計算機程式語言

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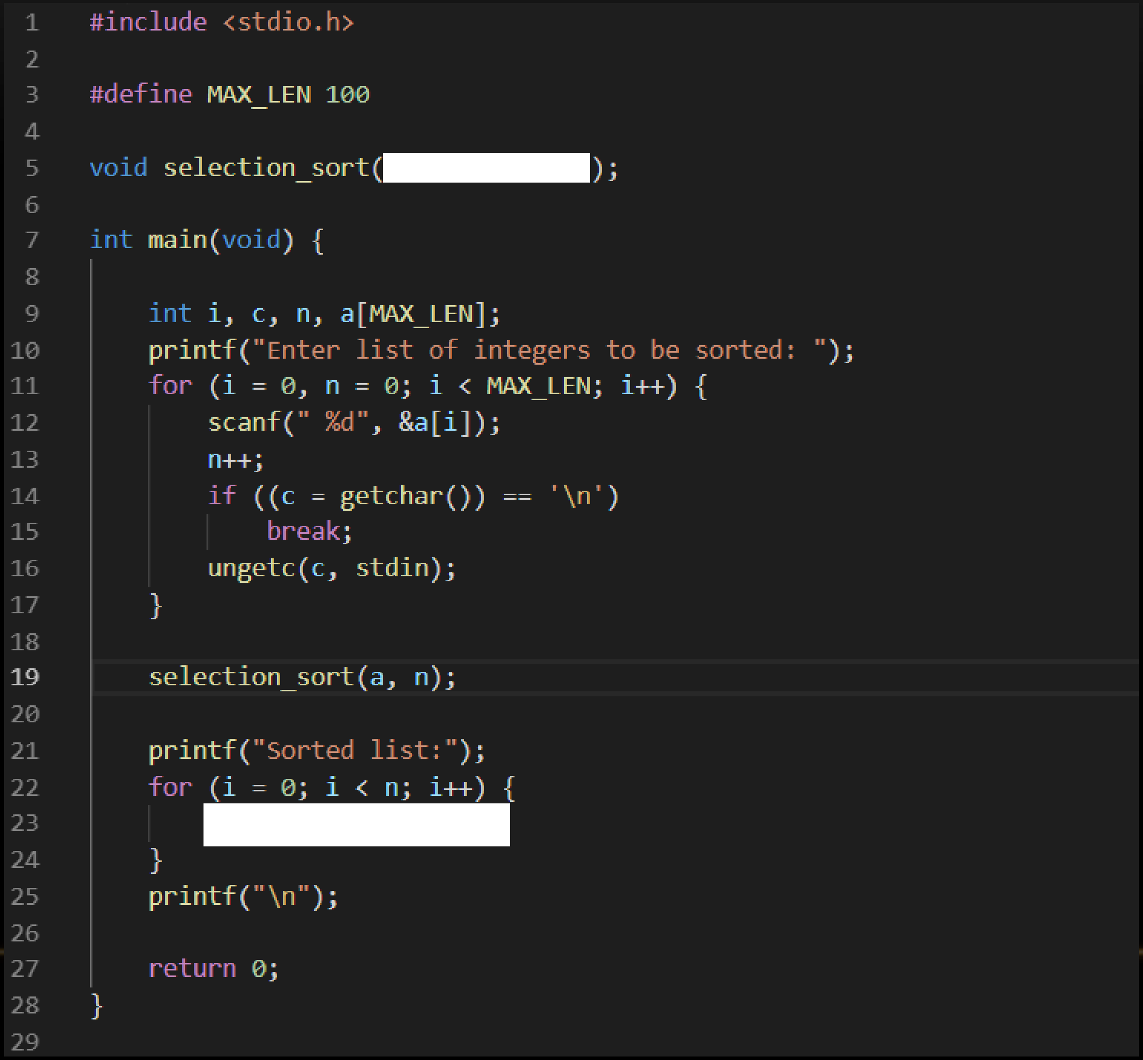
Chapter 9_project 1

Write a program that asks the user to enter a series of integers (which it stores in an array), then sorts the integers by calling the function *selection_sort*. When given an array with n elements. *selection_sort* must do the following:

1. Search the array to find the largest element, then move it to the last position in the array.
2. Call itself recursively to sort the first n - 1 elements of the array.

Solution

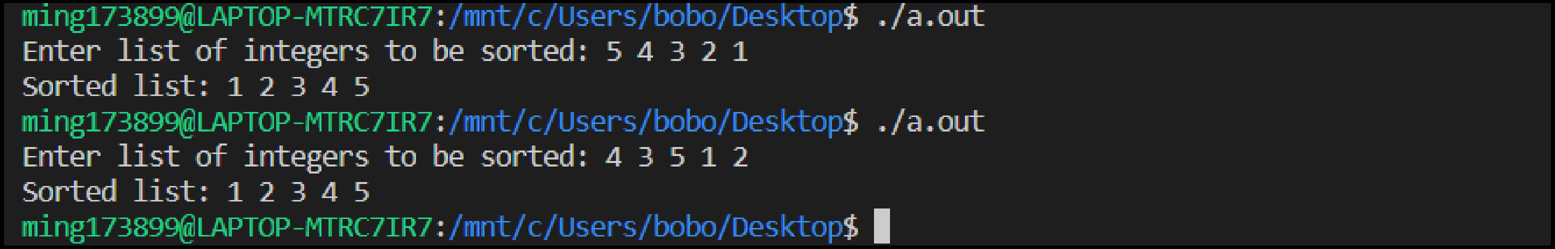


```c
#include <stdio.h>

#define MAX_LEN 100

void selection_sort([redacted]);

int main(void) {

    int i, c, n, a[MAX_LEN];
    printf("Enter list of integers to be sorted: ");
    for (i = 0, n = 0; i < MAX_LEN; i++) {
        scanf(" %d", &a[i]);
        n++;
        if ((c = getchar()) == '\n')
            break;
        ungetc(c, stdin);
    }

    selection_sort(a, n);

    printf("Sorted list:");
    for (i = 0; i < n; i++) {
        [redacted]
    }
    printf("\n");

    return 0;
}

```

Solution

```
void selection sort([redacted]) {
    [redacted]
}
```

Example



```
ming173899@LAPTOP-MTRC7IR7:/mnt/c/Users/bobo/Desktop$ ./a.out
Enter list of integers to be sorted: 5 4 3 2 1
Sorted list: 1 2 3 4 5
ming173899@LAPTOP-MTRC7IR7:/mnt/c/Users/bobo/Desktop$ ./a.out
Enter list of integers to be sorted: 4 3 5 1 2
Sorted list: 1 2 3 4 5
ming173899@LAPTOP-MTRC7IR7:/mnt/c/Users/bobo/Desktop$
```

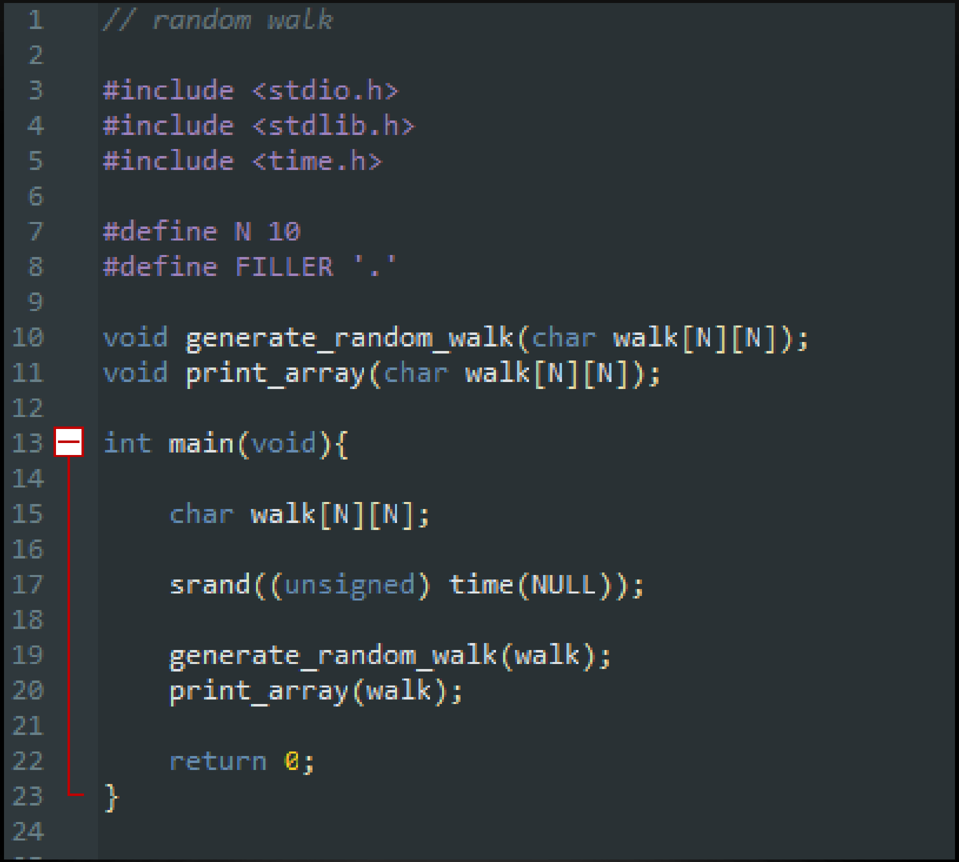
Chapter 9_project 3

Modify Programming Project 9 from Chapter 8 so that it includes the following functions:

void *generate_random_walk* (char walk [10] [10]);
void *print_array* (char walk[10] [10]) ;

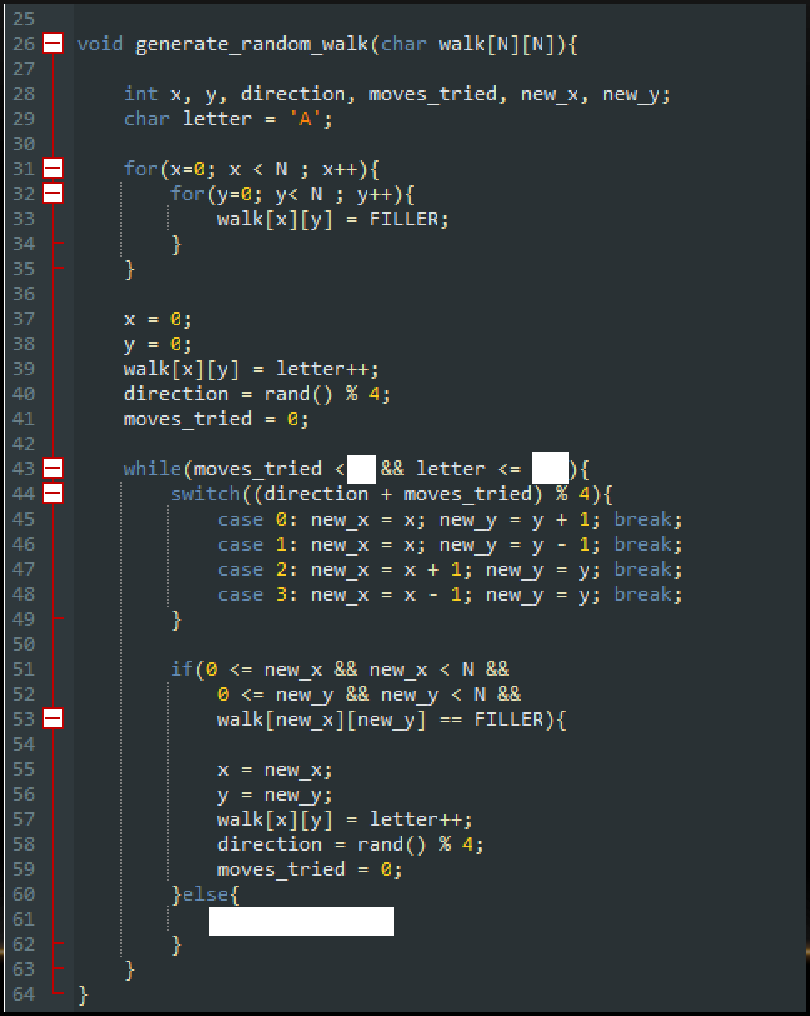
main first calls generate_random_walk, which initializes the array to contain ' . '
characters and then replaces some of these characters by the letters A through Z, as described in the original project, main then calls print_array to display the array on the screen.

Solution



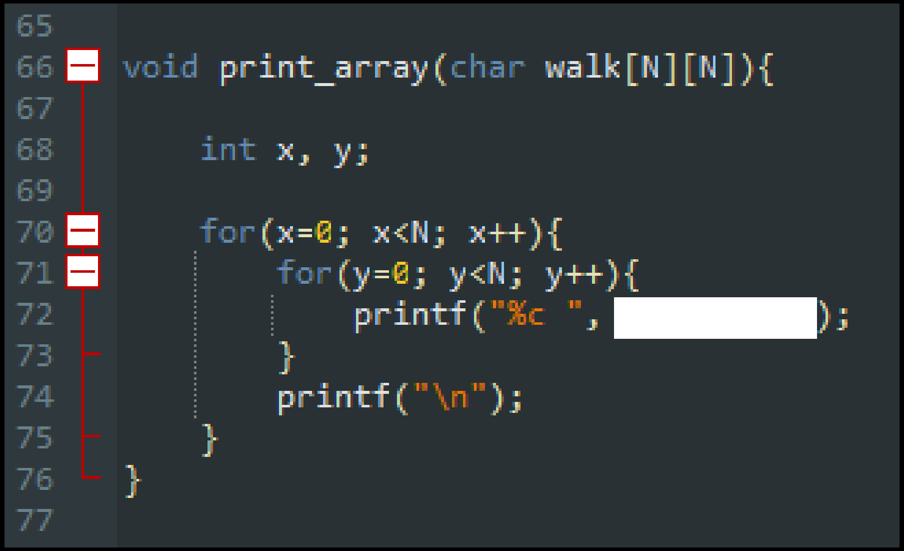
```c
// random walk

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

#define N 10
#define FILLER '.'

void generate_random_walk(char walk[N][N]);
void print_array(char walk[N][N]);

int main(void){

    char walk[N][N];

    srand((unsigned) time(NULL));

    generate_random_walk(walk);
    print_array(walk);

    return 0;
}

```

Solution



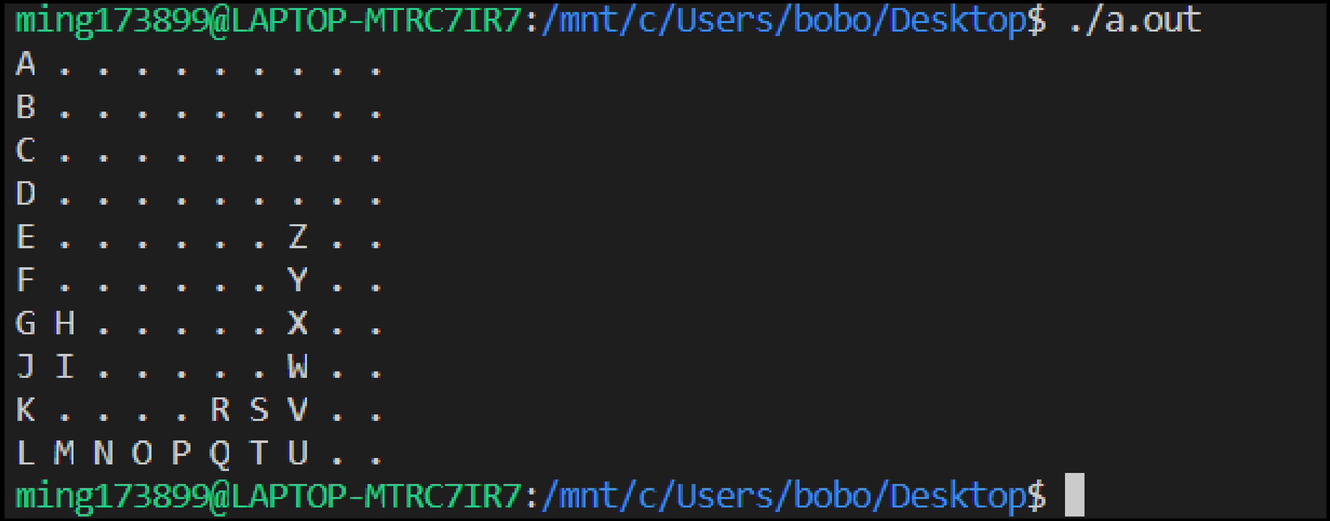
```
void generate_random_walk(char walk[N][N]){

    int x, y, direction, moves_tried, new_x, new_y;
    char letter = 'A';

    for(x=0; x < N ; x++){
        for(y=0; y< N ; y++){
            walk[x][y] = FILLER;
        }
    }

    x = 0;
    y = 0;
    walk[x][y] = letter++;
    direction = rand() % 4;
    moves_tried = 0;

    while(moves_tried <    && letter <=    ){
        switch((direction + moves_tried) % 4){
            case 0: new_x = x; new_y = y + 1; break;
            case 1: new_x = x; new_y = y - 1; break;
            case 2: new_x = x + 1; new_y = y; break;
            case 3: new_x = x - 1; new_y = y; break;
        }

        if(0 <= new_x && new_x < N &&
            0 <= new_y && new_y < N &&
            walk[new_x][new_y] == FILLER){

            x = new_x;
            y = new_y;
            walk[x][y] = letter++;
            direction = rand() % 4;
            moves_tried = 0;
        }else{

        }
    }
}
```

Solution



```c
void print_array(char walk[N][N]){

    int x, y;

    for(x=0; x<N; x++){
        for(y=0; y<N; y++){
            printf("%c ",            );
        }
        printf("\n");
    }
}
```

Example



```
ming173899@LAPTOP-MTRC7IR7:/mnt/c/Users/bobo/Desktop$ ./a.out
A . . . . . . . . .
B . . . . . . . . .
C . . . . . . . . .
D . . . . . . . . .
E . . . . . . Z . .
F . . . . . . Y . .
G H . . . . . X . .
J I . . . . . W . .
K . . . . R S V . .
L M N O P Q T U . .
ming173899@LAPTOP-MTRC7IR7:/mnt/c/Users/bobo/Desktop$ 
```

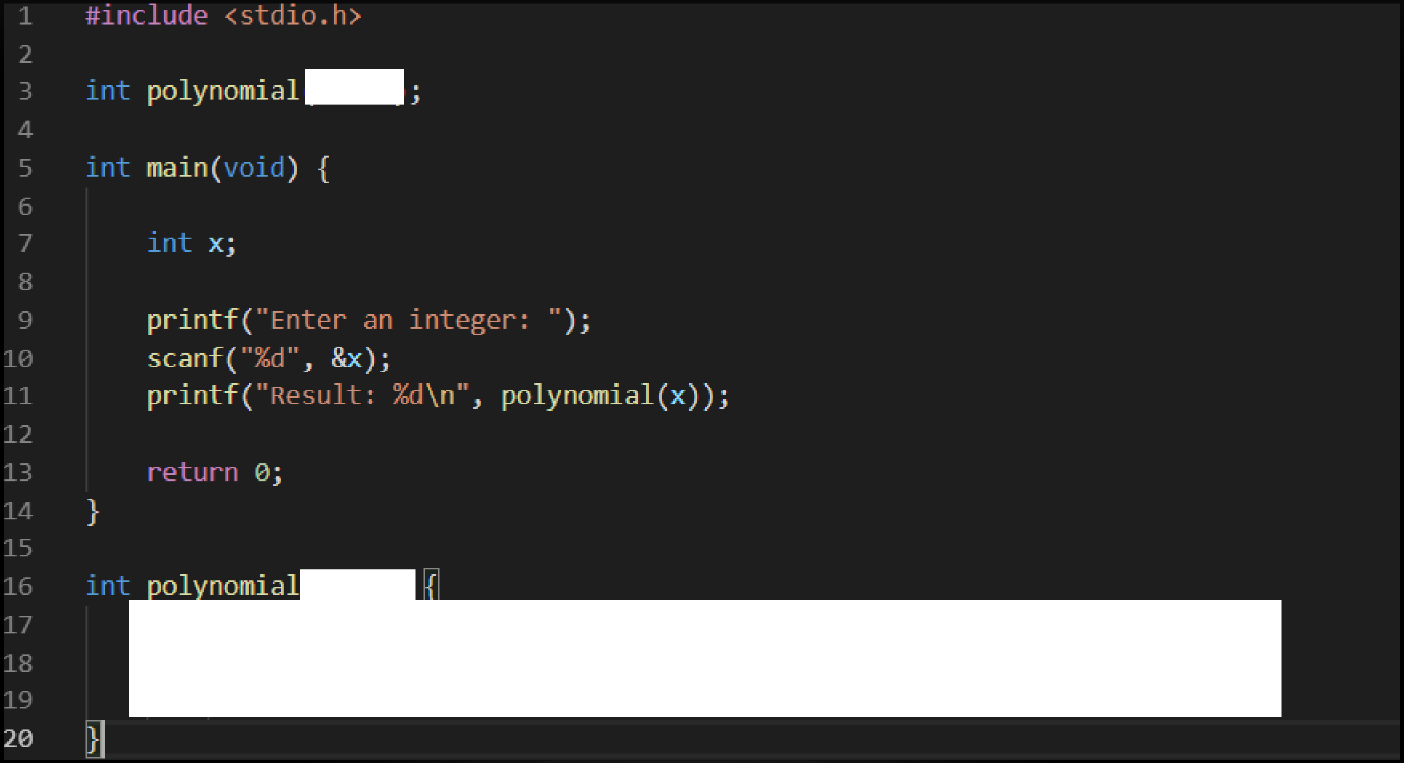
Chapter 9_project 6

Write a function that computes the value of the following polynomial:

$3x^5+2x^4-5x^3-x^2+7x-6$

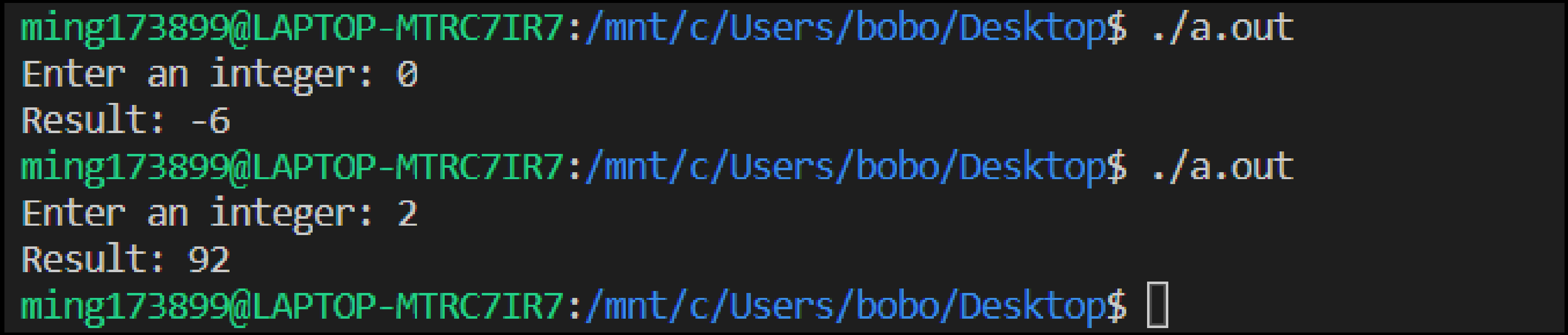
Write a program that asks the user to enter a value for x, calls the function to compute the value of the polynomial, and then displays the value returned by the function.

Solution



```c
#include <stdio.h>

int polynomial[redacted];

int main(void) {

    int x;

    printf("Enter an integer: ");
    scanf("%d", &x);
    printf("Result: %d\n", polynomial(x));

    return 0;
}

int polynomial[redacted] {
    [redacted]
}
```

Example

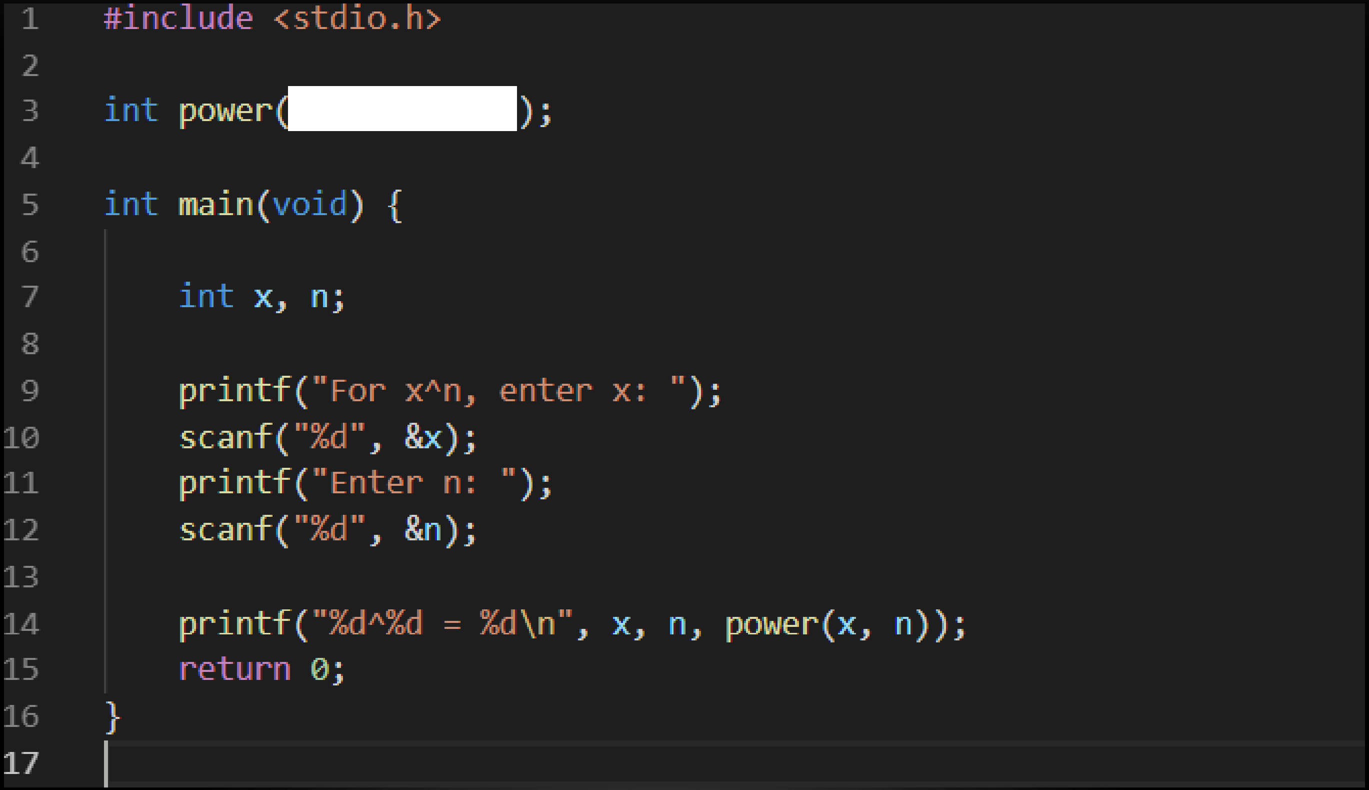


```
ming173899@LAPTOP-MTRC7IR7:/mnt/c/Users/bobo/Desktop$ ./a.out
Enter an integer: 0
Result: -6
ming173899@LAPTOP-MTRC7IR7:/mnt/c/Users/bobo/Desktop$ ./a.out
Enter an integer: 2
Result: 92
ming173899@LAPTOP-MTRC7IR7:/mnt/c/Users/bobo/Desktop$
```

Chapter 9_project 7

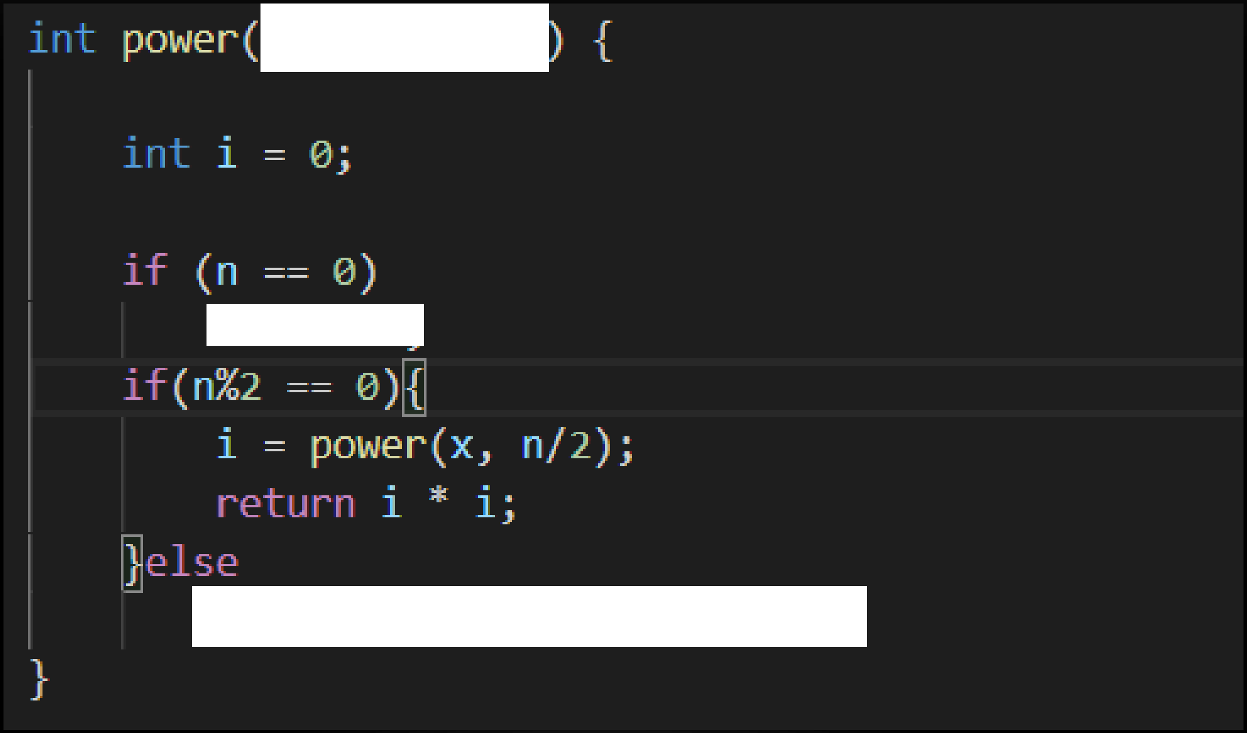
The power function of Section 9.6 can be made faster by having it calculate in x^na different way. We first notice that if n is a power of 2, then x^n can be computed by squaring. For example, x^4 is the square of x^2, so x^4 can he computed using only two multiplications instead of three. As it happens, this technique can be used even when n is not a power of 2. If n is even, we use the formula x^n = $(x^{n/2})^2$, If n is odd, then x^n = x * x^{n-1}. Write a recursive function that computes x^n. (The recursion ends when n = 0, in which case the function returns 1.)
To test your function, write a program that asks the user to enter values for x and n, calls power to compute x^n, and then displays the value returned by the function.

Solution



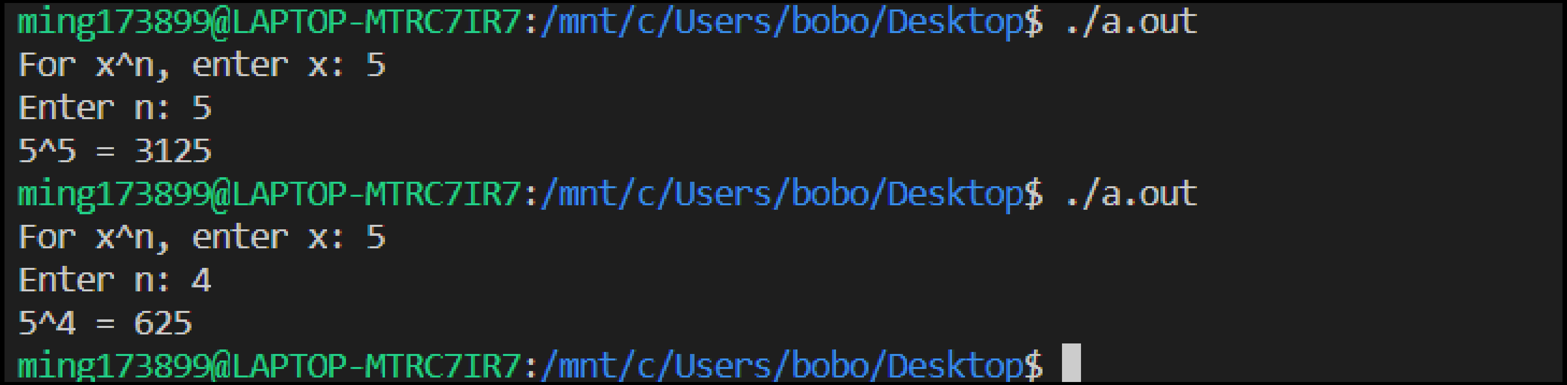
```c
#include <stdio.h>

int power([redacted]);

int main(void) {

    int x, n;

    printf("For x^n, enter x: ");
    scanf("%d", &x);
    printf("Enter n: ");
    scanf("%d", &n);

    printf("%d^%d = %d\n", x, n, power(x, n));
    return 0;
}

```

Solution



```
int power([redacted]) {

    int i = 0;

    if (n == 0)
        [redacted]
    if(n%2 == 0){
        i = power(x, n/2);
        return i * i;
    }else
        [redacted]
}
```

Example



```
ming173899@LAPTOP-MTRC7IR7:/mnt/c/Users/bobo/Desktop$ ./a.out
For x^n, enter x: 5
Enter n: 5
5^5 = 3125
ming173899@LAPTOP-MTRC7IR7:/mnt/c/Users/bobo/Desktop$ ./a.out
For x^n, enter x: 5
Enter n: 4
5^4 = 625
ming173899@LAPTOP-MTRC7IR7:/mnt/c/Users/bobo/Desktop$
```