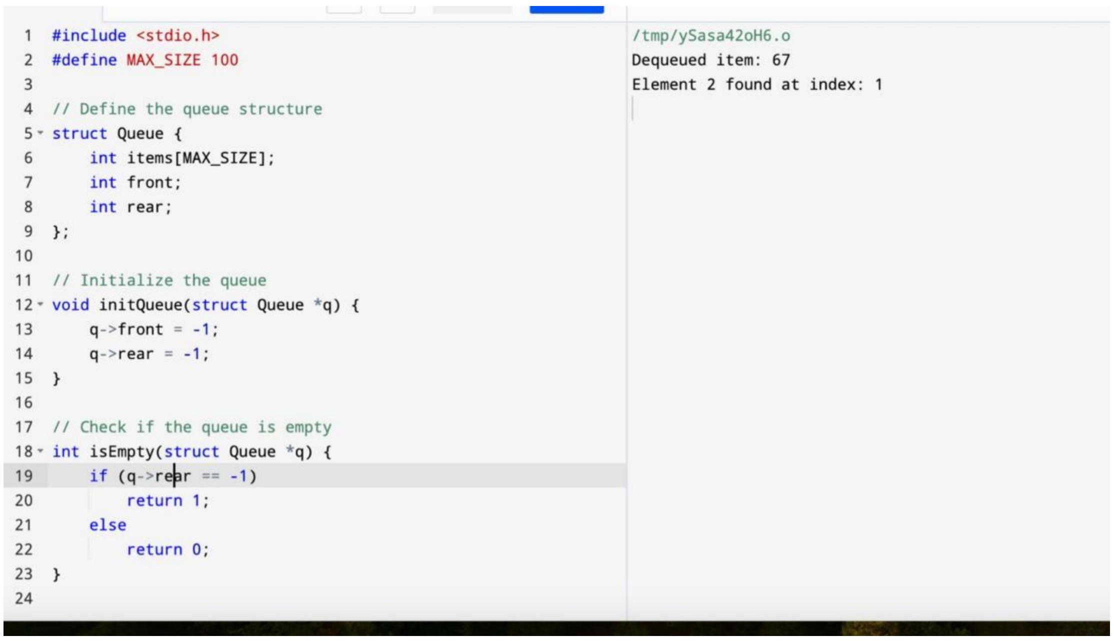
QUESTION1

```
 include <stdio.h>
#define MAX_SIZE 100


struct Queue {
    int items[MAX_SIZE];
    int front;
    int rear;
};


void initQueue(struct Queue *q) {
    q->front = -1;
    q->rear = -1;
}


int isEmpty(struct Queue *q) {
    if (q->rear == -1)
        return 1;
    else
        return 0;
}


int isFull(struct Queue *q) {
    if (q->rear == MAX_SIZE - 1)
        return 1;
    else
        return 0;
}


void enqueue(struct Queue *q, int value) {
    if (isFull(q)) {
        printf("Queue is full\n");
    } else {
        if (q->front == -1) q->front = 0;
        q->rear++;
        q->items[q->rear] = value;
    }
}


int dequeue(struct Queue *q) {
    int item;
    if (isEmpty(q)) {
        printf("Queue is empty\n");
        return -1;
    } else {
        item = q->items[q->front];
        q->front++;
        if (q->front > q->rear) {
            q->front = q->rear = -1;
        }
        return item;
    }
}


int find(struct Queue *q, int value) {
    if (isEmpty(q)) {
        printf("Queue is empty\n");
        return -1;
    } else {
        for (int i = q->front; i <= q->rear; i++) {
            if (q->items[i] == value) {
                return i;
            }
        }
        printf("%d not found in the queue\n", value);
        return -1;
    }
}


int main() {
    struct Queue q;
    initQueue(&q);

    enqueue(&q, 67);
    enqueue(&q, 2);
    enqueue(&q, 78);

    printf("Dequeued item: %d\n", dequeue(&q));

    printf("Element 2 found at index: %d\n", find(&q, 2));

    return 0;
}
```



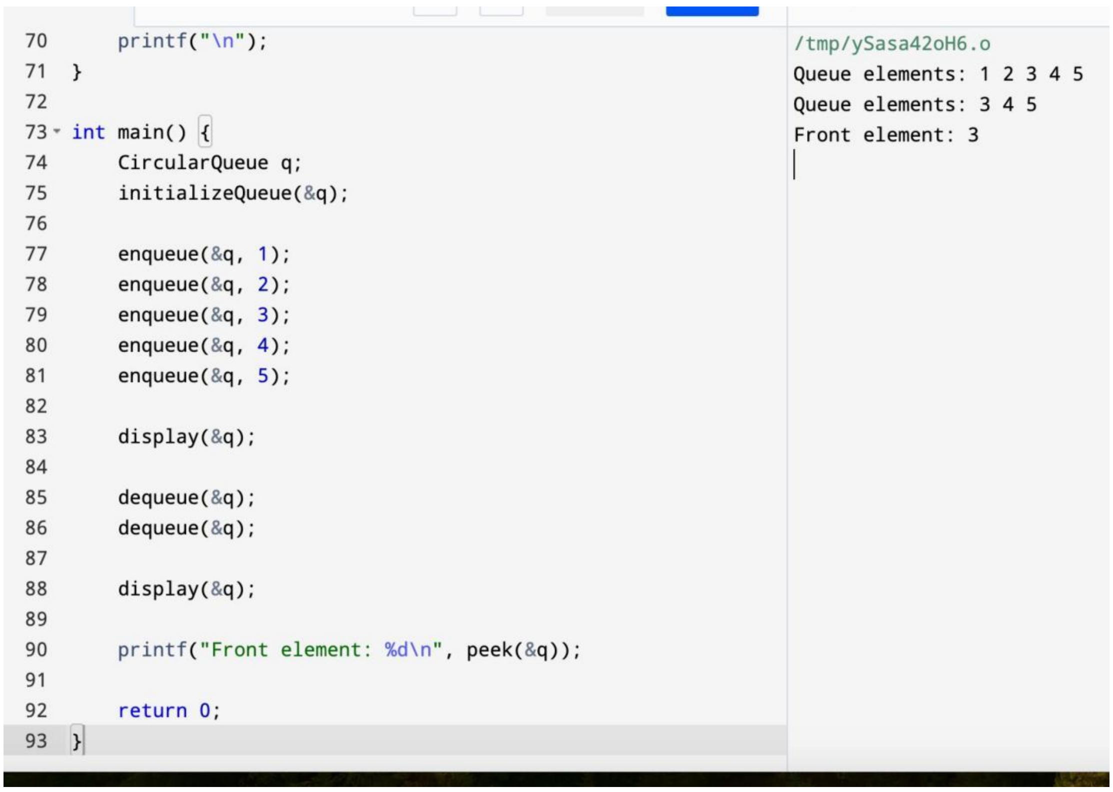
```c
#include <stdio.h>
#define MAX_SIZE 100

// Define the queue structure
struct Queue {
    int items[MAX_SIZE];
    int front;
    int rear;
};

// Initialize the queue
void initQueue(struct Queue *q) {
    q->front = -1;
    q->rear = -1;
}

// Check if the queue is empty
int isEmpty(struct Queue *q) {
    if (q->rear == -1)
        return 1;
    else
        return 0;
}

```

```
/tmp/ySasa42oH6.o
Dequeued item: 67
Element 2 found at index: 1
```

QUESTION2

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

#define MAX_SIZE 10

typedef struct {
   int items[MAX_SIZE];
   int front, rear;
} CircularQueue;

void initializeQueue(CircularQueue *q) {
   q->front = -1;
   q->rear = -1;
}

int isEmpty(CircularQueue *q) {
   return (q->front == -1 && q->rear == -1);
}

int isFull(CircularQueue *q) {
   return ((q->rear + 1) % MAX_SIZE == q->front);
}

void enqueue(CircularQueue *q, int data) {
   if (isFull(q)) {
      printf("Queue is full\n");
      return;
   }
```

```
    if (isEmpty(q)) {
        q->front = 0;
        q->rear = 0;
    } else {
        q->rear = (q->rear + 1) % MAX_SIZE;
    }
    q->items[q->rear] = data;
}

void dequeue(CircularQueue *q) {
    if (isEmpty(q)) {
        printf("Queue is empty\n");
        return;
    }
    if (q->front == q->rear) {
        q->front = -1;
        q->rear = -1;
    } else {
        q->front = (q->front + 1) % MAX_SIZE;
    }
}

int peek(CircularQueue *q) {
    if (isEmpty(q)) {
        printf("Queue is empty\n");
        exit(EXIT_FAILURE);
    }
    return q->items[q->front];
}

void display(CircularQueue *q) {
    if (isEmpty(q)) {
        printf("Queue is empty\n");
        return;
    }
    int i = q->front;
    printf("Queue elements: ");
    do {
        printf("%d ", q->items[i]);
        i = (i + 1) % MAX_SIZE;
    } while (i != (q->rear + 1) % MAX_SIZE);
    printf("\n");
}

int main() {
    CircularQueue q;
    initializeQueue(&q);
    enqueue(&q, 1);
    enqueue(&q, 2);
    enqueue(&q, 3);
    enqueue(&q, 4);
    enqueue(&q, 5);

    display(&q);

    dequeue(&q);
    dequeue(&q);

    display(&q);

    printf("Front element: %d\n", peek(&q));

    return 0;
}
```



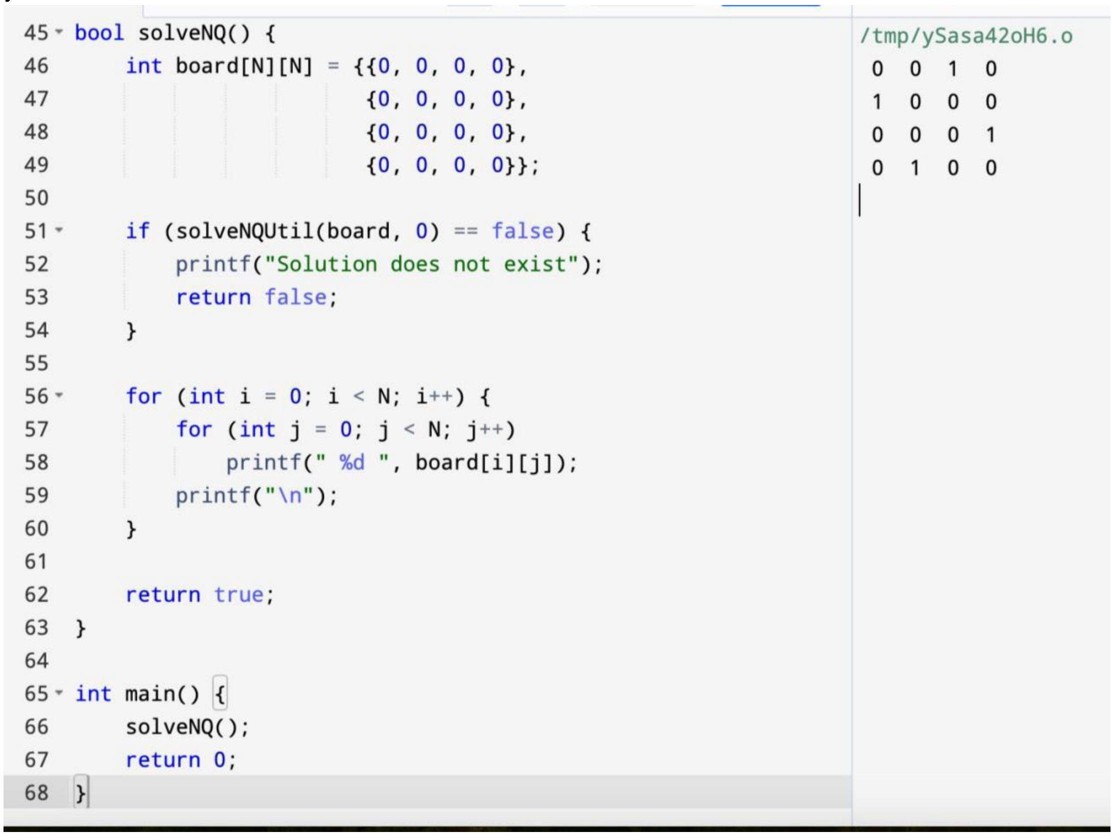
```
        printf("\n");
    }

    int main() {
        CircularQueue q;
        initializeQueue(&q);

        enqueue(&q, 1);
        enqueue(&q, 2);
        enqueue(&q, 3);
        enqueue(&q, 4);
        enqueue(&q, 5);

        display(&q);

        dequeue(&q);
        dequeue(&q);

        display(&q);

        printf("Front element: %d\n", peek(&q));

        return 0;
    }
```

```
/tmp/ySasa42oH6.o
Queue elements: 1 2 3 4 5
Queue elements: 3 4 5
Front element: 3
```

QUESTION3

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

#define N 4

bool isSafe(int board[N][N], int row, int col) {
   int i, j;


   for (i = 0; i < col; i++)
      if (board[row][i])
         return false;


   for (i = row, j = col; i >= 0 && j >= 0; i--, j--)
      if (board[i][j])
         return false;


   for (i = row, j = col; j >= 0 && i < N; i++, j--)
      if (board[i][j])
         return false;

   return true;
}

bool solveNQUtil(int board[N][N], int col) {
   if (col >= N)
      return true;

   for (int i = 0; i < N; i++) {
      if (isSafe(board, i, col)) {
         board[i][col] = 1;

         if (solveNQUtil(board, col + 1))
            return true;

         board[i][col] = 0;
      }
   }

   return false;
}
```

```
bool solveNQ() {
    int board[N][N] = {{0, 0, 0, 0},
                       {0, 0, 0, 0},
                       {0, 0, 0, 0},
                       {0, 0, 0, 0}};

    if (solveNQUtil(board, 0) == false) {
        printf("Solution does not exist");
        return false;
    }

    for (int i = 0; i < N; i++) {
        for (int j = 0; j < N; j++)
            printf(" %d ", board[i][j]);
        printf("\n");
    }

    return true;
}

int main() {
    solveNQ();
    return 0;
}
```



```
bool solveNQ() {
    int board[N][N] = {{0, 0, 0, 0},
                       {0, 0, 0, 0},
                       {0, 0, 0, 0},
                       {0, 0, 0, 0}};

    if (solveNQUtil(board, 0) == false) {
        printf("Solution does not exist");
        return false;
    }

    for (int i = 0; i < N; i++) {
        for (int j = 0; j < N; j++)
            printf(" %d ", board[i][j]);
        printf("\n");
    }

    return true;
}

int main() {
    solveNQ();
    return 0;
}
```

```
/tmp/ySasa42oH6.o
 0  0  1  0
 1  0  0  0
 0  0  0  1
 0  1  0  0
```