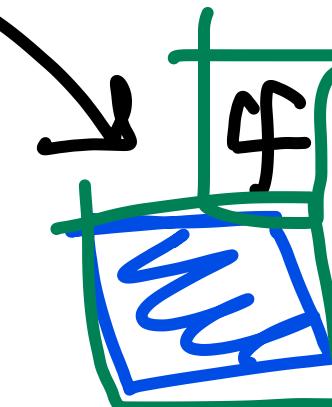
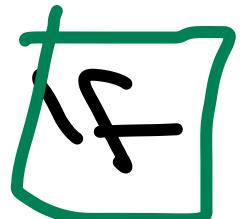
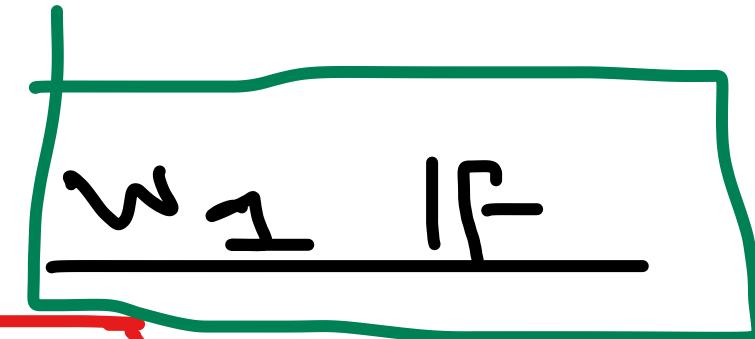
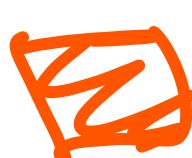
1

1

0

0

P != q

$w_1$  $w_2$  $w_2$ 

Else {

  If (P) { act3

}

↓

else If (P) {

  act

}

If (P) {

  If (q) { act1 }

}

d

Clean

If (P & q) { act1 }

## Predikat

91 -- 100 (A)

81 -- 90 (B)

75 -- 80 (C)

<75 (D)

## Mutual IF

```
if(prop1){  
    act()  
} else if(prop2){  
    act2()  
}
```

Given PROP 1 = False  
 $\neg \text{PROP 1} = \text{True}$   
If C  $\neg \underline{\text{PROP 1}} \wedge \text{PROP 2}$

Halo orang

— “ —

— ‘ —

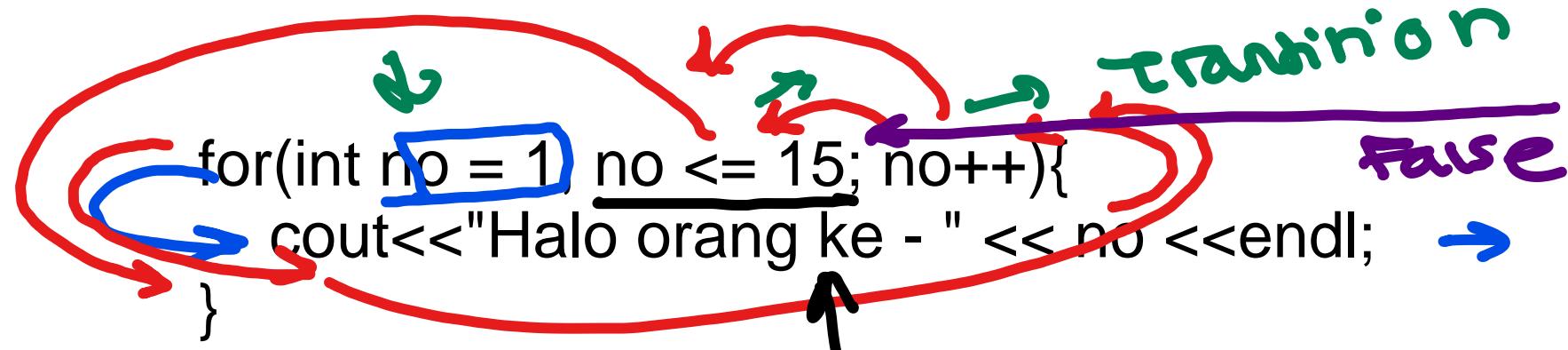
:

initial state

No  
1  
2  
3 } + 1  
} + 1

→ program

ending state



no = 1

no = 2

no = 3

no = 15

cout << 1

cout << 2

cout << 3

:

```

int s = 0; start
for(int i = 1; i <= 15; i++){
    s += i;
}
cout << s << endl;

```

**start**  $\Rightarrow$   $i = 1$

$$\begin{array}{llll}
 i = 1 & \rightarrow & s + 1 & \rightarrow \underline{s = 1} \quad s = 0 + 1 \\
 i = 2 & \rightarrow & \underline{s + 2} & \rightarrow \underline{s = 3} \quad s = 1 + 2 \\
 i = 3 & \rightarrow & \underline{s + 3} & \rightarrow \underline{s = 6} \quad s = 1 + 2 + 3 \\
 & & \vdots &
 \end{array}$$

$i = 15 \rightarrow$

$$S = 1 + 2 + 3 + \dots + 15$$

$$S = \frac{15 \times 15+1}{2} = 15.8 = \underline{\underline{120}}$$

$$S = 0$$

$i = 1 \rightarrow S + 1 \rightarrow S = \underline{\underline{S + 1}} = 0 + 1$

$i = 2 \rightarrow S + 2 \rightarrow S = \underline{\underline{S + 2}} = 0 + 1 + 2$

$i = 3 \rightarrow S + 3 \rightarrow S = \underline{\underline{S + 3}} = 0 + 1 + 2 + 3$

⋮

$$S_{ci} = 1 + 2 + 3 + \dots + i$$

$$S_{ci} = \frac{i * (i+1)}{2} \quad 1 \leq i \leq 15$$

```
int s = 0;
```

```
for(int i = 1; i <= 20; i+=2){
```

```
    s += i;
```

```
cout << s << endl;
```

→  $s_n$

$s_n$  unlike

Last i in value

•  $i = 9$

•  $i = 11$

... ...

•  $i = 19$   
end

•  $i = 1 \rightarrow s = 1 \rightarrow s = 1$

•  $i = 3 \rightarrow s = 3 \rightarrow s = 1 + 3$

•  $i = 5 \rightarrow s = 5 \rightarrow s = 1 + 3 + 5$

•  $i = 7 \dots \rightarrow s = 1 + 3 + 5 + 7$

•  $i = 13$

•  $i = 15$

•  $i = 17$

$$S_{C_{i=19}} = \dots ?$$

$$S_1 = 1 \quad S_3 = \frac{1}{1^2} \quad S_5 = \frac{1}{2^2}$$

$$S_{\boxed{19}} = 1 + 3 + 5 + \dots + 19 = 10^2 = 100$$

Sum ganjil ( $\textcircled{N}$ )

$$4n = 19$$
$$S_n = n^2$$

$$\text{Sum Ganjil } (27) = 1 + 3 = 4$$

$$\text{Sum Ganjil } (37) = 1 + 3 + 5 = 9$$

$$U_n = 19$$

$$2n - 1 = 19$$

$$\begin{aligned} 2n &= 20 \\ n &= 10 \end{aligned}$$

Sum Ganjil  $(10) = 10^2$

$u_n \rightarrow$  summa terakur ?

```
int s = 0;  
for(int i = 2025, i > 0; i /= 2){  
    s = i;  
}
```

```
cout << s << endl;
```

$i = 7$

$i = 3$

$i = 1$  →  $s = 1$

~~$i = 0$~~

$i = 2025$

$i = 1012$

$i = 506$

$i = 253$

$i = 126$

$i = 63$

$i = 31$

$i = 15$

$$U_n = q \Gamma^{n-1}$$

$$U_n = 1$$

$$1 \leq i \leq 1000$$

```
int ret = 0;  
for(int i = 1; i<=1000; i++){  
    if(i % 2 == 0) ret++;  
}  
cout<<ret<<endl;
```

Setiap kali i habis dibagi 2 (i genap)

ret bertambah 1.

Ret =  $\frac{1}{2} * \text{Berapa banyak kejadian } i \text{ genap}$

Ada berapa banyak bilangan genap dari 1 -- 1000 (Inklusif)

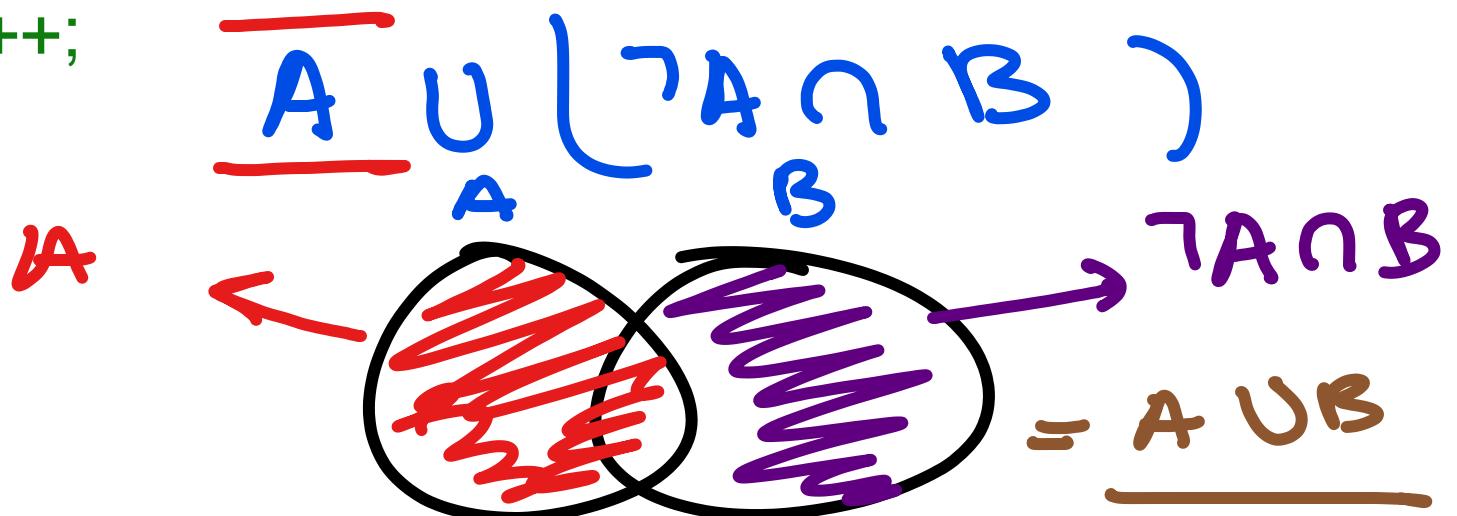
$$\left\lfloor \frac{1000}{2} \right\rfloor = \underline{\underline{500}}$$

```

int ret = 0;
for(int i = 1; i <=1000; i++){
    if(i % 2 == 0) ret++;
    else if(i % 3 == 0) ret++;
}
cout<<ret<<endl;

```

Ada berapa banyak bilangan habis dibagi 2 atau 3 dari 1 -- 1000  
(Inklusif)



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

$$A = \underline{\{2, 4, 6\}}$$

$$B = \underline{\{3, 6, 9\}}$$

$$A \cup B = \{2, 3, 4, 6, 9\}$$

$$|A \cup B| = 5$$

$$A + B = \{2, 3, 4, 6, 9\}$$

$$A \cap B = \cancel{\{6\}}$$

---

↓

-

$$|A \cup B| = \underline{|A| + |B|} - \underline{|A \cap B|}$$

$$|A| = \left\lfloor \frac{1000}{2} \right\rfloor = 500$$

$$|B| = \left\lfloor \frac{1000}{3} \right\rfloor = 333$$

$$|A \cap B| = \left\lfloor \frac{1000}{\text{KPK}(2,3)} \right\rfloor = \left\lfloor \frac{1000}{6} \right\rfloor = 166$$

↓  
dan

$$\text{ans} = 500 + 333 - 166 = 667$$

```

int ret = 0;
for(int i = 1; i<=1000; i++){
    if(i % 2 == 0) ret++;
    if(i % 3 == 0) ret++;
}
cout<<ret<<endl;

```

$$\begin{aligned} \text{ret} &= \left\lfloor \frac{1000}{2} \right\rfloor = 500 \\ \text{ret} &= \left\lfloor \frac{1000}{3} \right\rfloor = 333 \end{aligned}$$

$$\text{ans} = 500 + 333 = \underline{\underline{833}}$$

$$A_1 - 2 = 3B_1 \dots \underline{(1)}$$

$$\begin{aligned} \frac{A_2}{B_2} &= A_1 - 3 \\ &= B_1 - 3 \end{aligned}$$

$$A_3 = 3 A_2$$

$$A_3 = B_2$$

$$3A_2 = B_1 - 3$$

$$3(A_1 - 3) = B_1 - 3$$

$$A_1 - 2 = 3B_1$$

$$A_1 = 3B_1 + 2$$

$$3(3B_1 + 2 - 3) = B_1 - 3$$

$$9B_1 - \cancel{3} = B_1 - \cancel{3}$$

$$9B_1 - B_1 = 0$$

$$8B_1 = 0 \Leftrightarrow B_1 = 0$$

$$A_1 = 3 \cdot 0 + 2 = \underline{\underline{2}}$$

$c_2 = c_1$  ↗

```
for(int orang = 1; orang <= 5; orang++){
    cout << "Orang ke -" << orang << "Sedang berteriak" << endl;
    for(int teriakan = 1; teriakan <= 3; teriakan++){
        cout << "Woy" << endl;
    }
}
```

orang = 1

cout << orang 1

teriakan = 1

cout << woy

teriakan = 2

cout << woy

teriakan = 3  
cow moy

orang = 2

cout << orang 2

teriakan = 1

teriakan = 2

teriakan = 3

orang = 5

⋮

```

int N = 10;
for(int i = 1; i<=N; i++){
    for(int j = 1, j<=3; j++){
        cout << "*";
    }
    cout<<endl;
}
:

```

*i = 2*

\* \* \*

*i = 1*

*j = 1* → cout \*

*j = 2* → cout \*

*j = 3* → cout \*

*i = 2*

*j = 1* → cout \*

*j = 2* → cout \*

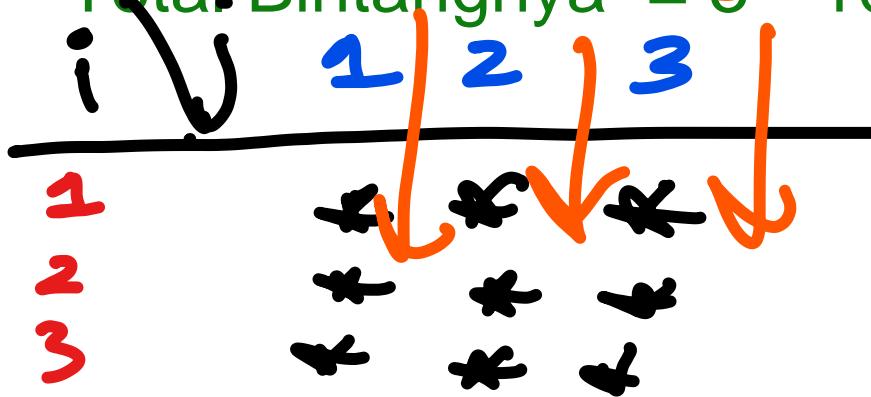
*j = 3* → cout \*

Setiap i mencetak bintang sebanyak 3 kali

Dan banyaknya i adalah 10

~~100 100 1~~

Total Bintangnya ~~22 \* 3 = 30~~



$\rightarrow$

Ban's 1

Ban's 2

:

$\rightarrow$

Ban's 10

$$\text{ukuran} = \frac{\text{Ban's}}{\text{ }} + \frac{1610m}{\text{ }}$$

$$N=5 \rightarrow i_{\max} = 5, j_{\max} = i - j_{\max} = 5$$

```

for(int i = 1; i<=N; i++){
    for(int j = 1; j<=i; j++){
        cout << j << " ";
        // sum += j;
    }
    cout<<endl;
}

```

$5 \times 5$

$i$	$j$	1	2	3	4	5
1		v	→	j	1.sd	1
2		v	v	→	j	1.s.d 2
3		v	v	v	→	j 2.sd 3
4		v	v	v	v	→ j 1 s/d 4
5		v	v	v	v	v
		v	v	v	v	v
		v	v	v	v	v
		v	v	v	v	v
		v	v	v	v	v

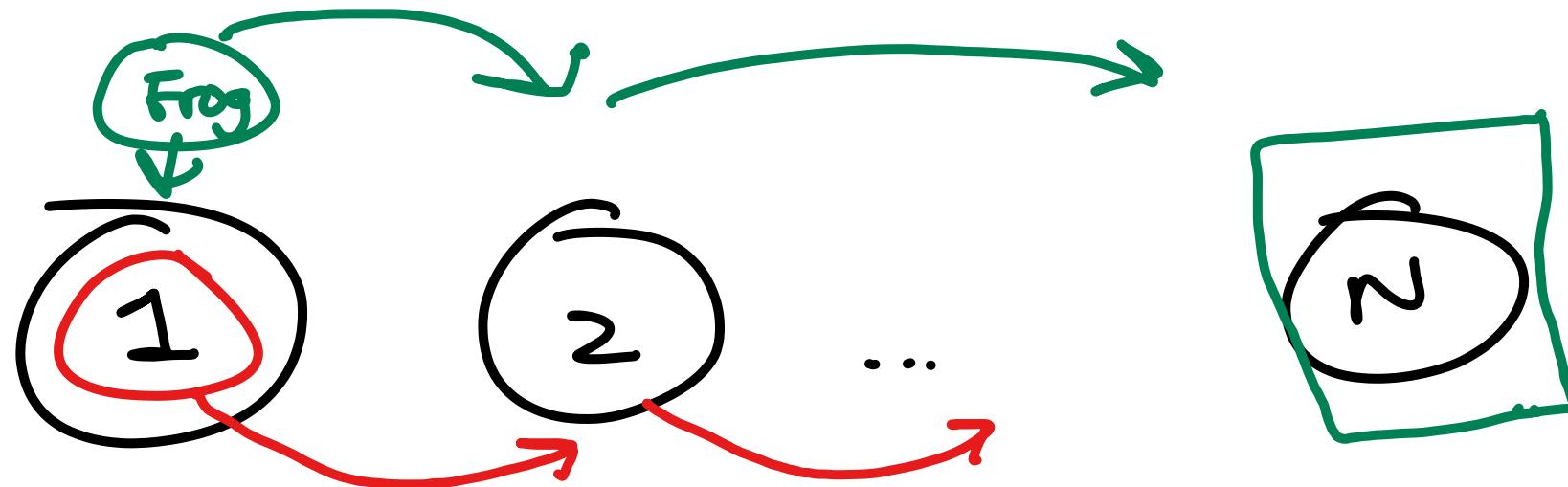
$$\begin{aligned}
&= 5 + 8 + 9 + 8 + 5 \\
&= 35 //
\end{aligned}$$

$$\begin{aligned}
&1 + 5 + 2 \times 4 + 3 \times 3 \\
&+ 4 \times 2 + 5 \times 1
\end{aligned}$$

$$* 14 + 14^2 = 210$$

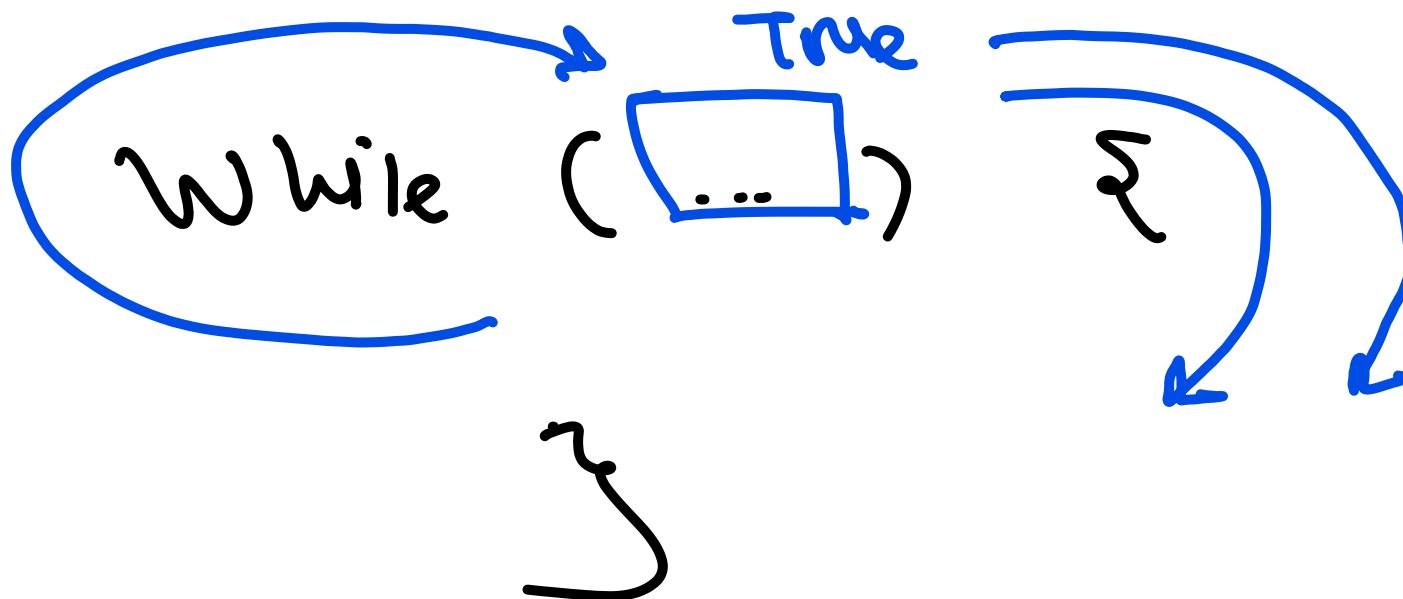
$$* 15 * n = 150$$

360



$\text{Pos} = 1$   
Digit  $\rightarrow$   $\text{Pos} += 1$

$\text{Pos} = 2$



Selama true  
Loop  
dilakukan  
Terus

```
int x = 0;
int y = 0;
while(x * 7 < 986 && y * 4 <= 876 && x - y > -67) {
    x += 2;
    y += 3;
}
```

$$x = 2k$$

$$y = 3k$$

$$2k - 3k > -67 \rightarrow -k > -67 \dots * (-1)$$

$$k < 67$$

$$2k + 7 < 986$$

$$3k + 4 \leq 876$$

$$14k < 986 \dots (1) \quad 12k \leq 876 \dots (2)$$

$$k < 67 \dots (3)$$

$$14k < 986 : 2 \rightarrow 7k < 493$$

$$12k \leq 876 : 12 \rightarrow k \leq 73$$

$$7k < 493 \quad 162 < 493$$

$$k \leq 876$$

$k < 67$

$\max = 66$

$k=0$

$67$  *benutzbar*

$$y = 3 \cdot 67 = 198$$

$$k, 2^k \leq 10$$

↓  
5

$$6 \quad k = (0, 1, 2, 3, 4, 5)$$

NO	Nama	Nilai
1	Raisya	
2	Asfa	
3	Handsel	

array

index	Nama
0	Raisya
1	Asfa
2	Handsel

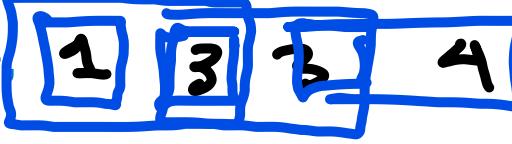
siswa = ["Raisya", "Asfa", "Handsel"]

$\text{siswa}[0] = \text{"Raisya"}$   
 $\text{siswa}[1] = \text{"Asfa"}$   
 $\text{siswa}[2] = \text{"Handsel"}$

$$\begin{array}{ccc}
 & \text{urutan} & \text{index} \\
 \text{Siswa } & \frac{\text{ke}-1}{\text{ke}-2} \rightarrow & \text{index } \underline{0} \\
 \text{Siswa } & \frac{\text{ke}-2}{\text{ke}-2} \rightarrow & \text{index } \underline{1} \\
 & \vdots &
 \end{array}$$

$$\text{index} = \text{urutan} - 1$$

$$\text{urutan} = \text{index} + 1$$

1 2 3 0 1 2 3 4 5 6 7 8 9  
 int arr[10] = {1,3,3,4,5,6,8,2,-1,0}   
 int ret = 0;  
 for(int i = 0; i < 10; i++){  
 if(i < 9){  
 ret += arr[i] + arr[i + 1];  
 }else{  
 ret += arr[i],  
 }
 }

cout << ret << endl;

$\downarrow$   
 $i$   
 $arr[0] + arr[1]$   
 $\downarrow$   
 $0 + 1$  current  
 $i \geq 1$   
 $\downarrow$   
 $next$

$\rightarrow curr = i$   
 $0 \rightarrow next = i + 1$   
 $1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \quad 7 \quad 8 \quad 9$

$$\begin{aligned}
 \text{ret} = & (1+3) + (3+3) + (3+4) + \\
 & (3+1) + (4+5) + (5+6) + (6+8) + \\
 & (8+2) + (2+(-1)) + (-1+0) + 0
 \end{aligned}$$

$$= 4 + 6 + 7 + 9 + 11 + 14 + 10 + \cancel{1} +$$

~~(-1)~~

$$= \underline{\underline{61}}$$

$$f(x) = x + 3 \xrightarrow{\text{range / return value}}$$

↓  
domain,  
Parameter

$$f: \mathbb{R} \rightarrow \mathbb{R}$$

↓      ↓  
Real    Real

## \* Recursive Function

$$f(n) = 2f\underline{n-1}, \text{Base case}$$

Rekursions

$$f(5) = 2 \cdot f(4)$$

$$f(4) = 2 \cdot f(3)$$

⋮

$$f(1) = 2 \cdot f(0) = \frac{\text{Base case}}{2 \cdot 1 = 2}$$

$$\begin{aligned}f(0) &= 1 \\ \text{if } n &= 0 \rightarrow 1\end{aligned}$$

$$f(2) = 2 \cdot f(1) = 2 \cdot 2 = 4 \dots 2^2$$

$$f(3) = 2 \cdot f(2) = 2 \cdot 4 = 8 \dots 2^3$$

$$f(4) = 2 \cdot f(3) = 2 \cdot 8 = 16 \dots 2^4$$

$$f(5) = 2^5 = 32$$











