1- Trace the following program and predict the output.

Input

```
5
```

```cpp
// www.gammal.tech

#include <iostream>
using namespace std;

int main() {
    int a;
    cin >> a;

    while (a) {
        if (a % 2 == 0) {
            cout << a << endl;
        }
        a--;
    }

    return 0;
}
```

Solution

```
4
2
```

2- Trace the following program and predict the output.
Input

```
17
```

```cpp
// www.gammal.tech

#include <iostream>
using namespace std;

int main() {
    int a;
    cin >> a;

    while (a) {
        if (a > 1) {
            int i;
            for (i = 2; i * i <= a; i++) {
                if (a % i == 0) {
                    break;
                }
            }
            if (i * i > a) {
                cout << a << endl;
            }
        }
        a--;
    }

    return 0;
}
```

Solution

```
17
13
11
7
5
3
2
```

3- Trace the following program and predict the output.
Input

```
8
```

```cpp
// www.gammal.tech

#include <iostream>
using namespace std;

int main() {
    int a;
    cin >> a;

    int sum = 0;
    while (a) {
        if (a % 2 == 0) {
            sum += a * a;
        }
        a--;
    }

    cout << "num : " << sum << endl;

    return 0;
}
```

Solution

```
num : 120
```

4- Trace the following program and predict the output.

Input

```
20
```

```cpp
// www.gammal.tech

#include <iostream>
using namespace std;

int main() {
    int a;
    cin >> a;

    int count = 0;
    while (a) {
        if (a % 3 == 0) {
            cout << a << endl;
            count++;
        }
        a--;
    }

    cout << "num : " << count << endl;

    return 0;
}
```

Solution

```
18
15
12
9
6
3
num : 6
```

5- Trace the following program and predict the output.
Input

```
5
```

```cpp
// www.gammal.tech

#include <iostream>
using namespace std;

int main() {
    int a;
    cin >> a;

    for (int i = 1; i <= a; i++) {
        for (int j = 1; j <= i; j++) {
            cout << j << " ";
        }
        cout << endl;
    }

    return 0;
}
```

Solution

```
1
1 2
1 2 3
1 2 3 4
1 2 3 4 5
```

6- Trace the following program and predict the output.

Input

```
6
```

```cpp
// www.gammal.tech

#include <iostream>
using namespace std;

int main() {
    int n;
    cin >> n;

    int a = 0, b = 1, nextTerm;
    cout << "\n";
    for (int i = 0; i < n; i++) {
        cout << a << " ";
        nextTerm = a + b;
        a = b;
        b = nextTerm;
    }
    cout << endl;

    return 0;
}
```

Solution

```
0 1 1 2 3 5
```

7- Trace the following program and predict the output.

Input

```
5
```

```cpp
// www.gammal.tech

#include <iostream>
using namespace std;

int main() {
    int a;
    cin >> a;

    int num = 1;
    while (a) {
        num += a;
        a--;
    }

    cout << "num : " << num << endl;

    return 0;
}
```

Solution

```
num : 16
```

8- Trace the following program and predict the output.
Input

```
3
```

```cpp
// www.gammal.tech

#include <iostream>
using namespace std;

int main() {
    int a;
    cin >> a;

    int factorial = 1;
    while (a) {
        factorial *= a;
        a--;
    }

    cout << "Factorial: " << factorial << endl;

    return 0;
}
```

Solution

```
Factorial: 6
```

9- Trace the following program and predict the output.
Input

```
123
```

```cpp
// www.gammal.tech

#include <iostream>
using namespace std;

int main() {
    int a;
    cin >> a;

    int count = 0;
    while (a) {
        count++;
        a /= 10;
    }

    cout << "Number : " << count << endl;

    return 0;
}
```

Solution

```
Number : 3
```

10- Trace the following program and predict the output.

Input

```
153
```

```cpp
// www.gammal.tech

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

int main() {
    int num, original, sum = 0, digit;
    cin >> num;
    original = num;

    while (num) {
        digit = num % 10;
        sum += pow(digit, 3);
        num /= 10;
    }

    if (sum == original) {
        cout << "Armstrong Number" << endl;
    } else {
        cout << "Not an Armstrong Number" << endl;
    }

    return 0;
}
```

Solution

```
Armstrong Number
```
