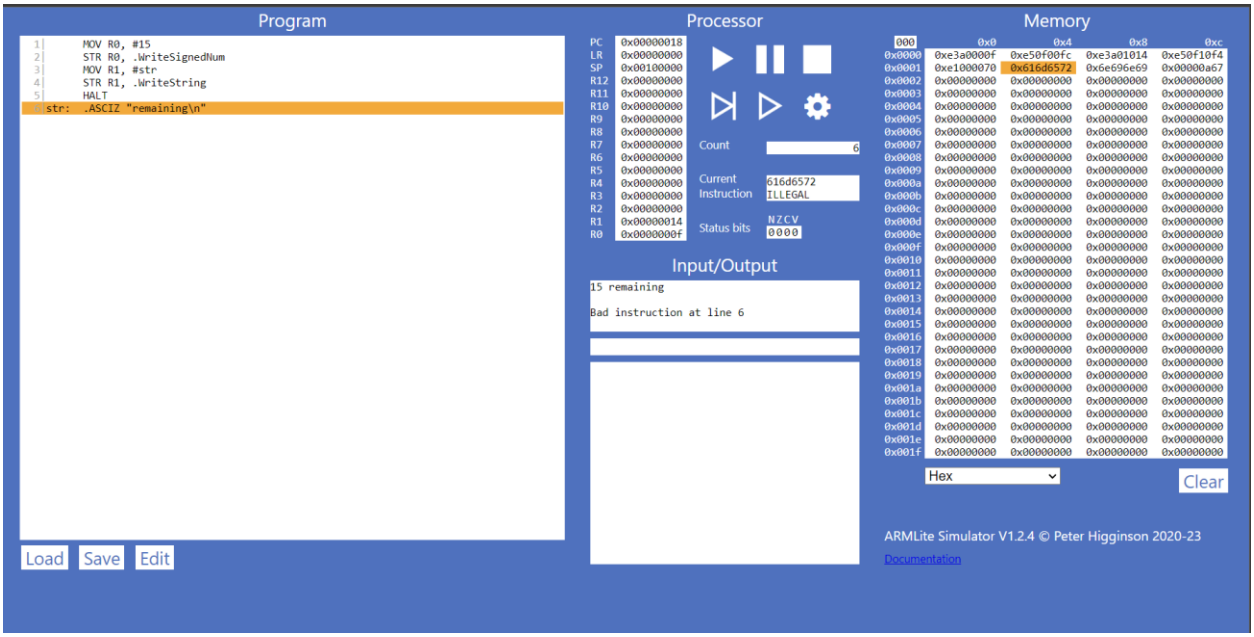
**Name**: Nguyen Quoc Thang

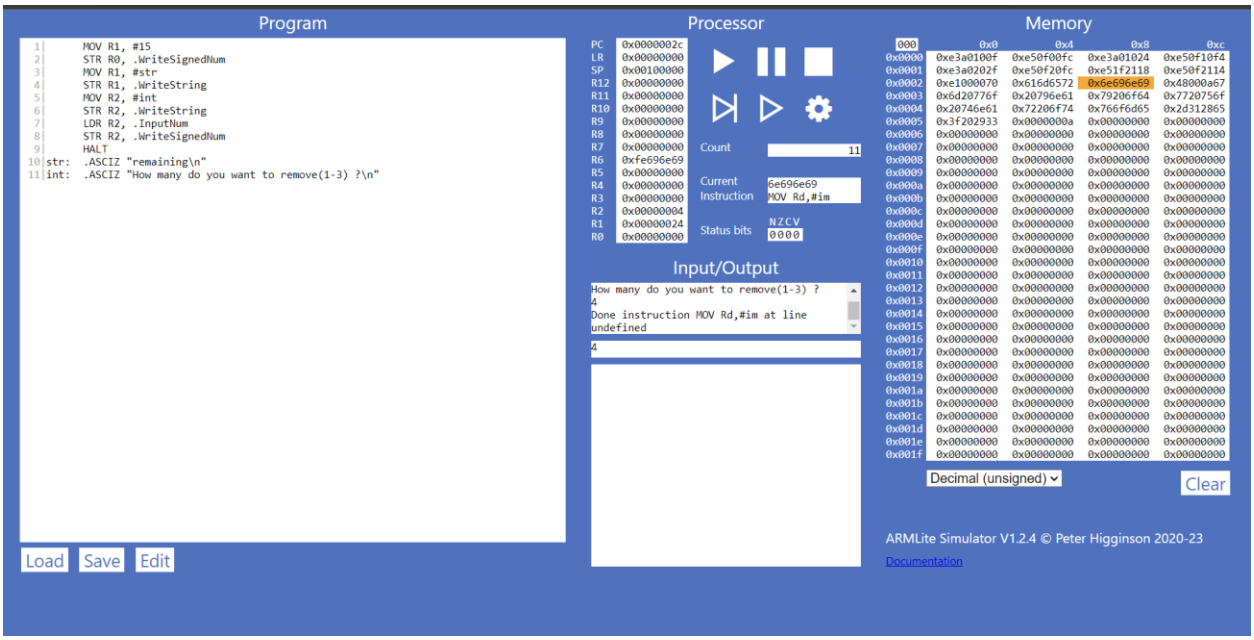
**ID** : 104193360

LAB 8 : SUBMISSION

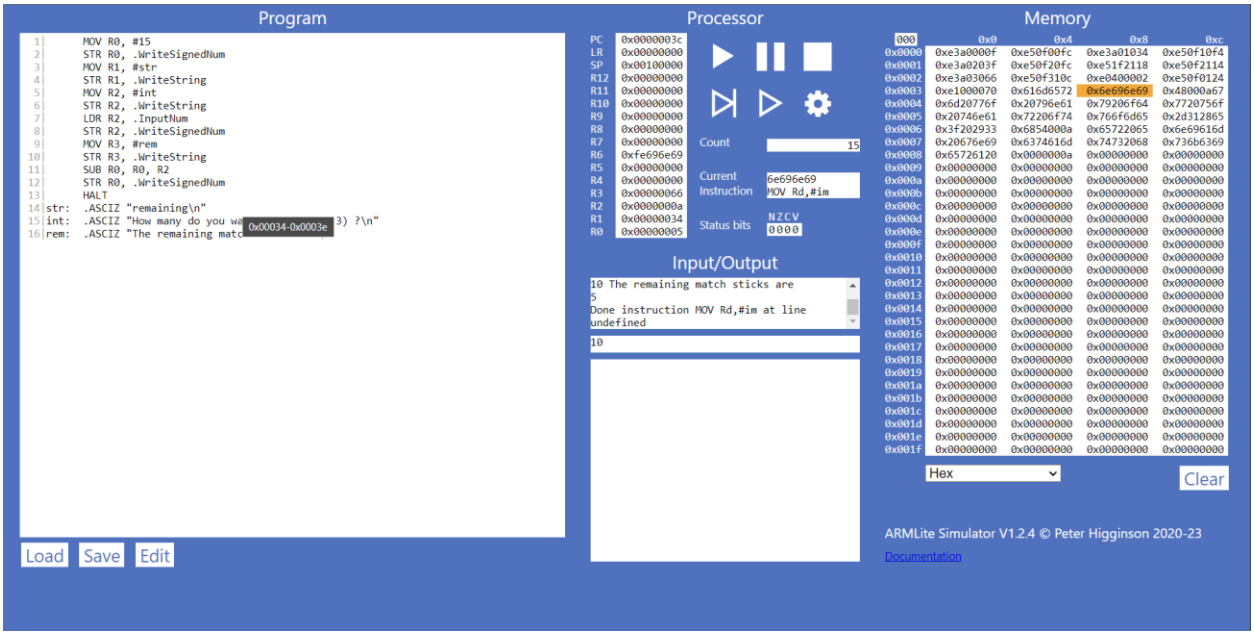
## Excercise 8.1.1



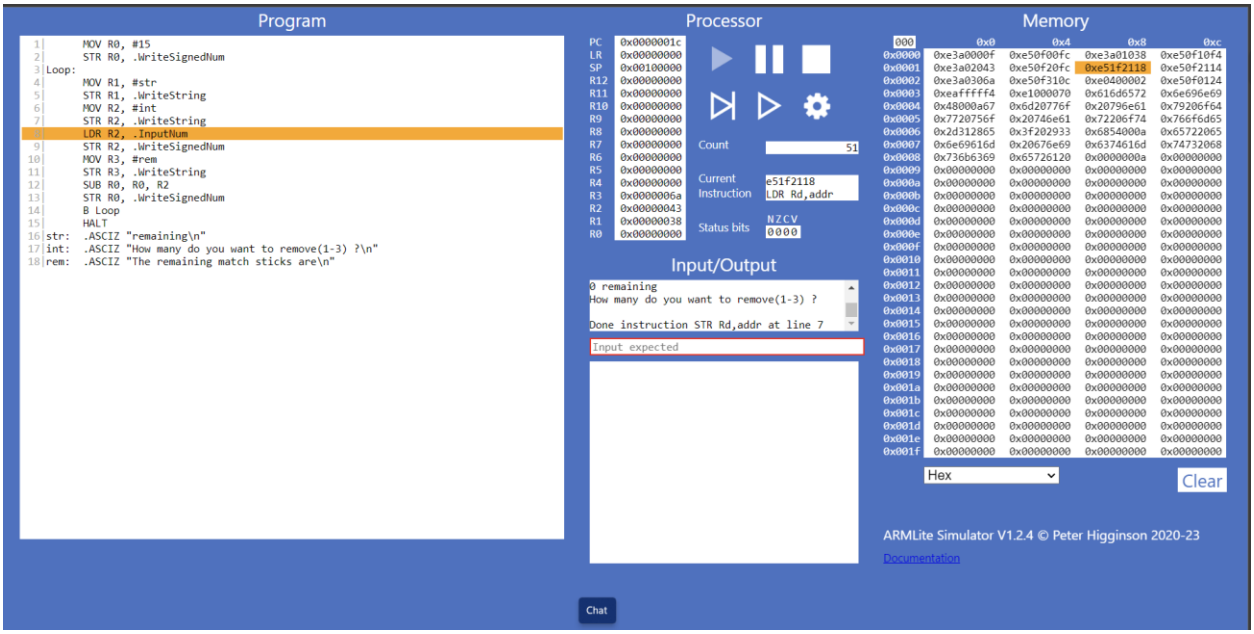

## Excercise 8.1.2



## Excercise 8.1.3




## Excercise 8.2.1




***What happens if you enter a number that takes the number of matchsticks remaining beyond 0 (i.e., into negative values) ? What do you think is going on here ? Hint - take a look at the value in the register!***

- The value of the R0 will be negative.

## Excercise 8.2.2

**Question 8.2.2(a) - What is the condition that needs to be satisifed in order for this loop to occur ? Write this as a comparison using an inequality (ie., less than, greater than, less than or equal, greater than or equal)**

- Satisfaction condition for the loop to occur is that the input value must not be between 1-3, it mean value entered must be < 1 and > 3

**Question 8.2.2(b) - What two ARM assembly instructions could be used to create a branch that only occurs under this condition ?**

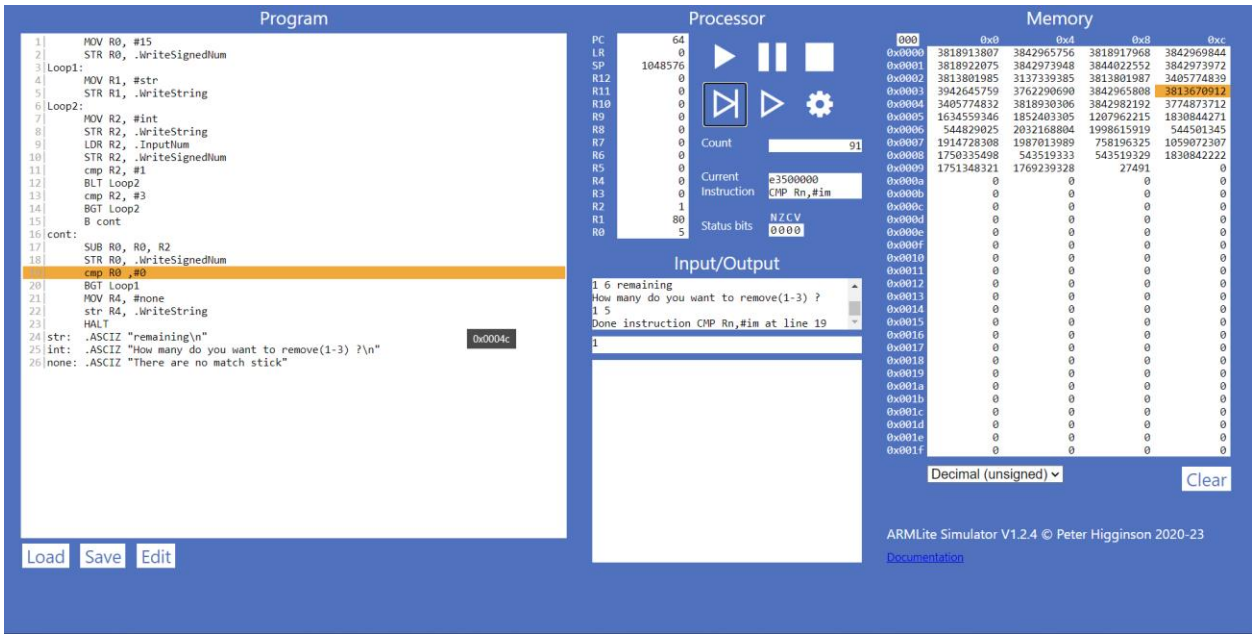
- BLT, BGT constructions could be used to create a branch that only occurs under this condition

**Question 8.2.2(c) - Based on the instructions you outlined in 8.2.2(b), what status bit would be set to 1 if the loop was to repeat ?**

- N , Z , C status bit would be set to 1 if the loop was to repeat. N set to 1 when input value is 1 or 2 means values less than 3. Z set to 1 when input value is 3 and C set to one when we compare register with value 1.

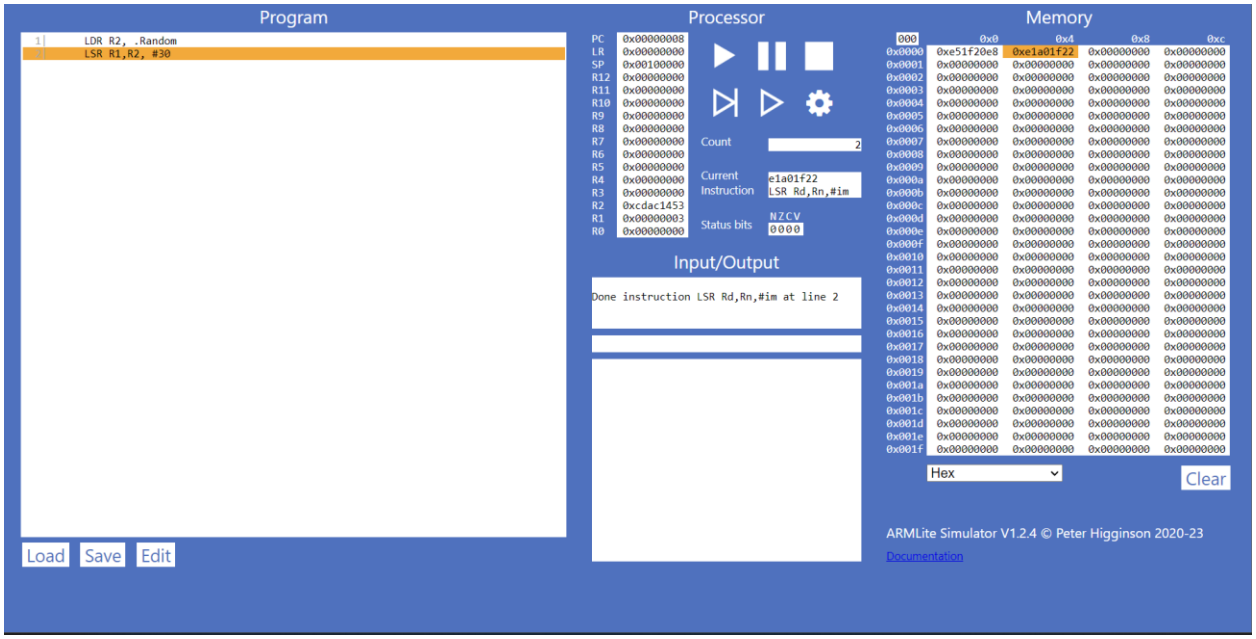
**Question 8.2.2(d) - What are all the modifications needed to the current program to implement this feature ? Make the required modifications to your program to perform the task.**

- I would add an iterator and use BLT to compare input value and value 1 and use BGT to compare input value and value 3 if the input value is less than 1 or greater than 3 then it will reverse the loop and fill in the value again from the beginning otherwise it will continue the program.

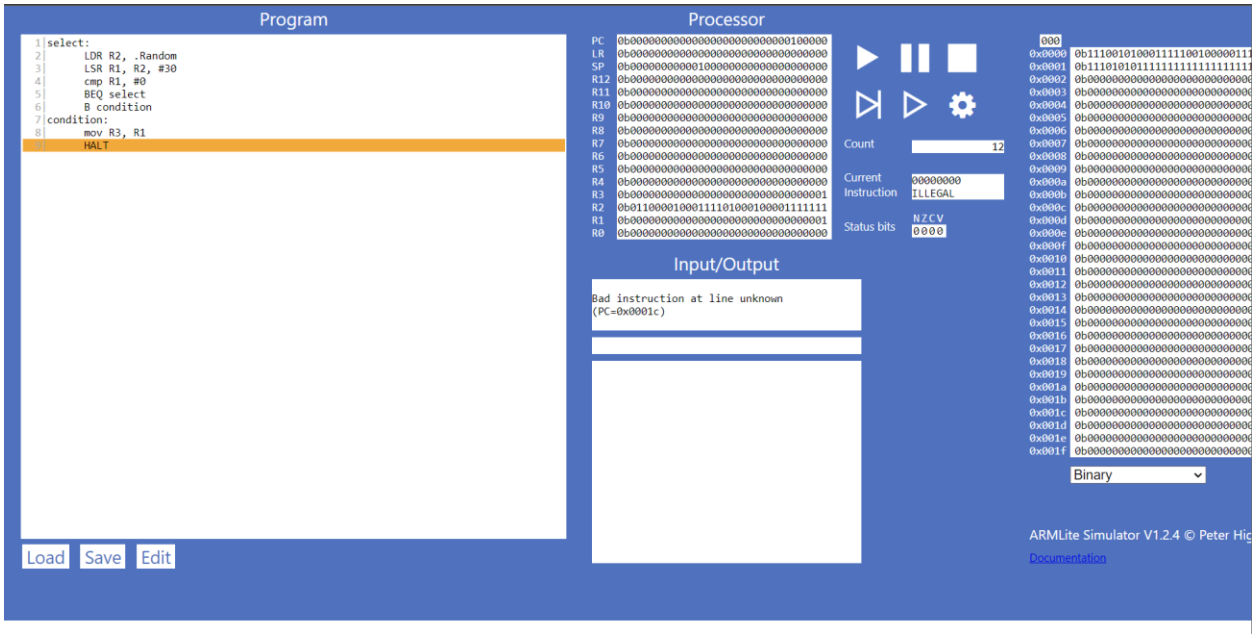


**Question 8.3.1(a) What bit-wise operation can we perform on the register holding the 32 bit pattern to set all bits in the register to zero except the least signficant 2 bits ? Write this as a single line of code.**

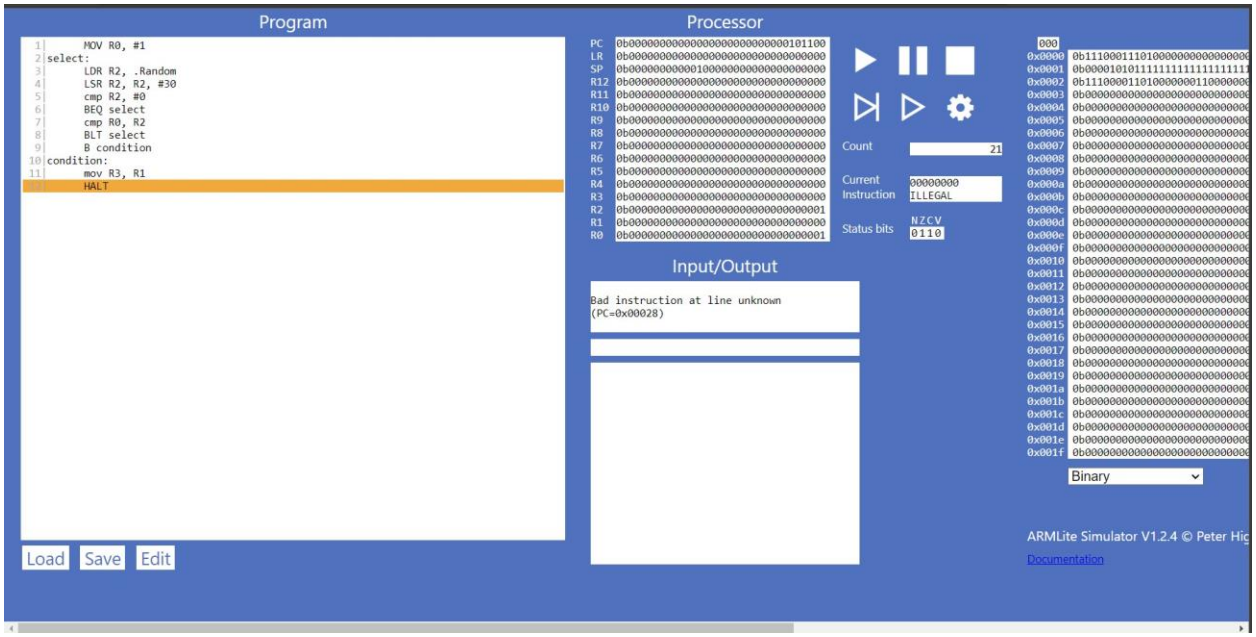
- LSR R0, #30 - *( It allows us to shift 30 bits of R0 to the right which means 30 bits of the value in R0 will become 0 only the last 2 bits will also be 2 bits random , it can be 0 or 1).*




**Question 8.3.1(b) Using a label named "`select:`" Write the code needed to repeatedly sample a random number (from .Random) until the value is in the range 1-3. For now, just write this as a seperate program and test it**



**Question 8.3.2(a) - Write the ARM assembly code that implements the algorithm expressed in the psuedo code above. Implement this as a seperate stand alone program and initialise R0 with a number at the start of your program to allow you to test the functionality. You wil want to test it using different values in R0.**




## Exercise 8.4

***My code:***

```
1|      MOV R0, #15
2|Loop1:
3|      STR R0, .WriteSignedNum
4|      MOV R1, #str
5|      STR R1, .WriteString
6|Loop2:
7|      MOV R2, #int
8|      STR R2, .WriteString
9|      LDR R2, .InputNum
10|     STR R2, .WriteSignedNum
11|     cmp R2, R0
```

```
12|     BGT Loop2
13|     cmp R2, #1
14|     BLT Loop2
15|     cmp R2, #3
16|     BGT Loop2
17|     B cont
18|cont:
19|     SUB R0, R0, R2
20|     STR R0, .WriteSignedNum
21|     cmp R0 ,#0
22|     BEQ result1
23|     BGT select
24|select:
25|     MOV R1, #str
26|     STR R1, .WriteString
27|     B comp
28|select2:
29|     LDR R6, .Random
30|     LSR R6, R6, #30
31|     cmp R6, #0
32|     BEQ select2
33|     cmp R0, R6
34|     BLT select2
35|     SUB R0, R0, R6
36|     cmp R0, #0
37|     BEQ result
```

```
38|     BGT Loop1
39|comp:
40|     MOV R5, #compt
41|     STR R5, .WriteString
42|     B select2
43|result1:
44|     MOV R4, #none
45|     str R4, .WriteString
46|     MOV R8, #rst
47|     STR R8, .WriteString
48|     B end
49|result:
50|     MOV R4, #none
51|     str R4, .WriteString
52|     MOV R9, #rst1
53|     STR R9, .WriteString
54|end:
55|     HALT
56|str:  .ASCIZ "remaining\n"
57|int:  .ASCIZ "How many do you want to remove(1-3) ?\n"
58|none: .ASCIZ "There are no match stick\n"
59|compt: .ASCIZ "-----Computer turn-----"
60|rst:  .ASCIZ "You lose\n"
61|rst1: .ASCIZ "You win\n"
```