

CSE326: Analysis and Design of Algorithms (Fall 2025)

Sheet 1 - Review

Due: **Saturday, September 27th at 10:00 a.m.**

1. Recursion Review

- Write pseudocode for a function that checks if a string is a palindrome recursively.
- Write pseudocode for a function that performs binary search recursively.

To get good practice, it is recommended to implement the above in your favorite programming language to test your code first, then submit it as pseudocode.

2. To handle a given task, assume you have two algorithms whose running times can be expressed as $T_1(n) = O(n^2)$, and $T_2(n) = O(n \lg n)$, where n is the input size. Which of these algorithms would you use in practice? Justify your answer.

3. Express the running times $T(n)$ of the following pseudocode using asymptotic notation.

```
a. for(i = 0; i <= n*n ; i+=n/2){
    print("a");
    for(j = n; j >= 0; j-=2){
        print("b");
    }
}
```

```
b. for(i = 0; i <= n/2 ; i++){
    print("a");
    for(j = 1; j <= n; j*=5){
        print("b");
    }
    for(k = 1; k <= n; k=k+n-10){
        print("c");
    }
}
```

4. Sort the following functions according to their asymptotic growth rates from the lowest to the highest.

$\sqrt{\lg n}$	8^n	4^{2n}	$n!$
$n \lg n$	n^n	8^{8^n}	$\log_8 \sqrt{n}$
$n^2 3^n$	$\lg n!$	$2^{\lg n}$	$\lg n^n$

Note: Section 3.2 in the CLRS book (3rd edition) has a review of standard mathematical functions that can help with this question.

5. Use a recursion tree to guess the solution of the following recurrence. Then, verify that your guess is correct.

$$T(n) = T(n/2) + T(n/4) + T(n/8) + n$$

6. Solve the following recurrences using the master method.

- $T(n) = 3T(n/2) + n \lg n$
- $T(n) = 4T(n/2) + n^2 \sqrt{n}$

Submission

- Please submit a scanned copy of **handwritten** solutions through this form: <https://forms.office.com/r/jGWS2GF5Er> . You will need to use your university account. The file name should be <your id #>_sheet1.pdf.

Policies

- Late submissions are not allowed unless there is a valid documented excuse.
- You must solve the sheet individually. You can neither give nor receive unauthorized assistance to/from your colleagues.
- The grading will be based on attempts. You will get a full grade as long as you make a serious attempt to answer all questions.