Q. 1.6

year	tech	clock speed	ipc/ core	cores	dram bandwidth	sp floating	cahe
2010	32	3.33	4	2	17.1	107	4
2013	22	3.9	6	4	25.6	250	8
2015	14	4.2	8	4	34.1	269	8
2017	14	4.5	8	4	38.4	288	8
2019	14	4.9	8	8	42.7	627	12

10-13	-31%	17%	50%	100%	50%	134%	100%
13-15	-36%	8%	33%	0%	33%	8%	0%
15-17	0%	7%	0%	0%	13%	7%	0%
17-19	0%	9%	0%	100%	11%	118%	50%
Imp/year	**-7%**	**4%**	**8%**	**20%**	**11%**	**27%**	**15%**
double every	10.65	17.63	8.64	3.60	6.75	2.71	4.80

Q. 1.6

proccessor	clock rate	CPI
p1	3.00E+09	1.5
p2	2.50E+09	1
p3	4.00E+09	2.2

Performance = Clock Rate / CPI		
Number of Cycles = Clock Rate × Time (in seconds)		
Number of Instructions = Number of Cycles × CPI		
Time in sec	10	

	Performance		**number of cycles**	number of instu.
p1 performance	2.00E+09	instruction/second	3.00E+10 cycles	4.50E+10 instructions
p2 performance	2.50E+09	instruction/second	2.50E+10 cycles	2.50E+10 instructions
p3 performance	1.82E+09	instruction/second	4.00E+10 cycles	8.80E+10 instructions

a. p2 has the highest performance

Q 1.7

Column1	CPI A	CPI B	CPI C	CPI D	Clock Rate

Instruction count = 1.00E+06

P1	1	2	3	3	2.50E+09
P2	2	2	2	2	3.00E+09
	10%	20%	50%	20%	

which is faster?

a. what is the global CPI for

global cpi p1 =	2.6
global cpi p2 =	2

b.Find the clock cylcles for **cpu clock cylcle = Instructions X average clock cycles per instruction(cpi)**

clock cyles p1	2.60E+06
clock cyles p2	2.00E+06

CPU execution time = clock cycles / Clock Rate

Execution time P1	1.04E-03 seconds
Execution time P2	6.67E-04 seconds

since P2 has a faster clockrate as well as a lower global

Q. 1.10.1

Column1	CPI	clock rate	# of instruction	1. clock cycles	2 ins. Time	4. instr. Time	8. inst time
arithmitic	1	2.00E+09	2.56E+09	2.56E+09	1.83E+09	9.14E+08	4.57E+08
Load/Store	12	2.00E+09	1.28E+09	1.54E+10	1.10E+10	5.49E+09	2.74E+09
branch	5	2.00E+09	2.56E+08	1.28E+09	1.28E+09	1.28E+09	1.28E+09
				1.92E+10	**1.41E+10**	**7.68E+09**	**4.48E+09**

0.7 X # of processor 1.10.1 1.10.2

program is parallel

# of processor	# of instructions can handle	Total execution time for all 3	doubled execution time
1	0.7	9.60	10.88
2	1.4	7.04	7.95
4	2.8	3.84	4.30
8	5.6	2.24	2.47

by changing the value of b49 the cpi we can see the effect of the

Q. 1.14

computer	execution time	fp execution time	l/s execution time	branch time	INT	
original	250	70	85	40	55	
20% better fp	236	56	85	40	55	the total time is reduce to 236 seconds
total reduced 20%	200	70	85	40	5	the int is reduce to 5 second
get to 20% better by reduce branch	200	70	85	-10	55	because we get a negative number it is not possible.

Q 1.15 Clock rate 2.0E+09

Program a	Fp execution	INT	L/S	Branch	total time		
# of Instructions	5.0E+07	1.1E+08	8.0E+07	1.6E+07			
cpi	1	1	4	2			
execution time	0.03	0.06	0.16	0.02	**0.26**		
2x faster fp inprovement	-0.10	0.06	0.16	0.02	0.13	-4.12	cpi, but this is not possible.
2x faster l/s improvement	0.025	0.055	0.03	0.016	0.13	0.80	cpi. The cpi of the ls would need to be .8

	0.015	0.033	0.112	0.0112	0.1712	1.495327103	The new time is about

2.2