

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

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- 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]);
    g = 1; while ( g < n ) {
        if ( simpleCompare ) {
            if ( simpleCompare ) {
                k = n; do {
                    if ( simpleCompare ) {
                        if ( simpleCompare ) {
                            simpleStatement;
                        } else {
                            simpleStatement;
                        }
                    } else {
                        simpleStatement;
                    }
                } while ( k > 1 );
            }
        }
        g++; }
    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]);
    if ( simpleCompare ) {
        if ( simpleCompare ) {
            if ( simpleCompare ) {
                k = n; do {
                    for ( i = n ; i > 1 ; i-- ) {
                        simpleStatement;
                    }
                    k -= 10; } while ( k > 1 );
            } else {
                simpleStatement;
            }
        } else {
            if ( simpleCompare ) {
                j = n; while ( j > 1 ) {
                    simpleStatement;
                    j--; }
            } else {
                simpleStatement;
            }
        }
    } else {
        if ( simpleCompare ) {
            g = 1; while ( g < n ) {
                for ( c = 1 ; c < n ; c += 2 ) {
                    simpleStatement;
                }
                g++; }
        } else {
            e = 1; while ( e < n ) {
                simpleStatement;
                e++; }
        }
    }
    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]);
    if ( simpleCompare ) {
        if ( simpleCompare ) {
            if ( simpleCompare ) {
                if ( simpleCompare ) {
                    for ( h = n ; h > 1 ; h-- ) {
                        if ( simpleCompare ) {
                            simpleStatement;
                        }
                    }
                } else {
                    simpleStatement;
                }
            } else {
                if ( simpleCompare ) {
                    e = 1; do {
                        simpleStatement;
                    } while ( e < n );
                }
            }
        }
    } else {
        if ( simpleCompare ) {
            c = 1; while ( c < n ) {
                if ( simpleCompare ) {
                    if ( simpleCompare ) {
                        if ( simpleCompare ) {
                            simpleStatement;
                        } else {
                            simpleStatement;
                        }
                    }
                }
            }
            c += 2; }
        }
    }
    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]);
    for ( i = n ; i > 1 ; i -= 2 ) {
        if ( simpleCompare ) {
            b = 1; do {
                if ( simpleCompare ) {
                    if ( simpleCompare ) {
                        if ( simpleCompare ) {
                            simpleStatement;
                        } else {
                            simpleStatement;
                        }
                    } else {
                        simpleStatement;
                    }
                } else {
                    if ( simpleCompare ) {
                        simpleStatement;
                    } else {
                        simpleStatement;
                    }
                }
            } while ( b < n );
        } else {
            if ( simpleCompare ) {
                c = 1; while ( c < n ) {
                    if ( simpleCompare ) {
                        for ( j = 1 ; j < n ; j++ ) {
                            simpleStatement;
                        }
                    } else {
                        simpleStatement;
                    }
                }
                c += 10; }
        }
    }
    return 0; }
```

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CS 201 Big Oh (simple)

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Total points 10.

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Answer Key (points per line)

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

Total points 10.