

Exam 1 - Monday 29th
 Allow 1 page of notes (2 sides of 8.5" x 11")

1

1

1

at lb = 0;

int ub = n - 1;

int m;

bool found = false;

while (lb <= ub)

$mid = (lb + ub) / 2;$
 if (Key[m] == v)
 found = true;
 break;
 else if (Key[m] < v)
 lb = m + 1;
 else
 ub = m - 1;

ub - lb + 1 = n

$n/2$

$n/4$

$n/2^k$

$n/2^k = 1$

3 return found;

$n = 2^k$

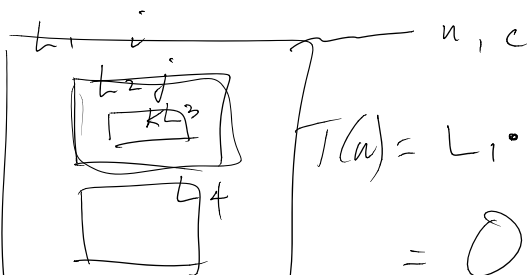
$\log_2 n = k$

$eT(n) = O(g(n)) = O(f(n))$

~~$T(n) = 5 \log_2(n) + 3$~~

$T(n) = O(\log_2(n))$

$T(n) = O(\log(n))$



$T(n) = L_1 \cdot L_2 \cdot L_3 + L_1 \cdot L_4$

$= O(n^3)$

$$\boxed{\boxed{\boxed{\boxed{\boxed{\quad}}}}} = O(n^3)$$

```

for ( i = 1; i <= n; i++)
{
    for ( j = 1; j <= i; j++)
    {
        stmt;
    }
}

```

$$T(n) = \sum_{i=1}^n \left(1 + \sum_{j=1}^i (1+1) \right)$$

$$= \sum_{i=1}^n (1 + 2 \cdot (i-1+1))$$

$$= \sum_{i=1}^n (2i + 1)$$

$$= \sum_{i=1}^n (2i) + \sum_{i=1}^n (1)$$

$$= 2 \sum_{i=1}^n (i) + \sum_{i=1}^n (1)$$

$$= 2 \left(\frac{n(n+1)}{2} + n \right)$$

$$T(n) = n^2 + 2n$$

$$= O(n^2)$$

$n \quad 1 \quad \dots \quad n \quad 1 \quad 1 \quad 1$


```

for ( i = 1; i <= n; i++)
{
    for ( j = 1; j <= i+5; j++)
    {
        stmt;
    }
}

```

```

bool bsearch (int key[], int lb, int ub, int v)
{
    if (lb <= ub)
    {
        int m = lb + ub / 2;
        if (key[m] == v)
            return true;
        else if (key[m] < v)
            return bsearch (key, m+1, ub, v);
        else
            return bsearch (key, lb, m-1, v);
    }
}

```

$$T(n) = K + T(n/2)$$

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

$$T(n)$$

$$- T(n/2)$$

$$- T(n/2)$$

$$)$$

$$n/4)$$

$\log_2 n$

$$\left(\frac{n}{2} \right) - 1$$

$$T\left(\frac{n}{4}\right) = K + T$$

$$T\left(\frac{n}{2^{k-1}}\right) = K +$$

$$T(n) = K + K + T$$

$$= K + K +$$

$$= K + K + K$$

$$= K + K + K$$

$$\underbrace{\hspace{10em}}$$

$$= \log_2 n$$

$$(n/8)$$

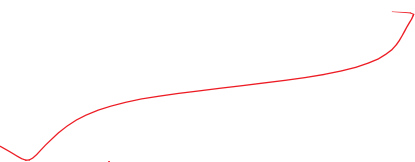


$$(n/4)$$

$$K + \underline{T(n/8)}$$

$$= \dots + T(0)$$

$$= \dots + K'$$



$$T_2(n)$$

$$+ K'$$

$$= \cancel{T} \log_2 Cn$$

$$= O(\log Cn)$$

```

if ( base case
    stmt;
else
    recursion

```

```

void bubble (int k[],

```

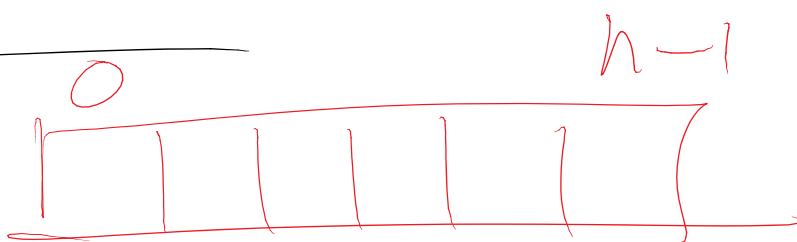
\sum
 $n \quad 1 \dots n-1 \quad n=0, \quad i < n$

$\dots + \dots$

$f(n)$

$e)$
 ive

$int\ n)$



$n), \quad [++)$

✓

for (int i = 0; i <

{

for (int j = 0; j <

{

if (k

Sw

}

}

T (

T(n) =

n^2

bubble S

n), $i++$)

$j < n - i - 1; j++$)

$\text{key}[j] > \text{key}[j+1]$)

$\text{swap}(\text{key}[j], \text{key}[j+1])$

$n) = O(n^2)$

$3n^2 + 2n + 1$

$\text{sort}(\text{key}, n)$

$O(\text{key}, n, 50)$

$\log n$

$\text{count} \ll b^S$

$\text{count} \ll b$

$$T(n) = O$$

$$= O$$

search(key, n, 50);

as each(key, n, 20);

~~$O(n^2 + 2 \log n)$~~

$O(n^2)$