

# RANGKAIAN ARITMETIKA 1

## *Pokok Bahasan :*

1. Sistim Bilangan : Desimal, Biner, Oktal, Hexadesimal
2. Konversi Sistim Bilangan

## *Tujuan Instruksional Khusus :*

1. Mahasiswa dapat menjelaskan perbedaan bentuk dan cara membilang dari sistim Desimal, Biner, Oktal dan Hexadesimal
2. Mahasiswa dapat mengkonversi dari satu sistim bilangan ke sistim bilangan yang lain.

# SISTIM BILANGAN

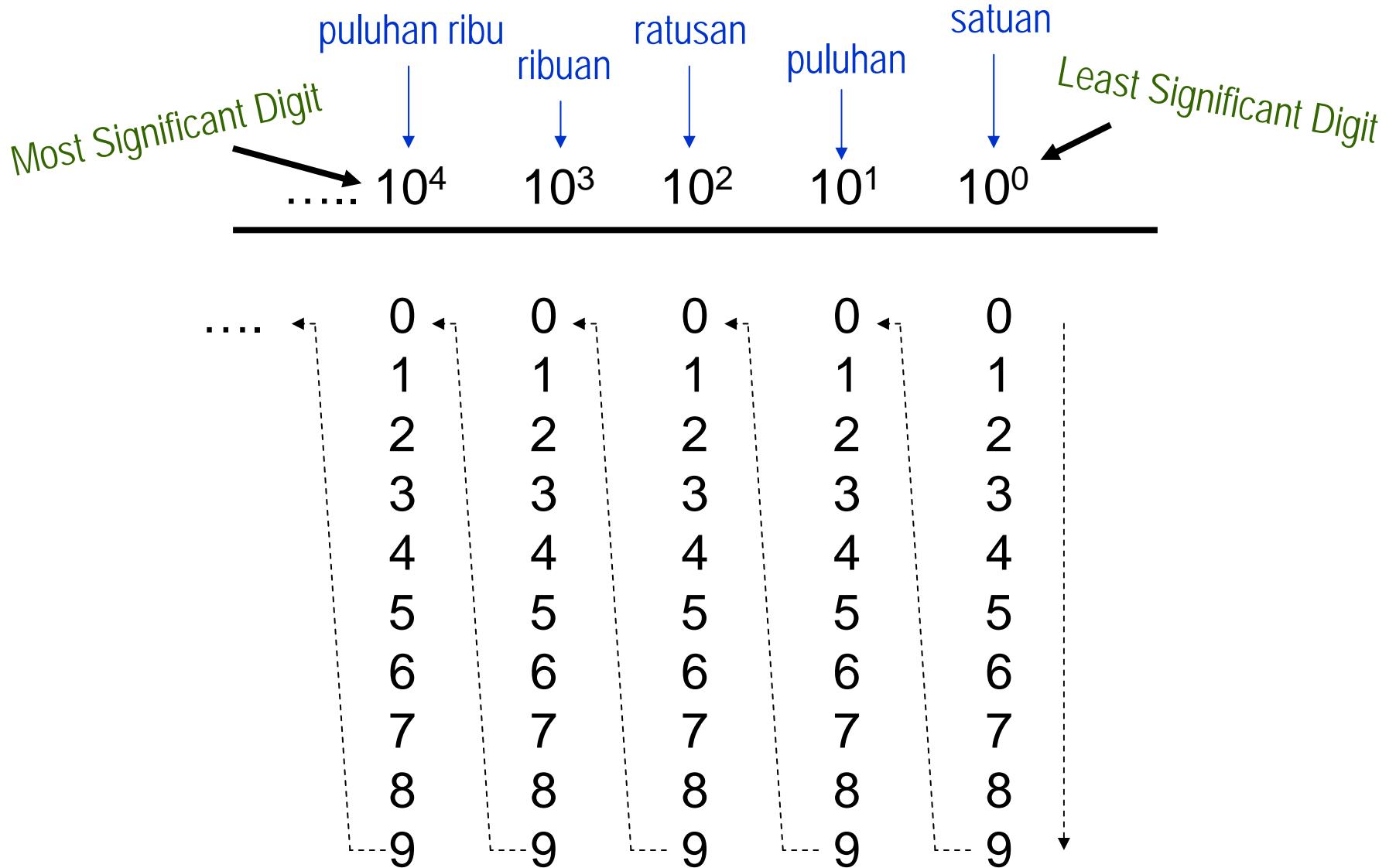
Sistim Bilangan terdiri dari :

1. Sistim Desimal → Dasar 10
2. Sistim Biner → Dasar 2
3. Sistim Oktal → Dasar 8
4. Sistim Hexadesimal → Dasar 16

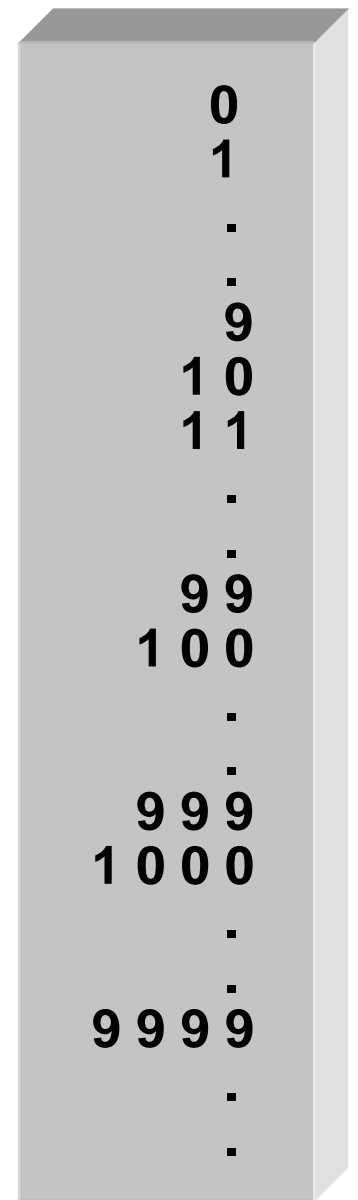
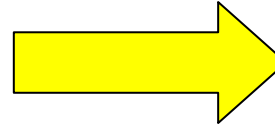
Aplikasi Sistim Bilangan :

1. Sistim Desimal → nilai mata uang : puluhan, ratusan, ribuan dsb
2. Sistim Biner → rangkaian elektronika digital
3. Sistim Oktal → instruksi komputer dengan kode 3-bit
4. Sistim Hexadesimal → pengalamatan memory pada micro controller

# Sistim Desimal



- Cara membilang dengan sistim desimal



- Cara menghitung dengan sistim desimal

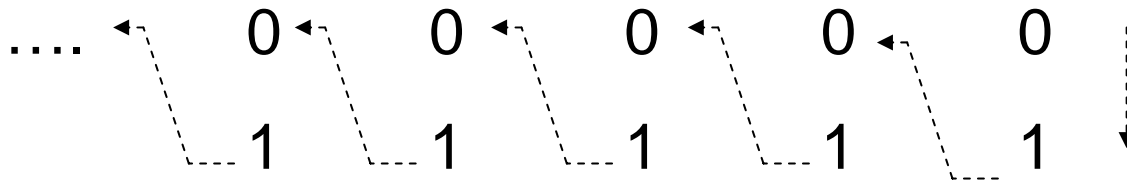
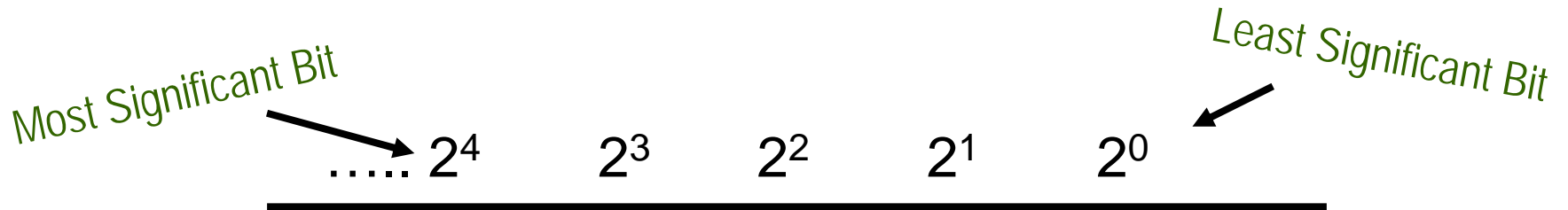
*Contoh :*

4	6	2	3	
				$3 \times 10^0 = 3$
				$2 \times 10^1 = 20$
				$6 \times 10^2 = 600$
				$4 \times 10^3 = \underline{4000} +$
				4623

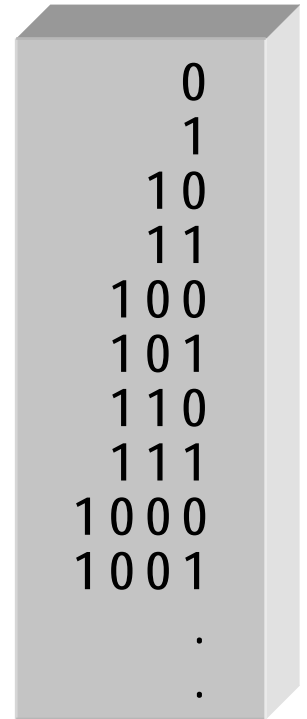
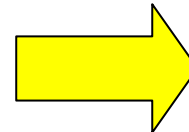
(empat ribu enam ratus dua puluh tiga)

# Sistim Biner

**BIT = B**inary **dig**i**T**



- Cara membilang dengan sistim biner



- Cara menghitung dengan sistim biner

Contoh :

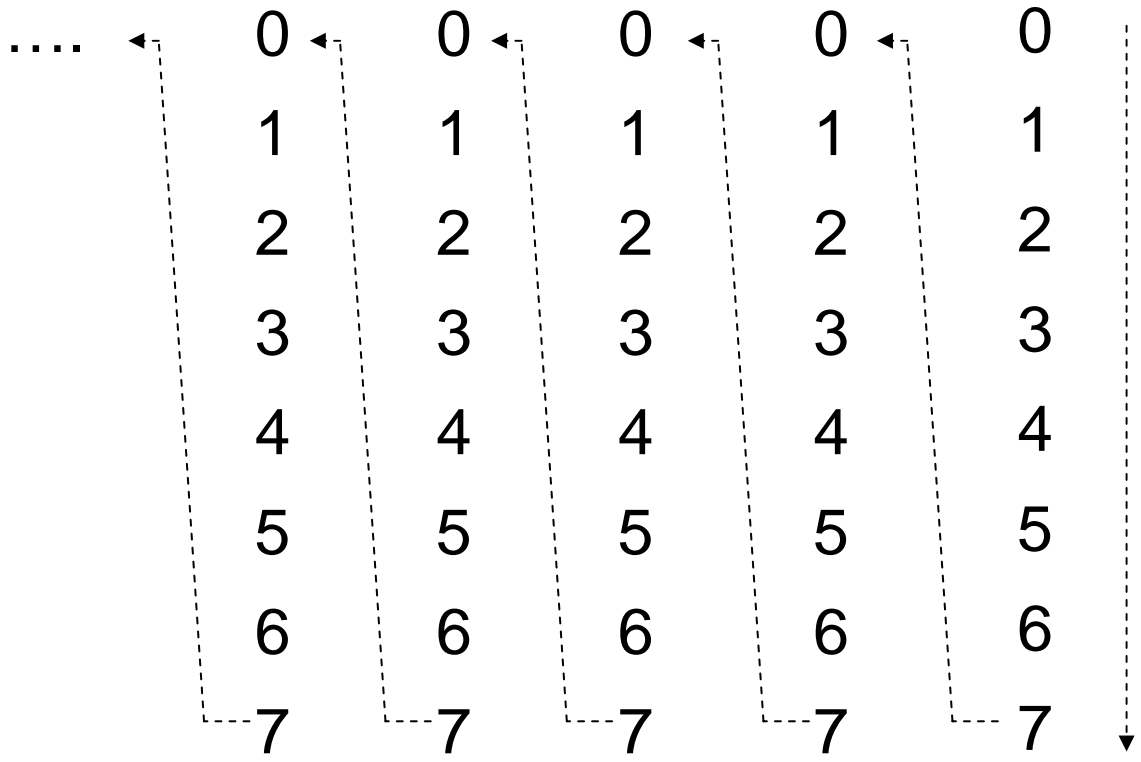
1	0	1	1	
				$1 \times 2^0 = 1$
			—	$1 \times 2^1 = 2$
		—		$0 \times 2^2 = 0$
	—			$1 \times 2^3 = 8+$
				<hr/>
				$11_{10}$

1	0	1	0	0	1	
						$1 \times 2^0 = 1$
				—		$0 \times 2^1 = 0$
			—			$0 \times 2^2 = 0$
		—				$1 \times 2^3 = 8$
	—					$0 \times 2^4 = 0$
—						$1 \times 2^5 = 32+$
						<hr/>
						$41_{10}$

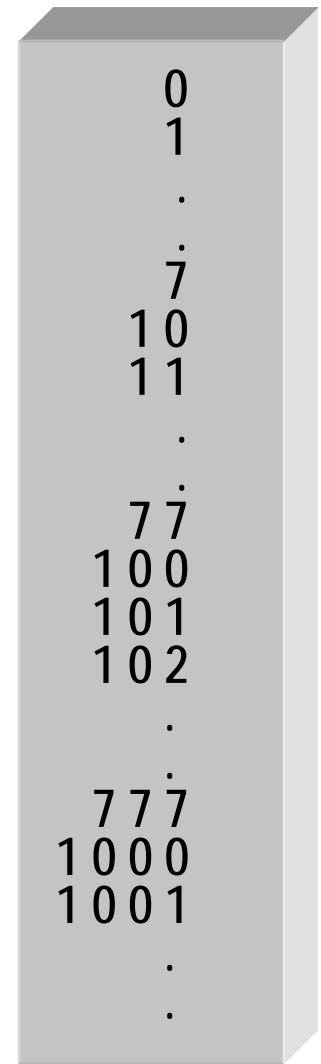
# Sistim Oktal

Most Significant Digit

Least Significant Digit



- Cara membilang dengan sistim Oktal



- Cara menghitung dengan sistim Oktal

*Contoh :*

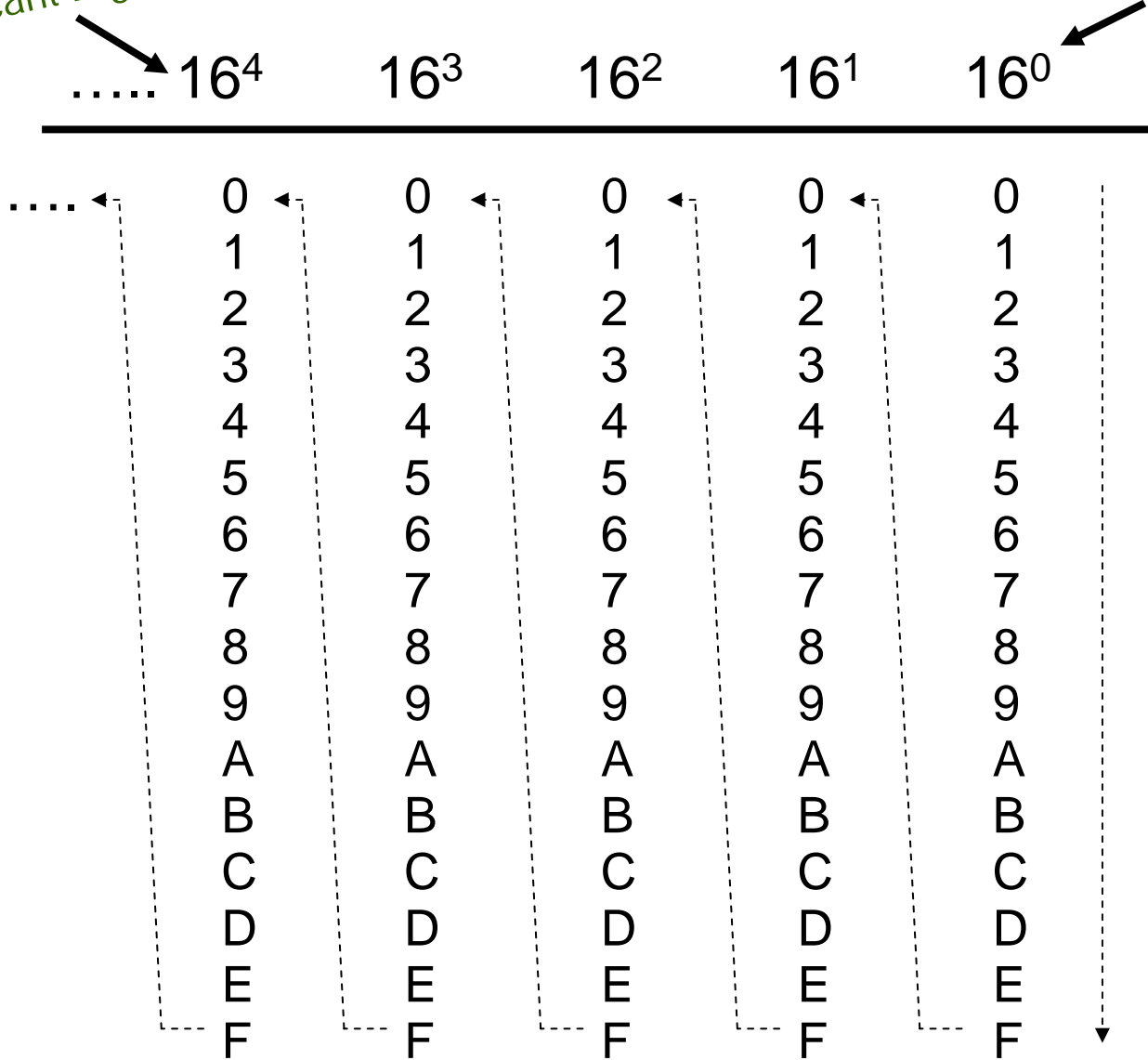
5	6	7	4	
				$4 \times 8^0 = 4$
				$7 \times 8^1 = 56$
				$6 \times 8^2 = 384$
				$5 \times 8^3 = \underline{2560} +$
				$3004_{10}$



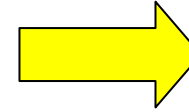
# Sistim Hexadesimal

Most Significant Digit

Least Significant Digit



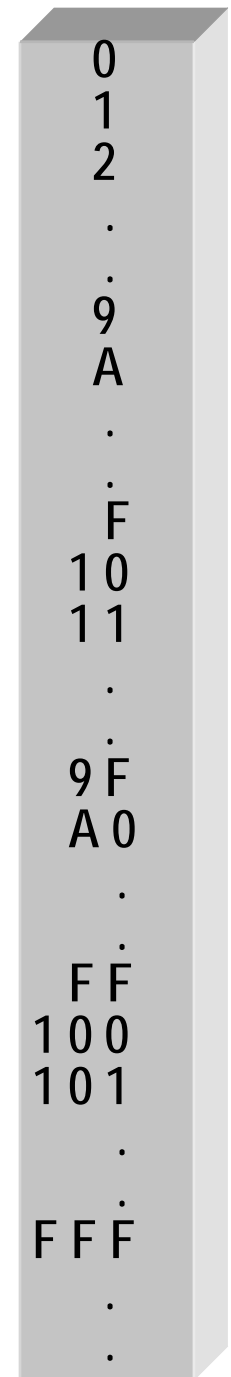
- Cara membilang dengan sistim Hexadesimal



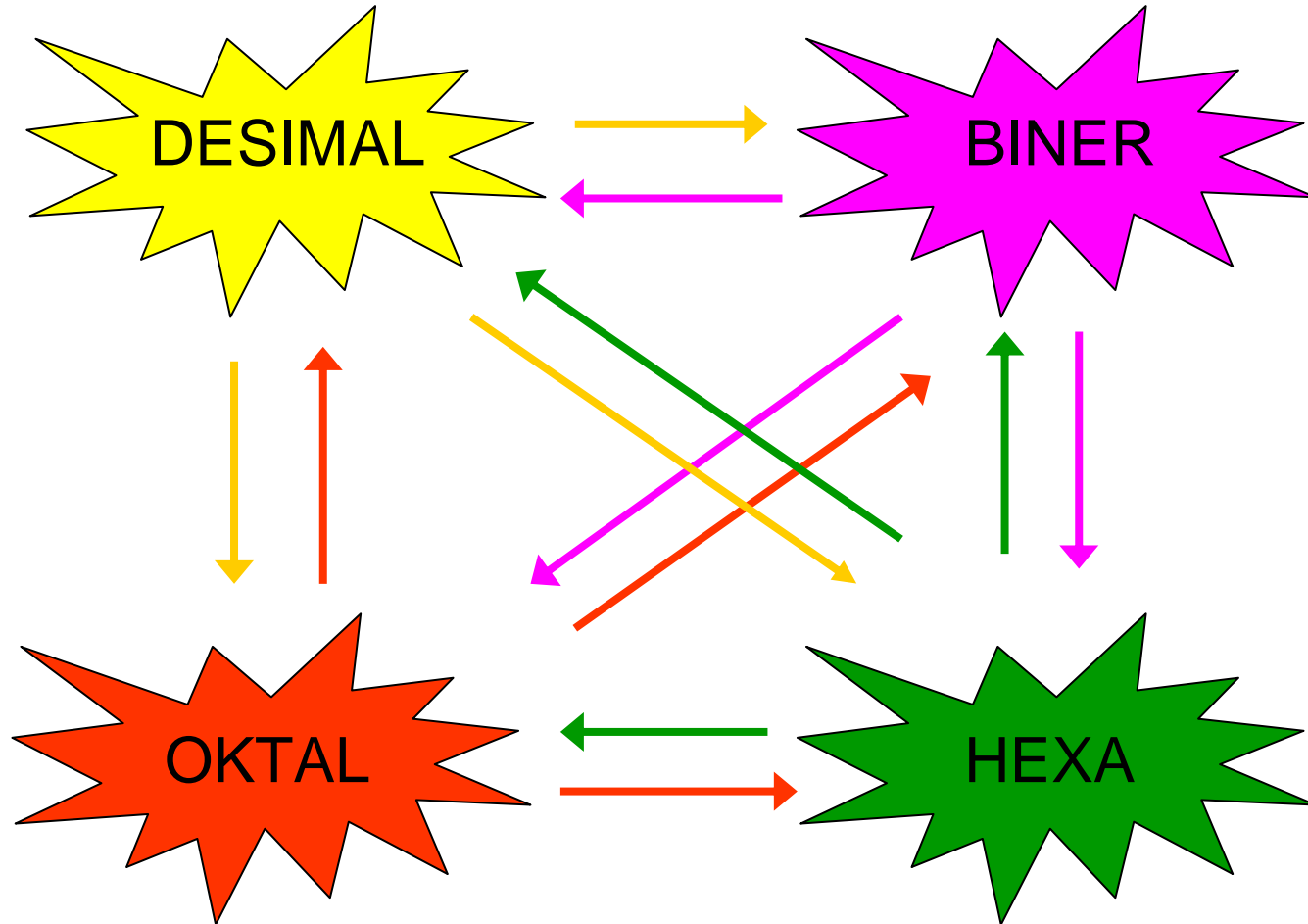
- Cara menghitung dengan sistim Hexadesimal

*Contoh :*

2	E	5	C	
				$12 \times 16^0 = 12$
				$5 \times 16^1 = 80$
				$14 \times 16^2 = 3584$
				$2 \times 16^3 = \underline{8192} +$
				$11868_{10}$



# KONVERSI SISTIM BILANGAN

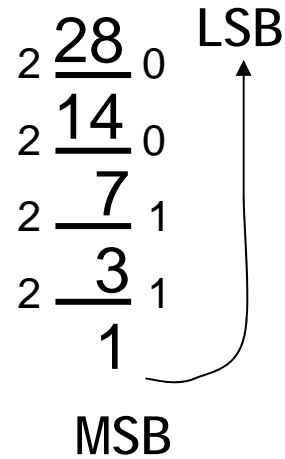


# 1. DESIMAL → BINER

Contoh :

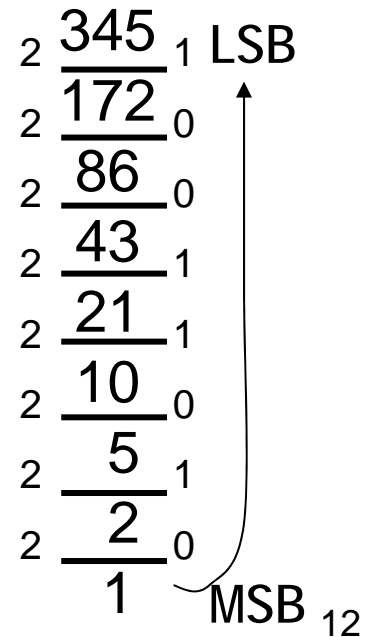
1)  $28_{10} = \dots\dots\dots_2 ?$

**$28_{10} = 11100_2$**



2)  $345_{10} = \dots\dots\dots_2 ?$

**$345_{10} = 101011001_2$**



## 2. DESIMAL → OKTAL

Contoh :

1)  $28_{10} = \dots\dots\dots_8 ?$

$$\begin{array}{r} 8 \overline{) 28} \quad 4 \text{ LSD} \\ \underline{\phantom{8} 24} \\ 4 \\ \underline{\phantom{8} 40} \\ 0 \end{array} \quad \begin{array}{l} \text{MSD} \end{array}$$

**$28_{10} = 34_8$**

2)  $345_{10} = \dots\dots\dots_8 ?$

$$\begin{array}{r} 8 \overline{) 345} \quad 1 \text{ LSD} \\ \underline{\phantom{8} 320} \\ 25 \\ \underline{\phantom{8} 24} \\ 1 \\ \underline{\phantom{8} 16} \\ 5 \\ \underline{\phantom{8} 40} \\ 5 \end{array} \quad \begin{array}{l} \text{MSD} \end{array}$$

**$345_{10} = 531_8$**

### 3. DESIMAL → HEXADESIMAL

Contoh :

1)  $28_{10} = \dots\dots\dots 16 ?$

$$\begin{array}{r} 16 \overline{) 28} \quad 12=C \quad \text{LSD} \\ \underline{1} \phantom{0} \\ 1 \phantom{0} \quad \text{MSD} \end{array}$$

**$28_{10} = 1C_{16}$**

2)  $345_{10} = \dots\dots\dots 16 ?$

$$\begin{array}{r} 16 \overline{) 345} \quad 9 \quad \text{LSD} \\ \underline{3} \phantom{0} \phantom{0} \\ 16 \overline{) 21} \quad 5 \\ \underline{1} \phantom{0} \\ 1 \phantom{0} \quad \text{MSD} \end{array}$$

**$345_{10} = 159_{16}$**

## 4. BINER → DESIMAL

Contoh :

1)  $1101_2 = \dots\dots\dots_{10} ?$

$$\begin{aligned} 1101_2 &= 1 \times 2^3 + 1 \times 2^2 + 0 \times 2^1 + 1 \times 2^0 \\ &= 8 + 4 + 0 + 1 \\ &= 13_{10} \end{aligned}$$

$$\mathbf{1101_2 = 13_{10}}$$

2)  $10110111_2 = \dots\dots\dots_{10} ?$

$$\begin{aligned} 10110111_2 &= 1 \times 2^7 + 0 \times 2^6 + 1 \times 2^5 + 1 \times 2^4 \\ &\quad + 0 \times 2^3 + 1 \times 2^2 + 1 \times 2^1 + 1 \times 2^0 \\ &= 128 + 0 + 32 + 16 + 0 + 4 + 2 + 1 \\ &= 183_{10} \end{aligned}$$

$$\mathbf{10110111_2 = 183_{10}}$$

## 5. OKTAL → DESIMAL

Contoh :

1)  $75_8 = \dots\dots\dots 10 ?$

$$\begin{aligned}75_8 &= 7 \times 8^1 + 5 \times 8^0 \\ &= 56 + 5 \\ &= 61_{10}\end{aligned}$$

$$75_8 = 61_{10}$$

2)  $6341_8 = \dots\dots\dots 10 ?$

$$\begin{aligned}6341_8 &= 6 \times 8^3 + 3 \times 8^2 + 4 \times 8^1 + 1 \times 8^0 \\ &= 3072 + 192 + 32 + 1 \\ &= 3297_{10}\end{aligned}$$

$$6341_8 = 3297_{10}$$



## 6. HEXADESIMAL → DESIMAL

Contoh :

1)  $9F_{16} = \dots\dots\dots_{10} ?$

$$\begin{aligned} 9F_{16} &= 9 \times 16^1 + 15 \times 16^0 \\ &= 144 + 15 \\ &= 159_{10} \end{aligned}$$

$$\mathbf{9F_{16} = 159_{10}}$$

2)  $3FE8_{16} = \dots\dots\dots_{10} ?$

$$\begin{aligned} 3FE8_{16} &= 3 \times 16^3 + 15 \times 16^2 + 14 \times 16^1 + 8 \times 16^0 \\ &= 12288 + 3840 + 224 + 8 \\ &= 16360_{10} \end{aligned}$$

$$\mathbf{3FE8_{16} = 16360_{10}}$$

## 7. BINER → OKTAL

Contoh :

$$1101011_2 = \dots\dots\dots_8 ?$$

Cara 1 :

Konversikan Biner → Desimal → Desimal → Oktal

$$\begin{aligned} 1101011_2 &= 1 \times 2^6 + 1 \times 2^5 + 1 \times 2^3 + 1 \times 2^1 + 1 \times 2^0 \\ &= 64 + 32 + 8 + 2 + 1 \\ &= 107_{10} \end{aligned}$$

$$\begin{array}{r} 8 \overline{)107} \quad 3 \\ 8 \overline{)13} \quad 5 \\ \quad \quad 1 \end{array}$$

$$1101011_2 = 153_8$$

Cara 2 :

Ambil per – 3bit menjadi 1 kelompok, mulai dari LSB.

Bit MSB ditambahkan “0”

$$1101011 \rightarrow \underbrace{001}_1 \quad \underbrace{101}_5 \quad \underbrace{011}_3 \quad 8$$

## 8. BINER → HEXADESIMAL

Contoh :

$$1101011_2 = \dots\dots\dots_{16} ?$$

Cara 1 :

Konversikan Biner → Desimal → Hexadesimal

$$\begin{aligned} 1101011_2 &= 1 \times 2^6 + 1 \times 2^5 + 1 \times 2^3 + 1 \times 2^1 + 1 \times 2^0 \\ &= 64 + 32 + 8 + 2 + 1 \\ &= 107_{10} \end{aligned}$$

$${}_{16} \frac{107}{6} 11 = C$$

$$\mathbf{1101011_2 = 6C_{16}}$$

Cara 2 :

Ambil per – 4bit menjadi 1 kelompok, mulai dari LSB.

Bit MSB ditambahkan “0”

$$1101011 \rightarrow \underbrace{0110}_6 \underbrace{1011}_C_{16}$$

## 9. OKTAL → BINER

Contoh :

$$64_8 = \dots\dots\dots_2 ?$$

Cara 1 :

Konversikan Oktal → Desimal → Desimal → Biner

$$\begin{aligned} 64_8 &= 6 \times 8^1 + 4 \times 8^0 \\ &= 48 + 4 \\ &= 52_{10} \end{aligned}$$

$$64_8 = 110100_2$$

$$\begin{array}{r} 2 \overline{)52} 0 \\ 2 \overline{)26} 0 \\ 2 \overline{)13} 1 \\ 2 \overline{)6} 0 \\ 2 \overline{)3} 1 \\ 1 \end{array}$$

Cara 2 :

Masing-masing digit dikonversikan menjadi 3 bit biner.

$$64 \rightarrow \begin{array}{cc} 6 & 4 \\ \swarrow \quad \searrow & \swarrow \quad \searrow \\ 110 & 100_2 \end{array}$$

# 10. HEXADESIMAL → BINER

Contoh :

$$7D_{16} = \dots\dots\dots_2 ?$$

Cara 1 :

Konversikan Hexa → Desimal → Biner

$$\begin{aligned} 7D_{16} &= 7 \times 16^1 + 13 \times 16^0 \\ &= 112 + 14 \\ &= 125_{10} \end{aligned}$$

$$\begin{array}{r} 2 \overline{)125} \ 1 \\ \underline{24} \phantom{0} \\ 2 \overline{)62} \ 0 \\ \underline{12} \phantom{0} \\ 2 \overline{)31} \ 1 \\ \underline{22} \phantom{0} \\ 2 \overline{)15} \ 1 \\ \underline{14} \phantom{0} \\ 2 \overline{)7} \ 1 \\ \underline{6} \phantom{0} \\ 2 \overline{)3} \ 1 \\ \underline{2} \phantom{0} \\ 1 \end{array}$$

**$7D_{16} = 1111101_2$**

Cara 2 :

Masing-masing digit dikonversikan menjadi 4 bit biner.

$$7D \rightarrow \begin{array}{c} 7 \\ / \quad \backslash \\ 0111 \end{array} \quad \begin{array}{c} D \\ / \quad \backslash \\ 1101_2 \end{array}$$

# 11. OKTAL → HEXADESIMAL

Contoh :

$$57_8 = \dots\dots\dots_{16} ?$$

Cara 1 :

Konversikan Oktal → Desimal → Hexa

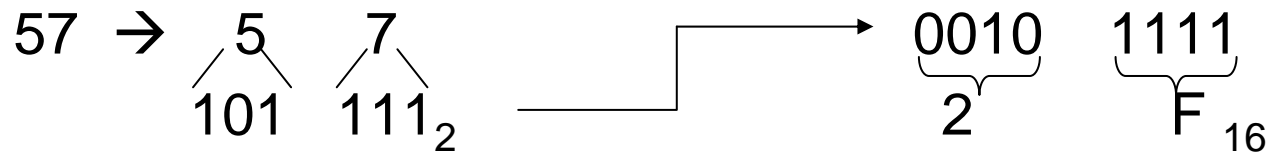
$$\begin{aligned} 57_8 &= 5 \times 8^1 + 7 \times 8^0 \\ &= 40 + 7 \\ &= 47_{10} \end{aligned}$$

$${}_{16} \frac{47}{2} 15 = F$$

**$57_8 = 2F_{16}$**

Cara 2 :

Konversikan Oktal → Biner → Hexa



## 12. HEXADESIMAL → OKTAL

Contoh :

$$6A_{16} = \dots\dots\dots_8 ?$$

Cara 1 :

Konversikan Hexa → Desimal → Desimal → Oktal

$$\begin{aligned} 6A_{16} &= 6 \times 16^1 + 10 \times 16^0 \\ &= 96 + 10 \\ &= 106_{10} \end{aligned}$$

$$\begin{array}{r} 8 \overline{)106} \ 2 \\ \underline{8 \ 13} \ 5 \\ \underline{8 \ 1} \ 5 \\ \underline{8 \ 0} \ 1 \end{array}$$

$$6A_{16} = 152_8$$

Cara 2 :

Konversikan Hexa → Biner → Biner → Oktal

$$6A \rightarrow \begin{array}{c} 6 \\ \swarrow \quad \searrow \\ 0110 \end{array} \quad \begin{array}{c} A \\ \swarrow \quad \searrow \\ 1010_2 \end{array}$$

$$\begin{array}{ccc} 001 & 101 & 010 \\ \underbrace{\hspace{1em}} & \underbrace{\hspace{1em}} & \underbrace{\hspace{1em}} \\ 1 & 5 & 2_8 \end{array}$$

## Soal Latihan

Konversikan sistim bilangan berikut :

a)  $27_{10} = \dots\dots\dots_2$

b)  $11010_2 = \dots\dots\dots_8$

c)  $63_8 = \dots\dots\dots_{10}$

d)  $6FE_{16} = \dots\dots\dots_2$

e)  $1101110_2 = \dots\dots\dots_{10}$

f)  $517_8 = \dots\dots\dots_{10}$

g)  $D3A_{16} = \dots\dots\dots_8$

h)  $47_8 = \dots\dots\dots_2$

i)  $756_8 = \dots\dots\dots_{16}$

j)  $4C_{16} = \dots\dots\dots_2$