ENSF 614 – Fall 2021

Lab 2 – Tuesday, September 28

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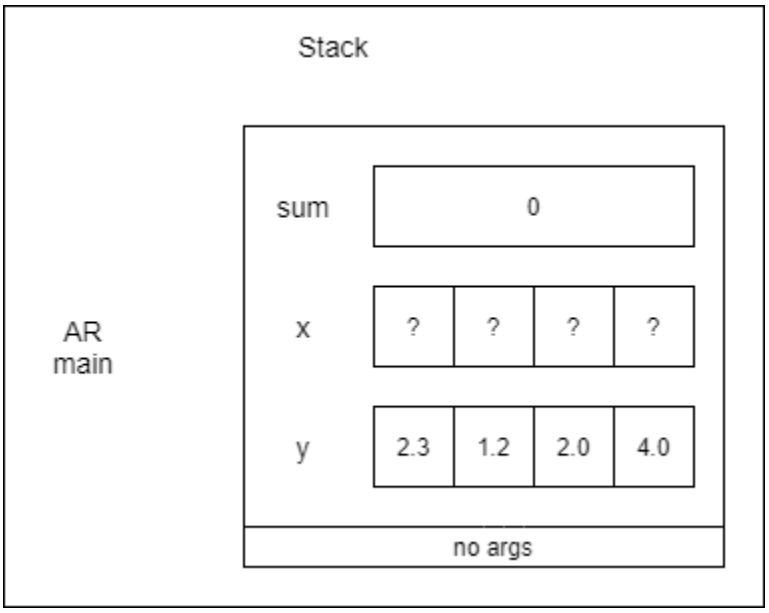
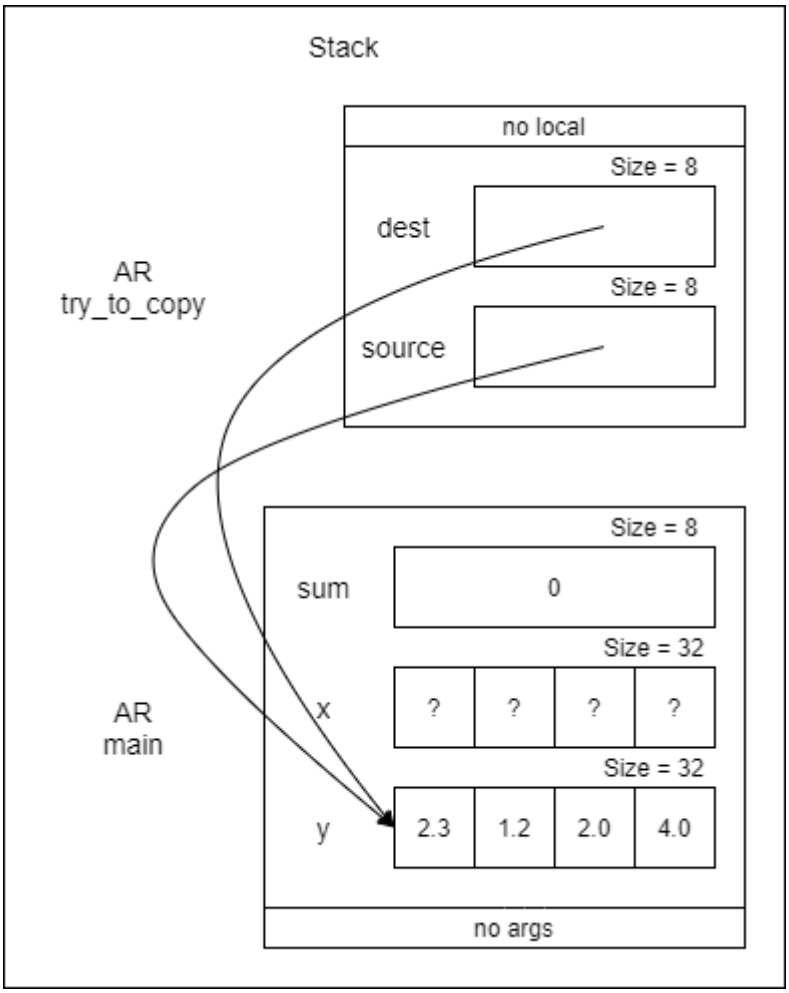
Submission date: September 28, 2021

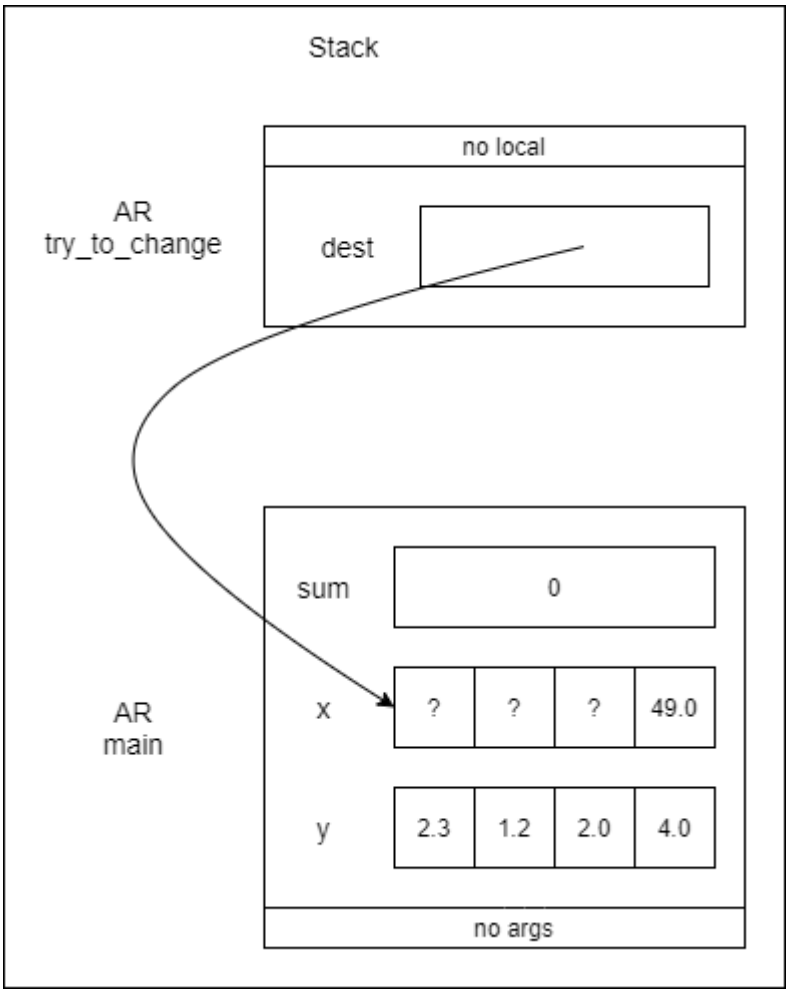
Exercise A – AR Diagram for Point One



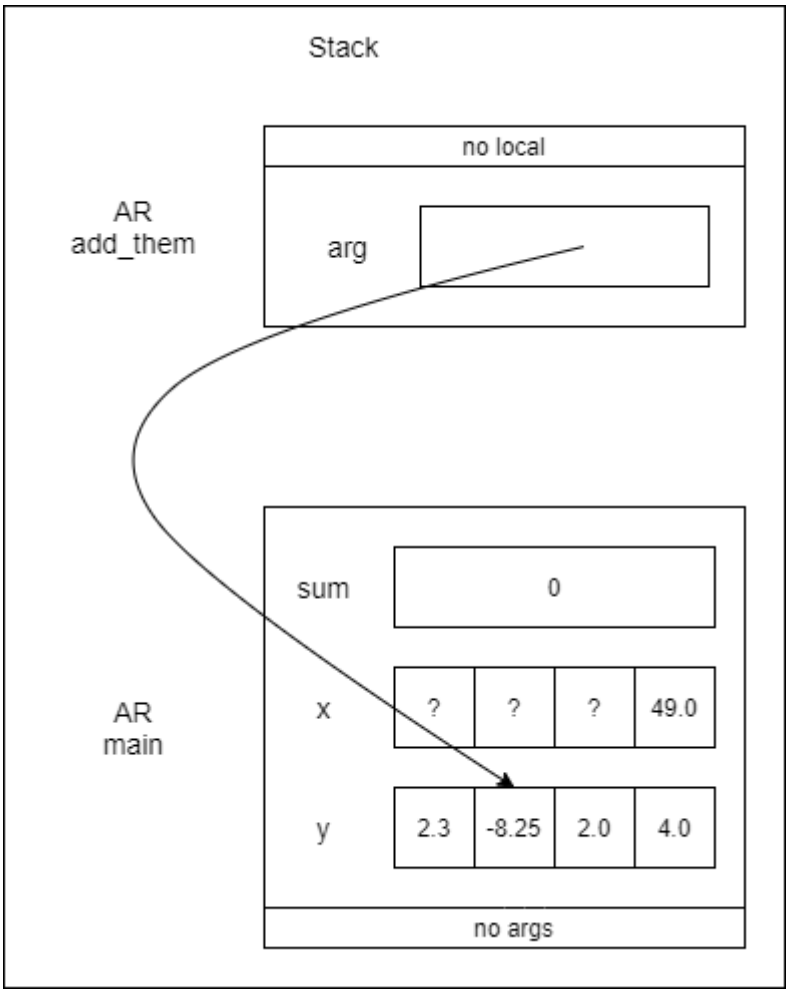
Exercise A – AR Diagram for Point Two



Exercise A – AR Diagram for Point Three



Exercise A – AR Diagram for Point Four



Exercise B – Source File

```c
/*
 * File Name:               my_lab2exe_B.c
 * Course:                  ENSF 614 - Fall 2021
 * Lab # and Assignment #:  Lab 2 Exercise B
 * Lab section:             B01
 * Completed by:            Bhavyai Gupta
 * Submission Date:         September 28, 2021
 */

int my_strlen(const char *s);
/*
 * Duplicates strlen from <string.h>, except return type is int.
 *
 * REQUIRES
 *     s points to the beginning of a string.
 *
 * PROMISES
 *     Returns the number of chars in the string, not including the
 *     terminating null.
 */

void my_strncat(char *dest, const char *source, int n);
/*
 * Duplicates strncat from <string.h>, except return type is void.
 *
 * REQUIRES
 *     dest and source pointing to the beginning of the string
 *     n is greater than or equal to 0
 *     sizeof(dest) > len(dest) + n
 *
 * PROMISES
 *     Copies first n characters from source to dest. If n is
 *     smaller than length of string, then characters are copied
 *     from source till '\0' is encountered.
 */

int my_strcmp(const char *str1, const char *str2);
/*
 * Duplicates strncat from <string.h>, except return type is void.
 *
```

```c
 * REQUIRES
 *     dest and source pointing to the beginning of the string
 *
 * PROMISES
 *     Returns 0 is two strings are exactly equal, otherwise difference
 *     of ASCII values of the first two characters that are different.
 */

#include <stdio.h>
#include <string.h>

int main(void)
{
    char str1[7] = "banana";
    const char str2[] = "-tacit";
    const char *str3 = "-toe";

    /* point 1 */
    char str5[] = "ticket";
    char my_string[100] = "";
    int bytes;
    int length;

    /* using strlen C library function */
    length = (int)my_strlen(my_string);
    printf("\nLine 1: my_string length is %d.", length);

    /* using sizeof operator */
    bytes = sizeof(my_string);
    printf("\nLine 2: my_string size is %d bytes.", bytes);

    /* using strcpy C libarary function */
    strcpy(my_string, str1);
    printf("\nLine 3: my_string contains: %s", my_string);

    length = (int)my_strlen(my_string);
    printf("\nLine 4: my_string length is %d.", length);

    my_string[0] = '\0';
    printf("\nLine 5: my_string contains:\"%s\"", my_string);

    length = (int)my_strlen(my_string);
    printf("\nLine 6: my_string length is %d.", length);

    bytes = sizeof(my_string);
    printf("\nLine 7: my_string size is still %d bytes.", bytes);
```

```
    /* strncat append the first 3 characters of str5 to the end of my_string *
/
    my_strncat(my_string, str5, 3);
    printf("\nLine 8: my_string contains:\"%s\"", my_string);

    length = (int)my_strlen(my_string);
    printf("\nLine 9: my_string length is %d.", length);

    my_strncat(my_string, str2, 4);
    printf("\nLine 10: my_string contains:\"%s\"", my_string);

    /* strncat append ONLY up ot '\0' character from str3 -
- not 6 characters */
    my_strncat(my_string, str3, 6);
    printf("\nLine 11: my_string contains:\"%s\"", my_string);

    length = (int)my_strlen(my_string);
    printf("\nLine 12; my_string has %d characters.", length);

    printf("\n\nUsing strcmp - C library function: ");

    printf("\n\"ABCD\" is less than \"ABCDE\" ... strcmp returns: %d", my_strc
mp("ABCD", "ABCDE"));
    printf("\n\"ABCD\" is less than \"ABND\" ... strcmp returns: %d", my_strcm
p("ABCD", "ABND"));
    printf("\n\"ABCD\" is equal than \"ABCD\" ... strcmp returns: %d", my_strc
mp("ABCD", "ABCD"));
    printf("\n\"ABCD\" is less than \"ABCd\" ... strcmp returns: %d", my_strcm
p("ABCD", "ABCd"));
    printf("\n\"Orange\" is greater than \"Apple\" ... strcmp returns: %d\n",
my_strcmp("Orange", "Apple"));

    return 0;
}

int my_strlen(const char *s)
{
    int count = 0;

    while (*s != '\0')
    {
        count++;
        s++;
    }

    return count;
}
```

```c
void my_strncat(char *dest, const char *source, int n)
{
    // move dest pointer to end of string pointed by dest
    while (*dest != '\0')
    {
        dest++;
    }

    for (int i = 0; i < n; i++)
    {
        // this condition will break the loop if n < strlen(source)
        if(*source == '\0')
            break;

        *dest = *source;
        dest++;
        source++;
    }

    *dest = '\0';
}
```

```c
int my_strcmp(const char *str1, const char *str2)
{
    while(!(*str1 == '\0' || *str2 == '\0'))
    {
        if(*str1 != *str2)
        {
            return (int) (*str1 - *str2);
        }

        else
        {
            str1++;
            str2++;
        }
    }

    return (int) (*str1 - *str2);
}
```

Exercise B – Program Output

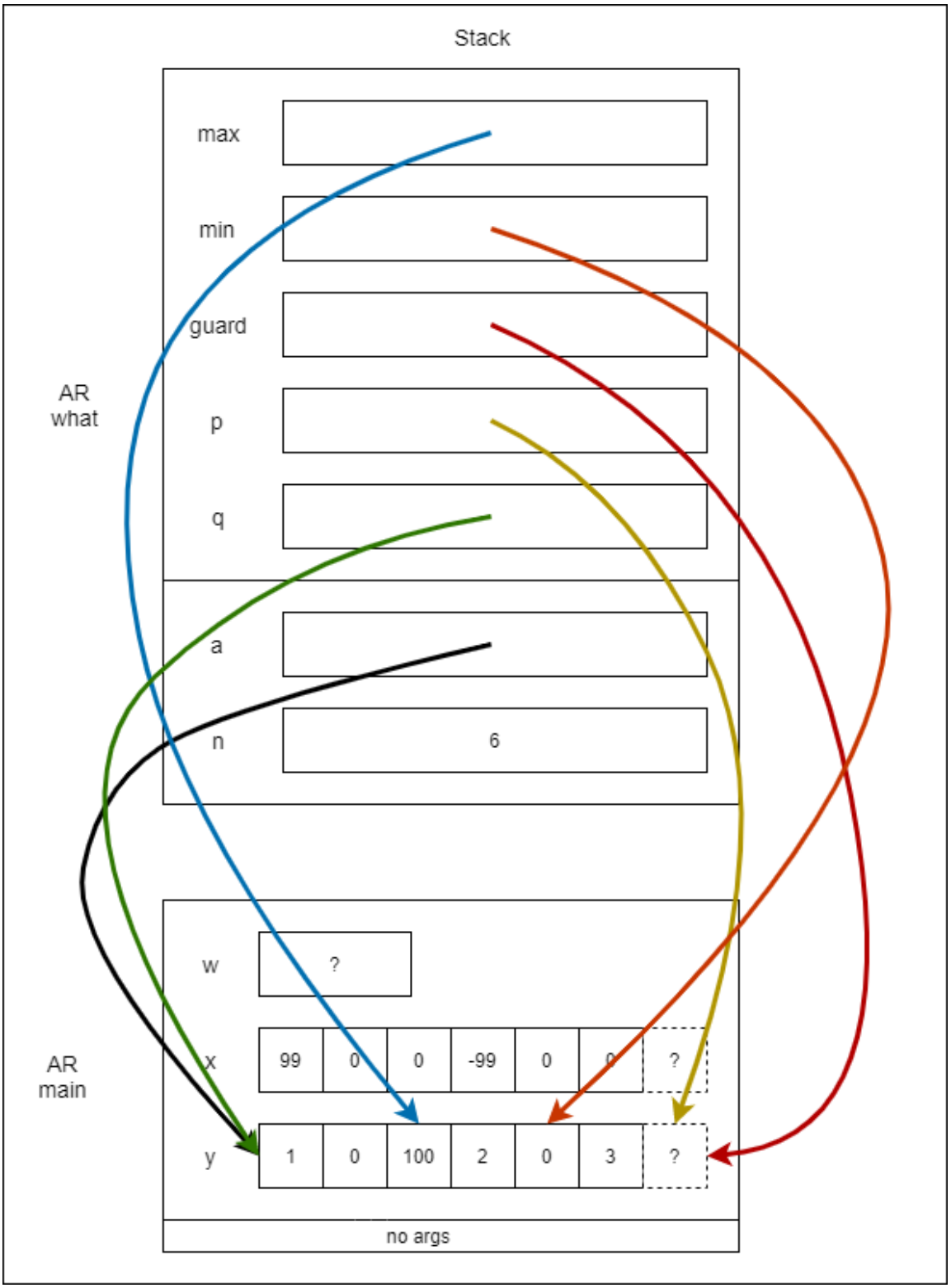
```
D:\GitHub\university-calgary\ENSF-614\lab2>gcc -Wall my_lab2exe_B.c -o my_lab2exe_B

D:\GitHub\university-calgary\ENSF-614\lab2>.\my_lab2exe_B.exe

Line 1: my_string length is 0.
Line 2: my_string size is 100 bytes.
Line 3: my_string contains: banana
Line 4: my_string length is 6.
Line 5: my_string contains:""
Line 6: my_string length is 0.
Line 7: my_string size is still 100 bytes.
Line 8: my_string contains:"tic"
Line 9: my_string length is 3.
Line 10: my_string contains:"tic-tac"
Line 11: my_string contains:"tic-tac-toe"
Line 12; my_string has 11 characters.

Using strcmp - C library function:
"ABCD" is less than "ABCDE" ... strcmp returns: -69
"ABCD" is less than "ABND" ... strcmp returns: -11
"ABCD" is equal than "ABCD" ... strcmp returns: 0
"ABCD" is less than "ABCd" ... strcmp returns: -32
"Orange" is greater than "Apple" ... strcmp returns: 14
```

Exercise C – AR Diagram



Exercise E – Source Code of functions

```c
struct cplx cplx_add(struct cplx z1, struct cplx z2)
{
    struct cplx result;

    result.real = z1.real + z2.real;
    result.imag = z1.imag + z2.imag;

    return result;
}

void cplx_subtract(struct cplx z1, struct cplx z2, struct cplx *difference)
{
    (*difference).real = z1.real - z2.real;
    (*difference).imag = z1.imag - z2.imag;
}

void cplx_multiply(const struct cplx *pz1, const struct cplx *pz2, struct cplx *p
roduct)
{
    double a = (*pz1).real;
    double b = (*pz1).imag;
    double c = (*pz2).real;
    double d = (*pz2).imag;

    (*product).real = (a*c - b*d);
    (*product).imag = (a*d + b*c);
}
```