

```
#include <stdlib.h>
#include <stdio.h>
#include <pthread.h>
#include <string.h>
#include <fcntl.h>
#include <signal.h>
#include <stdlib.h>
#include <time.h>
#include <sys/types.h>
#include <sys/stat.h>
#include <sys/mman.h>
#include <sys/syscall.h>
#include <stdbool.h>

#define ROCK 1
#define PAPER 2
#define SCISSORS 3

#define SIGREQ 98
#define SIGREADY 99

void throw_one();
void throw_two();
void determine_round_winner();
void determine_winner();

//pointer to player one shared memory object
int* p_one_ptr;
//pointer to player two shared memory object
int* p_two_ptr;
//strings that represent rock, paper, scissors in array
const char *rps[3];
//scores for the game
int player_one_score;
int player_two_score;
//thread identifier for each thread created
pthread_t tid[2];
//array that stores rolls from threads
int choice[2];
//array that stores each thread state
int command[2];
//array for each threads mutex
pthread_mutex_t lock[2];
//array for each threads signal/wait
pthread_cond_t cond[2];
int num_rounds;
int player_one_thread_id;
int player_two_thread_id;

int main(int argc, char** argv) {
    num_rounds = atoi(argv[1]);

    int parent_id = getpid();

    pthread_mutex_init(&lock[0], NULL);
    pthread_mutex_init(&lock[1], NULL);

    rps[0] = "Rock";
    rps[1] = "Paper";
    rps[2] = "Scissors";

    player_one_score = 0;
```

```

player_two_score = 0;

pthread_create(&tid[0], NULL, throw_one, NULL);
pthread_create(&tid[1], NULL, throw_two, NULL);

if(getpid() == parent_id) {
    printf("Child 1 tid: %d\n", player_one_thread_id);
    printf("Child 2 tid: %d\n", player_two_thread_id);
    printf("Beginning %d Rounds...\n", num_rounds);
    printf("Fight\n");
    printf("-----\n");

    for(int i=0; i<num_rounds; i++) {
        printf("Round %d:\n", i+1);
        pthread_mutex_lock(&lock[0]);
        pthread_mutex_lock(&lock[1]);
        command[0] = SIGREQ;
        command[1] = SIGREQ;
        pthread_cond_signal(&cond[0]);
        pthread_cond_signal(&cond[1]);
        while(command[0] == SIGREQ || command[1] == SIGREQ){
        }
        pthread_mutex_unlock(&lock[0]);
        pthread_mutex_unlock(&lock[1]);
        determine_round_winner();
        printf("-----\n");
    }
    pthread_join(tid[0], NULL);
    pthread_join(tid[1], NULL);
    determine_winner();
}
return 0;
}

void throw_one(int signum) {
    player_one_thread_id = syscall(SYS_gettid);
    for(int i=0; i<num_rounds; i++) {
        while(command[0] != SIGREQ) {
        }
        srand(time(NULL) * syscall(SYS_gettid) * (i + 100));
        choice[0] = rand() % 3 + 1;
        command[0] = SIGREADY;
    }
}

void throw_two(int signum) {
    player_two_thread_id = syscall(SYS_gettid);
    for(int i=0; i<num_rounds; i++) {
        while(command[1] != SIGREQ) {
        }
        srand(time(NULL) * syscall(SYS_gettid) * (i + 100));
        choice[1] = rand() % 3 + 1;
        command[1] = SIGREADY;
    }
}

void determine_round_winner() {
    int player_one_choice = choice[0];
    int player_two_choice = choice[1];
    bool player_one_win = false;
    bool player_two_win = false;
}

```

```
if(player_one_choice != player_two_choice) {
    if(player_one_choice == ROCK && player_two_choice == PAPER) {
        player_two_win = true;
    } else if(player_one_choice == ROCK && player_two_choice == SCISSORS) {
        player_one_win = true;
    } else if(player_one_choice == PAPER && player_two_choice == ROCK) {
        player_one_win = true;
    } else if(player_one_choice == PAPER && player_two_choice == SCISSORS) {
        player_two_win = true;
    } else if(player_one_choice == SCISSORS && player_two_choice == ROCK) {
        player_two_win = true;
    } else {
        player_one_win = true;
    }
}

printf("Child 1 throws %s!\n", rps[player_one_choice - 1]);
printf("Child 2 throws %s!\n", rps[player_two_choice - 1]);
if(player_one_win) {
    printf("Child 1 Wins!\n");
    player_one_score++;
} else if(player_two_win) {
    printf("Child 2 Wins!\n");
    player_two_score++;
} else {
    printf("Draw!\n");
}
}

void determine_winner() {
    printf("-----\n");
    printf("Results:\n");
    printf("Child 1: %d\n", player_one_score);
    printf("Child 2: %d\n", player_two_score);

    if(player_one_score > player_two_score) {
        printf("Child 1 Wins!\n");
    } else if(player_two_score > player_one_score) {
        printf("Child 2 Wins!\n");
    } else {
        printf("Draw!\n");
    }
}
```