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## Announcement

1) madhacks.org /spring fever

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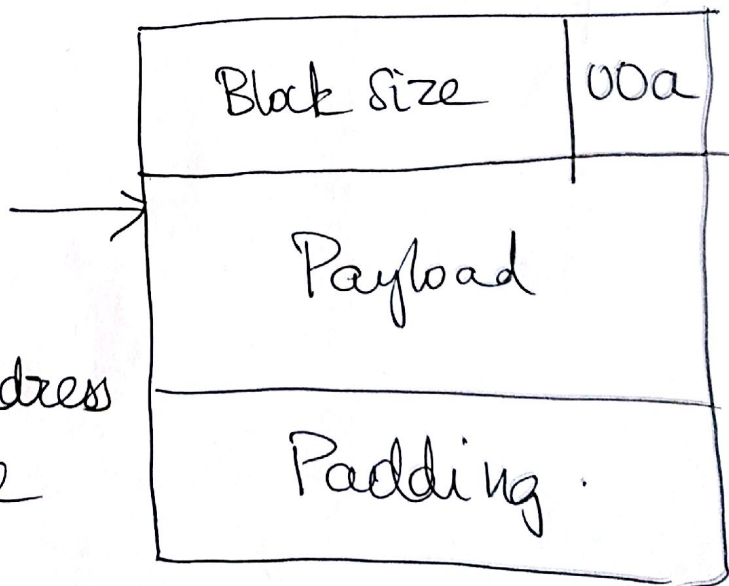
## Last Class

① Allocators / spak / bak

② Heap block structure

## Double Word Alignment

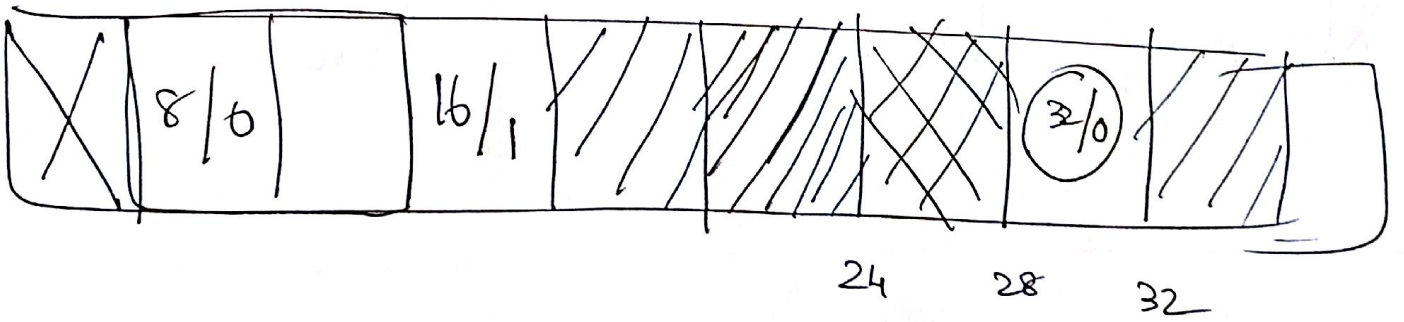
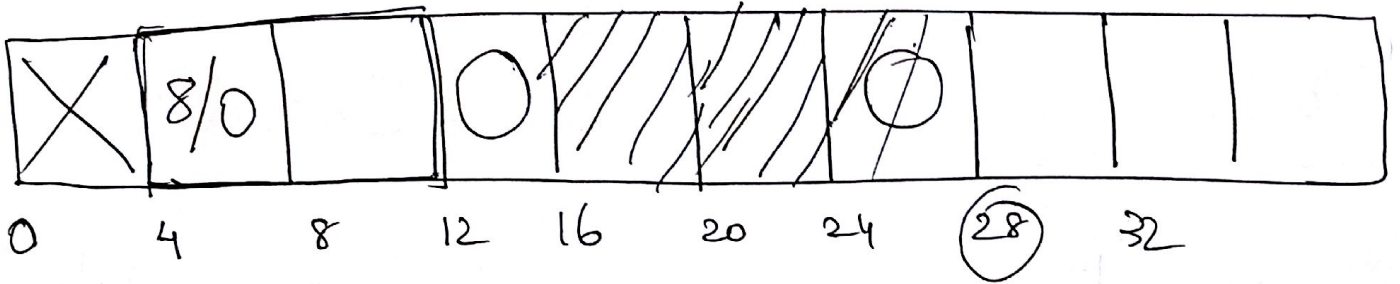
① Payload must start at an address that is a multiple of 8.

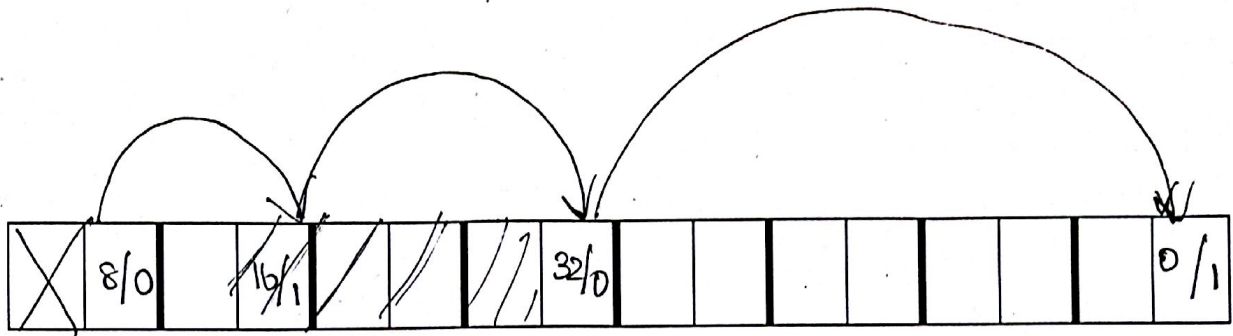


side effect

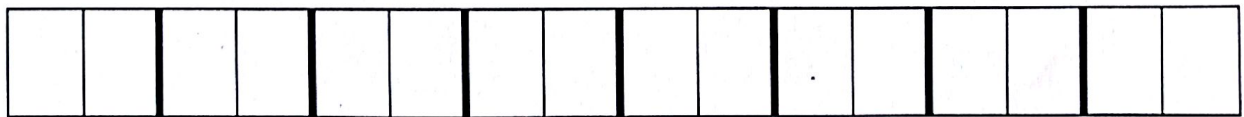
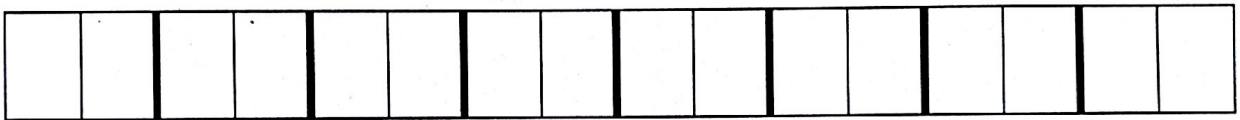
(b) Block size is also going to be also multiple of eight

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Terminating  
Block :-



Implicit

Free

List



?

Advantage

Disadvantage

① Less memory

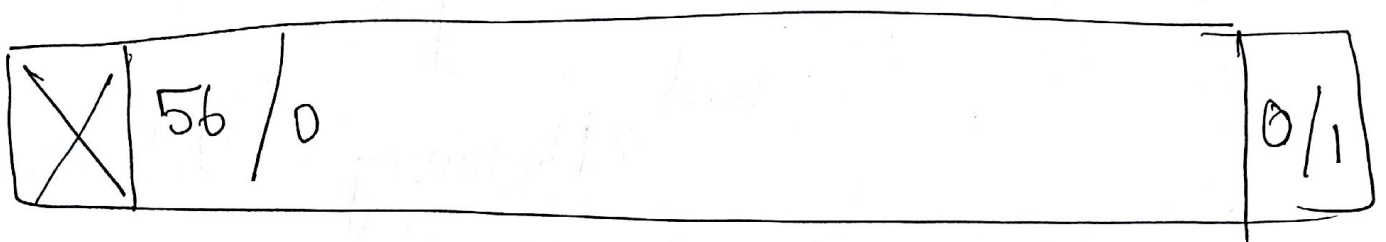
② Simple .

① Going through the entire list to satisfy an allocation request.

# Question 1

At the start of the program?

Your heap



Program requests a block of  $k$  bytes  
 $\text{malloc}(k)$

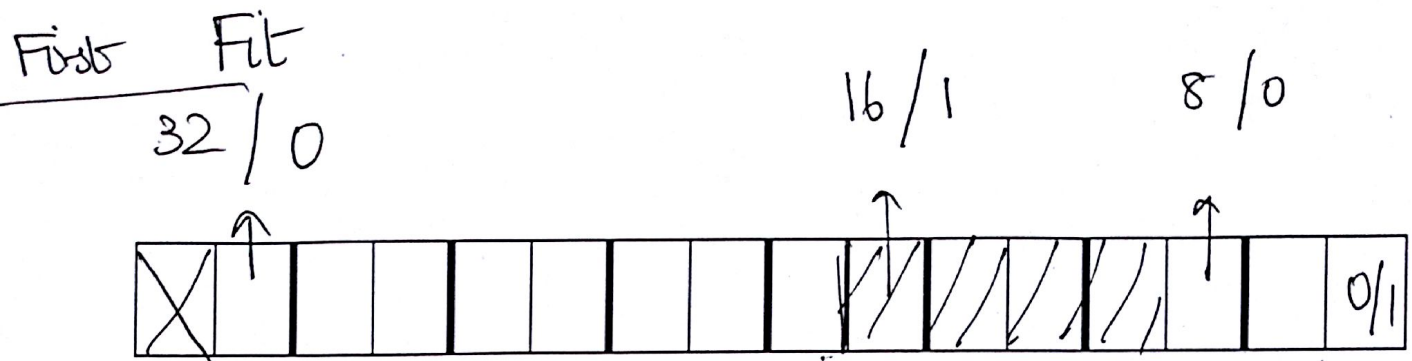
search the free list

- ① Find a suitable block
- ② Allocate it
- ③ return a pointer

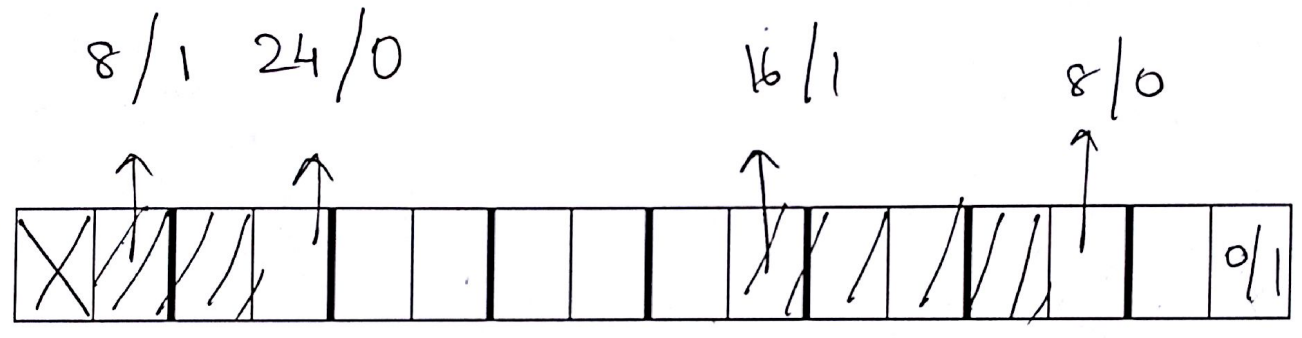
How?

## Placement Policy





→ Request for 2 bytes (malloc(2))  
 (4 bytes for header + 4 bytes for payload)



→ Request malloc(26)  
 4 bytes for header + 28 bytes for payload.

# ① First Fit

## Advantage.

① Fast

↓  
X

## Disadvantage

① External Fragmentation.

↓  
Bad. Memory Utilization.

② Next Fit X → Just like first fit.

↳ Instead of starting the search for a block from the beginning of the list, we start from where the previous search left off. //

# Best Fit

Adv

- ① Great Memory utilization

Disadv

Search takes time!

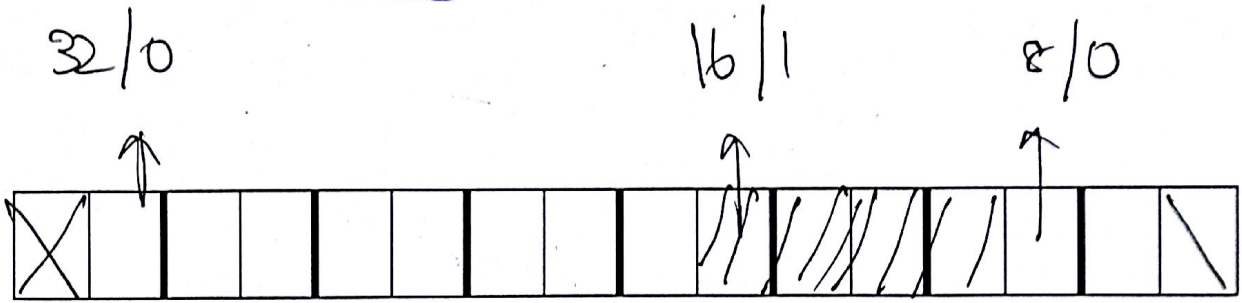
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## ③ Splitting Free Blocks

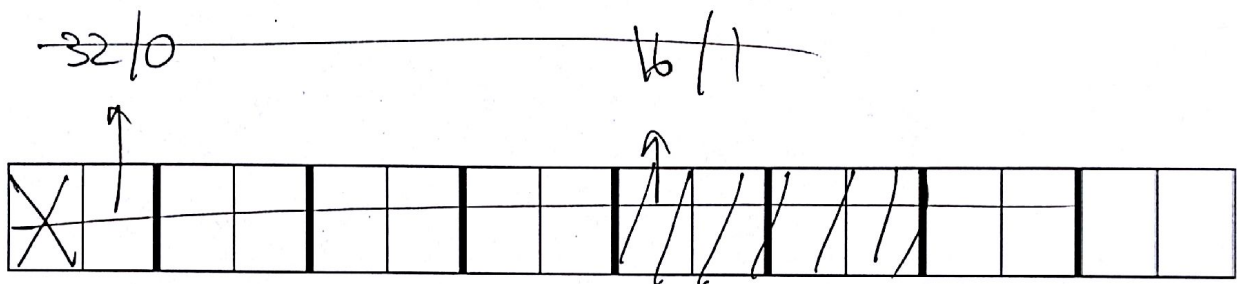
Split it into two → If the block size the larger.



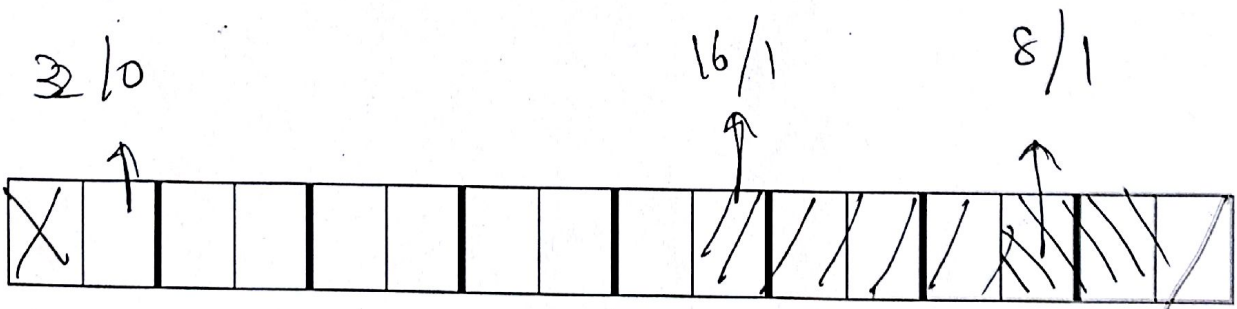
BEST FIT



→ Request malloc(3)

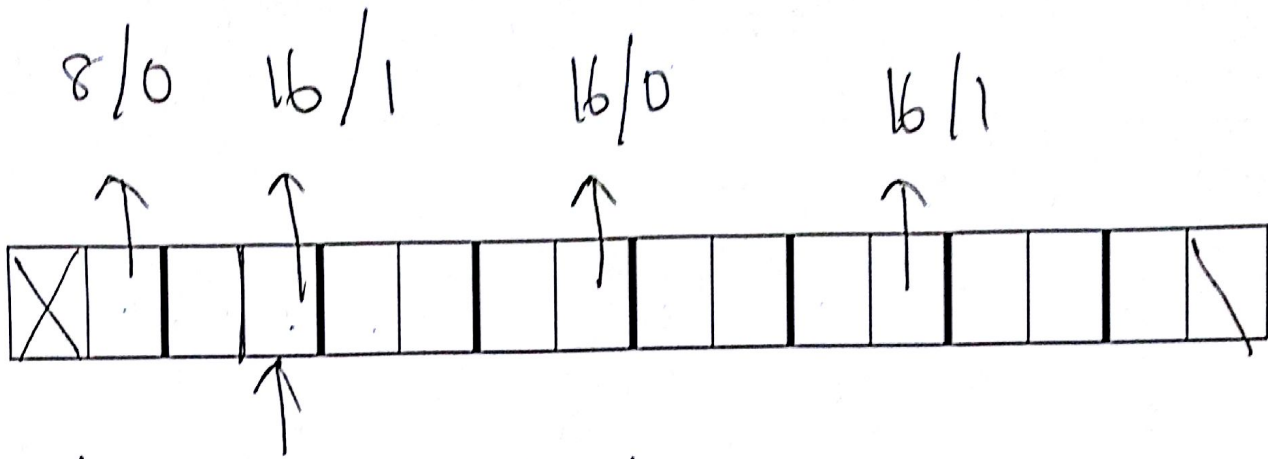


This is the best fit  
↓

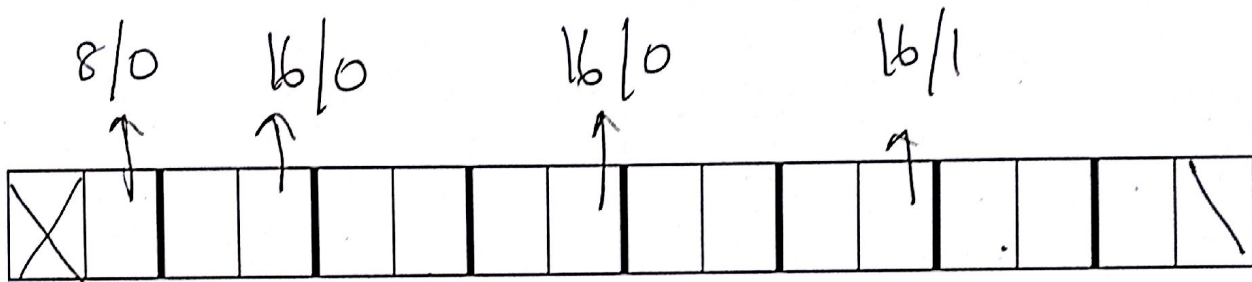


→ Request malloc(26)

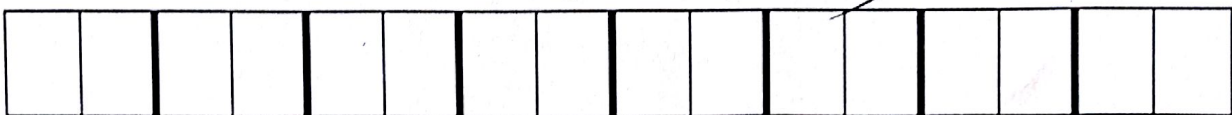
Block size → 4 + 28  
↳ can be satisfied!



Free this block



- Request malloc (20)
- No block large enough
- even though we have contiguous memory that is large enough.  
(False Fragmentation)



First part



Becomes the allocated block

Second Part

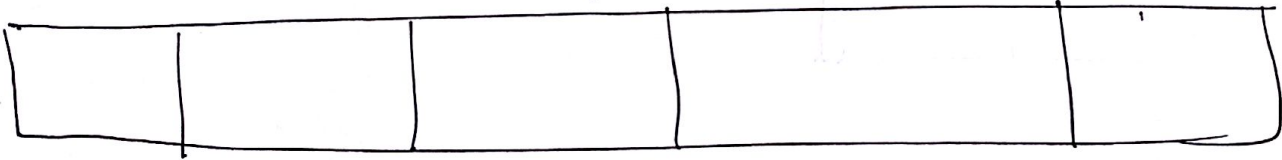


becomes a new free block.

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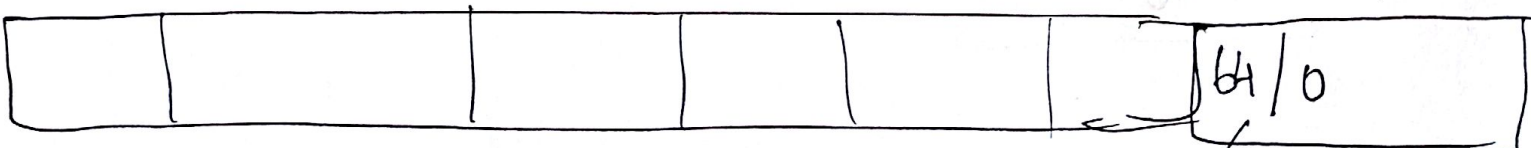
Quick aside → Get additional heap memory

Heap



↓ call (sbrk)

add the newly allocated memory here



big free block.



## ④ Coalescing Free Blocks

How do we solve False Fragmentation?



Merge the adjacent blocks

↓  
free



When?

① Immediately

② Deferred