COSC 320 - Advanced Data Structures and Algorithm Analysis
Homework 2

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Write the running time of the following algorithms as a precise function $T(n)$ (if it is recursive, $T(n)$ should be a recurrence relation), then simplify it to give the tightest asymptotic estimate you can:

1.
   1: **function** A(n)
   2:   $s := 0$
   3:   $i := 0$
   4:   **while** $i < n^2$ **do**
   5:     $s := s + i$
   6:     $j := i$
   7:     **while** $j < i^2$ **do**
   8:       $s := s + 10$
   9:       $j := j + 1$
   10:     **end while**
   11:     $i := i + 1$
   12:   **end while**
   13:   **return** s
   14: **end function**

2.
   1: **function** B(n)
   2:   $s := 0$
   3:   $i := 0$
   4:   **while** $i < n^2$ **do**
   5:     $s := s + i$
   6:     $j := 0$
   7:     **while** $j < i$ **do**
   8:       $s := s/2$
   9:       $k := j$
   10:       **while** $k > 0$ **do**
   11:         $s := s + 2$
   12:         $k := k - 3$
   13:       **end while**
   14:       $j := j + 2$
   15:     **end while**
   16:     $i := i + 2$
   17:   **end while**
   18:   **return** s
   19: **end function**

3.
   1: **function** C(n)
   2:   $s := 0$
   3:   **for** $i := 5n$ to $6n^3$ **do**

```
4:            for j := 5 to i do
5:                for k := j to i do
6:                    s := j + i
7:                end for
8:            end for
9:        end for
10:       return s
11: end function
```

4.
```
1: function D(n)
2:     if n ≤ 9 then
3:         return 25
4:     end if
5:     for i := 1 to n do
6:         for j := 1 to ⌊n/3⌋ do
7:             x := 17 + x
8:         end for
9:     end for
10:    return D(⌊n/3⌋)
11: end function
```

5.
```
1: function E(n)
2:     if n ≤ 10 then
3:         return 1
4:     end if
5:     while i < n do
6:         s := s + 1
7:         i := i + 2
8:     end while
9:     s := s + E(⌊n/2⌋) + E(⌊n/2⌋)
10: end function
```

6.
```
1: function E(n)
2:     if n ≤ 10 then
3:         return 1
4:     end if
5:     while i < n do
6:         s := s + 1
7:         i := i + 2
8:     end while
9:     s := s + E(⌊n/2⌋) + E(⌊n/2⌋) + E(⌊n/2⌋)
10: end function
```