INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

Programming with C and C++

CSC-101 (Lecture 14)

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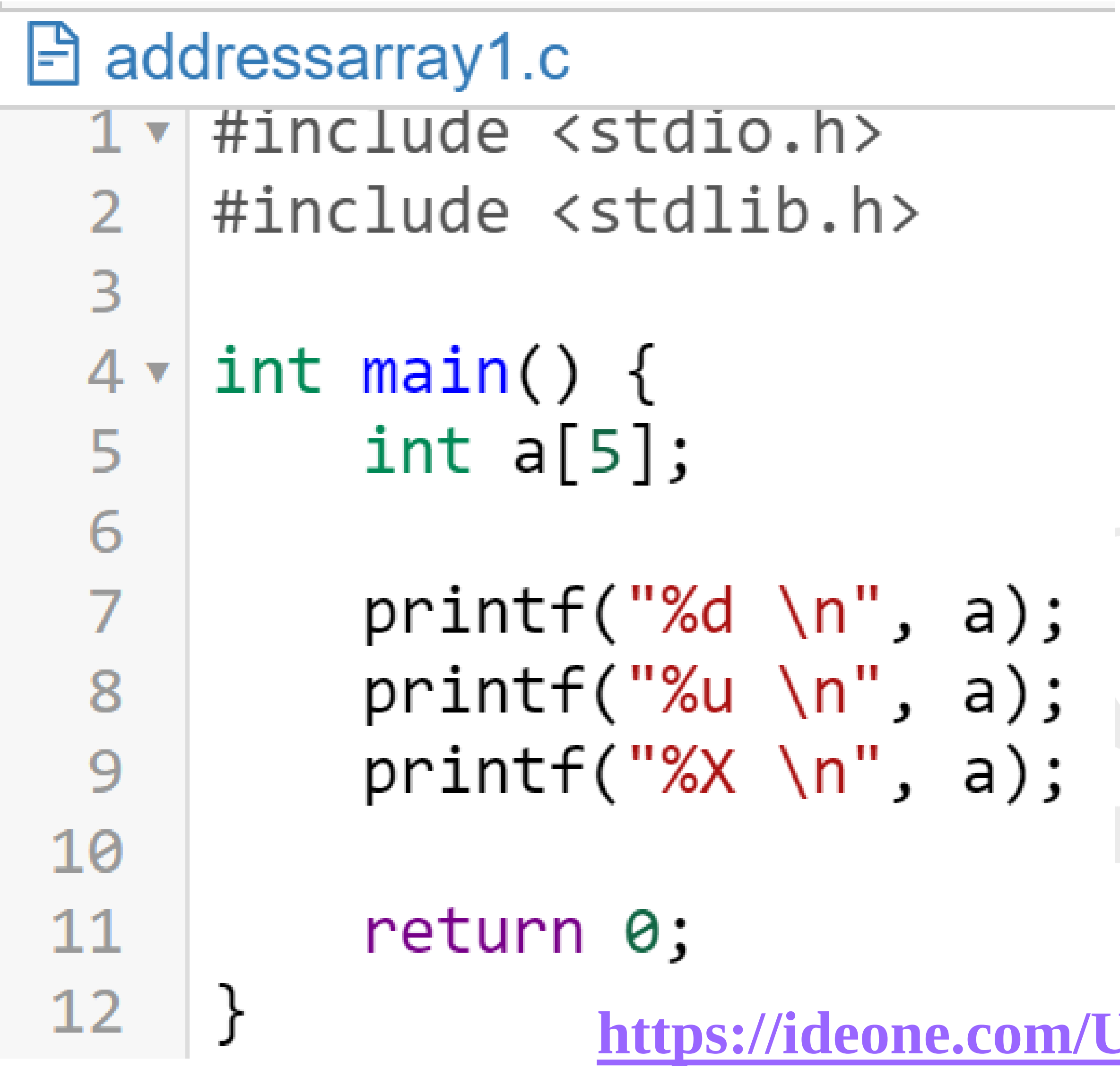
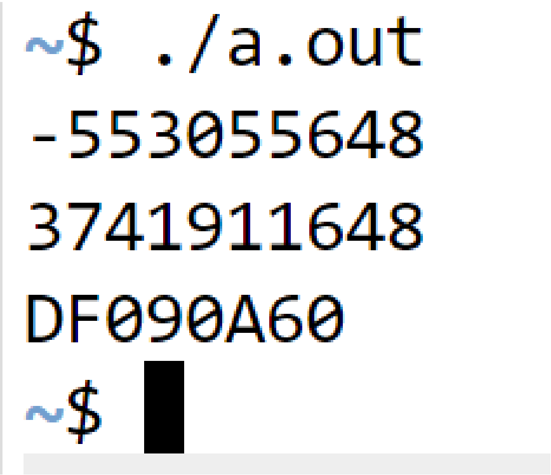
Printing base address of an array



addressarray1.c

```c
#include <stdio.h>
#include <stdlib.h>

int main() {
    int a[5];

    printf("%d \n", a);
    printf("%u \n", a);
    printf("%X \n", a);

    return 0;
}
```



```
~$ ./a.out
-553055648
3741911648
DF090A60
~$
```

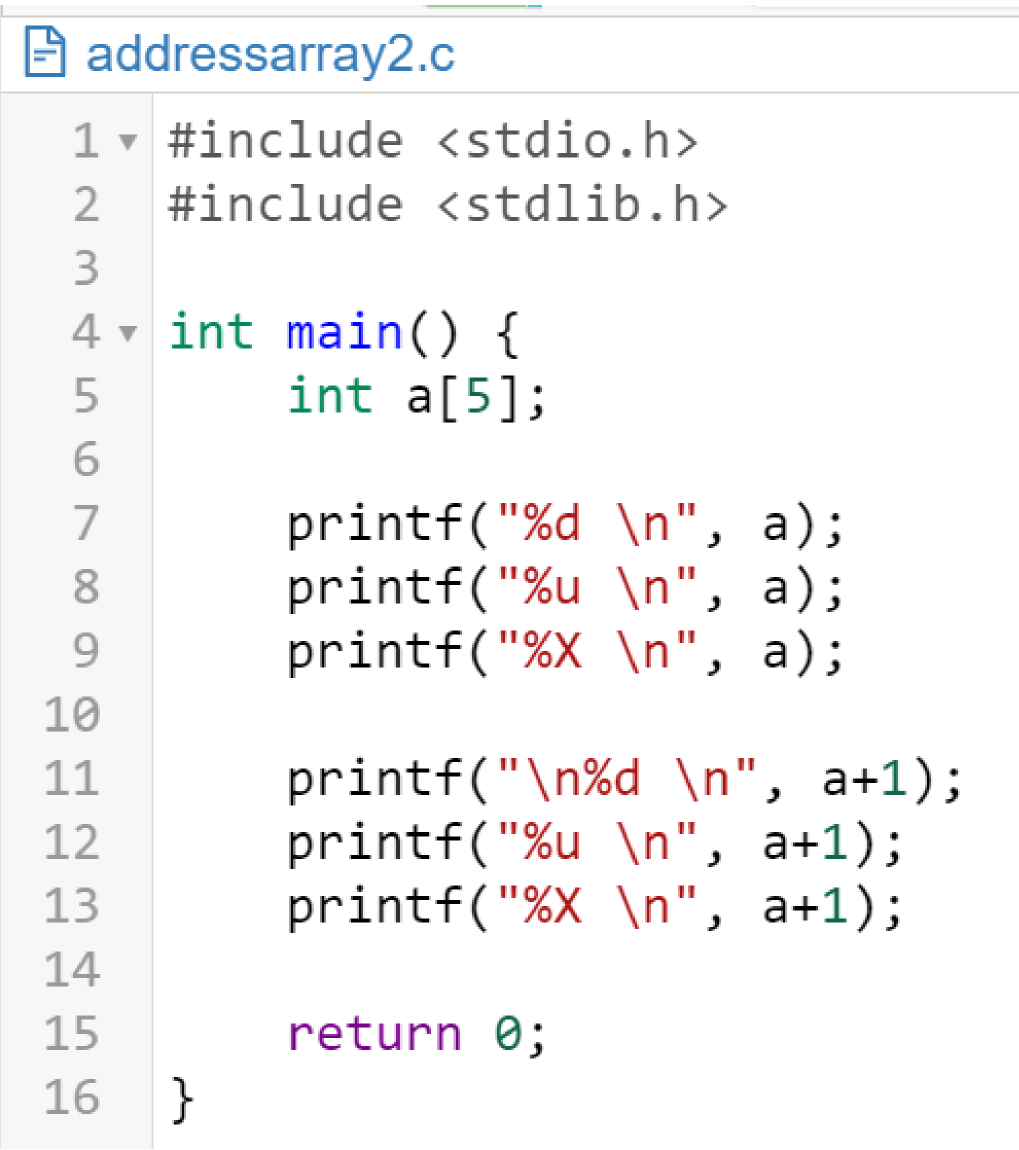
https://ideone.com/UdDQxE

Address of the general location

- Address of i^{th}location in an Array

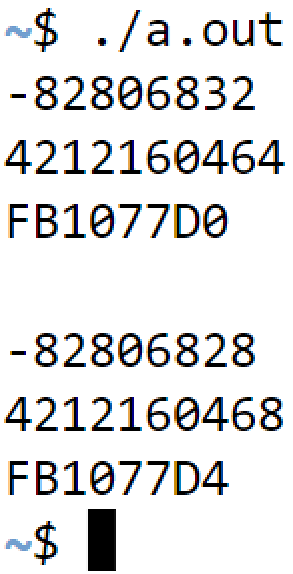
$$\&a[i] = \&a[0] + i * e\_size$$

Address of the general location



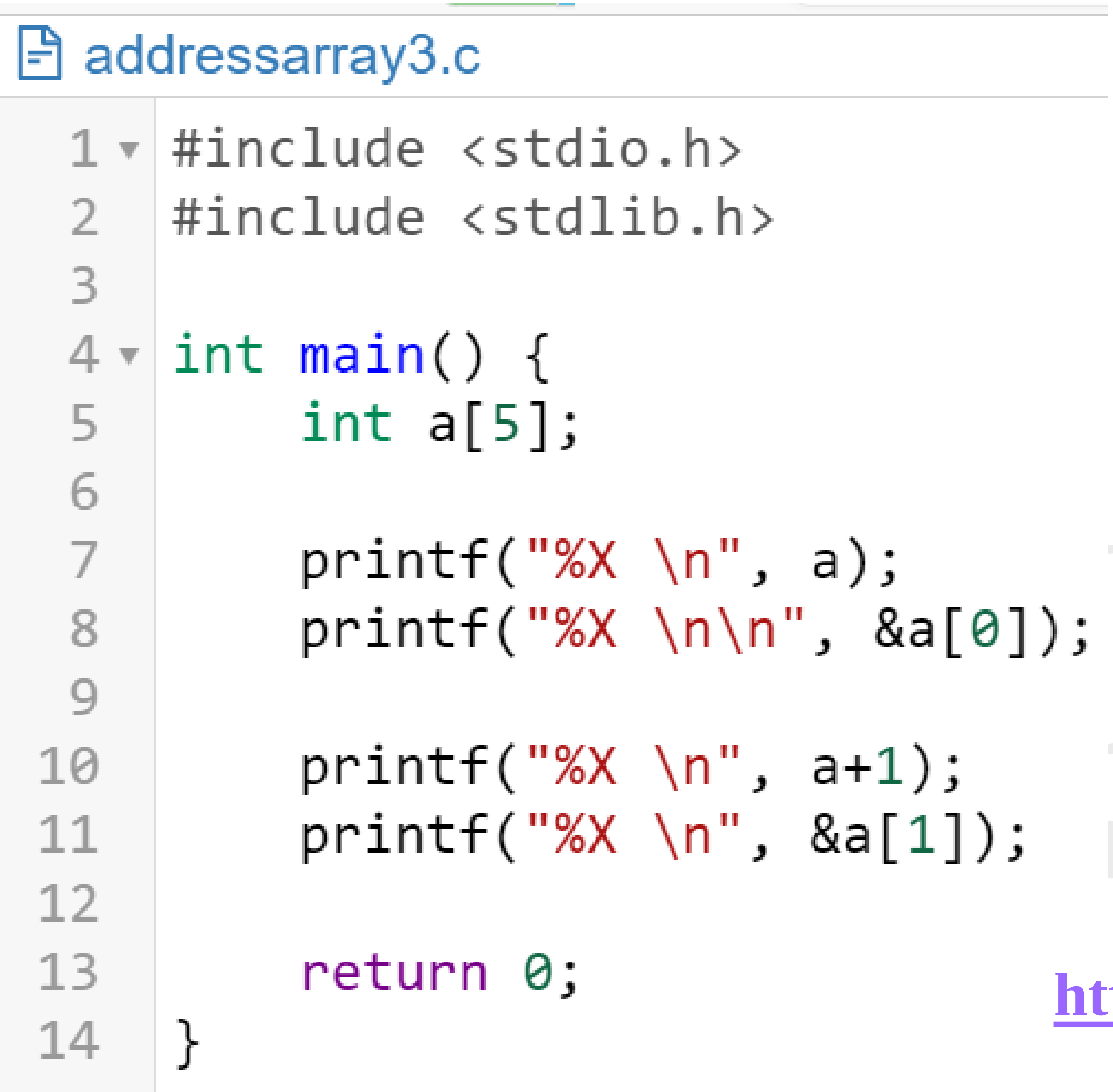
addressarray2.c

```c
#include <stdio.h>
#include <stdlib.h>

int main() {
    int a[5];

    printf("%d \n", a);
    printf("%u \n", a);
    printf("%X \n", a);

    printf("\n%d \n", a+1);
    printf("%u \n", a+1);
    printf("%X \n", a+1);

    return 0;
}
```



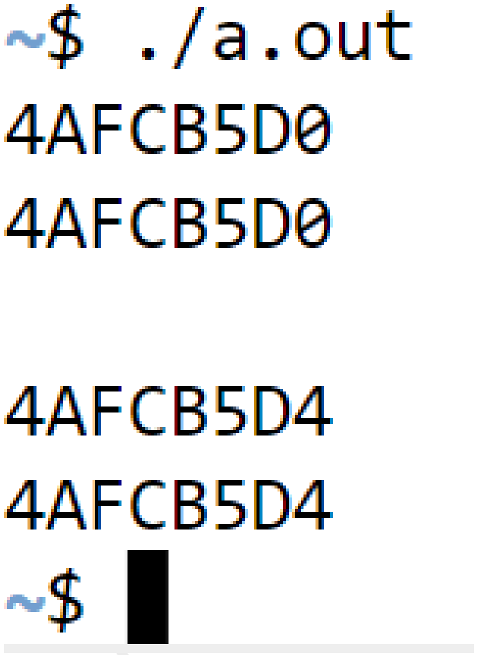
```
~$ ./a.out
-82806832
4212160464
FB1077D0

-82806828
4212160468
FB1077D4
~$ 
```

https://ideone.com/CI761w



addressarray3.c

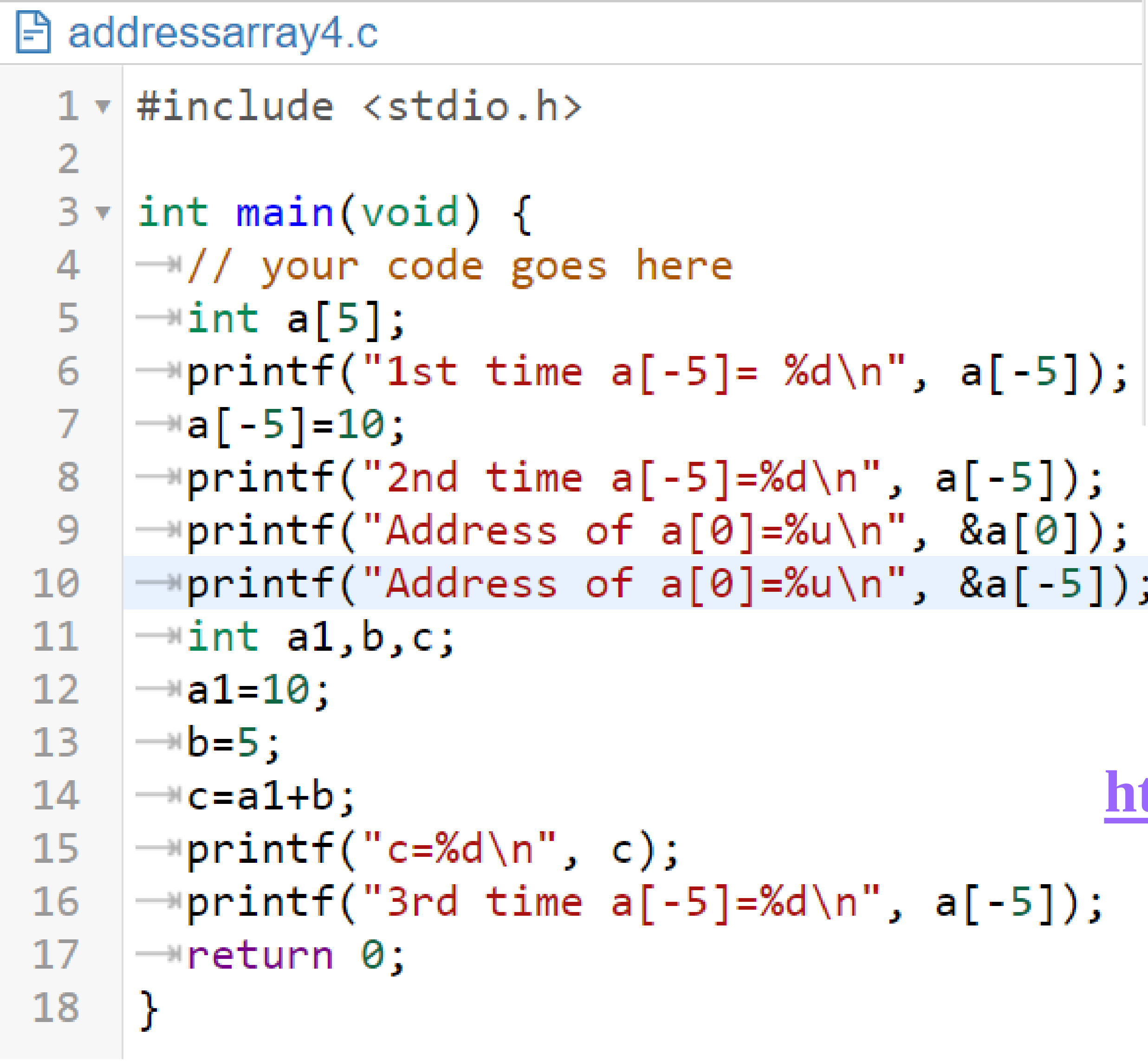
```c
#include <stdio.h>
#include <stdlib.h>

int main() {
    int a[5];

    printf("%X \n", a);
    printf("%X \n\n", &a[0]);

    printf("%X \n", a+1);
    printf("%X \n", &a[1]);

    return 0;
}
```



```
~$ ./a.out
4AFCB5D0
4AFCB5D0

4AFCB5D4
4AFCB5D4
~$ 
```

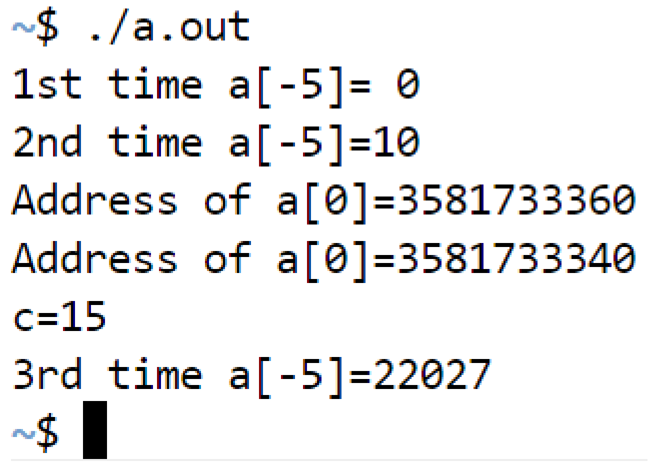
https://ideone.com/FgHK9P

Negative index of an Array



addressarray4.c

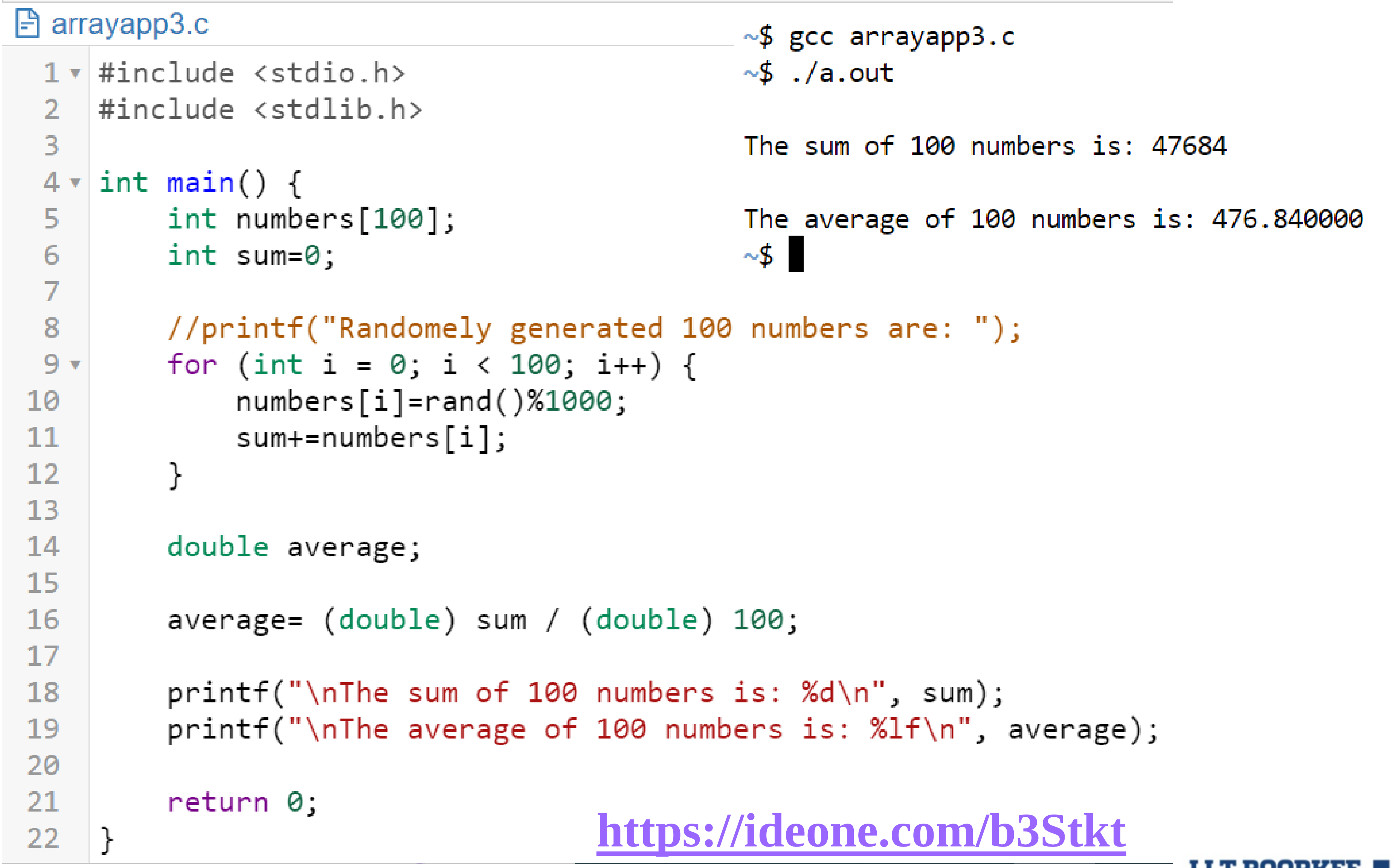
```c
#include <stdio.h>

int main(void) {
	// your code goes here
	int a[5];
	printf("1st time a[-5]= %d\n", a[-5]);
	a[-5]=10;
	printf("2nd time a[-5]=%d\n", a[-5]);
	printf("Address of a[0]=%u\n", &a[0]);
	printf("Address of a[0]=%u\n", &a[-5]);
	int a1,b,c;
	a1=10;
	b=5;
	c=a1+b;
	printf("c=%d\n", c);
	printf("3rd time a[-5]=%d\n", a[-5]);
	return 0;
}
```



```
~$ ./a.out
1st time a[-5]= 0
2nd time a[-5]=10
Address of a[0]=3581733360
Address of a[0]=3581733340
c=15
3rd time a[-5]=22027
~$ 
```

https://ideone.com/9YpKl6

- WAP to generate 100 random numbers between 1 and 1000 and then find its sum and average.



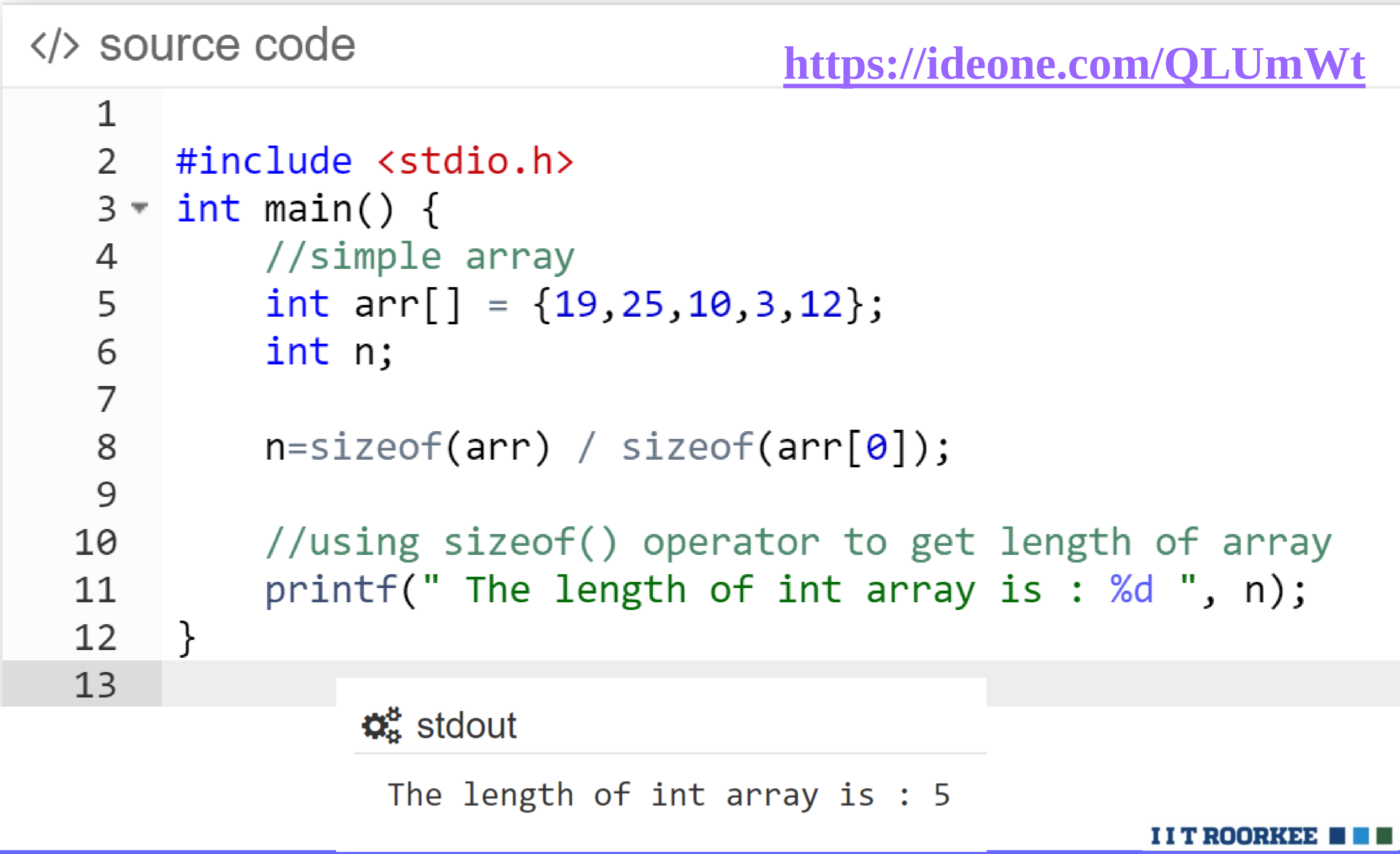
arrayapp3.c

```c
#include <stdio.h>
#include <stdlib.h>

int main() {
    int numbers[100];
    int sum=0;

    //printf("Randomely generated 100 numbers are: ");
    for (int i = 0; i < 100; i++) {
        numbers[i]=rand()%1000;
        sum+=numbers[i];
    }

    double average;

    average= (double) sum / (double) 100;

    printf("\nThe sum of 100 numbers is: %d\n", sum);
    printf("\nThe average of 100 numbers is: %lf\n", average);

    return 0;
}
```

```
~$ gcc arrayapp3.c
~$ ./a.out

The sum of 100 numbers is: 47684

The average of 100 numbers is: 476.840000
~$ 
```

https://ideone.com/b3Stkt

Length of an Array

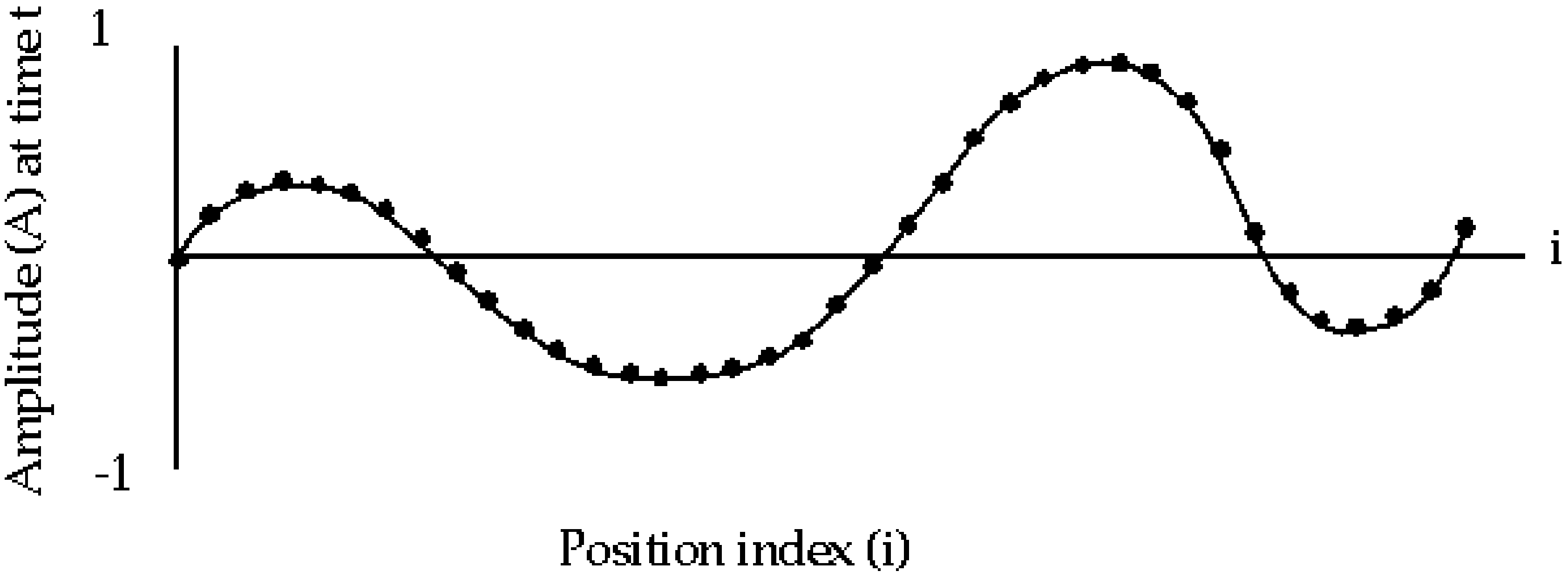


https://ideone.com/QLUmWt

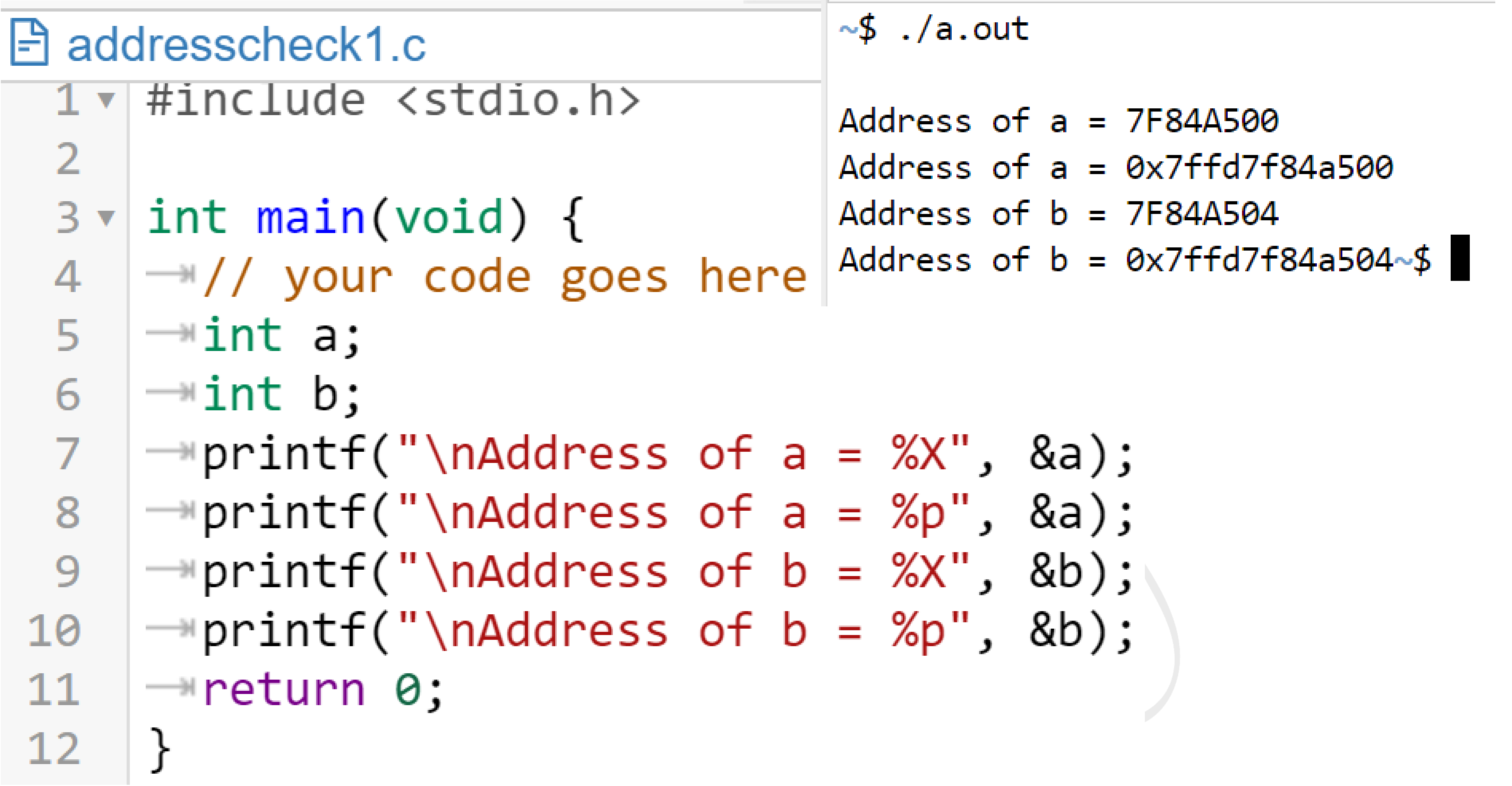
```c

#include <stdio.h>
int main() {
    //simple array
    int arr[] = {19,25,10,3,12};
    int n;

    n=sizeof(arr) / sizeof(arr[0]);

    //using sizeof() operator to get length of array
    printf(" The length of int array is : %d ", n);
}

```

```
The length of int array is : 5
```

Applications in signal Processing



Usage of %p



addresscheck1.c

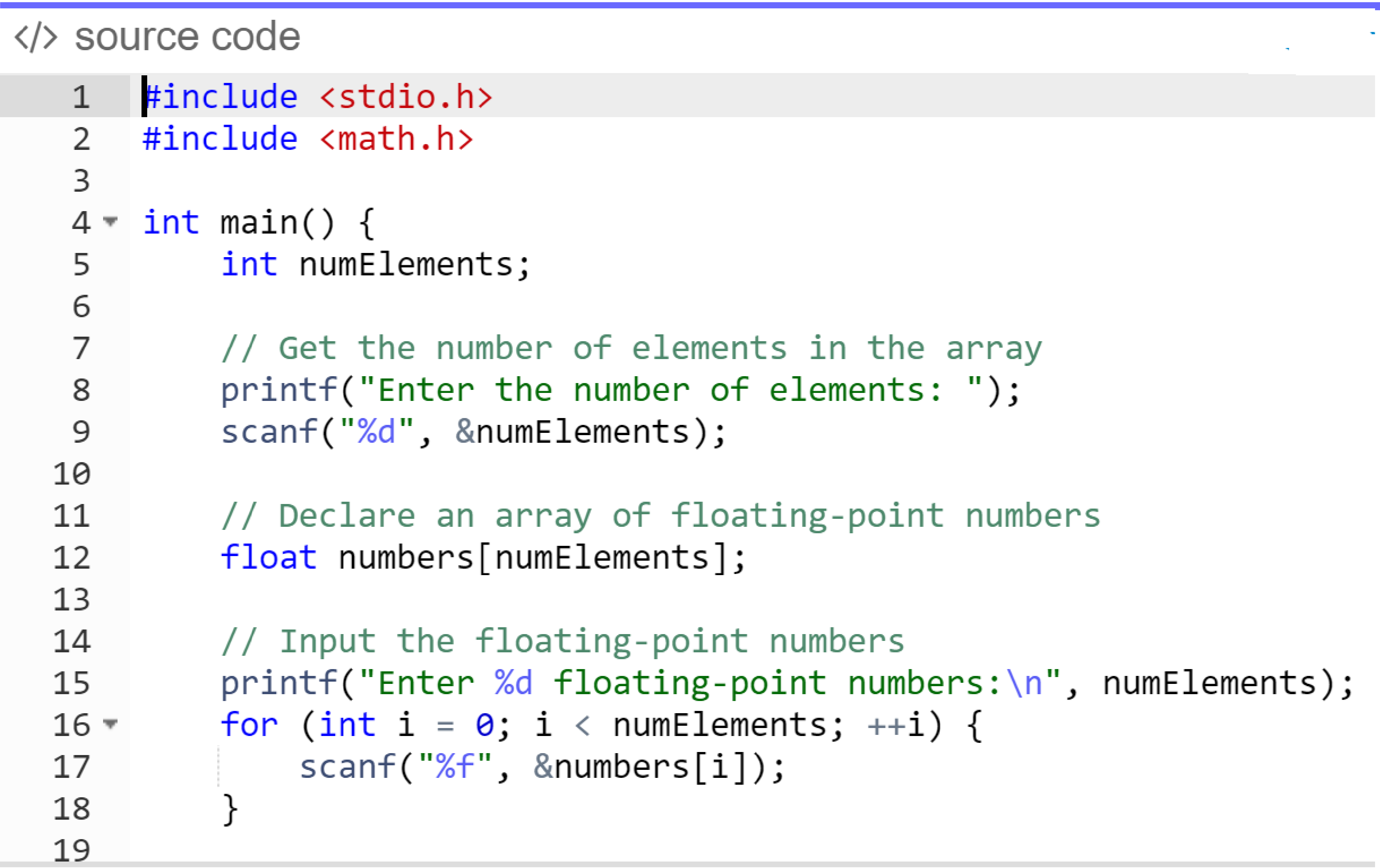
```c
#include <stdio.h>

int main(void) {
	// your code goes here
	int a;
	int b;
	printf("\nAddress of a = %X", &a);
	printf("\nAddress of a = %p", &a);
	printf("\nAddress of b = %X", &b);
	printf("\nAddress of b = %p", &b);
	return 0;
}
```

```
~$ ./a.out

Address of a = 7F84A500
Address of a = 0x7ffd7f84a500
Address of b = 7F84A504
Address of b = 0x7ffd7f84a504~$
```

https://ideone.com/rsUAW1

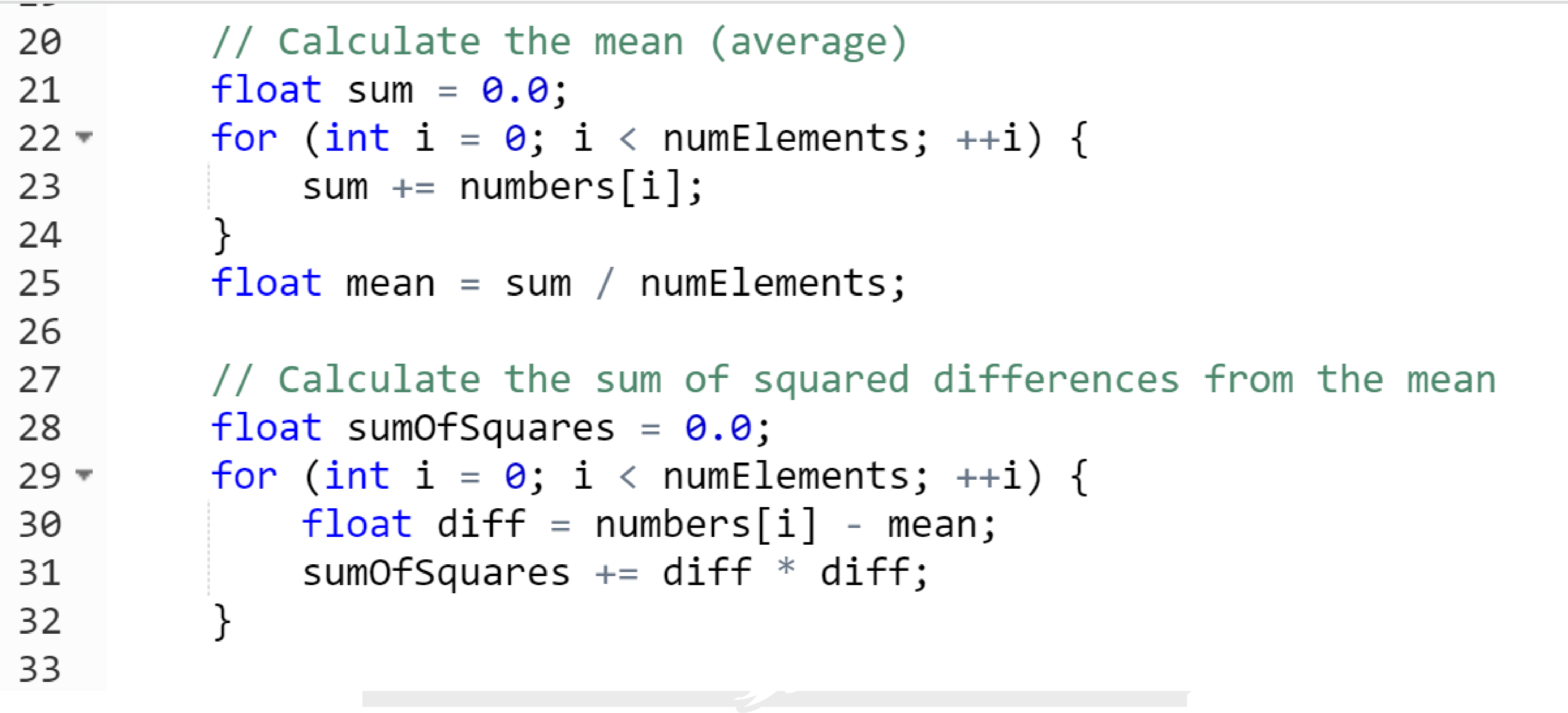
- Write a C program that uses floating-point arrays to calculate the standard deviation of a set of numbers

floating-point arrays

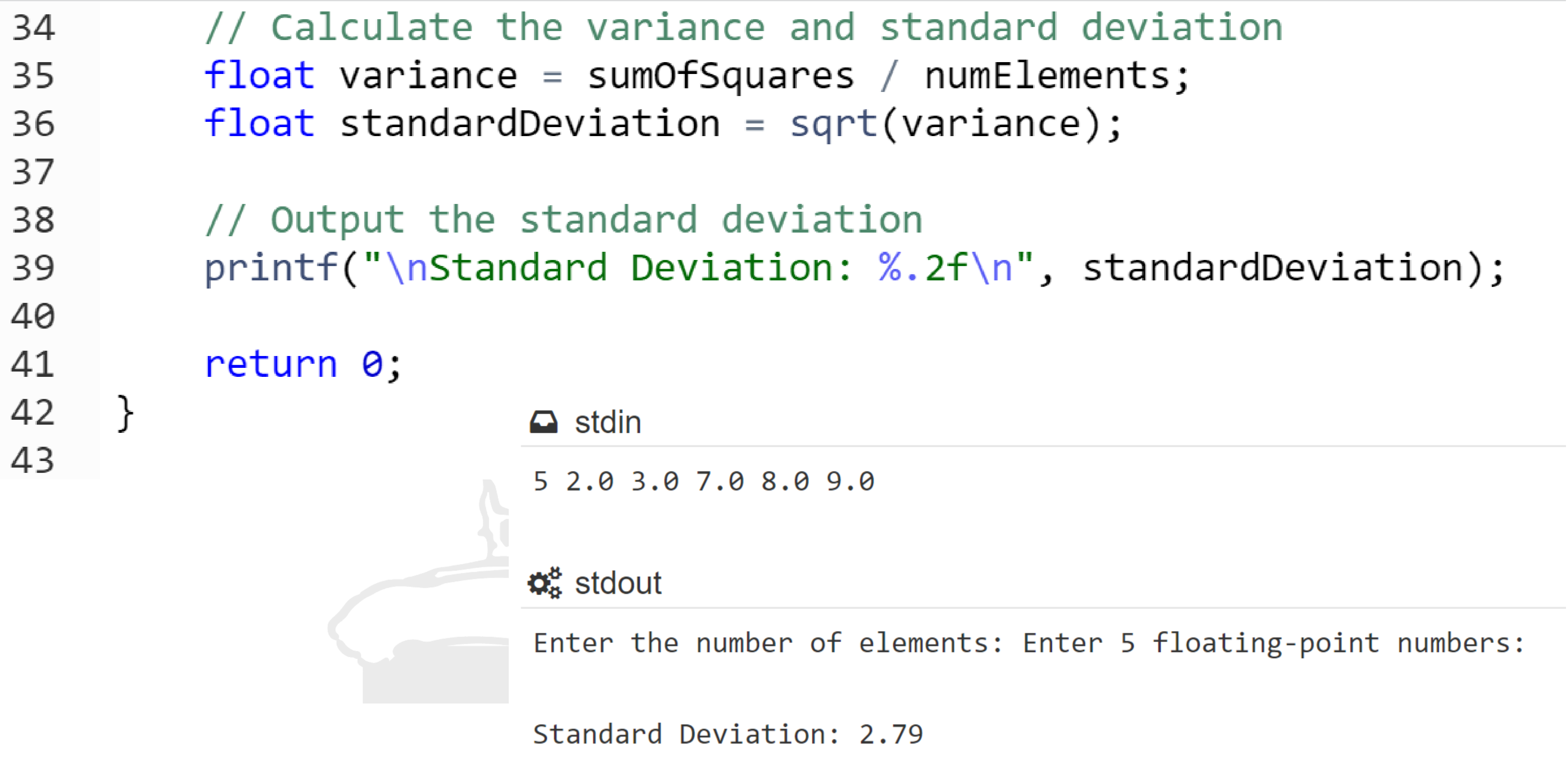


</> source code

```c
#include <stdio.h>
#include <math.h>

int main() {
    int numElements;

    // Get the number of elements in the array
    printf("Enter the number of elements: ");
    scanf("%d", &numElements);

    // Declare an array of floating-point numbers
    float numbers[numElements];

    // Input the floating-point numbers
    printf("Enter %d floating-point numbers:\n", numElements);
    for (int i = 0; i < numElements; ++i) {
        scanf("%f", &numbers[i]);
    }

```



```
    // Calculate the mean (average)
    float sum = 0.0;
    for (int i = 0; i < numElements; ++i) {
        sum += numbers[i];
    }
    float mean = sum / numElements;

    // Calculate the sum of squared differences from the mean
    float sumOfSquares = 0.0;
    for (int i = 0; i < numElements; ++i) {
        float diff = numbers[i] - mean;
        sumOfSquares += diff * diff;
    }

```



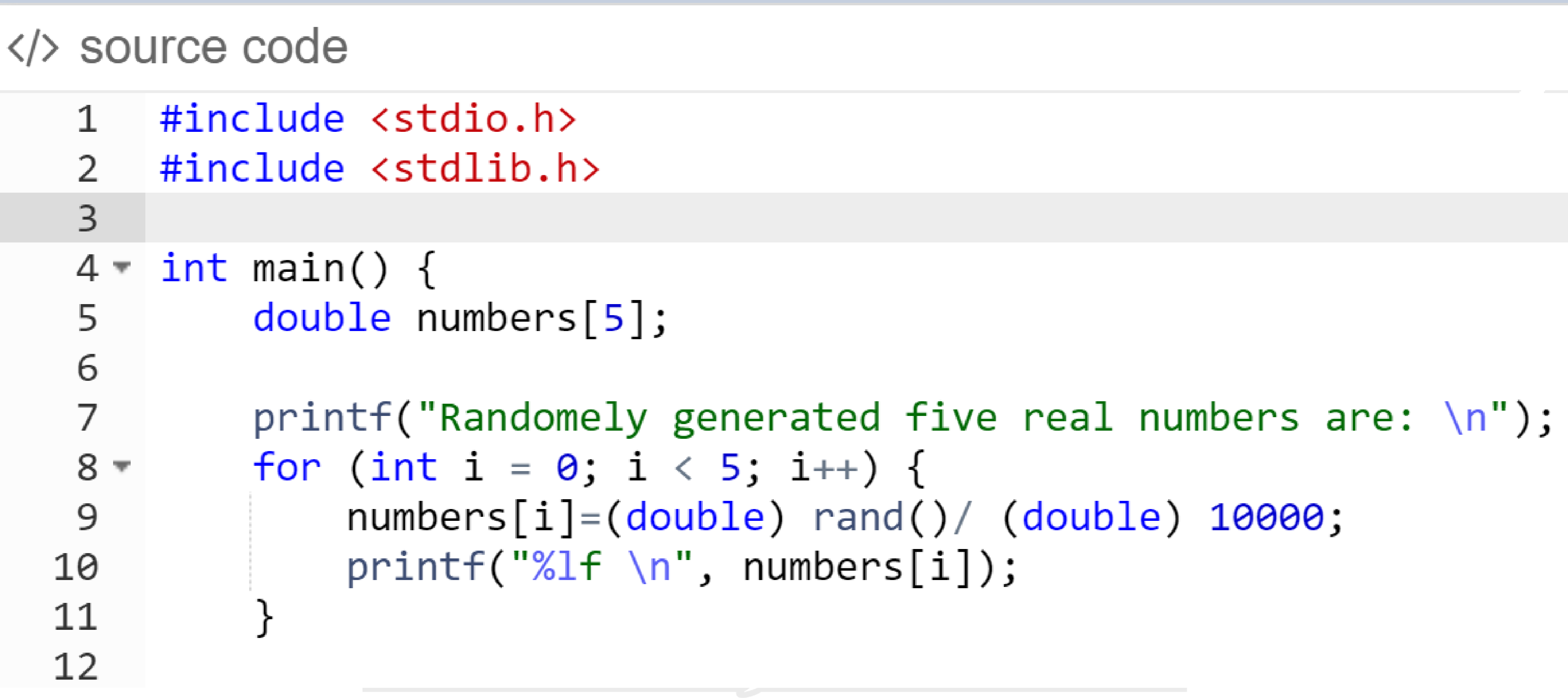
```
    // Calculate the variance and standard deviation
    float variance = sumOfSquares / numElements;
    float standardDeviation = sqrt(variance);

    // Output the standard deviation
    printf("\nStandard Deviation: %.2f\n", standardDeviation);

    return 0;
}
```

```
5 2.0 3.0 7.0 8.0 9.0
```

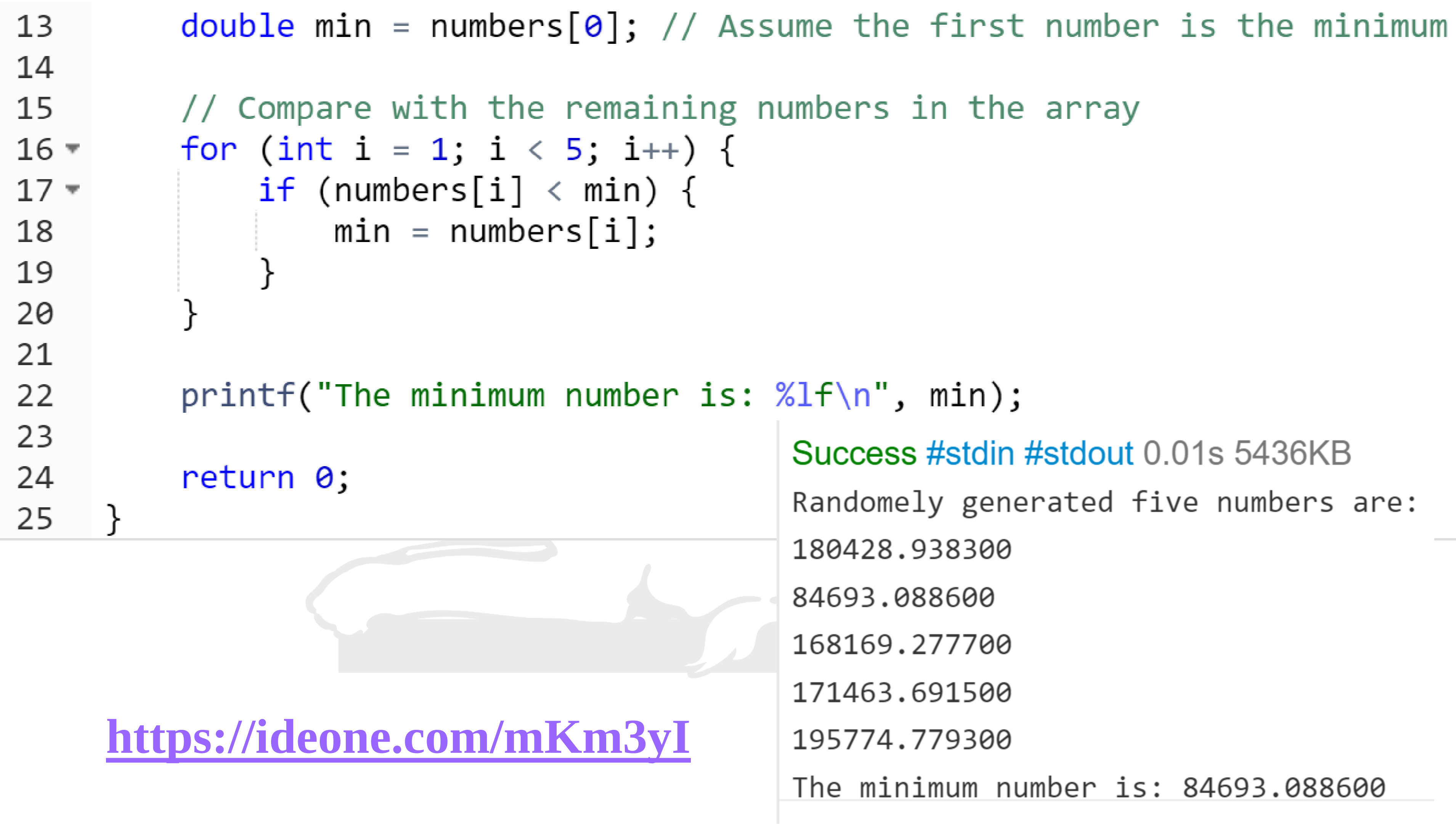
```
Enter the number of elements: Enter 5 floating-point numbers: 

Standard Deviation: 2.79
```

https://ideone.com/wSEXbD

Array with double data type



```
#include <stdio.h>
#include <stdlib.h>

int main() {
    double numbers[5];

    printf("Randomely generated five real numbers are: \n");
    for (int i = 0; i < 5; i++) {
        numbers[i]=(double) rand()/ (double) 10000;
        printf("%lf \n", numbers[i]);
    }

```



```
    double min = numbers[0]; // Assume the first number is the minimum

    // Compare with the remaining numbers in the array
    for (int i = 1; i < 5; i++) {
        if (numbers[i] < min) {
            min = numbers[i];
        }
    }

    printf("The minimum number is: %lf\n", min);

    return 0;
}
```

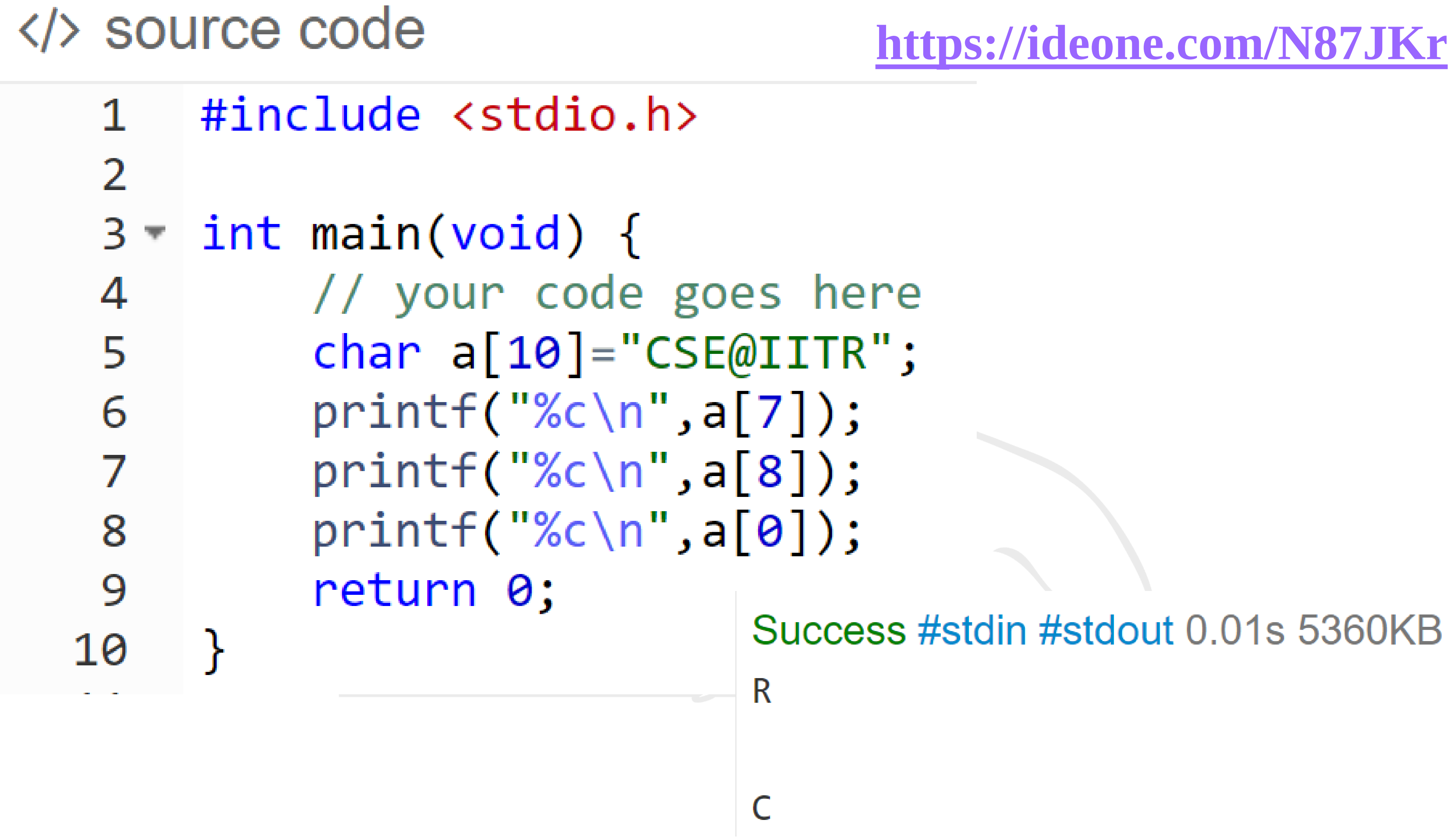
Success #stdin #stdout 0.01s 5436KB

```
Randomely generated five numbers are:
180428.938300
84693.088600
168169.277700
171463.691500
195774.779300
The minimum number is: 84693.088600
```

https://ideone.com/mKm3yI

Character Array

https://ideone.com/N87JKr



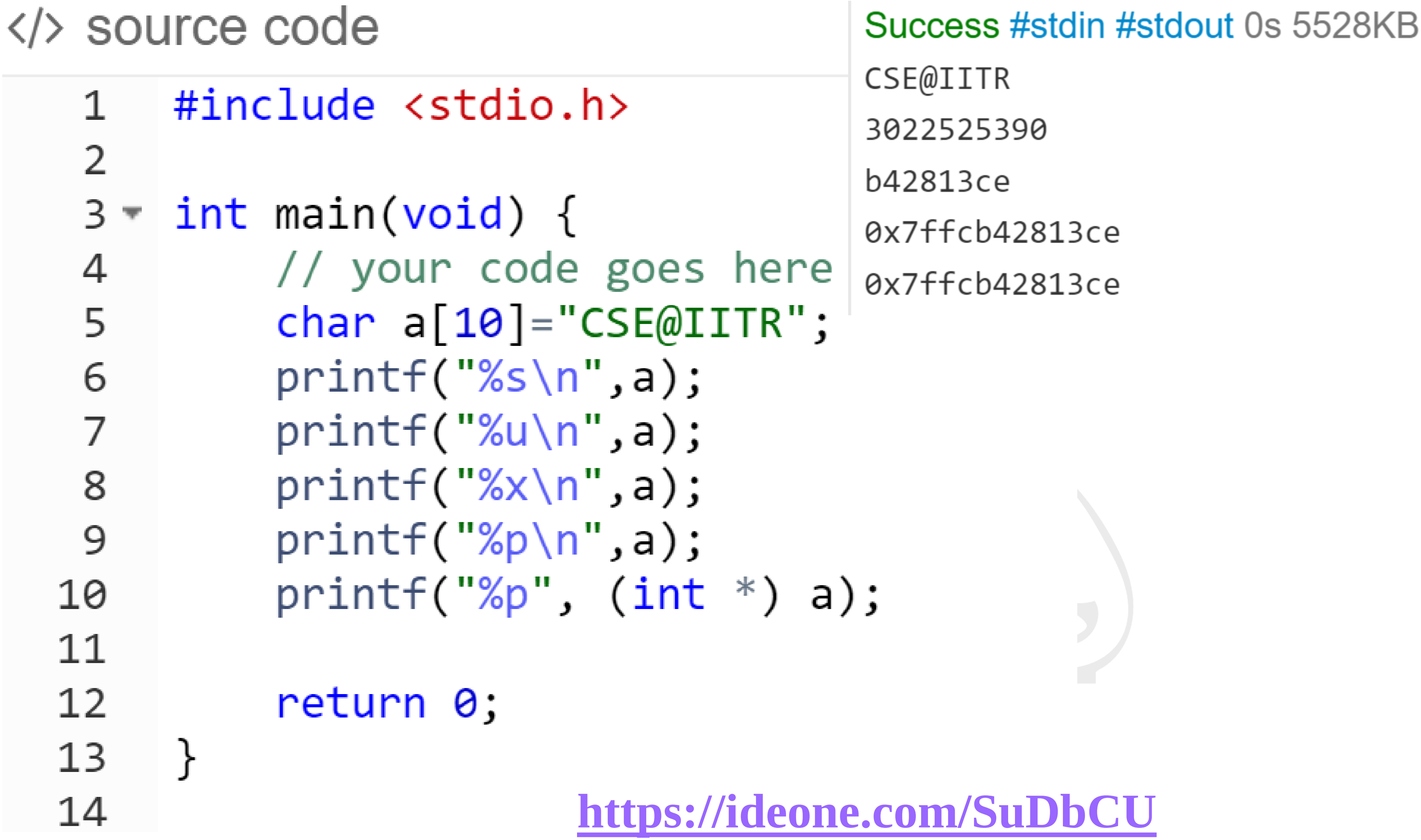
</> source code

```
#include <stdio.h>

int main(void) {
	// your code goes here
	char a[10]="CSE@IITR";
	printf("%c\n",a[7]);
	printf("%c\n",a[8]);
	printf("%c\n",a[0]);
	return 0;
}
```

Success #stdin #stdout 0.01s 5360KB

```
R

C
```

Character Array



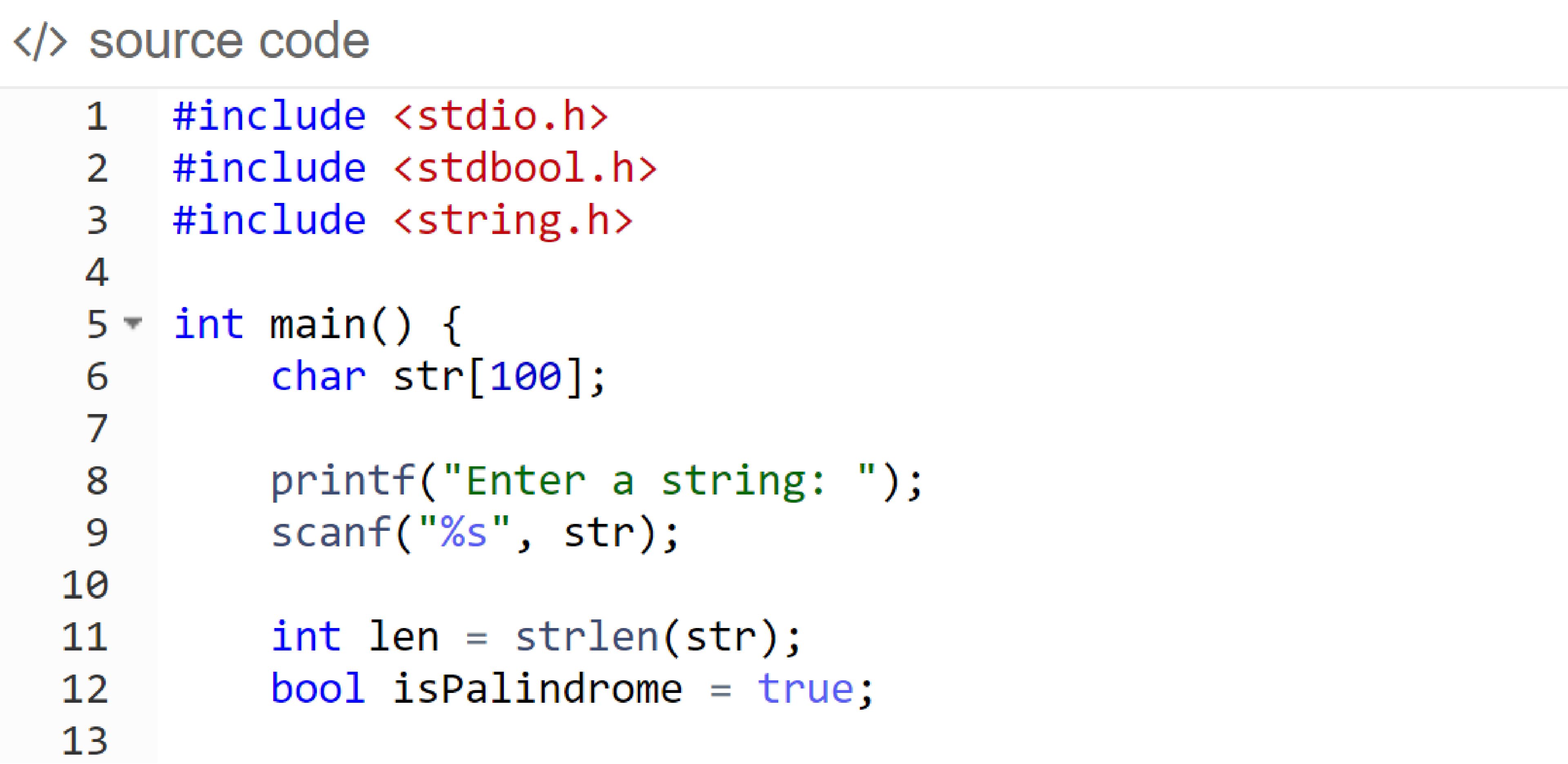
```c
#include <stdio.h>

int main(void) {
	// your code goes here
	char a[10]="CSE@IITR";
	printf("%s\n",a);
	printf("%u\n",a);
	printf("%x\n",a);
	printf("%p\n",a);
	printf("%p", (int *) a);

	return 0;
}
```

```
CSE@IITR
3022525390
b42813ce
0x7ffcb42813ce
0x7ffcb42813ce
```

https://ideone.com/SuDbCU

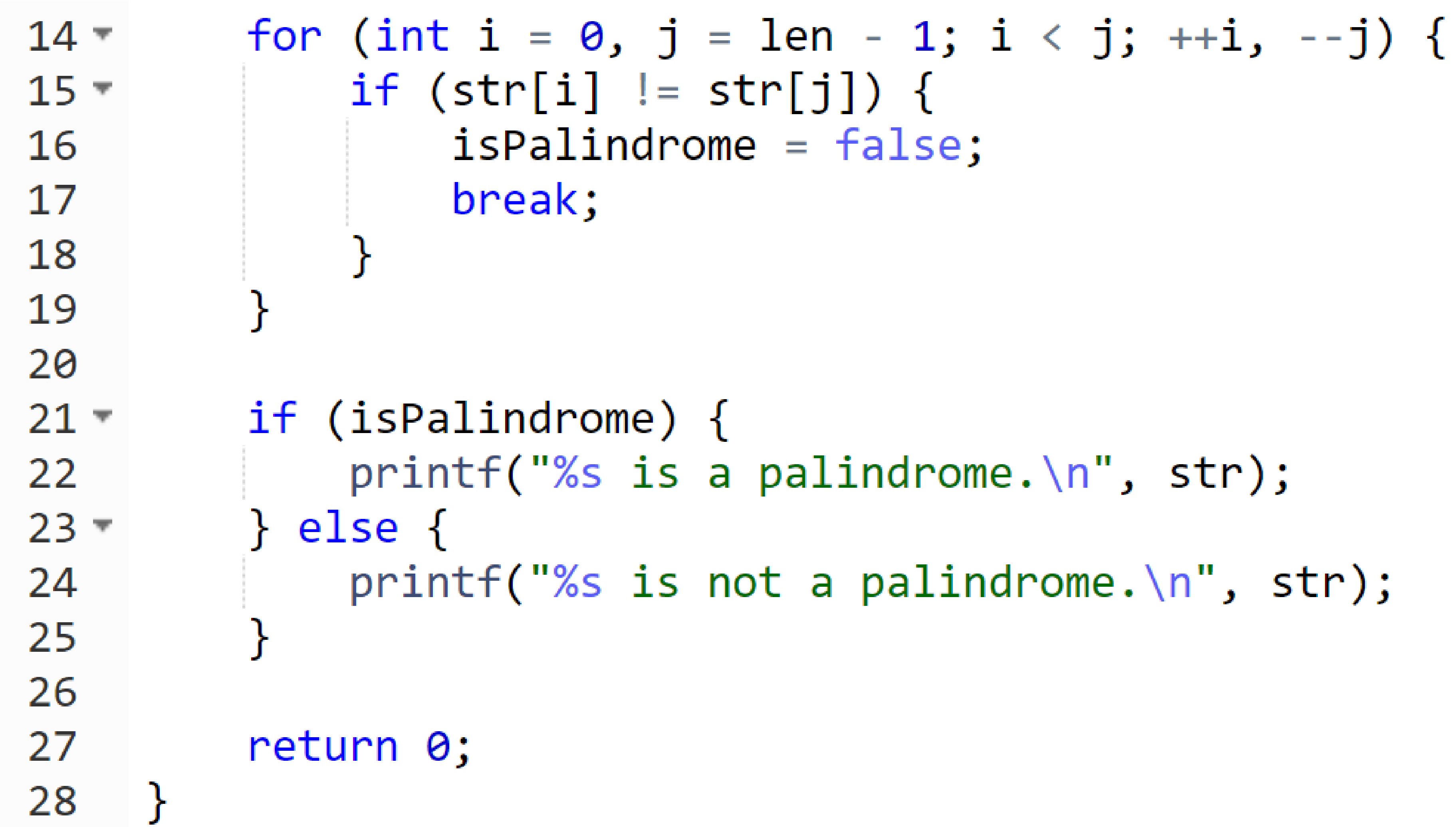
- Write a C program to determine if a given character array is a palindrome.

Character Array



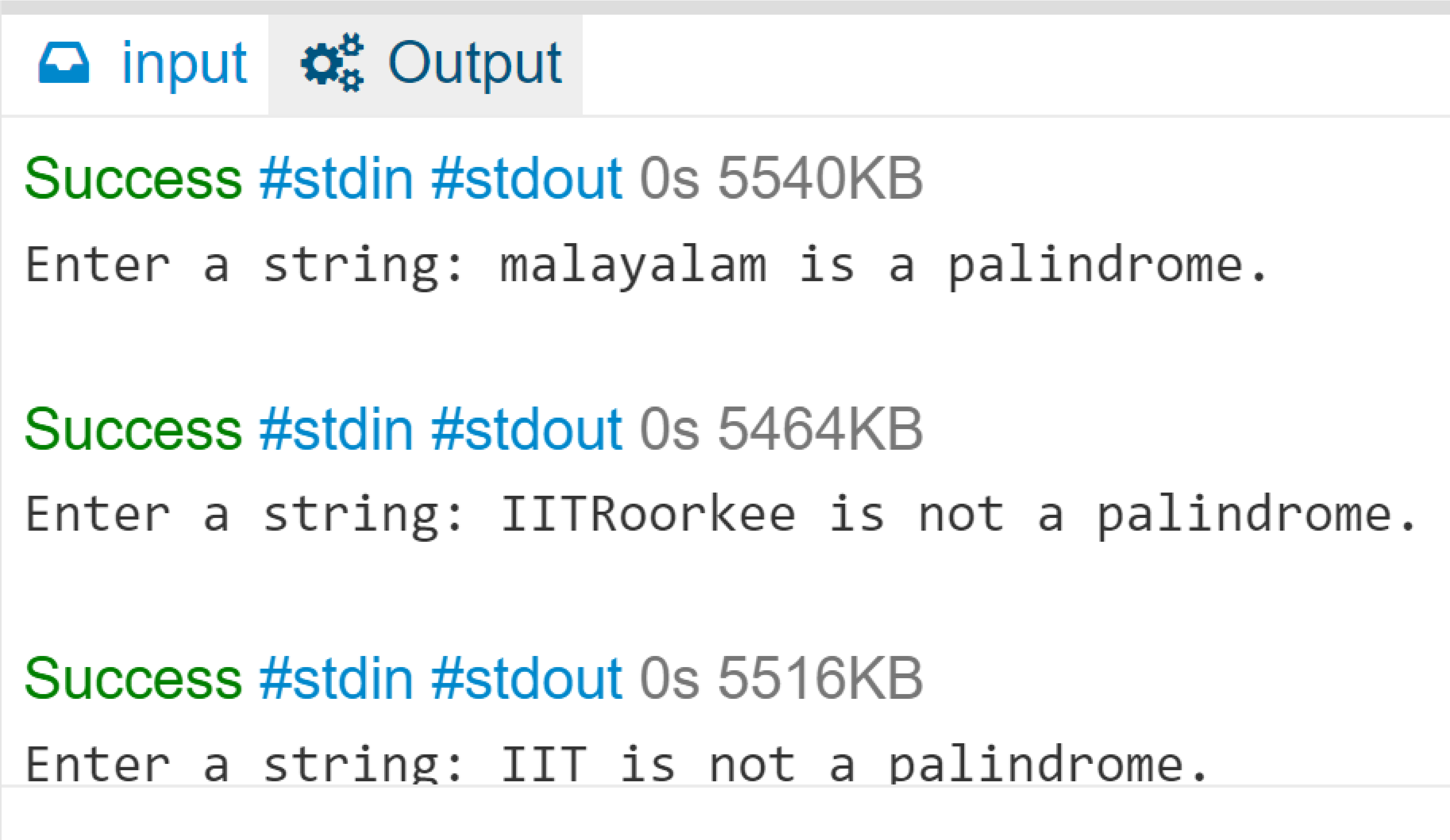
</> source code

```c
#include <stdio.h>
#include <stdbool.h>
#include <string.h>

int main() {
    char str[100];

    printf("Enter a string: ");
    scanf("%s", str);

    int len = strlen(str);
    bool isPalindrome = true;

```



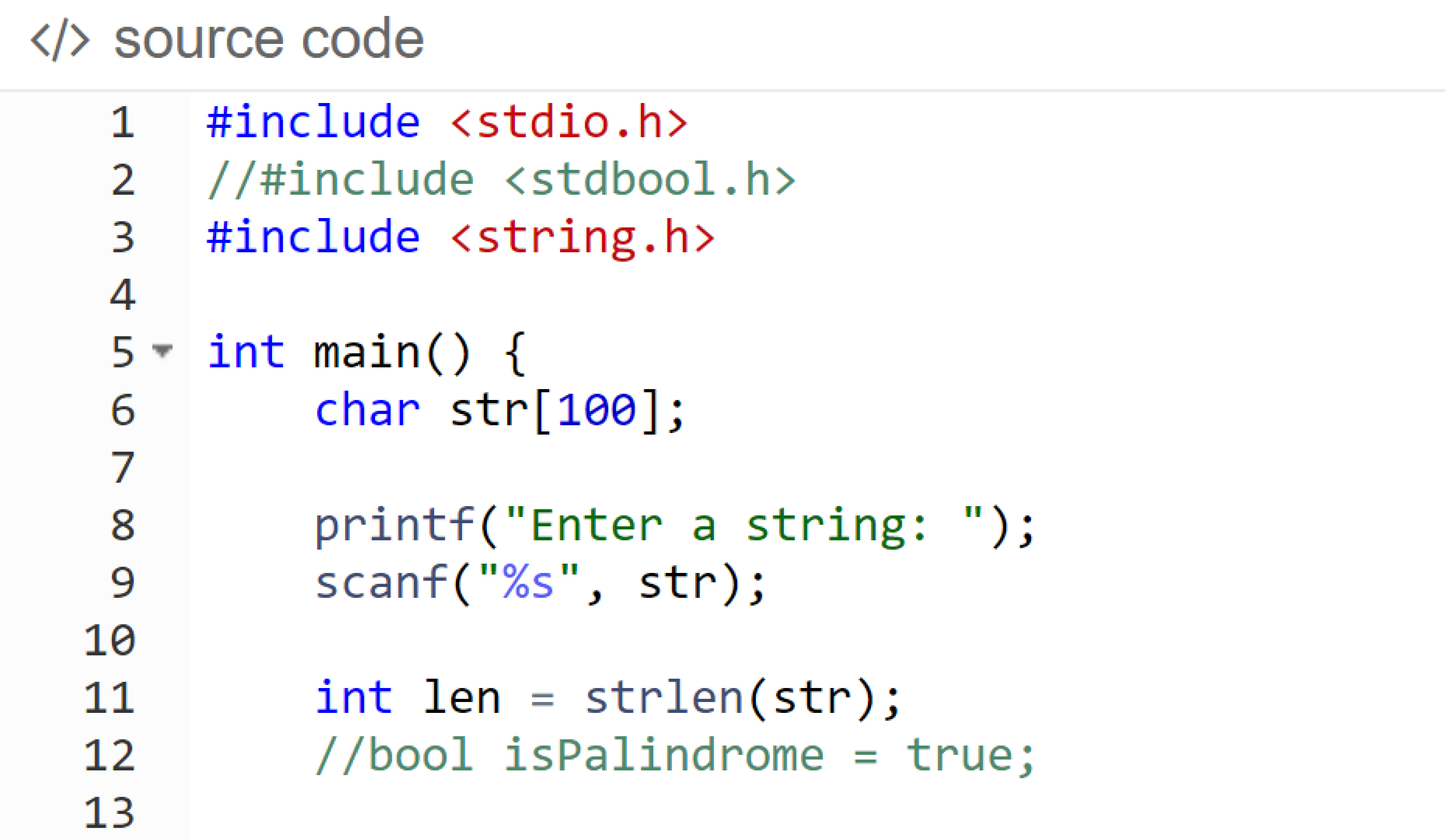
```c
    for (int i = 0, j = len - 1; i < j; ++i, --j) {
        if (str[i] != str[j]) {
            isPalindrome = false;
            break;
        }
    }

    if (isPalindrome) {
        printf("%s is a palindrome.\n", str);
    } else {
        printf("%s is not a palindrome.\n", str);
    }

    return 0;
}
```

https://ideone.com/9uQspr



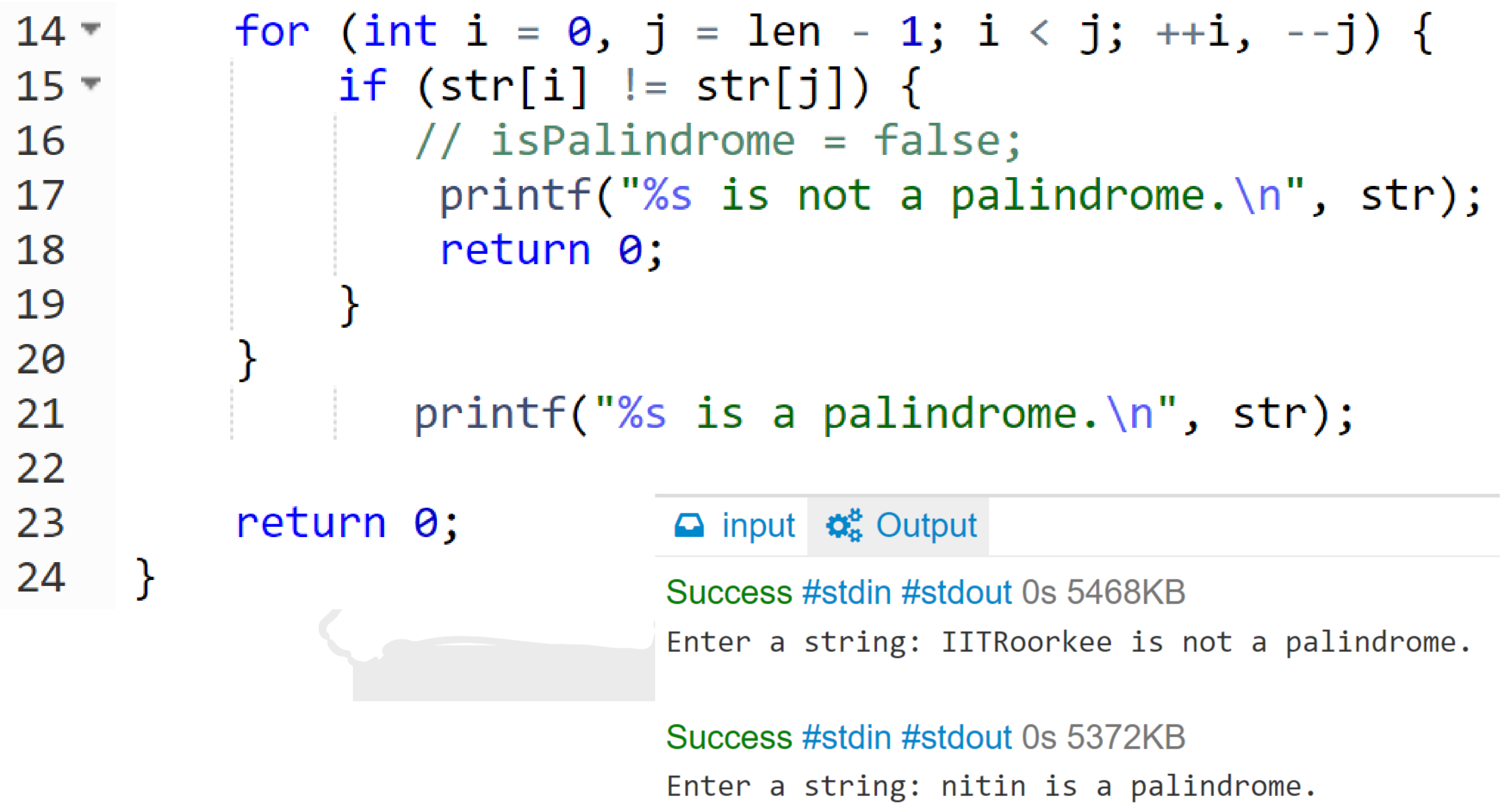
```
Success #stdin #stdout 0s 5540KB
Enter a string: malayalam is a palindrome.


Success #stdin #stdout 0s 5464KB
Enter a string: IITRoorkee is not a palindrome.


Success #stdin #stdout 0s 5516KB
Enter a string: IIT is not a palindrome.
```

Without break



</> source code

```
#include <stdio.h>
//#include <stdbool.h>
#include <string.h>

int main() {
    char str[100];

    printf("Enter a string: ");
    scanf("%s", str);

    int len = strlen(str);
    //bool isPalindrome = true;

```



```
    for (int i = 0, j = len - 1; i < j; ++i, --j) {
        if (str[i] != str[j]) {
           // isPalindrome = false;
            printf("%s is not a palindrome.\n", str);
            return 0;
        }
    }
           printf("%s is a palindrome.\n", str);

    return 0;
}
```

```
Success #stdin #stdout 0s 5468KB
Enter a string: IITRoorkee is not a palindrome.

Success #stdin #stdout 0s 5372KB
Enter a string: nitin is a palindrome.
```

https://ideone.com/u3Omfv

Thank You!