Task 1

Homework 1#: Guess the run-time output

02_homework1.cpp

```
#include<iostream>
using namespace std;

int main()
{
    cout<<"\n\nGuess the "
        <<"output\n---\n";

    cout<<10+20-5<<endl;
    cout<<"14/2"<<"\n";
    cout<<17-10<<"\n";
    cout<<"endl";
    cout<<"\nPractice makes perfect";

    //cout<<"The way to get started is to quit talking and begin doing";

    return 0;

    cout<<"\n\nBye\n\n";
}
```

- Pass over the code line by line
- Execute the line
- What is the output of this code?

the output is

Guess the output

…

25

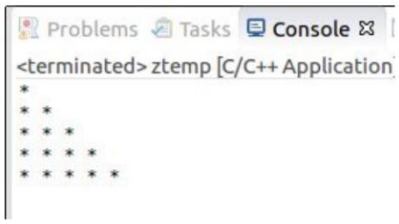
14/2

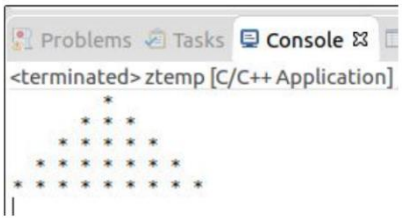
7

endl

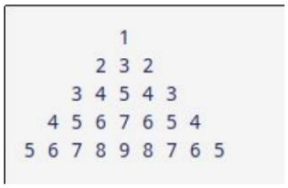
Practice makes prefect

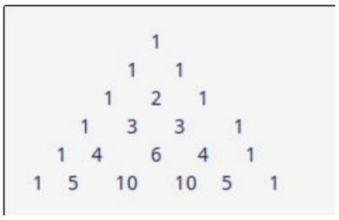
Homework 2#: Write code to print the following





- Write a code to each output





Code 1:

```
#include <iostream>
    using namespace std;
    int main()
    {
      cout << "*" << endl;
      cout << "**" << endl;
      cout << "***" << endl;
      cout << "****" << endl;
      cout << "*****" << endl;

 return 0;
 }
```

Code 2:

```
#include <iostream>
using namespace std;
int main()
{
      cout << "    *" << endl;
      cout << "   ***" << endl;
      cout << "  *****" << endl;
      cout << " *******" << endl;
      cout << "*********" << endl;

return 0;
}
```

Code 3:

```cpp
#include <iostream>
using namespace std;
int main()
{
	cout << "    *" << endl;
	cout << "   ***" << endl;
	cout << "  *****" << endl;
	cout << "   ***" << endl;
	cout << "    *" << endl;

return 0;
}
```

Code 4:

```cpp
#include <iostream>
using namespace std;
int main()
{
	cout << "    1" << endl;
	cout << "   323" << endl;
	cout << "  34543" << endl;
	cout << " 4567654" << endl;
	cout << "567898765" << endl;

return 0;
}
```

Code 5:

```cpp
#include <iostream>
using namespace std;
int main()
{
	cout << "     1" << endl;
	cout << "    1 1" << endl;
	cout << "   1 2 1" << endl;
	cout << "  1 3 3 1" << endl;
	cout << " 1 4 6 4 1" << endl;
	cout << "1 5 10 10 5 1" << endl;

return 0;
}
```

Homework 1: Find all errors and fix them

03_01_homework.cpp

```
1  #include<stream
2  using namespace STD
3
4
5  cout <<"work smart not hard\n";
6
7
8  int maIN() {
9
10
11     cout << "Children must be taught how to think, not what to think"
12     cout << "We worry about what a child will become "tomorrow", yet we forget that he is someone today\n";
13     cout << "Children are not things to be molded"<", but are people to be unfolded\n";
14     cout << "Each day of our lives we make deposits in the memory banks of our children."<<end;
15     cout      << ""It is easier to build strong children than to repair broken men""<<"\n";
16     cout >> "Children need models rather than critics\n";
17
18     out<<"Children have never been very good at listening to their elders, but they have never failed to imitate them";
19
20     cout < "Children are our most valuable resource\n";
21
22
```

The errors is

Line 1: `#include <iostream>`

Line 2: `using namespace std;`

Line 5:must be in main fuction

Line 8: main not main

Line 11 : forget semicolon ;

Line 12 to 16:using two quotes wrong

Line 18: cout not out

Missing } in the end

Homework 1: Math operations

- Write a program that reads 2 numbers and **print** their + - * / as following
  - For inputs 12 and 3
- Do good testing for your code
  - E.g. consider zero as first or 2nd number
  - E.g. consider negative values
  - E.g. even and odd values
  - E.g. try the MAX of int: 2147483647

```
12 3
12 + 3 = 15
12 - 3 = 9
12 / 3 = 4
12 * 3 = 36
```

The code is :#include <iostream>

```
using namespace std;

int main()

{  int n1,n2;

  cin >> n1 >> n2;

  cout << n1 << " + " << n2 << " = " << n1 + n2 << endl;

  cout << n1 << " - " << n2 << " = " << n1 - n2 << endl;

  cout << n1 << " / " << n2 << " = " << n1 / n2 << endl;

  cout << n1 << " * " << n2 << " = " << n1 * n2 << endl;



  return 0;}
```

Homework 2: Students grades

- A teacher want a program that reads 2 students information about math exam
  - Read per student: name, id and grade
  - Then print them. See the picture
- Be a good software engineer
  - Think deeply in your selected data types
  - The teacher gives us this dialogue to guide us
  - Be careful from your assumptions?
    - Is exam's grade an integer?

```
What is student 1 name: mostafa
His id: 111
His math exam grade: 20
What is student 2 name: ALI
His id: 555
His math exam grade: 30

Students grades in math
mostafa (with id 111) got grade: 20
ALI (with id 555) got grade: 30
Average grade is 25
```

The code is :

```
#include <iostream>

using namespace std;

int main(){

 string name1, name2;  int id1, id2;  double g1, g2;

 cout << "what is student1 name" << endl;  cin >> name1;

 cout << "his id" << endl;  cin >> id1;

 cout << "his math grade" << endl;   cin >> g1;

 cout << "what is student2 name" << endl;   cin >> name2;

 cout << "his id" << endl;   cin >> id2;

 cout << "his math grade" << endl;  cin >> g2;

 cout << "students grade in math" << endl;

 cout << name1 << "(with id " << id1 << ") got grade" << g1<<endl;

 cout << name2 << "(with id " << id2 << ") got grade" << g2<<endl;

 cout << "Average grade is " << (g2 + g1) / 2; return 0;}
```

Homework 3: Even and Odd sum

Problem Statement: Given 8 space-separated integers, find the sum of those in even places and the sum of those in odd places.

Note: Even place means the 2nd, 4th, 6th or 8th numbers, while odd places are the 1st, 3rd, 5th and 7th numbers.

Example Input:

```
11 2 7 9 12 -8 3 -1
```

Example Output:

```
2 33
```

Example Explanation:

2 + 9 + (-8) + (-1) = 2
11 + 7 + 12 + 3 = 33

The code is :

```
#include <iostream>
using namespace std;
int main(){
  int n1, n2, n3, n4, n5, n6, n7, n8;
cin>>  n1>> n2>> n3>> n4>> n5>> n6>> n7>> n8;
  cout << n2 + n4 + n6 + n8 << endl;
  cout << n1 + n3 + n5 + n7 << endl;
return 0;}
```

Homework 4: Guess Program Output

04_homework4.cpp

```
#include<iostream>
using namespace std;

int main() {
    int num1, num2, num3;

    num1 = 0, num2 = 1, num3 = num1 + num2, cout <<num3<<"\n";
    num1 = num2, num2 = num3, num3 = num1 + num2, cout <<num3<<"\n";
    num1 = num2, num2 = num3, num3 = num1 + num2, cout <<num3<<"\n";
    num1 = num2, num2 = num3, num3 = num1 + num2, cout <<num3<<"\n";
    num1 = num2, num2 = num3, num3 = num1 + num2, cout <<num3<<"\n";
    num1 = num2, num2 = num3, num3 = num1 + num2, cout <<num3<<"\n";
    num1 = num2, num2 = num3, num3 = num1 + num2, cout <<num3<<"\n";
    num1 = num2, num2 = num3, num3 = num1 + num2, cout <<num3<<"\n";
    num1 = num2, num2 = num3, num3 = num1 + num2, cout <<num3<<"\n";

    // https://en.wikipedia.org/wiki/Fibonacci_number

    return 0;
}
```

The output:

1

2

3

5

8

13

21

34

55

Homework 5: Guess Program Output

04_homework5.cpp

```cpp
#include<iostream>
using namespace std;

int main() {
    int num = 0;

    ++num;
    num *= 10;
    num += 2;
    num = num * 10;
    num += 3;
    num = num * 10 + 4;
    num = 5 + num * 10;
    num = (num * 10 + 6) * 10 + 7;
    num = 5 * num * 2 * 1 + 5 + 2 + 1;

    cout<<num<<"\n";

    return 0;
}
```

The output: 12345678

Homework 6: Swapping 2 numbers!

- Write a program that reads 2 variables num1 and num2
  - E.g. say we read num1 = 7 and num2 = 231
- Target: we want swap the values of Num1 and Num2?
  - Swap means exchange
  - So Num1 takes value 231 and Num2 takes value 7

```
int main() {
    int num1, num2, num3 = -1;

    cin>>num1>>num2;                    // let say we read 7 and 231

    // TODO write 3 lines that swaps them

    cout<<num1<<" "<<num2<<endl;        // This should print 231 7

    return 0;
}
```

The code is: #include <iostream>

using namespace std;

int main(){

int n1, n2, n3=0;

cin >> n1 >> n2;

n3 = n2;

n2 = n1;

n1 = n3;

cout << n1 << endl<<n2;

return 0;}

Homework 7: Swapping 3 numbers!

- Same as previous, but on 3 numbers
- Let say we have numbers a = 115, b = 20, c = 301
- We wanna their final values to be: a = 20, b = 301, c = 115

The code is:

```
#include <iostream>

using namespace std;

int main(){

  int n1, n2, n3,n4;

  cin >> n1 >> n2>>n3;

  n4 = n1;

  n1 = n2;

  n2 = n3;

  n3 = n4;

  cout << n1 << endl<<n2<<endl<<n3;

return 0;

}
```

Homework 1: Guess the output

03_homework1.cpp

```cpp
#include<iostream>
using namespace std;

int main() {

    int a = 10, b = 20, c = 30, d = 40;

    cout << (a + b == c) << "\n";
    cout << (a + b + c >= 2 * d) << "\n";

    cout << (a > 5 || d < 30) << "\n";
    cout << (a > 5 && d < 30) << "\n";
    cout << (a <= b && b <= c) << "\n";

    cout << (a > 5 && d < 30 || c - b == 10) << "\n";
    cout << (a <= b && b <= c && c <= d) << "\n";

    cout << (a > 5 && d < 30 || c > d || d % 2 == 0) << "\n";
    cout << (a > 5 && d < 30 || c > d && d % 2 == 0) << "\n";

    cout << ( a == 10 || b != 20  && c != 30 || d != 40) << "\n";
    cout << ((a == 10 || b != 20) && c != 30 || d != 40) << "\n";

    return 0;
}
```

The output: 1

0

1

0

1

1

1

1

0

1

0

Homework 2: Create logic!

- Write a program that reads 3 integers about the class room
  - Number of boys (nb), number of girls (ng), number of teachers (nt)
- Prepare and **print** a boolean variable for these cases:
- nb greater than 25
- ng less than or equal to 30
- nb > 20 and nt > 2 or ng > 30 and nt > 4
- Either nb < 60 or ng < 70
- Neither nb >= 60 nor ng >= 70
- nb is 10 more students than ng
- Difference between nb and ng is more than 10 or nt > 5
- Either **nb is 10 more students than ng** or **ng is 15 more students than nb**

The code:

```
#include <iostream>
using namespace std;
int main()
{
	int nb, ng, nt;
	cin >> nb >> ng >> nt;
	cout << (nb > 25) << endl;
	cout << (ng <= 30) <<endl;
	cout << (nb > 20 && nt > 2 || ng > 30 && nt > 4) << endl;
	cout << (nb < 60 || ng < 70) <<endl;
	cout << (!(nb >= 60) || !(ng >= 70)) << endl;
	cout << (nb -ng ==  10) << endl;
	cout << (nb - ng > 10 || nt > 5) << endl;
	cout << (nb == ng + 10 || ng == nb + 15) << endl;

return 0;
}
```

Homework 3 (optional): Simplify expressions

- For each expression:
  - Write a line of code that evaluate it to see its final value
  - Simplify it step by step to finally be a T or F
- T && T && F && T
- T && T && F && T || T && T
- T && T && T && T || T && (T || F)
- T && T && T || T && (F || (T && (T && T)))
- T && T || T && F && T || T && T && F || (T && (T || F))
- T && T || T && F && T || (T && T && F || (T && (T || F)))
- (T && T || T && F && T || T) && T && F || (T && (T || F))
- T && T || T && (F && T || T && T) && F || (T && (T || F))

Homework 1

- Read 2 integers A, B and print based on following cases:
  - if both are odd print their product A*B
  - if both are even print their division A/B
  - if the first is odd and the second is even then find their sum A+B
  - if the first is even and the second is odd then find their subtraction A-B
- Inputs ⇒ outputs
  - 5 7 => 35
  - 12 2 => 6
  - 5 6 => 11
  - 12 3 => 9

```
#include <iostream>
using namespace std;
int main()
{
	int a, b;
	cin >> a >> b;
	if (a % 2 != 0 && b % 2 != 0) {
		cout << a * b;
	}
	else if (a % 2 == 0 && b % 2 == 0) {
		cout << a / b;
	}
	else if (a % 2 != 0 && b % 2 == 0) {
		cout << a + b;
	}
	else if (a % 2 == 0 && b % 2 != 0) {
		cout << a - b;
	}
return 0;
}
```

Homework 2: Sort 3 numbers

- Given 3 integers, sort (order) them in ascending order and print them .
- Inputs
  - 1 2 3 ⇒ 1 2 3
  - 1 3 2 ⇒ 1 2 3
  - 2 1 3 ⇒ 1 2 3
  - 2 3 1 ⇒ 1 2 3
  - 3 1 2 ⇒ 1 2 3
  - 3 2 1 ⇒ 1 2 3
- Do you notice there are only 6 ways to permutate 3 numbers!

```
#include <iostream>
using namespace std;
int main()
{
	int a, b, c;
	cin >> a >> b >>c;
	if (a > b && a > c) {
		if (b > c) cout << a << " " << b << " " << c;
		else if (c > b) cout << a << " " << c << " " << b;
	}
	else if (b > a && b > c) {
		if (c > a)cout << b << " " << c << " " << a;
		else if (a > c) cout << b << " " << a << " " << c;
	}
	else if (c > a && c > b) {
		if (a > b) cout << c << " " << a << " " << b;
		else if (b > a)cout << c << " " << b << " " << a;
	}

return 0;
}
```

Homework 3: Maximum but constrained

- Given 3 integers, you have to find the biggest one of them which is < 100.
  - Print -1 if no such number
- Inputs
  - 22 90 115 ⇒ 90
    - Here [20 90] are only < 100. Maximum (20, 90) = 90
  - 200 300 400 ⇒ -1
    - All of them are > 100, so no answer
  - 50 100 150 ⇒ 50
    - Only 50 is < 100.
  - 10 30 20 ⇒ 30
    - The 3 numbers < 100, so their max is 30

```
#include <iostream>
using namespace std;
int main()
{
	int a, b, c;
	cin >> a >> b >>c;
	if (a > b && a > c) {
		if (a < 100)cout << a;
		else if (b > c && b < 100) cout << b;
		else if (c < 100) cout << c;
		else cout << -1;
	}
	else if (b > a && b > c) {
		if (b < 100)cout << b;
		else if (a > c && a < 100) cout << a;
		else if (c < 100) cout << c;
		else cout << -1;
	}
	else if (c > a && c > b) {
		if (c < 100) cout << c;
		else if (b > a && b < 100)cout << b;
		else if (a < 100) cout << a;
		else cout << -1;
	}

return 0;
}
```

Homework 4: Conditional Count

- Write a program that reads number X, then other 5 numbers. Print 2 values:
  - How many numbers <= X
  - How many numbers > X
  - Any relation between these 2 outputs?
- Inputs
  - 10 **300 1 5 100 200**
  - Output: 2 3
  - Explantation
  - 2 numbers (1, 5) are <= 10
  - 3 numbers (100, 200, 300) are > 10

```
#include <iostream>
using namespace std;
int main()
{
	int x;cin >> x;
	int n = 0;
	int l=0,s=0;
	while (n < 5) {
		int y;cin >> y;
		if (y <= x)s++;
		else l++;
		n++;
	}
	cout << s <<" "<< l;

return 0;
}
```

Homework 5: Find Maximum of 10

- Read 10 integers, find which of them has the biggest value and print it.
- Inputs
  - 1 67 -9 88 -45 129 90 65 77 34 ⇒ 129
- Restriction: In your whole code there should be 2 integer variables defined ONLY
  - If hard constraint; code it in whatever easier way for you

```
#include <iostream>
using namespace std;
int main()
{
	int result, num;

	cin >> result;
	cin >> num;  if (result < num)  result = num;
	cin >> num;  if (result < num)  result = num;
	cin >> num;  if (result < num)  result = num;
	cin >> num;  if (result < num)  result = num;
	cin >> num;  if (result < num)  result = num;
	cin >> num;  if (result < num)  result = num;
	cin >> num;  if (result < num)  result = num;
	cin >> num;  if (result < num)  result = num;
	cin >> num;  if (result < num)  result = num;

	cout << result;
return 0;
}
```

Homework 6: Find Maximum up to 10

- Read an integer N (2 <= N <= 10)
- Then read N integers, find which of them has the biggest value and print it.
- Inputs
  - 5 **1 3 2 4 2** ⇒ 4
    - 5 means read 5 integers
    - Then we read them [**1 3 2 4 2**]. Their maximum is 4
  - **10** 1 67 -9 88 -45 129 90 65 77 34 ⇒ 129
    - Same as last homework. This time we are given first N (10)
-

```
#include <iostream>
using namespace std;
int main()
{
	int n ,r = INT16_MIN;

	cin >> n;
	while (n > 0) {
		int y; cin >> y;	if (r < y)	r =y;
		n--;
	}

	cout << r;
return 0;
}
```

Homework 1

- Given a number. Using only %2 how to know if the number is even or odd?
- Given a number. Using only %10 how to know if the number is even or odd?
- Given a number. Using only /2 how to know if the number is even or odd?

Code 1:

```
#include <iostream>
using namespace std;
int main()
{
	int n;
	cin >> n;
	if (n % 2 == 0)cout << "even";
	else cout << "odd";
return 0;
}
```

Code 2:

```
#include <iostream>
using namespace std;
int main()
{
	int n;
	cin >> n;
	if (n%10 ==0 || n % 10 == 2 || n % 10 == 4 || n % 10 == 6 || n % 10 == 8
)cout << "even";
	else cout << "odd";
return 0;
}
```

Code 3:

```
#include <iostream>
using namespace std;
int main()
{
	int n;
	cin >> n;
	double b = (double)n / 2.0;
	b = b - (int)b;
	if (b == 0) cout << "even";
	else cout << "odd";

return 0;
}
```

Homework 2

- Write a program that reads 5 numbers and print the following:
  - A) Their average
  - B) The sum of the first 3 numbers divided by the sum of the last 2 numbers
  - C) The average of the first 3 numbers divided by the average of the last 2 numbers.

```
#include <iostream>
using namespace std;
int main()
{
	double n1,n2,n3,n4,n5;
	cin >> n1>>n2>>n3>>n4>>n5;
	cout <<(n1 + n2 + n3 + n4 + n5) / 5 << endl;
	cout << (n1 + n2 + n3 )/( n4 + n5)  << endl;
	cout << (n1 + n2 + n3) /3/ (n4 + n5)/2 << endl;



return 0;
}
```

Homework 3

- Write a program that reads an integer and print the sum of its last 3 digits.
- Inputs

```
#include <iostream>
using namespace std;
int main()
{
	int n;
	cin >> n;
	int r = 0;
	r = n % 10;
	n /= 10;
	r += n % 10;
	n /= 10;
	r += n % 10;
	cout << r;


return 0;
}
```

Homework 4

- Write a program that reads an integer and print the 4th from the right side. If no such digit, print 0

```
#include <iostream>
using namespace std;
int main()
{
	int n;
	cin >> n;
	int r = 0;
	n /= 1000;
	r += n % 10;
	cout << r;


return 0;
}
```

Homework 5

- Write a program that reads 2 numbers a, b and divide them (a/b), but prints only the fraction part
- E.g. for inputs 201 and 25, print 0.04
  - Notice: 201 / 25 = 8.04
  - We only want the fraction part: 0.04

```
#include <iostream>
using namespace std;
int main()
{
	double x, y;
	cin >> x >> y;
	double n = x / y;
	cout << n - (int)n;

return 0;
}
```