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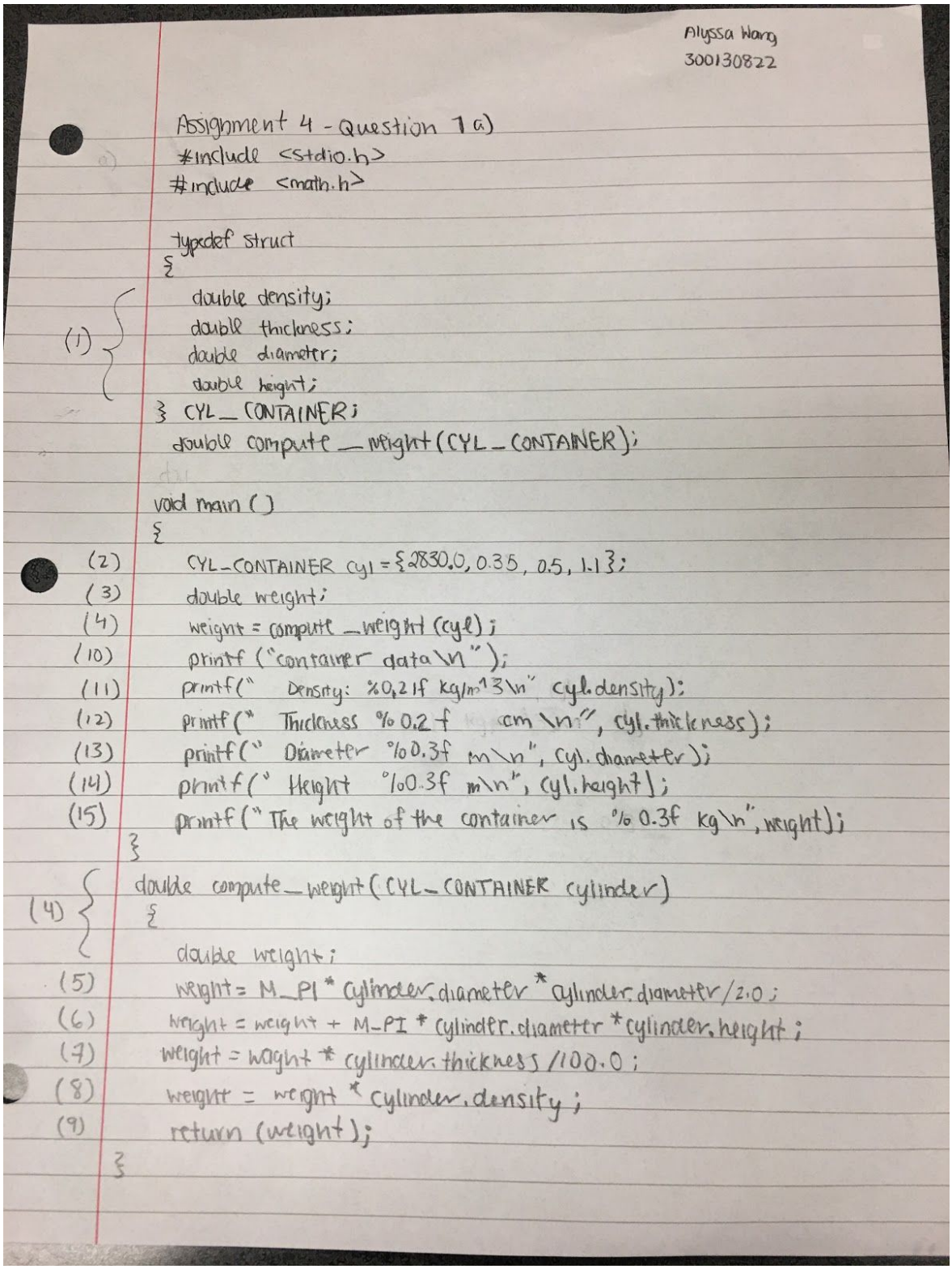
GNG 1106 - Assignment 4

Question 1

a)



```
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Assignment 4 - Question 1a)
#include <stdio.h>
#include <math.h>

typedef struct
{
    double density;
    double thickness;
    double diameter;
    double height;
} CYL_CONTAINER;
double compute_weight(CYL_CONTAINER);

void main()
{
    CYL_CONTAINER cyl = {2830.0, 0.35, 0.5, 1.1};
    double weight;
    weight = compute_weight(cyl);
    printf("container data\n");
    printf("  Density: %0.2lf kg/m^3\n", cyl.density);
    printf("  Thickness %0.2f  cm\n", cyl.thickness);
    printf("  Diameter %0.3f m\n", cyl.diameter);
    printf("  Height  %0.3f m\n", cyl.height);
    printf("The weight of the container is %0.3f kg\n", weight);
}

double compute_weight(CYL_CONTAINER cylinder)
{
    double weight;
    weight = M_PI * cylinder.diameter * cylinder.diameter/2.0;
    weight = weight + M_PI * cylinder.diameter * cylinder.height;
    weight = weight * cylinder.thickness/100.0;
    weight = weight * cylinder.density;
    return (weight);
}
```

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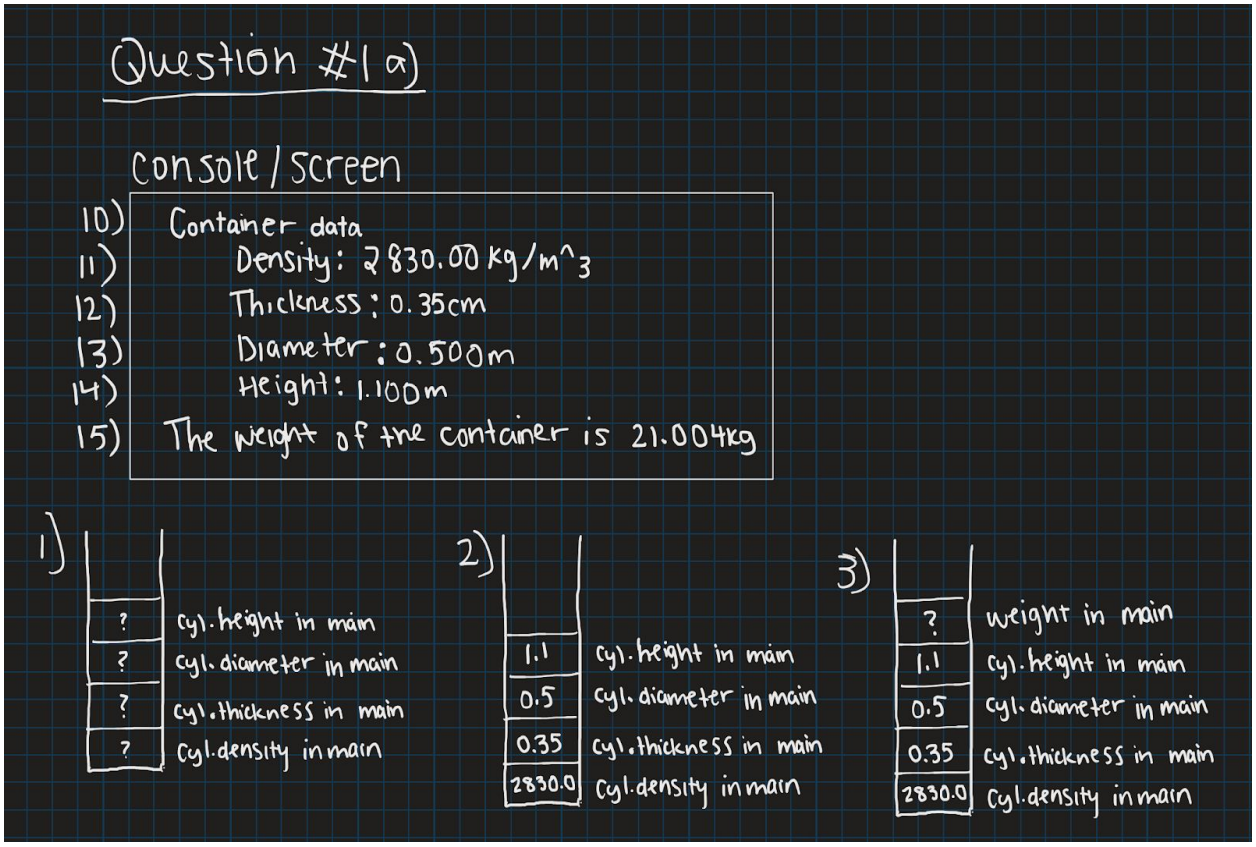

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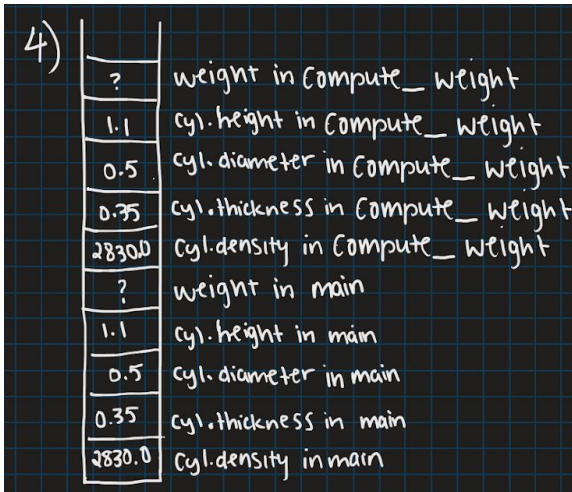
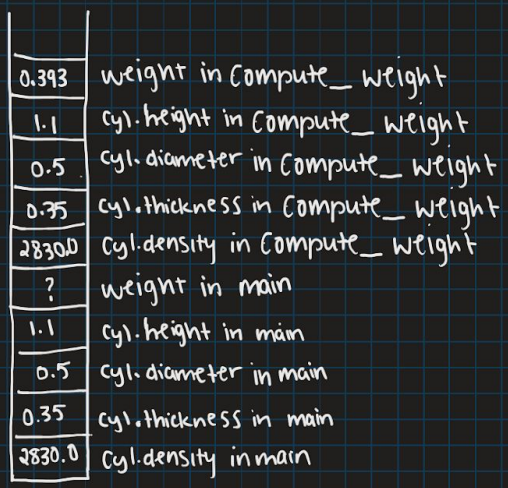
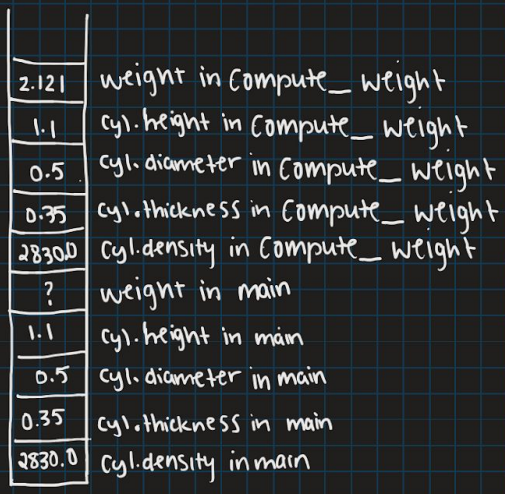
4)



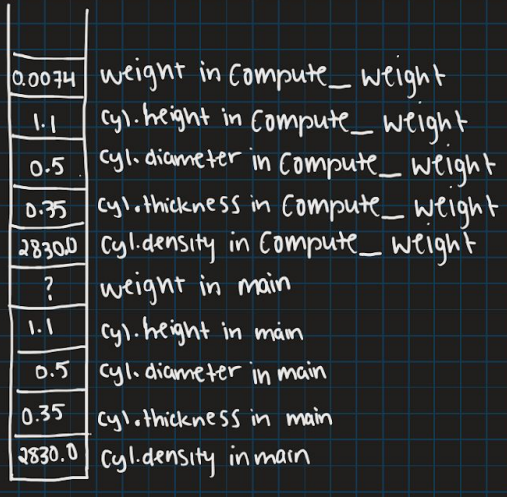
5)



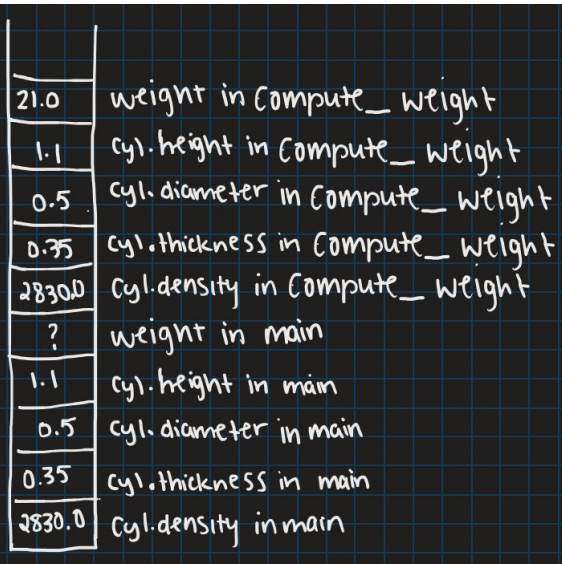
6)



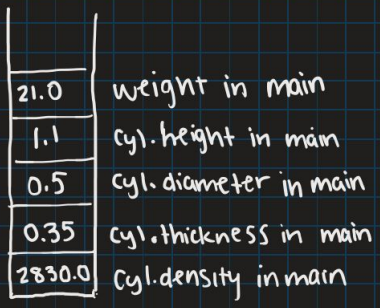
7)



8)



9)



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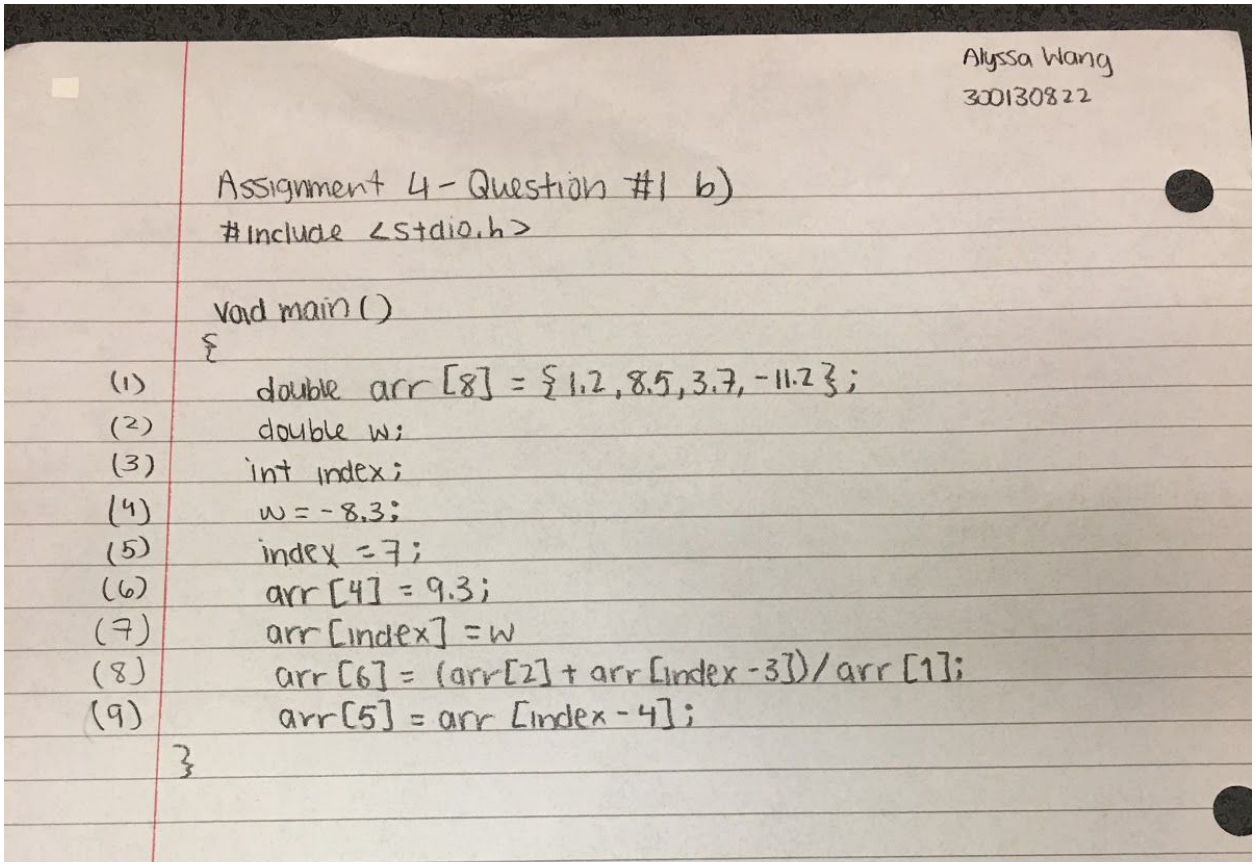
b)



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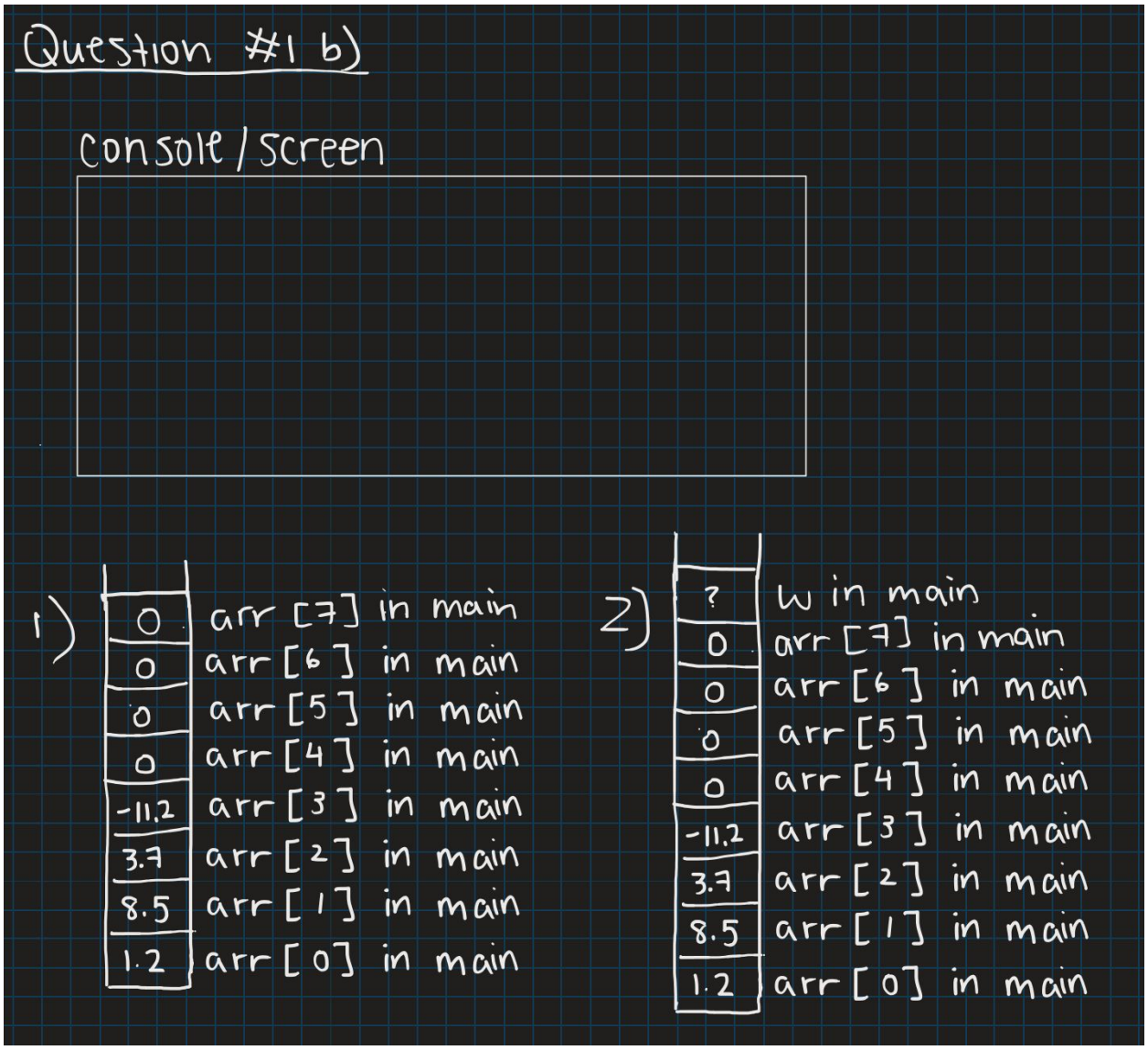

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3)

?	index in main
?	w in main
0	arr[7] in main
0	arr[6] in main
0	arr[5] in main
0	arr[4] in main
-11.2	arr[3] in main
3.7	arr[2] in main
8.5	arr[1] in main
1.2	arr[0] in main

4)

?	index in main
-8.3	w in main
0	arr[7] in main
0	arr[6] in main
0	arr[5] in main
0	arr[4] in main
-11.2	arr[3] in main
3.7	arr[2] in main
8.5	arr[1] in main
1.2	arr[0] in main

5)

7	index in main
-8.3	w in main
0	arr[7] in main
0	arr[6] in main
0	arr[5] in main
0	arr[4] in main
-11.2	arr[3] in main
3.7	arr[2] in main
8.5	arr[1] in main
1.2	arr[0] in main

6)

7	index in main
-8.3	w in main
0	arr[7] in main
0	arr[6] in main
0	arr[5] in main
9.3	arr[4] in main
-11.2	arr[3] in main
3.7	arr[2] in main
8.5	arr[1] in main
1.2	arr[0] in main

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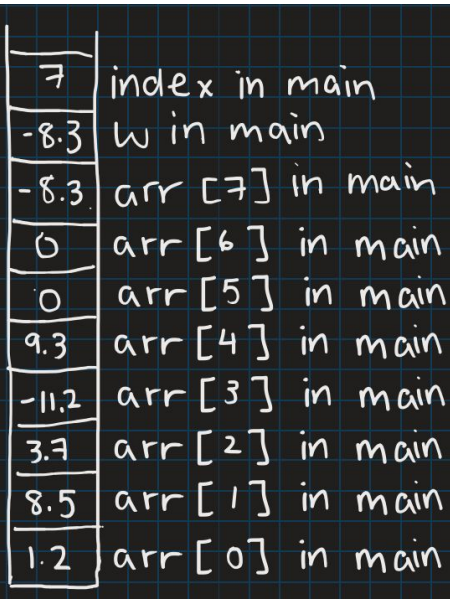
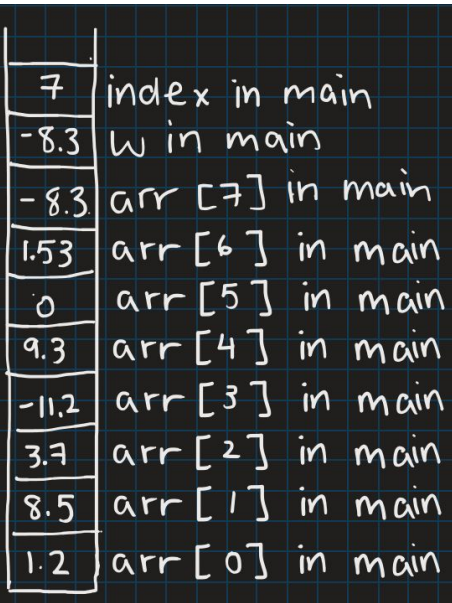
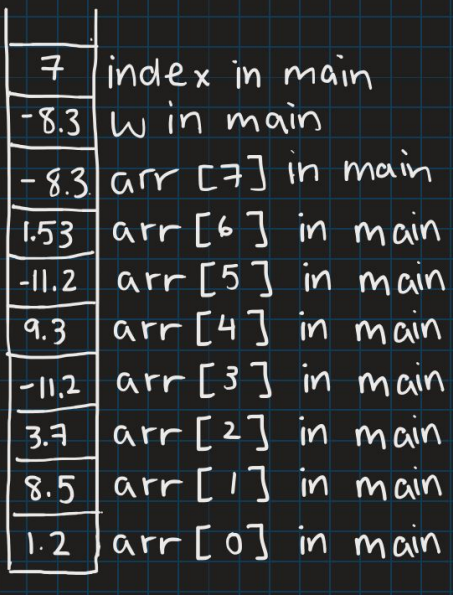
7)



8)



9)



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Question 2

```c
#include <stdio.h> // header file
#include <math.h> // header file used to complete basic mathematical operations

#define NUM_ROWS 25 // defining a symbolic constant where NUM_ROWS = 25

struct CHANNEL // creating a structure under
{
    // declaring the members in the structure
    int name;
    double n; // n = roughness coefficient
    double slope;
    double width;
    double maxDepth;
};

double computeVelocity(double depth, struct CHANNEL myCHANNEL)
/* Double function called computeVelocity and the parameters declares depth and the
members in the structure. It also assigns the name myCHANNEL to the structure. */
{
    double averageVelocity; // declares variable
    averageVelocity = (sqrt(myCHANNEL.slope) / myCHANNEL.n ) *
pow((myCHANNEL.width/depth) / (myCHANNEL.width + 2.0*depth), 2.0/3.0);
    // calculates the average velocity and assigns that result into the variable
averageVelocity
    return (averageVelocity); // returns the value of averageVelocity to the main
}

void displayTable(struct CHANNEL myCHANNEL)
/* void function called displayTable and the parameters declares the members in the
structure*/
{
    // declares variables
    int i;
    int repeat = 1; // declares 'flag' and its initial value
    double depth, averageVelocity, INC;
    printf("Enter the value of the depth as either 0.1680, 0.4600, or 0.0600:\n");
    scanf("%lf", &depth);
```

```
    do
    {
        if(depth == 0.1680) // if the depth is this value, it will break from the loop
            break;
        else if(depth == 0.4600) // if the depth is this value, it will break from the
loop
            break;
        else if(depth == 0.0600) // if the depth is this value, it will break from the
loop
            break;
        else
        {
            printf("Invalid input. Please enter a depth value of either 0.1680,
0.4600, or 0.0600\n");
            // will print this if the user inputs a value that is not 0.1680, 0.4600,
or 0.600
            scanf("%lf", &depth); // will let the user try inputting a correct value
        }
    }
    while (repeat == 1); // loop where the do loop will repeat while the condition is
true
    INC = depth;

    printf("\n\tDepth\t     Average Velocity\n"); // will display the table
    printf("-----------------------------------------\n"); // will display the table
    for (i=0; i<NUM_ROWS; i++) // for loop where code in curly brackets will repeat as
long as the conditions are true and i<25
    {
        averageVelocity = computeVelocity(depth, myCHANNEL); // calls the function
computeVelocity and receives the value of the average velocity
        printf("\t%.2lf\t\t%.4lf\n", depth, averageVelocity); // prints the values of
depth and average velocity in the table
        depth = depth + INC; // increases the value of depth by the increment for each
row in the table
    }
}

void main()
{
```

```
    struct CHANNEL myCHANNEL; // declares variables
    double depth, averageVelocity;
    printf("Please enter the name of the channel as 1, 2, or 3: "); // prompts the
user for the number of the channel
    scanf("%d", &myCHANNEL.name); // Reads the user's input and stores them into their
allocated variable

    do
    {
        printf("Please enter the value of the coefficient of roughness: ");
        scanf("%lf", &myCHANNEL.n); //Reads the user's input and stores them into
their allocated variable
        if(myCHANNEL.n <= 0.0) // loop which will repeat if value is less than 0
            printf("Value must be greater than zero.\n"); // prompts the user to input
another value that is positive
    } while (myCHANNEL.n <= 0.0);

    do
    {
        printf("Please enter the value of the slope: "); // prompts the user for the
value of the slope
        scanf("%lf", &myCHANNEL.slope); //Reads the user's input and stores them into
their allocated variable
        if(myCHANNEL.slope <= 0.0) // loop which will repeat if value is less than 0
            printf("Value must be greater than zero.\n"); // prompts the user to input
another value that is positive
    }
    while(myCHANNEL.slope <= 0.0);

    do
    {
        printf("Please enter the value of the width: "); // prompts the user for the
value of the width
        scanf("%lf", &myCHANNEL.width); // Reads the user's input and stores them into
their allocated variable
        if(myCHANNEL.width <= 0.0) // loop which will repeat if value is less than 0
            printf("Value must be greater than zero.\n"); // prompts the user to input
another value that is positive
    }
```

```
    while(myCHANNEL.width <= 0.0);

    do
    {
        printf("Please enter the value of the maxDepth: "); // prompts the user for
the value of the maximum depth
        scanf("%lf", &myCHANNEL.maxDepth); // Reads the user's input and stores them
into their allocated variable
        if(myCHANNEL.maxDepth <= 0.0) // loop which will repeat if value is less than
0
            printf("Value must be greater than zero.\n"); // prompts the user to input
another value that is positive
    } while (myCHANNEL.maxDepth <= 0.0);

    printf("Channel data for %d \nCoefficient of roughness: %.4lf \nSlope:
%.4lf\nWidth: %.0lf\nMaximum depth: %.1lf\n", myCHANNEL.name, myCHANNEL.n,
myCHANNEL.slope, myCHANNEL.width, myCHANNEL.maxDepth);
    // Inputs the collected values and then prints the final statement
    displayTable(myCHANNEL); // displays the table from the function displayTable
}
```

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```
Please enter the name of the channel as 1, 2, or 3: 1
Please enter the value of the coefficient of roughness: 0.035
Please enter the value of the slope: 0.0001
Please enter the value of the width: 10
Please enter the value of the maxDepth: 4.2
Channel data for 1
Coefficient of roughness: 0.0350
Slope: 0.0001
Width: 10
Maximum depth: 4.2
Enter the value of the depth as either 0.1680, 0.4600, or 0.0600:
0.1680

        Depth        Average Velocity
----------------------------------------
        0.1680          0.9180
        0.3360          0.5661
        0.5040          0.4232
        0.6720          0.3424
        0.8400          0.2894
        1.0080          0.2515
        1.1760          0.2228
        1.3440          0.2002
        1.5120          0.1819
        1.6800          0.1667
        1.8480          0.1538
        2.0160          0.1428
        2.1840          0.1333
        2.3520          0.1249
        2.5200          0.1175
        2.6880          0.1109
        2.8560          0.1050
        3.0240          0.0997
        3.1920          0.0948
        3.3600          0.0904
        3.5280          0.0864
        3.6960          0.0826
        3.8640          0.0792
        4.0320          0.0760
        4.2000          0.0731
```

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```
Please enter the name of the channel as 1, 2, or 3: 2
Please enter the value of the coefficient of roughness: 0.0013
Please enter the value of the slope: 0.0032
Please enter the value of the width: 2
Please enter the value of the maxDepth: 11.5
Channel data for 2
Coefficient of roughness: 0.0013
Slope: 0.0032
Width: 2
Maximum depth: 11.5
Enter the value of the depth as either 0.1680, 0.4600, or 0.0600:
0.4600

        Depth        Average Velocity
-----------------------------------------
        0.4600          56.7402
        0.9200          29.7787
        1.3800          19.6937
        1.8400          14.4502
        2.3000          11.2669
        2.7600          9.1461
        3.2200          7.6416
        3.6800          6.5248
        4.1400          5.6666
        4.6000          4.9889
        5.0600          4.4417
        5.5200          3.9918
        5.9800          3.6163
        6.4400          3.2986
        6.9000          3.0268
        7.3600          2.7920
        7.8200          2.5873
        8.2800          2.4076
        8.7400          2.2486
        9.2000          2.1072
        9.6600          1.9807
        10.1200         1.8668
        10.5800         1.7640
        11.0400         1.6707
        11.5000         1.5857
```

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```
Please enter the name of the channel as 1, 2, or 3: 3
Please enter the value of the coefficient of roughness: 0.17
Please enter the value of the slope: 0.041
Please enter the value of the width: 40
Please enter the value of the maxDepth: 1.5
Channel data for 3
Coefficient of roughness: 0.1700
Slope: 0.0410
Width: 40
Maximum depth: 1.5
Enter the value of the depth as either 0.1680, 0.4600, or 0.0600:
0.0600

        Depth        Average Velocity
----------------------------------------
        0.0600          7.7561
        0.1200          4.8763
        0.1800          3.7139
        0.2400          3.0597
        0.3000          2.6316
        0.3600          2.3258
        0.4200          2.0946
        0.4800          1.9124
        0.5400          1.7645
        0.6000          1.6417
        0.6600          1.5376
        0.7200          1.4482
        0.7800          1.3703
        0.8400          1.3017
        0.9000          1.2408
        0.9600          1.1863
        1.0200          1.1371
        1.0800          1.0925
        1.1400          1.0519
        1.2000          1.0146
        1.2600          0.9803
        1.3200          0.9485
        1.3800          0.9191
        1.4400          0.8917
        1.5000          0.8662
```

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Question 3

1. The result that will be printed on the console when x= 5 and y= 3 is " the values of x and y are respectively 8 and 76". This is because the program will run through the first if statement since the condition of x>y and y>0 is true. Thus, the value of x= 5+3 which is 8. The y++ means y+1, thus y = 4. The program will move to the next if statement and check if the condition is true, but it is not. Consequently, it will run through the else statement making y=8 + 8*8 + 4, thus y = 76. Then it will input these values into the printf statement and print it on the console.

2. The result that will be printed on the console when x= 7 and y= 4 is " the values of x and y are respectively 11 and 137". This is because the program will run through the first if statement since the condition of x>y and y>0 is true. It will input the given values of x and y into the following equations, x=x+y and y++, and assign that answer to x and y again. Thus, x = 11 and y = 5. It will then check if the second if statement conditions are true which they are not. As a result, it will move to the else statement and complete the calculation, y=x+ x*x +y making y = 11+ 11*11 + 5 = 137. Then it will input these values into the printf statement and print it on the console.

3. The result that will be printed on the console when x= 5 and y= -1 is " the values of x and y are respectively 5 and 29". This is because the function will check if the first if statement conditions are true. The condition states that x>y and y>0, however, this statement is only true for the x>y thus it does not complete the instructions for that if statement. Then, it checks if the second if statement conditions are true and concludes that they are false. As a result, it moves to the else statement and calculates y=x+x*x+y making y = 5+ 5*5 + (-1) = 29. Since no value of x was computed throughout the code, it returns the original value of x which is 5. Then it will input these values into the printf statement and print it on the console.

4. The result that will be printed on the console when x= 11 and y= 12 is " the values of x and y are respectively 11 and 132". This is because the function will check if the first if statement conditions are true. The condition states that x>y and y>0, however, this statement is only true for the y>0 thus it does not complete the instructions for that if statement. It then checks if the second if statement condition is true which is x>10, which is true. Thus, it will calculate y=x*y making y = 11*12 = 132. The else statement will be skipped because the prior if statement was completed. Since no value of x was computed throughout the code, it returns the original value of x which is 11. Then it will input these values into the printf statement and print it on the console.