

Some practice problems for the midterm exam

What are relocatable programs?

What is the main role of linkers?

Write a gcd function.

Write a swap function that exchanges two integers

In which of the following areas will each of the variables of the program below be allocated?

Program areas: stack, read only data area, read/write data area, uninitialized data area

```
void print(int d, int maxd) {  
    int a = 0;  
    static int s = 0;  
    extern int e;  
}
```

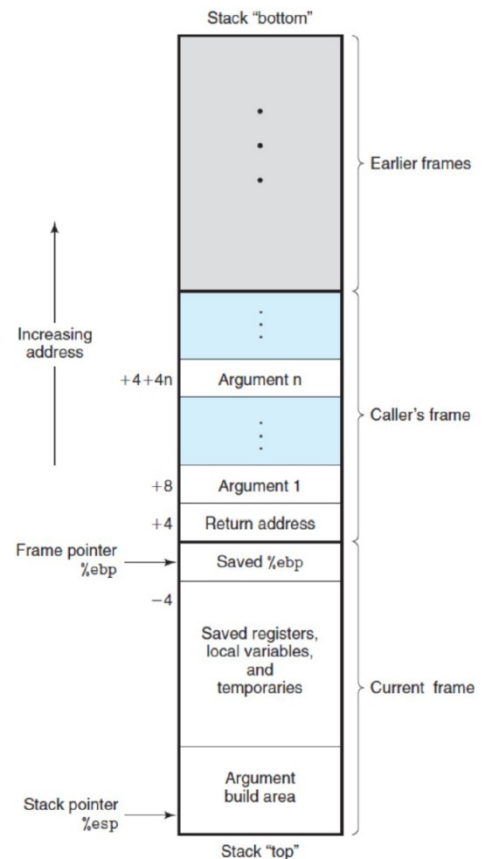
In C, how callers pass their parameters to callees?

How callees access the parameters passed from a caller?

What is a stack frame?

What elements are in a stack frame?

Explain how each element of a stack frame is added to the frame?



Below are a C function and a part of its compiled assembly code. Add simple comments to each line of the assembly code about what that line is doing.

```
long print()
{
    long a = 24, b = 30;
    long c = gcd(a, b);
    printf("gcd(%ld, %ld) = %ld\n",
          a, b, c);
    return 0;
}

print:
    pushq %rbp #
    movq %rsp, %rbp #,
    subq $32, %rsp #,
    movq $24, -24(%rbp) #, a
    movq $30, -16(%rbp) #, b
```

Implement a function that inserts a node into a linked list.

Implement a function that removes a node from a linked list.

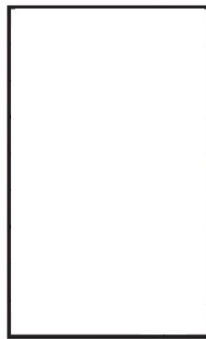
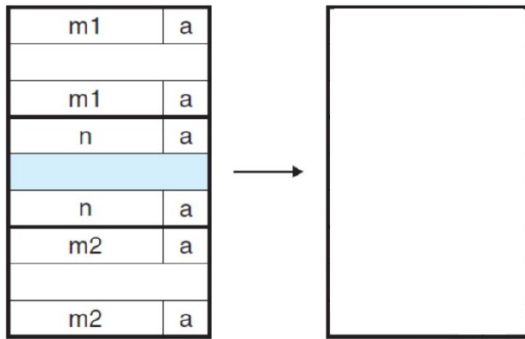
Explain what sbrk function is doing.

In allocation blocks, what comprises the header?

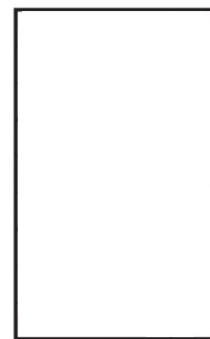
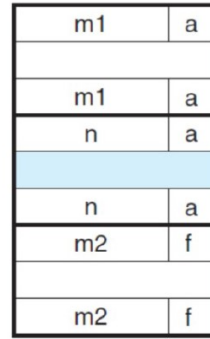
In allocation blocks, why do we need the footer?

Assuming that the size of the header of an allocator block is 32 bit and each block has a header and a footer, write a pseudo code that gets the sizes of the current block, the next block and the previous block.

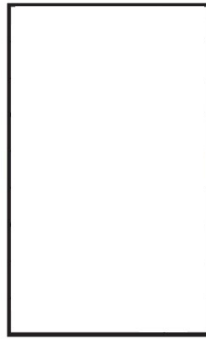
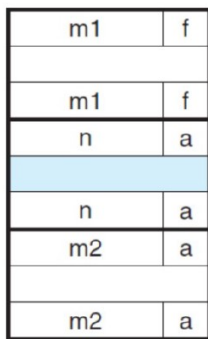
Below are 4 possible cases of the coalescing. Draw the resulting configurations after coalescing when the shaded blocks are freed.



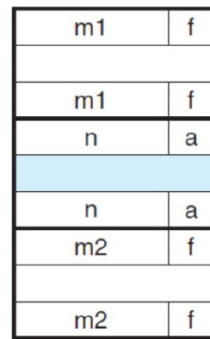
Case 1



Case 2



Case 3



Case 4