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 ) {
      g = n; do {
         f = 1; while ( f < n ) {
            if ( simpleCompare ) {
               simpleStatement;
            } else {
               simpleStatement;
            }
         f += 2; }
      g--; } while ( g > 1 );
   } else {
      j = 1; do {
         simpleStatement;
      j++; } while ( j < n );
   }
   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]);
   if ( simpleCompare ) {
      if ( simpleCompare ) {
         if ( simpleCompare ) {
            simpleStatement;
         } else {
            simpleStatement;
         }
      } else {
         simpleStatement;
      }
   } else {
      simpleStatement;
   }
   return 0; }
```

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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]);
   for ( h = n ; h > 1 ; h-- ) {
      if ( simpleCompare ) {
         i = n; while ( i > 1 ) {
            f = 1; do {
               if ( simpleCompare ) {
                  if ( simpleCompare ) {
                     if ( simpleCompare ) {
                        simpleStatement;
                     } else {
                        simpleStatement;
                     }
                  } else {
                     simpleStatement;
                  }
               } else {
                  simpleStatement;
               }
            f++; } while ( f < n );
         i -= 3; }
      } else {
         if ( simpleCompare ) {
            if ( simpleCompare ) {
               if ( simpleCompare ) {
                  if ( simpleCompare ) {
                     simpleStatement;
                  }
               } else {
                  simpleStatement;
               }
            }
         }
      }
   }
   return 0; }
```

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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]);
   e = n; do {
      if ( simpleCompare ) {
         if ( simpleCompare ) {
            h = 1; while ( h < n ) {
               if ( simpleCompare ) {
                  if ( simpleCompare ) {
                     simpleStatement;
                  }
               } else {
                  simpleStatement;
               }
            h++; }
         } else {
            if ( simpleCompare ) {
               simpleStatement;
            } else {
               simpleStatement;
            }
         }
      } else {
         if ( simpleCompare ) {
            if ( simpleCompare ) {
               f = 1; do {
                  simpleStatement;
               f++; } while ( f < n );
            } else {
               simpleStatement;
            }
         } else {
            simpleStatement;
         }
      }
   e--; } while ( e > 1 );
   return 0; }
```

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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]);
   if ( simpleCompare ) {
      if ( simpleCompare ) {
         h = 1; while ( h < n ) {
            if ( simpleCompare ) {
               for ( k = n ; k > 1 ; k-- ) {
                  if ( simpleCompare ) {
                     simpleStatement;
                  } else {
                     simpleStatement;
                  }
               }
            } else {
               if ( simpleCompare ) {
                  simpleStatement;
               } else {
                  simpleStatement;
               }
            }
         h += 10; }
      }
   } else {
      e = n; do {
         if ( simpleCompare ) {
            f = 1; do {
               if ( simpleCompare ) {
                  simpleStatement;
               } else {
                  simpleStatement;
               }
            f++; } while ( f < n );
         }
      e--; } while ( e > 1 );
   }
   return 0; }
```

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Total points 10.

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Answer Key (points per line)

1 (2).	`H` (n^2)
2 (2).	`J` (1)
3 (2).	`G` (n^3)
4 (2).	`H` (n^2)
5 (2).	`H` (n^2)

Total points 10.