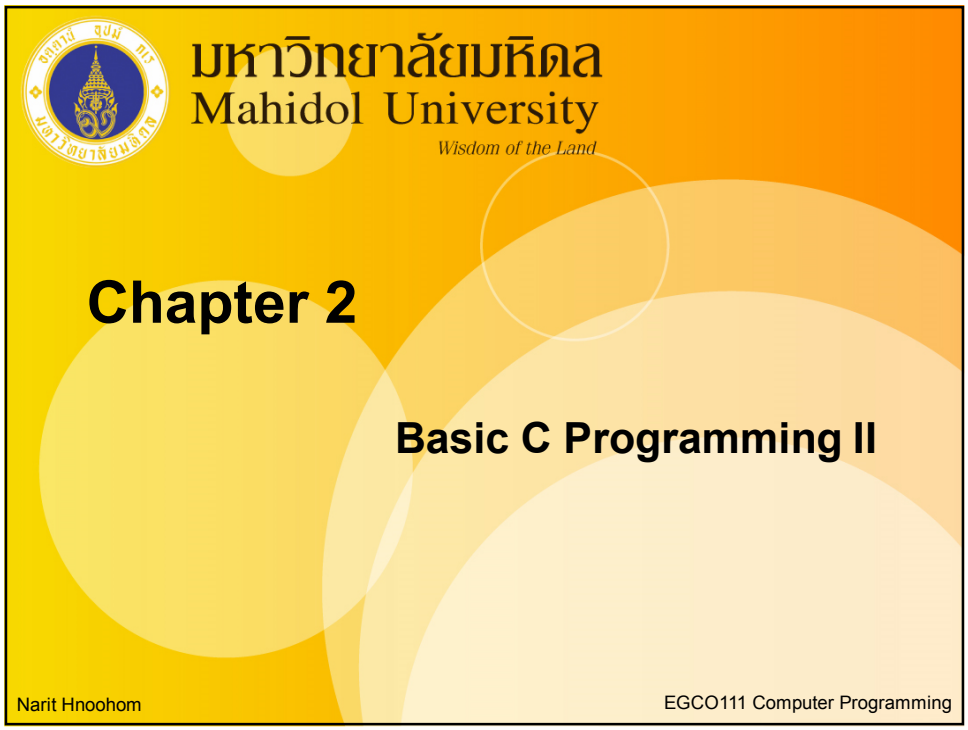


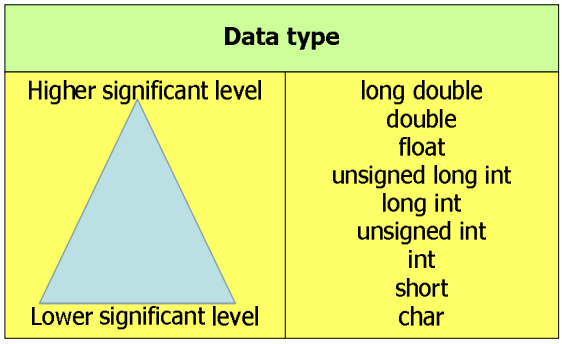
Types of Conversion

Type conversion

- Implicit type conversion
- Explicit type conversion

- **Implicit type conversion** is an automatic type conversion by the compiler.
- **Explicit type conversion** is a manual type conversion which is explicitly defined within a program.

Implicit Type Conversion



- **Example**

(short+long int)/double ⟶ double
int/long double ⟶ long double
float*double ⟶ double
unsigned int – long int ⟶ long int
char+float ⟶ float

Implicit Type Conversion

- **Example 1**

```
int i =2.7;
printf("i = %d", i);
```

- **Result**

i = 2

- **Example 2**

```
float f =2;
printf("f = %0.1f", f);
```

- **Result**

f = 2.0

Implicit Type Conversion

- **Example 3**

```
int a; float b;
b = a = 3.25;
printf("b = %0.2f", b);
```

- **Result**

```
b = 3.00
```

- **Example 4**

```
float x = 2.44, y=4.56;
int z = x + y;
printf("z = %d", z);
```

- **Result**

```
z = 7
```


Explicit Type Conversion

- **Syntax**

(*data_type*) expression;

- **Example**

```
int sum=22, count = 5;
float mean = sum/count;
printf("mean = %0.4f", mean);
mean = 4.0000
```

```
float mean = (float) sum/count;
printf("mean = %0.4f", mean);
mean = 4.4000
```

Explicit Type Conversion

- **Example**

  int x =3, y = 10; float z;

  z = (float) (x / y) vs z = (float) x / y

z = (float) (x / y)
= (float) (3 / 10)
= (float) (0)
= 0.0

z = (float) x / y
= (float) 3 / 10
= 3.0 / 10
= 0.3

z = (float) x / (float) y
= (float) 3 / (float) 10
= 3.0 / 10.0
= 0.3

Exercise of Type Conversion

- **Write a program to find the average of x, y and z**
  - Declare x, y and z to integer type
  - Let x = 65, y =87, and z=21
- **Example of Result:**

  Average = 57.67

Operators

- Arithmetic Operators
- Assignment Operators
- Increment & Decrement Operators
- Comparative Operators
- Logical Operators

Arithmetic Operators

Operator	Arithmetic Operator	Algebraic Expression	C Expression
Modulus	%	r mod s	r%s
Division	/	x/y, x÷y	x/y
Multiplication	*	b x m, bm	b*m
Subtraction	-	p-c	p-c
Addition	+	f+7	f+7

- **Example of Modulus**
  - 10 % 5 = 0
  - 5 % 10 = 5
  - 17 % 3 = 2
  - -17 % 3 = -2
  - 17 % -3 = 2
  - -17 % -3 = -2

Precedence of Arithmetic Operators

1. Parentheses
2. Multiplication, Division, and Modulus
3. Addition, and Subtraction

$$z = p * r \% q + w / x - y;$$

(6) (1) (2) (4) (3) (5)

Example of Arithmetic Operators

Operators	Associativity	Type
( )	Left to Right	Parentheses
* / %	Left to Right	Multiplication, Division, Modulus
+ -	Left to Right	Addition, Subtraction
=	Right to Left	Assignment

- **Example**
  - Ex1
    3 + 4 / 2 = 3 + (4 / 2) = 5
  - Ex2
    3 * 2 + 4 % 2 = (3 * 2) + (4 % 2) = 6 + 0 = 6
  - Ex3
    3 + 2 * 4 % 2 = 3 + ((2 * 4) % 2) = 3 + (8 % 2) = 3
  - Ex4
    2 * 3 - 14 / 7 + 5 = (2 * 3) – (14 / 7) + 5 = 6 - 2 + 5 = 9

Exercise of Arithmetic Operators

- **Do the exercises below**
  - Ex1
    2 * 3 + 4 / 2 = ?
  - Ex2
    4 * (2 + 3) / 2 = ?
  - Ex3
    (3 * 4 + 2) / 2 = ?
  - Ex4
    2 * (3 + 4 / 2) = ?
  - Ex5
    3 – 2 + 5 * 4 % 2 = ?
  - Ex6
    2 * 3 / 3 * 4 % 5 = ?
  - Ex7
    -(4 + 3 + 2) + 5 * 3 = ?
  - Ex8
    -(3 - 4 - 5) * 3 % 4 = ?

Exercise of Arithmetic Operators

- **Write a program to displaying the output of the following expressions**

- Ex1
  2 * 3 + 4 / 2 = ?
- Ex2
  4 * (2 + 3) / 2 = ?
- Ex3
  (3 * 4 + 2) / 2 = ?
- Ex4
  2 * (3 + 4 / 2) = ?
- Ex5
  3 – 2 + 5 * 4 % 2 = ?
- Ex6
  2 * 3 / 3 * 4 % 5 = ?
- Ex7
  -(4 + 3 + 2) + 5 * 3 = ?
- Ex8
  -(3 - 4 - 5) * 3 % 4 = ?

- **Example of result:**

Ex1	Ex2	Ex3	Ex4	Ex5	Ex6	Ex7	Ex8
?	?	?	?	?	?	?	?

Assignment Operators

Simple Assignment Operator

Operator	Example	Result
=	x = y;	Assign x with the value of y.

Compound Assignment Operator

Operator	Example	Result
+= -= *= /= %=	x += y; x *= y;	x = x + y; x = x * y;

Exercise of Assignment Operators

- **Write a program to display the value of x in the following statements**
- **Let x = 7 and y = 2**

- **Example of result**

  x: 7, y: 2
  x += y => ?
  x -= y => ?
  x *= y => ?
  x /= y => ?
  x %= y => ?

Increment & Decrement Operators

Operator	Meaning	Side Effect	Value of Expression
Postfix: x++; Prefix: ++x;	Increment	(x = x + 1);	process x before add x by 1 add x by 1 before process x
Postfix: x--; Prefix: --x;	Decrement	(x = x – 1);	process x before minus x by 1 minus x by 1 before process x

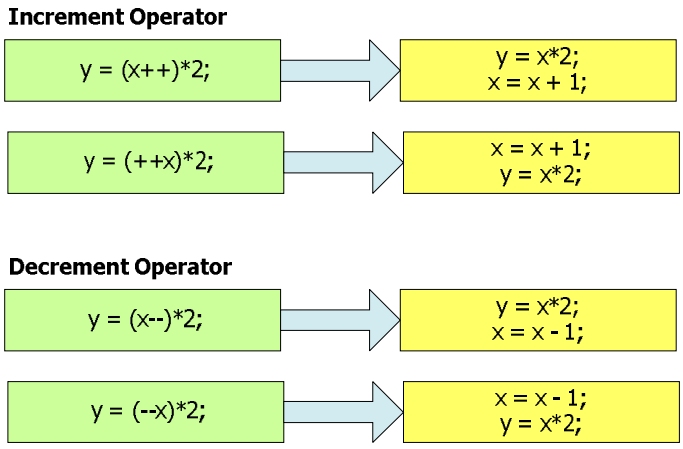
- **Increment**
  - y = x++; 1. y=x;
2. x=x+1;
  - z = ++x; 1. x=x+1;
2. z=x;

- **Decrement**
  - y = x--; 1. y=x;
2. x=x-1;
  - z = --x; 1. x=x-1;
2. z=x;

- **Example** x = 3;
  - y = x++; 1. y=3;
2. x=4;
  - z = ++x; 1. x=5;
2. z=5;

- **Example** x = 5;
  - y = x--; 1. y=5;
2. x=4;
  - z = --x; 1. x=3;
2. z=3;

Meaning of Increment and Decrement Operators



Exercise of Increment & Decrement Operators

- **Write a program to display the value of z in the following statements**
- Let x = 6, y = 3, and z=0

- **Example of result**

  x: 6, y: 3, z: 0
  x: 7, y: 4, z: 10, z=(x++)+(++y)
  x: 6, y: 4, z: 16, z=2*5+(--x)
  x: 5, y: 3, z: 2, z=(--x)-(--y)

Comparative Operators

Algebraic	C Operator	Example	Meaning
=	==	x==y	x is equal to y
≠	!=	x!=y	x is not equal to y
>	>	x>y	x is greater than y
<	<	x<y	x is less than y
≥	>=	x>=y	x is greater than or equal to y
≤	<=	x<=y	x is less than or equal to y

- **Example:**
  - x = 3
  - x == 3
  - x != 3
  - x > 4
  - x < 4
  - x >= 4
  - x <= 4

- **Result:**

// assign value of x
True
False
False
True
False
True

Logical Operators

Operator	C Operator	Example	Meaning
AND	&&	x && y	1 if each of x and y is equal to 1, otherwise 0
OR	||	x || y	0 if each of x and y is equal to 0, otherwise 1
NOT	!	!x	1 if x is equal to 0, otherwise 0

A	B	A&&B	A||B	A!
True	True	True	True	False
True	False	False	True	False
False	True	False	True	True
False	False	False	False	True

Precedence of Operators

Operators	Associativity	Type
( )	Left to Right	Parentheses
* / %	Left to Right	Multiplicative
+ -	Left to Right	Additive
< <= > >=	Left to Right	Relational
== !=	Left to Right	Equality
=	Right to Left	Assignment

Algebraic Expression

- **Example 1:**

$$x = \frac{(a+2)\times(b-5)}{2a}$$

- **Result:**

```
x = (a+2)*(b-5)/(2*a)
```

- **Example 2:**

$$y = (\sim A \wedge B) \vee (A \wedge \sim B)$$

- **Result:**

```
y = ((!A)&&B)||(A&&(!B))
```

Standard Mathematic Functions

math.h

Functions	Syntax	Example
Absolute	int abs(int)	x = abs(-2); → 2
	double fabs(double)	x = fabs(-3.5); → 3.5
Power	double pow(base,power)	x = pow(2,3); → 8
Sine	double sin(double)	x = sin(3.1415); → 0
Cosine	double cos(double)	x = cos(3.1415); → -1
Tangent	double tan(double)	x = tan(3.1415); → 0
Square Root	double sqrt(double)	x = sqrt(9); → 3
Logarithm	double log(double)	x = log(10); → 2.302585
	double log10(double)	x = log10(10); → 1

Example of Expression

- **Algebraic Expression**

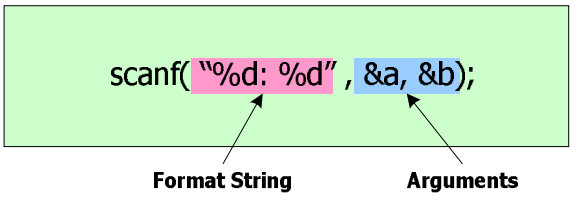
$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

- **C Expression**

```
x1 = (-b+sqrt(pow(b,2)-(4*a*c)))/(2*a);
                and
x2 = (-b-sqrt(pow(b,2)-(4*a*c)))/(2*a);
```

Input variables (Scanf)

- **Syntax**



- **Example**

```
int a, b;
scanf( "%d:%d" , &a, &b );
```

- **Result**

4:8 <enter>	a = **4** and b = **8**

Example of scanf

- **Example**

```
1  #include <stdio.h>
2  main()
3  {
4      int W, L, A;
5      printf("Enter (W:L): ");
6      scanf("%d:%d", &W, &L);
7      A = W*L;
8      printf("\nArea of rectangle = %d", A);
9  }
```

- **Result:**

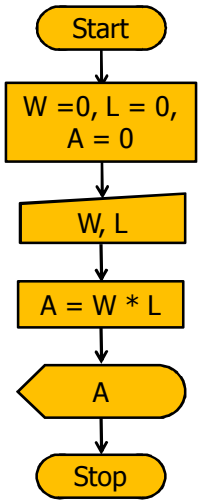
  Enter (W:L) : **4:5**

  Area of rectangle = **20**

Example of scanf

- **Example**

```
1   #include <stdio.h>
2   main()
3   {
4       int W = 0, L=0, A=0;
5
6       printf("Enter (W:L): ");
7       scanf("%d:%d", &W, &L);
8
9       A = W*L;
10
11      printf("\nArea of rectangle = %d", A);
12  }
```



Exercise of scanf

- **Write a program to convert temperature from Fahrenheit to Celsius.**
  - Formula: Celsius = (F-32) * 5/9
- **Example of result:**

  Enter Fahrenheit (F): **81.5**

  81.5 Fahrenheit **= 27.50** Celsius

Exercise of scanf()

- **Write a program to swap the value of two numbers (A and B)**
- **Example of result:**
  Before: a = **3,** b = **4**
  After: a = **4,** b = **3**

Exercise of scanf()

- **Write a program to convert a number of days into a number of months and days**
  - **Assume 1 month = 30 days**
- **Example of result:**
  Enter days **1825**
  1825 days = **60** months and **25** days

Exercise of scanf

- **Write a program to find the area of trapezoid.**
  - Formula: ½ x sum of the lengths of the bases x high
- **Example of result:**
  Enter (w1:w2:h): **8:13:7**
  Area of trapezoid = 73.50

Exercise of scanf

- **Write a program to add two times**
- **Example of result:**
  Enter time 1 (hh:mm) **2:30**
  Enter time 2 (hh:mm) **1:45**
  Total Time: **4:15**

Thanks for your attention