Konsep - konsep inti pemrograman

Operator - operator logika

& (AND)

```
b <- 15
b
```

15

```
b < 20
```

TRUE

```
b > 10
```

TRUE

```
b > 10 & b < 20 # TRUE & TRUE = TRUE
```

TRUE

```
b > 30 & b < 20 # FALSE & TRUE = FALSE
```

FALSE

```
(b > 5) & (b < 25) & (b == 15) # TRUE & TRUE & TRUE = TRUE
```

TRUE

```
(b < 5) & (b < 25) & (b == 15) # FALSE & TRUE & TRUE = FALSE
```

FALSE

| (OR)

```
(b==10) | (b < 25) # FALSE | TRUE = TRUE
```

TRUE

```
(b > 10) | (b < 10)
```

TRUE

```
(b > 10) | (b < 10) | (b == 12)
```

TRUE

```
TRUE | FALSE
```

TRUE

```
FALSE | FALSE
```

FALSE

! (NOT)

```
(b == 10) | (b < 25)
```

TRUE

```
!((b == 10) | (b < 25))
```

FALSE

```
!T
```

FALSE

```
!(b > 10)
```

FALSE

Penerapan operator - operator logika pada data frame

```
# Kita juga dapat menggunakan operator - operator logika pada data frame
df <- mtcars
```

```
head(df)
```

	mpg	cyl	disp	hp	drat	wt	qsec	vs	am	gear	carb
Mazda RX4	21.0	6	160	110	3.90	2.620	16.46	0	1	4	4
Mazda RX4 Wag	21.0	6	160	110	3.90	2.875	17.02	0	1	4	4
Datsun 710	22.8	4	108	93	3.85	2.320	18.61	1	1	4	1
Hornet 4 Drive	21.4	6	258	110	3.08	3.215	19.44	1	0	3	1
Hornet Sportabout	18.7	8	360	175	3.15	3.440	17.02	0	0	3	2
Valiant	18.1	6	225	105	2.76	3.460	20.22	1	0	3	1

```
df[df$mpg > 20,'mpg']
```

1. 21
2. 21
3. 22.8
4. 21.4
5. 24.4
6. 22.8
7. 32.4
8. 30.4
9. 33.9
10. 21.5
11. 27.3
12. 26
13. 30.4
14. 21.4

```
subset(df, mpg > 20)
```

	mpg	cyl	disp	hp	drat	wt	qsec	vs	am	gear	carb
Mazda RX4	21.0	6	160.0	110	3.90	2.620	16.46	0	1	4	4
Mazda RX4 Wag	21.0	6	160.0	110	3.90	2.875	17.02	0	1	4	4
Datsun 710	22.8	4	108.0	93	3.85	2.320	18.61	1	1	4	1
Hornet 4 Drive	21.4	6	258.0	110	3.08	3.215	19.44	1	0	3	1
Merc 240D	24.4	4	146.7	62	3.69	3.190	20.00	1	0	4	2
Merc 230	22.8	4	140.8	95	3.92	3.150	22.90	1	0	4	2
Fiat 128	32.4	4	78.7	66	4.08	2.200	19.47	1	1	4	1
Honda Civic	30.4	4	75.7	52	4.93	1.615	18.52	1	1	4	2
Toyota Corolla	33.9	4	71.1	65	4.22	1.835	19.90	1	1	4	1
Toyota Corona	21.5	4	120.1	97	3.70	2.465	20.01	1	0	3	1
Fiat X1-9	27.3	4	79.0	66	4.08	1.935	18.90	1	1	4	1
Porsche 914-2	26.0	4	120.3	91	4.43	2.140	16.70	0	1	5	2
Lotus Europa	30.4	4	95.1	113	3.77	1.513	16.90	1	1	5	2
Volvo 142E	21.4	4	121.0	109	4.11	2.780	18.60	1	1	4	2

```
df[(df$mpg > 20) & (df$cyl > 4),]
```

	mpg	cyl	disp	hp	drat	wt	qsec	vs	am	gear	carb
Mazda RX4	21.0	6	160	110	3.90	2.620	16.46	0	1	4	4
Mazda RX4 Wag	21.0	6	160	110	3.90	2.875	17.02	0	1	4	4
Hornet 4 Drive	21.4	6	258	110	3.08	3.215	19.44	1	0	3	1

```
df[(df$mpg > 20) | (df$cyl > 4),]
```

	mpg	cyl	disp	hp	drat	wt	qsec	vs	am	gear	carb
Mazda RX4	21.0	6	160.0	110	3.90	2.620	16.46	0	1	4	4
Mazda RX4 Wag	21.0	6	160.0	110	3.90	2.875	17.02	0	1	4	4
Datsun 710	22.8	4	108.0	93	3.85	2.320	18.61	1	1	4	1
Hornet 4 Drive	21.4	6	258.0	110	3.08	3.215	19.44	1	0	3	1
Hornet Sportabout	18.7	8	360.0	175	3.15	3.440	17.02	0	0	3	2
Valiant	18.1	6	225.0	105	2.76	3.460	20.22	1	0	3	1
Duster 360	14.3	8	360.0	245	3.21	3.570	15.84	0	0	3	4
Merc 240D	24.4	4	146.7	62	3.69	3.190	20.00	1	0	4	2
Merc 230	22.8	4	140.8	95	3.92	3.150	22.90	1	0	4	2
Merc 280	19.2	6	167.6	123	3.92	3.440	18.30	1	0	4	4
Merc 280C	17.8	6	167.6	123	3.92	3.440	18.90	1	0	4	4
Merc 450SE	16.4	8	275.8	180	3.07	4.070	17.40	0	0	3	3
Merc 450SL	17.3	8	275.8	180	3.07	3.730	17.60	0	0	3	3
Merc 450SLC	15.2	8	275.8	180	3.07	3.780	18.00	0	0	3	3
Cadillac Fleetwood	10.4	8	472.0	205	2.93	5.250	17.98	0	0	3	4
Lincoln Continental	10.4	8	460.0	215	3.00	5.424	17.82	0	0	3	4
Chrysler Imperial	14.7	8	440.0	230	3.23	5.345	17.42	0	0	3	4
Fiat 128	32.4	4	78.7	66	4.08	2.200	19.47	1	1	4	1
Honda Civic	30.4	4	75.7	52	4.93	1.615	18.52	1	1	4	2
Toyota Corolla	33.9	4	71.1	65	4.22	1.835	19.90	1	1	4	1
Toyota Corona	21.5	4	120.1	97	3.70	2.465	20.01	1	0	3	1
Dodge Challenger	15.5	8	318.0	150	2.76	3.520	16.87	0	0	3	2
AMC Javelin	15.2	8	304.0	150	3.15	3.435	17.30	0	0	3	2
Camaro Z28	13.3	8	350.0	245	3.73	3.840	15.41	0	0	3	4
Pontiac Firebird	19.2	8	400.0	175	3.08	3.845	17.05	0	0	3	2

	mpg	cyl	disp	hp	drat	wt	qsec	vs	am	gear	carb
Fiat X1-9	27.3	4	79.0	66	4.08	1.935	18.90	1	1	4	1
Porsche 914-2	26.0	4	120.3	91	4.43	2.140	16.70	0	1	5	2
Lotus Europa	30.4	4	95.1	113	3.77	1.513	16.90	1	1	5	2
Ford Pantera L	15.8	8	351.0	264	4.22	3.170	14.50	0	1	5	4
Ferrari Dino	19.7	6	145.0	175	3.62	2.770	15.50	0	1	5	6
Maserati Bora	15.0	8	301.0	335	3.54	3.570	14.60	0	1	5	8
Volvo 142E	21.4	4	121.0	109	4.11	2.780	18.60	1	1	4	2

Pernyataan `if`, `else`, dan `else if`

```
if (5 > 3){
    print('Bener, Bro!')
}
```

```
[1] "Bener, Bro!"
```

```
if (5 < 3){
    print('Bener, Bro!')
}

# tidak ada output karena kondisi FALSE
```

```
if (5 < 3){
    print('Bener, Bro!')
}else{
    print('Salah, Bro!')
}
```

```
[1] "Salah, Bro!"
```

```
a <- 10
b <- 20

if (a > b){
    print('a lebih besar dari b.')
}else{
    print('a lebih kecil dari b.')
}
```

```
[1] "a lebih kecil dari b."
```

```
minuman <- 'Coca Cola'

if (minuman == 'Kopi'){
    print('Ngopi, Bro!')
}else if (minuman == 'Coca Cola'){
    print('Mantap!')
}else if (minuman == 'air putih'){
    print('Bagus, Bro buat kesehatan.')
}else{
    print('Terserah mau minum apa, Bro yang penting halal.')
}
```

```
[1] "Mantap!"
```

Pengulangan `while`

```
b <- 0
while (b < 10){
    print(b)
    b = b + 1
}
```

```
[1] 0
[1] 1
[1] 2
[1] 3
[1] 4
[1] 5
[1] 6
[1] 7
[1] 8
[1] 9
```

```
b <- 0
while (b < 10){
    print(paste0('b sama dengan ',b))
    b = b + 1
}
```

```
[1] "b sama dengan 0"
[1] "b sama dengan 1"
[1] "b sama dengan 2"
[1] "b sama dengan 3"
[1] "b sama dengan 4"
[1] "b sama dengan 5"
[1] "b sama dengan 6"
[1] "b sama dengan 7"
[1] "b sama dengan 8"
[1] "b sama dengan 9"
```

```
b <- 0
while (b < 10){
    print(paste0('b sama dengan ',b))
    b = b + 1
    if (b == 10){
        print('b sama dengan 10. Pengulangan selesai.')
    }
}
```

```
[1] "b sama dengan 0"
[1] "b sama dengan 1"
[1] "b sama dengan 2"
[1] "b sama dengan 3"
[1] "b sama dengan 4"
[1] "b sama dengan 5"
[1] "b sama dengan 6"
[1] "b sama dengan 7"
[1] "b sama dengan 8"
[1] "b sama dengan 9"
[1] "b sama dengan 10. Pengulangan selesai."
```

```
b <- 0
while (b < 10){
    print(paste0('b sama dengan ',b))
    b = b + 1
    if (b == 10){
        print('b sama dengan 10. Pengulangan selesai.')
        print('Yuk Belajar pemrograman R!')
    }
}
```

```
[1] "b sama dengan 0"
[1] "b sama dengan 1"
[1] "b sama dengan 2"
[1] "b sama dengan 3"
[1] "b sama dengan 4"
[1] "b sama dengan 5"
[1] "b sama dengan 6"
[1] "b sama dengan 7"
[1] "b sama dengan 8"
[1] "b sama dengan 9"
[1] "b sama dengan 10. Pengulangan selesai."
[1] "Yuk Belajar pemrograman R!"
```

```
# penggunaan break() untuk mengakhiri pengulangan
b <- 0
while (b < 10){
    print(paste0('b sama dengan ',b))
    b = b + 1
    if (b == 10){
        print('b sama dengan 10. Pengulangan selesai.')
        break()
        print('Yuk Belajar pemrograman R!')
    }
}
```

```
[1] "b sama dengan 0"
[1] "b sama dengan 1"
[1] "b sama dengan 2"
[1] "b sama dengan 3"
[1] "b sama dengan 4"
[1] "b sama dengan 5"
[1] "b sama dengan 6"
[1] "b sama dengan 7"
[1] "b sama dengan 8"
[1] "b sama dengan 9"
[1] "b sama dengan 10. Pengulangan selesai."
```

```
b <- 0
while (b < 10){
    print(paste0('b sama dengan ',b))
    b = b + 1
    if (b == 5){
        print('b sama dengan 5. Pengulangan selesai.')
        break()
        print('Yuk Belajar pemrograman R!')
    }
}
```

```
[1] "b sama dengan 0"
[1] "b sama dengan 1"
[1] "b sama dengan 2"
[1] "b sama dengan 3"
[1] "b sama dengan 4"
[1] "b sama dengan 5. Pengulangan selesai."
```

Pengulangan `for`

```
v <- c(1,2,3,4,5)
```

```
v
```

1. 1
2. 2
3. 3
4. 4
5. 5

```
for (i in v){
    print(i)
}
```

```
[1] 1
[1] 2
[1] 3
[1] 4
[1] 5
```

```
for (i in v){
    print('Halo')
}
```

```
[1] "Halo"
[1] "Halo"
[1] "Halo"
[1] "Halo"
[1] "Halo"
```

```
buah2an <- c('Apel', 'Jeruk', 'Pisang', 'Mangga')

for (buah in buah2an){
    print(buah)
}
```

```
[1] "Apel"
[1] "Jeruk"
[1] "Pisang"
[1] "Mangga"
```

```
# Pengulangan for pada list
c1 <- c(10,20,30,40,50)
c2 <- c('A', 'B', 'C', 'D', 'E')
df <- data.frame(c1,c2)
df
```

c1	c2
10	A
20	B
30	C
40	D
50	E

```
v
```

1. 1
2. 2
3. 3
4. 4
5. 5

```
l <- list(v,df)
l
```

1.
    1. 1
    2. 2
    3. 3
    4. 4

5. 5

2.

c1	c2
10	A
20	B
30	C
40	D
50	E

```
for (i in l){
    print(i)
}
```

```
[1] 1 2 3 4 5
  c1 c2
1 10  A
2 20  B
3 30  C
4 40  D
5 50  E
```

```
# Pengunaan pengulangan for pada matriks
mat <- matrix(1:25, nrow=5, byrow=T)
mat
```

1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25

```
for (num in mat){
    print(num)
}
```

```
[1] 1
[1] 6
```

```
[1] 11
[1] 16
[1] 21
[1] 2
[1] 7
[1] 12
[1] 17
[1] 22
[1] 3
[1] 8
[1] 13
[1] 18
[1] 23
[1] 4
[1] 9
[1] 14
[1] 19
[1] 24
[1] 5
[1] 10
[1] 15
[1] 20
[1] 25
```

```
# Pengulangan for bersarang
for (i in 1:5){
    print(i^2)
}
```

```
[1] 1
[1] 4
[1] 9
[1] 16
[1] 25
```

```
for (i in 1:5){
    for (j in 1:2){
        print(i*j)
    }
}
```

```
[1] 1
[1] 2
[1] 2
[1] 4
[1] 3
[1] 6
[1] 4
[1] 8
[1] 5
[1] 10
```

Proses kerjanya:

1. 1×1
2. 1×2
3. 2×1
4. 2×2
5. 3×1
6. 3×2, dst...

Fungsi

```
# sintaks
nama_fungsi <- function(arg_1,arg_2, arg_3 = 10){
    # Kode yang hendak dieksekusi
    hasil <- arg_1 + arg_2
    return(hasil)
}
```

```
salam <- function(){
    print('Halo!')
}
```

```
salam()
```

```
[1] "Halo!"
```

```
salam <- function(nama){
    print(paste('Halo', nama, '!'))
}
```

```
salam('Sandy')
```

```
[1] "Halo Sandy !"
```

```
salam() # error karena tidak ada nama default
```

```
Error in paste("Halo", nama, "!"): argument "nama" is missing, with no default
Traceback:
```

```
1. salam()

2. print(paste("Halo", nama, "!"))   # at line 2 of file <text>

3. paste("Halo", nama, "!")   # at line 2 of file <text>
```

```r
salam <- function(nama = 'Priska'){
    print(paste('Halo', nama, '!'))
}
```

```r
salam()
```

```
[1] "Halo Priska !"
```

```r
salam('Sandy')
```

```
[1] "Halo Sandy !"
```

```r
penjumlahan <- function(b1,b2){
    print(b1 + b2)
}
```

```r
penjumlahan(10,20)
```

```
[1] 30
```

```r
# Harusnya pakai return
penjumlahan <- function(b1,b2){
    return(b1 + b2)
}
```

```r
x <- penjumlahan(10,20) # dapat disimpan di variabel
x
```

30

```r
# Jangkauan variabel
kuadrat <- function(x){
    hasil <- x^2
    return(hasil)
}
```

```r
out <- kuadrat(5)
out
```

25

```r
hasil # ga ada karena bersifat lokal
```

```
Error in eval(expr, envir, enclos): object 'hasil' not found
Traceback:
```

```r
var <- 'Variabel global'
internet <- 'Jaringan global'

jaringan <- function(internet){
    print(var)
    internet <- 'Jaringan lokal'
    print(internet)
}
```

```r
jaringan()
# redefinisi variabel lokal internet
```

```
[1] "Variabel global"
[1] "Jaringan lokal"
```

```r
print(internet) # di luar fungsi berlaku variabel global
```

```
[1] "Jaringan global"
```