Lab 06

Introduction to Modular Programming

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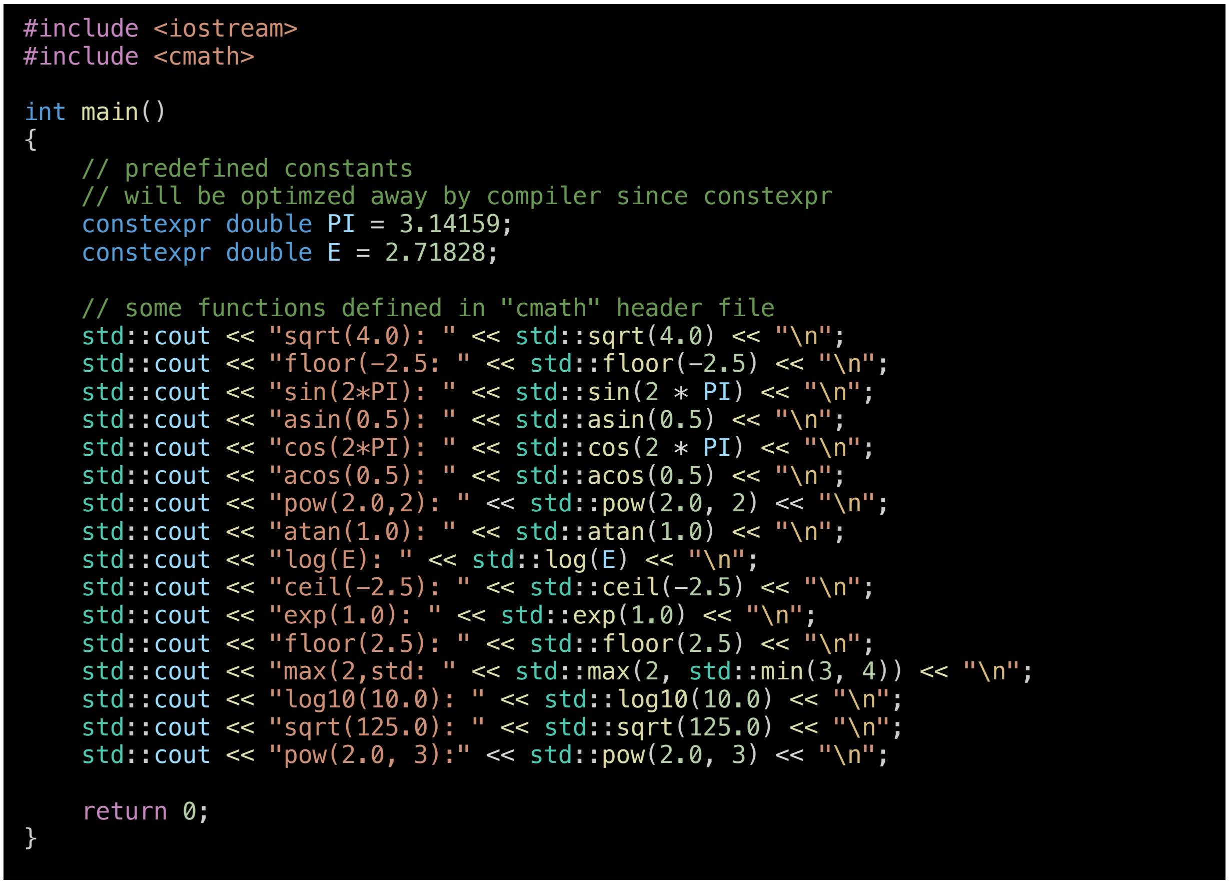
Class: BESE 16B

Batch: 2k25

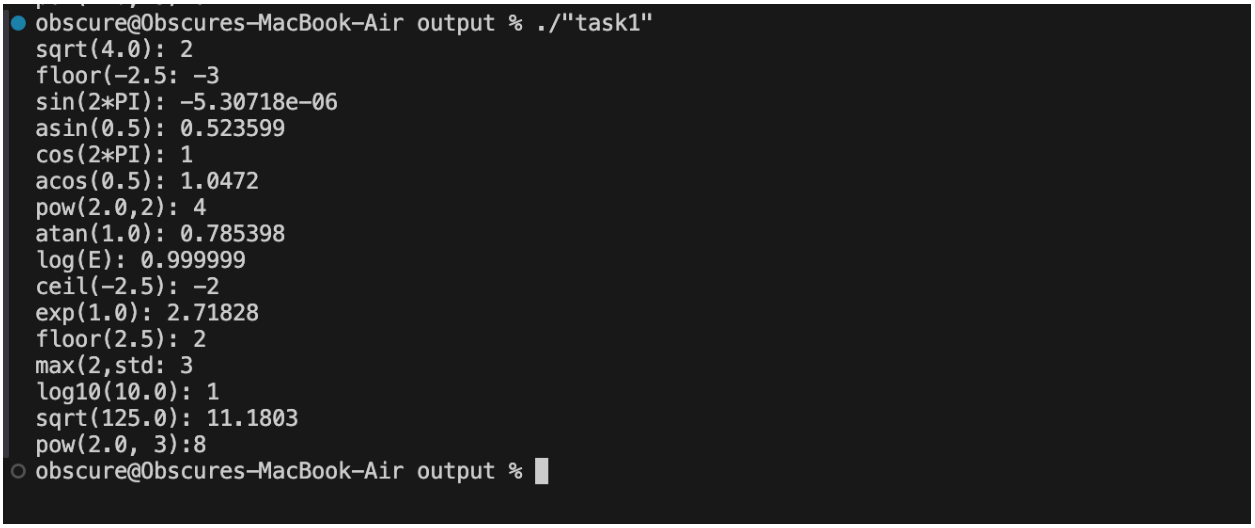
Task 1 [CLO 1]:

CODE:



```cpp
#include <iostream>
#include <cmath>

int main()
{
    // predefined constants
    // will be optimzed away by compiler since constexpr
    constexpr double PI = 3.14159;
    constexpr double E = 2.71828;

    // some functions defined in "cmath" header file
    std::cout << "sqrt(4.0): " << std::sqrt(4.0) << "\n";
    std::cout << "floor(-2.5: " << std::floor(-2.5) << "\n";
    std::cout << "sin(2*PI): " << std::sin(2 * PI) << "\n";
    std::cout << "asin(0.5): " << std::asin(0.5) << "\n";
    std::cout << "cos(2*PI): " << std::cos(2 * PI) << "\n";
    std::cout << "acos(0.5): " << std::acos(0.5) << "\n";
    std::cout << "pow(2.0,2): " << std::pow(2.0, 2) << "\n";
    std::cout << "atan(1.0): " << std::atan(1.0) << "\n";
    std::cout << "log(E): " << std::log(E) << "\n";
    std::cout << "ceil(-2.5): " << std::ceil(-2.5) << "\n";
    std::cout << "exp(1.0): " << std::exp(1.0) << "\n";
    std::cout << "floor(2.5): " << std::floor(2.5) << "\n";
    std::cout << "max(2,std: " << std::max(2, std::min(3, 4)) << "\n";
    std::cout << "log10(10.0): " << std::log10(10.0) << "\n";
    std::cout << "sqrt(125.0): " << std::sqrt(125.0) << "\n";
    std::cout << "pow(2.0, 3):" << std::pow(2.0, 3) << "\n";

    return 0;
}
```

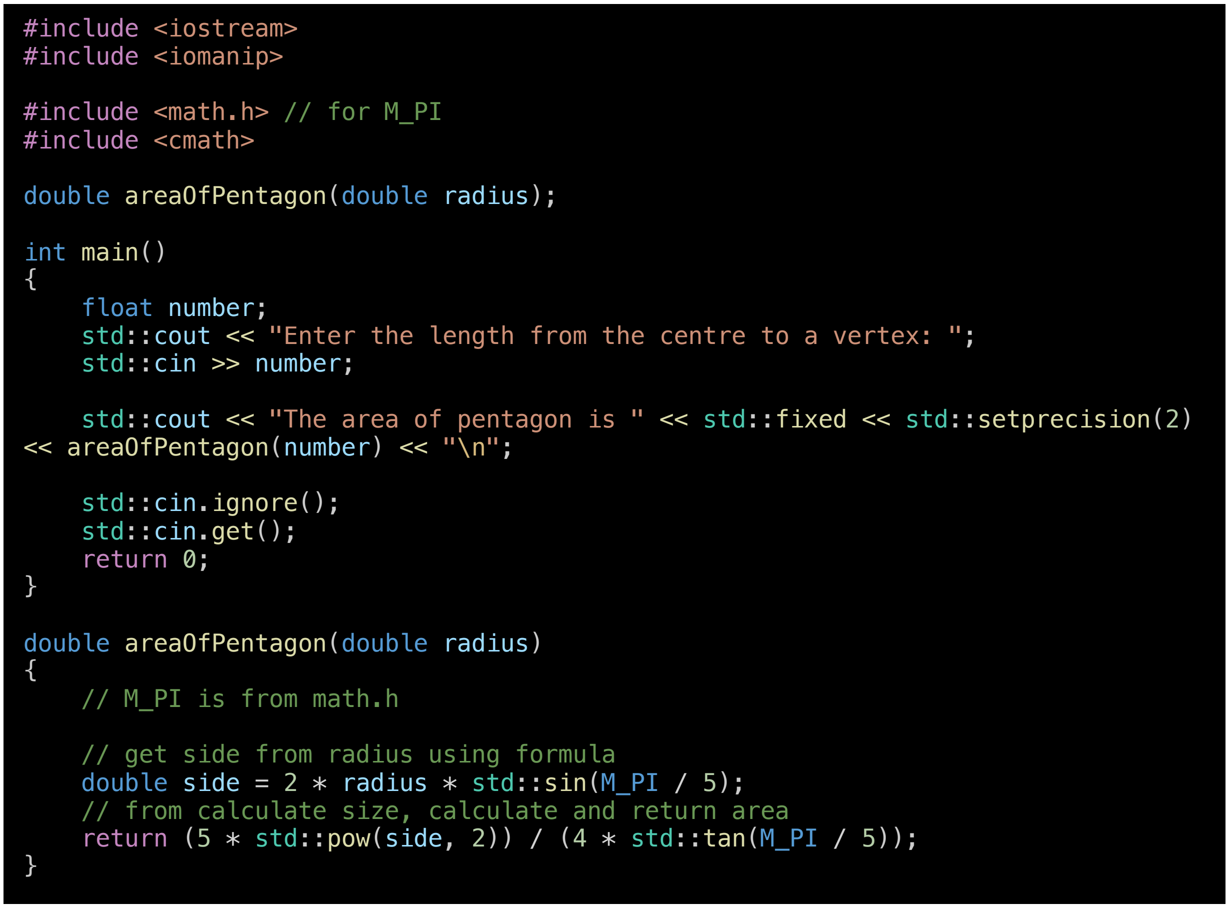
OUTPUT:



```
● obscure@Obscures-MacBook-Air output % ./"task1"
  sqrt(4.0): 2
  floor(-2.5: -3
  sin(2*PI): -5.30718e-06
  asin(0.5): 0.523599
  cos(2*PI): 1
  acos(0.5): 1.0472
  pow(2.0,2): 4
  atan(1.0): 0.785398
  log(E): 0.999999
  ceil(-2.5): -2
  exp(1.0): 2.71828
  floor(2.5): 2
  max(2,std: 3
  log10(10.0): 1
  sqrt(125.0): 11.1803
  pow(2.0, 3):8
○ obscure@Obscures-MacBook-Air output % █
```

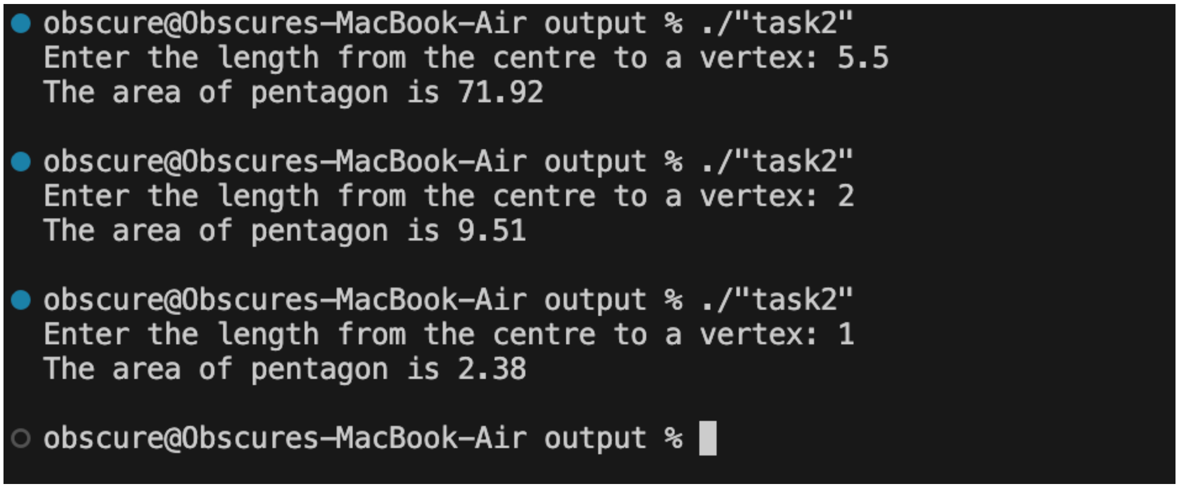
Task 2 [CLO 2]:

CODE:



```cpp
#include <iostream>
#include <iomanip>

#include <math.h> // for M_PI
#include <cmath>

double areaOfPentagon(double radius);

int main()
{
    float number;
    std::cout << "Enter the length from the centre to a vertex: ";
    std::cin >> number;

    std::cout << "The area of pentagon is " << std::fixed << std::setprecision(2)
<< areaOfPentagon(number) << "\n";

    std::cin.ignore();
    std::cin.get();
    return 0;
}

double areaOfPentagon(double radius)
{
    // M_PI is from math.h

    // get side from radius using formula
    double side = 2 * radius * std::sin(M_PI / 5);
    // from calculate size, calculate and return area
    return (5 * std::pow(side, 2)) / (4 * std::tan(M_PI / 5));
}
```

OUTPUT:



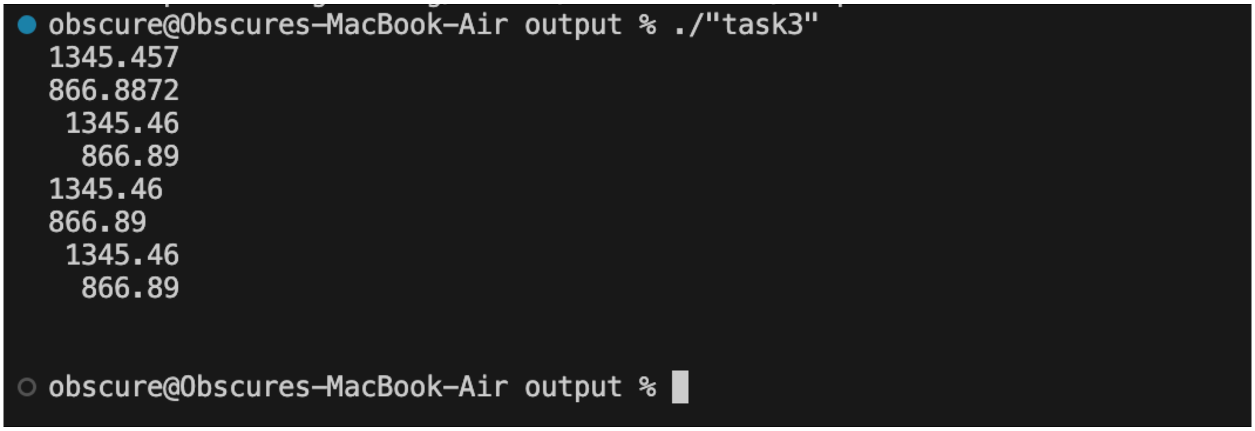
```
● obscure@Obscures-MacBook-Air output % ./"task2"
  Enter the length from the centre to a vertex: 5.5
  The area of pentagon is 71.92

● obscure@Obscures-MacBook-Air output % ./"task2"
  Enter the length from the centre to a vertex: 2
  The area of pentagon is 9.51

● obscure@Obscures-MacBook-Air output % ./"task2"
  Enter the length from the centre to a vertex: 1
  The area of pentagon is 2.38

○ obscure@Obscures-MacBook-Air output % █
```

Task 3 [CLO 1]:

CODE:

```
#include <iostream>
#include <iomanip>

int main()
{
    double monthlyPayment = 1345.4567;
    double totalPayment = 866.887234;

    std::cout << std::setprecision(7); // will not work; requieres fixed
    std::cout << monthlyPayment << std::endl;
    std::cout << totalPayment << std::endl;
    std::cout << std::fixed << std::setprecision(2); // will work now
    // all subsequent print statements printing float will be rounded down to two
decimal places
    std::cout << std::setw(8) << monthlyPayment << std::endl;
    std::cout << std::setw(8) << totalPayment << std::endl;
    std::cout << std::left; // all subsequent print statements will be aligned to
left
    std::cout << std::setw(8) << monthlyPayment << std::endl;
    std::cout << std::setw(8) << totalPayment << std::endl;
    std::cout << std::right; // all subsequent print statements will be aligned
to right
    std::cout << std::setw(8) << monthlyPayment << std::endl;
    std::cout << std::setw(8) << totalPayment << std::endl;

    std::cin.ignore();
    std::cin.get();
    return 0;
}
```

OUTPUT:

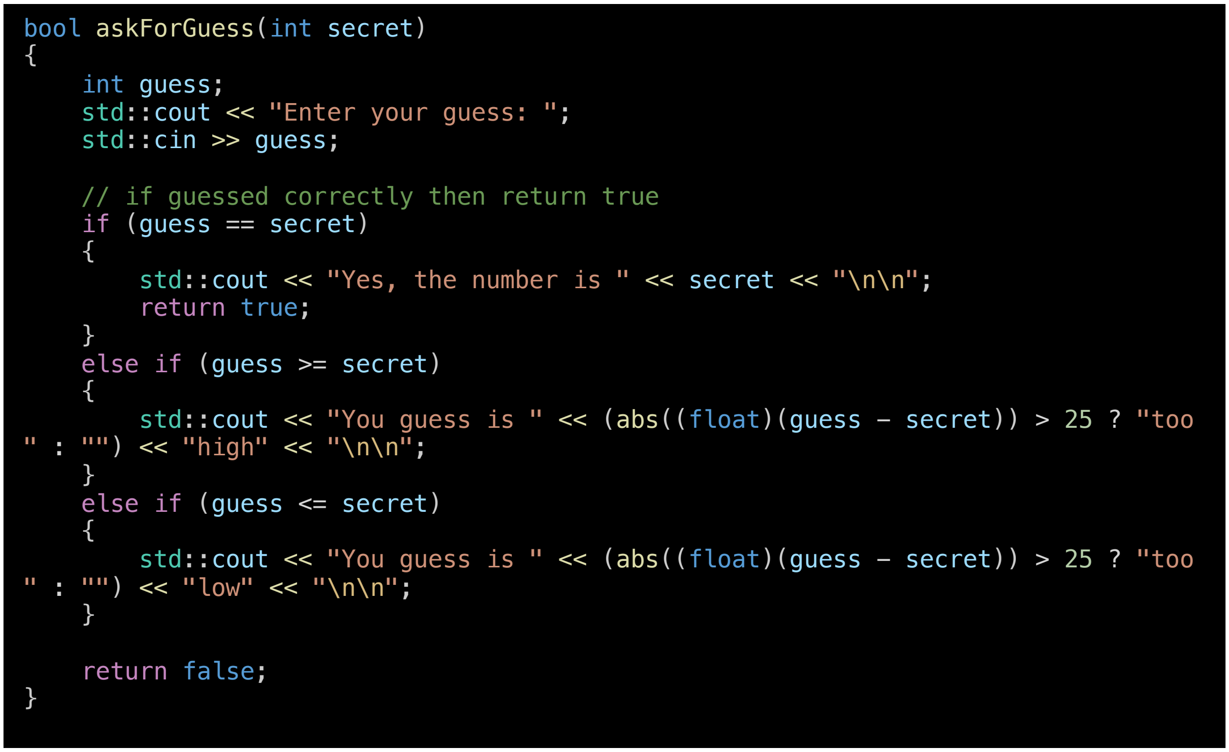


```
● obscure@Obscures-MacBook-Air output % ./"task3"
  1345.457
  866.8872
   1345.46
    866.89
  1345.46
  866.89
   1345.46
    866.89


○ obscure@Obscures-MacBook-Air output % █
```

Task 4 [CLO 2]:

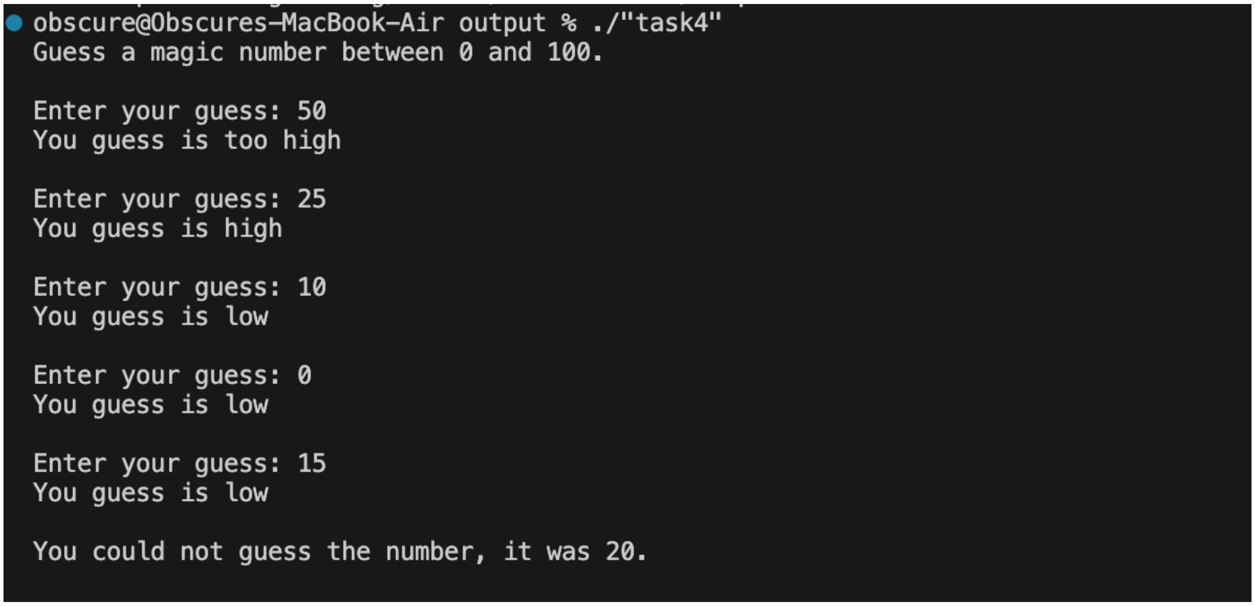
CODE:

```
#include <iostream>
#include <cstdlib>
#include <ctime>

int getRandom(int minInc, int maxInc);
bool askForGuess(int secret);

int main()
{
    srand(time(nullptr)); // for seeding rand() function

    // variables
    int secret = getRandom(1, 100);
    const size_t max_guesses = 5;
    bool has_guessed_correctly = false;

    std::cout << "Guess a magic number between 0 and 100.\n\n";

    for (size_t i = 0; i < max_guesses; i++)
    {
        has_guessed_correctly = askForGuess(secret);
        if (has_guessed_correctly)
            break;
    }

    if (!has_guessed_correctly)
    {
        std::cout << "You could not guess the number, it was " << secret <<
".\n\n";
    }

    // ignoring previous input
    std::cin.ignore();
    std::cin.get();
    return 0;
}

// get random value for int (% operator only supports int) between given values
inclusive
int getRandom(int minInc, int maxInc)
{
    // we later subtract bigger from smaller so swapping
    if (maxInc < minInc)
    {
        std::cerr << "WARNING> minInc is greater than maxInc. Swapping\n\n";
        std::swap(minInc, maxInc);
    }

    // first term: calculate random number from 0 to (max - min): min will be
added later
    // second term: offset by min
    return (rand() % maxInc - minInc + 1) + minInc;
}
```

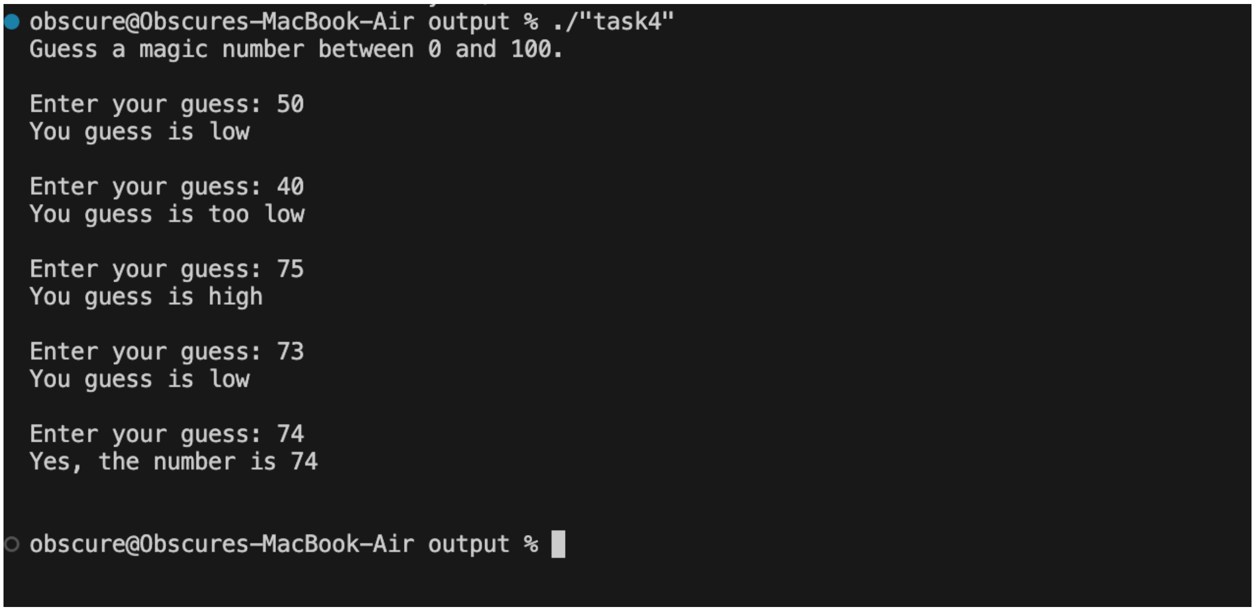


```
bool askForGuess(int secret)
{
    int guess;
    std::cout << "Enter your guess: ";
    std::cin >> guess;

    // if guessed correctly then return true
    if (guess == secret)
    {
        std::cout << "Yes, the number is " << secret << "\n\n";
        return true;
    }
    else if (guess >= secret)
    {
        std::cout << "You guess is " << (abs((float)(guess - secret)) > 25 ? "too
" : "") << "high" << "\n\n";
    }
    else if (guess <= secret)
    {
        std::cout << "You guess is " << (abs((float)(guess - secret)) > 25 ? "too
" : "") << "low" << "\n\n";
    }

    return false;
}
```

OUTPUT:



```
obscure@Obscures-MacBook-Air output % ./"task4"
Guess a magic number between 0 and 100.

Enter your guess: 50
You guess is too high

Enter your guess: 25
You guess is high

Enter your guess: 10
You guess is low

Enter your guess: 0
You guess is low

Enter your guess: 15
You guess is low

You could not guess the number, it was 20.
```



```
obscure@Obscures-MacBook-Air output % ./"task4"
Guess a magic number between 0 and 100.

Enter your guess: 50
You guess is low

Enter your guess: 40
You guess is too low

Enter your guess: 75
You guess is high

Enter your guess: 73
You guess is low

Enter your guess: 74
Yes, the number is 74


obscure@Obscures-MacBook-Air output % 
```