Problem 1:

A pentagonal number is defined as n(3n-1)/2 for n=1,2,… and so on. Therefore, the first few numbers are 1,5,12,22,…Write a function with the following header that returns a pentagonal number according to the given integer n:

int getPentagonalNumber(int n)

Write a test program that uses this function to display the first 100 pentagonal numbers with 10 numbers on each line.

Program code

#include <iostream>

using namespace std;

int getPentagonalNumber(int n)

{

int PentagonalNumber;

PentagonalNumber=n\*(3\*n-1)/2;

return PentagonalNumber;

}

int main()

{

int n;

for (n=1;n<=100;n=n+1)

{

cout<<getPentagonalNumber(n)<<" ";

if (n%10==0) cout<<endl;

}

return 0;

}

Program analysis

1. Function should be put outside the main;
2. The formula n(3n-1)/2 should be changed into n\*(3\*n-100)/2
3. Using “if (n%10==0) cout<<endl;” to line feed

Program result

Problem 2

Twin primes are a pair of prime numbers that differ by 2. For example, 3 and 5 are twin numbers, as are 5 and 7, and 11 and 13. Write a program to find all twin primes less than 10000. Display the output as follows:

(3, 5)

(5, 7)

Program code

#include <iostream>

using namespace std;

bool prime(int n)

{

int i;

int check=0;

for (i=2;i\*i<=n;i=i+1)

{

if (n%i==0)

return false;

}

return true;

}

int main()

{

int n;

for (n=3;n<=9998;n=n+2)

{

if (prime(n) && prime(n+2))

cout<<"("<<n<<","<<n+2<<")"<<endl;

}

}

Program analysis

1. using bool function to check if the number is a prime;
2. in the main function , if n and n+2 both are prime ,then cout the 2 number

Program result

Problem 3

You can use Cramer’s rule to solve the following 2\*2 system of linear equations:

ax+by=e

cx+dy=f

x=(ed-bf)/(ad-bc)

y=(af-ec)/(ad-bc)

Write a function with the following header:

void solveEquation(double a, double b, double c, double d, double e, double f, double& x, double& y, bool& isSolvaable)

If ad-bc is 0, the equation has no solution and isSolvable should be false. Write a program that prompts the user to enter a,b,c,d,e and f and displays the result. If ad-bc is 0, report that “The equation has no solution.”

Program code

#include <iostream>

#include<math.h>

using namespace std;

void solveEquation(double a, double b, double c, double d, double e, double f, double& x, double& y, bool& isSolvable)

{

isSolvable=true;

if( abs(a\*d-b\*c-0)<=0.00001)

{

isSolvable=false;

}

else

{

x=(e\*d-b\*f)/(a\*d-b\*c);

y=(a\*f-e\*c)/(a\*d-b\*c);

};

if (isSolvable==false)

cout<<"The equation has no solution."<<endl;

else cout<<"The solution of the equation is :"<<"x="<<x<<" "<<"y="<<y<<endl;

}

int main()

{

double a,b,c,d,e,f,x,y;

bool isSolvable;

cin>>a>>b>>c>>d>>e>>f;

solveEquation(a,b,c,d,e,f,x,y,isSolvable);

}

Program analysis

1. we can’t say that ad-bc=0,we need to write ads(ad-bc<=1\*e-5)
2. use a void function do do the equation.
3. Use double& to keep the result

Program result

Problem 4

Write a function with the following header to format a positive integer with the specified width:

       string format(int number, int width)

The function returns a string for the number with one or more prefix 0s. For example, format(34,4) return 0034 and format(34,5) return 00034. If the number is longer than the width, the function returns a string representation for the number. For example, format(34,1) return 34.

Write a test program that prompts the user to enter a number and its width and displays the a string returned by invoking format(number, width).

Program code

Program analysis

Program result