

5/5 points (100%)

# ✓ Congratulations! You passed!

Next Item



1/1 point

1

This question will give you further practice with the Master Method. Suppose the running time of an algorithm is governed by the recurrence  $T(n) = 7 * T(n/3) + n^2$ . What's the overall asymptotic running time (i.e., the value of T(n))?

- $\theta(n^{2.81})$
- $\theta(n^2)$

#### Correct

a=7, b=3, d=2. Since  $b^d > a$ , this is case 2 of the Master Method.

- $\theta(n^2 \log n)$
- $\theta(n \log n)$



1/1 point

2.

This question will give you further practice with the Master Method. Suppose the running time of an algorithm is governed by the recurrence  $T(n) = 9 * T(n/3) + n^2$ . What's the overall asymptotic running time (i.e., the value of T(n))?

- $\theta(n^{3.17})$
- $\theta(n^2)$

### Correct

 $a = b^d = 9$ , so this is case 1 of the Master Method.



5/5 points (100%)

This question will give you further practice with the Master Method. Suppose the running time of an algorithm is governed by the recurrence T(n) = 5 \* T(n/3) + 4n. What's the overall asymptotic running time (i.e., the value of T(n))?

- $\theta(n^2)$
- $\theta(n\log(n))$
- $\theta(n^{2.59})$
- hinspace hin
- $igcap heta(n^{\log_3(5)})$

## Correct

a = 5, b = 3, d = 1. Since  $a > b^d$ , this is case 3 of the Master Method.

hinspace hin



1/1 point

4.

Consider the following pseudocode for calculating  $a^b$  (where a and b are positive integers)

```
FastPower(a,b) :
 1
 2
      if b = 1
 3
        return a
      else
        c := a*a
 6
        ans := FastPower(c, [b/2])
      if b is odd
 8
         return a*ans
9
      else return ans
10
    end
```

Here [x] denotes the floor function, that is, the largest integer less than or equal to x.

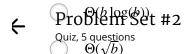
Now assuming that you use a calculator that supports multiplication and division (i.e., you can do multiplications and divisions in constant time), what would be the overall asymptotic running time of the above algorithm (as a function of b)?



## Correct

Constant work per digit in the binary expansion of b.

 $\Theta(b)$ 



5/5 points (100%)



1/1 point

5.

Choose the smallest correct upper bound on the solution to the following recurrence: T(1)=1 and  $T(n)\leq T([\sqrt{n}])+1$  for n>1. Here [x] denotes the "floor" function, which rounds down to the nearest integer. (Note that the Master Method does not apply.)

- $O(\sqrt{n})$
- $O(\log n)$
- O(1)
- $O(\log \log n)$

#### Correct

Bingo! This answer may be easiest to see by writing n as  $2^{\log n}$  and then noting that every square-root operation cuts the exponent in half.

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