

Code:

add \$t3, \$t2, \$t1

nop

nop

or \$t5, \$t3, \$t4

nop

nop

add \$t7, \$t2, \$t1

b) We can solve by rearranging the instructions as there is no direct dependency between them.

Code:

add \$t3, \$t2, \$t1

andi \$t6, \$t7, \$t4

nop

or \$t5, \$t3, \$t4

nop

add \$t7, \$t2, \$t1

5a) The 5 stage pipeline execution cycle when forwarding and branch prediction are used:

Instructions	1	2	3	4	5	6	7
addi \$s0, \$zero, 3	F	D	X	M	W		
LOOP: Lw \$t0, 0(\$s1)		F	D	X	M	W	
add \$t1, \$t0, \$t2			F	D	X	M	W
add \$t3, \$t1, \$t4				F	D	X	M
addi \$s0, \$s0, -1					F	D	X
bne \$s0, \$zero, LOOP						F	D
addi \$s1, \$zero, \$zero							F