Final Review for Chapters 1 and 2

These images should help in analyzing the problems.
Use upper case when typing an instruction or a HEX value.
Put ONE space between operands in the instructions

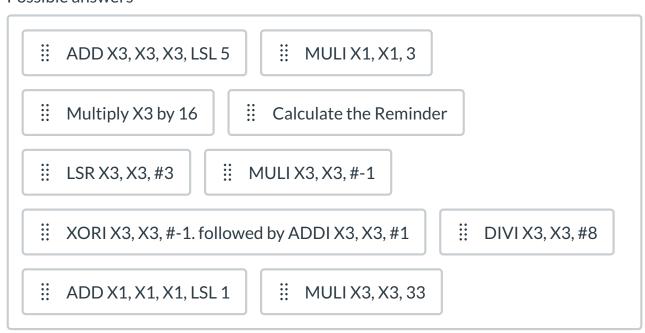
Pul Oi	VE S	bace be	rwee	snobe	:I di	ius ii	I LII	ems	uctio	0115
Name	Form	at				Ex	amp	le		
ADD	R	111	L2	3			0		2	1
SUB	R	162	24	3			0		2	1
ADDI	1	58	0			100			2	1
SUBI	1	83	6			100			2	1
LDUR	D	198	36		10	0		0	2	1
STUR	D	198	34		10	0		0	2	1
Field size		11 or 1	0 bits	5 bits	6	5 or 4	bits	2 bits	5 bits	5 bits
R-format	R	opco	de	Rm		sha	amt		Rn	Rd
I-format	I	opco	de		ir	nmediat	е		Rn	Rd
D-format	D	opco	de		addr	ess		_op2	Rn	Rt
Name						Fields				
Field size		6 to 11 bits	5 to	10 bits	50	r 4 bits	2 bit	s 5	bits	5 bits
R-format	R	opcode		Rm		sham	t		Rn	Rd
I-format	1	opcode		im	medi	ate			Rn	Rd
D-format	D	opcode		addre	SS		op2	2	Rn	Rt
B-format	В	opcode					addre	ss		
CB-format	СВ	opcode				addres	s			Rt
IW-format	IW	opcode				immedia	ate			Rd

Mnemonic 🗖	Format 🗖	Width	Binary
LDUR	D	11	11111000010
STUR	D	11	11111000000
MOVK	IM	9	111100101
BR	R	11	11010110000
LSL	R	11	11010011011
LSR	R	11	11010011010
MOVE	IM	9	110100101
SUBI	I	10	1101000100
SUB	R	11	11001011000
CBNZ	СВ	8	10110101
CBZ	СВ	8	10110100
BL	В	6	100101
ANDI	I	10	1001001000
ADDI	I	10	1001000100
ADD	R	11	10001011000
AND	R	11	10001010000
B.Cond	СВ	8	01010100
В	В	6	000101

Associate the line of code with the category

Triple the value of X1	Multiply by 33
/·	, ,
To the state of th	_ I
T I	_ I
<u> </u>	
,	'
Create the 2s complement of register	Integer divide by 8
Create the 2s complement of register X3	Integer divide by 8
	Integer divide by 8

Possible answers



We need to call procedure calculateBonus A - What line of code will call our procedure	
You have a procedure that needs to save 3 registers X2, X3, are 64 bit registers.	
When you enter the procedure you need to modify the stack save these registers. put registers in order from lowest to hard B - What lines of code would be used to create the space or	ighest
// need space for 3 64 bit	t registers
// save register X2	
// save register X3	
// save register X6	
C - at the end of the procedure the registers and the stack r are those lines of code?	need to be restored. What
D - What is the line of code to return from a procedure	
// return from procedure	

8 points 3

List 4 different kinds of **R** - Type instructions.

Include any registers, addresses or immediate values needed. Make it look like a real line of code.

Edit View Insert Format Tools Table I_{\triangleright} \blacksquare \vee \sqrt{x} \longleftrightarrow

p









14 points

This table lists either the Op Code or the Operation to be executed. Either Determine the Hex value for the instruction or figure out what Operation is to be performed. Use ALL CAPS for the HEX or the OPERATOR and the REGISTER

Op Code	Operator				
D37DF02A	,				
	ignore shamt				
8B0A000A	ADD x10, x0, x10	ADD x10, x0, x10			
F8400149					
	LDUR x11, [x10, #8]				
	STUR x11, [x10, #0]				
F8008149					
	BR x30				

Write the code to support a WHILE loop. Register X4 must be initialized to 0 by you, Register X5 will be the loop index and you must initialize it to 19

```
let max = 19;
let index = 0;
while (index < max) {</pre>
    // whatever
    index++;
}
```

Edit View Insert Format Tools Table

$$\underline{T}_{\emptyset}$$
 \blacksquare
 \sqrt{x}

р











6

10 points

Given this line of Code (which is an R Format) what are the values for the respective fields

		opcode	immediate	Rn	Rd	Hex Value
SUBI SF #0x30	P, SP,					

7	12	point

For the following convert HEX to unsigned Decimal and Decimal to HEX. Use capital letters for A-F and no commas for the decimal numbers

1.	Convert 0x1234 to decimal
2.	Covert 1234 to Hex
3.	Convert -555 to 16-bit Binary. (answer will contain 16 bits)
4.	Convert 0000 1110 0011 0011 to Decimal.
5.	Convert (assume we have an 8-bit integer) 1110 0111 from SIGNED Binary and to UNSIGNED

8 5 points

What are the classic components of a computer

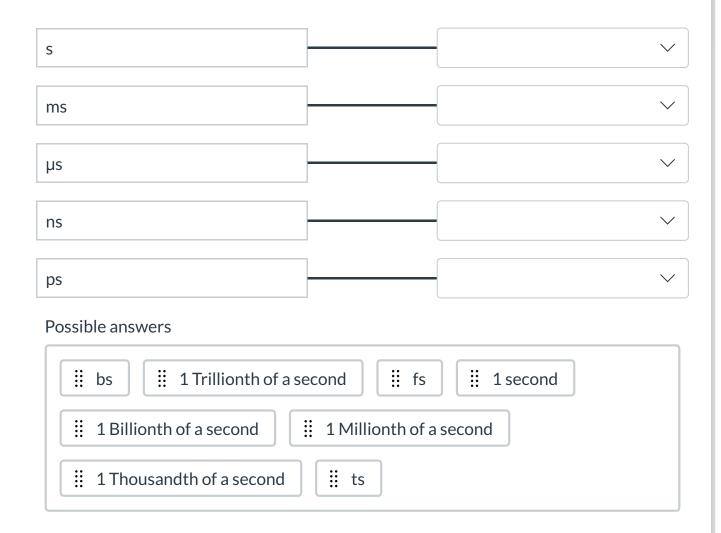
Memory	У
--------	---

vacuum	tubes
	vacuum

electricity

Control

Match the abbreviation with the measurement



10 10 points



The cells in Yellow are steps along the way which you will need to solve for the Green cells.

Do NOT include commas or spaces, If the answer does not have a decimal portion do not include it. DO include the leading zero is answer is less than 1

BAD BAD BAD

12,000,000 12.0 12.10 12 000 000 .4 0.40

GOOD

12000000 12 12.1 12000000 0.4 0.4



		Run Time	0.0002 secs		
# of Cycles	# of Instructions	Instr Type	Cycles per Instructions	% of Instructions	CPI for Instruction Type
	500,000	Add/Mov Instr	1		
	250,000	Branch	2		
	500,000	Multiply	3	0.4	1.2
Total Cycles	Total # of Instructions				Average CPI
	Clock Rate GHz	Clock Rate (cycles / sec)			
	Cycle Time (Sec/Cyc) x 10 ^-12	Clock Cycle Time (sec / cycle)			

Given three pieces of information about the application parameters calculate the missing piece. If number is less then 1 include the leading 0. Only include the significant fractional portion, no trailing zeros. Do not include commas or spaces. 0.5, 1.55, 2, 1.7

0.5, 1.55, 2,	1.7		
СРІ	# of Instructions	Clock Rate Cycles/Sec	CPU Time
2.25	200000000	90000000	0.5
3	100000000	100000000	
1.5	100000000		0.3
1.5	125000000		0.75
3.5		350 000 000	1.25
4		5 000 000	120
	150 000 000	5 000 000	66
	12 000	240 000	0.3



Order chips from slowest to fastest

Slowest

- 5 ns seconds per cycle
- iii 5 x 10⁻¹⁵ seconds per cycle
- 200 ns seconds per cycle
- 50.0 Ghz cycles per second
- 1.8 GHz cycles per second

fastest

13 _{12 points}



The cells in Yellow are steps along the way which you will need to solve for the Green cells.

Processor B runs App X

		Run Time	0.0002 secs		
# of Cycles	# of Instructions	s Instr Type	Cycles per Instructions	Pct of Instr Type	(you will need to know % of Instr Type)
	500,000	Add/Move	1	%	
	150,000	Branch	2	%	.30
	200,000	Multiply	3	%	
	150,000	Floating Point	4	%	
Total Cycles	Total # of Instructions				Averag e CPI
	Clock Rate (GHz)	Clock Rate (cycles / sec)			
	Cycle Time (Sec/Cyc)	Cycle Time (sec / cycle)			

Application A on Computer A				
CPU Time (secs) 20.00				
Cycles	70.00E+9			
Cycle Rate (cycles / sec)	3.50E+9			
We have created a new chip and have tested Application A. It runs in 12 secs and requires an additional 20% in instruction cycles				
Application A on Computer B				
CPU Time (secs)	12.00			
Cycles (enter whole number no decimals)	10 ⁹			
Cycle Rate (enter whole number no decimals)	x10 ⁹			

Compare Performance of Chip X to Chip Z

Tice of Chip A to Chip Z	1				
Chip X	Chip Z				
27 000 000 000					
4.2 GHz	3.5 GHz				
If the new chip design for Computer Z decreases instruction cycles by 20% and has a cycle time of 3.5 GHz,					
•	Sec				
•					
·	Secs				
application faster? (X or					
	Chip X 27 000 000 000 4.2 GHz gn for Computer Z decrea				

Application A on (Computer A		
CPU Time (secs)	12.00		
Cycles	30.00E+9		
Cycle Rate (cycles / sec)	GHz		
We have created a new chip and have tested Application A. It runs in 8 secs and requires an additional 1/3 in instruction cycles			
Application A on Computer B			
CPU Time (secs)	8.00		
Cycles	Giga Cycles		
Cycle Time	GHz		

Convert Clock Rate to Clock Cycle or Clock Cycles to Clock Rate If you are given the Clock Rate: cycles / sec (2MHz, 4,000,000, 5×10^6) determine the Clock Cycle Time: sec / cycle (500×10^{-9} , 250×10^{-9} , 200×10^{-9}) respectively.

i.e. if answer is 800×10^{-9} your response will just be 800.00

Clock Rate	Clock Cycles	Exponen t	
12.00 x 10 ⁶			
166.66 x 10 ⁶		-9	
MHz	200.00	-9	
2,000,000.00		-9	
1 MHz			
MHz	100.00	-9	

Given the Cycles per Instruction Type. Determine The CPI per Instruction Type and the Average CPI. All answers should have TWO decimal places. Even if the second decimal is 0.

Examples 2.00, 1.50, 1.66, 0.10, 0.25

Instruction Type	Add	Store	Branc h	FP	
Cyles per Instruction Type	1	2	4	4	
Instruction Type Mix	50%	20%	20%	10%	
CPI per Instruction Type					Averag e CPI