

1.(a) i) `lea msg, a1` \Rightarrow $\$43F9$ $\$0002000$

$\$43F9$ Binary: $0100^{\vee}0011^{\vee}11111001$
`lea` $0100\boxed{001}111\boxed{111001}$
 ↑ register = a1 ↑ effective address mode, register, = addressing mode (xxx).w

ii) This means the absolute address given in the longword extension (xxx).w of the instruction, namely $\$0002000$

is loaded into a1. See sec. 2.2.17, Absolute Long Addressing Mode. We see that $\$0002000$ is indeed the address of the first byte of msg.

iii) This would not be used in the MAS system since data are always accessed with indirect addressing relative to a5.

(b) For `jsr`, the SP is decremented by 4 and the return address is placed on the stack.

Thus $SP = \$1000000 - 4 = \$FFFFFFC$
 and the memory contains $\$1028$ at that location ($\$FFFFFFC$).

(c) `zero = $30 (ASCII) in do`

`cmp.b #$30, do` sets condition codes as if $\$30$ had been subtracted from $\$20$ resulting in zero. Thus, $Z=1$, $N=0$ (zero, not negative).