CS 7A - Fall 2019 - Midterm 1. 10/31/19

Write all responses on separate paper.

1. Which of the following declarations are illegal, and why? Be sure to state your reasons.

   (a) `int double;`

   (b) `double 33.7;`

   (c) `bool end?;`

   (d) `unsigned int next-number;`

2. Each of the following programs has error(s). Locate the error(s), classify each error as either a syntax error, or a logical error and then correct it.:

   (a)
```
#include <iostream>

int main()
    double x = 2.7e-1;
    int y = x;
    int a = 1000;
    char b = a;
    std::cout << "\ny = " << y << " and " << "\nb = " << b << endl;
}
```

   (b)
```
#include <iostream>
int main() {
   float n /= 10.1;
   std::cout << n*10.1: }
```

3. Write a loop that will cause an integer overflow error in any compiler.

4. Determine whether each boolean expression is `true` or `false`, assuming `w=2, x=3, y=5` and `z=7`.

   (a) `x-2==1 && z+x==10`

   (b) `++x == --y`

   (c) `w % x * y > 10 || y % z * x == 14`

5. What is the output of the following program if the user inputs `1600`?

```
#include <iostream>
using namespace std;
int main() {
    int murbs, hurbs, durbs, x;
    cout << "\nInput a an integer: ";
    cin >> x;
    durbs = x/(4*6);
    hurbs = x%(4*6)/3;
    murbs = x%(4*6)%6;
    cout << endl << x << " murbs is equivalent to " << durbs
        << " durbs  and " << hurbs << " murbs";
}
```

6. Consider the following program fragment.

```
int accumulator = 0, sam, pam;
cout << "\nEnter integers for sam and pam: ";
cin >> sam >> pam;
while (true ) {
   if (pam == 0) break ;
   accumulator += ((pam % 2 == 1) ? sam : 0);
   pam /= 2;
   sam *= 2;
}
cout << accumulator << "\n";
```

(a) Complete the following tables until the program completes, or indicate that it's an infinite loop:

sam	pam	accumulator
5	4	0

sam	pam	accumulator
6	17	0

(b) In a few words, describe the output of this program in terms of the input values of `sam` and `pam`, and how it works.

7. Consider the following program:

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

int main() {
    int i = 5;
    for(int i = 1; i < 10; ++i) {
        cout << i*i << '\t';
        if(i%3 == 0) cout << endl;
    }
    cout << "\ni = " << i << endl;
    return 0;
}
```

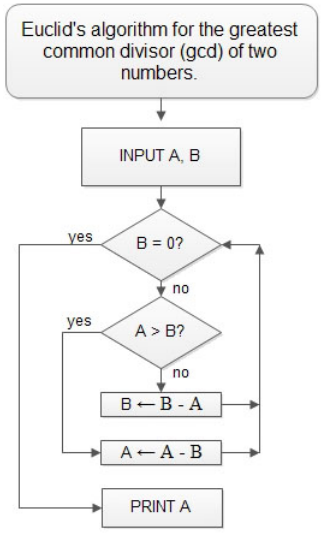
   (a) What is the output of the program?
   (b) Rewrite the for loop as an equivalent while loop and so that the output of the program doesn't change.

8. The sum of the first n cubes is given by $1 + 2^3 + 3^3 + \cdots + n^3 = \left(\frac{n(n+1)}{2}\right)^2$. Write a complete program that checks this formula by inputting n and then computing and comparing the values of both sides of the equation.

9. Consider the flow chart for a greatest common divisor algorithm shown at right.

   (a) Tabulate values for `A` and `B` as the algorithm progresses. Start with `A = 1232` and `B = 1190`.

   (b) Write a C++ function that takes integer parameters `A` and `B` and returns the output of this algorithm.



10. Consider the code below:

```
int main() {
    cout << "\nInput a year and this program will determine if it's a leap year.";
    cout << "\nInput ctrl+d to quit:";
int N;
    while(cin >> N) {
        if(/*condition for N to be divisible by 4*/) {
            if(/*N is divisible by 400*/) cout << endl << N << " is a leap year.";
            else if(/*N is divisible by 100*/)
                cout << endl << N << " is not a leap year.";
```

```
            else cout << endl << N << " is a leap year.";
        }
        else cout << endl << N << " is not a leap year.";
        cout << "\nInput a year and this program will determine if it's a leap year.";
        cout << "\nInput ctrl+d to quit:";
    }
    return 0;
}
```

(a) Fill in appropriate code for the conditional of each if statement.

(b) What happens when the user enters 2000?