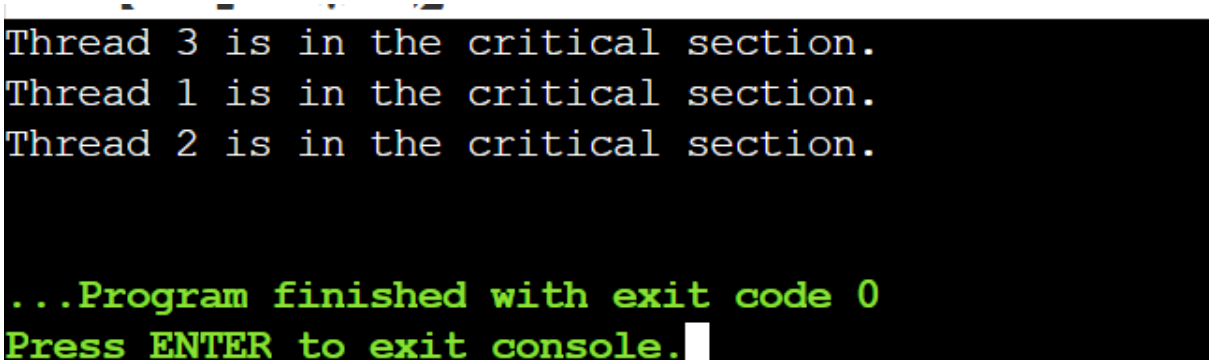
19)

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

#define NUM_THREADS 5

pthread_mutex_t lock;

void* threadFunction(void* arg) {
    pthread_mutex_lock(&lock);
    printf("Thread %d is in the critical section.\n", *(int*)arg);
    pthread_mutex_unlock(&lock);
    return NULL;
}

int main() {
    pthread_t threads[NUM_THREADS];
    int threadIds[NUM_THREADS];

    pthread_mutex_init(&lock, NULL);

    for (int i = 0; i < NUM_THREADS; i++) {
        threadIds[i] = i;
        pthread_create(&threads[i], NULL, threadFunction, &threadIds[i]);
    }

    for (int i = 0; i < NUM_THREADS; i++) {
        pthread_join(threads[i], NULL);
    }

    pthread_mutex_destroy(&lock);
```

```
    return 0;
}
```

OUTPUT:



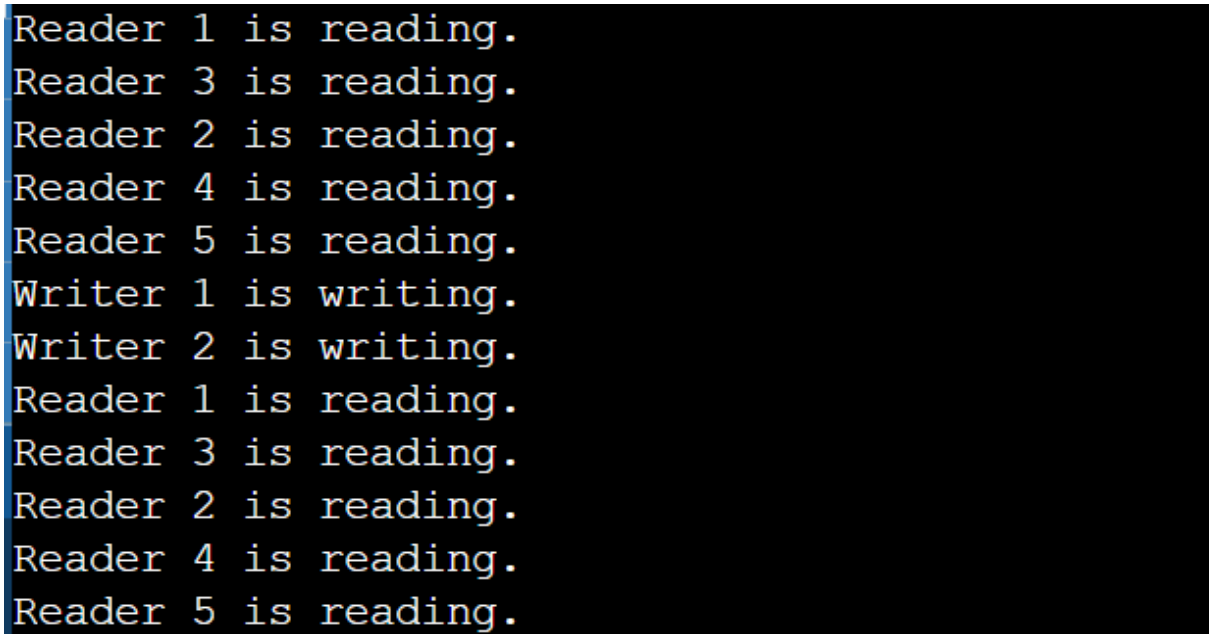
20)

```
#include <stdio.h>
#include <stdlib.h>
#include <pthread.h>
#include <semaphore.h>
#include <unistd.h>
#define READERS 5
#define WRITERS 2
sem_t mutex, writeBlock;
int readCount = 0;
void* reader(void* arg) {
    int id = *(int*)arg;
    while (1) {
        sem_wait(&mutex);
        readCount++;
        if (readCount == 1) sem_wait(&writeBlock);
        sem_post(&mutex);
        printf("Reader %d is reading.\n", id);
        sleep(1);
        sem_wait(&mutex);
        readCount--;
```

```
        if (readCount == 0) sem_post(&writeBlock);
        sem_post(&mutex);
        sleep(1);
    }
    return NULL;
}
void* writer(void* arg) {
    int id = *(int*)arg;
    while (1) {
        sem_wait(&writeBlock);
        printf("Writer %d is writing.\n", id);
        sleep(2);
        sem_post(&writeBlock);
        sleep(1);
    }
    return NULL;
}
int main() {
    pthread_t r[READERS], w[WRITERS];
    int ids[READERS + WRITERS];
    sem_init(&mutex, 0, 1);
    sem_init(&writeBlock, 0, 1);
    for (int i = 0; i < READERS; i++) {
        ids[i] = i + 1;
        pthread_create(&r[i], NULL, reader, &ids[i]);
    }
    for (int i = 0; i < WRITERS; i++) {
        ids[READERS + i] = i + 1;
        pthread_create(&w[i], NULL, writer, &ids[READERS + i]);
    }
    for (int i = 0; i < READERS; i++) pthread_join(r[i], NULL);
```

```
    for (int i = 0; i < WRITERS; i++) pthread_join(w[i], NULL);
    sem_destroy(&mutex);
    sem_destroy(&writeBlock);
    return 0;
}
```

OUT PUT:

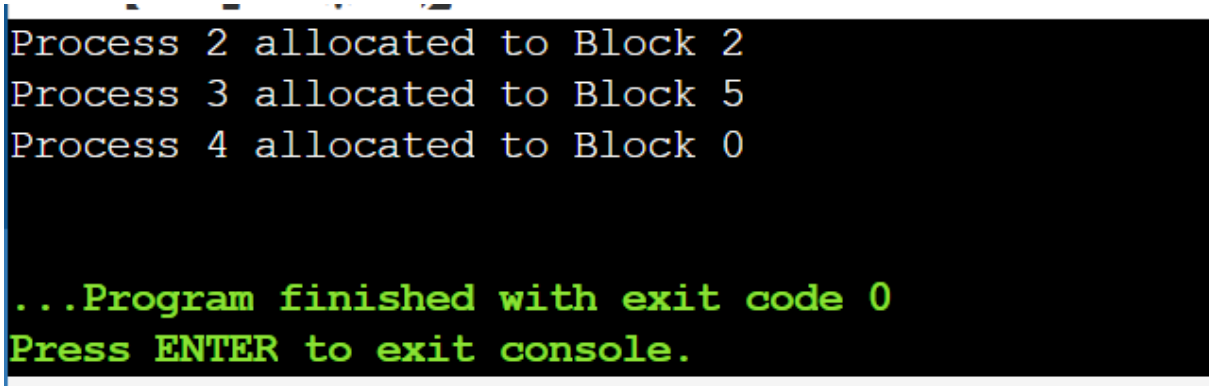


21)

```
#include <stdio.h>
int main() {
    int blockSize[] = {100, 500, 200, 300, 600};
    int processSize[] = {212, 417, 112, 426};
    int n = sizeof(blockSize) / sizeof(blockSize[0]);
    int m = sizeof(processSize) / sizeof(processSize[0]);
    int allocation[m];
    for (int i = 0; i < m; i++) {
        int worstIdx = -1;
        for (int j = 0; j < n; j++) {
            if (blockSize[j] >= processSize[i]) {
```

```
            if (worstIdx == -1 || blockSize[j] > blockSize[worstIdx])
                worstIdx = j;
        }
    }
    if (worstIdx != -1) {
        allocation[i] = worstIdx;
        blockSize[worstIdx] -= processSize[i];
    } else {
        allocation[i] = -1;
    }
  }
  for (int i = 0; i < m; i++)
    printf("Process %d allocated to Block %d\n", i + 1, allocation[i] + 1);
  return 0;
}
```

OUT PUT:



22)

```
#include <stdio.h>

int main() {
  int blockSize[] = {100, 500, 200, 300, 600};
```

```
    int processSize[] = {212, 417, 112, 426};
    int n = sizeof(processSize) / sizeof(processSize[0]);
    int m = sizeof(blockSize) / sizeof(blockSize[0]);
    int allocation[n];
    for (int i = 0; i < n; i++) {
        int bestIdx = -1;
        for (int j = 0; j < m; j++) {
            if (blockSize[j] >= processSize[i]) {
                if (bestIdx == -1 || blockSize[bestIdx] > blockSize[j])
                    bestIdx = j;
            }
        }
        if (bestIdx != -1) {
            allocation[i] = bestIdx;
            blockSize[bestIdx] -= processSize[i];
        } else {
            allocation[i] = -1;
        }
    }
    printf("Process No.\tProcess Size\tBlock No.\n");
    for (int i = 0; i < n; i++) {
        printf("%d\t\t%d\t\t", i + 1, processSize[i]);
        if (allocation[i] != -1)
            printf("%d\n", allocation[i] + 1);
        else
            printf("Not Allocated\n");
    }
    return 0;
}
```

OUTP UT:

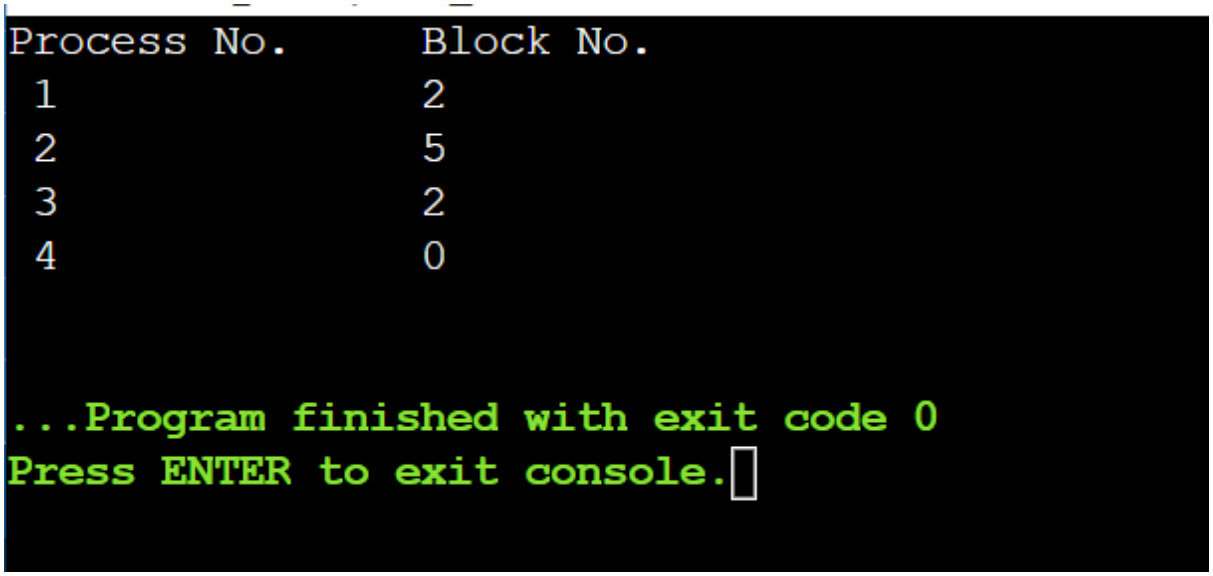
```
Process No.     Process Size    Block No.
1               212             4
2               417             2
3               112             3
4               426             5


...Program finished with exit code 0
Press ENTER to exit console.
```

23)

```
#include <stdio.h>
int main() {
   int blockSize[] = {100, 500, 200, 300, 600};
   int processSize[] = {212, 417, 112, 426};
   int n = sizeof(processSize) / sizeof(processSize[0]);
   int m = sizeof(blockSize) / sizeof(blockSize[0]);
   int allocation[n];
   for (int i = 0; i < n; i++) {
      allocation[i] = -1;
      for (int j = 0; j < m; j++) {
         if (blockSize[j] >= processSize[i]) {
            allocation[i] = j;
            blockSize[j] -= processSize[i];
            break;
         }
      }
   }
   printf("Process No.\tBlock No.\n");
   for (int i = 0; i < n; i++)
      printf(" %d\t\t%d\n", i + 1, allocation[i] + 1);
```

```
    return 0;
}
```

OUT PUT:

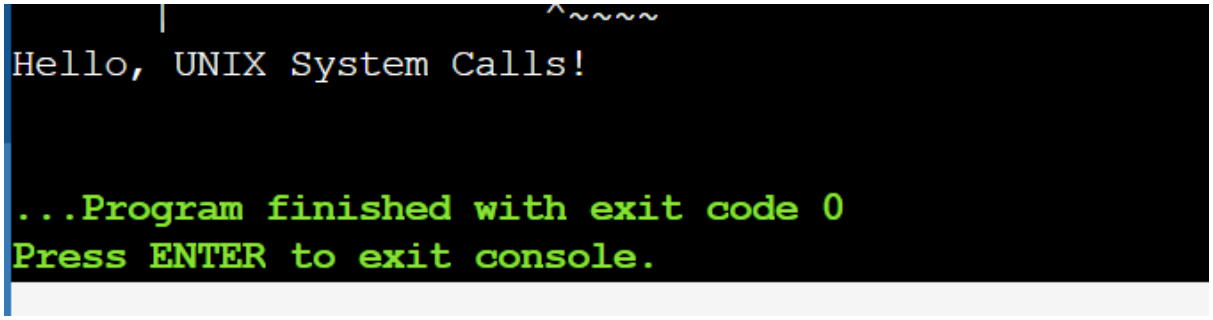


24)

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

int main() {
    int fd;
    char *text = "Hello, UNIX System Calls!\n";
    char buffer[50];
    fd = open("example.txt", O_CREAT | O_WRONLY, 0644);
    write(fd, text, 30);
    close(fd);
    fd = open("example.txt", O_RDONLY);
    read(fd, buffer, 30);
    printf("%s", buffer);
    close(fd);
```

```
    unlink("example.txt");
    return 0;
}
```

OUT PUT:

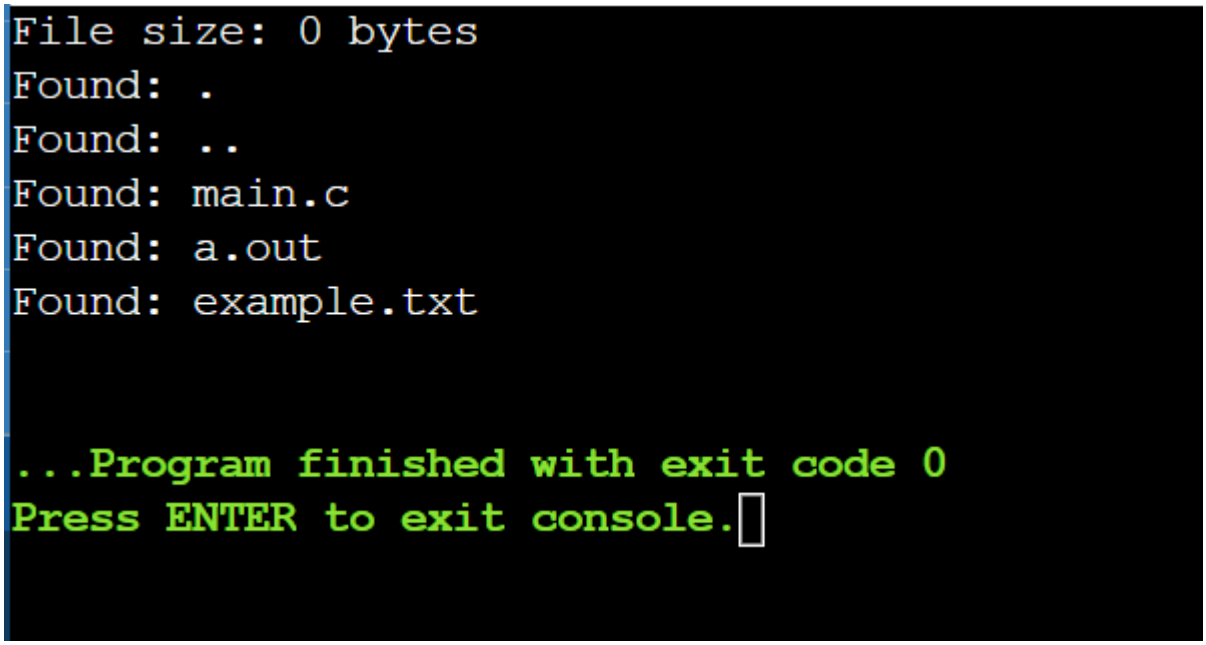


25)

```
#include <stdio.h>
#include <fcntl.h>
#include <unistd.h>
#include <sys/stat.h>
#include <dirent.h>
int main() {
    int fd = open("example.txt", O_RDWR | O_CREAT, 0644);
    fcntl(fd, F_SETFL, O_NONBLOCK);
    lseek(fd, 0, SEEK_SET);
    struct stat fileStat;
    stat("example.txt", &fileStat);
    printf("File size: %ld bytes\n", fileStat.st_size);
    DIR *dir = opendir(".");
    struct dirent *entry;
    while ((entry = readdir(dir)) != NULL) {
        printf("Found: %s\n", entry->d_name);
    }
    closedir(dir);
    close(fd);
    return 0;
```

}

OUT PUT:

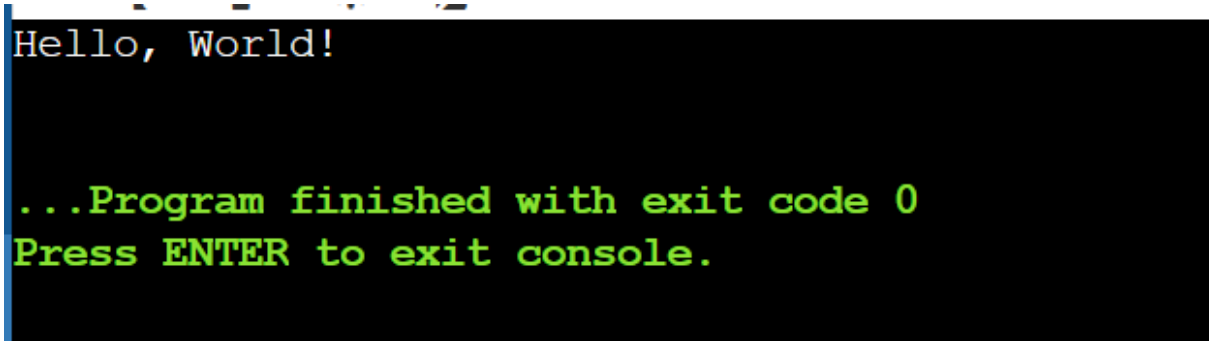


26)

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

void createFile(const char *filename) {
    FILE *file = fopen(filename, "w");
    if (file) fclose(file);
}

void writeFile(const char *filename, const char *content) {
    FILE *file = fopen(filename, "a");
    if (file) {
        fputs(content, file);
        fclose(file);
    }
}
```

```
void readFile(const char *filename) {
    char buffer[100];
    FILE *file = fopen(filename, "r");
    if (file) {
        while (fgets(buffer, sizeof(buffer), file)) {
            printf("%s", buffer);
        }
        fclose(file);
    }
}

void deleteFile(const char *filename) {
    remove(filename);
}

int main() {
    const char *filename = "example.txt";
    createFile(filename);
    writeFile(filename, "Hello, World!\n");
    readFile(filename);
    deleteFile(filename);
    return 0;
}
```

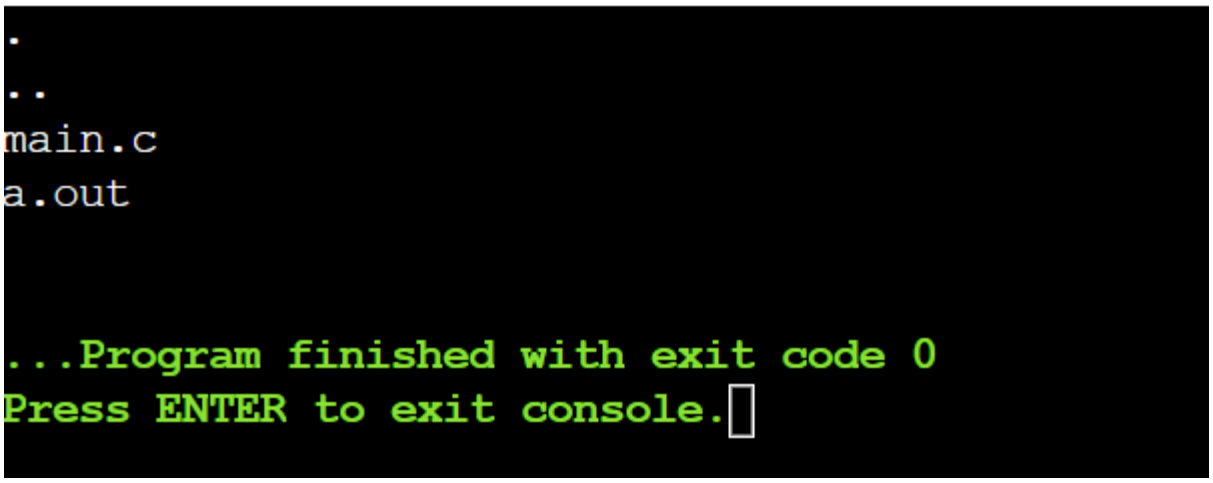
OUT PUT:



27)

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

int main() {
    struct dirent *entry;
    DIR *dp = opendir(".");

    if (dp == NULL) {
        perror("opendir");
        return 1;
    }

    while ((entry = readdir(dp)) != NULL) {
        printf("%s\n", entry->d_name);
    }

    closedir(dp);
    return 0;
}
```

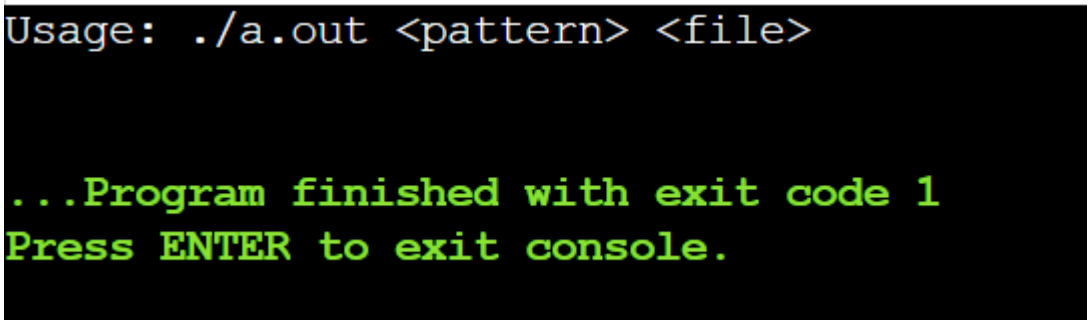
OUT PUT:



28)

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

int main(int argc, char *argv[]) {
    if (argc != 3) {
        printf("Usage: %s <pattern> <file>\n", argv[0]);
        return 1;
    }
    FILE *file = fopen(argv[2], "r");
    if (!file) {
        perror("File opening failed");
        return 1;
    }
    char line[256];
    while (fgets(line, sizeof(line), file)) {
        if (strstr(line, argv[1])) {
            printf("%s", line);
        }
    }
    fclose(file);
    return 0;
}
```

OUT PUT:

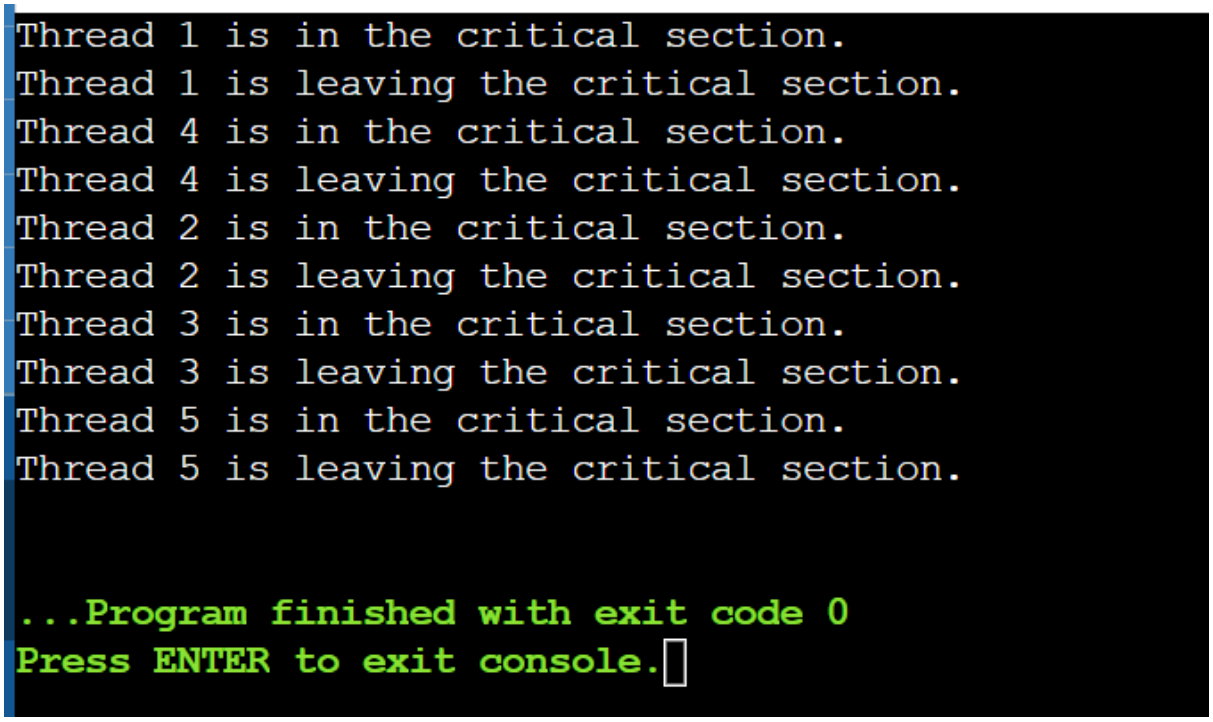


29)

```
#include <stdio.h>
#include <stdlib.h>
#include <pthread.h>
#include <semaphore.h>
#include <unistd.h>

#define NUM_THREADS 5

sem_t semaphore;

void* threadFunction(void* arg) {
    int id = *((int*)arg);
    sem_wait(&semaphore);
    printf("Thread %d is in the critical section.\n", id);
    sleep(1);
    printf("Thread %d is leaving the critical section.\n", id);
    sem_post(&semaphore);
    return NULL;
}

int main() {
    pthread_t threads[NUM_THREADS];
```

```
    int thread_ids[NUM_THREADS];

    sem_init(&semaphore, 0, 1);

    for (int i = 0; i < NUM_THREADS; i++) {
        thread_ids[i] = i + 1;
        pthread_create(&threads[i], NULL, threadFunction, &thread_ids[i]);
    }

    for (int i = 0; i < NUM_THREADS; i++) {
        pthread_join(threads[i], NULL);
    }

    sem_destroy(&semaphore);
    return 0;
}
```

OUT PUT:

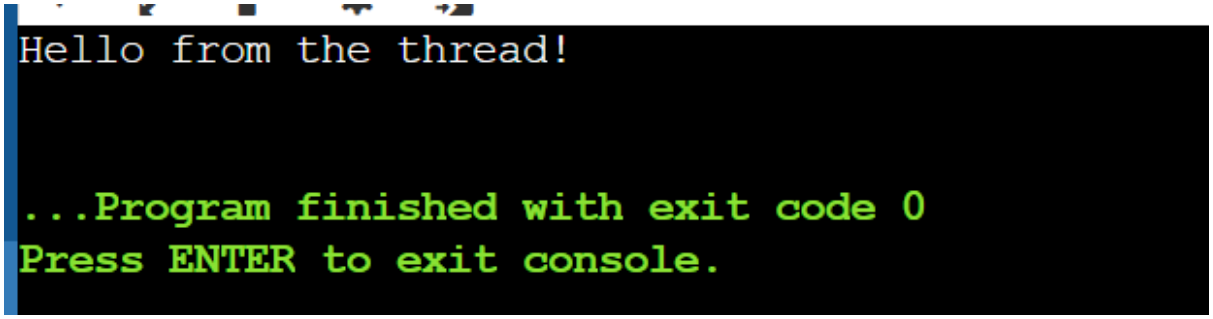


30)

1.

```
#include <stdio.h>
#include <pthread.h>
void* printMessage(void* msg) {
   printf("%s\n", (char*)msg);
   return NULL;
}
int main() {
   pthread_t thread;
   char* message = "Hello from the thread!";
   pthread_create(&thread, NULL, printMessage, (void*)message);
   pthread_join(thread, NULL);
   return 0;
}
```

OUT PUT:

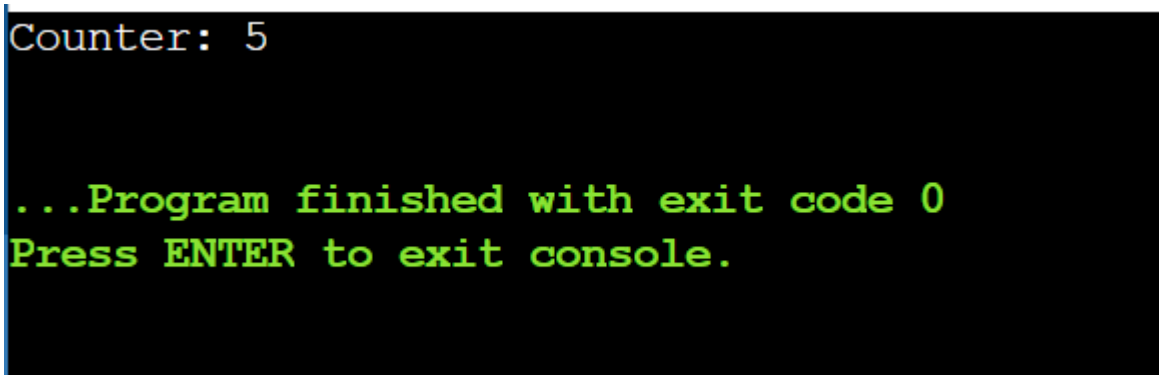


2)

```
#include <stdio.h>
#include <pthread.h>
int counter = 0;
pthread_mutex_t lock;
void* incrementCounter(void* arg) {
   pthread_mutex_lock(&lock);
   counter++;
```

```
    pthread_mutex_unlock(&lock);
    return NULL;
}
int main() {
    pthread_t threads[5];
    pthread_mutex_init(&lock, NULL);
    for (int i = 0; i < 5; i++) pthread_create(&threads[i], NULL, incrementCounter, NULL);
    for (int i = 0; i < 5; i++) pthread_join(threads[i], NULL);
    printf("Counter: %d\n", counter);
    pthread_mutex_destroy(&lock);
    return 0;
}
```

OUT PUT:

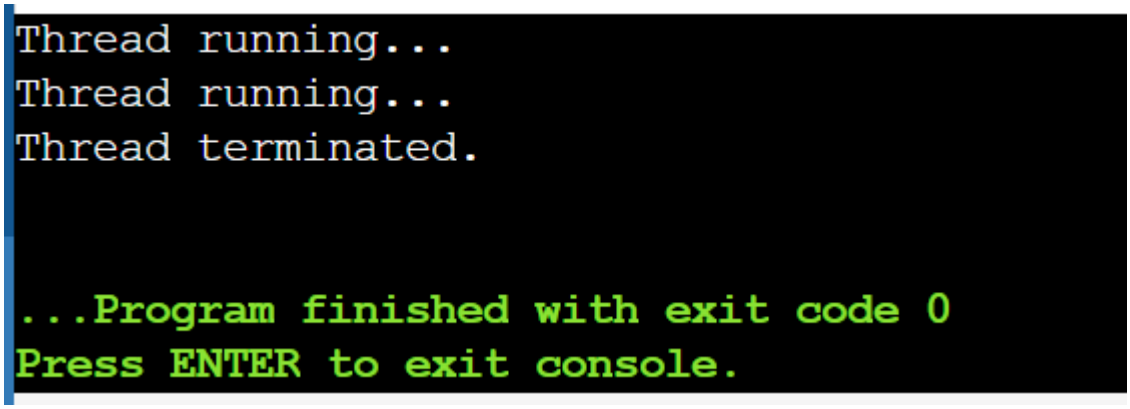


3)

```
#include <stdio.h>
#include <pthread.h>
#include <unistd.h>
void* run(void* arg) {
    while (1) {
        printf("Thread running...\n");
        sleep(1);
    }
    return NULL;
```

```
}
int main() {
   pthread_t thread;
   pthread_create(&thread, NULL, run, NULL);
   sleep(3);
   pthread_cancel(thread);
   pthread_join(thread, NULL);
   printf("Thread terminated.\n");
   return 0;
}
```

OUT PUT:

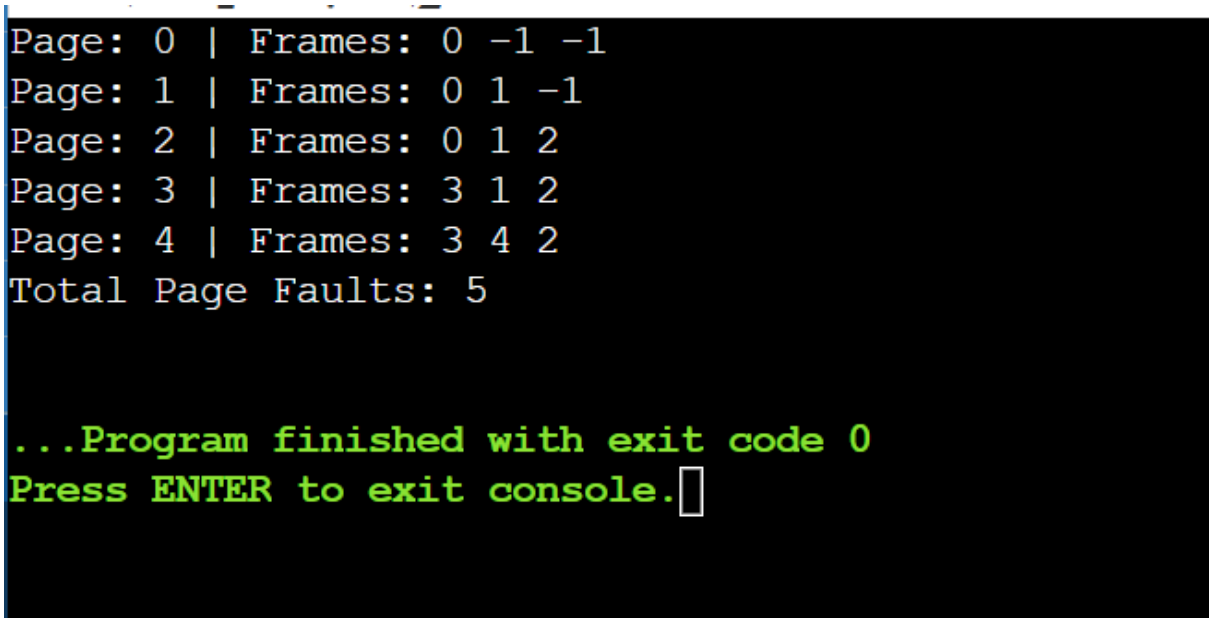


31)

```
#include <stdio.h>
#define FRAME_SIZE 3
#define PAGE_COUNT 5
int main() {
   int pages[PAGE_COUNT] = {0, 1, 2, 3, 4};
   int frames[FRAME_SIZE] = {-1, -1, -1};
   int pageFaults = 0, i, j, k;
   for (i = 0; i < PAGE_COUNT; i++) {
      int found = 0;
      for (j = 0; j < FRAME_SIZE; j++) {
         if (frames[j] == pages[i]) {
```

```
            found = 1; break;
        }
    }
    if (!found) {
        frames[pageFaults % FRAME_SIZE] = pages[i];
        pageFaults++;
    }
    printf("Page: %d | Frames: ", pages[i]);
    for (k = 0; k < FRAME_SIZE; k++) printf("%d ", frames[k]);
    printf("\n");
  }
  printf("Total Page Faults: %d\n", pageFaults);
  return 0;
}
```

OUT PUT:

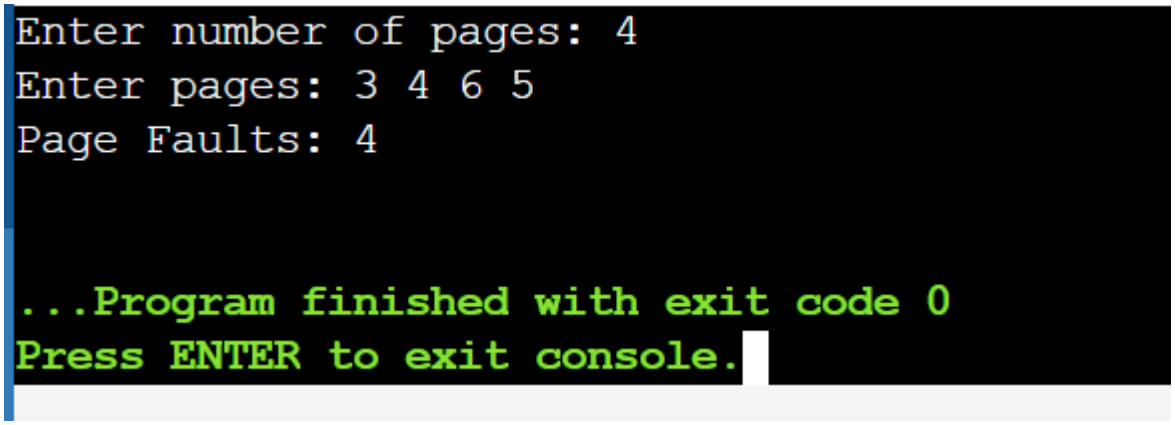


32)

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

```
int main() {
   int pages[10], frame[3], n, m, i, j, k, pos, flag, pageFaults = 0;
   printf("Enter number of pages: ");
   scanf("%d", &n);
   printf("Enter pages: ");
   for (i = 0; i < n; i++) scanf("%d", &pages[i]);

   for (i = 0; i < 3; i++) frame[i] = -1;

   for (i = 0; i < n; i++) {
      flag = 0;
      for (j = 0; j < 3; j++) if (frame[j] == pages[i]) flag = 1;
      if (!flag) {
         pageFaults++;
         pos = -1;
         for (j = 0; j < 3; j++) {
            if (frame[j] == -1) { pos = j; break; }
            for (k = i - 1; k >= 0; k--) if (frame[j] == pages[k]) { pos = j; break; }
         }
         if (pos == -1) pos = 0;
         frame[pos] = pages[i];
      }
   }
   printf("Page Faults: %d\n", pageFaults);
   return 0;
}
```

OUT PUT:

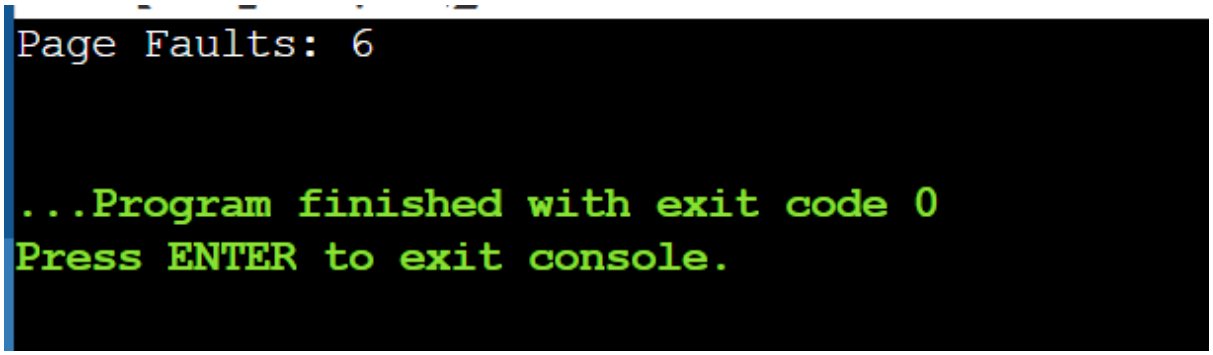


33)

```
#include <stdio.h>

int main() {
   int pages[] = {0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2};
   int frames[3] = {-1, -1, -1}, pageFaults = 0, n = 12, f = 3;

   for (int i = 0; i < n; i++) {
      int j, found = 0;
      for (j = 0; j < f; j++) if (frames[j] == pages[i]) found = 1;
      if (!found) {
         int replace = -1, farthest = -1;
         for (j = 0; j < f; j++) {
            int k;
            for (k = i + 1; k < n; k++) {
               if (frames[j] == pages[k]) break;
            }
            if (k > farthest) { farthest = k; replace = j; }
         }
         frames[replace] = pages[i];
         pageFaults++;
      }
   }
```

```
    printf("Page Faults: %d\n", pageFaults);
    return 0;
}
```

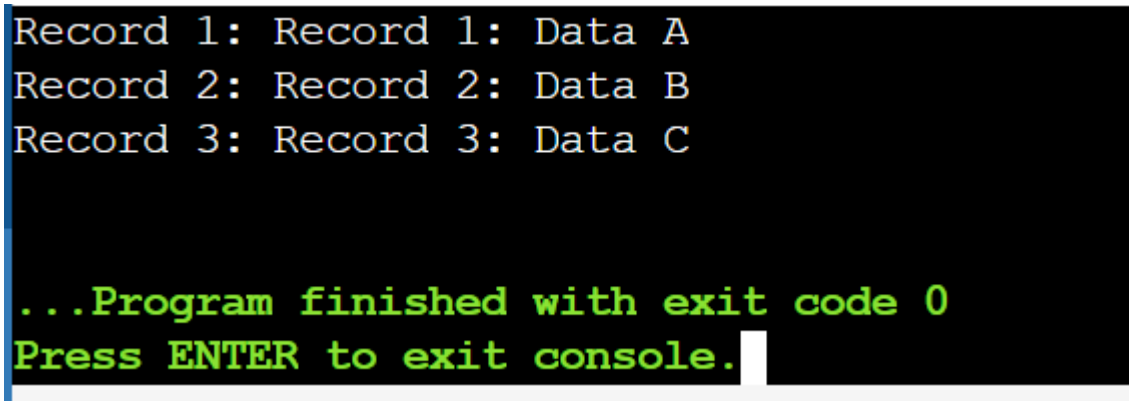
OUT PUT:



34)

```
#include <stdio.h>
#define MAX_RECORDS 100
void readRecords(char records[MAX_RECORDS][50], int count) {
    for (int i = 0; i < count; i++) {
        printf("Record %d: %s\n", i + 1, records[i]);
    }
}
int main() {
    char records[MAX_RECORDS][50] = {
        "Record 1: Data A",
        "Record 2: Data B",
        "Record 3: Data C"
    };
    int count = 3;
    readRecords(records, count);
    return 0;
}
```

OUT PUT:


Record 1: Record 1: Data A
Record 2: Record 2: Data B
Record 3: Record 3: Data C
...Program finished with exit code 0
Press ENTER to exit console.