

COS126 Scientific Computation Questions

1. Imagine you can only store and use integers with 10 digits. What results when you add $9999999999 + 0000000001$?
2. Using a factorial method which returns $N!$ as an `int`, you get the following results:

```
30! = 1409286144
31! = 738197504
32! = -2147483648
```

What happened?

3. What will the following java fragment print?

```
double x1 = 0.3;
double x2 = 0.1 + 0.1 + 0.1;
StdOut.println(x1 == x2);

double z1 = 0.5;
double z2 = 0.1 + 0.1 + 0.1 + 0.1 + 0.1;
StdOut.println(z1 == z2);
```

4. Is the previous result a consequence of Round Off Error or Catastrophic Cancellation?
5. Will the following java fragment print 0.0?

```
System.out.println( (.3 - .1 - .1 - .1)*1e15);
```

6. Is the previous result a consequence of Round Off Error or Catastrophic Cancellation?
7. Give an example when java will give you NaN.
8. Give an example when java will give you Infinity.
9. What will the following java fragment print?

```
System.out.println( 1/0 );
```

10. What will the following java fragment print?

```
System.out.println( 1000000000000. + .00001);
```

11. Why is an ill-conditioned problem worse than an unstable algorithm?