CSI 33 Solutions to Chapter 1 exercises

True/False

4. False
A function's **signature** is an interface of a function (name, parameter(s) and return value(s)).

5. False
There is a convention for a well-designed function to present all the side effects in its specification (described in postconditions).

6. True
**Θ(n)** algorithms works faster than **Θ(n²)** algorithm.

9. False
big-O notation gives only upper bound, whereas the Θ-notations gives both lower and upper bounds.

10. True (see the explanation in 9.)

Multiple Choice

1. b)
see the definition of the signature of a function at the end of the book (page 560)

2. b), c)

3. d)

4. a)

5. d)

6. c)
Solution:
n = 1,000,000 and, T(n) ≈ 3 seconds, where T(n) is Θ(n²).
Therefore, roughly, \( bn^2 < T(1,000,000) < an^2 \) or
\( b*1,000,000,000,000 < 3 < a*1,000,000,000,000 \)
If we multiply all sides by 4, we will get:
\( b*4,000,000,000,000 < 12 < a*4,000,000,000,000 \) or
\( b*(2,000,000)^2 < 12 < a*(2,000,000)^2 \)
which is an approximate running time of the same algorithm with 2,000,000 elements as input.

10. c)
Solution:
2,000,000 (input) → 4,000,000,000,000 (operations performed in algorithm)
4,000,000,000,000 (operations) ÷ 1,000,000,000 (operations per second) = 4,000 (seconds)