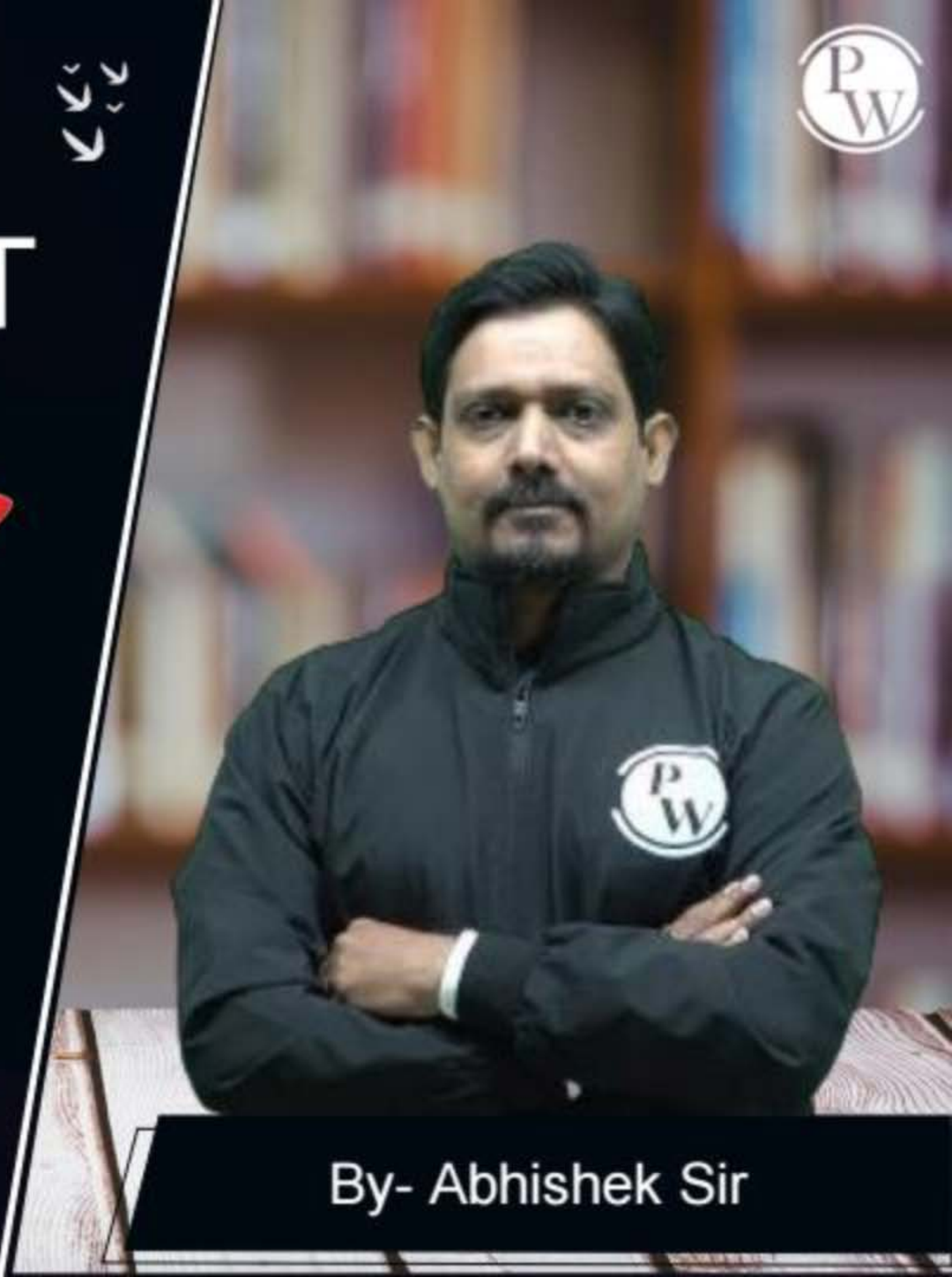
# Computer Science & IT

## C programming

## Data Types & Operators

**Lecture No. 03**



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# Recap of Previous Lecture

Consistency

Managed Notes

- Topic — Singed No. Range
- Topic — overflow of Sign No.
- Topic — Singed No unsigned value
- Topic
- Topic

Slide

# Topics to be Covered

- Topic — char
- Topic — operator
- Topic
- Topic
- Topic

Slide

# Character

```
#include <stdio.h>
int main(){
        char a = 121;
        char c = -124;
        printf("%c\n", a);
        printf("%d\n", a);
        printf("%c\n", c);
        printf("%d", c);
        return 0;
}
```

256
-124
132

121

256
134
122

0 - 48
A - 65
a - 97


$2^8 - 1$

Negative character value

Char

ASCII table

1 Byte

8 bits

Slide

# Character

```
#include <stdio.h>
int main() {
    char ch = -134;
    printf("%c", ch);
    return 0;
}
```

# UnSigned value

(d)
Unsigned value for –134= 256 – 134 = 122.
Hence, ‘z’ is printed.

# ASCII Table

| Dec | Hex | Name | Char | Ctrl-char | Dec | Hex | Char | Dec | Hex | Char | Dec | Hex | Char |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | Null | NUL | CTRL-@ | 32 | 20 | Space | 64 | 40 | @ | 96 | 60 | ` |
| 1 | 1 | Start of heading | SOH | CTRL-A | 33 | 21 | ! | 65 | 41 | A | 97 | 61 | a |
| 2 | 2 | Start of text | STX | CTRL-B | 34 | 22 | " | 66 | 42 | B | 98 | 62 | b |
| 3 | 3 | End of text | ETX | CTRL-C | 35 | 23 | # | 67 | 43 | C | 99 | 63 | c |
| 4 | 4 | End of xmit | EOT | CTRL-D | 36 | 24 | $ | 68 | 44 | D | 100 | 64 | d |
| 5 | 5 | Enquiry | ENQ | CTRL-E | 37 | 25 | % | 69 | 45 | E | 101 | 65 | e |
| 6 | 6 | Acknowledge | ACK | CTRL-F | 38 | 26 | & | 70 | 46 | F | 102 | 66 | f |
| 7 | 7 | Bell | BEL | CTRL-G | 39 | 27 | ' | 71 | 47 | G | 103 | 67 | g |
| 8 | 8 | Backspace | BS | CTRL-H | 40 | 28 | ( | 72 | 48 | H | 104 | 68 | h |
| 9 | 9 | Horizontal tab | HT | CTRL-I | 41 | 29 | ) | 73 | 49 | I | 105 | 69 | i |
| 10 | 0A | Line feed | LF | CTRL-J | 42 | 2A | * | 74 | 4A | J | 106 | 6A | j |
| 11 | 0B | Vertical tab | VT | CTRL-K | 43 | 2B | + | 75 | 4B | K | 107 | 6B | k |
| 12 | 0C | Form feed | FF | CTRL-L | 44 | 2C | , | 76 | 4C | L | 108 | 6C | l |
| 13 | 0D | Carriage feed | CR | CTRL-M | 45 | 2D | - | 77 | 4D | M | 109 | 6D | m |
| 14 | 0E | Shift out | SO | CTRL-N | 46 | 2E | . | 78 | 4E | N | 110 | 6E | n |
| 15 | 0F | Shift in | SI | CTRL-O | 47 | 2F | / | 79 | 4F | O | 111 | 6F | o |
| 16 | 10 | Data line escape | DLE | CTRL-P | 48 | 30 | 0 | 80 | 50 | P | 112 | 70 | p |
| 17 | 11 | Device control 1 | DC1 | CTRL-Q | 49 | 31 | 1 | 81 | 51 | Q | 113 | 71 | q |
| 18 | 12 | Device control 2 | DC2 | CTRL-R | 50 | 32 | 2 | 82 | 52 | R | 114 | 72 | r |
| 19 | 13 | Device control 3 | DC3 | CTRL-S | 51 | 33 | 3 | 83 | 53 | S | 115 | 73 | s |
| 20 | 14 | Device control 4 | DC4 | CTRL-T | 52 | 34 | 4 | 84 | 54 | T | 116 | 74 | t |
| 21 | 15 | Neg acknowledge | NAK | CTRL-U | 53 | 35 | 5 | 85 | 55 | U | 117 | 75 | u |
| 22 | 16 | Synchronous idle | SYN | CTRL-V | 54 | 36 | 6 | 86 | 56 | V | 118 | 76 | v |
| 23 | 17 | End of xmit block | ETB | CTRL-W | 55 | 37 | 7 | 87 | 57 | W | 119 | 77 | w |
| 24 | 18 | Cancel | CAN | CTRL-X | 56 | 38 | 8 | 88 | 58 | X | 120 | 78 | x |
| 25 | 19 | End of medium | EM | CTRL-Y | 57 | 39 | 9 | 89 | 59 | Y | 121 | 79 | y |
| 26 | 1A | Substitute | SUB | CTRL-Z | 58 | 3A | : | 90 | 5A | Z | 122 | 7A | z |
| 27 | 1B | Escape | ESC | CTRL-[ | 59 | 3B | ; | 91 | 5B | [ | 123 | 7B | { |
| 28 | 1C | File separator | FS | CTRL-\ | 60 | 3C | < | 92 | 5C | \ | 124 | 7C | \| |
| 29 | 1D | Group separator | GS | CTRL-] | 61 | 3D | = | 93 | 5D | ] | 125 | 7D | } |
| 30 | 1E | Record separator | RS | CTRL-^ | 62 | 3E | > | 94 | 5E | ^ | 126 | 7E | ~ |
| 31 | 1F | Unit separator | US | CTRL-_ | 63 | 3F | ? | 95 | 5F | _ | 127 | 7F | DEL |

121 - (Y)

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# ASCII Table

ä - 132

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 128 | Ç | 144 | É | 160 | á | 176 | ▒ | 192 | └ | 208 | ╨ | 224 | α | 240 | ≡ |
| 129 | ü | 145 | æ | 161 | í | 177 | ▒ | 193 | ┴ | 209 | ╤ | 225 | ß | 241 | ± |
| 130 | é | 146 | Æ | 162 | ó | 178 | ▓ | 194 | ┬ | 210 | ╥ | 226 | Γ | 242 | ≥ |
| 131 | â | 147 | ô | 163 | ú | 179 | │ | 195 | ├ | 211 | ╙ | 227 | π | 243 | ≤ |
| 132 | ä | 148 | ö | 164 | ñ | 180 | ┤ | 196 | ─ | 212 | ╘ | 228 | Σ | 244 | ⌠ |
| 133 | à | 149 | ò | 165 | Ñ | 181 | ╡ | 197 | ┼ | 213 | ╒ | 229 | σ | 245 | ⌡ |
| 134 | å | 150 | û | 166 | ª | 182 | ╢ | 198 | ╞ | 214 | ╓ | 230 | µ | 246 | ÷ |
| 135 | ç | 151 | ù | 167 | º | 183 | ╖ | 199 | ╟ | 215 | ╫ | 231 | τ | 247 | ≈ |
| 136 | ê | 152 | ÿ | 168 | ¿ | 184 | ╕ | 200 | ╚ | 216 | ╪ | 232 | Φ | 248 | ° |
| 137 | ë | 153 | Ö | 169 | ⌐ | 185 | ╣ | 201 | ╔ | 217 | ┘ | 233 | Θ | 249 | ∙ |
| 138 | è | 154 | Ü | 170 | ¬ | 186 | ║ | 202 | ╩ | 218 | ┌ | 234 | Ω | 250 | · |
| 139 | ï | 155 | ¢ | 171 | ½ | 187 | ╗ | 203 | ╦ | 219 | █ | 235 | δ | 251 | √ |
| 140 | î | 156 | £ | 172 | ¼ | 188 | ╝ | 204 | ╠ | 220 | ▄ | 236 | ∞ | 252 | ⁿ |
| 141 | ì | 157 | ¥ | 173 | ¡ | 189 | ╜ | 205 | ═ | 221 | ▌ | 237 | φ | 253 | ² |
| 142 | Ä | 158 | ₧ | 174 | « | 190 | ╛ | 206 | ╬ | 222 | ▐ | 238 | ε | 254 | ■ |
| 143 | Å | 159 | ƒ | 175 | » | 191 | ┐ | 207 | ╧ | 223 | ▀ | 239 | ∩ | 255 | |

Source: www.LookupTables.com



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# Topic: Qustion

MSQ

```
#include <stdio.h>
int main() {
char ch = -139;
printf("%c", ch);
return 0;
}
```

The output is-

(a) u

(b) Non printable output

(c) Overflow warning

(d) U

(a)(c)

256
139
117

97 a
98 b
99 c
100 d
101 e
2 f
3 9
4 h
5 i
6 j
7 k
8 l
9 m
10 n
11 0
12 p
13 9
14 8
15 5
16 t
117 (u)

Slide

# Topic: Question

**Consider the following program:**

```
#include <stdio.h>
int main(){
char ch=112;
ch=ch+6;
printf("%c", ch);
return 0; }
```

The output is _____.

# Topic: Question

**Consider the following program:**

```
#include <stdio.h>
int main(){
char ch=112;
ch=ch+6;
printf("%c", ch);
return 0; }
```

The output is _____.

*v is the output*

Slide

# Topic : Operators & Arithmetic Expresion

Statement & Expression : Arithmetic expression
Logical expression
Relational

Arithmetic operators

BODMAS → order of evaluation

+ , - , * , / , % , = , += , -= , *=
/= , %= , ++(post)

++(post) (++) pre (--) post
(--) pre

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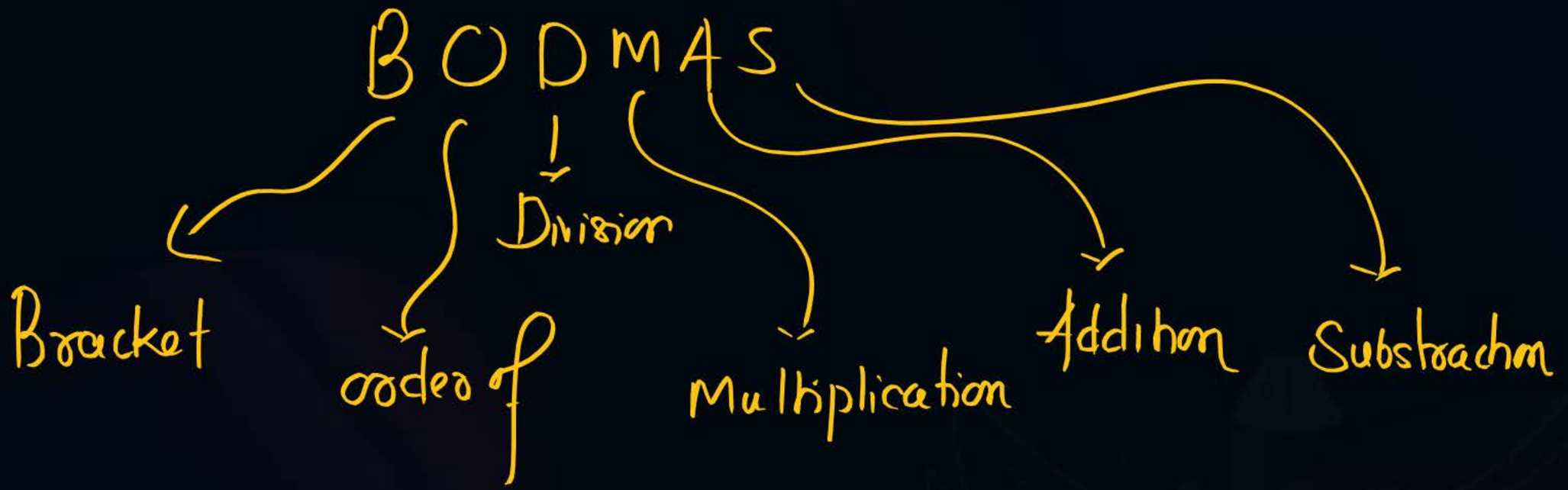
# Topic : Arithmetic Expression Rule

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# Topic : Operators

## precedence & Associativity

1. The order of evaluation of operators defined by precedence Rule

2. If precedence of operator is Same then order of evaluation defind by Associativity Rule.

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# Topic : Operators

(1) $5 \times 4 + 6 = 20 + 6 = 26$

(2) $10 / 5 - 2 = 2 - 2 = 0$

↑ Binary

(3) $-5 + 6 * 2 =$ $-5 + 6 * 2 = -5 + 12 = 7$

Unary minus

only 1 operand it will be appled

5 + 4

operand

operator

Operand is a Numeric value or variable

C Language unary operator precedence is higher

Slide

# Topic : Operators

(4) $4+5-2 = 9-2 = 7$ Left to Right

AAju Baju

(5) $5-4+3 = 1+3 = 4$

(6) $5+6+7 = 11+7 = 18$

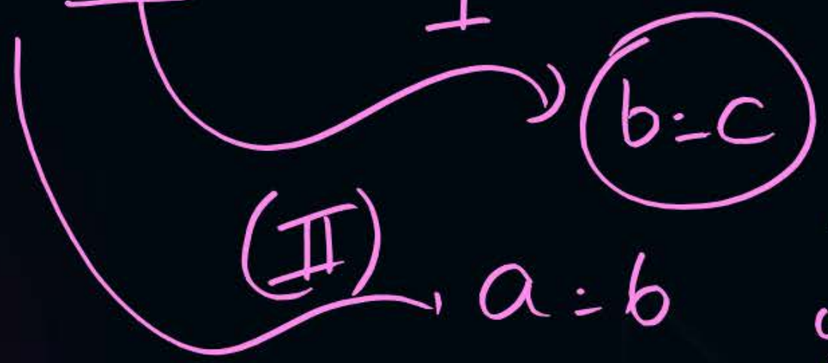
(7) $5-3-1 = 2-1$

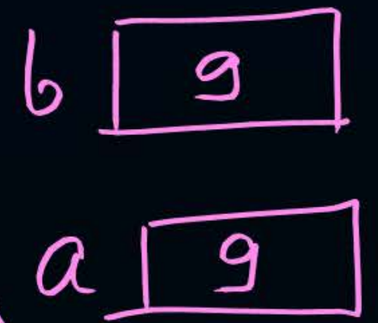
Slide

# Topic : Operators

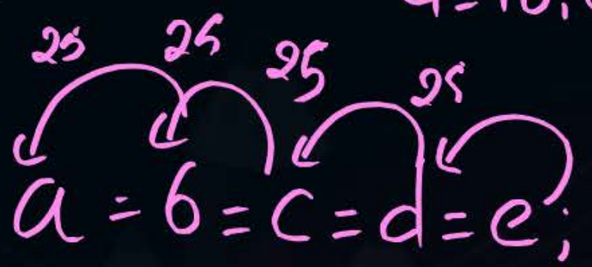
(8) int a=4, b=3, c=9;

a=b=c;




d=10, e=25




Right to left

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# Topic : Arithmetic Operator

+, -, *, /, %

7/3 Q: 2 R: 1

% → Remainder

Dividend positive Remainder positive

Dividend Negative Remainder Negative

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# Topic : Arithmetic Operator

+, -, *, /, %

/ → quotient

% → remainder

```
int a = 7/3;
```

```
7/3 + 2;
2 + 2 = 4
```

```
6/3.0 + 2;
2.0 + 2
= 4.0
```

* operation between integer and integer is Integer
* operation between integer float (real No) is float.
* operation between float & float is float.

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# Topic : Arithmetic Operator

Dividend
Divisor
Quotient
Remainder

Dividend = Quotient * Divisor+ Remainder

# Topic : Arithmetic Operator

Q 2
7 / 3, R 1

Q : -2
-7/3, R : - 1

Q : -2
7/-3, R - 1

-7/-3
Q : 2
R : -1

Quotient

Remainder

7 / 3 → Dividend / Divisor → Quotient.

Remainder :

Dividend = Quotient * Divisor + Remainder

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# Topic : Arithmetic Operator

Q 2
7 / 3, R 1

Q : -2
-7/3, R : - 1

Q : -2
7/-3, R 1

-7/-3
Q : 2
R : -1

Quotient

Remainder

$\frac{7}{3}$ $\frac{\text{Dividend}}{\text{Divisor}}$

Quotient :

Remainder :

Dividend = Quotient * Divisor + Remainder

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# Topic : Arithmetic Operator

7 / 3, -7/3, 7/-3, -7/-3

| | 7/3 | 7/-3 | -7/3 | -7/-3 |
|---|---|---|---|---|
| Dividend | 7 | -7 | 7 | -7 |
| Divisor | 3 | 3 | -3 | -5 |
| Quotient | 2 | -2 | -2 | 2 |
| Remainder | 1 | 1 | -1 | -1 |

# Program

```
#include <stdio.h>
int main() {
    printf("%d\n",7/3);
    printf("%d\n",7/-3);
    printf("%d\n",-7/3);
    printf("%d\n",-7/-3);
    printf("%d\n",7%3);
    printf("%d\n",7%-3);
    printf("%d\n",-7%3);
    printf("%d\n",-7%-3);
    return 0;
}
```

# Associativity Rule

# Precedence & Associativity Rule

Associativity

| | | | |
|---|---|---|---|
| bracket | ( ) ✓ | | Highest |
| Unary minus | - ✓ | | |
| Multiplicative | *, / , % | Left to Right ✓ | Aaju |
| Additive | +,- Same precedence | Left to Right | |
| Equal | = +=,-= ecl | Right to Left | Lowest |

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# Toipc:Question

```
#include <stdio.h>
int main(void){
   float x;
   x = 7*2.0/2+10/3;
   printf("%f", x);
   return 0;
}
```

The value of x is ___

(a) 10
(b) 10.0
(c) 10.33
(d) 11.0

Slide

# Toipc:Question

```
#include<stdio.h>
   int main(){
   int x;
   x= -2 + 11 - 7 * 9 % 6 / 12;
   printf("%d",x);
   return 0 ;
   }
```

The value of x is

(a) 6
(b) 7
(c) 8
(d) 9

$-2+11-7*9\%6/12$

$-2+11-63\%6/12$

$-2+11-3/12$

$-2+11-0$

$= 9-0=9$

Slide

# Toipc:Question

```
#include<stdio.h>
   int main(){
   int x;
   x=  2 * 3/4+4/4 +8-2+5/8;
   printf("%d",x);
   return 0 ;
   }
```

Maths

The value of x is

____

(a) 6
(b) 7
(c) 8
(d) 9

$= 6/4 + 1 + 8 - 2 + 0$

$= 1 + 1 + 8 - 2 + 0$

$= 2 + 8 - 2 + 0$

$= 10 - 2 + 0$

$= 8 + 0 = 8$

Slide

# Toipc:Question

```
#include<stdio.h>
   int main(){
   int x;
   x=  3/2*4+3/8+3;
   printf("%d",x);
   return 0 ;
   }
```

The value of x is

____

(a) 6
(b) 7
(c) 8
(d) 9

Slide

# Toipc:Question

```
#include<stdio.h>
   int main(){
   int x;
   x=  4+2%-8;
   printf("%d",x);
   return 0 ;
   }
```

2/-8

4+②=⑥

Q=0

R=2

2%-8

Dividend +ve

Remainder +

2 = -8x2+2

2/-8 : Q 0

R : 2

The value of x is

____

(a) 6

(b) 7

(c) 8

(d) 9

t.me/Abhishekshaarmapw

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# 2 mins Summary

- Topic
- Topic
- Topic
- Topic
- Topic

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# THANK - YOU