COSC 3020

Performance Indicator (a.4) : Calculate the sum of arithmetic series that arise in computing applications

Performance Indicator (a.5) : Calculate the sum of geometric series that arise in computing applications

Problem 3.8 from Exam 3

true false : $2*n \in O(n)$

true false : $2^c + 4^c + 8^c + \ldots + 2^{nc} \in \Theta(2^{n(c+1)})$

true false : $(\log n^2) \in O(n / \log n)$

true false : $9^{\log_3(n)} \in \Omega(n * (n+1))$

true false : $1 + 8 + 27 + 64 + \ldots + (n/3)^3) \in \Theta(n^4)$

true false : Merge Sort time is in $\theta(n \log n)$.

true false : Binary Search time is in $\Omega(\log n)$.

31 students were assessed.

12 students excelled.
18 students mastered.
1 students partially mastered.
no students were below expectations.

COSC 3020

Performance Indicator (a.6) : Use calculus to find the asymptotic limit of functions

Problem 3.5 from Exam 3

Order these Big Oh time complexity classes from smallest (slowest growing) to largest.

$O(\log(n^n))$	$O((\log(n))*(\log(n^2)))$
$O(n * (1 + n))$	$O(n + 2\sqrt{n})$
$O(8^{\log_2 n})$	$O(n! / 2^n)$
$O(24)$	$O(3^n)$

31 students were assessed.

11 students excelled.
20 students mastered.
no students partially mastered.
no students were below expectations.

COSC 3020

Performance Indicator (b.1) : Identify key components and algorithms necessary for a solution

Problem 3.1 from Exam 3

Partition can be used to solve the Selection problem.

What is the expected time complexity of this solution when the required value is the smallest value in the collection?

Explain your answer.

31 students were assessed.

5 students excelled.
11 students mastered.
9 students partially mastered.
6 students were below expectations.

COSC 3020

Performance Indicator (b.2) : Analyze at two or more proposed solutions to a given problem and select the best solution for the given problem

Lab 13: Bin Packing

Bin Packing Problem: Given a bin capacity, b, and a list of object sizes , L, what is the minimum number of bins needed to put each object in L into a bin. Since the sum of sizes in one bin must be no more than b, all the object sizes must be no more than b.

This Problem is NP-complete.

So we should consider approximate solutions.

First-fit places an object in the first bin of a sequence that has enough remaining capacity to accept the object. A new bin is added to the sequence if no bin has enough remaining capacity.

Best-fit places an object in the bin with the smallest remaining capacity, but with enough remaining capacity to accept the object.

32 students were assessed.

27 students excelled.
1 students mastered.
no students partially mastered.
4 student were below expectations.

COSC 3020

Performance Indicator (j.1) : Analyze the asymptotic cost of divide-and-conquer algorithms

Lab 3

Topic: Iterative Versions of MergeSort

part 4. Verity that the experimental time complexity of the call to mergesort is order n log n.

part 6. I expect the time complexity of the new version of mergesort to have time complexity $\theta(n^p)$.

Use experimental time complexity analysis to determine p.

Why does the new version of mergesort have this slower time complexity?

32 students were assessed.

17 students excelled.
11 students mastered.
2 students partially mastered.
2 students were below expectations.

COSC 3020

Performance Indicator (j.2) : Analyze the asymptotic cost of recursive algorithms

Problem 1.3 from Exam 1

Give a recurrence relation for the time required by this C++ function. The size of the problem is the value of jump.

```
int stumble( int jump )
{
    if( jump < 8 )
    {
        return jump;
    }

    int step = 3;
    while( step * step < jump )
    {
        ++step;
    }

    int distance = 0;
    for( int i=0; i<step; ++i )
    {
        distance += stumble( step );
    }
    return distance;
}
```

33 students were assessed.

2 students excelled.
9 students mastered.
7 students partially mastered.
15 students were below expectations.

COSC 3020

Performance Indicator (j.3) : Analyze the asymptotic cost of basic graph algorithms

Lab 07

Graph methods: reverse, topological sort

32 students were assessed.

21 students excelled.
0 students mastered.
5 students partially mastered.
6 student were below expectations.

COSC 3020

Performance Indicator (j.4) : Describe the impact of techniques such as caching and dynamic programming on the performance of algorithms

Problem 4.1 from Exam 4

. Consider this recursive function:

```
int
test(int n)
{
	const int terms = 19;

	int sum = 1;
	if (n >= 1)
	{
		for (int i = 1; i <= terms; ++i)
			sum += test(n / (i + 1));
	}
	return sum;

}
```

When called with n = 100,000, the function required more than 25 seconds to make over 900,000,000 recursive calls.

Sketch the pseudo code for a memorization of this function. Explain why this version is expected to be much faster than the pure recursive version.

Why would memorization be better than dynamic programming for this problem?

18 students were assessed.

2 students excelled.
10 students mastered.
4 students partially mastered.
2 students were below expectations.

COSC 3020

Performance Indicator (j.5) : Understand the difference between polynomial and exponential complexity

Problem 12 from the Final Exam

Define the longest increasing subsequence problem.

Describe a naïve, brute force solution that solves this problem.

What is the time complexity of this solution?

Describe a dynamic programming solution that solves this problem in $O(n^2)$ time.

16 students were assessed.

5 students excelled.
4 students mastered.
4 students partially mastered.
3 student2 were below expectations.