QB1

Big Oh (simple)

Do NOT write on this test. Record all answers on the bubble sheet. **Closed book. No notes.** Work strictly from memory. No time limit. **No calculators. Scratch paper okay.**

1/2p.   Give a tight big-oh $\Theta()$ bound on the running time T(n) of this program.

Assume `atoi`, `simpleStatement`, and `simpleCompare` each run in $\Theta(1)$ time.

(A) n^9 (C) n^7 (E) n^5 (G) n^3 (I) n

(B) n^8 (D) n^6 (F) n^4 (H) n^2 (J) 1

```
int main ( int argc, char * * argv ) {
   int n = atoi(argv[1]);
   if ( simpleCompare ) {
      for ( b = 1 ; b < n ; b += 3 ) {
         if ( simpleCompare ) {
            for ( i = 1 ; i < n ; i += 2 ) {
               if ( simpleCompare ) {
                  simpleStatement;
               } else {
                  simpleStatement;
               }
            }
         } else {
            simpleStatement;
         }
      }
   }
   return 0; }
```

2/2p.   Give a tight big-oh $\Theta()$ bound on the running time T(n) of this program.

Assume `atoi`, `simpleStatement`, and `simpleCompare` each run in $\Theta(1)$ time.

(A) n^9 (C) n^7 (E) n^5 (G) n^3 (I) n

(B) n^8 (D) n^6 (F) n^4 (H) n^2 (J) 1

```
int main ( int argc, char * * argv ) {
   int n = atoi(argv[1]);
   i = 1; do {
      if ( simpleCompare ) {
         c = 1; while ( c < n ) {
            h = 1; while ( h < n ) {
               simpleStatement;
            h++; }
         c++; }
      } else {
         if ( simpleCompare ) {
            simpleStatement;
         }
      }
   i++; } while ( i < n );
   return 0; }
```

q09 v1115962469

QB1

3/2p.   Give a tight big-oh $\Theta()$ bound on the running time T(n) of this program.
Assume `atoi`, `simpleStatement`, and `simpleCompare` each run in $\Theta(1)$ time.
(A) n^9 (C) n^7 (E) n^5 (G) n^3 (I) n
(B) n^8 (D) n^6 (F) n^4 (H) n^2 (J) 1

```
int main ( int argc, char * * argv ) {
   int n = atoi(argv[1]);
   if ( simpleCompare ) {
      if ( simpleCompare ) {
         if ( simpleCompare ) {
            if ( simpleCompare ) {
               if ( simpleCompare ) {
                  if ( simpleCompare ) {
                     simpleStatement;
                  } else {
                     simpleStatement;
                  }
               } else {
                  simpleStatement;
               }
            } else {
               simpleStatement;
            }
         } else {
            c = 1; do {
               simpleStatement;
            c += 10; } while ( c < n );
         }
      }
   } else {
      if ( simpleCompare ) {
         if ( simpleCompare ) {
            if ( simpleCompare ) {
               f = 1; while ( f < n ) {
                  simpleStatement;
               f += 10; }
            } else {
               simpleStatement;
            }
         }
      } else {
         h = 1; do {
            simpleStatement;
         h++; } while ( h < n );
      }
   }
   return 0; }
```

QB1

4/2p.   Give a tight big-oh $\Theta()$ bound on the running time T(n) of this program.
Assume `atoi`, `simpleStatement`, and `simpleCompare` each run in $\Theta(1)$ time.
(A) n^9 (C) n^7 (E) n^5 (G) n^3 (I) n
(B) n^8 (D) n^6 (F) n^4 (H) n^2 (J) 1

```
int main ( int argc, char * * argv ) {
   int n = atoi(argv[1]);
   if ( simpleCompare ) {
      for ( h = n ; h > 1 ; h-- ) {
         if ( simpleCompare ) {
            if ( simpleCompare ) {
               if ( simpleCompare ) {
                  f = 1; while ( f < n ) {
                     g = 1; while ( g < n ) {
                        simpleStatement;
                     g += 3; }
                  f++; }
               }
            } else {
               d = n; do {
                  simpleStatement;
               d -= 10; } while ( d > 1 );
            }
         }
      }
   } else {
      for ( k = n ; k > 1 ; k -= 1 ) {
         if ( simpleCompare ) {
            for ( c = n ; c > 1 ; c -= 3 ) {
               if ( simpleCompare ) {
                  simpleStatement;
               } else {
                  simpleStatement;
               }
            }
         } else {
            j = 1; do {
               simpleStatement;
            j += 3; } while ( j < n );
         }
      }
   }
   return 0; }
```

5/2p.   Give a tight big-oh $\Theta()$ bound on the running time T(n) of this program.
Assume `atoi`, `simpleStatement`, and `simpleCompare` each run in $\Theta(1)$ time.
(A) n^9 (C) n^7 (E) n^5 (G) n^3 (I) n
(B) n^8 (D) n^6 (F) n^4 (H) n^2 (J) 1

```
int main ( int argc, char * * argv ) {
   int n = atoi(argv[1]);
   for ( e = 1 ; e < n ; e++ ) {
      if ( simpleCompare ) {
         for ( b = n ; b > 1 ; b-- ) {
            if ( simpleCompare ) {
               c = n; do {
                  if ( simpleCompare ) {
                     for ( h = n ; h > 1 ; h-- ) {
                        simpleStatement;
                     }
                  }
               c--; } while ( c > 1 );
            } else {
               if ( simpleCompare ) {
                  simpleStatement;
               } else {
                  simpleStatement;
               }
            }
         }
      } else {
         if ( simpleCompare ) {
            k = 1; while ( k < n ) {
               for ( g = 1 ; g < n ; g += 2 ) {
                  d = n; while ( d > 1 ) {
                     simpleStatement;
                  d--; }
               }
            k += 1; }
         } else {
            j = 1; while ( j < n ) {
               simpleStatement;
            j++; }
         }
      }
   }
   return 0; }
```

QB1

Total points 10.

QB1

Answer Key (points per line)

1 (2).	H	(n^2)
2 (2).	G	(n^3)
3 (2).	I	(n)
4 (2).	G	(n^3)
5 (2).	F	(n^4)

Total points 10.