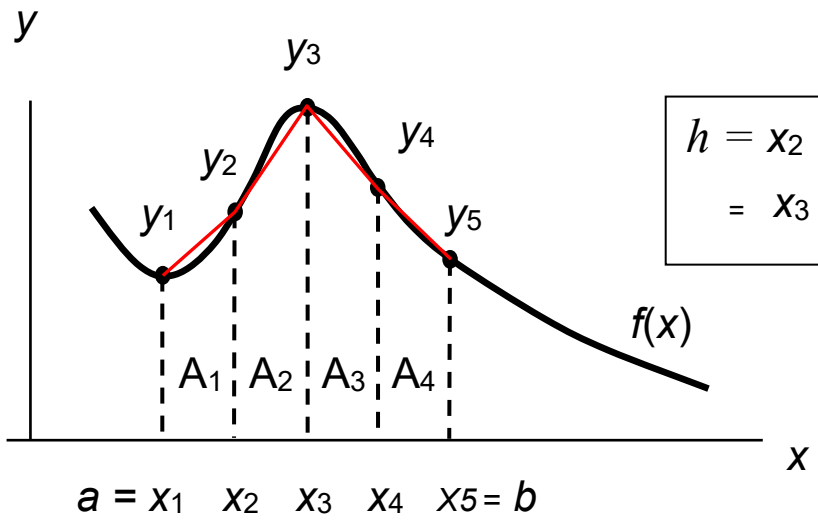
Lab 10/25

Please do not use self-defined functions and array in this Lab.

Homework Part

8. The Integration:

(I) Using the Trapezoidal Rule:

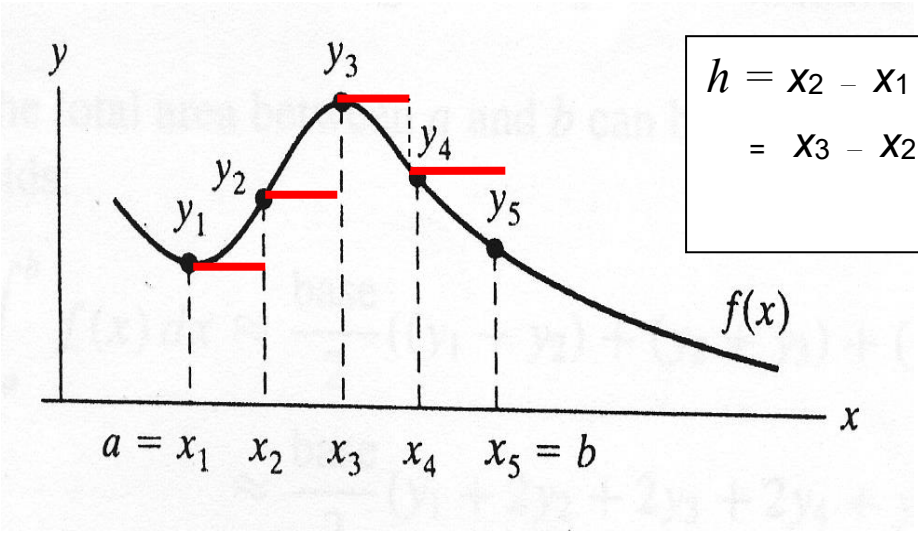


$h = x_2 - x_1$

$= x_3 - x_2 = \ldots$

In general, Area $= \int_a^b f(x)dx = \frac{h}{2}[f(a) + f(b) + 2\sum_{i=2}^{n} f(x_i)]$, where $h = \frac{b-a}{n}$. Note that the interval [a, b] is divided into n subintervals.

(II) Using the Rectangular Rule:



$h = x_2 - x_1$

$= x_3 - x_2 = \ldots$

In general, Area = $\int_a^b f(x)dx = h * [\sum_{i=1}^{n} f(x_i)]$

(a) Using trapezoidal rule and rectangular rule to find the area bounded by $f(x) = 5x^3 + 2x^2 + 7x + 3$, a=5, b=15. Given that integration interval h = (b-a)/n.

(b) The interval [a, b] is divided into n subintervals.

(c) Please let user input n continuously to calculate the results and stop the program when inputting CTRL+Z.

(d) Please show the answer to the 8th decimal place.

Modification:

(a) $f(x) = 2x^3 - 6x^2 + 5x - 7 \quad a = 2, b = 13$

Input/Output Example:

```
Please input n: 10000
Trapezoidal Rule: 10230.00008652
Rectangular Rule: 10228.10643652

Please input n: 50000
Trapezoidal Rule: 10230.00000346
Rectangular Rule: 10229.62127346

Please input n: 100000
Trapezoidal Rule: 10230.00000087
Rectangular Rule: 10229.81063587

Please input n: ^Z

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Process exited after 437.3 seconds with return value 0
```

9. Write a program that prompts the user to input three numbers. The program should then output the numbers in ascending order. (由小排到大)

Please let user input data continuously and stop the program when inputting CTRL+Z. No ternary operator in this problem.

Modification:

Print out a*b, b*c, c*a first.

Output these numbers in ascending order.

Input/Output Example:

```
Input 3 numbers: 2 3 4
ab = 6 , bc = 12 , ca = 8
From smallest to largest is: 6 < 8 < 12

Input 3 numbers: 6 4 3
ab = 24 , bc = 12 , ca = 18
From smallest to largest is: 12 < 18 < 24

Input 3 numbers: ^Z

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Process exited after 110 seconds with return value 0
```

10. Suppose you can buy a chocolate bar from the vending machine for $1 each. Inside every chocolate bar is a coupon. You can redeem seven coupons for one chocolate bar from the machine. You would like to know how many chocolate bars you can eat, including those redeem via coupon, if you have n dollars.

Write a program that inputs the number of dollars and outputs how many chocolate bars you can collect after spending all your money and redeeming as many coupons as possible. Also output the number of leftover coupons, and stop the program when inputting CTRL+D.

Modification:

Suppose you can buy a chocolate bar from the vending machine for $3 each. Inside every chocolate bar is two coupons. You can redeem six coupons for one chocolate bar from the machine.

Input/Output Example:

```
Please input the number of dollars: 36
The number of chocolate bars you can collect is 17
The number of leftover coupons is 4

Please input the number of dollars: 64
The number of chocolate bars you can collect is 31
The number of leftover coupons is 2

Please input the number of dollars: 14
The number of chocolate bars you can collect is 5
The number of leftover coupons is 4

Please input the number of dollars: ^D

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Process exited after 458.4 seconds with return value 0
```

11. Use the switch syntax to solve this problem:
Write a program that mimics a calculator.
(a). The calculator provides only 4 arithmetic operations: +, -, *, /.
(b). The program should take as input one integer, the operator that the operation to be performed and the other integer.
(c). It should then output the numbers, the operators, and the operation result.
(d). For division, if the denominator is zero, output an error message.
(e). If the input operator is not one of +, -, * , / then also output error message.
(f). The user can continue to execute the program until the user inputs 'N' or 'n' to stop the program.

Modification:
Adding one operation
x , y : Output a message indicating whether the point is the origin, is located on the x (or y) axis, or appears in a particular quadrant.
No ternary operator in this problem
Message example:

(0,0) is the origin
(4,0) is on the x-axis
(0,-3) is on the y-axis
(-2,3) is in the second quadrant
(-1,-9) is in the third quadrant

Note: You can use your HW problem5 to help you finish this problem.

Input/Output Example:

```
Please input integer, the operator and integer:
1 + -3
Answer: 1 + -3 = -2
Continue or not: y

Please input integer, the operator and integer:
1 - -3
Answer: 1 - -3 = 4
Continue or not: y

Please input integer, the operator and integer:
2 * -3
Answer: 2 * -3 = -6
Continue or not: y

Please input integer, the operator and integer:
2 / -3
Answer: 2 / -3 = 0
Continue or not: y

Please input integer, the operator and integer:
3 / -3
Answer: 3 / -3 = -1
Continue or not: y

Please input integer, the operator and integer:
3 / 0
The denominator cannot be zero.
Continue or not: y

Please input integer, the operator and integer:
6 = 6
Error: incorrect operator!!!
Continue or not: N

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Process exited after 36.64 seconds with return value 0
```

```
Please input integer, the operator and integer:
0 , 0
(0,0) is the origin.
Continue or not: y

Please input integer, the operator and integer:
0 , 1
(0,1) is on the y-axis.
Continue or not: y

Please input integer, the operator and integer:
1 , 0
(1,0) is on the x-axis.
Continue or not: y

Please input integer, the operator and integer:
1 , 1
(1,1) is in the first quadrant.
Continue or not: y

Please input integer, the operator and integer:
-1 , 1
(-1,1) is in the second quadrant.
Continue or not: y

Please input integer, the operator and integer:
-1 , -1
(-1,-1) is in the third quadrant.
Continue or not: y

Please input integer, the operator and integer:
1 , -1
(1,-1) is in the fourth quadrant.
Continue or not: n


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Process exited after 58.73 seconds with return value 0
```