Name	
Student number	

CMPT 225
Summer 2019
T. Shermer

Midterm Examination.

Please write your answers on the question sheets. No notes, books, or electronic devices of any sort allowed. Write clearly. This exam is scheduled for 50 minutes.

Instructor and TA use only. Do not write in this area.

Q1	30
Q2	10
Q3	20
Q4	20
Q5	20
Total	100

Question 1 (30 points total; 3 each)

Short answer questions. Complete sentences are not required. Justification for your answer is not required.

(a) What is your name?

(b) What is an exception used for?

(c) True or false? Any function that uses **`new`** in C++ is required to use **`delete`**.

(d) If a C++ function includes the statement/declaration:

```
Donkey* eeyore;
```

Does one of Donkey's constructors get called, and if so, which one?

(e) What is the worst-case time complexity of *enqueue* for a queue implemented as a (extendable) array?

(f) What is the average-case time complexity of *enqueue* for a queue implemented as a (extendable) array?

(g) What is the worst-case time complexity of *enqueue* for a queue implemented as a linked list?

(h) What is the average-case time complexity of *enqueue* for a queue implemented as a linked list?

(i) Let the class Pink be a subclass of the class Red. Red has a protected member variable *intensity.* True or false: an instance of Pink can access the variable *intensity* in its constructor.

(j) You are given an implementation of the Stack ADT. True or false: you can convert this to an efficient implementation of the Queue ADT by using an adapter class.

Question 2 (10 points)

Define Polymorphism.

Question 3 (20 points)

Give pseudocode for a recursive function to remove all elements in a stack.

Question 4 (20 points; 4 each)

For each of the subparts below, choose the answer on the right that best expresses the function given in the subpart.

5a. $4n \log n + 3n^2$

5b. $14n + 5n^3 - 3n^2$

5c. $n/2 + 4 \log n$

5d. $12n + 2n \log n$

5e. $\log n^2 – 2 \log n + 1$

A. $O(1)$
B. $O(3n^2)$
C. $O(n)$
D. $O(\log n)$
E. $O(n^2)$
F. $O(n^3)$
G. $O(n \log n)$
H. $O(2^n)$

Question 5 (20 points)

What is the (worst-case) time complexity of the pseudocode function *Multiply* below? Assume that A and C are *n*-element vectors and B is an *n* by *n* matrix. Express in O-notation. Show your work.

```
Multiply( A, B, C) {      // A = B * C
        for(i = 1 to n) {
                A[i] = findOneEntry(B, C, i);
        }
)

findOneEntry(M, V, I) {
        sum = 0;
        for(k = 1 to n) {
                sum += M[i, k] * V[k];
        }
        return sum;
}
```