



Programming Fundamentals (CS1002) | Fall 2023

Quiz: 01

Total marks:

- Read the problem statement carefully and understand what is being asked. Failure to comprehend the problem statement may result in incorrect assumptions and answers.
 - Ensure that your answers are easy to read and understand. Unclear or hard-to-follow answers may receive reduced marks.
 - **Plagiarism will not be tolerated. Any evidence of copied work, including minor instances, will result in a grade of zero for the entire quiz.**
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Easy Questions:

These will be the first questions of each quiz:

1. Why do programmers use flowcharts and pseudocodes? (2 lines)

Flowcharts and pseudocodes are used by programmers to visualize and design the logic of a program before actual coding. They help to break down complex problems into manageable steps and facilitate clear and efficient communication among team members.

2. What is an algorithm and why is it important in programming? (2 lines)

An algorithm is a step-by-step procedure to solve a particular problem. It is important in programming because it provides a clear and efficient roadmap for writing code that solves specific problems.

3. What is the function of comments in a C program? (2 lines)

Comments in a C program provide explanations and annotations about the code. They make the code more understandable for others (and for the coder when revisiting the code), but they do not affect the operation of the program as they are ignored by the compiler.

4. What is the difference between = and == in C programming? (2 lines)

In C programming, = is an assignment operator used to assign the value of the right operand to the left operand. On the other hand, == is a relational operator used to check if the values of two operands are equal.

Intermediate Questions:

These will be the Second questions of each quiz:

1. What is the output of the following equation?

$a = 5, b = 10, c = 15, d = 20$
 $a + b * c / d - a \% b$

Answer:

Output = $5 + 10 * 15 / 20 - 5 \% 10$

Output = $5 + 150 / 20 - 5$

Output = $5 + 7 - 5$

Output = $12 - 5$

Output = 7

2. What is the output of the following equation?

$x = 10, y = 20, z = 30$
 $x * y + z / x - y \% z$

Answer:

Output = $10 * 20 + 30 / 10 - 20 \% 30$

Output = $200 + 3 - 20$

Output = $203 - 20$

Output = 183

3. What is the output of the following equation?

$p = 25, q = 50, r = 75, s = 100$
 $p * q / r + s - p \% q$

Answer:

Output = $25 * 50 / 75 + 100 - 25 \% 50$

Output = $1250 / 75 + 100 - 25$

Output = $16 + 100 - 25$

Output = $116 - 25$

Output = 91

4. What is the output of the following equation?

$p = 15, q = 30, r = 45, s = 60$
 $p + q * r / s - p \% q$

Answer:

Output = $15 + 30 * 45 / 60 - 15 \% 30$

Output = $15 + 1350 / 60 - 15$

Output = $15 + 22 - 15$

Output = $37 - 15$

Output = 22

Hard Questions:

These will be the third questions of each quiz:

1. Design a flowchart to output if the odd numbers from 0 to 101 are a Buzz Number?

Hint: A number is said to be Buzz Number if it ends with 7 OR is divisible by 7.

- i. Start
- ii. Set number `n` to 1
- iii. If $n \leq 101$:
 - a. If $n \% 10 == 7$ or $n \% 7 == 0$:
 - i. Output "Buzz Number: ", n
 - b. Increment n by 2
 - c. Goto iii
- iv. Output "Not a Buzz Number"
- v. End

2. Design a flowchart to output whether the inputted number is a prime number.

Hint: A number is said to be prime if it has only 2 divisors.

- i. Start
- ii. Input a number `n`
- iii. If $n \leq 1$:
 - a. Output "The number is prime"
 - b. End
- iv. Set a divisor `d` to 2
- v. If the $d \leq n / 2$:
 - a. If the $n \% d == 0$:
 - i. Output "The number is not prime"
 - ii. End
 - b. Increment d by 1
 - c. Goto v
- vi. Output "The number is prime"
- vii. End

3. Design a flowchart to output whether the inputted word is a palindrome.

Hint: A word is said to be a palindrome if it is the same backwards and forwards.

- i. Start
- ii. Input a word `w`
- iii. Set left counter `l` and first letter and right counter `r` at last letter
- iv. If l is to the left or at the position of r:
 - a. If l != r:
 - i. Output "The word is not a palindrome"
 - ii. End
 - b. Move l to right
 - c. Move r to left
 - d. Goto iv
- v. Output "The word is a palindrome"
- vi. End

4. Design a flowchart to output whether the inputted number is a perfect square.

Hint: A number is said to be a perfect square if it is a square of a whole number.

- i. Start
- ii. Input a number `n`
- iii. If $n < 0$:
 - a. Output "Not A Perfect Square"
 - b. End
- iv. Set counter `c` to 0:
- v. If $c * c \leq n$:
 - a. If $c * c == n$:
 - i. Output "Perfect Square"
 - ii. End
 - b. Increment c by 1
 - c. Goto v
- vi. Output "Not A Perfect Square"
- vii. End

Debugging questions of each quiz:

1. What is the output of the following code?

```
#include <stdio.h>
int main() {
    const int var;
    var = 20;
    printf("Value of var: %d", var);
    return 0;
}
```

Answer: You need to define and declare a const at initialization.

2. What is the output of the following code?

```
#include <stdio.h>
int main() {
    int x = 5;
    int y = 2;
    float result = x / y;
    printf("Result: %f\n", result);
    return 0;
}
```

Answer: 2.00000

3. What will be the output of the program?

```
#include <stdio.h>
int main() {
    const int var = 10;
    var = 30;
    printf("Value of var: %d\n", var);
    return 0;
}
```

Answer: The program will not compile because you cannot change the value of a constant after it has been declared and initialized.

4. What will be the output of the program?

```
#include <stdio.h>
int main() {
    const float PI = 3.14;
    PI = 3.14159;
    printf("Value of PI: %f\n", PI);
    return 0;
}
```

Answer: The program will not compile because you cannot change the value of a constant after it has been declared and initialized.

Answers & Rubric

Q1 (2 marks):

What purpose do flowcharts serve? In which situation is a flowchart better than pseudocode?

Answer:

- Flowcharts serve to:
 - Visualize and plan the logical flow of a program or process.
 - Represent complex algorithms using symbols and connectors.
 - Aid in understanding and communicating the program's structure.
- Flowcharts are better than pseudocode in situations where:
 - Visual representation is essential for clarity.
 - Explaining processes to non-programmers.
 - Designing algorithms with multiple decision points and loops.

Rubric:

- 2 marks: Provides a clear and accurate explanation of the purpose of flowcharts and identifies situations where flowcharts are better than pseudocode.
- 1 mark: Provides a somewhat accurate explanation of the purpose of flowcharts and situations where they are better than pseudocode.
- 0 marks: Does not provide a clear or accurate explanation.

Q2 (4 marks):

Stepwise solve the following equation and write the value of `j`, no need to write code:

$$x = 10, y = 20, z = 30$$

$$j = x * y + z / x - y \% z$$

Answer:

1. $j = 10 * 20 + 30 / 10 - 20 \% 30$
2. $j = 200 + 3 - 20$
3. $j = 183$

Rubric:

- 4 marks: Correctly evaluates the expression step by step and provides the correct final value of `j` without writing any code.
- 3 marks: Makes minor errors in evaluating the expression but arrives at the correct final value of `j` without writing any code.
- 2 marks: Makes significant errors in evaluating the expression but attempts to calculate the final value of `j` without writing any code.
- 0-1 marks: Does not correctly evaluate the expression or if code is written.

Q3 (10 marks):

Write code to perform all arithmetic operations on **t=10.00** and **w=4.00** and display output for each operation. Also, draw a flowchart for the said program.

Answer:

```
#include <stdio.h>

int main() {
    double t = 10.00, w = 4.00;
    printf("t + w = %.21f\n", t + w);
    printf("t - w = %.21f\n", t - w);
    printf("t * w = %.21f\n", t * w);
    printf("t / w = %.21f\n", t / w);
    return 0;
}
```

Flowchart:

Start

|

|__ Initialize t = 10.00

|__ Initialize w = 4.00

|__ t + w = 14.00 --> Display result

|__ t - w = 6.00 --> Display result

|__ t * w = 40.00 --> Display result

|__ t / w = 2.50 --> Display result

|

End

Rubric:

- **Code (5 marks):**

- 5 marks: Correctly writes C code to perform arithmetic operations on t and w and displays the output for each operation with appropriate formatting.
- 3-4 marks: Writes C code with some minor errors in arithmetic operations or output formatting.
- 0-2 marks: Code has significant errors or does not correctly perform the required operations.

- **Flowchart (5 marks):**

- 5 marks: Creates a clear and accurate flowchart representing the program's logic, including appropriate symbols, labels, and connectors.
- 3-4 marks: Creates a flowchart with some inaccuracies or omissions but conveys the program's logic.
- 0-2 marks: Flowchart is incomplete, unclear, or significantly deviates from the program's logic.

Q4 (10 marks):

What will be the output of the program?

```
#include <stdio.h>

int main() {
    const int var;
    var = 20;
    printf("Value of var: %d", var);
    return 0;
}
```

Answer:

Constants in C must be initialized when they are declared. Therefore, the code will not compile, and there will be no output.

Rubric:

- 10 marks: Student accurately identifies that the code will result in a **compilation error due to the attempt to declare a constant variable without initializing it**, including mentioning the concept of constants in C.
- 8-9 marks: Student correctly identifies the compilation error but lacks a detailed explanation or misses some key points in the explanation.
- 6-7 marks: Student identifies the compilation error but provides a partial or somewhat inaccurate explanation of why the error occurs.
- 4-5 marks: Student acknowledges that there is an error in the code but fails to identify it accurately or does not provide a clear explanation.
- 2-3 marks: Student makes a vague or incorrect statement about the error without a proper explanation.
- 0-1 mark: Student does not recognize the compilation error or provides an entirely incorrect explanation.