Homework Assignment 4

(Due 2:10pm, Oct. 29, email to daehyun.kim@wsu.edu or submit a hardcopy)

You can use the following instructions only for this homework.

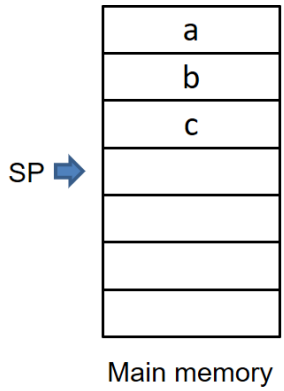
- Instructions
  - ADD, SUB
  - AND, ORR, EOR
  - CMP, BGE/BLT/BGT/BLE/BEQ/BNE
  - B, BL, BX
  - MOV
  - LDR, STR

1. (30 points) Make an assembly code for the following C code shown in (a).

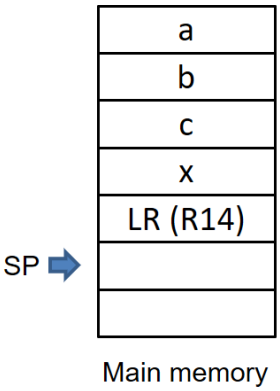
```
int main () {
  int a, b, c;
  a = 20;
  b = 30;
  c = comp (a+b);
...
}

int comp (int x) {
  if ( x > 0 )
    return 1;
  else
    return 0;
}
```

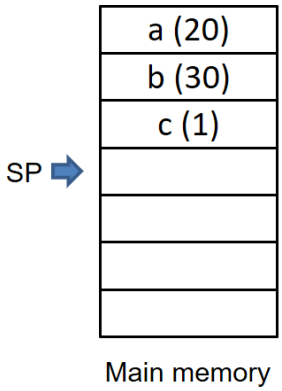
(a)



(b)



(c)



(d)

- Assume that (b) shows the memory map when the main function begins.
- (c) shows the memory map at the time the "comp" function begins (i.e., a+b is passed to x through the stack).
- (d) shows the memory map after the last line "c = comp (a+b);".
- Use R12 for the return value.
- Use R8-R11 for temporary registers in the comp function.

2. (70 points) Make an assembly code for the following C code.

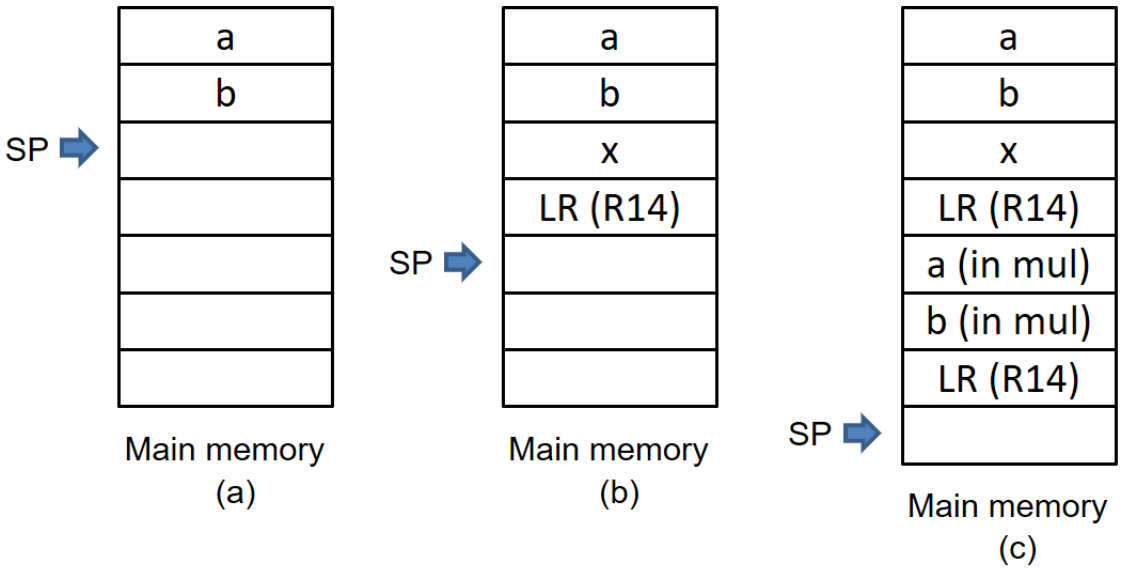
```
int main () {
  int a, b;
  a = 20;
  b = fact (a);
  ...
}
```

```
int fact (int x) {
  if ( x == 1 )
    return 1;
  else
    return mul(x, fact(x-1));
}
```

```
int mul (int a, int b) {
  int x = 0;

  for ( int i = 1 ; i <= b ; i++ )
    x = x + a;

  return x;
}
```



- Use R12 for the return values (in all the functions).
- Use (b) for the function call *fact()*.
- Use (c) for the function call *mul()*.
- Use R8-R11 for temporary registers in the functions.
- If you need more registers (R0 – R7), you should store them in the stack before you use them and then restore them later.