

Problem 8 of 8

Threads

This problem tests your understanding of threads and data sharing across threads.

- Assume that the given program compiles correctly without any errors or warnings.
- Assume all syscalls succeed.

Consider the following code snippet:

```
long int globals[10] = {10, 9, 8, 7, 6, 5, 4, 3, 2, 1};

void *runner(void *arg)
{
    long int index = (long int)arg;
    if(index > 0 && index < 10)
        globals[index]--;

    return NULL;
}

int main()
{
    int i;
    pthread_t tid[10];

    for(i = 0; i < 10; i++)
    {
        pthread_create(&tid[i], NULL, runner, (void *)globals[i]);
    }

    for(i = 0; i < 10; i++)
    {
        pthread_join(tid[i], NULL);
    }

    for(i = 0; i < 10; i++)
        printf("%ld\t", globals[i]);

    printf("\n");
    fflush(stdout);

    return 0;
}
```

1) Which of the following are shared by threads belonging to the same process? Check all that apply.

- ☐ Local variables
- ☐ Global variables
- ☐ Text segment (as defined in ELF binary)
- ☐ None of the above

2) How many possible outputs are there?

- ☐ 1
- ☐ More than 1 and less than or equal to 10
- ☐ More than 10 but less than 21
- ☐ More than or equal to 21

3) What could be a possible output from this program's execution? Check all that apply.

- ☐ 10 8 7 6 6 4 3 2 1 0
- ☐ 9 8 7 6 6 4 3 2 1 -1
- ☐ 9 8 7 6 6 4 3 2 1 0
- ☐ 10 9 7 6 5 4 3 2 1 0
- ☐ 10 8 7 6 5 4 3 2 1 0