CS & IT ENGINEERING

Programming in C

Operators -01

Lecture No-05

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1)

int a;
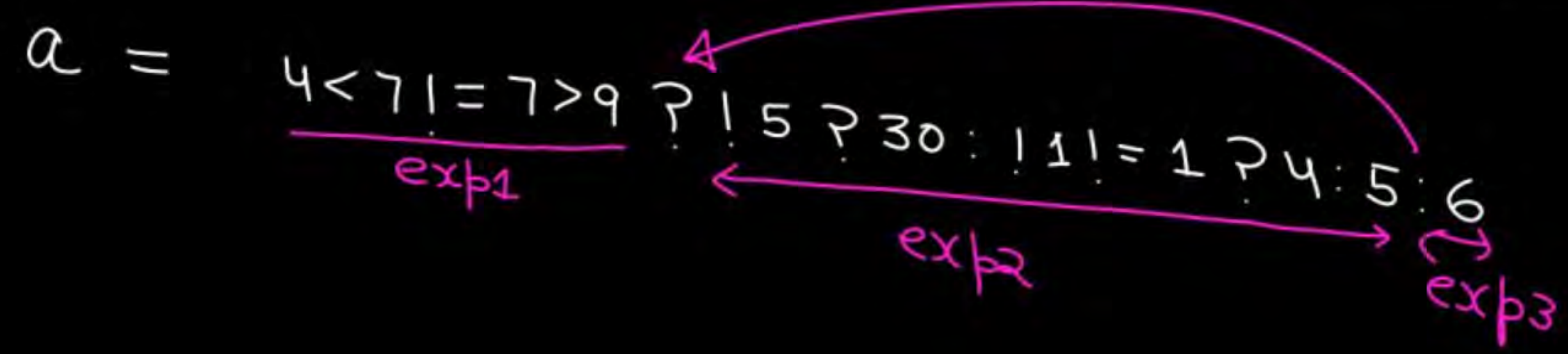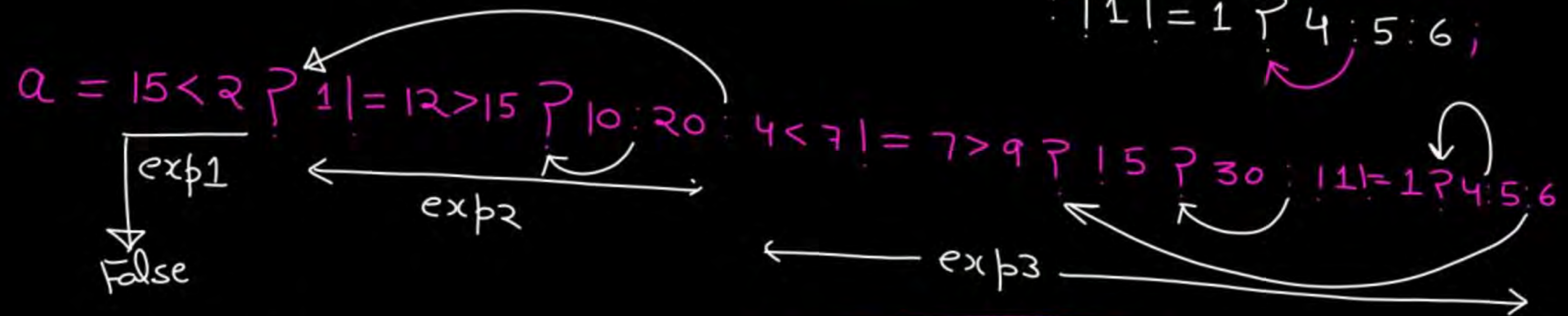
a = 15 < 2 ? 11 = 12 > 15 ? 10 : 20 : 4 < 7 1 = 7 > 9 ? 15 ? 30

11 = 1 ? 4 : 5 : 6;

a = 15 < 2 ? 11 = 12 > 15 ? 10 : 20 : 4 < 7 1 = 7 > 9 ? 15 ? 30 : 11 = 1 ? 4 : 5 : 6

exp1

exp2

False

exp3

a =   4 < 7 1 = 7 > 9 ? 15 ? 30 : 11 = 1 ? 4 : 5 : 6

exp1

exp2

exp3

$a = \boxed{4<7|=7>9} ?\ 15\ ?\ 30 : |1| = 1\ ?\ 4 : 5 : 6$

Left ⟵→   M   R

① $<, >, <=, >=$
② $!=, ==$

$\dfrac{4<7}{①} |=7>9$

$1 | = \boxed{7>9}$

$1 | = 0\ \text{True}$

$a = \ \{15\}\ ?\ 30 : |1| = 1\ ?\ 4 : 5\ ,$
$\quad\quad\ \ L \quad M \quad\quad\quad\quad R$

$\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad a$

$\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\boxed{4}$

$a = \ |1| = 1\ ?\ 4 : 5$

True

unary   binary
$|\,1\,|\!=\!1$

$(!1) ! = 1$

$0\ ! = 1\quad \text{True}$

$\underbrace{\qquad}$

1

2/

int a;

$a = 5 < 12$? $\left(\text{printf("GATE") \&\& printf("Wallah")}\right) || \text{printf("2023")}$

Anna 24 Ghante chaukanna

(1)

True

$\longleftarrow$ Mid $\longrightarrow$

printf("Sir");

R

$\checkmark$ printf("%d", a);

$a = \left(\overset{4}{\cancel{\text{printf("GATE")}}} \&\& \overset{6}{\cancel{\text{printf("wallah")}}}\right) || \text{printf("2023")}$

$\overset{\times}{1 || \text{printf("2023")}}$
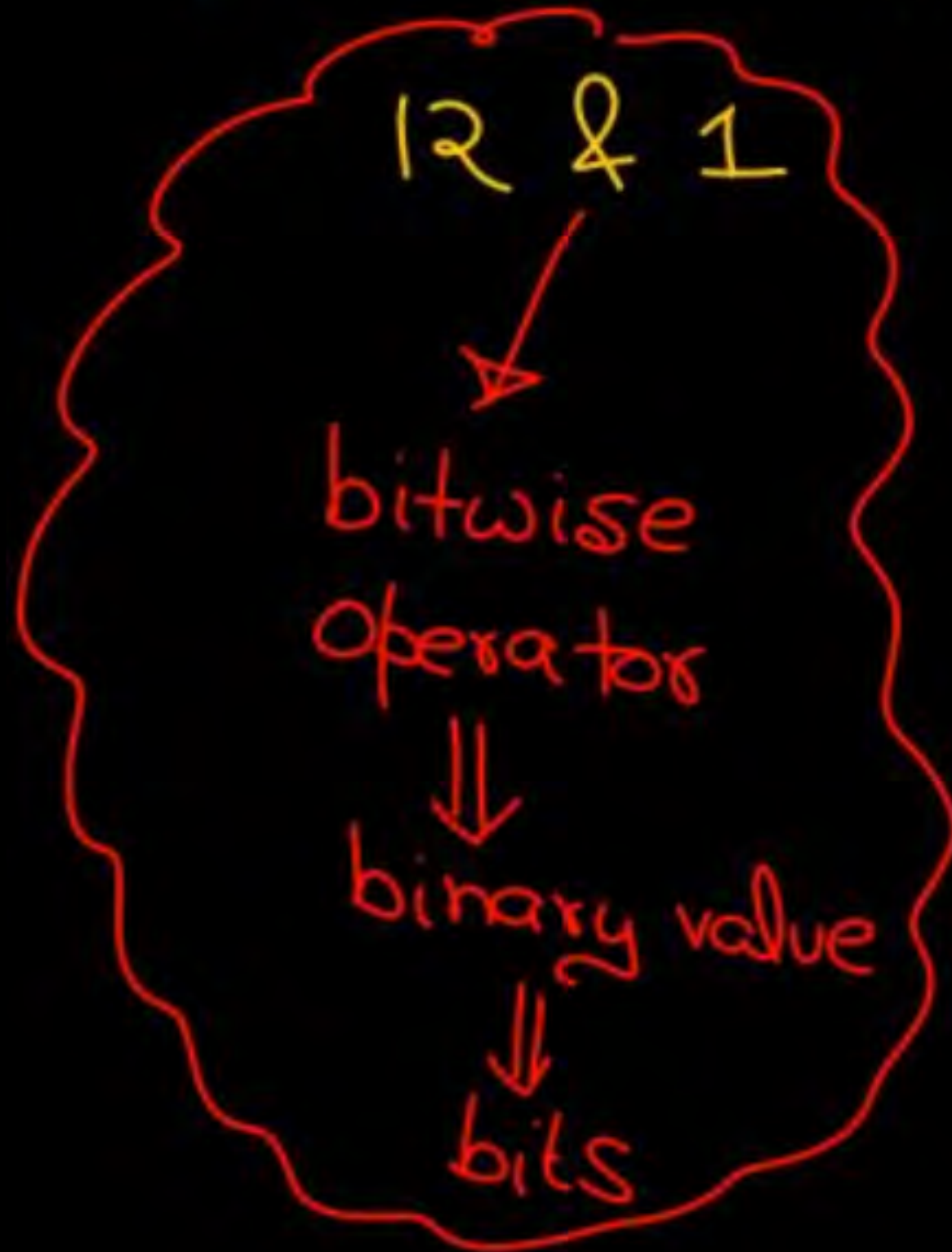
a = 1

O/P : GATE Wallah 1

3.

```
int y ;
int x = 12;

      12
y =  (x & 1) ? printf("Hello") : printf("Everyone");
      0
printf("%d", y);
```

12 & 1

bitwise
operator
⇓
binary value
⇓
bits

$y =$ printf("Everyone");
     8 ①

00001100
00000001
─────────
00000000 ⇒ 0
           False

O/P : Everyone 8

$$\underset{x}{\sim\sim\sim}\boxed{0} \Rightarrow 2x \quad (\text{Even}) \quad \sim\sim\sim\rightarrow \text{last bit} \Rightarrow 0$$

$$\underset{x}{\sim\sim\sim}\boxed{1} \Rightarrow 2x+1 \quad (\text{Odd}) \quad \sim\sim\sim\rightarrow \text{last bit} \Rightarrow 1$$

$$\text{Even}$$

$$\&\quad \overbrace{b_1\, b_2\, b_3\, b_4\, b_5\, b_6\, b_7\, 0}$$

$$\underline{0\;0\;0\;0\;0\;0\;0\;1} \qquad (1)$$

$$0\;0\;0\;0\;0\;0\;0\;0$$

$$\text{Even no.} \;\&\; 1 \Rightarrow 0$$

$$\text{Odd no.} \;\&\; 1 \Rightarrow 1$$

1) $5 \wedge 5 = 0$

$$
\begin{array}{r}
00000101 \\
00000101 \\
\hline
00000000
\end{array}
$$

$5 \wedge 5 \wedge 5 = 5$

$5 \wedge 5 \wedge 5 \wedge 5 = 0$

① int $a = 10, b = 20, c;$

$c = a;$
$a = b;$ ⎤ swap
$b = c;$ ⎦

Q) $5, 1, 3, 5, 3, 1, 4 \Rightarrow 4$

a $\boxed{10}$ b $\boxed{20}$ ②

$$a = a + b;$$
$$b = a - b;$$
$$a = a - b;$$

$10 \char`^ \boxed{20 \char`^ 20}$

$a \char`^ b \char`^ \cancel{b}$

Lost ?

a $\boxed{30}$ b $\boxed{20}$

a $\boxed{10}$ b $\boxed{20}$

②.

$$a = a \char`^ b;$$
$$b = a \char`^ b;$$
$$a = a \char`^ b$$

a $\boxed{30}$ b $\boxed{10}$

a $\boxed{10 \char`^ 20}$ b $\boxed{20}$

a $\boxed{20}$ b $\boxed{10}$

a $\boxed{10 \char`^ 20}$ b $\boxed{10}$

$\cancel{10} \char`^ 20 \char`^ \cancel{10}$

$\boxed{20}$ $\boxed{10}$

a

| 10 |

b

| 20 |

a

| 0001I110 |

b
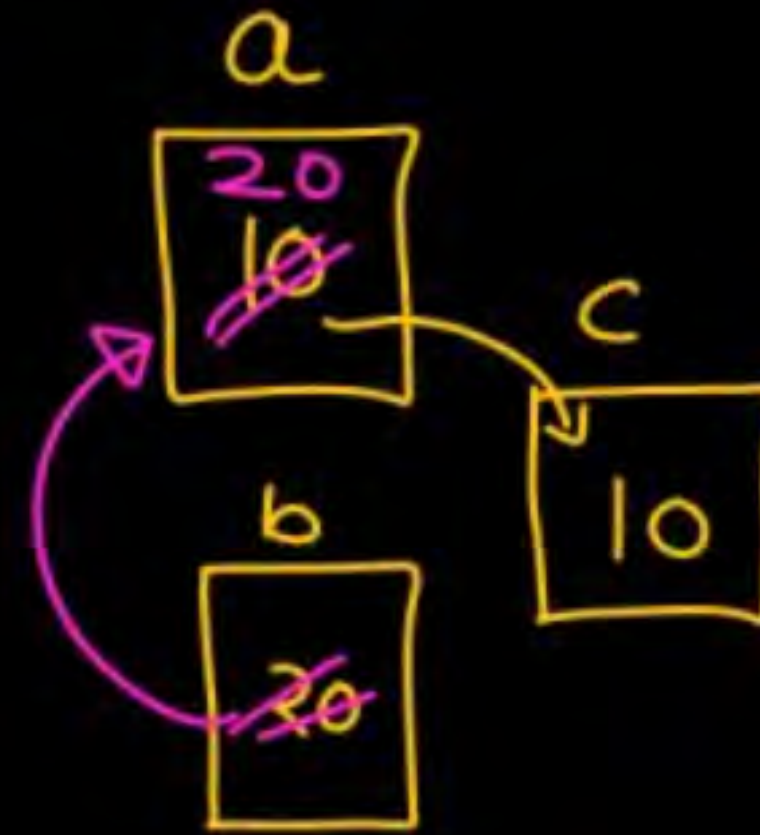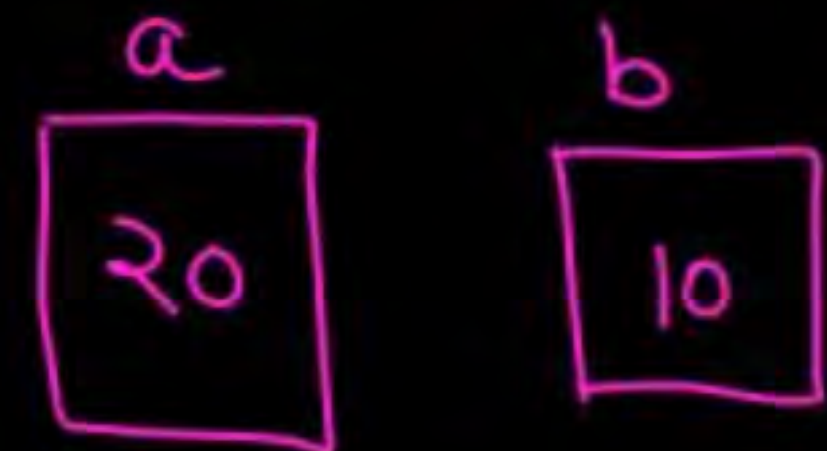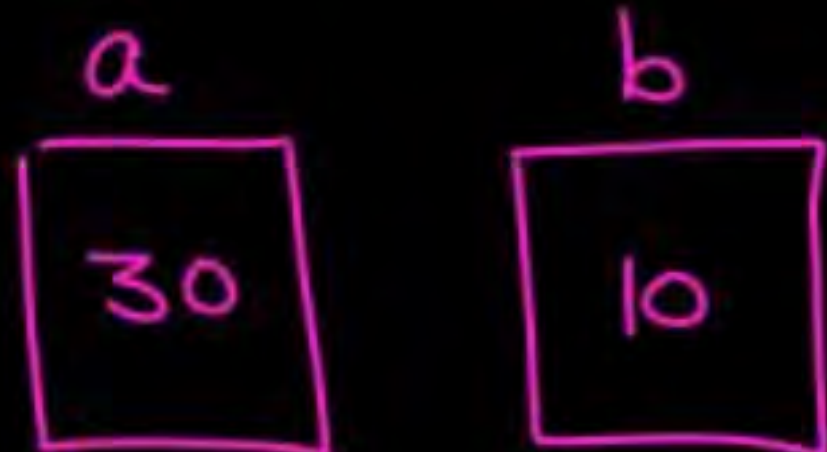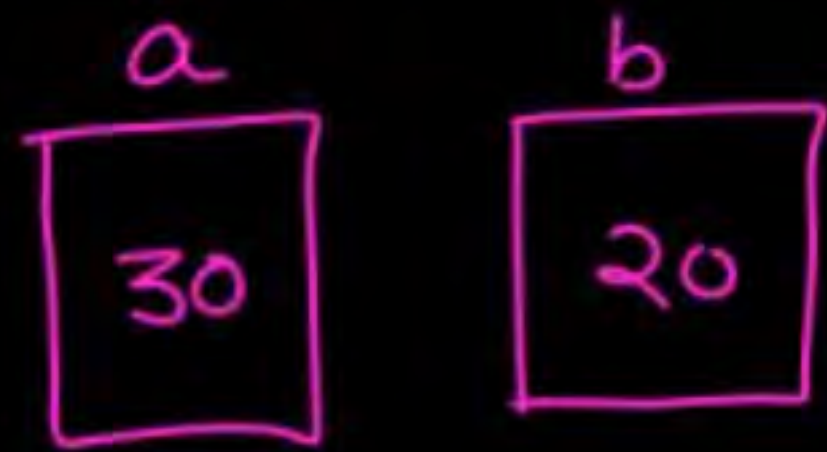
| 00010100 |

① $\begin{cases} a = a \wedge b \\ b = a \wedge b \\ a = a \wedge b \end{cases}$

$a : 00001010$
$b : 00010100$
───────────
$a : 00011110$
───────────
$b : 00010100$
───────────
00001010

$a = a \wedge b ;$

a

| 10 |

b

| 20 |

a

| $10 \wedge 20$ |

b

| 20 |

a

| $10 \wedge 20$ |

b

| 10 |

$$x = x + 10 \implies x + = 10 \quad \overset{①}{} \overset{②}{}$$

$$x = x - 10 \implies x - = 10$$

$$x = x \times 10 \implies x \times = 10$$

$$x = x / 10 \implies x / = 10$$

$$x = x \% 10 \implies x \% = 10$$

$$x = x \& 10 \implies x \& = 10$$

$$x = x | 10 \implies x | = 10$$

$$x = x << 10 \implies x << = 10$$

$$x = x >> 10 \implies x >> = 10$$

$$x = x \,\hat{}\, 10 \implies x \,\hat{}\, = 10$$

int a, b, c;

$$a = b = \boxed{c = 4} ;$$

a   b   c

| 4 | | 4 | | | 4 |
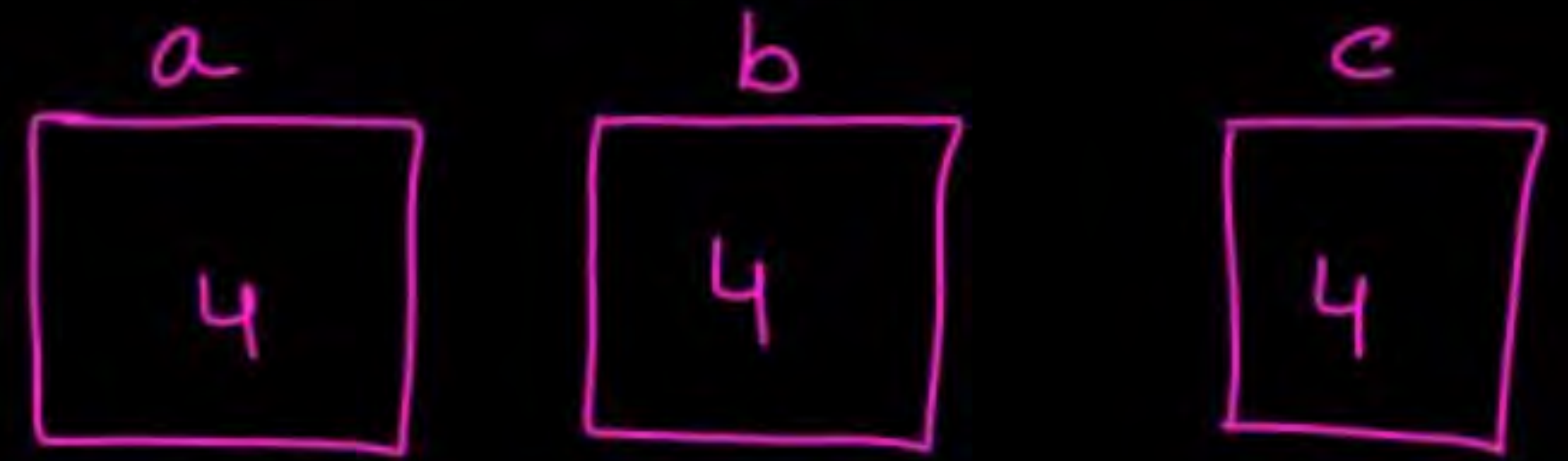
$$a = \boxed{b = 4}$$

$$a = 4$$

int a = 5, b = 10 $\longrightarrow$ Assignment statement

b = (a+b) - (a = b);

$\longrightarrow$ (i) value assign

$\longrightarrow$ (ii) its value is the value we are assigning

printf("%d", a);

printf("%d", b);

15 — (10)

b = 5

a

| 5̶ 10 |

b

| 5
1̶0̶ |
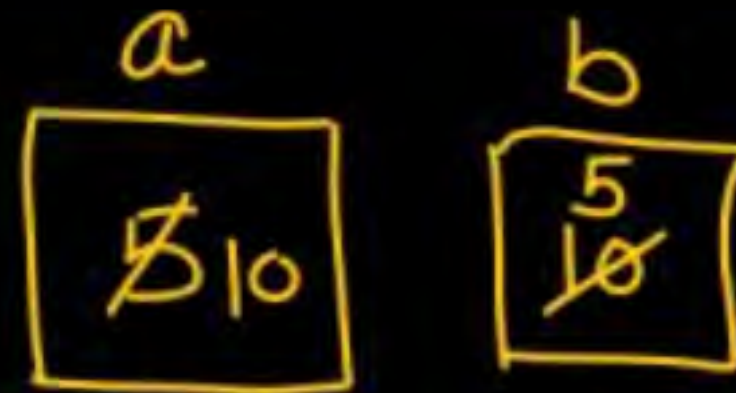
Every operator $\Rightarrow$ result/output

Assignment $\Rightarrow$ Operator

binary

$2 \Rightarrow 10$

$4 \Rightarrow 100$

$8 \Rightarrow 1000$

$16 \Rightarrow 10000$

$2^4 2^3 2^2 2^1 2^0$

$2^x =$ binary value always contains single 1

bits Addition

$1 + 0 = 1$

$0 + 1 = 1$

$0 + 0 = 0$

$1 + 1 = ②$ → 10

$\dfrac{7}{3}$

10 ↗

Carry

$1 \leftarrow$ carry

16
24
─────
$0 \leftarrow$ sum

1

$10 \leftarrow$ sum

$\nearrow$

Carry

0 0111
0 1000
─────
0 1 1 1 1

1 1 1

0 0 1 0 1 0
0 0 0 1 1 0
─────────
0 1 0 0 0 0

$$\overset{\text{Carry}}{\underset{}{}}\overset{\text{Carry}}{\underset{}{}}\overset{\text{Carry}}{\underset{}{}}$$
$$\overset{1\ 1\ 1}{}$$

```
  1000111
  0100001
  _____
  1101000
  _____
```

$$00000111$$
$$00000001$$
$$\overline{}$$

$$\Rightarrow$$

$$\overset{\text{Carry}}{}\overset{\text{Carry}}{}\overset{\text{Carry}}{}$$
$$1\ 1\ 1$$

```
    0000011 1
  +         1
  _____
    0001000 0
  _____
```

1.
$$0000|111 \quad (15)$$
$$+ \quad \underline{1} \quad (1)$$
$$\underline{000|0000} \quad (16) \quad 2^4$$

$1111 \Rightarrow 2^4 - 1$

$$2^0 + 2^1 + 2^2 + 2^3$$
$$\Rightarrow 2^4 - 1$$

2.
$$\overleftarrow{}$$
$$000| | | | | | \quad (31)$$
$$+ \quad \underline{1} \quad (1)$$
$$\underline{00\,1\,0\,0\,0\,0\,0} \quad (32) \quad 2^5$$

$| | | | |$

$2^4 2^3 2^2 2^1 2^0 \Rightarrow 2^0 + 2^1 + 2^2 + 2^3 + 2^4$
$$= 2^5 - 1$$

$$00011111 \qquad (2^5-1)$$

$$\frac{1}{00100000} \qquad 2^5$$

$$G.P \Rightarrow \frac{a\left(r^n-1\right)}{r-1}$$

$$1+2+4+8+16$$

$$1+2^1+2^2+2^3+2^4$$

a

$$r=2$$
$$n=5$$

$$\Rightarrow \frac{①(2^5-1)}{\boxed{r-1}} = 2^5-1$$

$$0\ 0\ 0\ 1\ 1\ 1\ 1\ 1 \qquad 2^n - 1$$

$$\underline{1}$$

$$0\ 0\ 1\ 0\ 0\ 0\ 0\ 0$$

1.)

  & $0\ 0\ 0\ 0\ 1\ 1\ 1\ 1$ (15)

     $\underline{0\ 0\ 0\ 1\ 0\ 0\ 0\ 0}$ (16)

     $0\ 0\ 0\ 0\ 0\ 0\ 0$

2.)

  & $0\ 0\ 0\ 1\ 1\ 1\ 1\ 1$ (31)

     $\underline{0\ 0\ 1\ 0\ 0\ 0\ 0\ 0}$ (32)

     $0\ 0\ 0\ 0\ 0\ 0\ 0\ 0$

3.)

   $0\ 0\ 1\ 1\ 1\ 1\ 1\ 1$ (63)

   $\underline{0\ 1\ 0\ 0\ 0\ 0\ 0\ 0}$ (64)

   $0\ 0\ 0\ 0\ 0\ 0\ 0$

$$2^n - 1$$

$$000 \, \boxed{1 \, 1 \, 1 \, 1 \, 1 \, 1 \, 1 \ldots 1 \, 1 \, 1}$$

$$0 \, 0 \, 1 \, 0 \, 0 \, 0 \, 0 \ldots \, 0 \, 0 \, 0 \, 0$$

$$\left(2^n - 1\right) \, \& \, \left(2^n\right) \qquad 0$$

Sizeof

* Unary

* Compile time

short int - 2
int   - 4
float   - 4

int + int $\Rightarrow$ int

int a = 10;

                                → Memory
sizeof(a)   4

float b = 20.8;

        sizeof(b)   4

$sizeof()$ $\longrightarrow$ $\overset{o/p}{-ve}$ It can't be

unsigned int

1.   char ch = 'A'; ← variable

| printf("/.u", sizeof(ch));

| printf("/.u", sizeof(char)); ← data - type

2.   (int) i = 10;   int + int

     printf("/.u", sizeof(i + 10));

                   sizeof(int)

Q

int i = 10;

printf("%u", sizeof(i = i + 10)); 4

printf("%d", i); 10

i
| 10 |

(float) b = 12.7;

int float → variable
10 + b } sizeof(float)

10 + 5.6

int + literal
+ double ⟹ double

1) floating point literals
⟹ are considered as double

$$\text{sizeof} (\quad) \Rightarrow \text{Answer unsigned value}$$