1. (50 points) Determine the block size and header values that would result from the following sequence of malloc requests. Assumptions:

1. The allocator maintains a 16-byte alignment and block sizes are rounded up to the nearest multiple of 16 bytes.

2. The free blocks are maintained implicitly with a 64-bit header: bit 0 encodes the allocation status (similar to Figure 9.35).

Hint: Work on Practice problem 9.6 prior to this. The solutions for the practice problems are provided in the textbook.

Request	Block size (decimal bytes)	Block header (hex)
malloc(1)	‑‑‑‑‑‑‑‑	‑‑‑‑‑‑‑‑
malloc(5)	‑‑‑‑‑‑‑‑	‑‑‑‑‑‑‑‑
malloc(12)	‑‑‑‑‑‑‑‑	‑‑‑‑‑‑‑‑
malloc(24)	‑‑‑‑‑‑‑‑	‑‑‑‑‑‑‑‑
malloc(25)	‑‑‑‑‑‑‑‑	‑‑‑‑‑‑‑‑

1)

a)	Request	b)	Block Size	c)	Block Header
d)	Malloc(1)	e)	8	f)	9
g)	Malloc(5)	h)	16	i)	11
j)	Malloc(20)	k)	32	l)	19
m)	Malloc(24)	n)	32	o)	29
p)	Malloc(25)	q)	36	r)	39

2. (50 points) Determine the minimum block size for each of the following combinations of alignment requirements and block formats. Assumptions:

1. Implicit free list.

2. Zero-size payloads are not allowed.

3. Headers and footers are 8 bytes.

Hint: Work on Practice problem 9.7 prior to this. The solutions for the practice problems are provided in the textbook.

Alignment	Allocated block	Free block	Minimum block size (bytes)
8 bytes	Header and footer	Header and footer	‑‑‑‑‑‑‑‑
8 bytes	Header, but no footer	Header and footer	‑‑‑‑‑‑‑‑
16 bytes	Header and footer	Header and footer	‑‑‑‑‑‑‑‑
16 bytes	Header, but no footer	Header and footer	‑‑‑‑‑‑‑‑

2)

a)	Alignment	b)	Allocated Block	c)	Free Block	d)	Minimum Block Size(bytes)
e)	8 bytes	f)	Header and Footer	g)	Header and Footer	h)	32

i) 8 bytes	j) Header, but no Footer	k) Header and Footer	l) 24
m) 16 bytes	n) Header and Footer	o) Header and Footer	p) 40
q) 16 bytes	r) Header, but no Footer	s) Header and Footer	t) 32

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