Answer Key for Practice Questions on Complexity (Week 3)

Tutorial Questions

1. O(n)

2.

	Number of steps	Big O
a	$9 + 0.02N^2 + 0.1N$	$O(N^2)$
b	$N^2 + 2N^{-3}$	$O(N^2)$
c	$N! + 100N^{20}$	$O(N!)$
d	$2^N + N!$	$O(N!)$
e	$5N(\log_2 N) + N \times \text{sqrt}(N)$	$O(N^{1.5})$
f	$N^2(\log_2 N) + N(\log_2 N)^2$	$O(N^2 \log N)$
g	$10N^2\log(N) + 5N^3 + N^{\log(N)}$	$O(N^{\log N})$
h	$10^5 + 10^4(\log(N))^2 + 10^3\log(N^2)$	$O((\log N)^2)$

See https://youtu.be/GEQPI5FWjfc

3. The complexities are:
   a. O(n + m) or O(max(n, m))
   b. $O(n^2)$
   c. $O(n^2)$

   See 3(c): https://youtu.be/ezIA4GqDzx8

4. The complexities are:
   a. For f(n), it's O(n)
   b. For g(n), it's $O(n^2)$
   c. For h(n), it's $O(n^2)$

   See https://youtu.be/Pc-kO4IOMHc

5. The complexities:
   a. $O(n^2)$
   b. $O(n^3)$

   See https://youtu.be/all1ZpUNhic

6. The complexities:
   a. $O(n^3)$
   b. $O(n^4)$
   c. $O(n^3 \log n)$

   See (a) https://youtu.be/LCpce0_-0AA
   (b) https://youtu.be/hvKe-AFm2Vs
   (c) https://youtu.be/TKjHmpCe9H0

Extra Practice Questions

7. O(1)

8.

	Number of steps	Big O
a	$2N^2 + 2N^3 + 3N^4$	$O(N^4)$
b	$N^2 \times 2N^{-3}$	$O(N^{-1})$
c	$N! \times 100N^{20}$	$O(N! \times N^{20})$
d	$5 \times (2N)!$	O((2N)!)
e	$N(\log_2 N) + N(\log_3 N) + N(\log_4 N)$	O(N log N)
f	$N(\log_2 (2N))$	O(N log N)
g	$1000 + 5\log(N) + 2N + N^2 + 2^{2N}$	$O(2^{2N})$
h	$\log(N^5) + \log_5(N) + 5N$	O(N)

9. The complexities are:
    a. O(n)
    b. $O(n^2)$
    c. O(nk)

10. The complexities are:
    a. $O(n^2)$
    b. O(n log n)
    c. $O(n^2)$

11. Answers:
    a. $O(2^n)$
    b. O(1)

12. Answers:
    a. These lines set **ith_min** to the next smallest value after **min**.
    So, if a = [1, 2, 3, 4, 5] (position of the elements in a does not matter), max = 5 and min = 1.
    ith_min will be set to 2.
    If min = 2, **ith_min** will be set to 3.
    If min = 3, **ith_min** will be set to 4.
    b. i = 4, ith_min = 6
    c. $O(n^2)$
    d. Possible to come up with an algorithm with time complexity of O(n log n).

~End