Homework 10

Abhi Agarwal

1 Simple Register Allocation

Question 1.1

We say that j is a local variable and that k,m,n,p are temporaries. Explain why.

j is the only variable that is used or appears throughout different blocks, and therefore needs to be saved so it can be accessed by different portions of the program. It's the only accessed variable that is shared across all blocks - whereas the others are only need within their own blocks.

Question 1.2

Generate code with good register allocation for the basic block from lines 2-8 in the example above, following the pattern of the Dragon Book 8.6 and Figure 8.16.

Code	R1	R2	R3	a	i	j	k	m	n	p
BLOCK:										
				a	i	j				
2: k = 10 * i										
LDR R1,[R11,&i]	i			a	i, R1	j				
MUL R2, R1, #10	i	k		a	i, R1	j	R2			
3: m = k + j										
LDR R1,[R11,&j]	j	k		a	i	j, R1	R2			
ADD R3, R2, R1	j	k	m	a	i	j, R1	R2	R3		
4: n = 8 * m										
MUL R3, #8, R3	j	k	n	a	i	j, R1	R2		R3	
5: p = n - 88										
SUB R3, R3, #88	j	k	p	a	i	j, R1	R2			R3
6: a = a + p										
LDR R1[R11,&a]	a	k	p	a, R1	i	j	R2			R3
ADD R1, R1, R3	a	k	p	a, R1	i	j	R2			R3
7: j = j + k										
LDR R1[R11,&j]	j	k	p	a	i	j, R1	R2			R3
ADD R1, R1, R2	j	k	p	a	i	j, R1	R2			R3
8: if j <= 100 goto 2										
CMPS R1, #100	j	k	p	a	i	j, R1	R2			R3
BLE BLOCK	j	k	p	a	i	j, R1	R2			R3