## Unit 08_010 – Declaring multiples

1. What is an address?

2. In the listing we see text like the following. If we execute the program, will char3 be loaded at location 0003 in physical memory? Explain.

```
0003 43                 char3: .byte 67  # same as 0x43
```

3. We have been using the term "variable" this semester. How are they similar to the idea of a variable in a high level language? How are they different? (I did not cover this explicitly in the video. Think about it.)

4. What does $ mean when it appears before a label?

5. What does it mean when a register appears in (parenthesis)?

6. How are the $ and () compliments of each other?

7. Explain the difference between the following two lines of code. What would be loaded into the register in each? Also, why doesn't (%rdx) change?

```
movb (%rbx), %dil
movq (%rbx), %rdi
```

## Unit 08_020 – Arrays

*Video Length 8:10*

8. Use commas to declare an array of 3 integers as quads.

9. Given the array in the question above, write the code needed to create a variable that will calculate the size of the array.

10. Given the array and the array size calculated above, how many bytes will be stored as the size?

11. For review, fill in the right column of the following table.

| size | declaration |
|---|---|
| 1 | .byte |
| 2 | |
| 4 | |
| 8 | |

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## Unit 08_ 030 – Addressing Modes

12. Memory modes are about the _____ of an instruction

13. What are the three basic addressing modes?

14. What is immediate mode? How can you recognize immediate mode in GAS assembler?

15. How do you recognize that an operand is Register mode in GAS assembler?

16. Which of the three modes involves calculation of an address?

17. For each of the following, write I for immediate mode, R for register mode, or M for Memory mode. Assume "number" is a label.

    - $99
    - %rdx
    - (%rax)
    - $number
    - number

---

## Unit 08_040 – Memory Addressing Modes

18. Fill in the blanks in the following:
$address =$ _____(_____, _____, _____)

19. Is the value added to or multiplied by the fields in parenthesis

20. In the formula above, which two fields must be registers?

21. What values are allowed for the multiplier?

22. What is the default number if the value field is omitted?

23. What is the default number if the basereg field is omitted?

24. What is the default number if the idxreg field is omitted?

25. What is the default number if the multiplier is omitted?

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## Unit 08_050 – Printing a byte the hard way

26. What would need to be changed in the following block of code to get it to prink the "n" in skunk?

```
    .data
    format:.asciz "The char is \'%c\'.\n"
    animal:.ascii "skunk","\0"
.text
main:
   movq \$animal, \%r15
   movq \$0, \%r14
   xor \%rax, \%rax
   movq \$format, \%rdi
   movb (\%r15,\%r14), \%sil
   call printf
```

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## Unit 08_055 – Printing bytes with a loop

*Video Length*

27. Modify the text part of the code from the previous question so that it will print all of the characters in animal. Just do the main: label up until the _exit label.

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## Unit 08_060 – Looping Quads

28. Suppose you want to skip the

    0

    year. Modify the following line of code so that it would skip the first year.

```
movq (\%r15,\%r14,8), %rdx
```

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## Unit 08_070 – RIP Relative Addressing

29. What are two things that RIP Relative addressing accomplishes?

30. What is the difference between PIC and PIE?

31. In the following code, change the line or lines that need to be modified for PIC.

```
.data
    ages: .quad 10, 23, 8, 9, 23
    agesN .quad 5
.text
main:
   movq ages, %r8
   movq agesN, %r9
   xorg %rax, %rax
   movq $ages %rdi
```

If you have any lingering questions or problems, please write them here or see me.