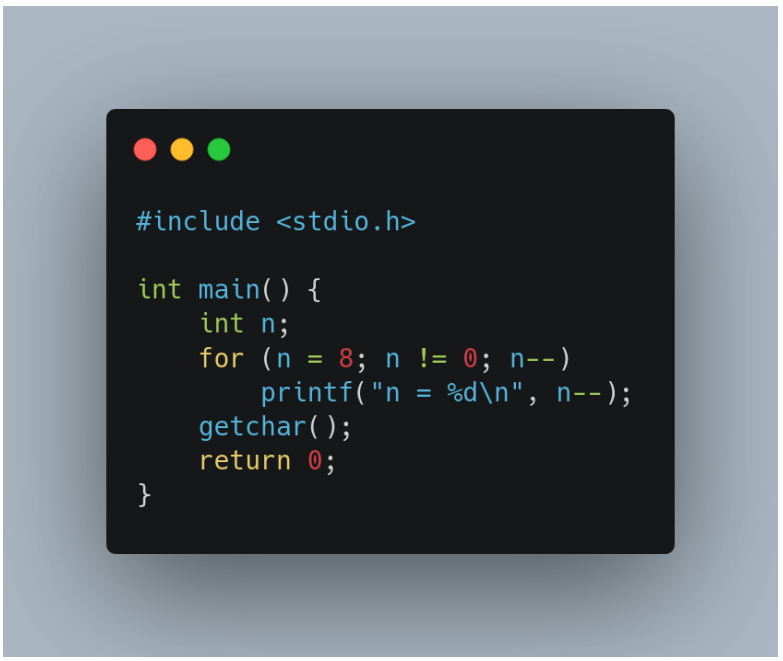
Practice Problems for Week 2

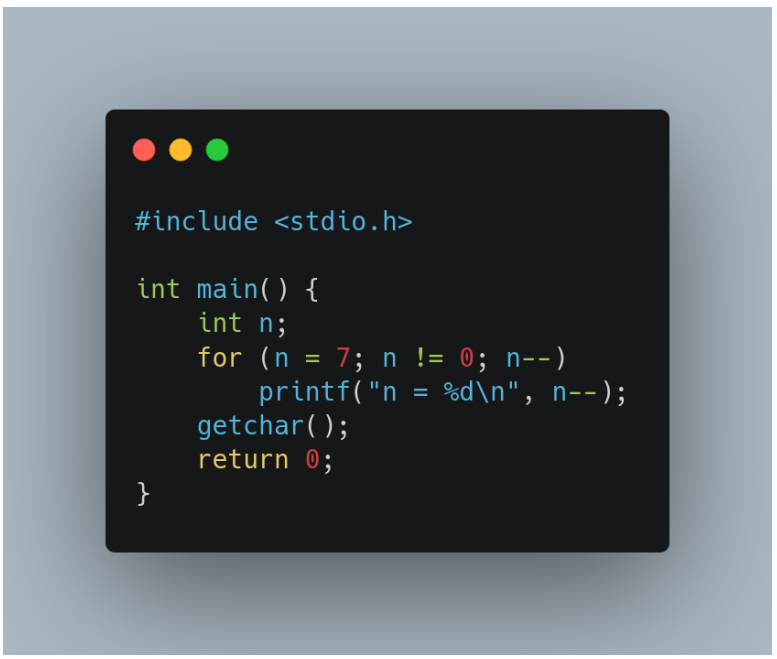
1. Predict whether the following codes will terminate or go into an infinite loop. If the code terminates, print the expected output.

A.



```c
#include <stdio.h>

int main() {
    int n;
    for (n = 8; n != 0; n--)
        printf("n = %d\n", n--);
    getchar();
    return 0;
}
```

B.

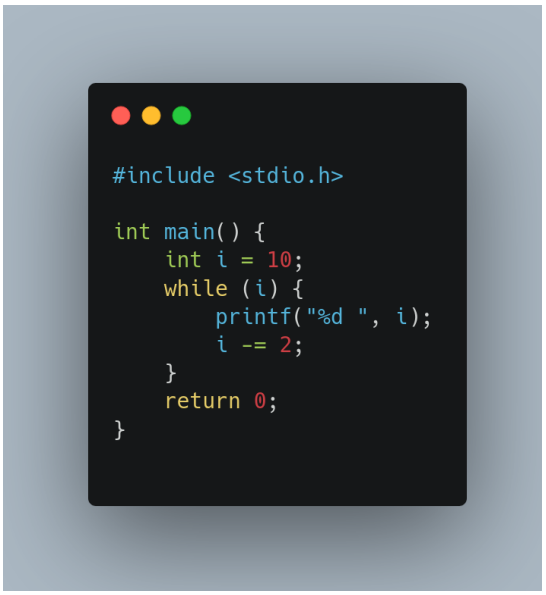


```c
#include <stdio.h>

int main() {
    int n;
    for (n = 7; n != 0; n--)
        printf("n = %d\n", n--);
    getchar();
    return 0;
}
```

C.

```c
#include <stdio.h>

int main() {
    int i = 0;
    for (printf("initStatement\n"); printf("conditionStatement\n"); printf("updateStatement\n")) {
        i++;
        if (i == 3)
            break;
    }
    return 0;
}
```

D.

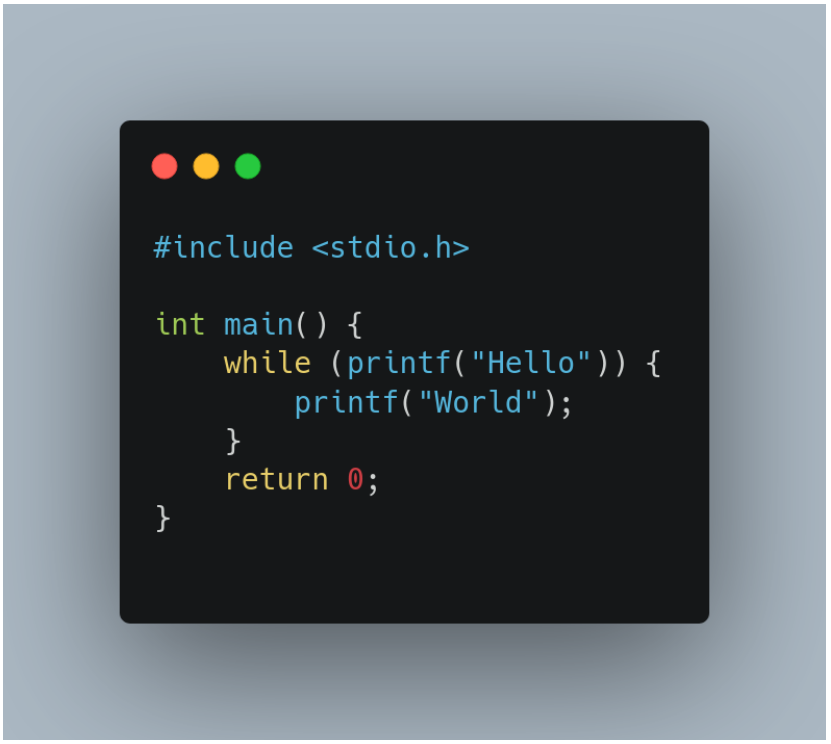


```c
#include <stdio.h>

int main() {
    int i = 10;
    while (i) {
        printf("%d ", i);
        i -= 2;
    }
    return 0;
}
```

E.

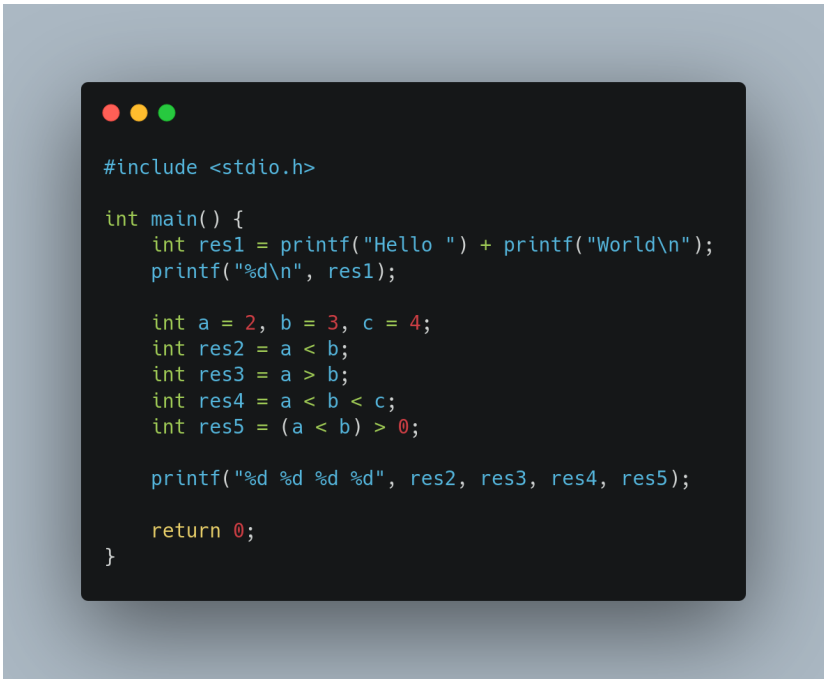
```c
#include <stdio.h>

int main() {
    int i = 10;
    while (i) {
        printf("%d ", i);
        i -= 3;
    }
    return 0;
}
```

F.



```c
#include <stdio.h>

int main() {
    while (printf("Hello")) {
        printf("World");
    }
    return 0;
}
```

G.



```c
#include <stdio.h>

int main() {
    int res1 = printf("Hello ") + printf("World\n");
    printf("%d\n", res1);

    int a = 2, b = 3, c = 4;
    int res2 = a < b;
    int res3 = a > b;
    int res4 = a < b < c;
    int res5 = (a < b) > 0;

    printf("%d %d %d %d", res2, res3, res4, res5);

    return 0;
}
```

2. Given marks as input, output the grade based on the following grading scheme:

Marks(inclusive)	Grade
90 - 100	A
80 - 89	B

70 - 79	C
60 - 69	D
0 - 59	E

3. Given a number ***N***, print all factors of the number ***N***.
    a. Subtask 1:
        $1 <= N <= 10^5$
    b. Subtask 2:
        $1 <= N <= 10^9$

4. Given ***N*** natural numbers as input, find the smallest natural number which is not included in the input.

    Input Format:
    a. The first line of input contains an integer ***N***, the number of natural numbers given as input.
    b. The second line of input contains ***N*** natural numbers (a_1, a_2, a_3, …, a_N)

    Output Format:
    Print a single number, the smallest natural number which is not given as input.

    Constraints:
    $1 <= N <= 10^5$
    $1 <= a_i <= 10^9$

    Example:
    Input1:
    7
    8 1 7 3 5 6 2
    Output1:
    4
    Input2:
    5
    1 2 3 4 5
    Output2:
    6

5.
    a. Given a number ***N***, print (Factorial(N)).
        Example:
        Input: 5
        Output: 120

    b. Given two integers ***N*** and ***R***, print ${}^{N}C_{R}$

        Example:
        Input: 5 3
        Output: 10