Q1. Give, in **tilde** notation, the value of 'sum' (as a function of N) at the end of following code fragment:

```
int sum = 0;
for (int i = 1; i < N; i *= 2)
    for (int j = 0; j < N ; j++)
        sum++;
```

A. N^2

B. $N^2/2$

C. **N log N**

D. 1/2 N log N

E. None of the above

Q2. Give, in Θ (Big Theta) notation, the value of 'sum' (as a function of N) at the end of following code fragment:

```
int sum = 0;
for (int i = 1; i < N; i *= 2)
   for (int j = 0; j < i ; j++)
       sum++;
```

A. N²

B. N log N

C. N

D. Log N

E. None of the above

Q3. What sorting algorithms correspond to the intermediate stages shown here?

A. Mrg, Ins, Sel, Sh, Mgr BU

B. Mrg BU, Sh, Sel, Ins, Mgr

C. Ins, Sh, Mrg, Sel, Mgr BU

D. Mrg BU, Ins, Mrg, Sel, Sh

E. None of the above

original	1	2	3	4	5	sorted
lifo	data	hash	data	data	data	data
fifo	fifo	fifo	exch	fifo	fifo	exch
data	lifo	data	fifo	find	find	fifo
type	type	link	find	hash	hash	find
hash	hash	leaf	hash	heap	heap	hash
heap	heap	heap	heap	lifo	lifo	heap
sort	link	exch	leaf	link	link	leaf
link	sort	node	left	list	list	left
list	find	lifo	less	push	push	less
push	list	left	lifo	root	root	lifo
find	push	find	link	sort	sort	link
root	root	path	list	type	type	list
leaf	leaf	list	sort	leaf	leaf	next
tree	null	next	tree	left	tree	node
null	path	less	null	node	null	null
path	tree	root	path	null	path	path
node	exch	sink	node	path	node	push
left	left	swim	type	tree	left	root
less	less	null	root	exch	less	sink
exch	node	sort	push	less	exch	sort
sink	next	type	sink	next	sink	swap
swim	sink	tree	swim	sink	swim	swim
next	swap	push	next	swap	next	tree
swap	swim	swap	swap	swim	swap	type

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Q3.

original	Merge BU	Shellsort	Selection	Insertion	Merge	sorted
lifo	data	hash	data	data	data	data
fifo	fifo	fifo	exch	fifo	fifo	exch
data	lifo	data	fifo	find	find	fifo
type	type	link	find	hash	hash	find
hash	hash	leaf	hash	heap	heap	hash
heap	heap	heap	heap	lifo	lifo	heap
sort	link	exch	leaf	link	link	leaf
link	sort	node	left	list	list	left
list	find	lifo	less	push	push	less
push	list	left	lifo	root	root	lifo
find	push	find	link	sort	sort	link
root	root	path	list	type	type	list
leaf	leaf	list	sort	leaf	leaf	next
tree	null	next	tree	left	tree	node
null	path	less	null	node	null	null
path	tree	root	path	null	path	path
node	exch	sink	node	path	node	push
left	left	swim	type	tree	left	root
less	less	null	root	exch	less	sink
exch	node	sort	push	less	exch	sort
sink	next	type	sink	next	sink	swap
swim	sink	tree	swim	sink	swim	swim
next	swap	push	next	swap	next	tree
swap	swim	swap	swap	swim	swap	type