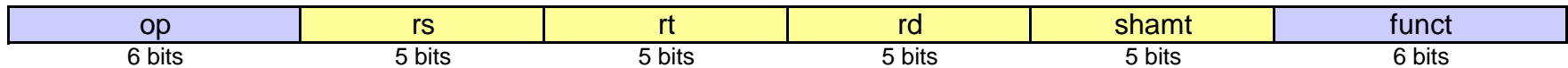


Three instruction formats: R, I, J

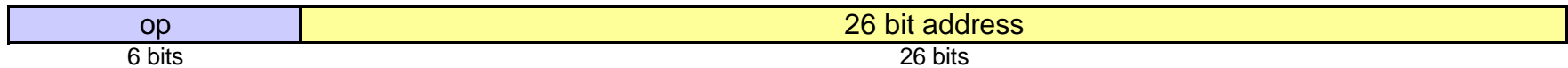
NOTES:



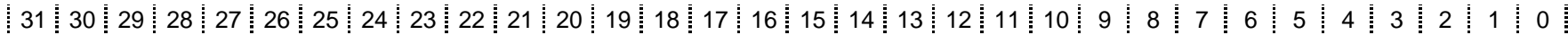
R See the lectures 2, 3 and the textbook Patterson and Hennessey "Computer Organization & Design" Ch3 (Ed2) or Ch2 (Ed3).



I



J



1 word -- 32 bits

Two examples of translating a machine instruction into a MIPS assembly instruction

0x 02324020 - what MIPS instruction is it?

0		2		3		2		4		0		2		0																		
0	0	0	0	0	0	1	0	0	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
op						rs						rt				rd				shamt				funct								
0 0 0 0 0 0						1 0 0 0 1						1 0 0 1 0				0 1 0 0 0				0 0 0 0 0				1 0 0 0 0 0								
						16						1				16				2				8				dec: 32 or hex: 20				
R-type instruction						R17=\$s1						R18=\$s2				R8=\$t0				not used by "add"				add								
						ANSWER: add \$8, \$17, \$18 ==> add \$t0, \$s1, \$s2														add rd, rs, rt												

op (operation) field tells us that this is R-type instruction (see the textbook from p.117, Fig. 3.18 or Fig. A.19). R-type instructions fields are allocated in groups: 6bits-5bits-5bits-5bits-5bits-6bits. Funct field tells us that the instruction is 'add', format: add rd, rs, rt (p. A-55).

0x 34020005 - what MIPS instruction is it?

3		4		0		2		0		0		0		5																	
0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
op						rs						rt				imm															
0 0 1 1 0 1						0 0 0 0 0						0 0 0 1 0				0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1															
dec: 13 or hex: 0d												2				4										1					
ori						R0=\$r0						R2=\$v0				5															
ori rt, rs, imm						ANSWER: ori rt, rs, imm ==> ori \$2, \$0, 5 ==> ori \$v0, \$0, 5																									

op field tells us that this instruction is 'ori' (see the textbook from p.117, Fig. 3.18 or Fig. A.19). ori is I-type instructions, so fields are allocated in groups: 6bits-5bits-5bits-16bits. The instruction format is: ori rt, rs, imm (p. A-57).