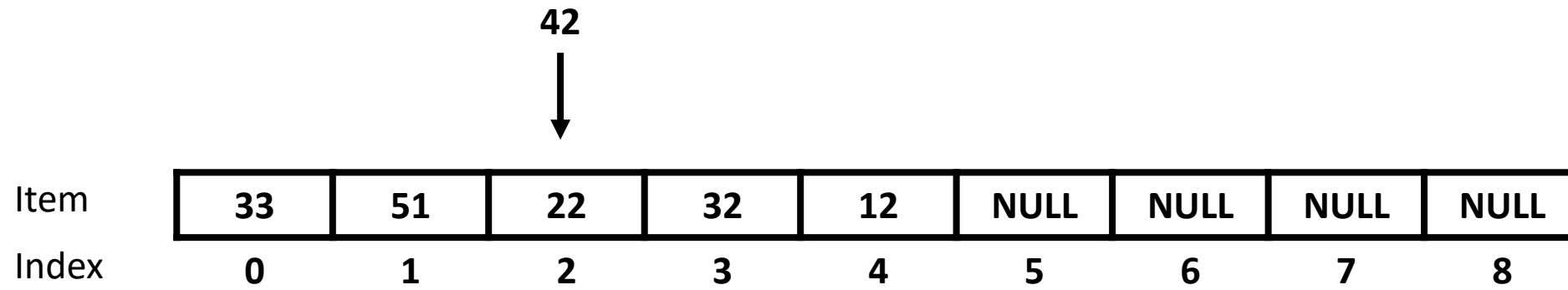


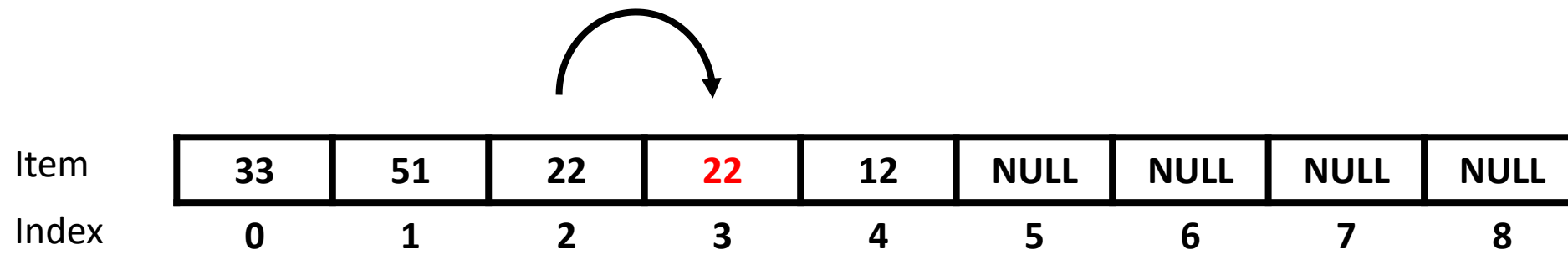
Insert when $n + 1 \leq U$
(space left in array)

Wrong Way



Wrong Way

- Forward right copy – Shift items to the right starting from the front.



We have just written over 32. Oops!

Right Way

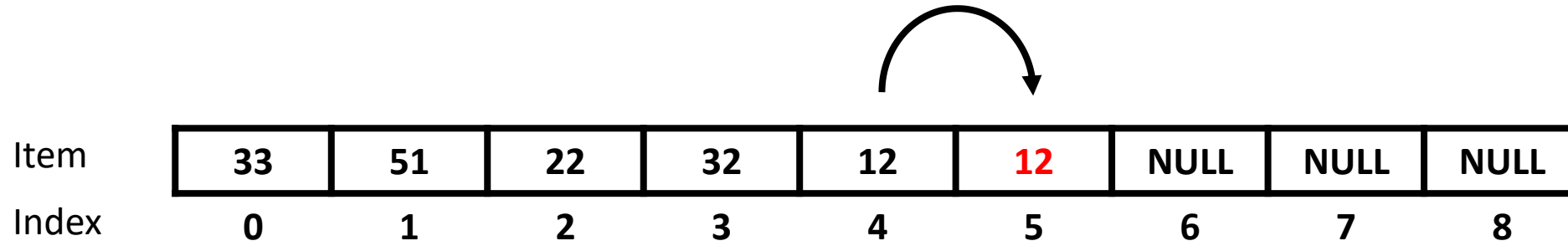
42

↓

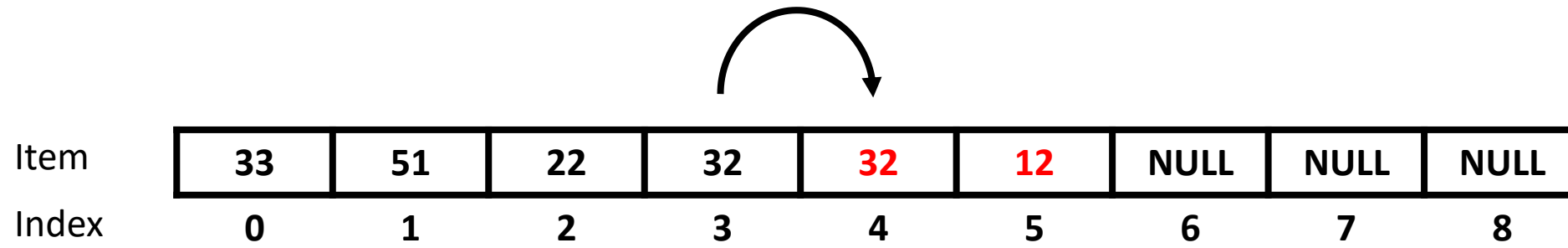
Item	33	51	22	32	12	NULL	NULL	NULL	NULL
Index	0	1	2	3	4	5	6	7	8

Right Way

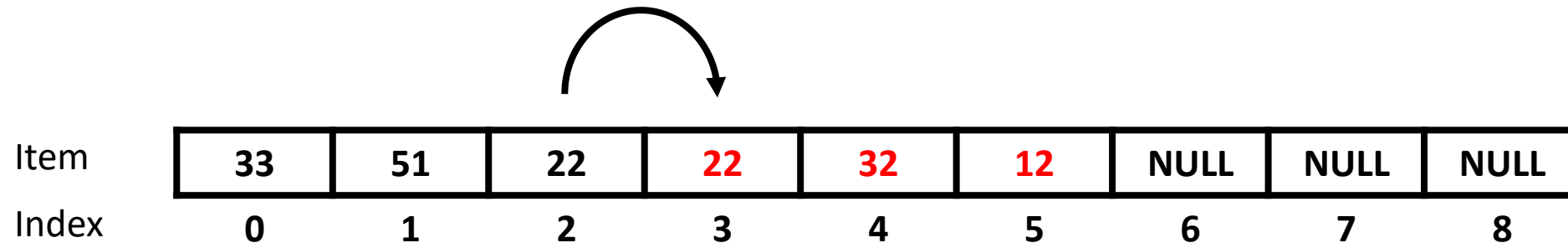
- Backward right copy – Shift items to the right starting from the back.




- Backward right copy – Shift items to the right starting from the back.



- Backward right copy – Shift items to the right starting from the back.



- Perform Insert

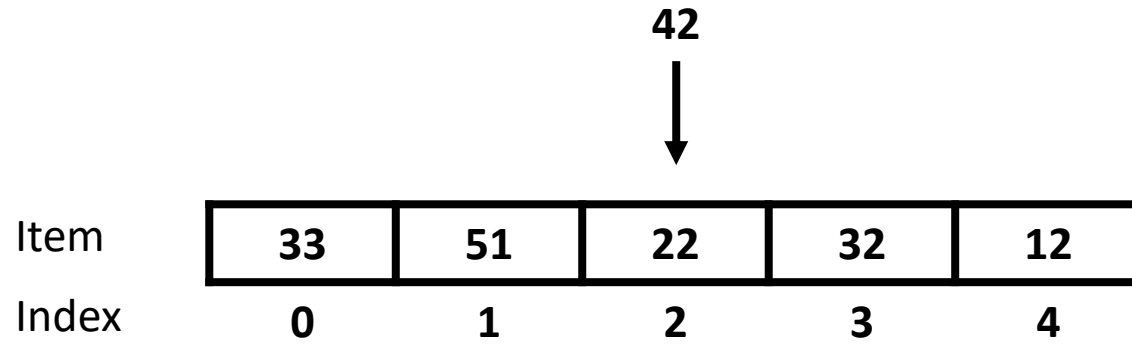


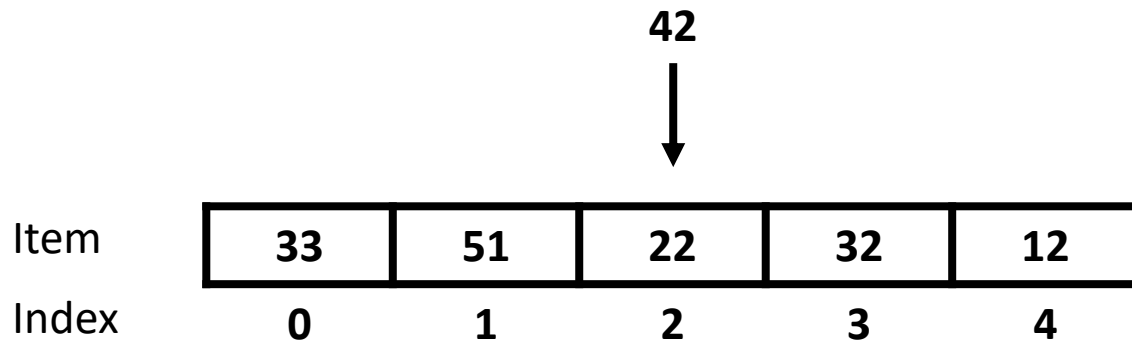
Item	33	51	42	22	32	12	NULL	NULL	NULL
Index	0	1	2	3	4	5	6	7	8

Item	33	51	42	22	32	12	NULL	NULL	NULL
Index	0	1	2	3	4	5	6	7	8

Insert when $n + 1 > U$
(array full)

- Resize and Forward right copy. We could use a backward right copy as well.

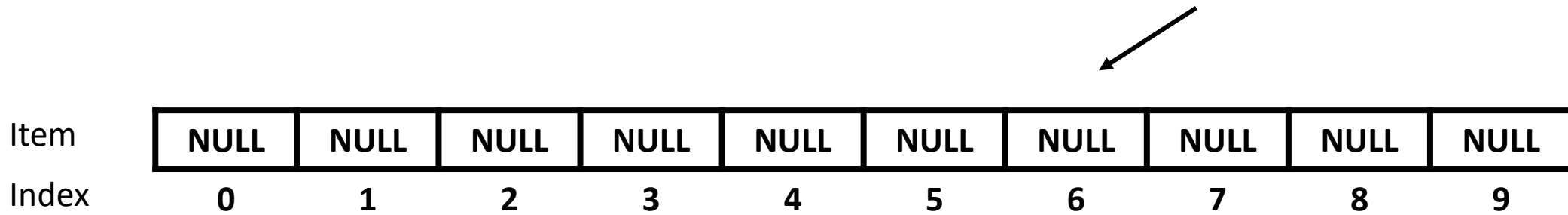




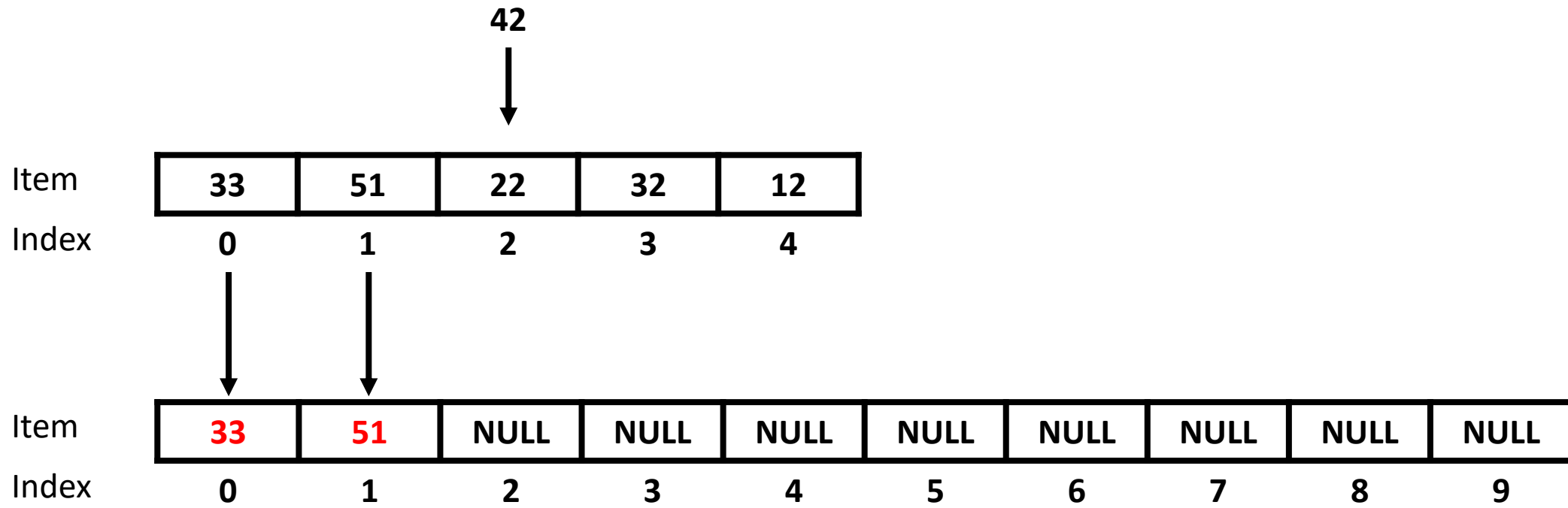
We assume this is constant time as we are just asking for a chunk of memory.

At a low level this will be dependent on the OS and programming language.

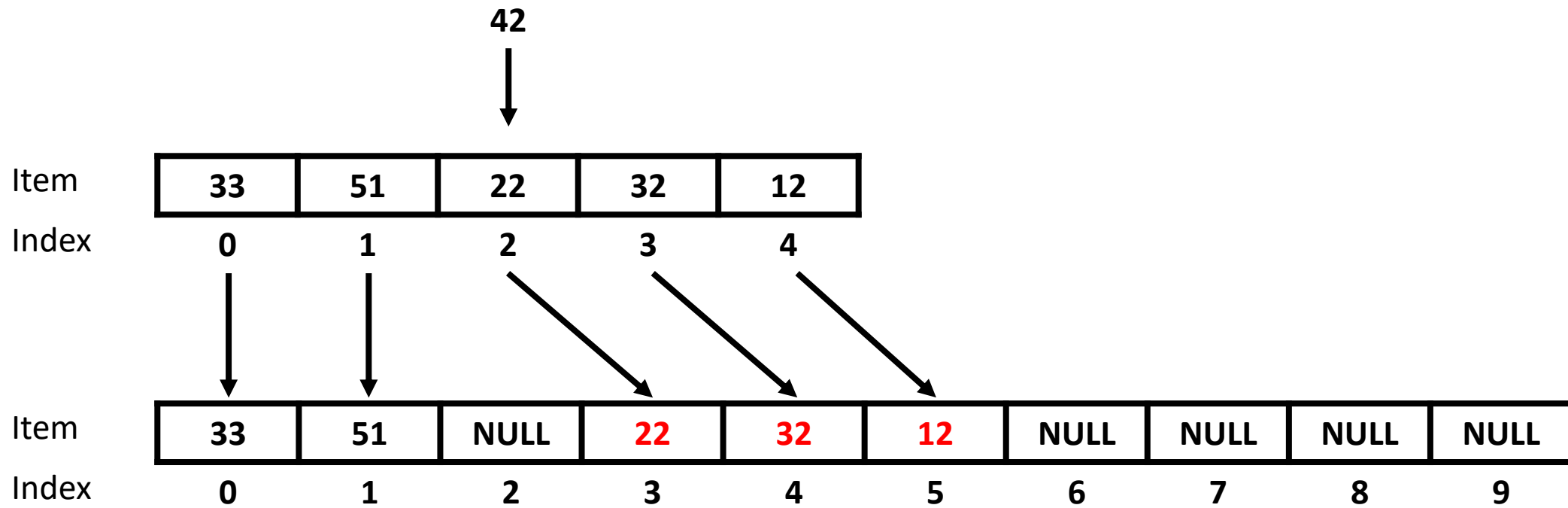
Our assumption is we ignore it which is fine for our analysis.



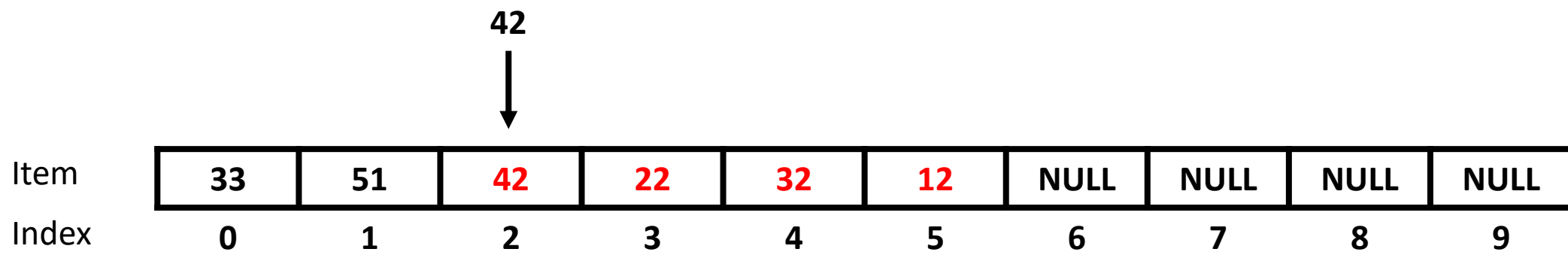
- Copy across before insert



- Copy across after insert



- Perform Insert



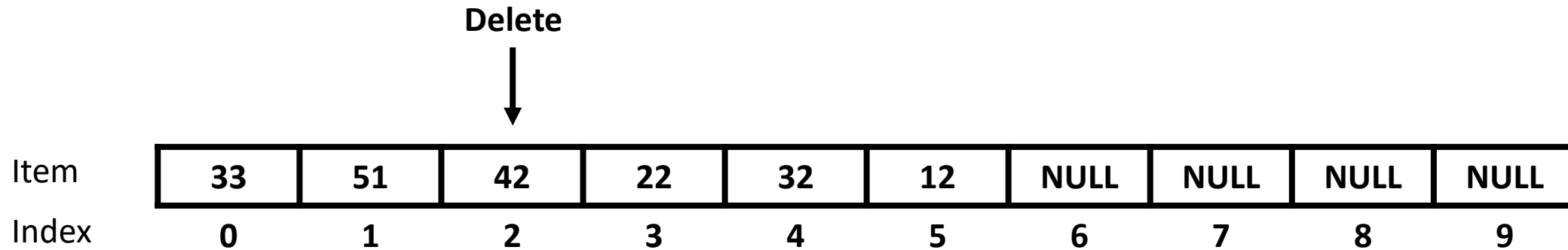
Item	33	51	42	22	32	12	NULL	NULL	NULL	NULL
Index	0	1	2	3	4	5	6	7	8	9

Item	33	51	42	22	32	12	NULL	NULL	NULL	NULL
Index	0	1	2	3	4	5	6	7	8	9

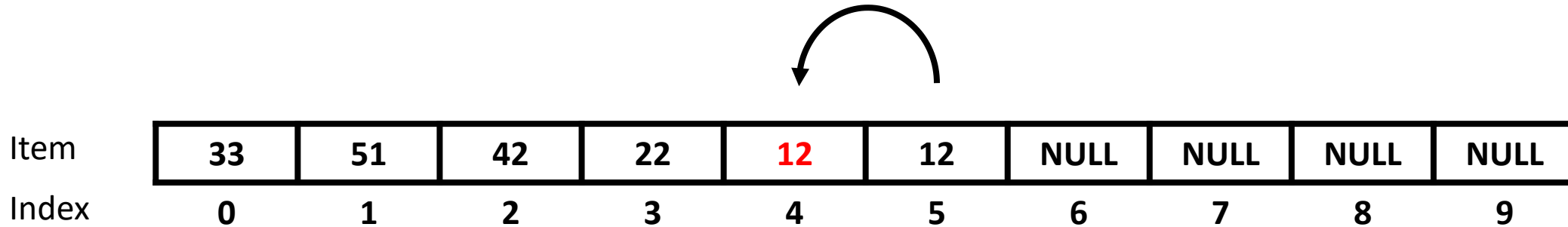
Delete when $n - 1 > L$
(above threshold)

Wrong Way

- Delete, backward left copy. Threshold might be 4 items. $6-1 = 5 > 4$



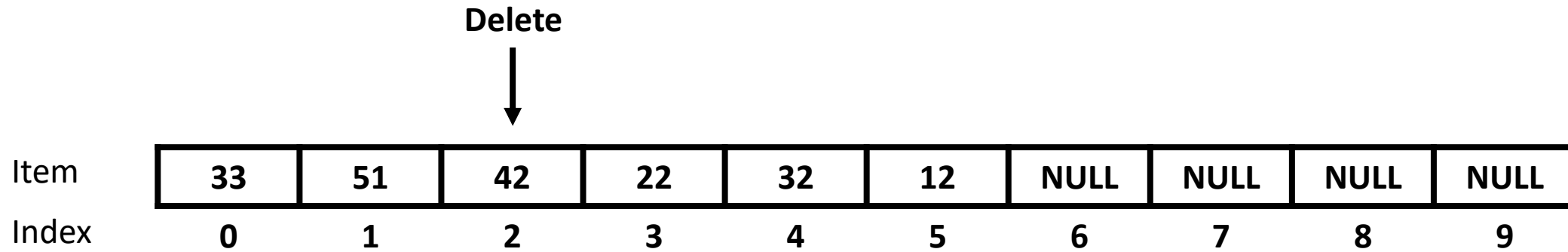
- Delete, Backward left copy. Threshold might be 4 items. $6-1 = 5 > 4$



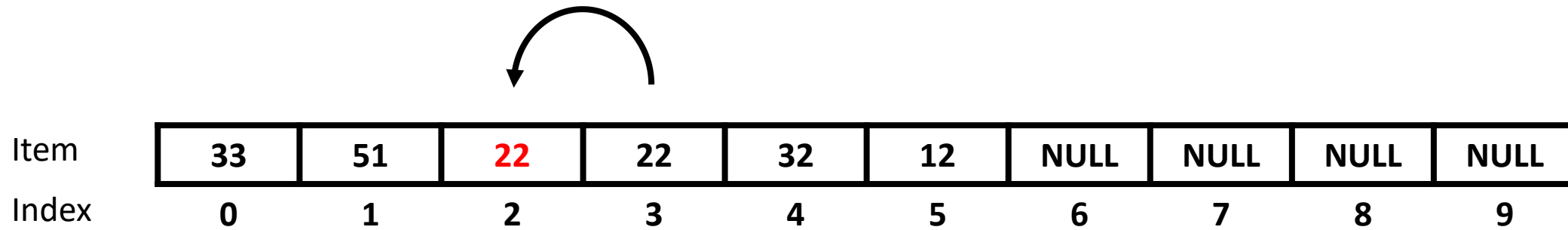
We have just written over 32. Oops!

Right Way

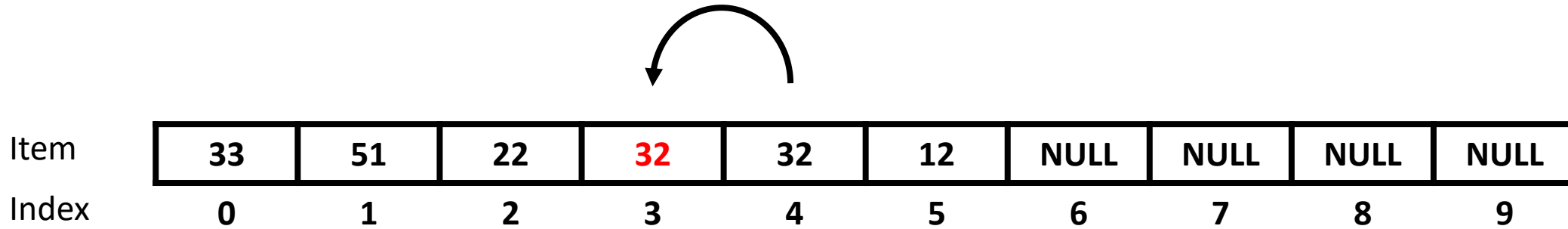
- Delete, Forward left copy. Threshold might be 4 items. $6-1 = 5 > 4$



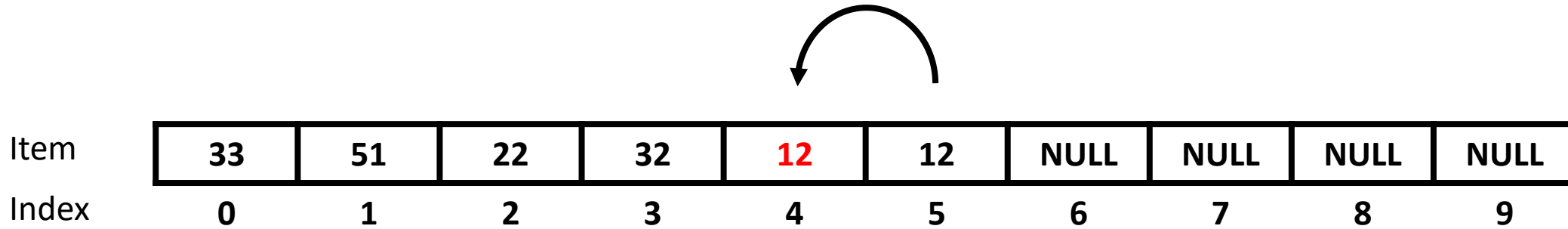
- Delete, Forward left copy. Threshold might be 4 items. $6-1 = 5 > 4$



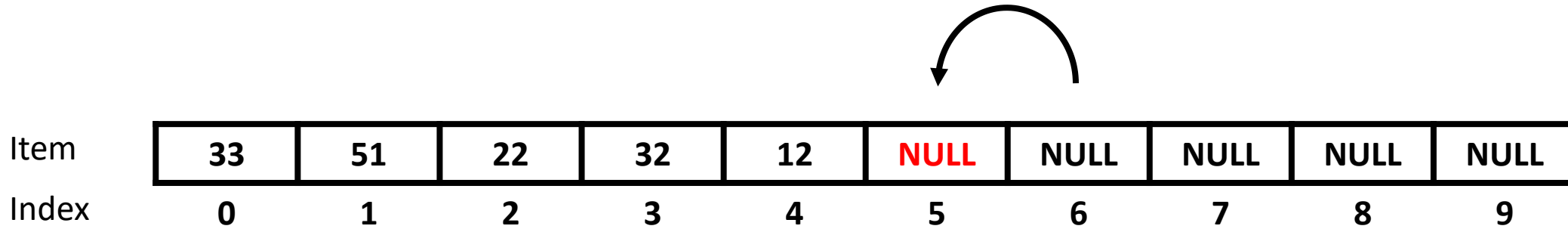
- Delete, Forward left copy. Threshold might be 4 items. $6-1 = 5 > 4$



- Delete, Forward left copy. Threshold might be 4 items. $6-1 = 5 > 4$



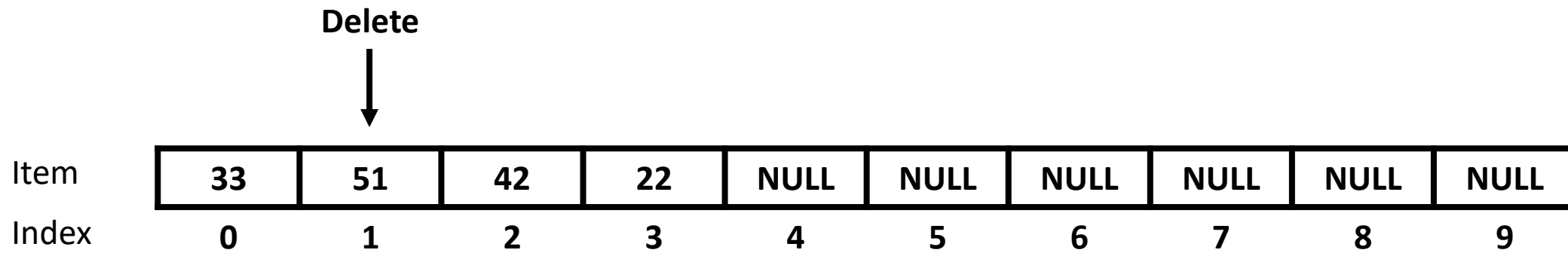
- Delete, Forward left copy. Threshold might be 4 items. $6-1 = 5 > 4$



Item	33	51	22	32	12	NULL	NULL	NULL	NULL	NULL
Index	0	1	2	3	4	5	6	7	8	9

Delete when $n - 1 \leq L$
(at threshold)

- Resize, Forward left copy, $n - 1 = 4 - 1 = 3 \leq 3$. Here our threshold is $L = 3$



Delete



Item

33	51	42	22	NULL	NULL	NULL	NULL	NULL	NULL
----	----	----	----	------	------	------	------	------	------

Index

0 1 2 3 4 5 6 7 8 9

Item

NULL	NULL	NULL	NULL	NULL
------	------	------	------	------

Index

0 1 2 3 4

Delete



Item

Index

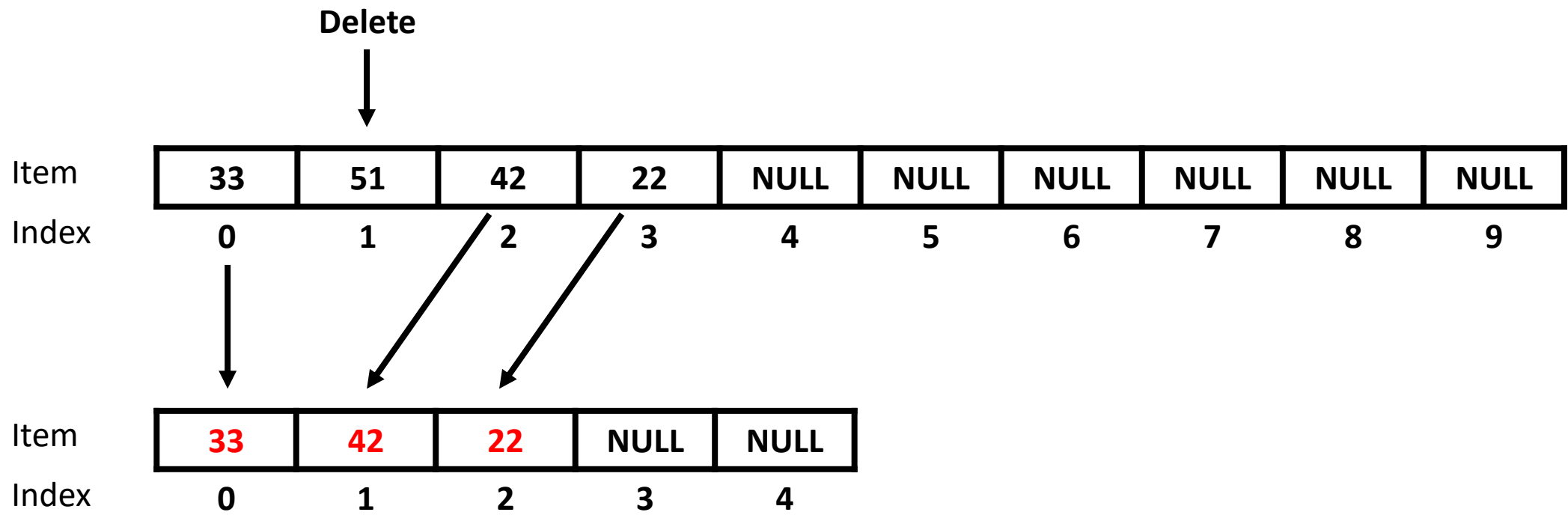
33	51	42	22	NULL	NULL	NULL	NULL	NULL	NULL
0	1	2	3	4	5	6	7	8	9



Item

Index

33	NULL	NULL	NULL	NULL
0	1	2	3	4



Delete



Item

33	51	42	22	NULL	NULL	NULL	NULL	NULL	NULL
----	----	----	----	------	------	------	------	------	------

Index

0 1 2 3 4 5 6 7 8 9

Item

33	42	22	NULL	NULL
----	----	----	------	------

Index

0 1 2 3 4