

CS1231S Assignment #1

AY2024/25 Semester 1

Deadline: Monday, 16 September 2024, 1:00pm

TEMPLATE FOR SUBMISSION

Q0. Full name:

Tutorial grp: T

Write your full name and tutorial group number above.

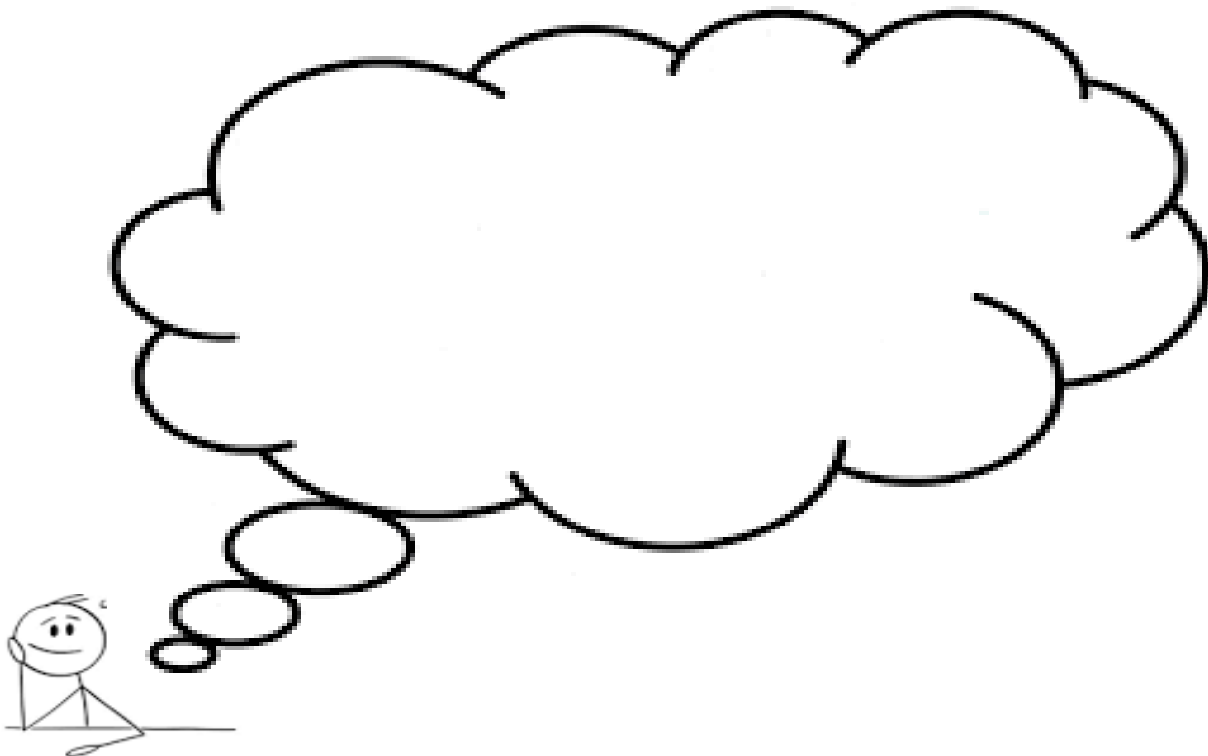
Enter your **Student Number** into the box on the right, by filling in your student number at the top row, and shading the digits and check letter.

We are going to use a software to identify your shaded Student Number, so it is very important that you **shade your Student Number correctly**, otherwise you will score zero mark for the assignment! The Student Number you write at the top is for us to identify you in case you have shaded your number wrongly.

(We are going to do the same thing for your midterm test and final exam, so take this as a practice. In your midterm test and final exam, you are not allowed to write your name – this is the university rule.)

STUDENT NUMBER										
A										
U	<input type="radio"/>	0	0	0	0	0	0	0	A	N
A	<input checked="" type="radio"/>	1	1	1	1	1	1	1	B	R
HT	<input type="radio"/>	2	2	2	2	2	2	2	E	U
NT	<input type="radio"/>	3	3	3	3	3	3	3	H	W
		4	4	4	4	4	4	4	J	X
		5	5	5	5	5	5	5	L	Y
		6	6	6	6	6	6	6	M	
		7	7	7	7	7	7	7		
		8	8	8	8	8	8	8		
		9	9	9	9	9	9	9		<input type="checkbox"/>

Do you have any comment about this assignment, or CS1231S in general? If you do, kindly fill in the thought bubble below. This will not be graded!



Q1. Propositional logic (Total: 7 marks)

(a) (i)

[1 mark]

p	q	$\sim p \vee q$	$p \wedge (\sim p \vee q)$	$p \wedge q$
T	T			
T	F			
F	T			
F	F			

(a) (ii)

[2 marks]

$$p \vee (\sim p \wedge q)$$

≡

(b) (If you use fewer than 9 steps, you can leave the later steps blank.)

[4 marks]

$$(p \wedge (p \rightarrow r \vee q)) \wedge (r \rightarrow q)$$

Step 1: ≡

Step 2: ≡

Step 3: ≡

Step 4: ≡

Step 5: ≡

Step 6: ≡

Step 7: ≡

Step 8: ≡

Step 9: ≡

Q2. Argument (Total: 6 marks)

The given argument is

Q3. Sets (Total: 6 marks)

(a) [3 marks]

$B_2 =$

$B_3 =$

$B_4 =$

(b) [3 marks]

$D_2 =$

$D_3 =$

$D_6 =$

$D_{18} =$

$\bigcap_{k=6}^{14} D_k =$

$\bigcup_{k=6}^{14} D_k =$

Q4. Quantified statements on Sets (Total: 6 marks)

(a) $\forall x \in C ((x \in A) \Leftrightarrow (x^2 \in B))$.

[3 marks]

(b) $\exists x \in A \forall y \in A ((x \neq 0) \wedge (xy \in B))$.

[3 marks]

Q5. Proof (Total: 7 marks)

(a) Rewrite the given statement using mathematical notation.

[2 marks]

(b) Explain why the proof begins by assuming that one integer is even and the other is odd. [4 marks]

(c) Explain what is meant by “without loss of generality” in this proof.

[1 mark]

Q6. Proof on Sets (6 marks)

(a) For all sets A, B and C , $(A \cap B) \times (B \cap C) = (B \cap C) \times (A \cap B)$.

[1 mark]

(b) For every set A , if $A \subseteq \emptyset$, then $A = \emptyset$.

[2 marks]

(c) For all sets A and B , $\mathcal{P}(A \cap B) = \mathcal{P}(A) \cap \mathcal{P}(B)$.

[3 marks]

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