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| Lab 7 – Pointer Practice  CPSC 2311- Sp 23 |  |

# Introduction

The goal of this lab is to give you practice with pointers, and structs.

**Due: Monday, March 6, 2023 - midnight**

# Lab Instructions

Consider the following snippet of code:

struct NODE{

int a;

struct NODE \*b;

struct NODE \*c;

};

struct NODE nodes[5] = {

{9, nodes + 4, NULL}, nodes[0]

{32, nodes + 2, nodes + 3}, nodes[1]

{16, NULL, nodes + 4}, nodes[2]

{41, nodes + 1, nodes}, nodes[3]

{81, nodes + 3, nodes + 1} nodes[4]

};

struct NODE \*np = nodes + 2;

struct NODE \*\*npp = &nodes[1].b;

**Task 1:**

Using the boxes below you are to draw the representation of the nodes array declared above (including variables and their values). This will help you complete the remainder of this lab.

**You are to assume (pretend) the nodes array begins at address location 200 and that the computer is 64-bit architecture.** This information is needed to help you determine the address of each node and the elements of a node.

With the above you should have all needed information to complete this diagram.

Address **(0x200)** Address **(0x224)** Address **(0x248)** Address **(0x272)** Address **(0x296)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| a = 9  \*b = 0x296  \*c = 0x0 (NULL) | a = 32  \*b = 0x248  \*c = 0x272 | a = 16  \*b = 0x0  \*c = 0x296 | a = 41  \*b = 0x224  \*c = 0x200 | a = 81  \*b = 0x272  \*c = 0x224 |

nodes [\_\_0\_\_] nodes [\_\_1\_\_] nodes [\_\_2\_\_] nodes [\_\_3\_\_] nodes [\_\_4\_\_]

**Task 2:**

You will need to evaluate each expression to determine the value. If the expression cannot be evaluated enter ILLEGAL, if the expression can be evaluated but there is no way to know the value then enter DO NOT KNOW. You should evaluate each expression with the original values shown (In other words do not use the results of one expression to evaluate the next expression.)

Using the above information, complete the following chart.

**Expression Value**

nodes \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

nodes.a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

nodes[3].a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

nodes[3].c \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

nodes[3].c->a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\*nodes.a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(\*nodes).a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

nodes->a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

nodes[3].b->b \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

&nodes[3].a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

&nodes[3].c \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

&nodes[3].c->a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

&nodes->a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

np \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

np->a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

np->c->c->a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

npp \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

npp->a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\*npp \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\*npp->a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(\*npp)->a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

&np \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

&np->a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

&np->c->c->a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Task 3:**

Once you have evaluated each expression you are required to write a program, in C, that will print out the value of each legal expression. Name the “C” file lab7.c.

The format of the output should be the expression, a tab, and the output. The expressions in the blanks above, that produce an address, obviously will not be the same address as the one you print out.

So, you are probably wondering why you don’t just write the program and copy the output to the blanks above. Good question! Some of the expressions above will rely on you knowing what will print in order to even write the print statement. Also, if you do this you will not learn what you are supposed to learn from this lab. Lastly, you will see some of these or questions like these on a quiz and/or exam.

In your lab7.c file you must have a comment block that has the following information.

/\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

\*Your name

\*Username

\*Email

\*Lab 7 and your lab section

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*/

**Submission Instructions:**

Once you have completed the assignment please convert your answers to the ex.json file I have provided.   
  
If you don’t know what json is do a quick google. It’s pretty common and good to know.

You need only go through and put in data for each item.   
For task one the array is in order top to bottom in json is left to right in the table.

Please obey the following formatting constraints.

For a hex memory address

“example”: “0x200”

For an integer value

“example”: “2”

Gradescope wants your .json file and a c program with a makefile to compile it as LAB7  
3 files:

answers.json

lab7.c

makefile