

Overview of C

Refat Othman Computer Science Department Comp 133

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```
//C program for area of circle Comment
#include <stdio.h> // standard header file (contains printf and scanf)
#define PI 3.141
int main() // int, float, and return (reserved words)
    float r, a; // r, a are variables
    printf("Please enter the radius: "); //standard identifier
    scanf("%f", &r); //standard identifier
    a = PI * r * r; // = , *, {, } special symbols
    printf("%f\n", a); // standard identifier
```

return 0;

preprocessor directives

#include

- gives a program access to a library
- <stdio.h>
 - standard header file
 - contains information about standard input and output functions such as scanf and printf

#define

 using only data values that never change should be given names.

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• EX: #define MAX_LENGTH 100

Comments

One-line comment (//)

// This is a one-line comment

Multiple-line comment (/* */)

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/* Hello, this is

multiple-line comment*/

Variable declarations and data types

- A variable must consist only of letters, digits, and underscores.
- A variable cannot begin with a digit.
- A C reserved word/standard identifiers cannot be used as a user variable.
- A variable defined in a C standard library should not be redefined.

- Reserved Words : A word that has special meaning in C
 - for example: int, float, double, char, return ,...etc
- Standard identifiers: printf, scanf

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Variable declarations and data types

Data types:

- > int (16 bit)
- > float (32 bit)
- double (64 bit)
- > char (8 bit)
 - represent an individual character value
 - include a letter, a digit, a special symbol ex. 'A', 'z', '2', '* ', ': ', ' " ', '

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Invalid variables names

Invalid identifier	Reason Invalid
1Letter	begins with a digit
double	reserved word
int	reserved word
TWO*FOUR	character * not allowed
joe's	character ' not allowed

Reserved Words	Standard Identifiers	User-Define Identifiers
int	printf	KMS_PER_MILE
void	scanf	miles
float		kms
double		sum
return		sum

NOTE: <u>Sum</u>, <u>sum</u>, <u>SUM</u> are viewed by the compiler as different identifiers STUDENTS-HUB.com

Placeholders in format strings

Placeholder	Variable Type	Function Use
% с	char	printf / scanf
%d	int	printf / scanf
%f	float	printf / scanf
% f	double	printf
%lf	double	scanf

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Placeholders in format strings

printf

- printf(" Hello this is comp133");
- printf("sum equal %d", sum);
- printf("sum equal %d and avg equal %f", sum, avg);

scanf

scanf("%f",&r);

Placeholders in format strings

```
printf ("The area is %f", a);
scanf(" %f ",&r);
printf ("the result is %d", sum);
scanf ("%lf",& num);
printf ("the number is %f", num)
```

Arithmetic expressions.

- int / int = int
 - 10/2= 5
 - 18/2=9
- int/float =float
- float/int=float
- float/float=float

9/8.0=1.125000

9.0/8=1.125000

9.0/8.0=1.125000 STUDENTS-HUB.com • Example:

double k,m;

k= 9/6;

m=9/6.0;

printf("k=%f \nm= %f", k,m);

Output:

k=1.000000 m=1.500000

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Arithmetic expressions.

Mathematical Formula	C Expression
b ² -4ac	b * b - 4 * a * c
a + b - c	a + b - c
A+b c+d	(a + b) / (c + d)
$\frac{1}{1+x^2}$	1 / (1 + x * x)
a *(b + c)	a * -(b + c)

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Formatting output

int x= 4678, y=3, z=19

1. printf ("%d %d %d", x,y,z)



2. printf ("%7d %5d %6d", x,y,z)



Formatting output

 float x=56.2757 y=2.3849 z=114.2; printf ("%8.3f%-7.2f%7.4f",x,y,z);

56.276 2.38 114.2000

 double a= 38.56, b= 201.117; printf("ls it%6.1f%9.4f", a, b);

Is it 38.6 201.1170

• float x=333.256;

printf("%0.2f",x); 333.26

Formatting output

Value	Format	Displayed Output	Value	Format	Displayed Output
234	%4d	234	-234	%4d	-234
234	%5d	234	-234	%5d	-234
234	% 6d	234	-234	% 6 d	-234
234	%1d	234	-234	%2d	-234

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Value	Format	Displayed Output	Value	Format	Displayed Output
3.14159	%5.2f	3.14	3.14159	%4 .2 f	3.14
3.14159	%3.2f	3.14	3.14159	%5.1f	3.1
3.14159	%5.3f	3.142	3.14159	% 8. 5f	3.14159
.1234	%4 .2 f	0.12	006	%4 .2 f	-0.01
006	% 8. 3f	-0.006	006	% 8. 5f	-0.00600
006	%.3f	-0.006	-3.14159	% .4 f	-3.1416

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Example:

Write a complete C program that prompts the user to enter the radius of a circle and displays the circumference. Circumference= $2 \pi r$

```
#include <stdio.h>
#define PI 3.14159
int main(void)
{
    double radius, circum;
    printf("Please enter radius of circle> ");
    scanf("%lf", &radius);
    circum = 2 * PI * radius;
    printf("The circumference is %.2f.\n", circum);
    return 0;
```

Common programming errors

Syntax Errors

- is a mistake in the syntax.

Ex:

- missing semicolon
- undeclared variable
- last comment is not closed because of blank in */ close-comment sequence

Logic Errors

an error caused by following an incorrect algorithm.

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Ex:sum = x-y(minus instead of plus) STUDENTS-HUB.com

Common programming errors

- Run-Time Errors
 - an attempt to perform an invalid operation, detected during program execution.

Ex:

result= x / 0 (undefined)

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Files

- Declare a file pointer variable
 - FILE *fpt_in , /* pointer to input file */
 - FILE *fpt_out; /* pointer to output file */
- The calls to function fopen
 - fpt_in = fopen("distance.dat", "r");
 - fpt_out = fopen("distance.out", "w");
- Use of the functions
 - fscanf(fpt_in, "%lf", &miles);
 - fprintf(fpt_out, "The distance in miles is %.2f. \n", miles);
- End of use
 - fclose(fpt_in);
 - fclose(fpt_out);

```
Files (Example 1 solution)
 Write a program to read two integers from a file
 (input.txt), find the sum of them and save the result into
 another file (output.txt).
                                                                   input.txt - Notepad
                                                            File Edit Format View Help
         #include <stdio.h>
                                                            5 4
        int main()
                                                                     Ln1.C
                                                            🔲 output.txt - Notepad 🗖 🖂 🖾
              FILE * fpt in, * fpt out;
                                                            File Edit Format View Help
                                                            The result is 9
              int num1, num2;
              int sum;
                                                                     Ln 1. (
              fpt in = fopen ("input.txt", "r");
              fpt out = fopen ("output.txt", "w");
              fscanf (fpt in, "%d%d", &num1, &num2);
              sum=num1+num2;
              fprintf(fpt out, "The result is %d", sum);
              fclose(fpt in);
              fclose(fpt out);
              return 0;
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```

Casting

- type cast
 - converting an expression to a different type by writing the desired type in parentheses in front of the expression
- Example 1: n = (int)(9 * 0.5);

The value of n is 4

Type conversion through casts

Without Cast integer division would cause the loss Using Cast of the fractional part of the mean #include <stdio.h> #include <stdio.h> int main() int main() **int** sum = 17, **count** = 5; **int** sum = 17, **count** = 5; double mean; double mean; mean = sum / count; mean = (double) sum / count; printf("Value of mean : %f\n", mean); printf("Value of mean : %f\n", mean); return 0; return 0; Value of mean : 3.400000 Value of mean : 3.000000

Find more examples: http://www.tutorialspoint.com/cprogramming/c_type_casting.htm

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Escape sequences

Escape Sequence causes the program to escape from the normal interpretation of a string, so that the next character is recognized as having a special meaning. The back slash "\" character is called the "Escape Character".

- The escape sequence includes the following:
- \n => new line
- \t => tab
- \r => carriage return
- \" => double quotations
- \\ => back slash etc.

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Thank You.



