



# TEE2101/TE2101 Programming Methodology

## Laboratory Exercise (LAB-I)

**Name:**

**Matriculation Number:**

**Date submission due: Tuesday 22 February 2022 (1 week from your lab day)**  
**VIA LumiNUS – “Lab 1 Student Submission Folder”**

**Grading: Your assignment will be graded out of 50 marks and the final weight of this assignment is 10%.**

**Please adhere to the guidelines.**

### **Guidelines to be followed while writing Report and submission**

1. Please prepare the report in **PDF format** only.
2. Sign the declaration form (attached in this template).
3. **Add THIS report file and your working C code into one folder.** Submit the folder as a compressed “**zip**” file.
  - For the code file, please submit your **.c file(s) only**, not the whole Visual Studio project folder (if you use MS. Visual Studio).
4. Submitted **zip file name** should be in the following format.
  - MATRICULATION\_NUMBER\_ASSIGNMENT1\_NAME (First Name).zip
  - Example: A0066493U\_ASSIGNMENT1\_SEUNGMIN.zip
5. We do not mark your submission if the submission does not follow the above format.

### **You are expected to follow the guidelines given below. These also carry marks:**

1. Use meaningful variable names while programming. It’s a good practice to develop good programming skills and enables readability.
2. Explain the code with proper comments; Comments must be meaningful and descriptive.
3. Please adhere to the report deadlines and any late submissions are not accepted.
4. Please sign the declaration form (Page 3). We do not mark your submission if this form is not signed.

### **What you need to submit? - YOUR OUTPUT:**

- For the short questions: State your answer and write your explanation clearly (if explanation is required in the question). Paste the screenshot of your code and output if required in the question.
- For the programming problems: Paste the screenshot of your code and output for ALL the test cases as required in the question. Draw the flow chart if required in the question.

## Assignment Declaration Form

Please read sections A, B and C below. Sign and submit this declaration form together with your answers.

### A. Academic, Professional and Personal Integrity

1. *The University is committed to nurturing an environment conducive for the exchange of ideas, advancement of knowledge and intellectual development. Academic honesty and integrity are essential conditions for the pursuit and acquisition of knowledge, and the University expects each student to always maintain and uphold the highest standards of integrity and academic honesty.*
2. *The University takes a strict view of cheating in any form, deceptive fabrication, plagiarism and violation of intellectual property and copyright laws. Any student who is found to have engaged in such misconduct will be subject to disciplinary action by the University.*
3. *It is important to note that all students share the responsibility of protecting the academic standards and reputation of the University. This responsibility can extend beyond each student's own conduct and can include reporting incidents of suspected academic dishonesty through the appropriate channels. Students who have reasonable grounds to suspect academic dishonesty should raise their concerns directly to the relevant Head of Department, Dean of Faculty, Registrar, Vice Provost or Provost.*

### B. I have read and understood the rules of the assessments stated below:

- a. *Students should attempt the assessments on their own. There should be no discussion or communication, via face to face or communication devices, with any other person during the assessment.*
- b. *Students should not reproduce any assessment materials, e.g., by photograph y, videography, screenshots, copying down of questions, etc. Posting on public f rums s, e.g., social media and websites, is prohibited.*

### C. I understand that by breaching any of the rules above, I would have committed offences under clause 3(1) of the NUS Statute 6, Discipline with Respect to Students, which is punishable with disciplinary action under clause 10 or clause 11 of the said statute.

- 3) *Any student who is alleged to have committed or attempted to commit, or caused or attempted to cause any other person to commit any of the following offences, may be subject to disciplinary proceedings:*

*(I) plagiarism, giving or receiving unauthorized assistance in academic work, or other forms of academic dishonesty.*

**I have read and will abide by the NUS Code of Student Conduct (in particular, (A) Academic, Professional and Personal Integrity), B and C when attempting this assessment.**

**Signature:** \_\_\_\_\_

**Date:** 22/02/2022

**Matric.No:** \_\_\_\_\_A0245336E\_\_\_\_\_

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**NOTE: Start your answers from here. Use as much space as needed.**

### Part 1

1. b(' ' is not accepted)  
d(cannot start with a number)  
e(cannot separate with blank space, separate with '\_')  
f (& is not accepted)  
g (@ is not accepted)
- 2.

### Error message:

	Code	Description	Project	File	Line	Suppressi
abc	E0040	expected an identifier	Lab1	L1Q2.c	1	
abc	E0020	identifier "Length" is undefined	Lab1	L1Q2.c	7	
abc	E0020	identifier "Width" is undefined	Lab1	L1Q2.c	7	
abc	E0031	expression must have integral type	Lab1	L1Q2.c	11	
✖	C2007	#define syntax	Lab1	L1Q2.c	1	
✖	C2065	'Length': undeclared identifier	Lab1	L1Q2.c	7	
✖	C2065	'Width': undeclared identifier	Lab1	L1Q2.c	7	
✖	C2065	'Length': undeclared identifier	Lab1	L1Q2.c	8	
✖	C2065	'Width': undeclared identifier	Lab1	L1Q2.c	8	
⚠	C4013	'printf' undefined; assuming extern returning int	Lab1	L1Q2.c	10	
✖	C2111	'+'; pointer addition requires integral operand	Lab1	L1Q2.c	11	
⚠	C4244	'initializing': conversion from 'double' to 'int', possible loss of data	Lab1	L1Q2.c	6	
⚠	C4244	'initializing': conversion from 'double' to 'int', possible loss of data	Lab1	L1Q2.c	6	
⚠	C4244	'initializing': conversion from 'int' to 'float', possible loss of data	Lab1	L1Q2.c	7	

### Explanation:

Declared variable Length and Width are case sensitive error, need to be standardized

#define syntax error, should #include<> instead

(+perimeter+) error at C2111 should be removed replace with (,perimeter,)

### Working Code after debug:

```
#include <stdio.h>

int main() {
    // The program ins used to compute the area and perimeter
    // of a rectangle
    float length = 9.1257291, width = 3.28;
    float perimeter = (length + width) * 2;
    int area = length * width;

    printf("Length and width are %0.3f and %0.3f\n", length, width);
    printf("Perimeter of the rectangle is %0.3f\n", perimeter);
    printf("Area of the rectangle is %d\n", area);

    return 0;
}
```

**Output:**

```
Length and width are 9.126 and 3.280
Perimeter of the rectangle is 24.811
Area of the rectangle is 29
```

3.

i) option **e)** is the output**Explanation:**

“%15.4f” represent the number with minimum 15 length space by including . , and with 4 decimal place.

ii)

Output is 1276.3142

**Explanation:**

The minimum length is 4 with 4 decimal places take place.

1276.3142 is display without space as, it is > 4 length space with 4 decimal place display.

iii)

```
#include<stdio.h>
#include<math.h>
int main() {
    float var = 1276.314159;
    printf("%6.0f", var);
    return 0;
}
```

**Explanation:**

printf(“%6.0f”, var);

To set with 0 decimal place, and length to be 6

4.

expression	Result	
$ab + 2.5 - a/4.2 + 5 \times 10^{-2} + 10^2$	617.121	a=6
$a + A + 2^b$	79.000	b=3
$2 + 9 \times 7 + 0.25a + n$	560.500	
$ab/2.2 - 2.9$	5.282	

5.

expression	True/False	
$(x \% 2 == 0) \&\& ((x < 2) \geq 12)$	TRUE	x=6
$!((!x != 7)) \    \ (y == 9) \    \ (x+y) \leq ' \backslash n'$	TRUE	y=3
$(x > 10) \&\& (y < 5) \    \ ((x+y) \% 2 == 0)$	FALSE	
$!(((x \geq 10) \&\& (y \leq 5)) \    \ ((x \geq 10) \&\& ((x+y) \% 2 == 0)))$	FALSE	

6.

```
stock_day1 value is 48
stock_day2 value is 72
stock_day3 value is 53
stock_day4 value is 48
```

7.

```
stock_day1 value is 48
stock_day2 value is 71
stock_day3 value is 52
stock_day4 value is 48
```

Difference of 1 due to one extra -1 trigger with when line stock\_day2 calculation take place with --stock\_day1. Thus, there is minus 1 difference for **stock\_day2** and **stock\_day3** case.

**stock\_day1** value remains **unchanged** as both --stock\_day1 and stock\_day1-- (-1-1) executed in the end of the loop,  $50 - 2 = 48$ .

stock\_day4 remain unchanged, as both %2 remainder is 0, thus stock\_day4 = stock\_day1 = 48.

8.

```
#include<stdio.h>
#include<math.h>
int main() {
    int a, b, c;
    printf("key in number a\n");
    scanf_s("%d", &a);
    printf("key in number b\n");
    scanf_s("%d", &b);
    printf("key in number c\n");
    scanf_s("%d", &c);
    if ((pow(b, 2) - 4 * a * c > 0) && (a != 0))
        printf("This quadratic equation has two distinct real roots");
    else
        printf("This quadratic equation has not dinstinct real roots");

    return 0;
}
```

```
key in number a
1
key in number b
2
key in number c
3
This quadratic equation has not dinstinct real roots
```

```
key in number a
1
key in number b
4
key in number c
1
This quadratic equation has two distinct real roots
```

## Part 2:

1.

### Code:

```
#include<stdio.h>
#include<math.h>
int main() {
    int a,b,c;
    float e,f,g,h,d;
    //user input
    printf("Input value 1:");
    scanf_s("%d", &a);
    printf("Input value 2:");
    scanf_s("%f", &e);
    printf("Input value 3:");
    scanf_s("%f", &f);
    g = f / 99914945.32;
    printf("Input value 4:");
    scanf_s("%f", &d);
    h = (float)d / 100;
```

### Output:

```
Input value 1:123456789
Input value 2:123.456789
Input value 3:123345.0
Input value 4:2356
output value 1:123456789
output value 2: 123.457
output value 3:0.0012345
output value 4:23.56%
```



2.

a)

Code:

```
#include<stdio.h>
#include<math.h>
int main() {
    //Declaration variable
    const int F = 20*8; // File size 20MB in bits
    const int D = 25000000; // distance in meter
    const int S = 3 * pow(10, 8); // Speed of light m/s
    float P; // Propagation time
    float t, b1, b2, b3, b4, C1, C2, C3, C4, C; // Trans time, Bandwidth and Total time
    P = (float)D / (float)S; // Propagation time = 0.083333s

    printf("Key in Bandwidth required(1Mbps):");
    scanf_s("%f", &b1); //input bandwidth
    printf("Key in Bandwidth required(5Mbps):");
    scanf_s("%f", &b2); //input bandwidth
    printf("Key in Bandwidth required(7.5Mbps):");
    scanf_s("%f", &b3); //input bandwidth
    printf("Key in Bandwidth required(10Mbps):");
    scanf_s("%f", &b4); //input bandwidth

    t = F / b1; //transmission time
    C1 = P + t; // sub_Total_time
    printf("Total upload time is with 1Mbps %f s\n", C1);
    t = F / b2; //transmission time
    C2 = P + t; // sub_Total_time
    printf("Total upload time is with 5Mbps %f s\n", C2);
    t = F / b3; //transmission time
    C3 = P + t; // sub_Total_time
    printf("Total upload time is with 7.5Mbps %f s\n", C3);
    t = F / b4; //transmission time
    C4 = P + t; // sub_Total_time
    printf("Total upload time is with 10Mbps %f s\n", C4);

    C = C1 + C2 + C3 + C4; //total time
    printf("Total upload time is %f s\n", C);

    return 0;
}
```

Output:

```
Key in Bandwidth required(1Mbps):1
Key in Bandwidth required(5Mbps):5
Key in Bandwidth required(7.5Mbps):7.5
Key in Bandwidth required(10Mbps):10
Total upload time is with 1Mbps 160.083328 s
Total upload time is with 5Mbps 32.083332 s
Total upload time is with 7.5Mbps 21.416668 s
Total upload time is with 10Mbps 16.083334 s
Total upload time is 229.666656 s
```

b)

**Code:**

```
#include<stdio.h>
#include<math.h>
int main() {
    //Declaration variable
    const int D = 25000000; // distance in meter
    const int S = 3 * pow(10,8); // Speed of light m/s
    const int t = 1; // Trans time
    float t1, t2, t3; // subtotal of each file trans time
    float C; //total trans time
    float P; // Propagation time

    P = (float)D / (float)S; // Propagation time = 0.083333s
    printf("Propagation time is %f\n", P);
    t1 = (3*8)/(float)t + P; //3MB file size
    printf("transmission time for 3MB required(s):%f s\n", t1);
    t2 = (18*8)/(float)t + P; //18MB file size
    printf("transmission time for 18MB required(s):%f s\n", t2);
    t3 = (15.75*8)/(float)t + P; //15.75MB file size
    printf("transmission time for 15.75MB required(s):%f s\n", t3);

    C = t1 + t2 + t3; // Total_time trans
    printf("total transmission time required:%f s\n", C);

    return 0;
}
```

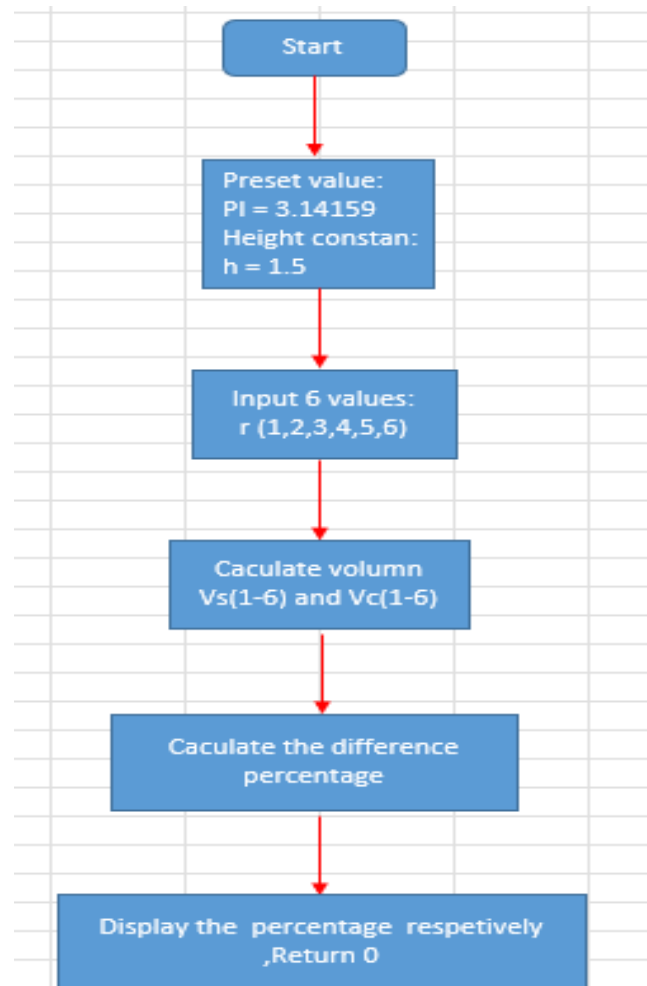
**output:**

```
Propagation time is 0.083333
transmission time for 3MB required(s):24.083334 s
transmission time for 18MB required(s):144.083328 s
transmission time for 15.75MB required(s):126.083336 s
total transmission time required:294.250000 s
```

3.

a)

### Flow Chart



b)

### Code:

```
# define PI 3.14159
#include<stdio.h>
#include<math.h>
int main() {
    //Declaration variable
    float r1, r2, r3, r4, r5, r6; //radius
    const float h = 1.5; // height
    float Vs1, Vc1, Vs2, Vc2, Vs3, Vc3, Vs4, Vc4, Vs5, Vc5, Vs6, Vc6; //Volume of sphere and Cylinder
    float D1, D2, D3, D4, D5, D6; //percentage difference between cylinder and sphere
    //input value r
    printf("Key in radius value:");
    scanf_s("%f", &r1);
    printf("Key in radius value:");
    scanf_s("%f", &r2);
    printf("Key in radius value:");
    scanf_s("%f", &r3);
    printf("Key in radius value:");
    scanf_s("%f", &r4);
    printf("Key in radius value:");
    scanf_s("%f", &r5);
    printf("Key in radius value:");
    scanf_s("%f", &r6);

    //Volumne caculation
    Vs1 = (4 / 3) * pow(r1, 3) * PI; // sphere 1
    Vc1 = pow(r1, 2) * h * PI; // cylinder 1

    Vs2 = (4 / 3) * pow(r2, 3) * PI; // sphere 2
    Vc2 = pow(r2, 2) * h * PI; // cylinder 2

    Vs3 = (4 / 3) * pow(r3, 3) * PI; // sphere 3
    Vc3 = pow(r3, 2) * h * PI; // cylinder 3

    Vs4 = (4 / 3) * pow(r4, 3) * PI; // sphere 4
    Vc4 = pow(r4, 2) * h * PI; // cylinder 4

    Vs5 = (4 / 3) * pow(r5, 3) * PI; // sphere 5
    Vc5 = pow(r5, 2) * h * PI; // cylinder 5

    Vs6 = (4 / 3) * pow(r6, 3) * PI; // sphere 6
    Vc6 = pow(r6, 2) * h * PI; // cylinder 6

    //difference percentage caculation
    D1 = (Vs1 - Vc1) * 100 / Vs1;
    printf(" The percentage difference with 0.1 radius is %0.4f %%\n", D1);
    D2 = (Vs2 - Vc2) * 100 / Vs2;
    printf(" The percentage difference with 0.4 radius is %0.4f %%\n", D2);
    D3 = (Vs3 - Vc3) * 100 / Vs3;
    printf(" The percentage difference with 0.8 radius is %0.4f %%\n", D3);
    D4 = (Vs4 - Vc4) * 100 / Vs4;
    printf(" The percentage difference with 1.2 radius is %0.4f %%\n", D4);
    D5 = (Vs5 - Vc5) * 100 / Vs5;
    printf(" The percentage difference with 1.6 radius is %0.4f %%\n", D5);
    D6 = (Vs6 - Vc6) * 100 / Vs6;
    printf(" The percentage difference is with 2.0 radius %0.4f %%\n", D6);
```

### Output:

```
Key in radius value:0.1
Key in radius value:0.4
Key in radius value:0.8
Key in radius value:1.2
Key in radius value:1.6
Key in radius value:2
  The percentage difference with 0.1 radius is -1400.0000 %
  The percentage difference with 0.4 radius is -275.0000 %
  The percentage difference with 0.8 radius is -87.5000 %
  The percentage difference with 1.2 radius is -25.0000 %
  The percentage difference with 1.6 radius is 6.2500 %
  The percentage difference is with 2.0 radius 25.0000 %
```