

Today, you are asked to complete **at least 4 exercises in each part**. You will be randomly asked to share your solution with the whole class.

PART 1.

Analyze the time complexity (function and asymptotic notation) of each of the following fragments of code:

Exercise 1:

```
j = 1
while j < n:
    for k in range(n):
        print('*')
    j = j*2
```

Exercise 2:

```
for j in range (n):
    k = 1
    while k < n:
        print('*')
        k = k*2
```

Exercise 3:

```
j = 1
while j < n^2:
    for k in range(n):
        print('*')
    j = j*3
```

Exercise 4:

```
for j in range (n^2):
    k = 1
    while k < n:
        print('*')
        k = k*3
```

Exercise 5:

```
j = 1
while j < n:
    for k in range(j):
        print('*')
    j = j*2
```

Exercise 6:

```
j = 1
while j < n:
    k = 1
    while k < j:
        print('*')
        k = k*2
    j = j*2
```

Exercise 7:

```
for j in range(n):  
    k = 1  
    while k < j:  
        print('*')  
        k = k*2
```

PART 2.

Exercise 1. Write the recurrence formula for the method that recursively computes the nth Fibonacci number:

$T(n) =$
 $T(1) =$

Exercise 2. Write the recurrence formula for merge sort:

$T(n) =$
 $T(1) =$

Exercise 3. Write the recurrence formula of the method that recursively computes the factorial of n:

$T(n) =$
 $T(1) =$

Exercise 4. Write the recurrence formula of recursive binary search on a sorted array of n elements:

$T(n) =$
 $T(1) =$

Exercise 5. Write the recurrence formula of recursive selection sort on an array of n elements:

$T(n) =$
 $T(1) =$

Exercise 6. Write the recurrence formula of recursive quick sort on an array of n elements in its best case:

$T(n) =$
 $T(1) =$

Exercise 7. Write the recurrence formula of recursive quick sort on an array of n elements in its worst case:

$T(n) =$
 $T(1) =$

PART 3.

exercise 1: $1+2+\dots+3527=?$

exercise 2: $7+8+9+\dots+10386=?$

exercise 3: $1+3+5+\dots+39=?$

exercise 4: $2+4+6+\dots+12468=?$

exercise 5: $59+60+61+\dots+387=?$

exercise 6: $1+7+13+19+25+\dots+601=?$

exercise 7: $1+2+2^2+2^3+\dots+2^n=?$

exercise 8: $1+5+5^2+5^3+\dots+5^{17}=?$

exercise 9: $7^4+7^5+7^6+\dots+7^{12}=?$

exercise 10: $b^k+b^{k+1}+b^{k+2}+\dots+b^m=?$

exercise 11: you want to test a software that takes 3 parameters: A, B, and C.

A has 10 possible values

B has 7 possible values

C has 12 possible values

- How many test cases do you need to run in order to fully test your software?
- Write a program to generate all of these test cases.

exercise 12: how many triangles are there in the following drawing?



Explain your reasoning to someone.

exercise 13: how many rectangles are there in the following drawing:



Explain your reasoning to someone.

exercise 14: how many rectangles are there in the following drawing:



Explain your reasoning to someone.