Objective Questions for Algorithm Interviewing

(20 min is recommended for these questions)

1. How many ways are there to put 6 same balls into 3 different boxes (empty box not allowed)?
2. Let `f(x)=ln(1+exp(-x))`, then what is `f'(0)`?
3. What is the projection of the vector `[1,1,1]` onto the plane `x+y=0`, in Euclidean 3-D space?
4. The *Binomial Distribution* `X~B(100, 0.4)` is very similar to a *Gaussian Distribution* `X~N(____, ____)`.
5. How many nodes are there in a *complete binary tree* with 3 nodes in the last layer and 16 nodes in the second to last layer?
6. We have an empty *LRU cache* with capacity 3. What are the keys in the cache after the following sequence of operations?
   `[put(1, 1), put(2, 2), put(3, 3), get(1), get(4), put(4, 4), get(3), put(1, 5), put(5, 6)]`
7. Complete the following code:
```
void swap_without_tmp(int& a, int& b) {
    a = a ^ b;
    b = a ^ b;
    _________;
}
```
8. The statement `` `x = a>b ? a*2 : b-1;` `` in C is equivalent to `` `_____` `` in Python. (A single-line statement is preferred)
9. Say we train a SVM on the classification problem `X->Y` of 4 samples $\{(X_i,Y_i)\}$ = `{([0,0],1), ([0,1],1), ([1,0],0), ([1,1],1)}`, then what are the support vectors?
10. Let `values=[1, 2, 3, 4, 5]`, and `filter=[-1, 2, -1]`, then what is the result of vector convolution `` `conv1d(values,filter)` `` with stride 1 and without padding?