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

# Introduction

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

**Due:** Monday, October 23, 2023

# Lab Instructions

Consider the following snippet of code:

struct NODE{

int a

struct NODE \*b;

struct NODE \*c;

};

struct NODE nodes[5] = {

{15, nodes + 2, nodes +1},

{30, nodes + 3, NULL},

{46, nodes + 1, nodes +4},

{95, nodes + 4, nodes},

{123, NULL, nodes + 2}

};

struct NODE \*np = nodes + 4;

struct NODE \*\*npp = &nodes[2].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 0x210 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(0x210) Address(0x228) Address(0x240) Address(0x258) Address(0x270)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| a = 0x210  \*b = 0x218  \*c = 0x220 | a = 0x228  \*b = 0x230  \*c = 0x238 | a = 0x240  \*b = 0x248  \*c = 0x250 | a = 0x258  \*b = 0x260  \*c = 0x268 | a = 0x270  \*b = 0x278  \*c = 0x280 |

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 0x210

nodes.a ILLEGAL

nodes[3].a 95

nodes[3].c 0x210

nodes[3].c->a 15

\*nodes.a ILLEGAL

(\*nodes).a 15

nodes->a 15

nodes[3].b->b NULL

&nodes[3].a 0x258

&nodes[3].c 0x268

&nodes[3].c->a 0x210

&nodes->a 0x210

np 0x270

np->a 123

np->c->c->a 123

npp 0x248

npp->a ILLEGAL

\*npp 0x228

\*npp->a ILLEGAL

(\*npp)->a 30

&np DO NOT KNOW

&np->a 0x270

&np->c->c->a 0x270

**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 output of this file can be used to help you determine if you have the correct answers.

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! Any addresses printed will not be the same as your document. Also, some of the expressions above will rely on you knowing what will print in order to even write the print statement. Also, if you solely rely on the program for the answers 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 an exam.

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

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

\*Your name

\*Your Email

\*Lab 7 and your lab section

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**Submission Instructions:**

Tar.gz your lab7.c file and submit to handin.

You will need to submit the paper part to canvas.