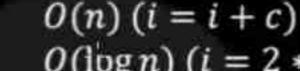
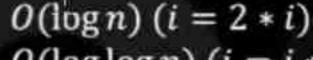
Takeaway from class-

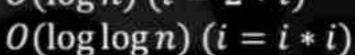
Exponentiation =>

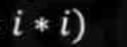
Increment =>

Doubling =>









Consider the following program fragment:

Which one of the following statements about the runtime R(N) is true?

$$(B)$$
 $R(N) = \Theta(\sqrt{N})$

```
for( int i = n; i > 0; i /= 2 ) {
    for( int j = 1; j < n; j *= 2 ) {
        for( int k = 0; k < n; k += 2 ) {
            ... // constant number of operations
```

```
for ( int k = n; k > 0; k /= 3 ) {
  for ( int i = 0; i < n; i += 2 ) {
     // constant number C of elementary operations
  for ( int j = 2; j < n; j = (j*j)) {
      // constant number C of elementary operations
```

```
int i=1;
while (i \le n) {
   int j = i;
   while (j > 0) {
      j = j/2;
```

```
for (k = 1; k \ll n; k += 1)
    for (i = 1; i \le n; i *= 3)
        while (j > 1)
            sum += 1;
            j /= 3;
```

```
for(int i = 0; i < N*N; i++) {
   for(int j = 0; j < i; j++) {
      //something 0(1)
```

```
for (int i = 0; i < n; i++) {
    for (int j = 0; j < n * n; j++) {
        for (int k = 0; k < j; k++) {
            sum++;
```

```
i = 1;
k = 1;
while(k<n){
    k = k + i;
    i = i + 1;
```

```
for(int i =1; i<=n;i++)
  for(int j=i ; j<=n; j+=i*2);
```

```
for( i=1; i<n; i=i*2 ) {
for( j=1; j<p; j=j*2 ) {
   some_statement
```

```
for (int j = 2; j < N; j++) {
    for (int k = 2*j; k \le N; k += j) {
        some_statement
```

```
int sum = 0;
for (int i = 1; i < n; i++) {
    for (int j = 0; j < n/i; j++) {
        sum++;
```

```
for (i=1;i<=n;i*=2){
  for (j=1;j<=i;j++) {
    // some O(1) operation
```

```
for (int i = 1; i < n; i*=2)
  for (int j = 0; j < i; j +=2)
    // some contstant time operations
```

```
for ( int i = 1; i < n*n*n; i *= n ) {
    for ( int j = 0; j < n; j += 2 ) {
        for ( int k = 1; k < n; k *= 3 ) {
            // some contstant time operations
```

```
for(int i = 0; i < n-3; i++){
    if(i \% 3 == 0){
           break;
    else{
         print ":D"
```

```
for(i = 1; i < n; i = i * 2) {
    for(j = 1; j < i; j++) {
        sum++;
```

```
int n;
int sum;
for (int i = 1; i < n; i++)
  for (int j = 0; j < i*i; j++)
      if (j % i == 0)
          for (int k = 0; k < j; k++)
```

```
for (i = 1; i \le N; i = i*2)
     for (j = 1; j \le i^2; j = j \times 2)
          sum++;
```

```
for (i=1; i < n; i *= 2)
for (j = n; j > 0; j /= 2)
for (k = j; k < n; k += 2) {
 sum += (i + j * k);
```