**Master’s Theorem Solution**

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* Find the time complexity of the below functions in Θ form. Write NA if the function does not apply to any case:

According to Master’s theorem:

**T (n) = a T (n / b) + f (n),** where f (n) = nd

1. **T (n) = 3 T (n / 2) + n**

Here, a = 3, b = 2, f (n) = n. So, d = 1

As a > bd, case 3 applies here i.e., T(n) = 🞊 (nlogab)

Therefore, by substituting the values we will get,

* **T (n) = Θ (nlog32)**

1. **T (n) = 64 T (n / 8) – n2 (log n)**

* **NA. Since, f (n) is negative, Master’s theorem will not be applied here**

1. **T (n) = 2 n T (n / 2) + nn**

Here, a = 2 n, b = 2, f (n) = nn. So, d = n

As a < bd, case 1 applies here i.e., T (n) = Θ (nd)

Therefore, by substituting the values we will get,

* **T (n) = Θ (nn)**

1. **T (n) = 3 T (n / 3) + n / 2**

Here, a = 3, b = 3, f (n) = n / 2. So, d = 1

As, a = bd, case 2 applies here i.e., T (n) = Θ (nd log n)

Therefore, by substituting the values we will get,

* **T (n) = Θ (n log n)**

1. **T (n) = 7 T (n / 3) + n2**

Here, a = 7, b = 3, f (n) = n2. So, d = 2

As, a < bd, case 1 applies here i.e., T (n) = Θ (nd)

Therefore, by substituting the values we will get,

* **T (n) = Θ (n2)**