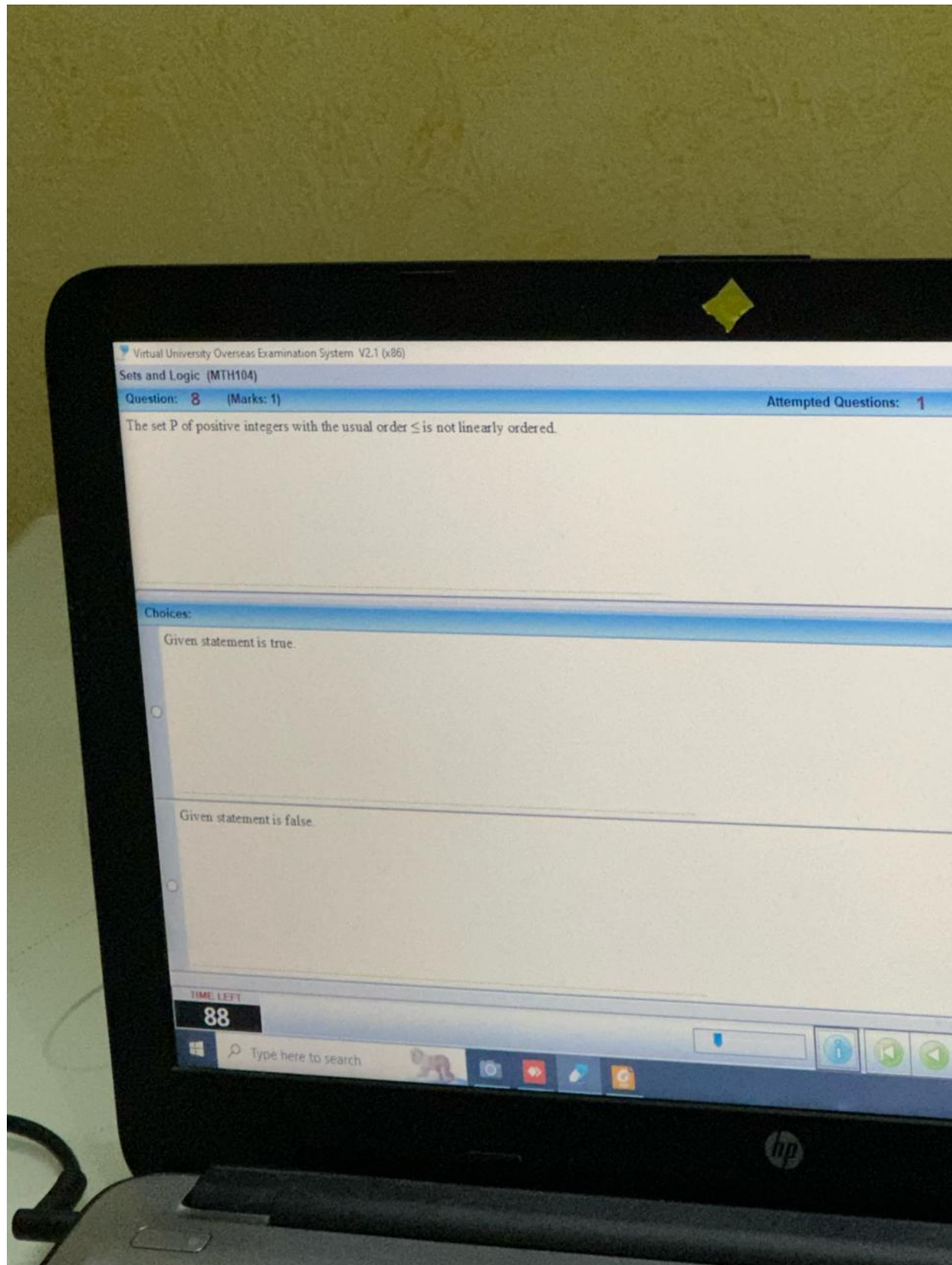
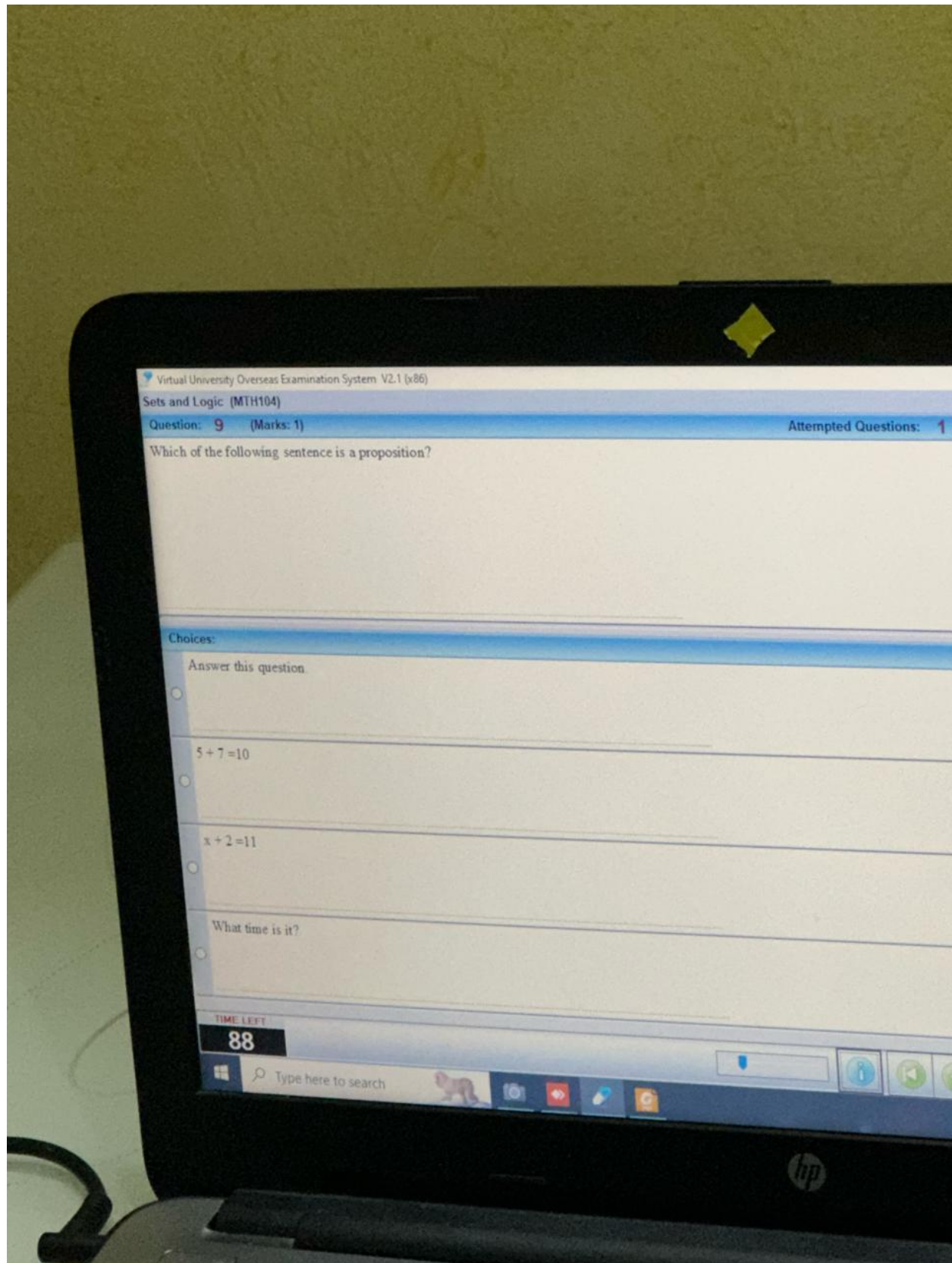


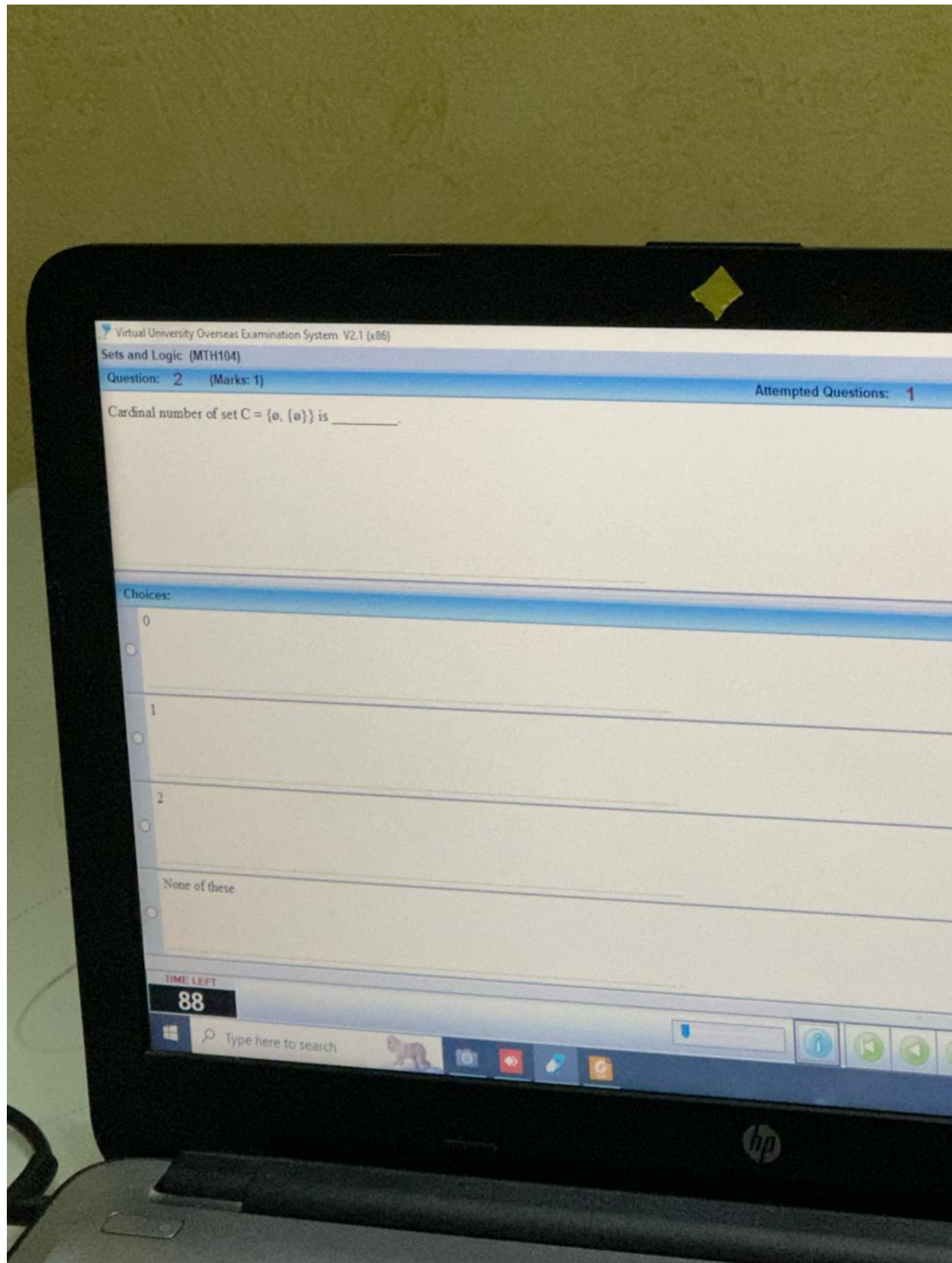
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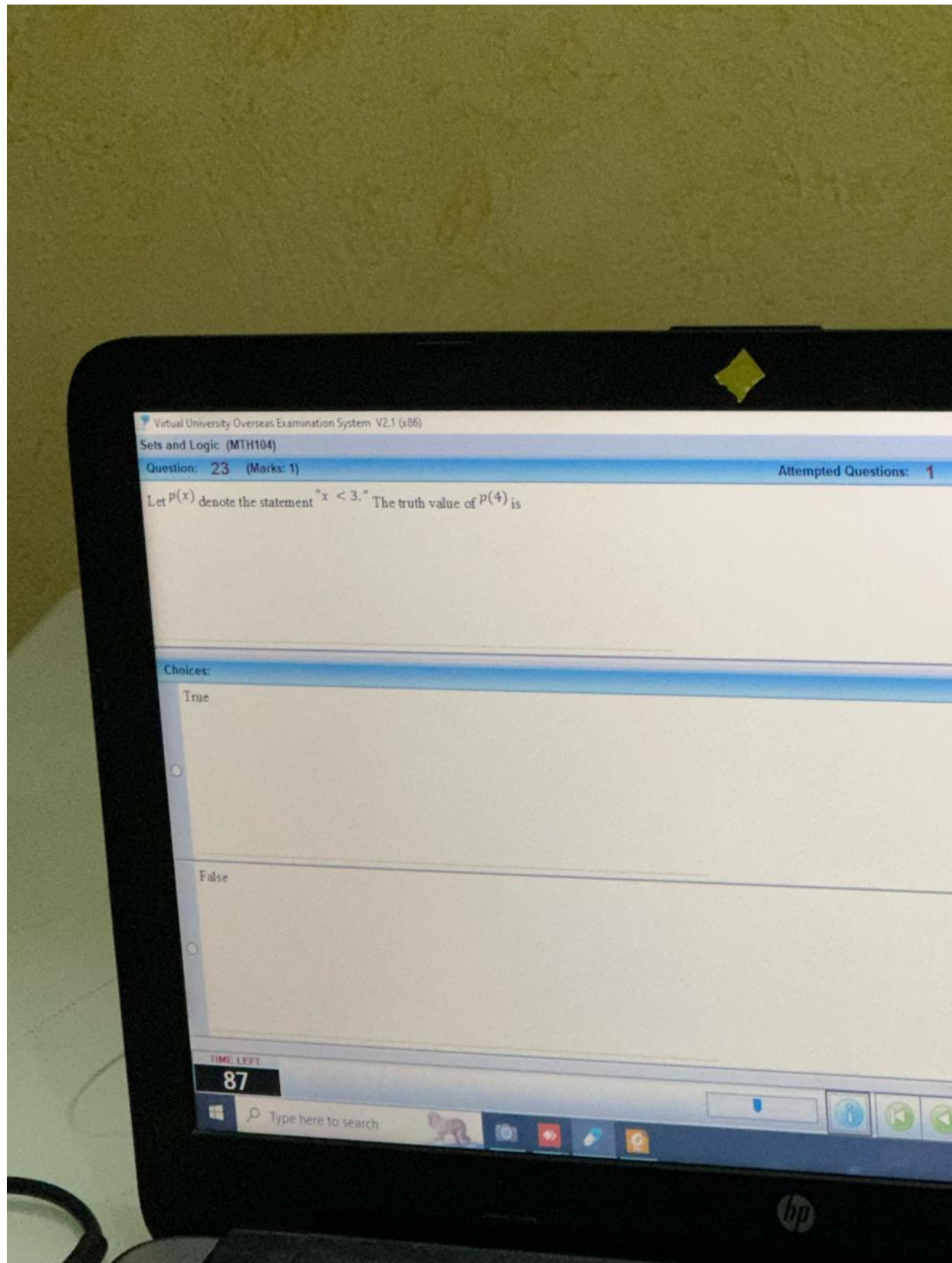
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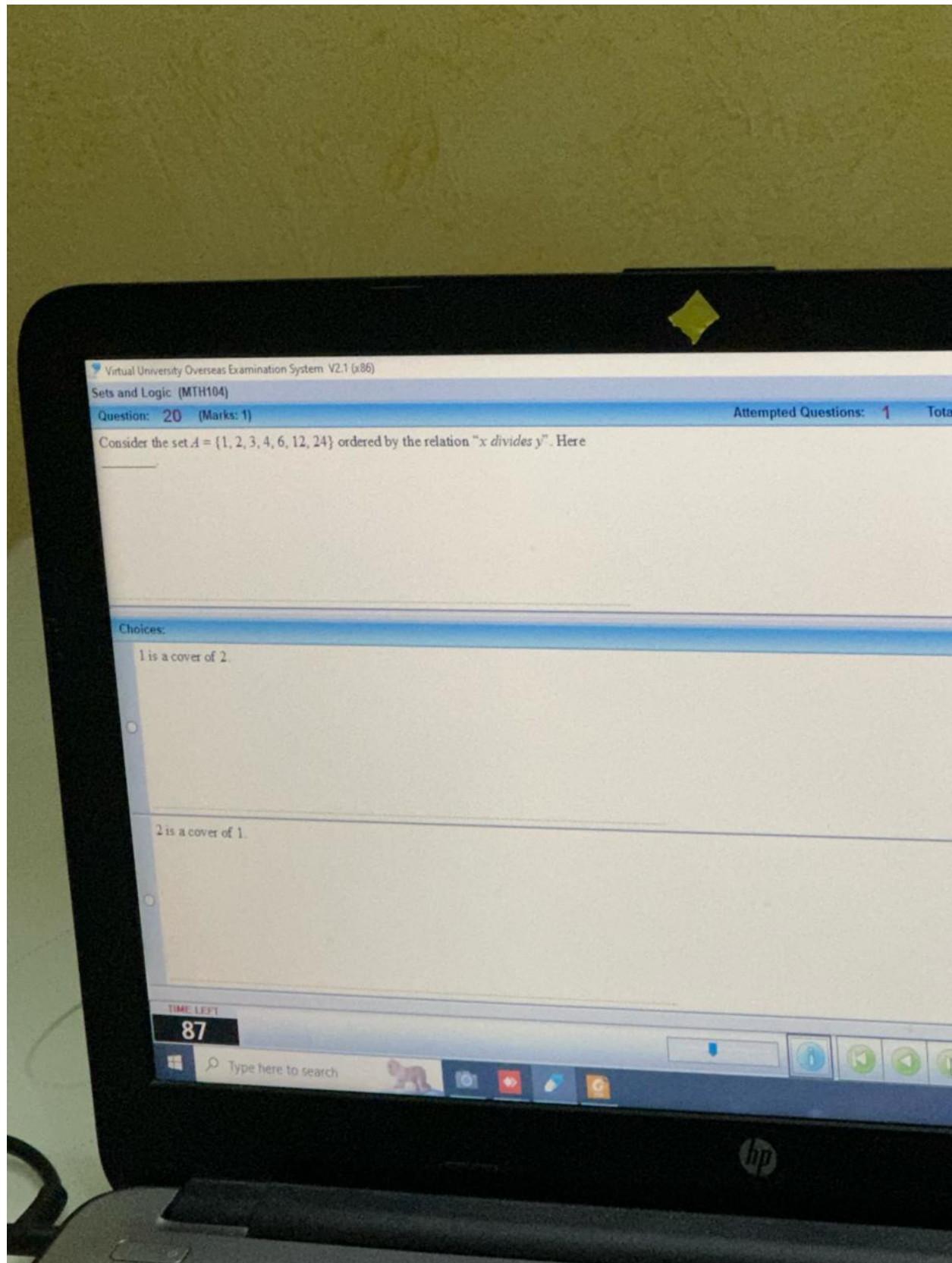
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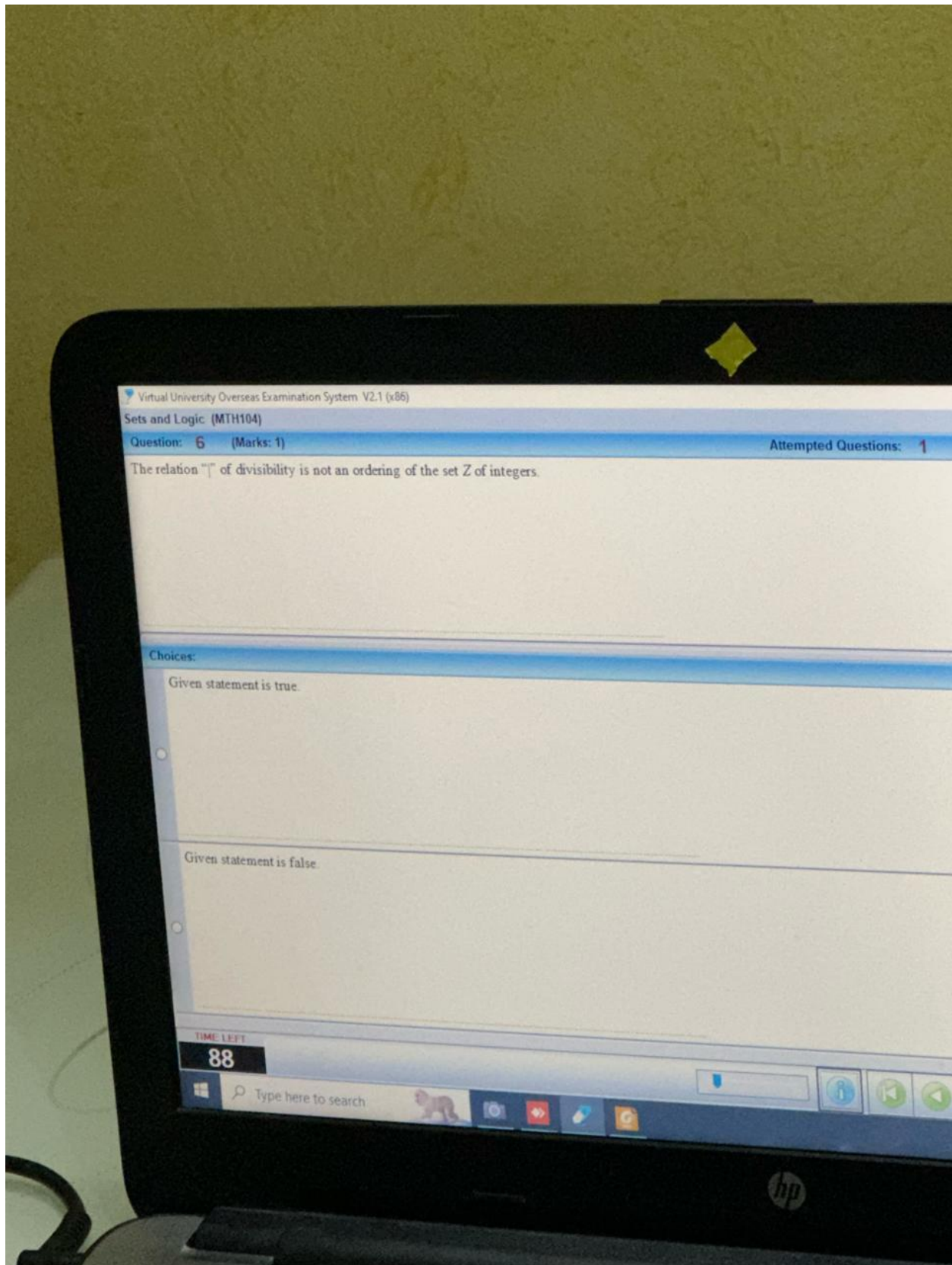
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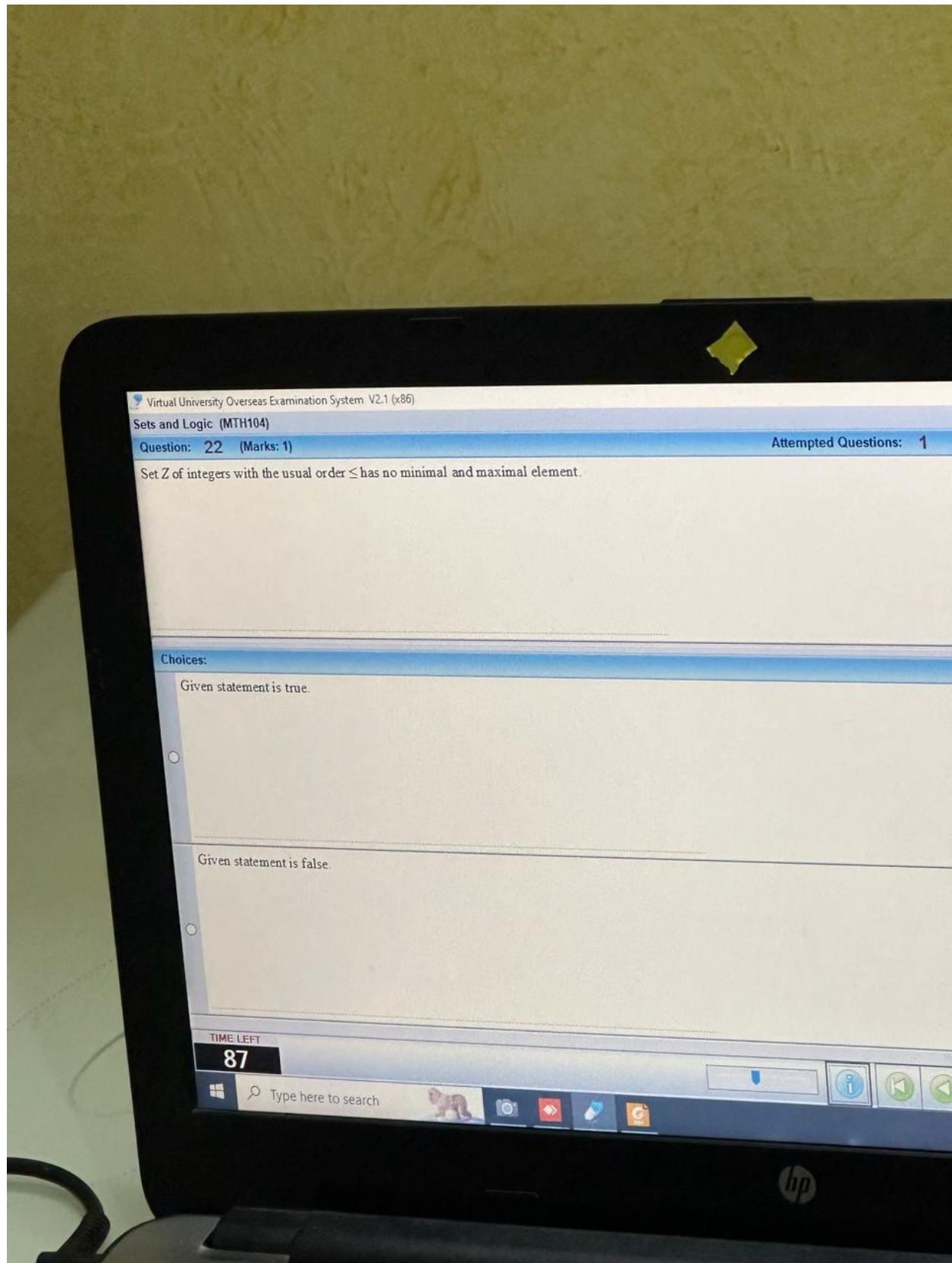
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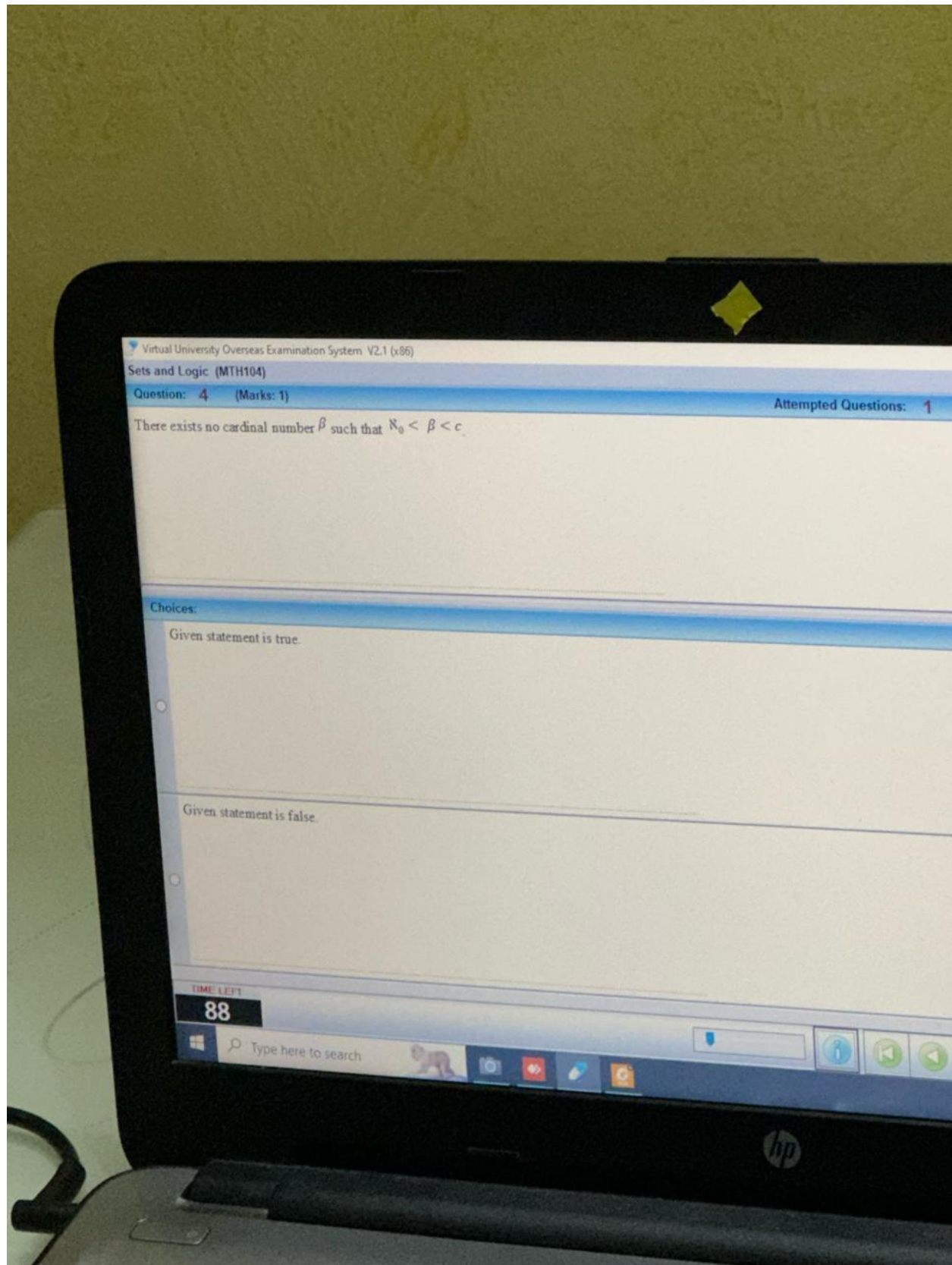
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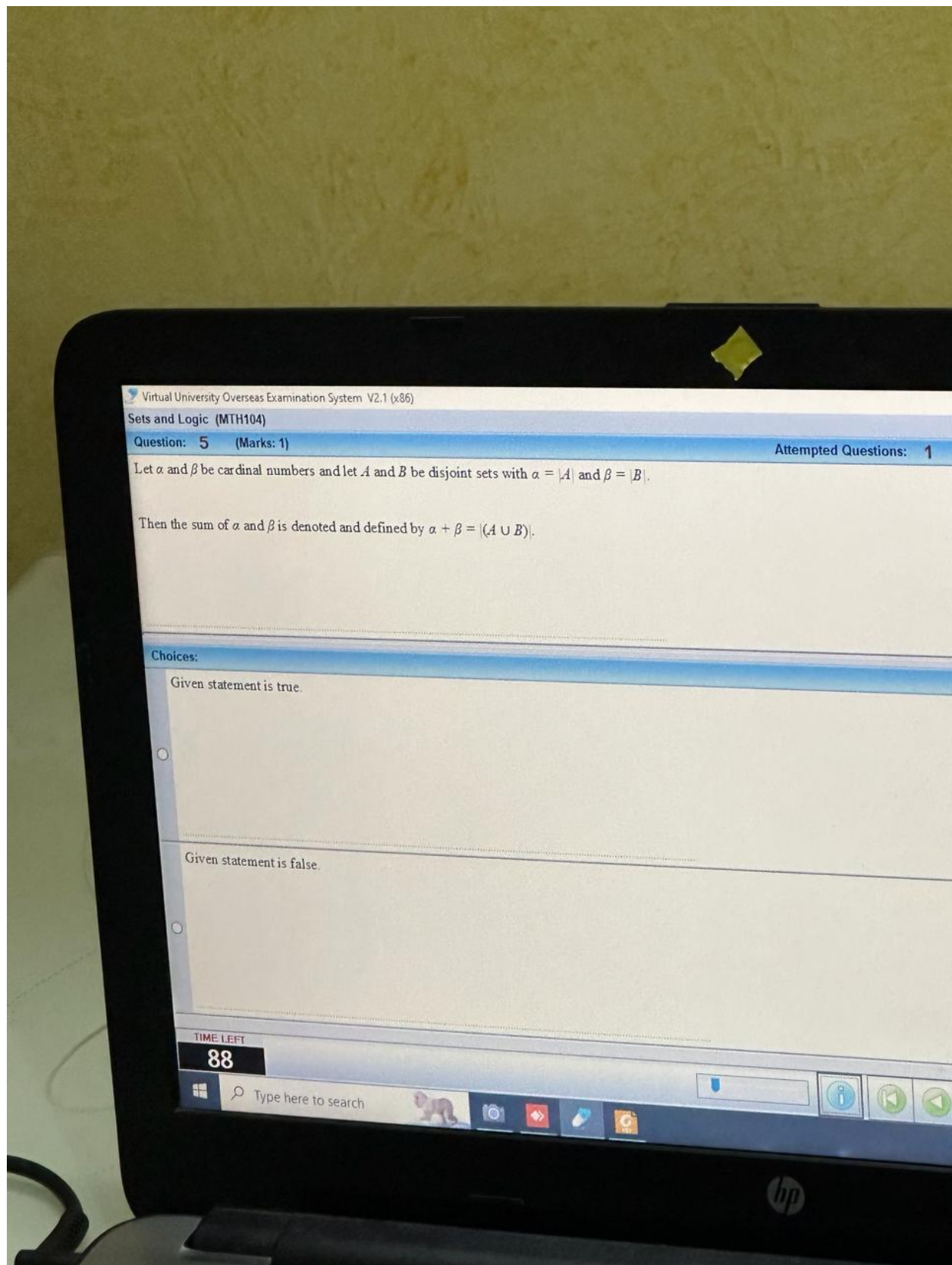
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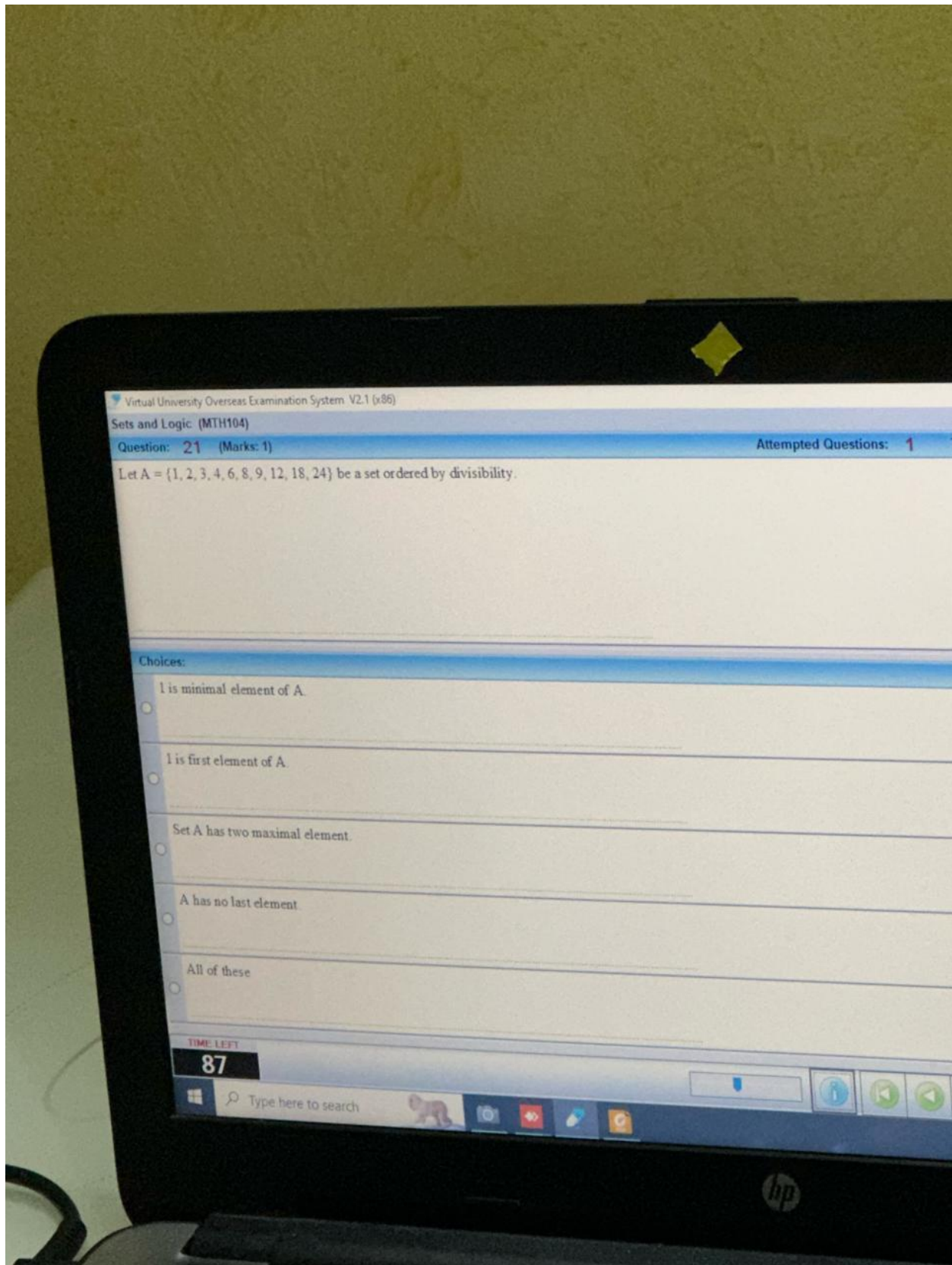
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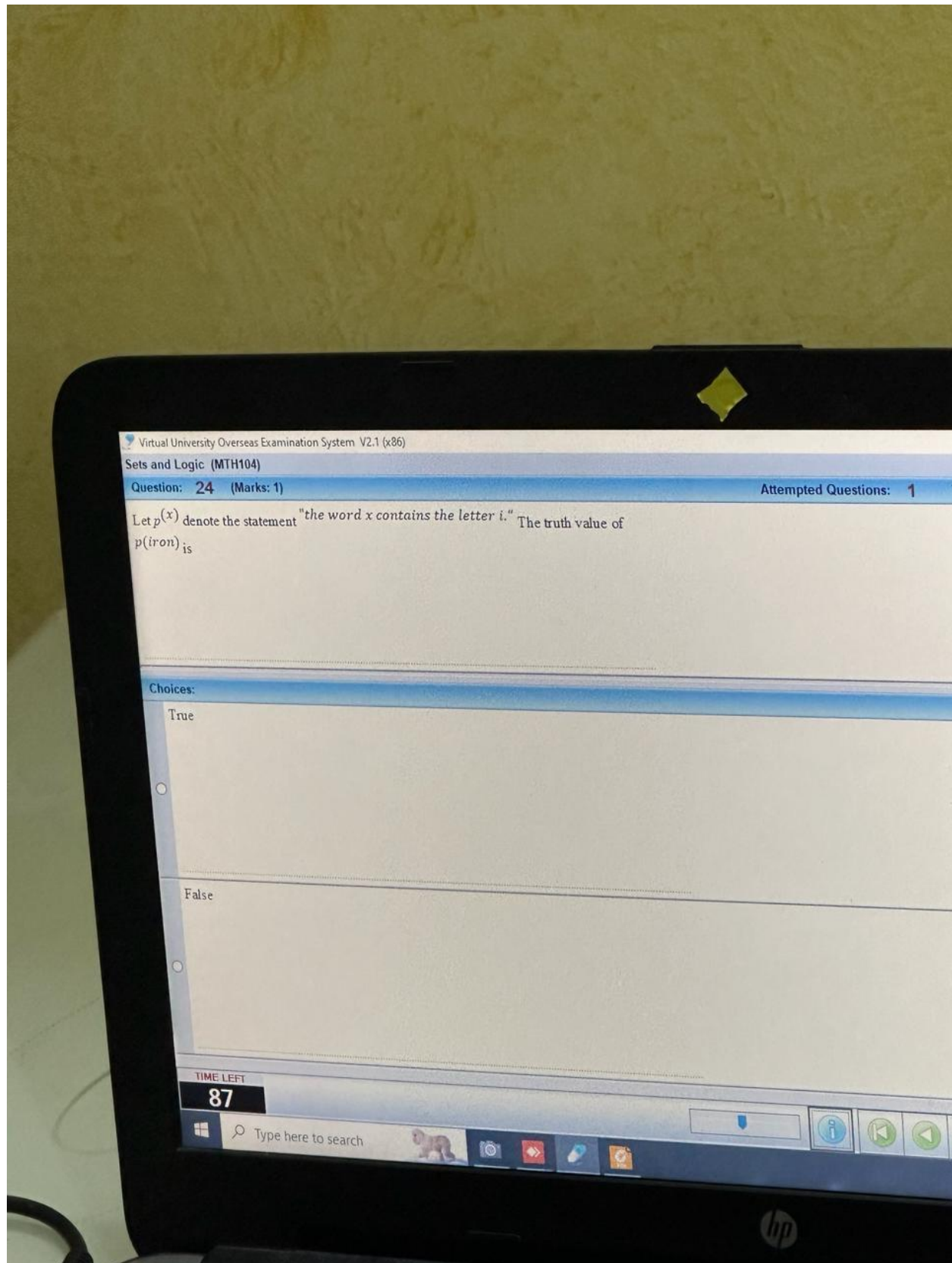
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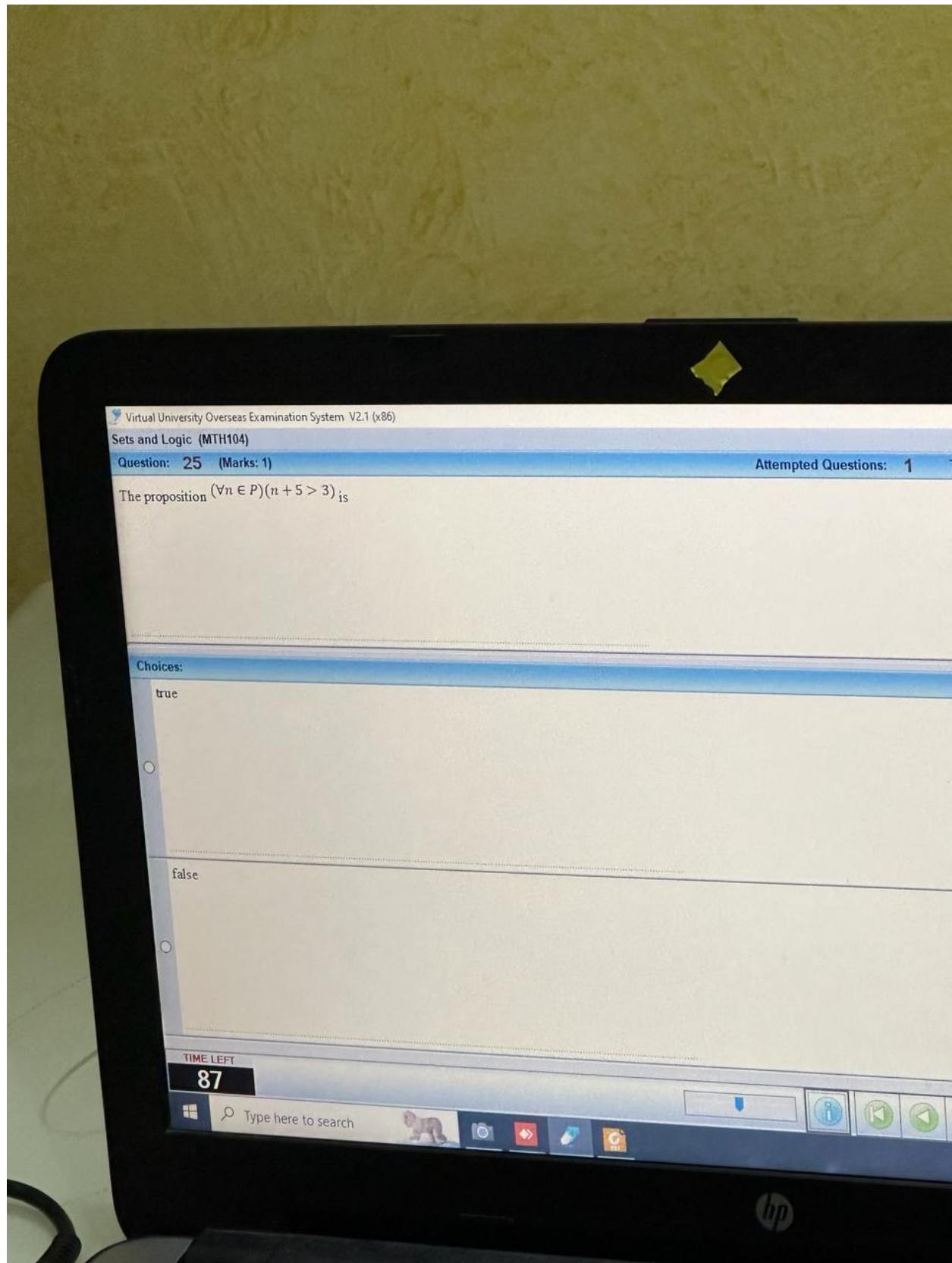
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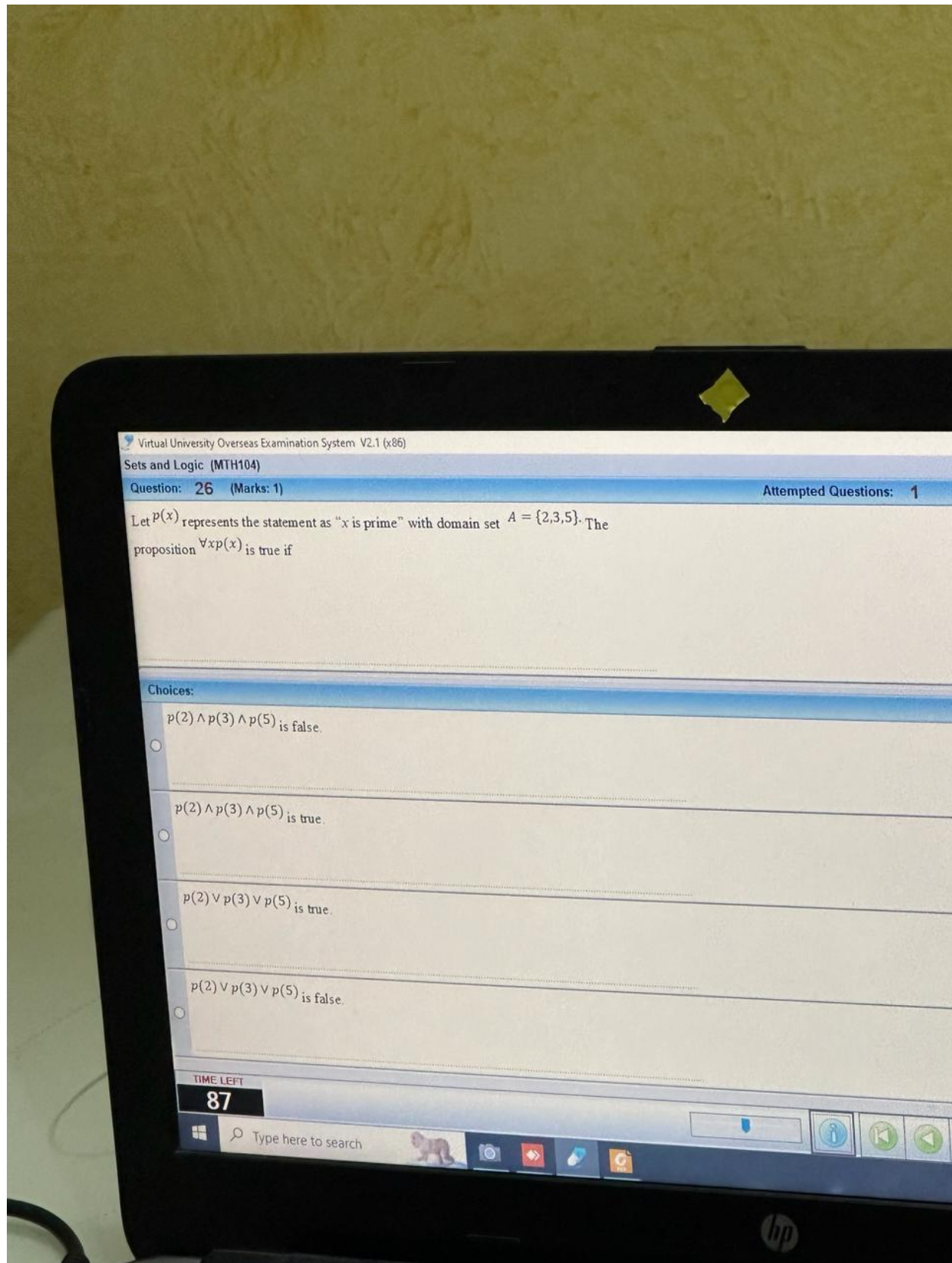
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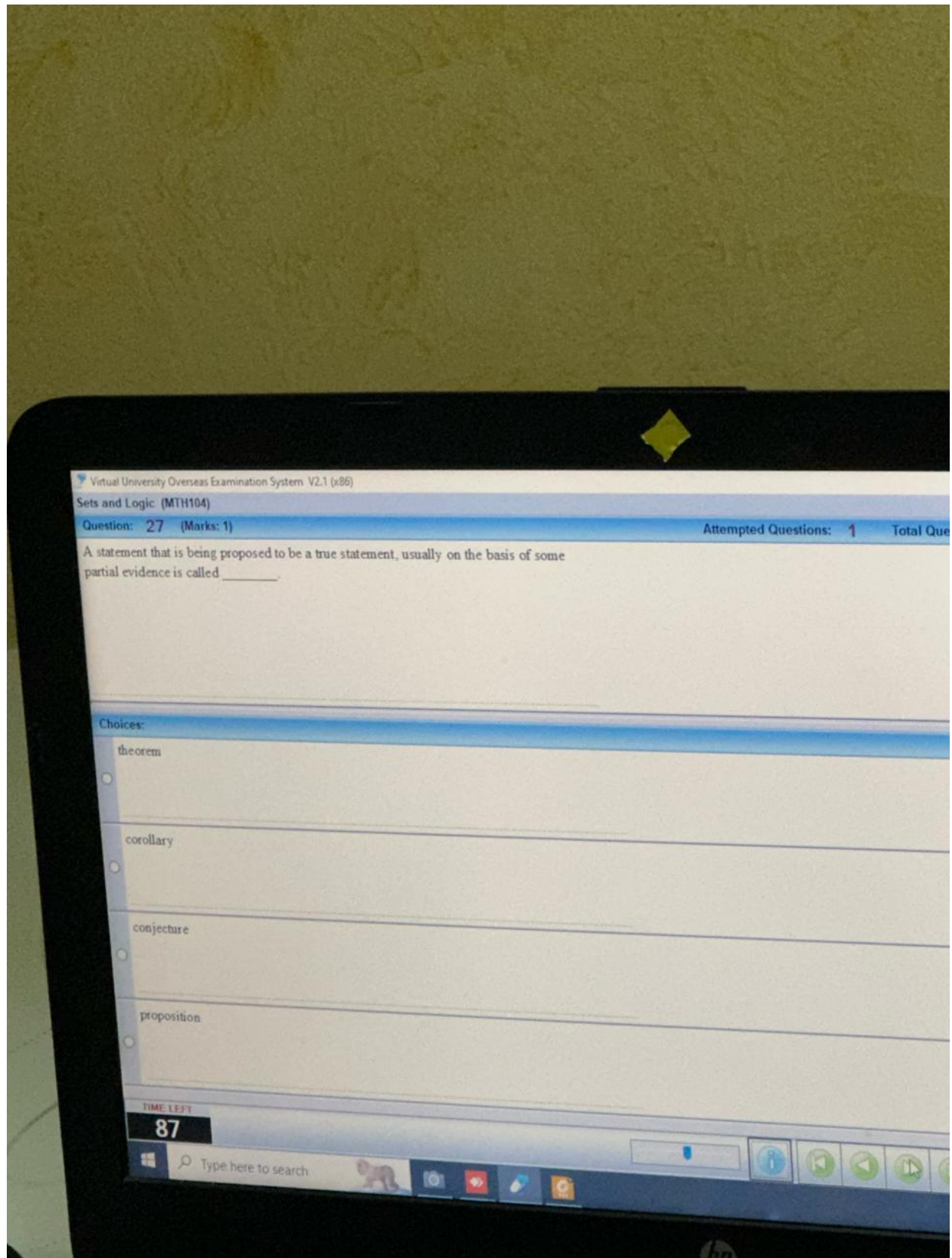
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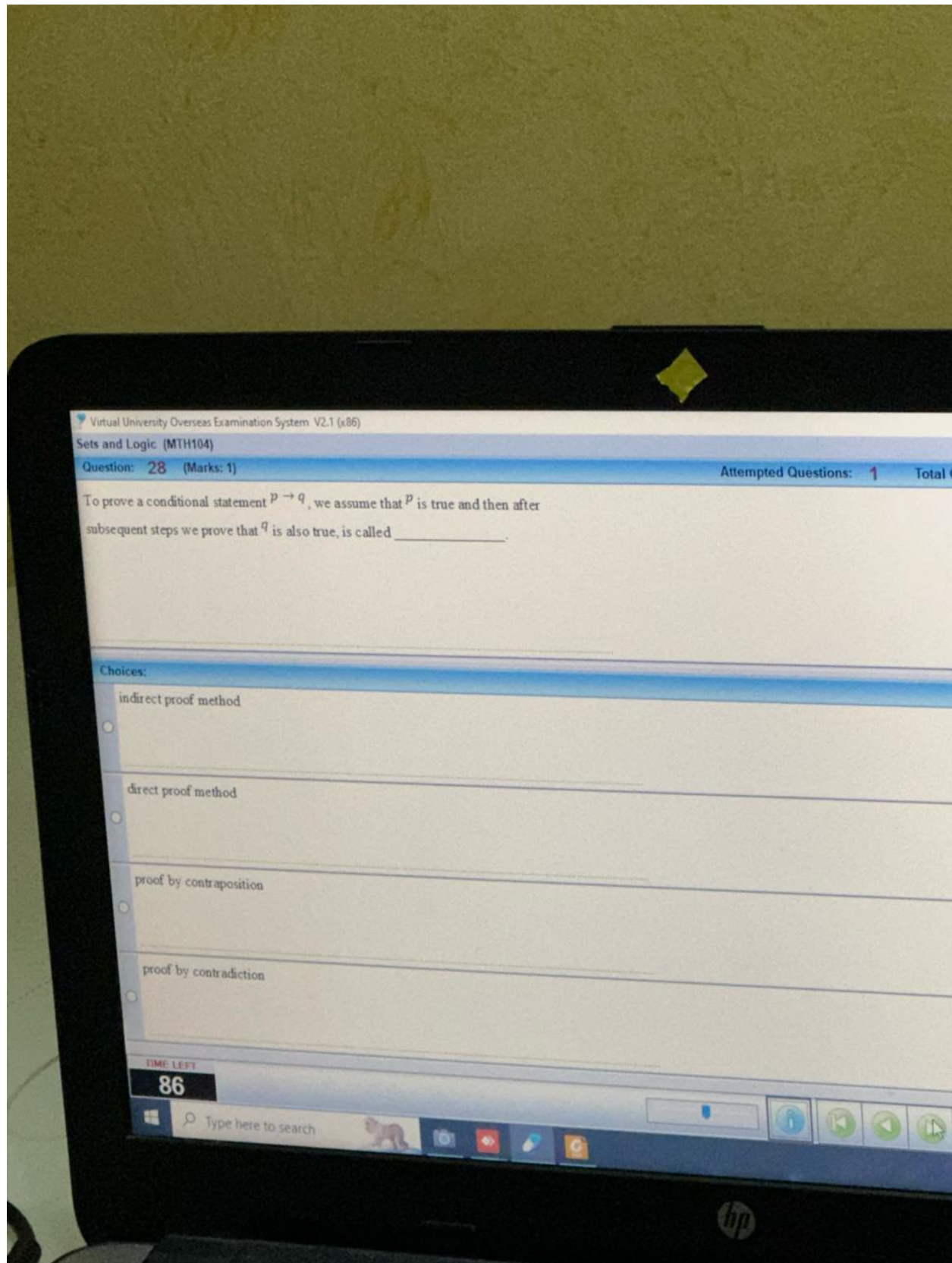
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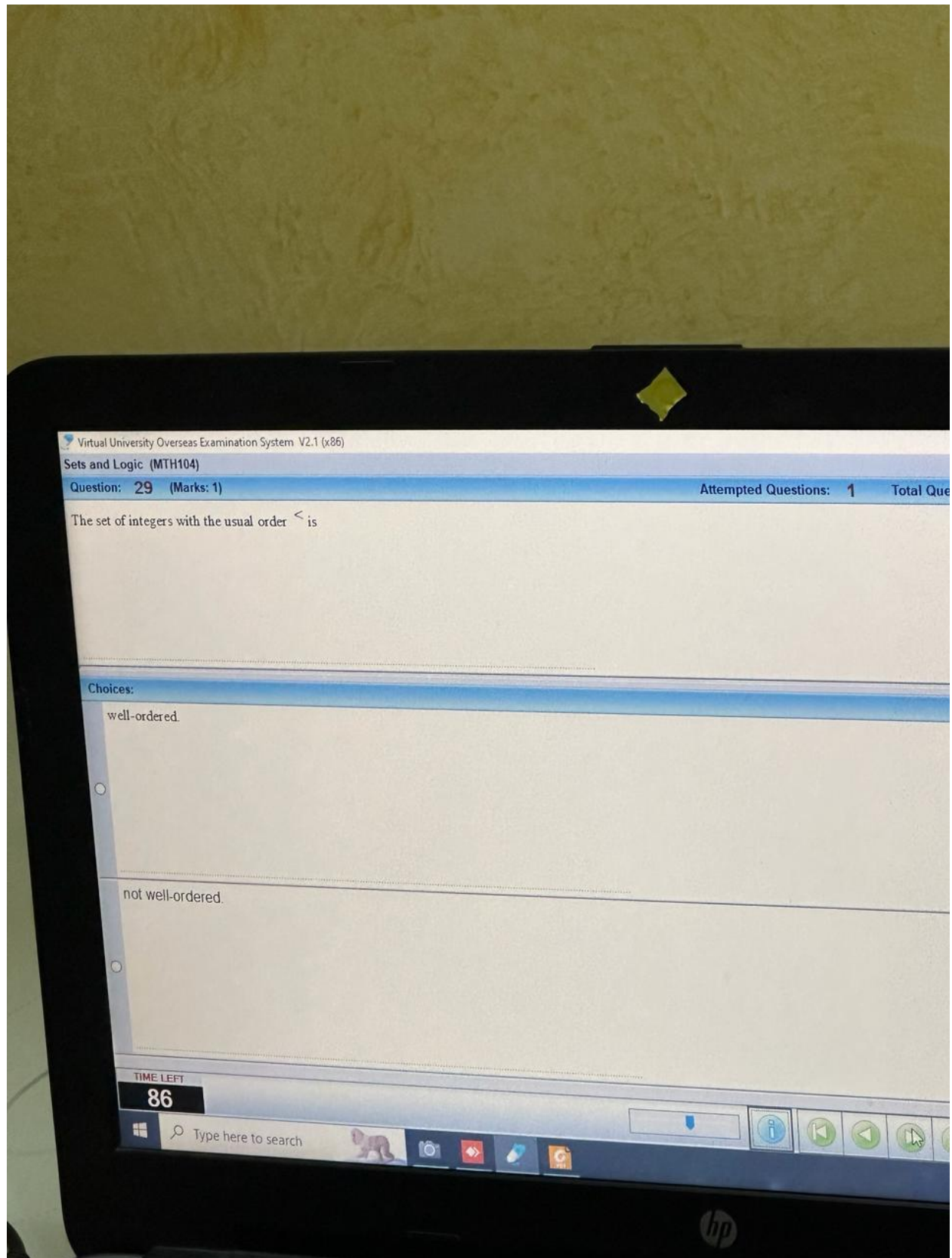
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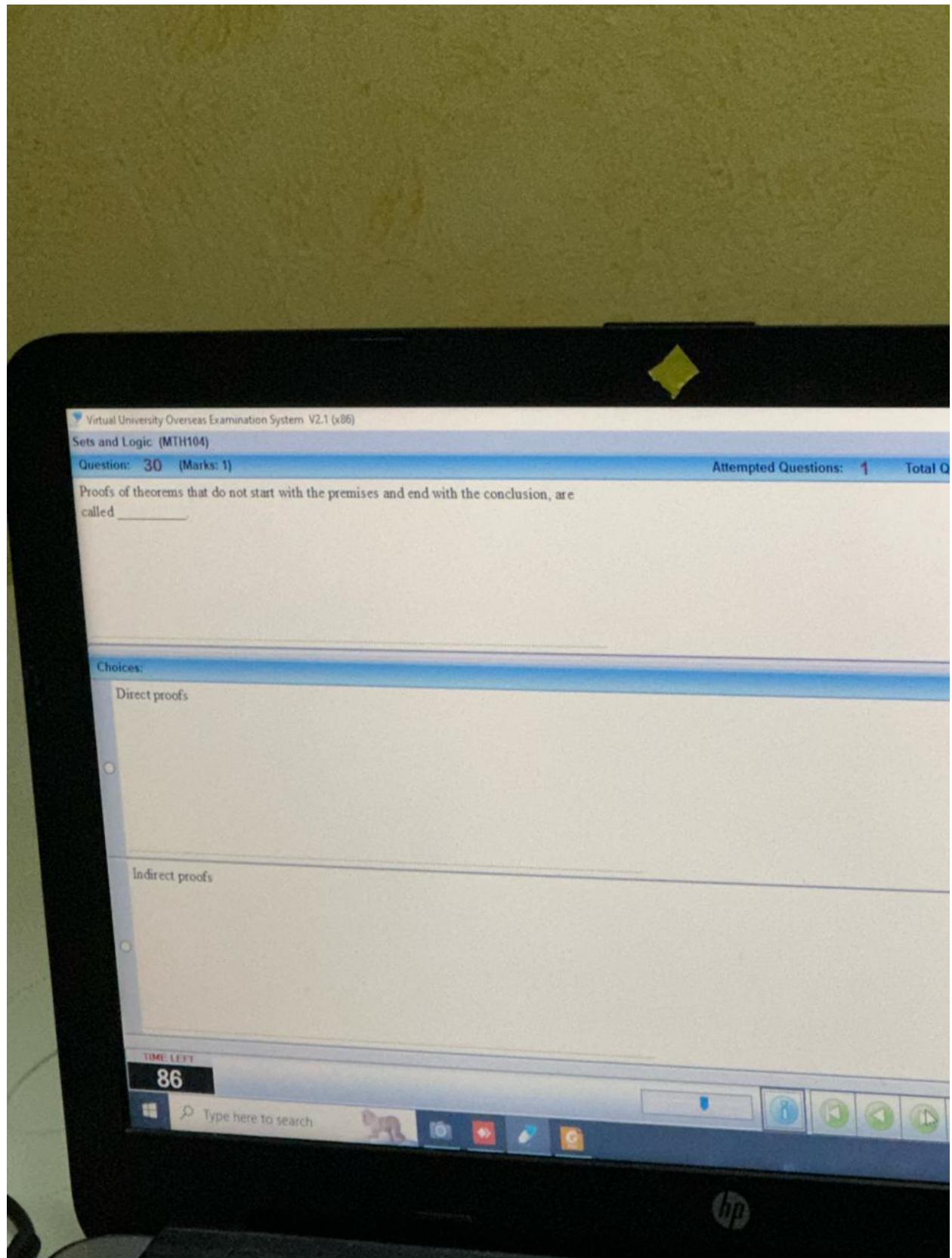
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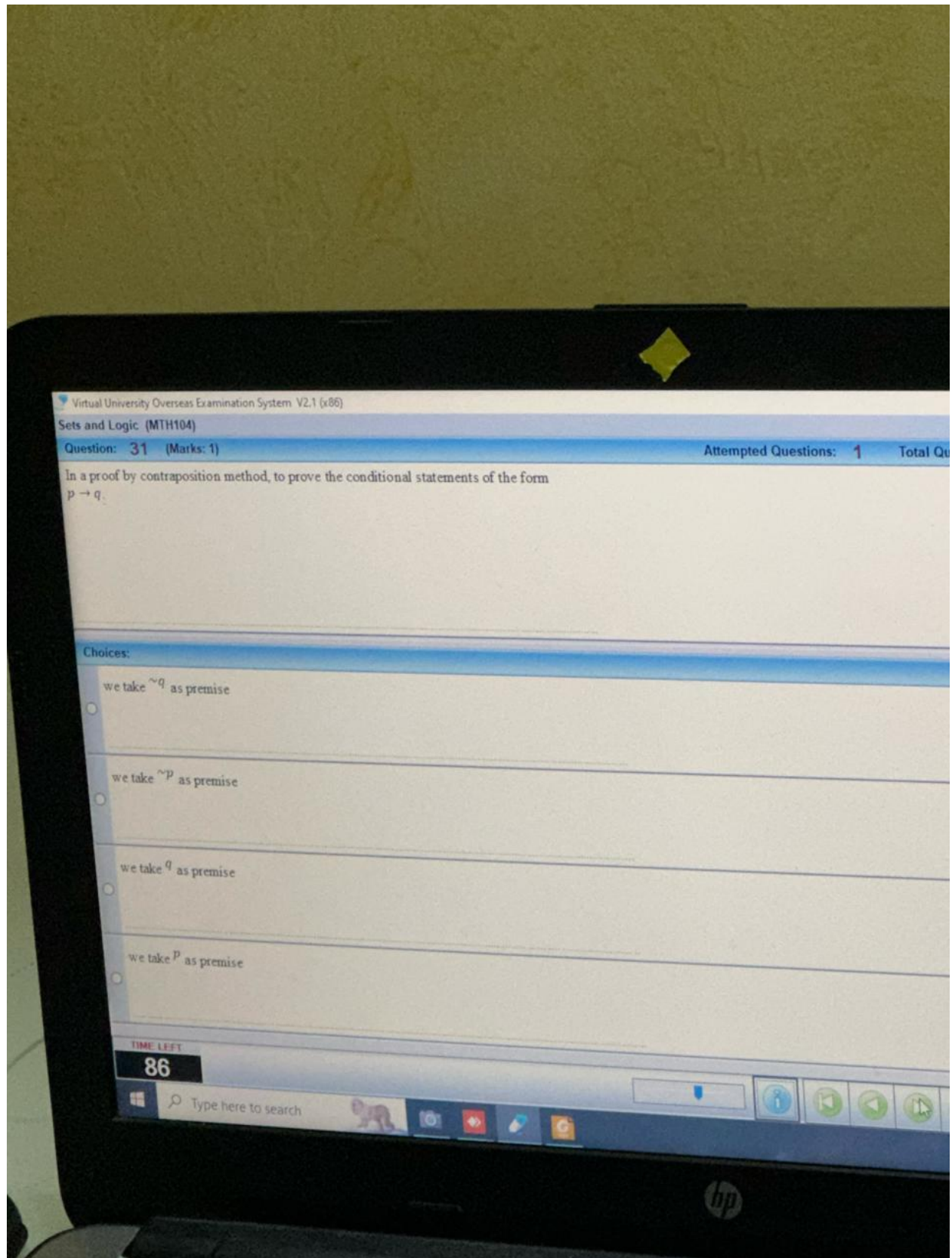
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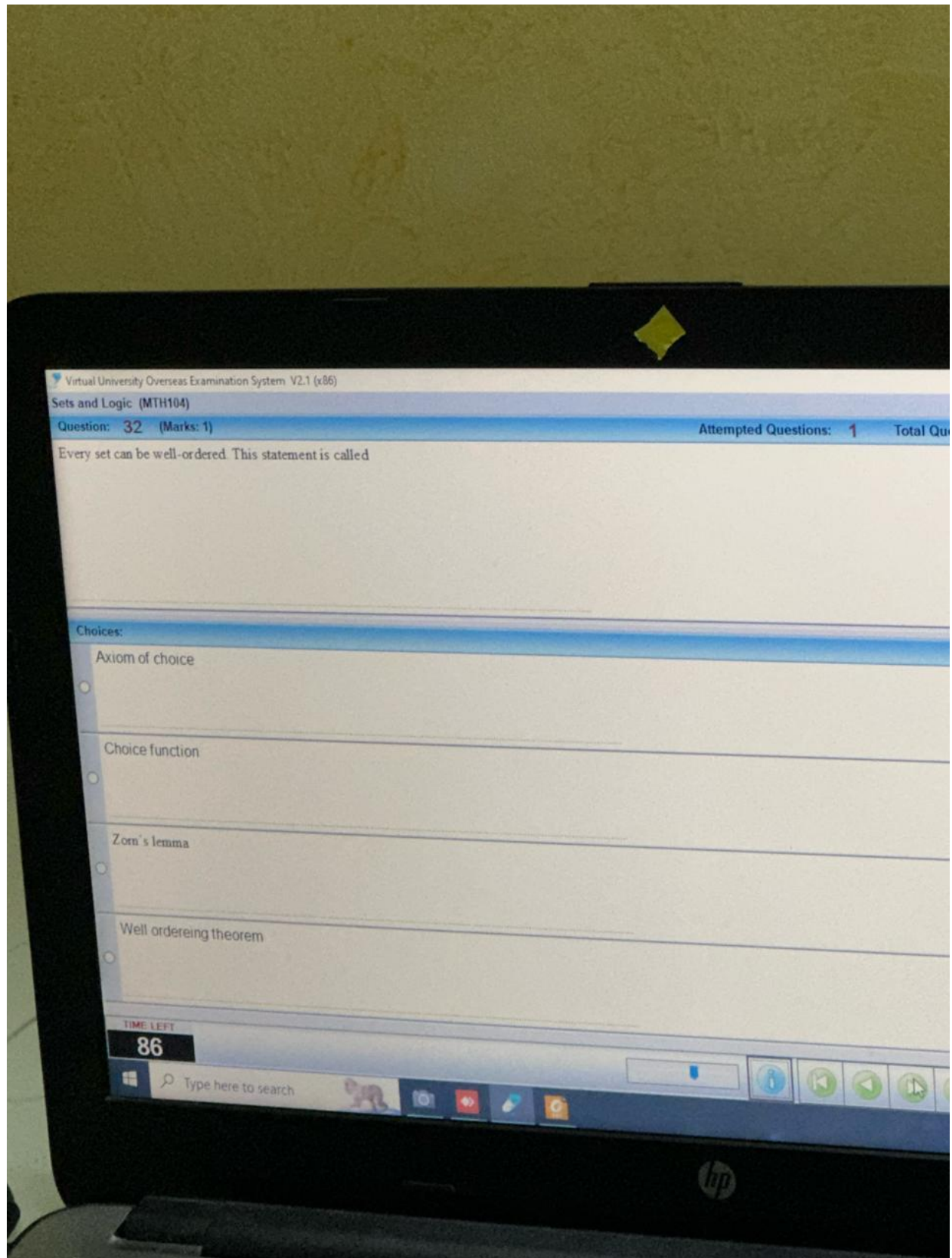
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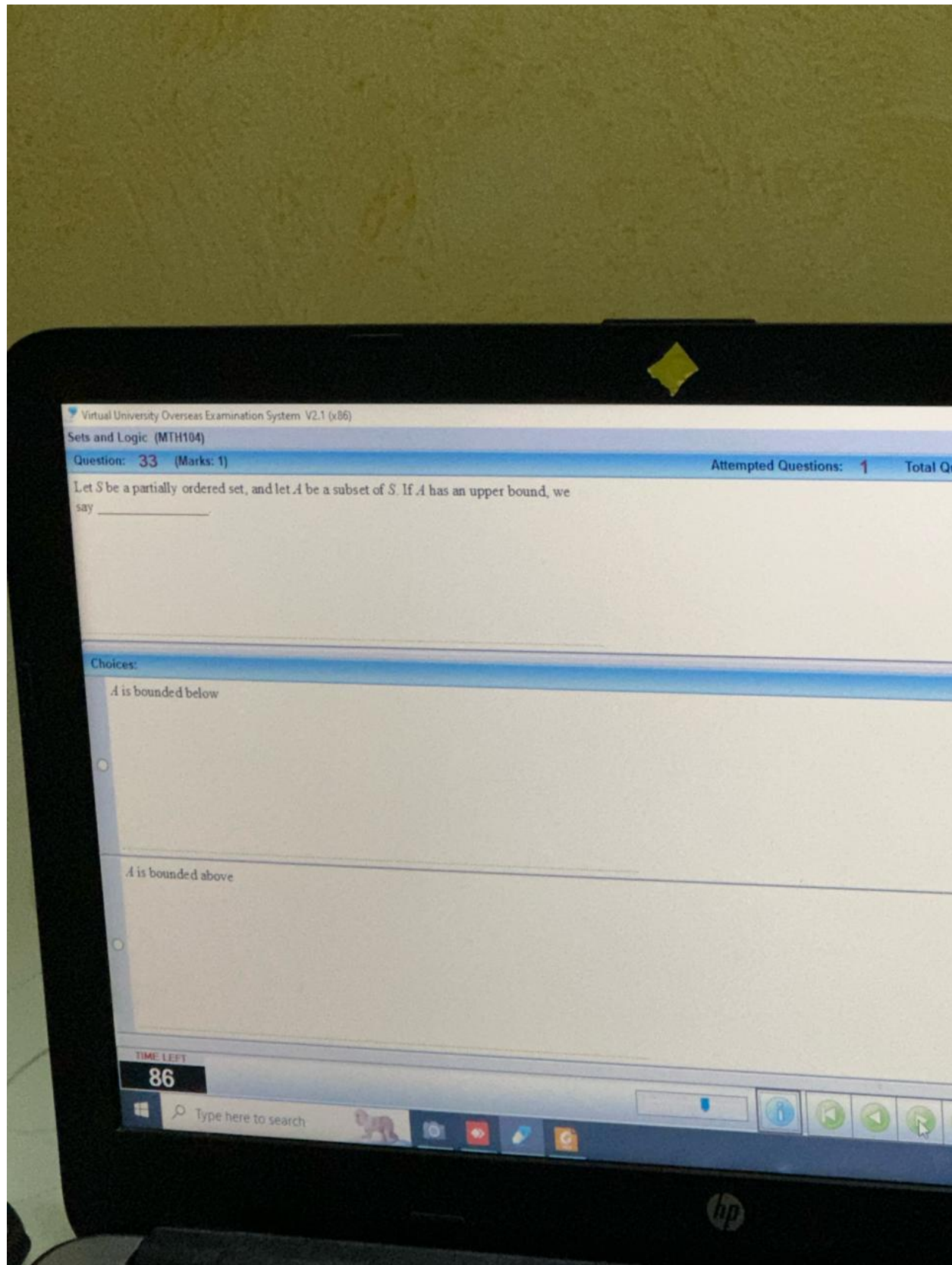
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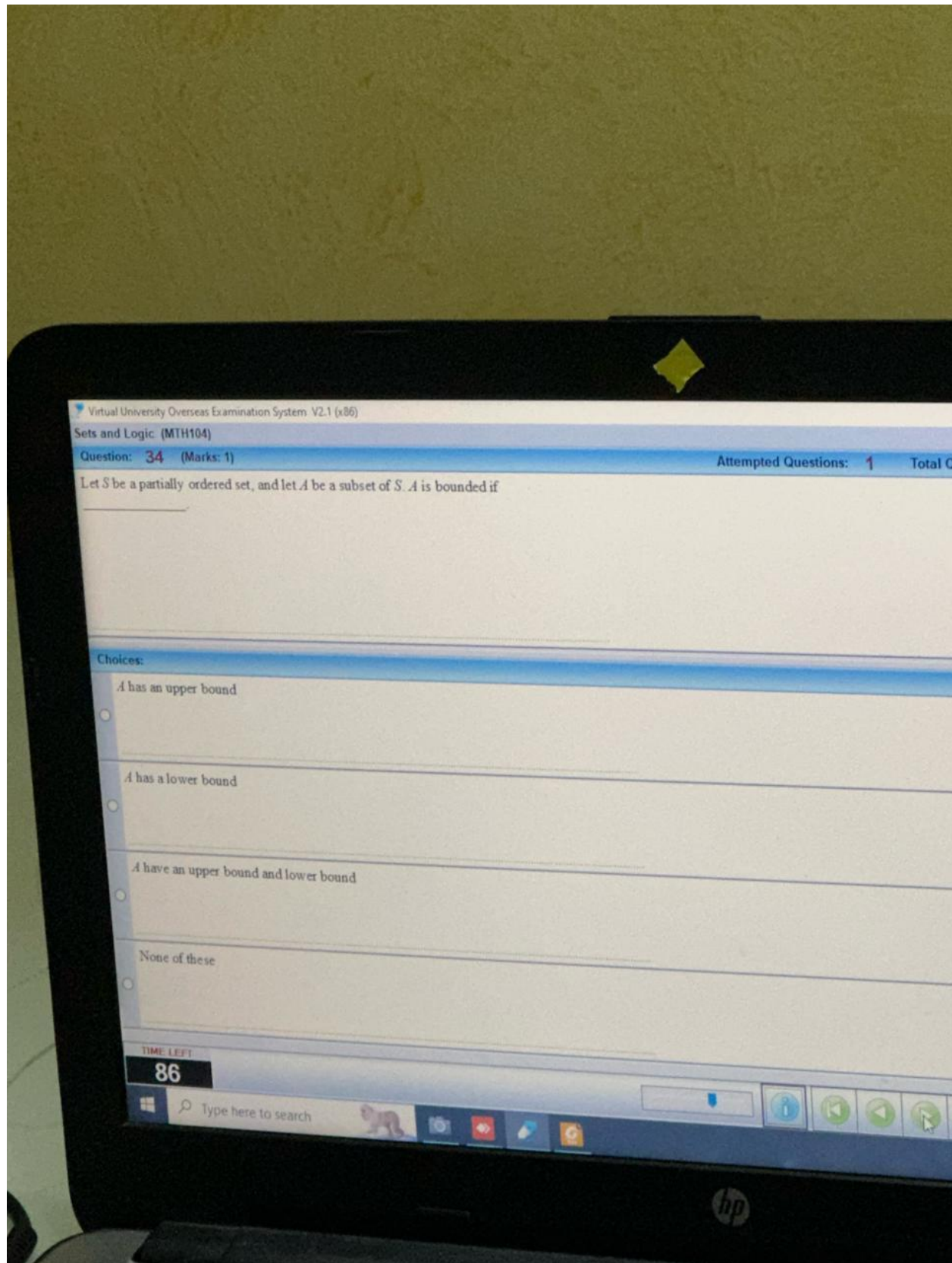
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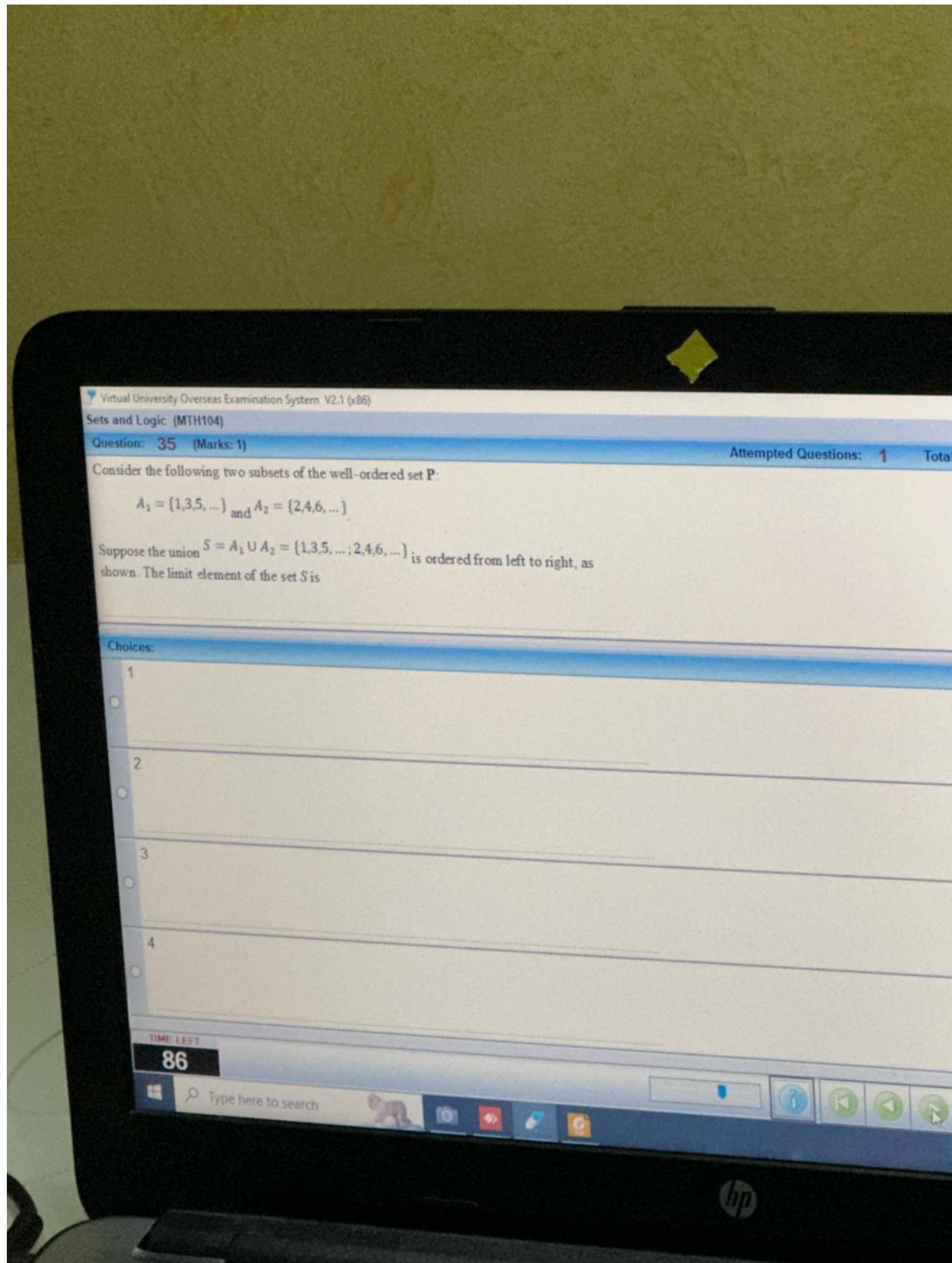
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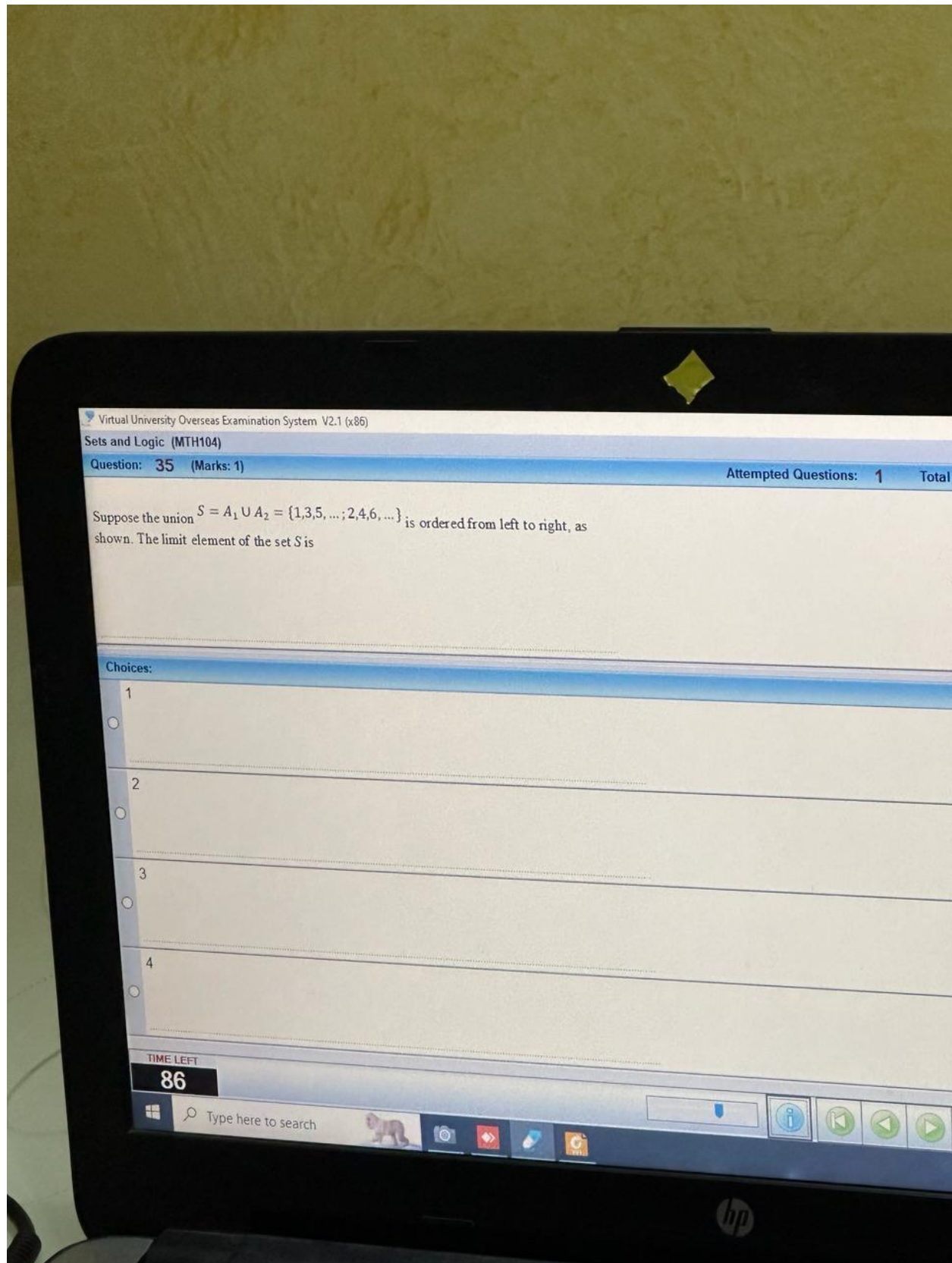
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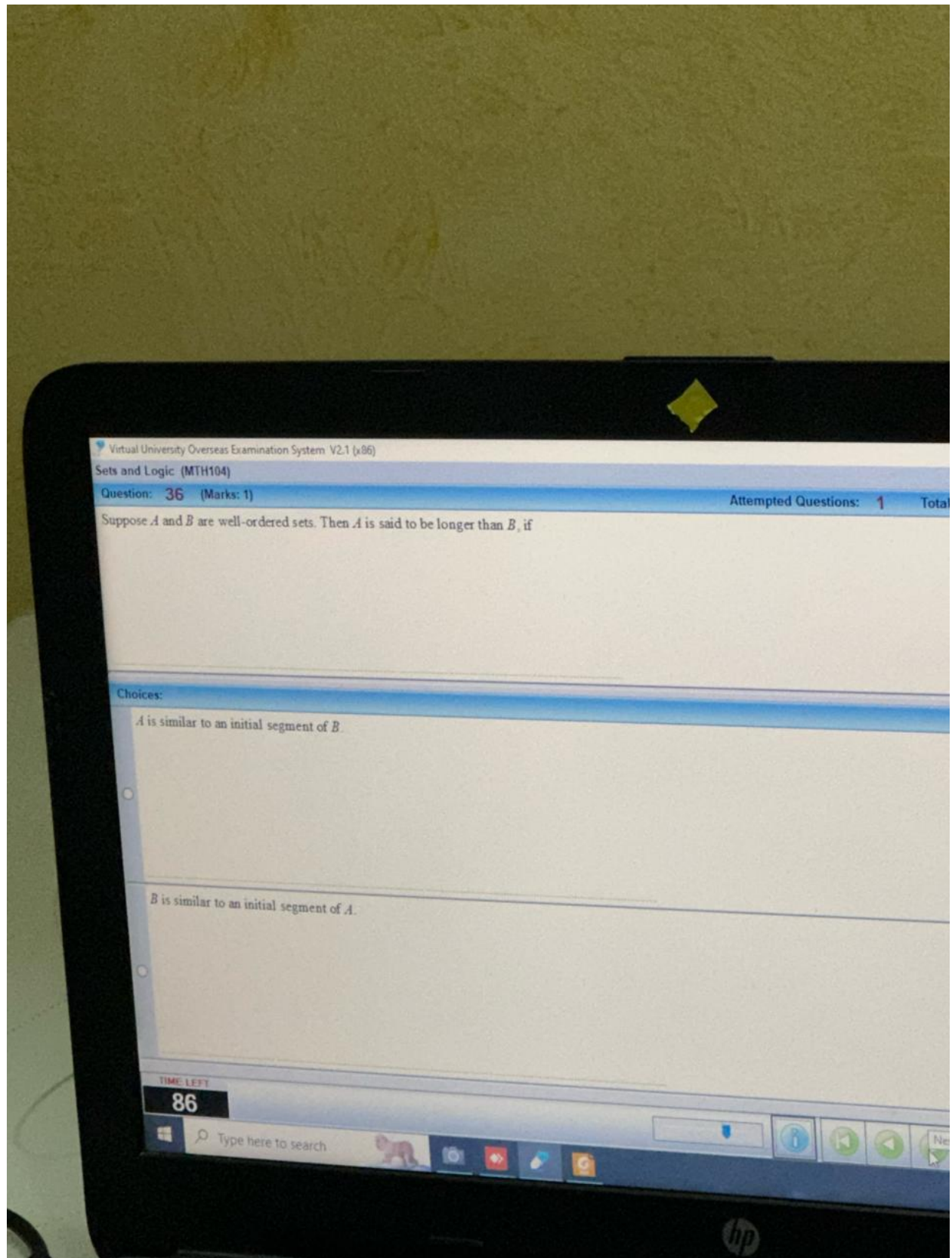
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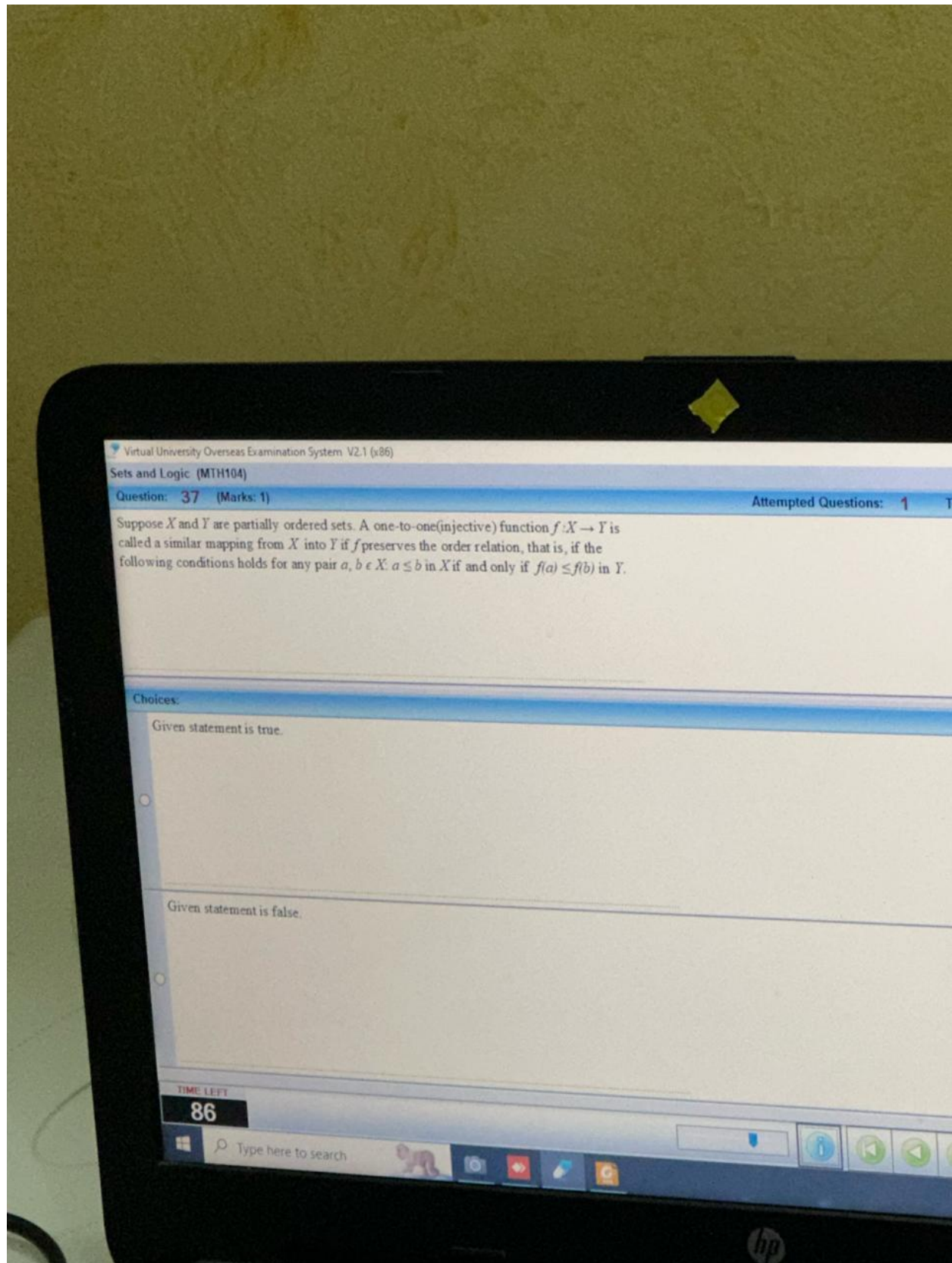
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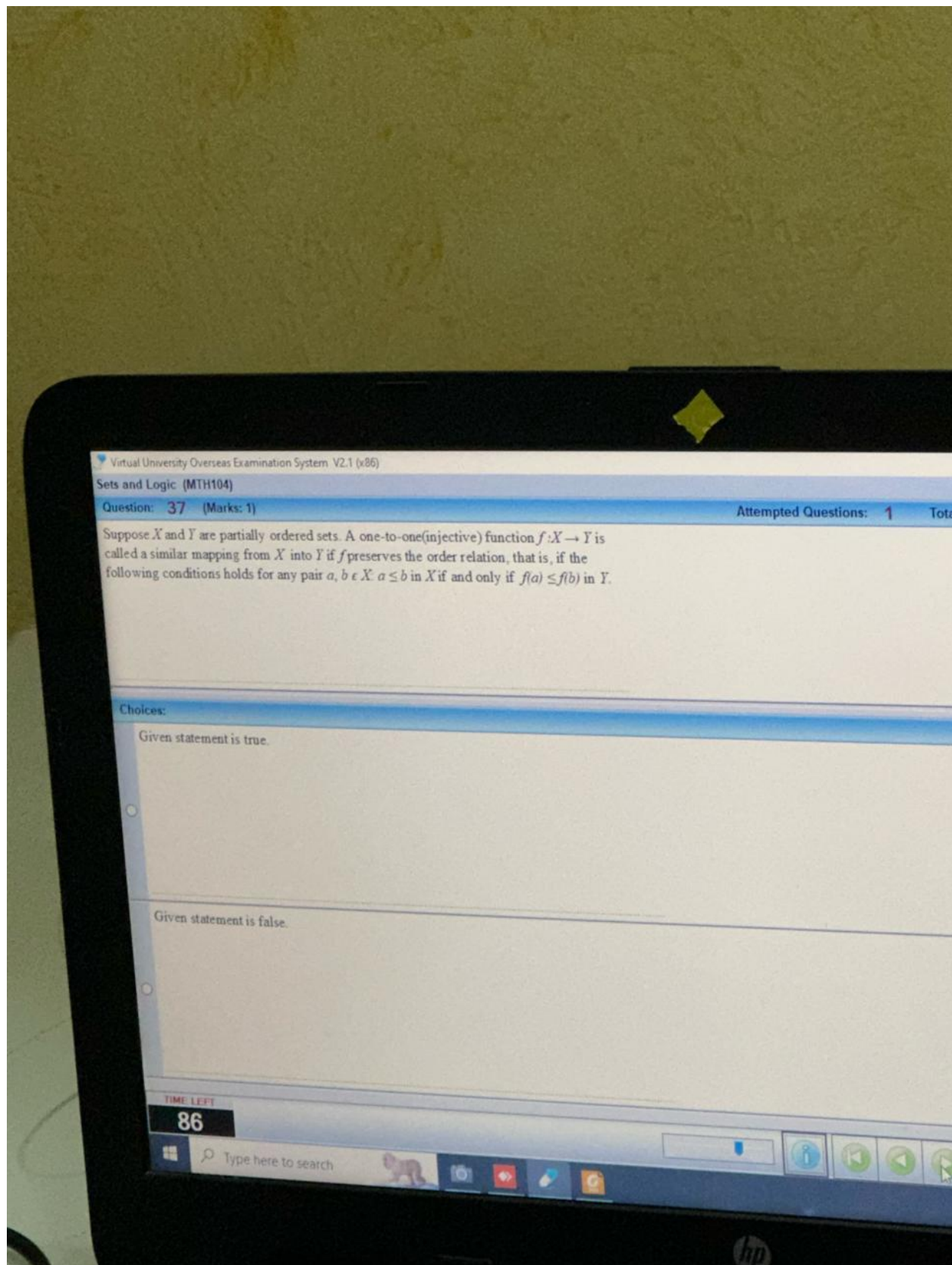
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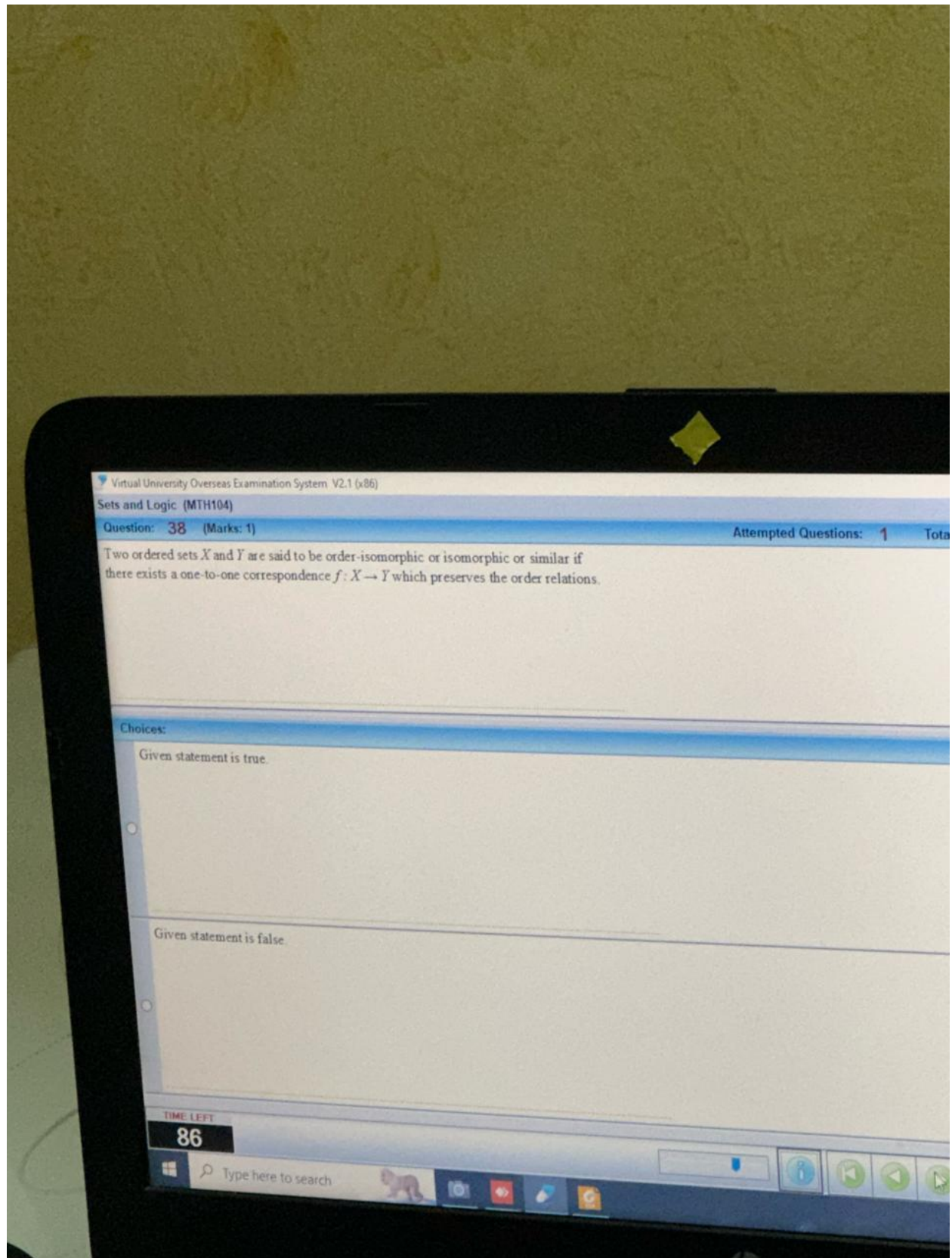
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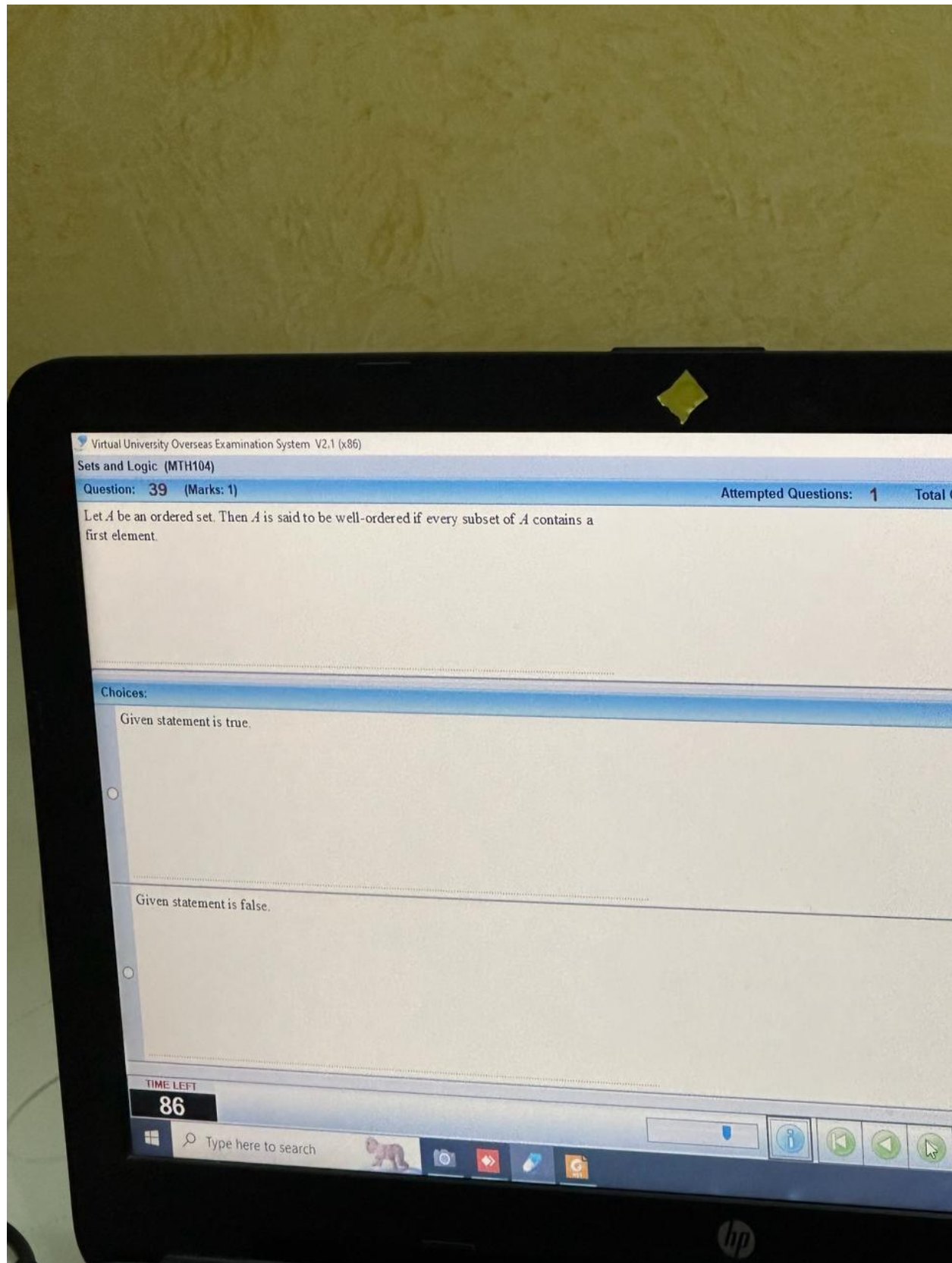
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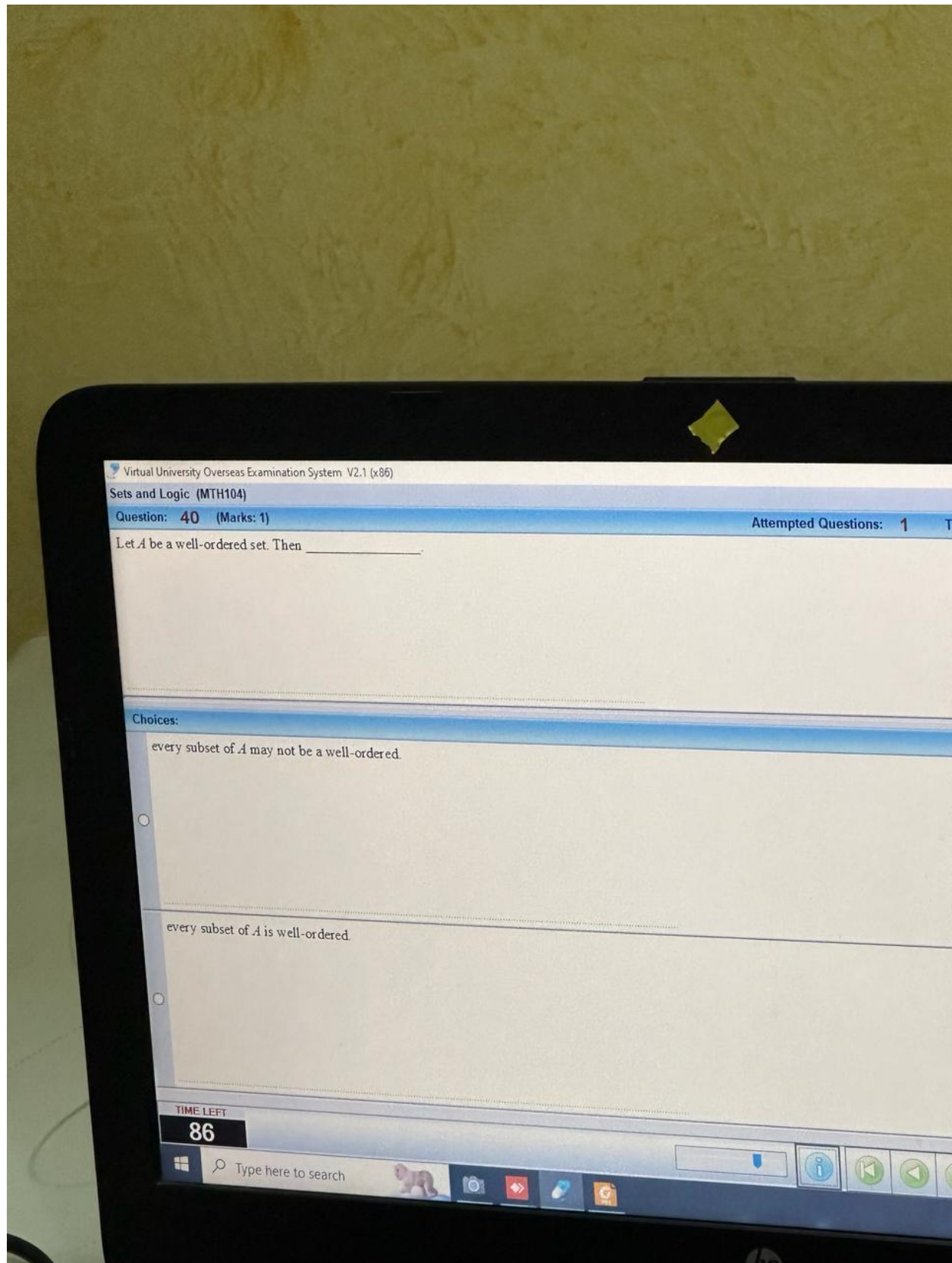
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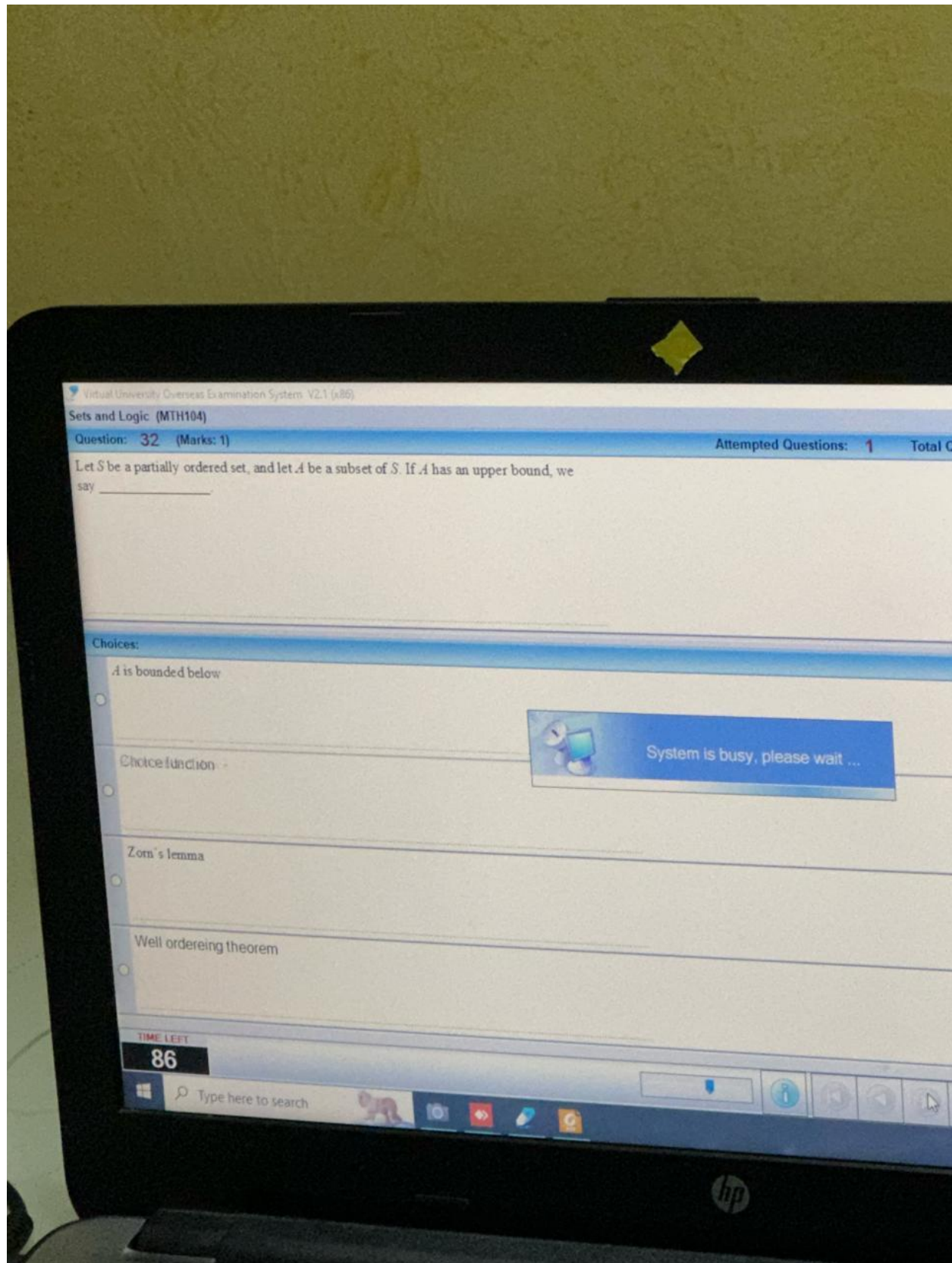
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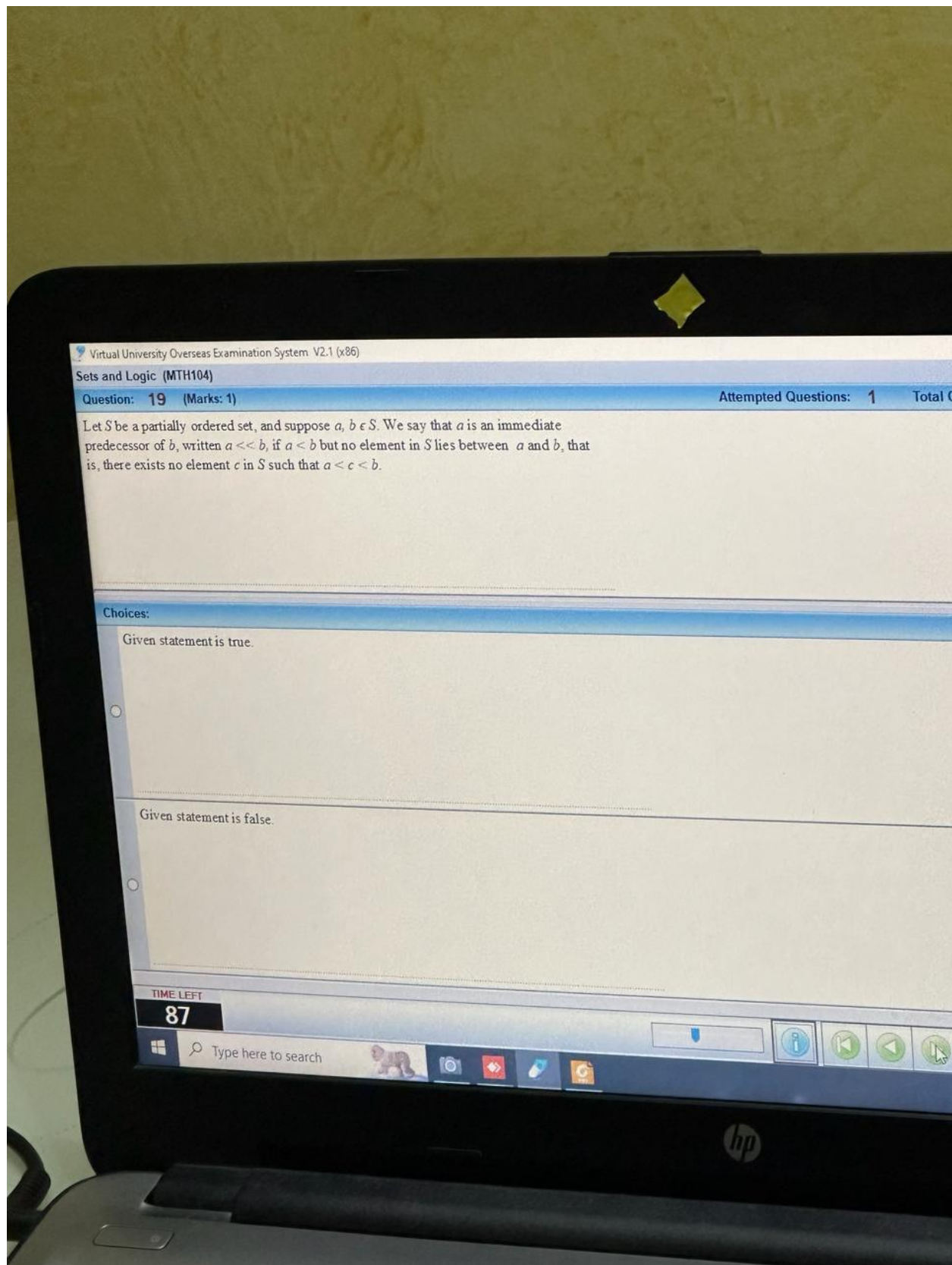
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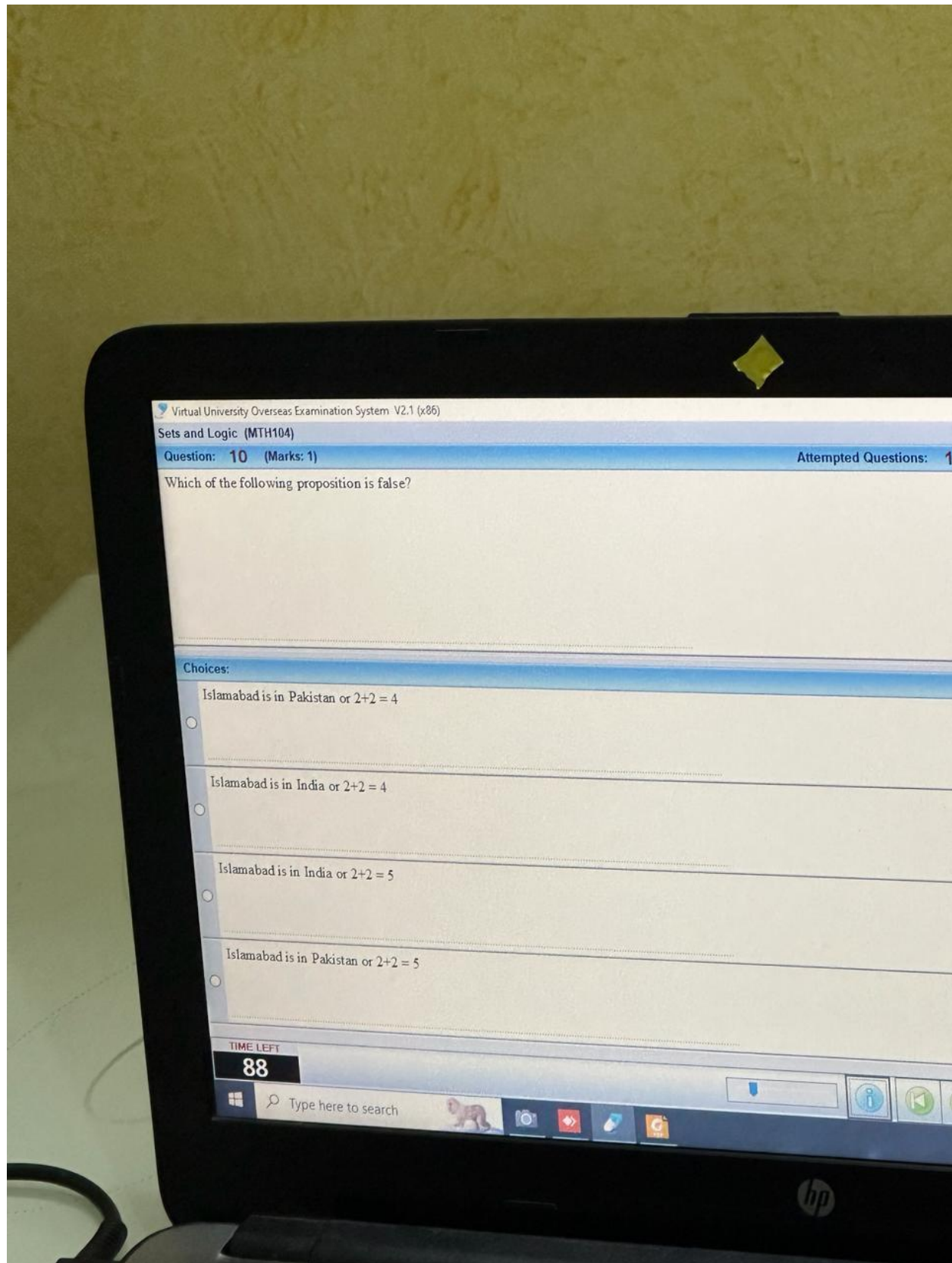
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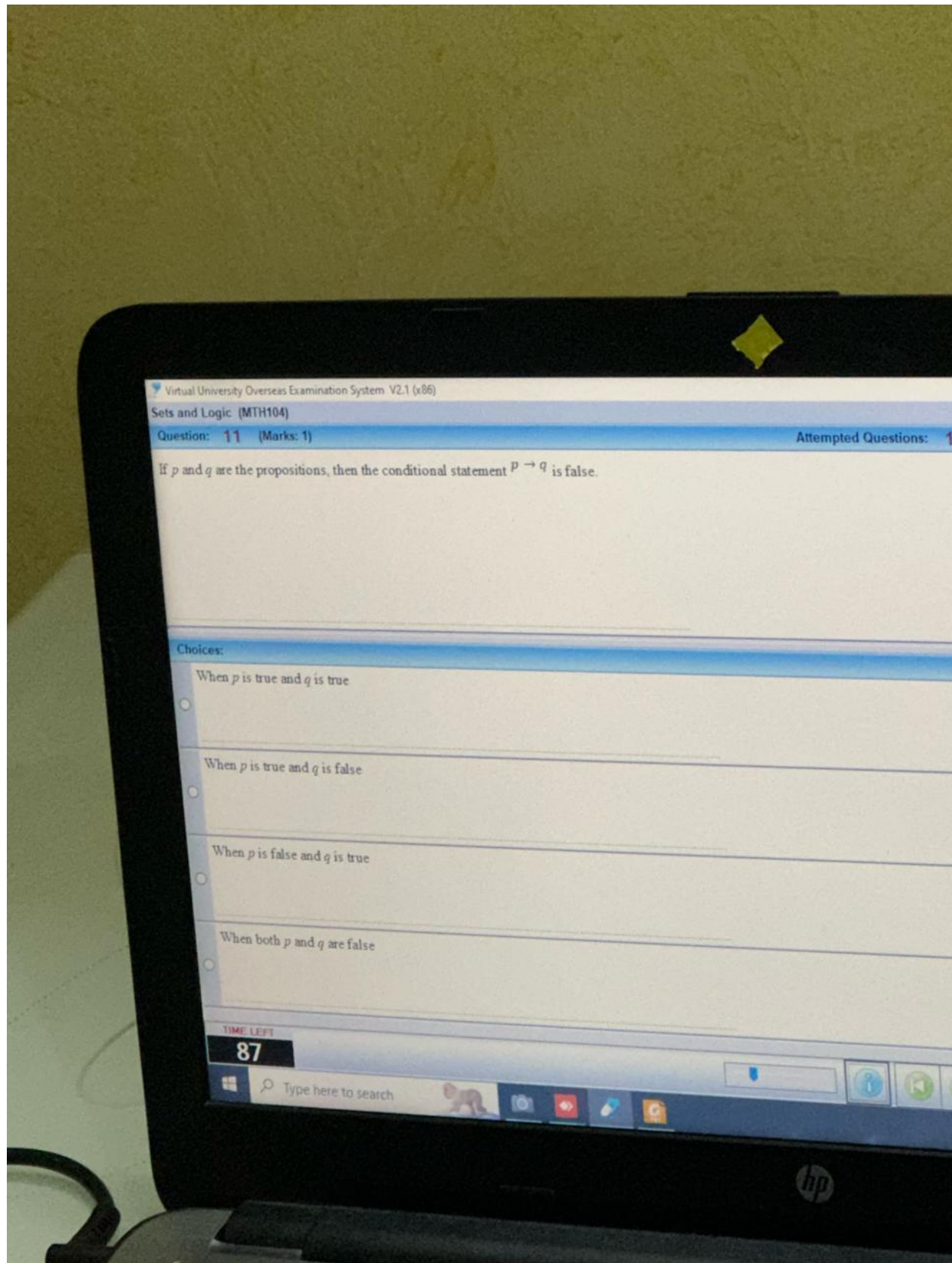
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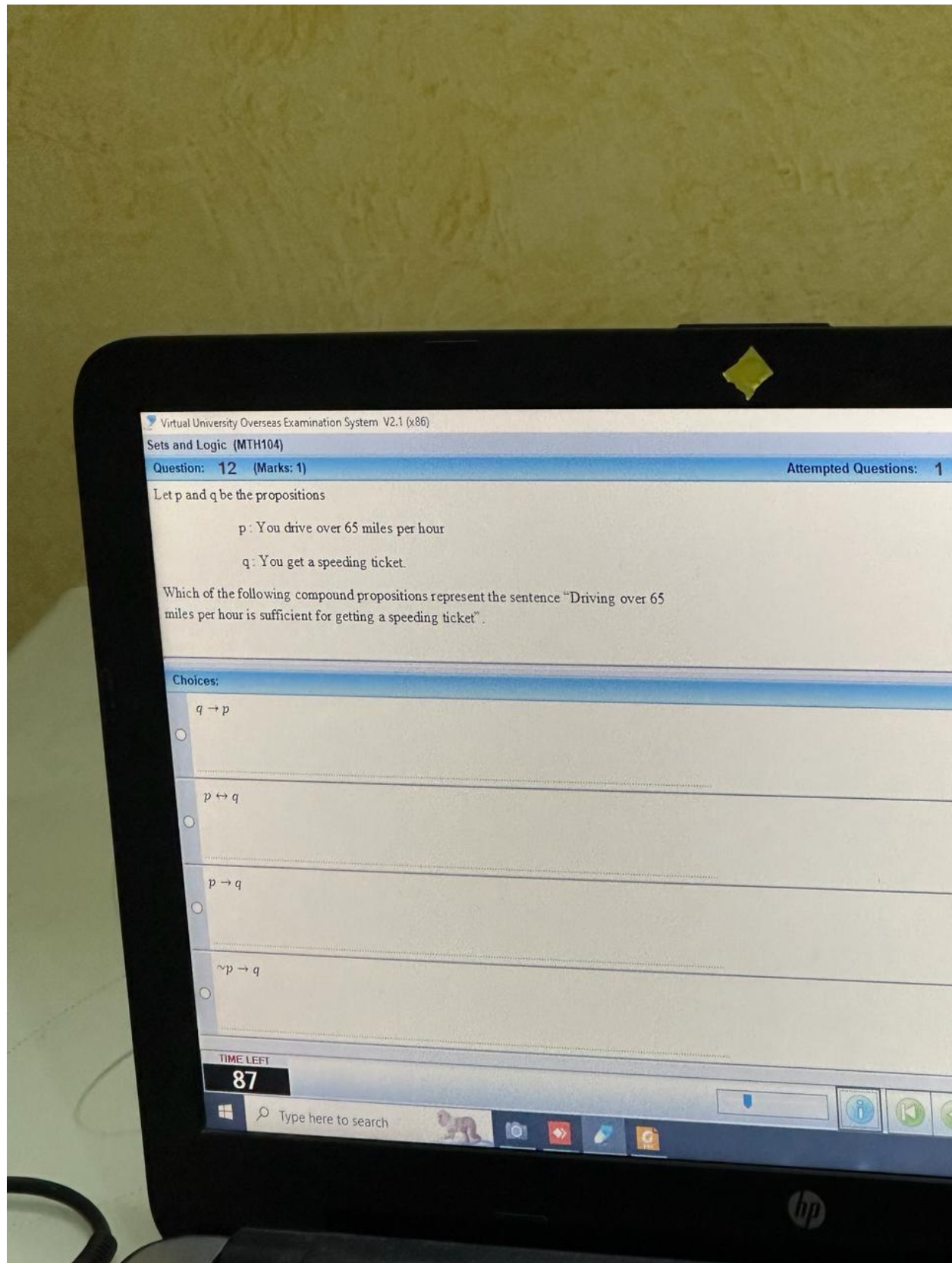
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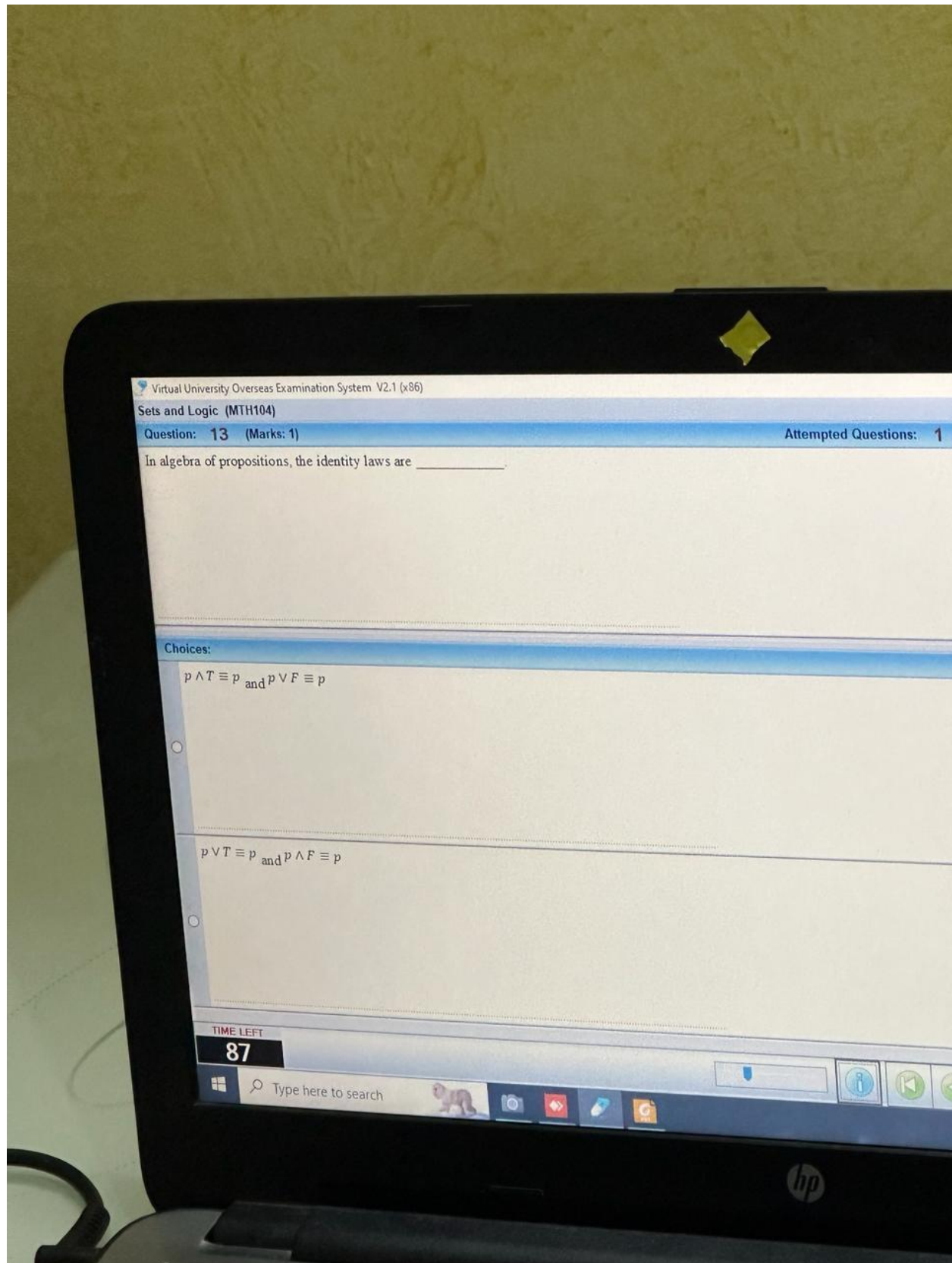
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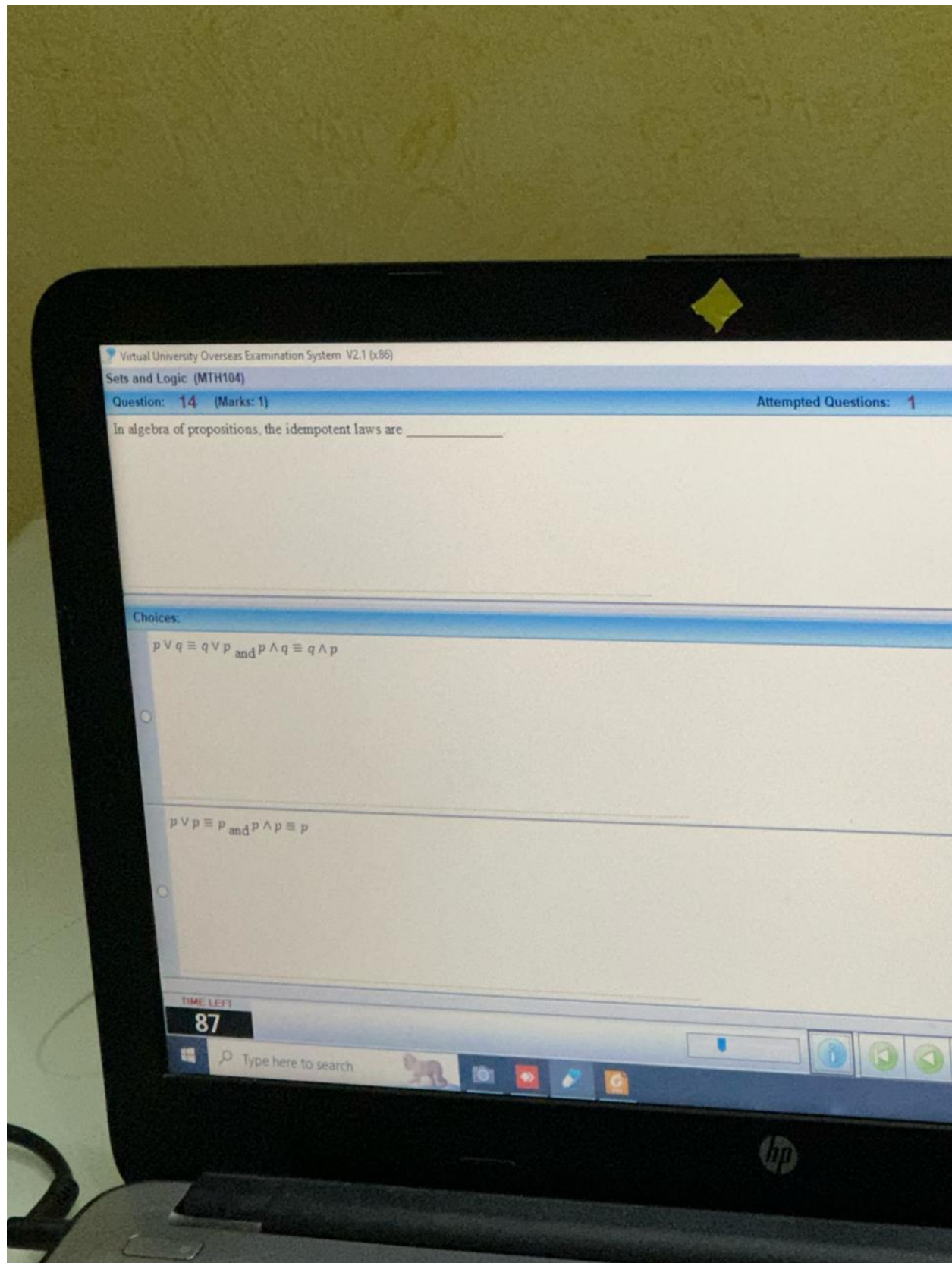
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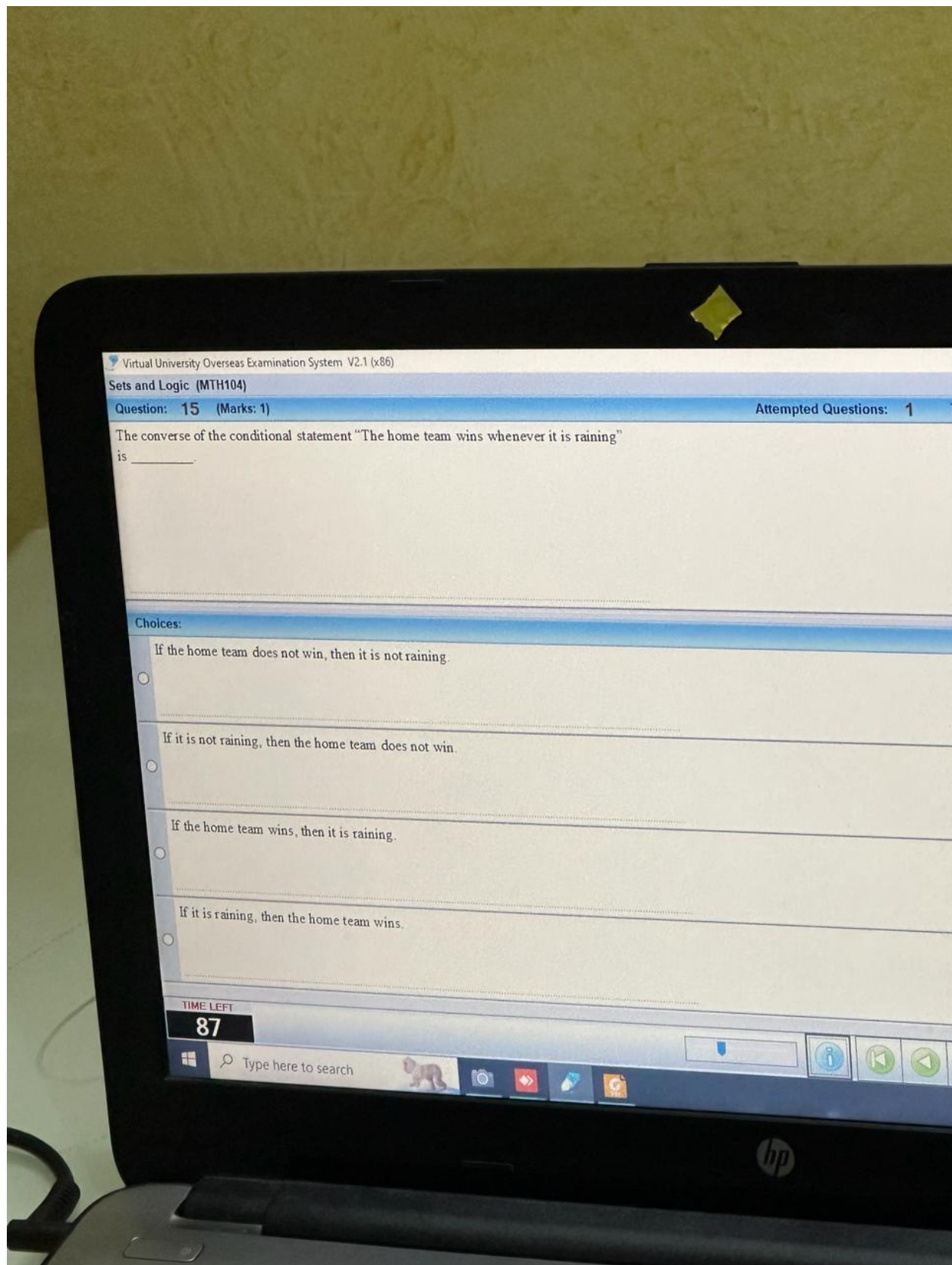
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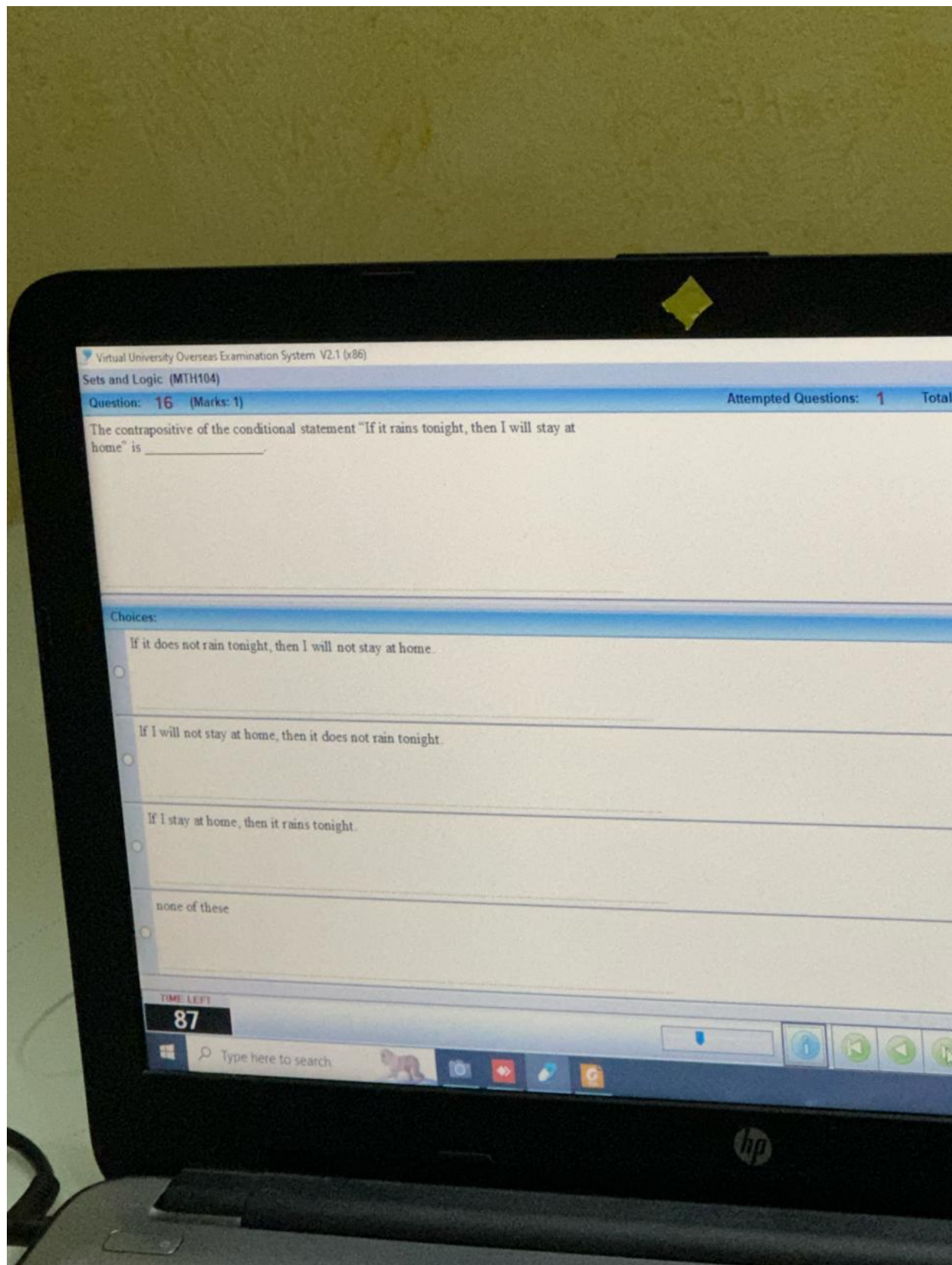
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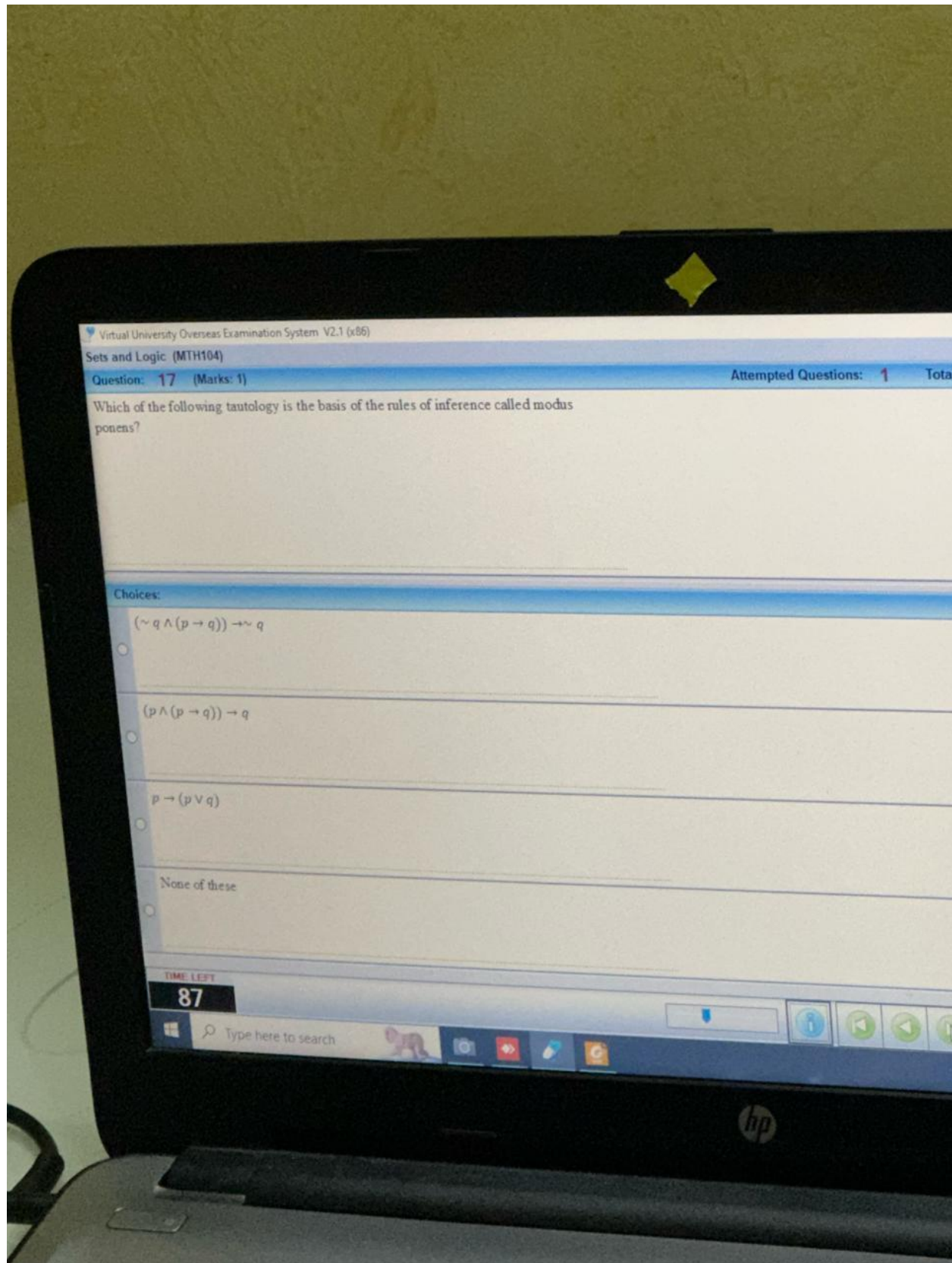
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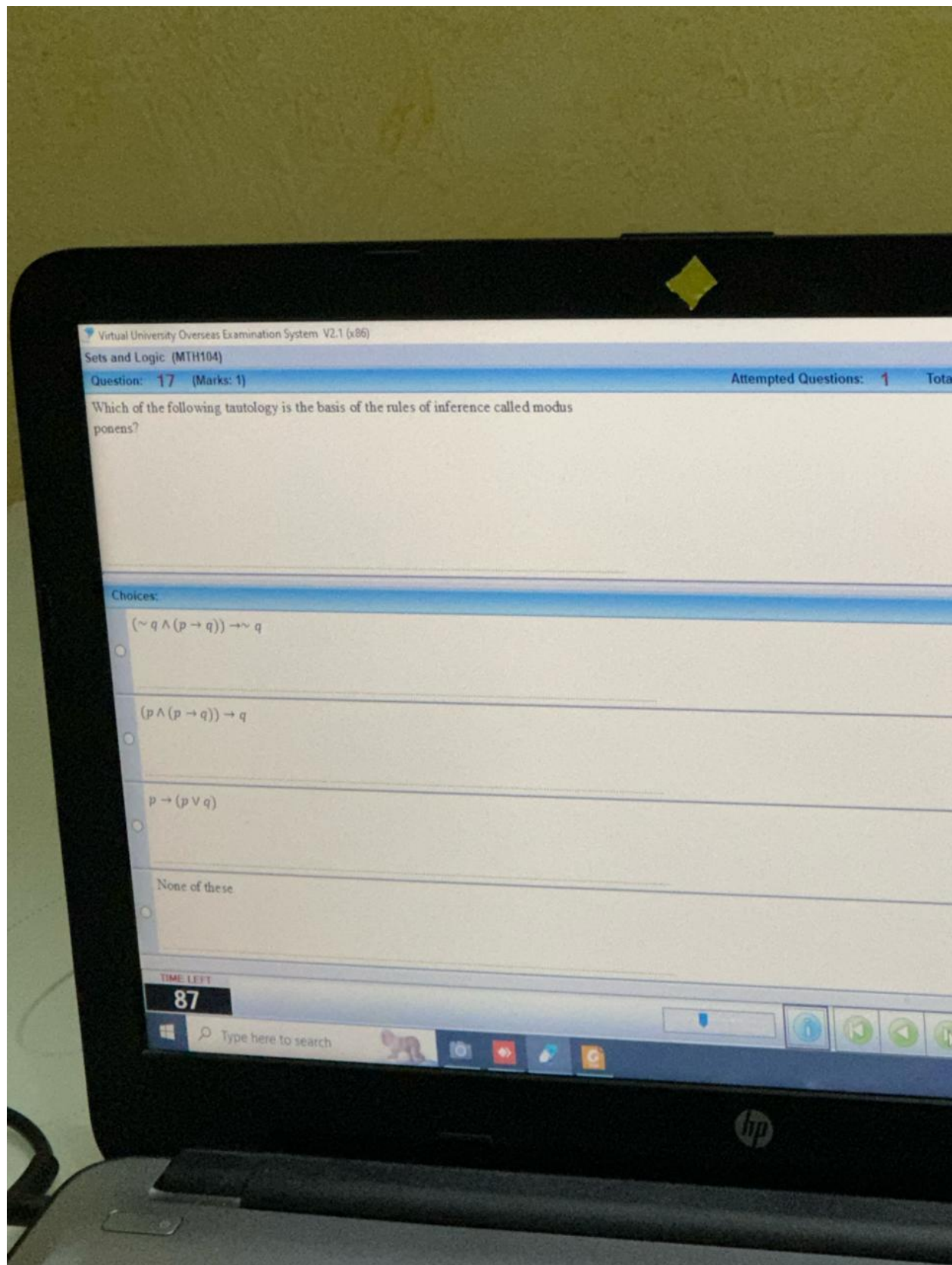
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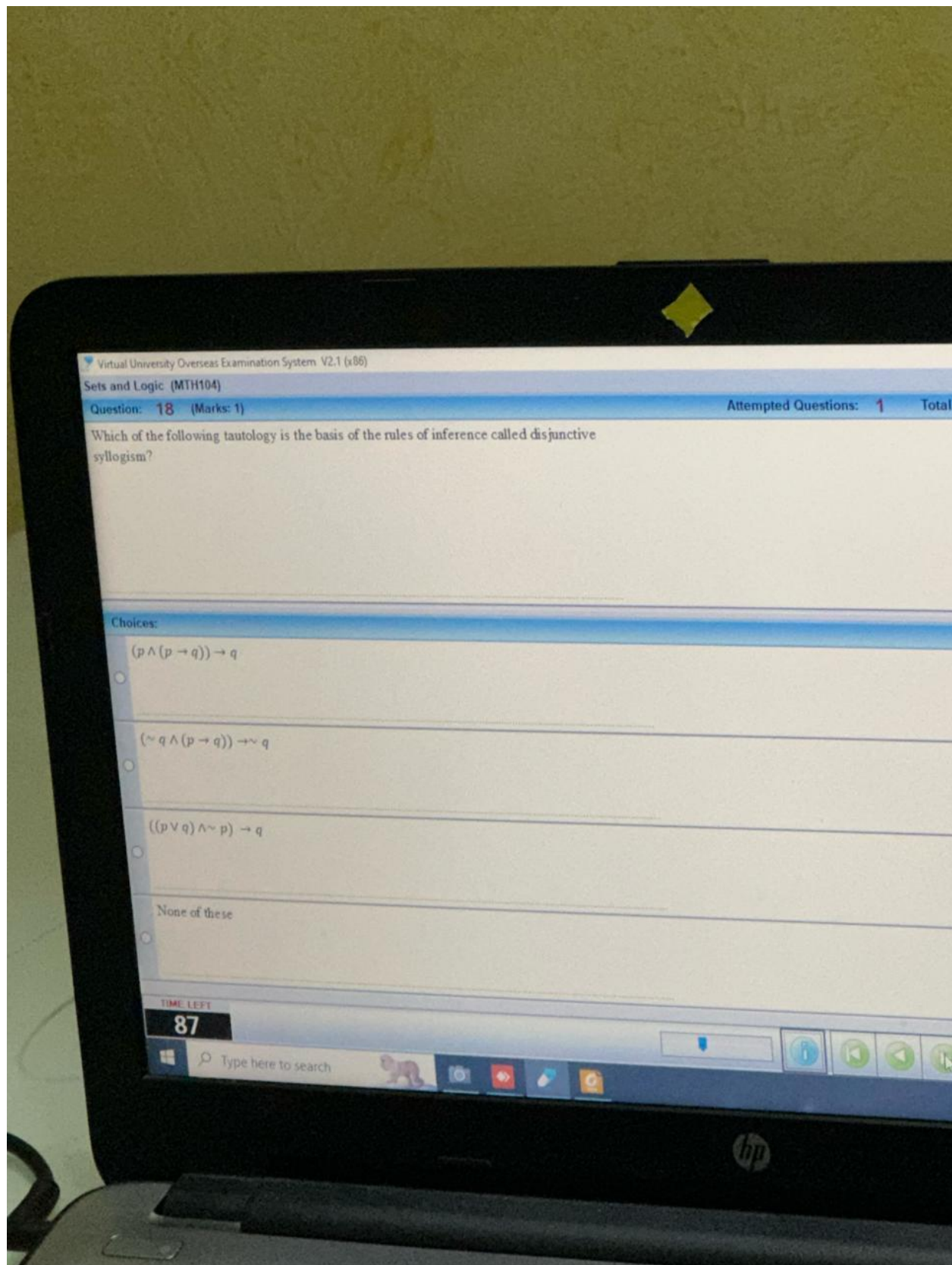
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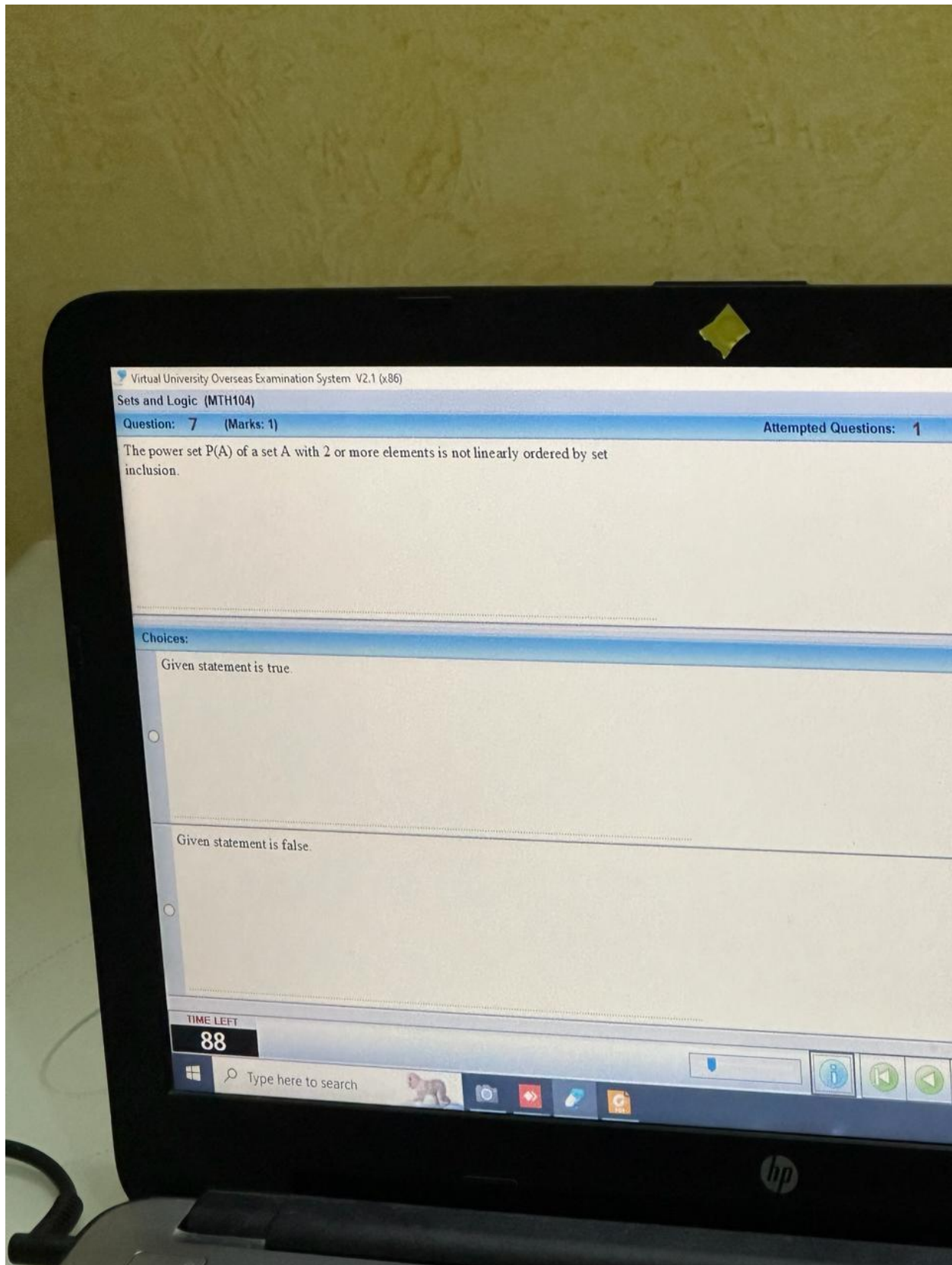
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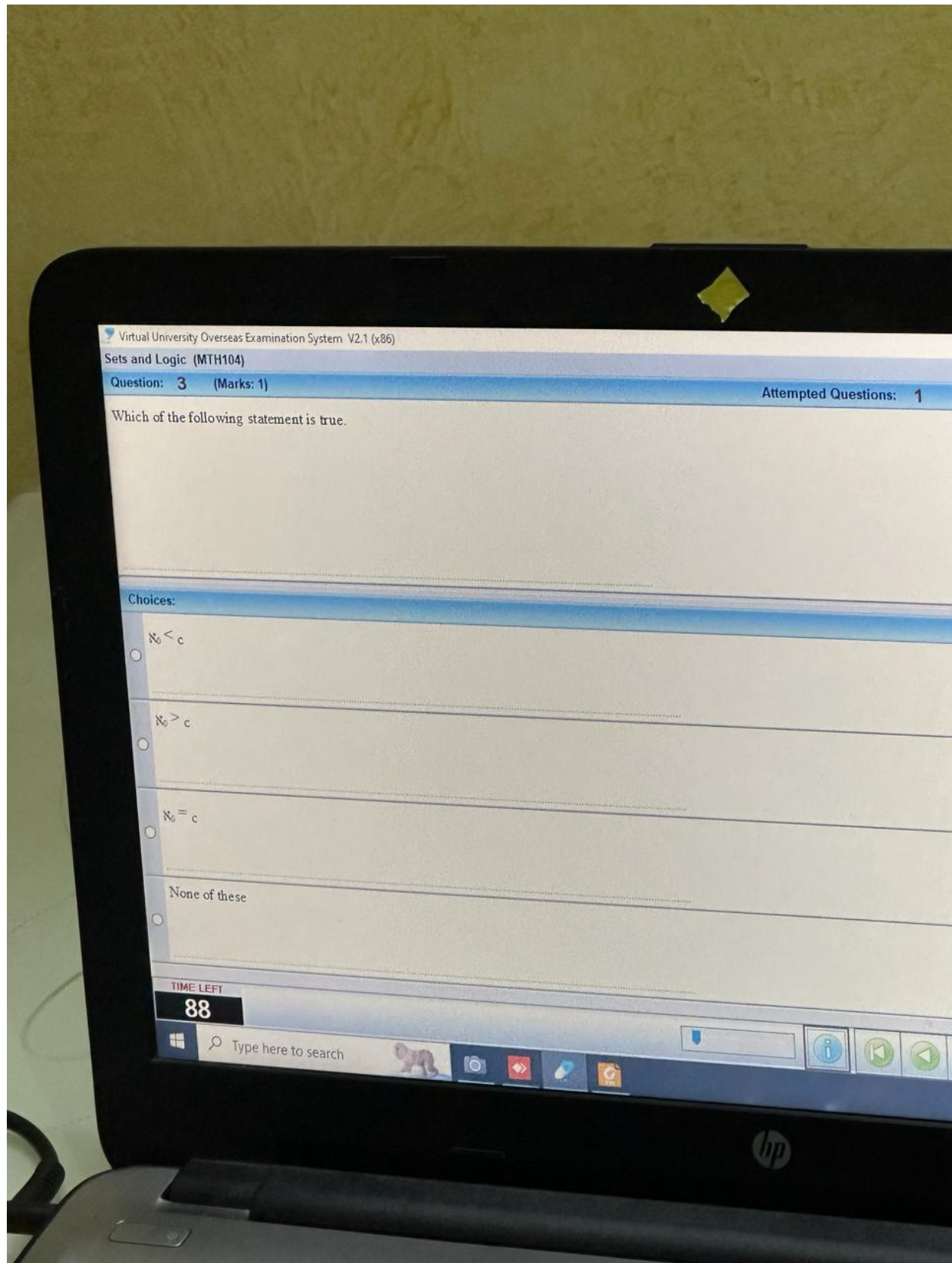
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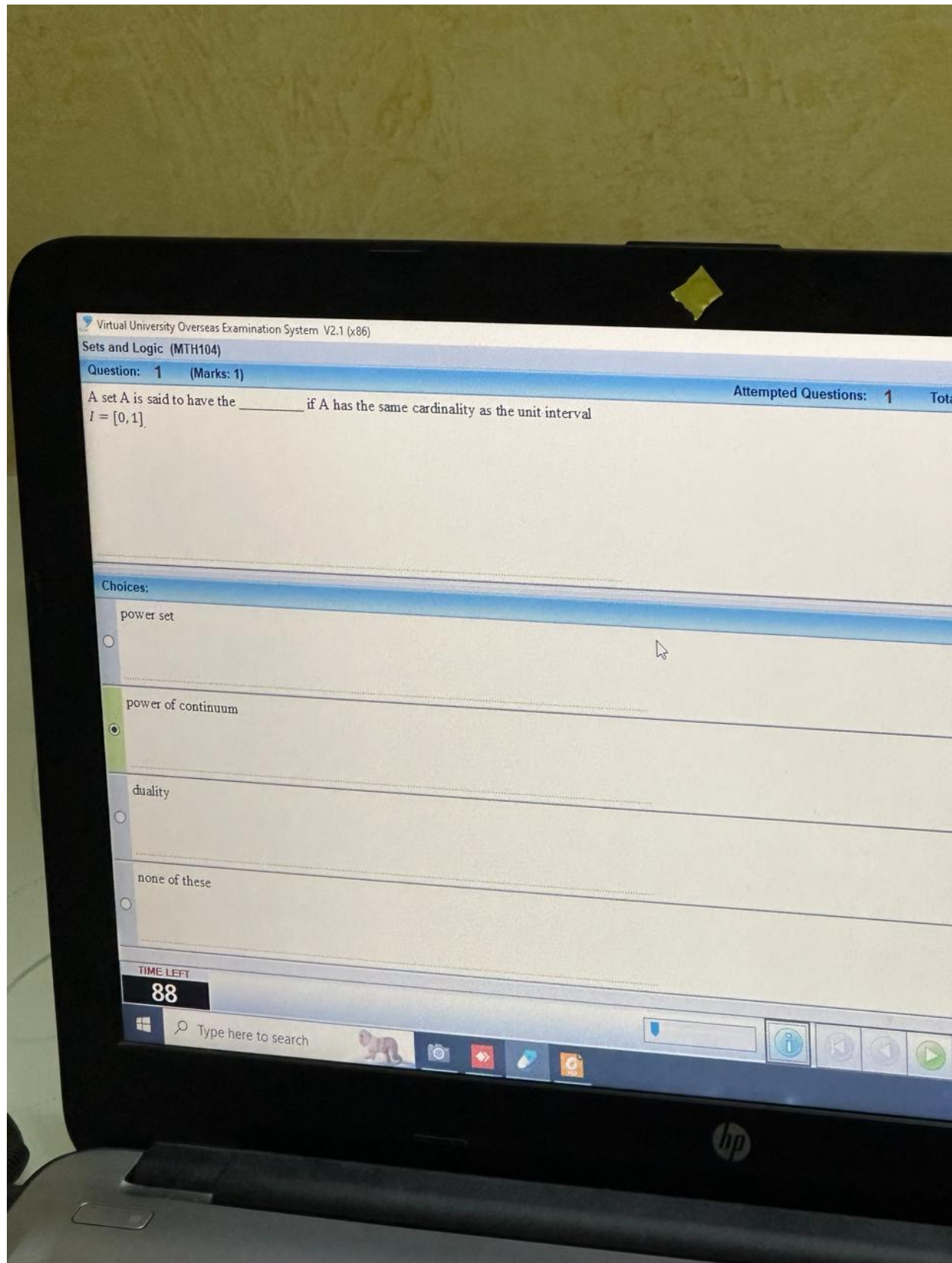
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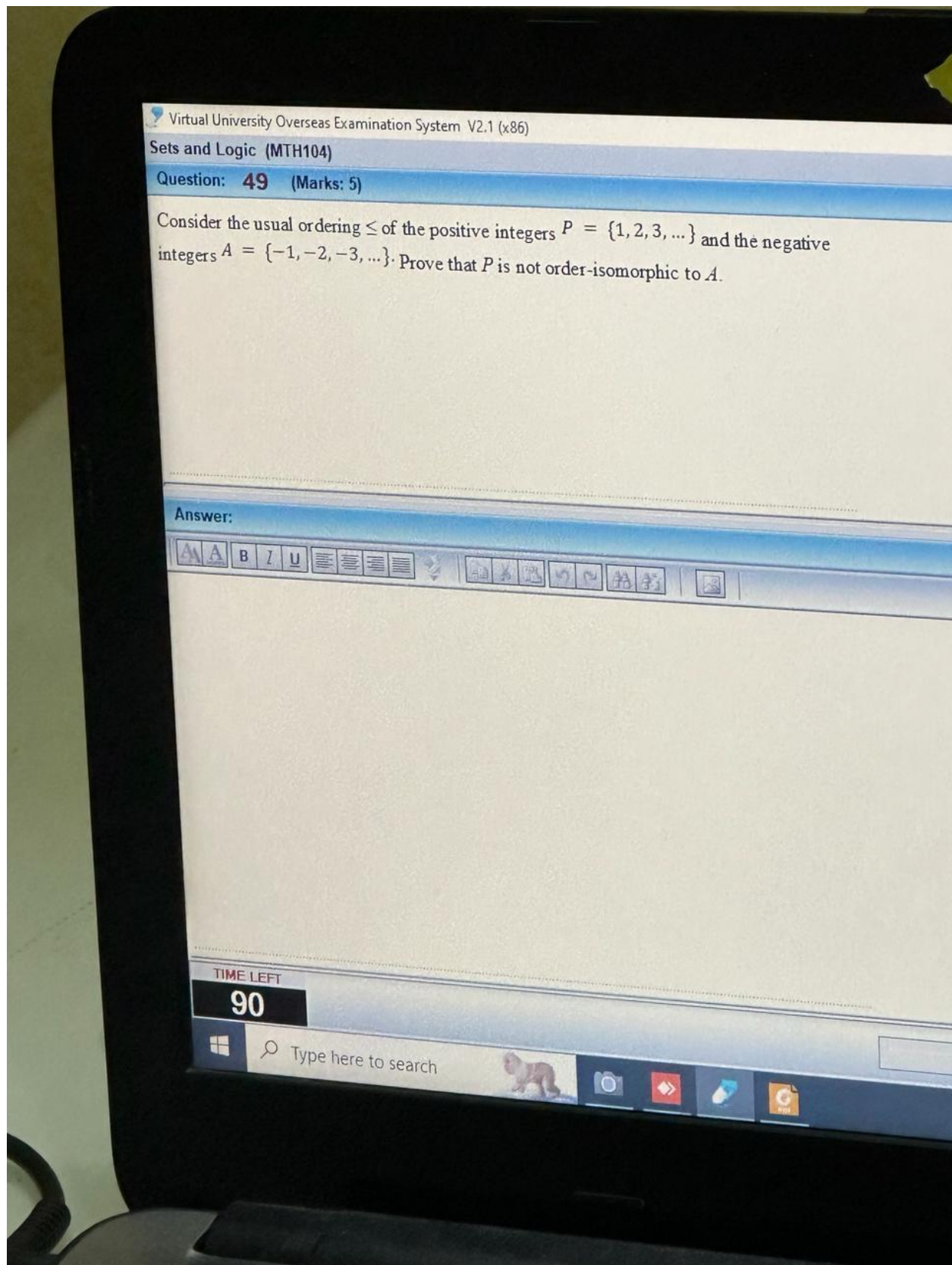
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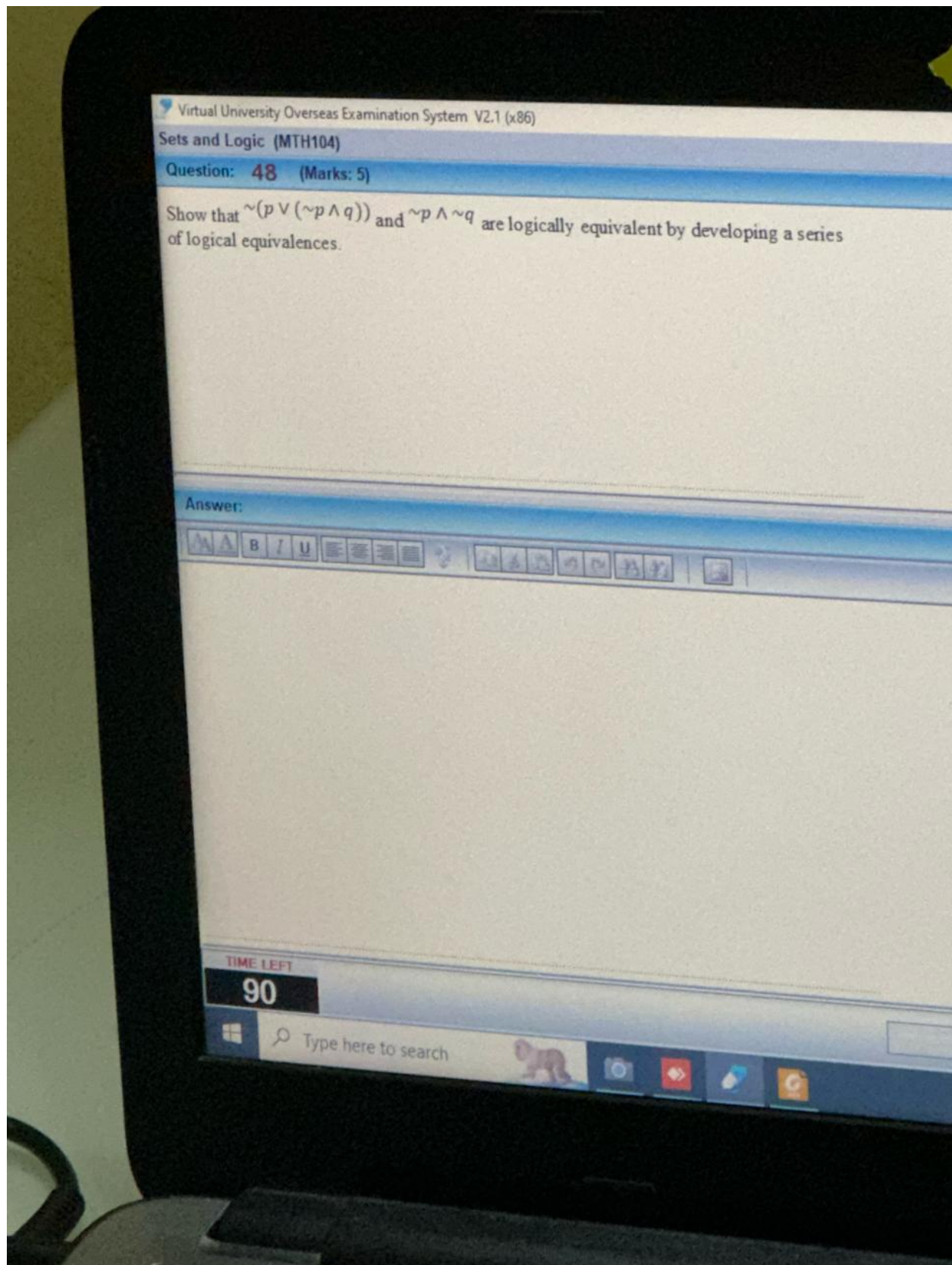
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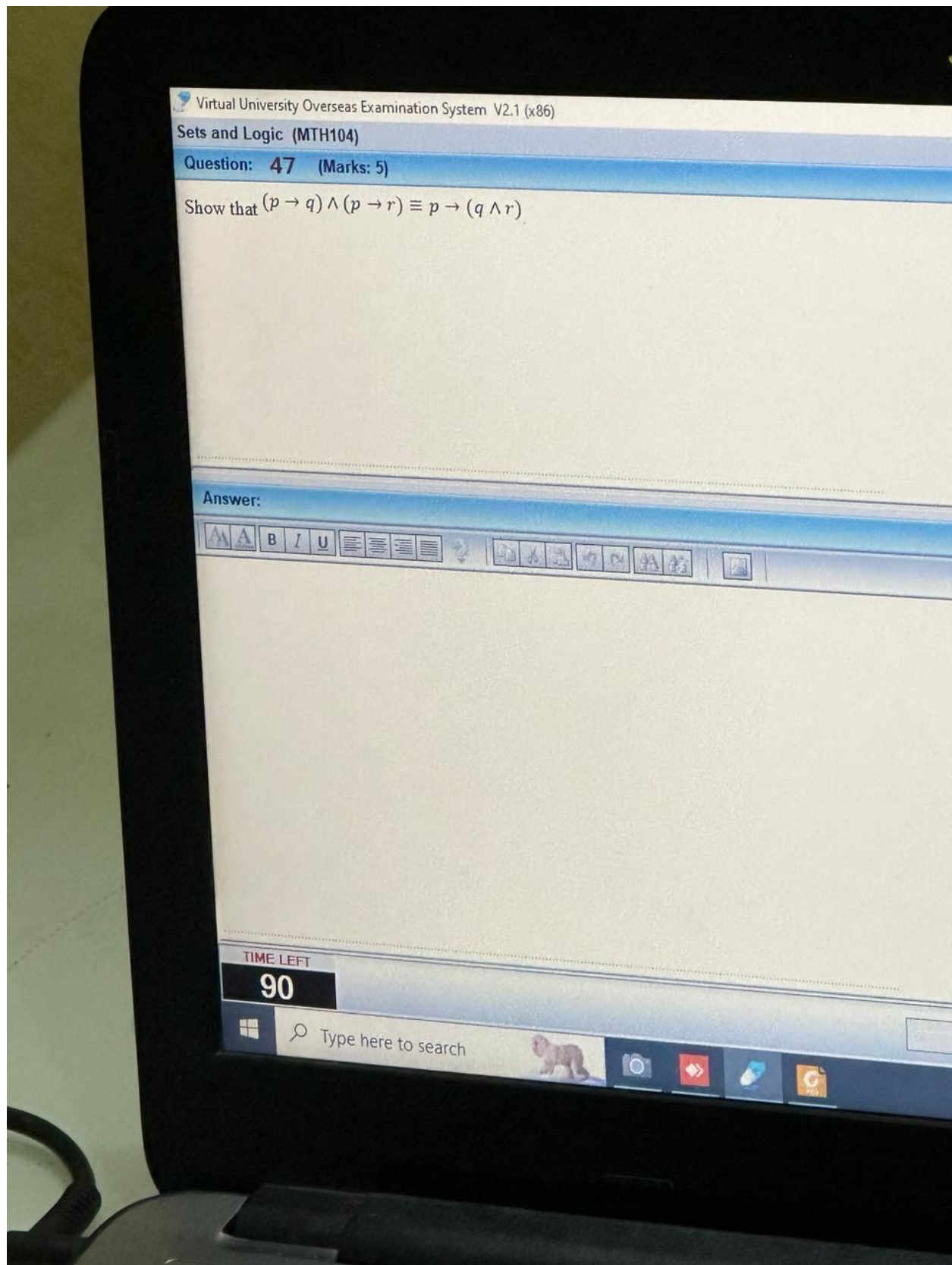
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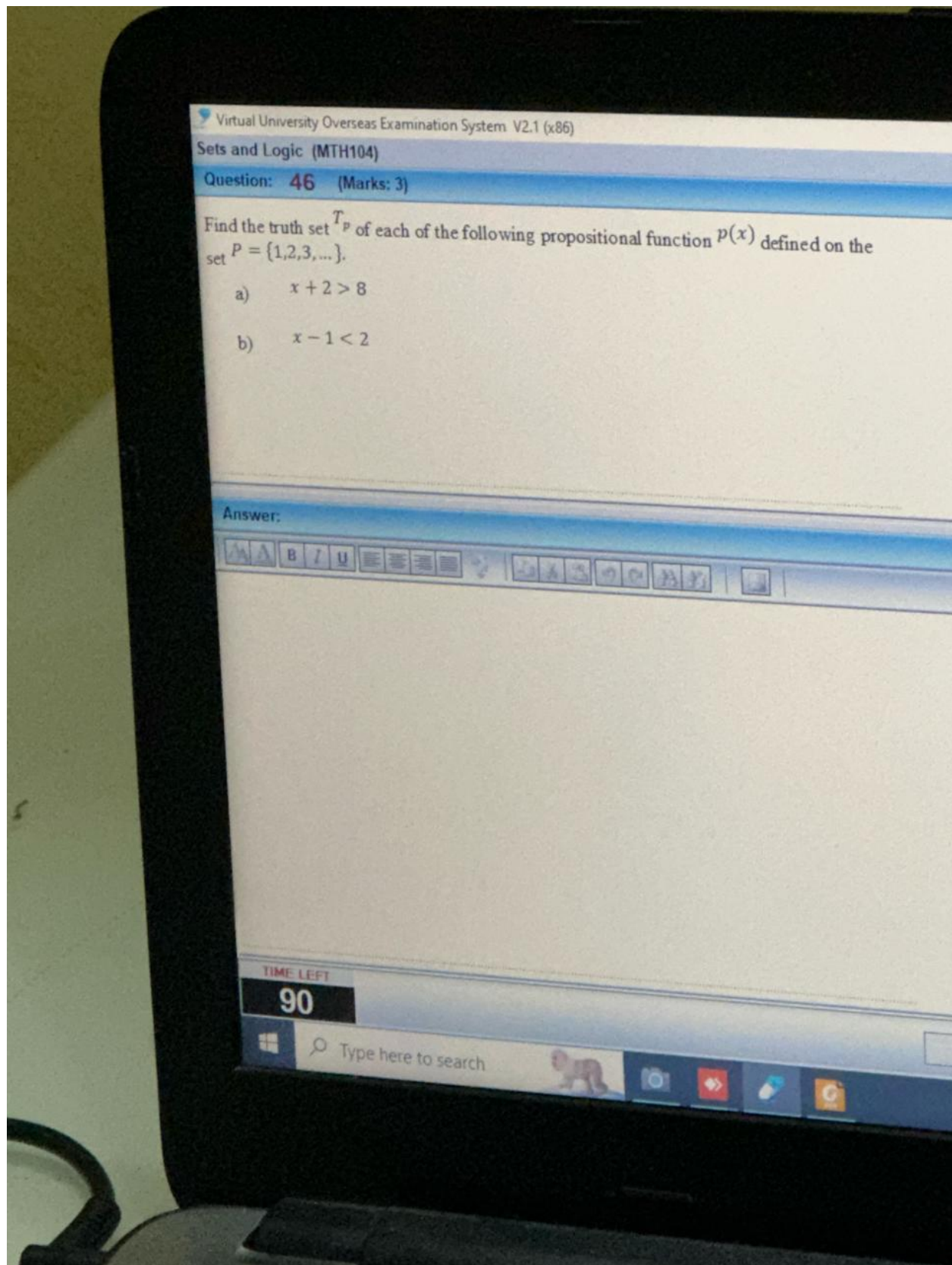
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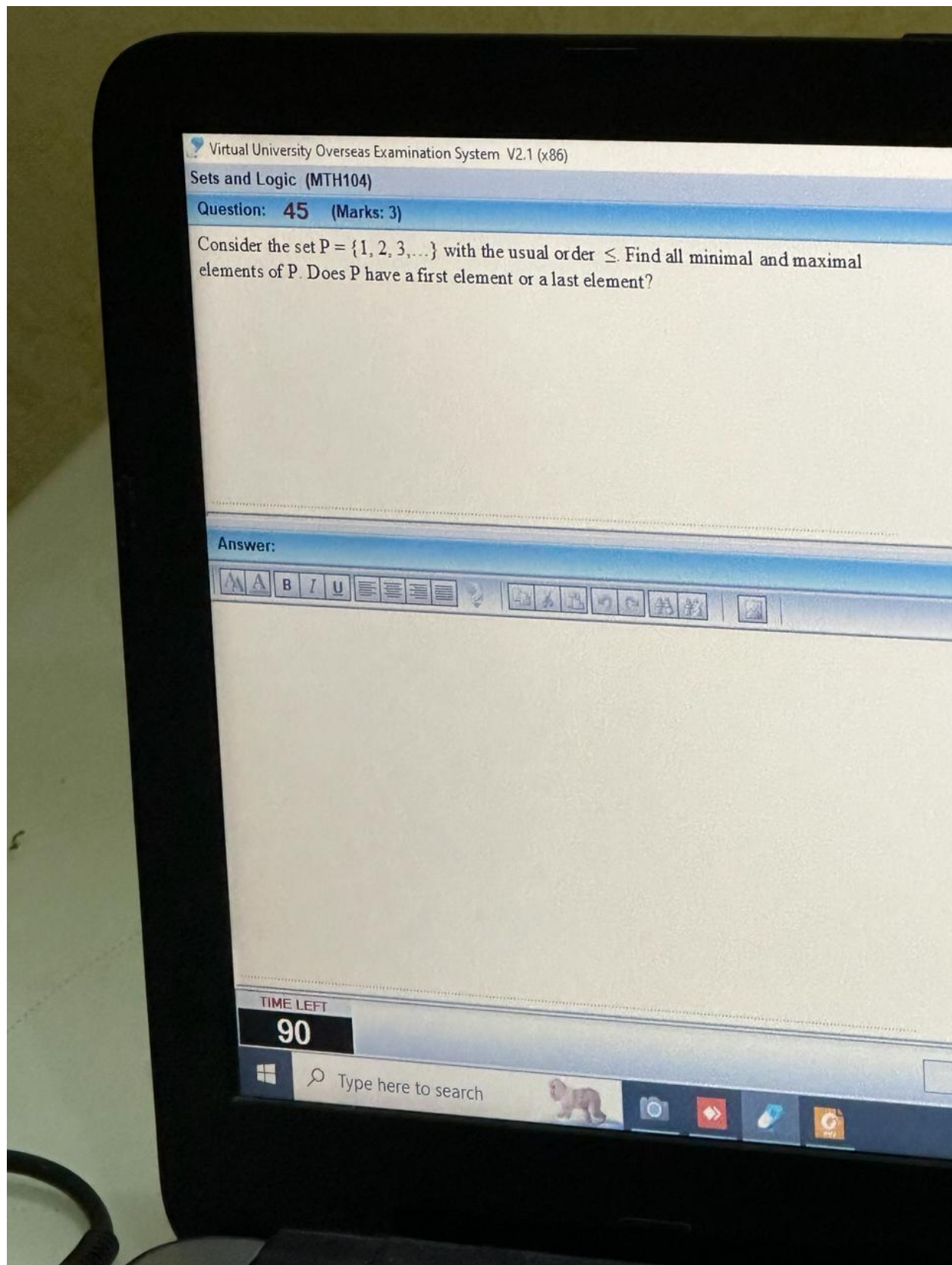
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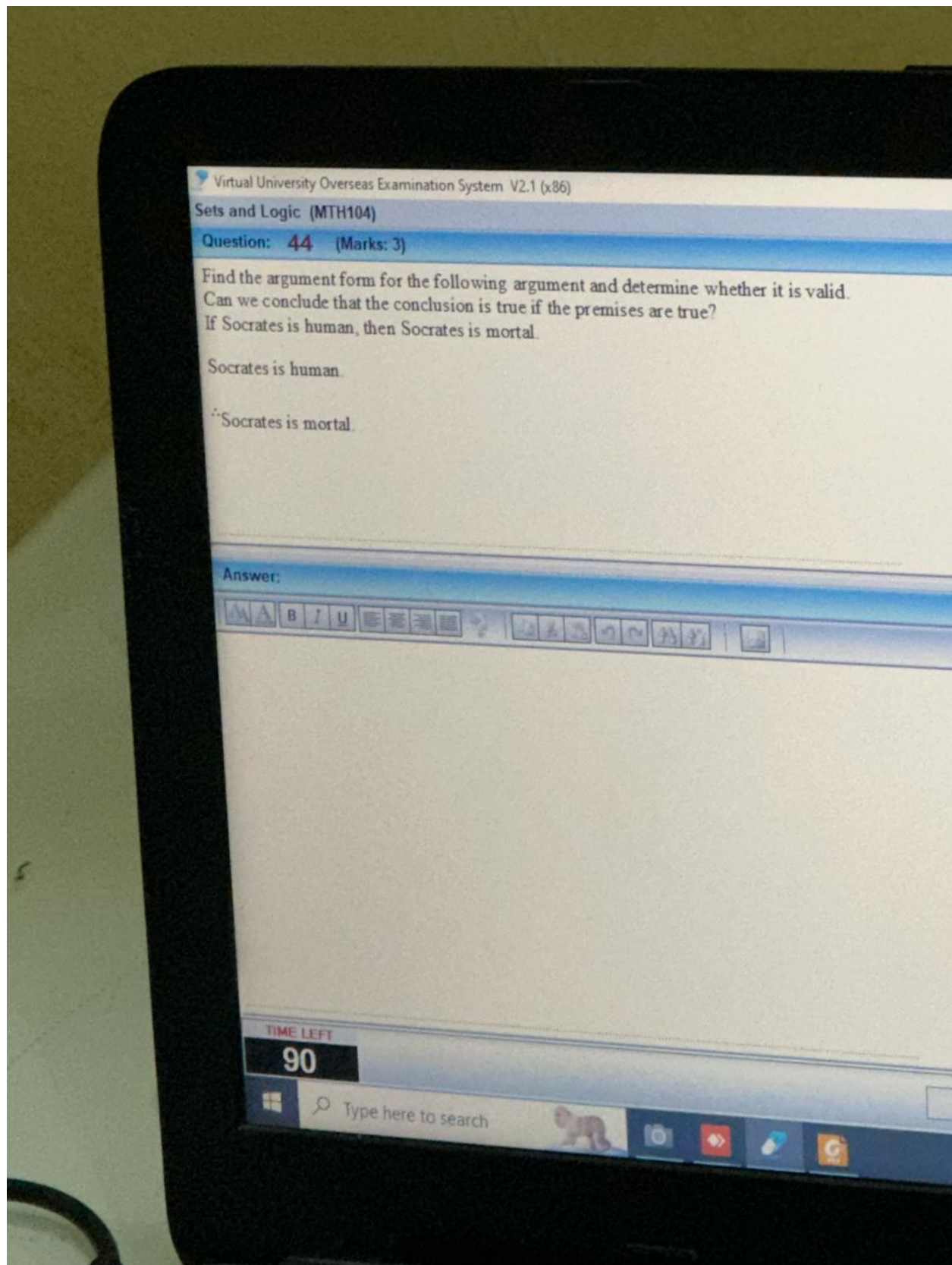
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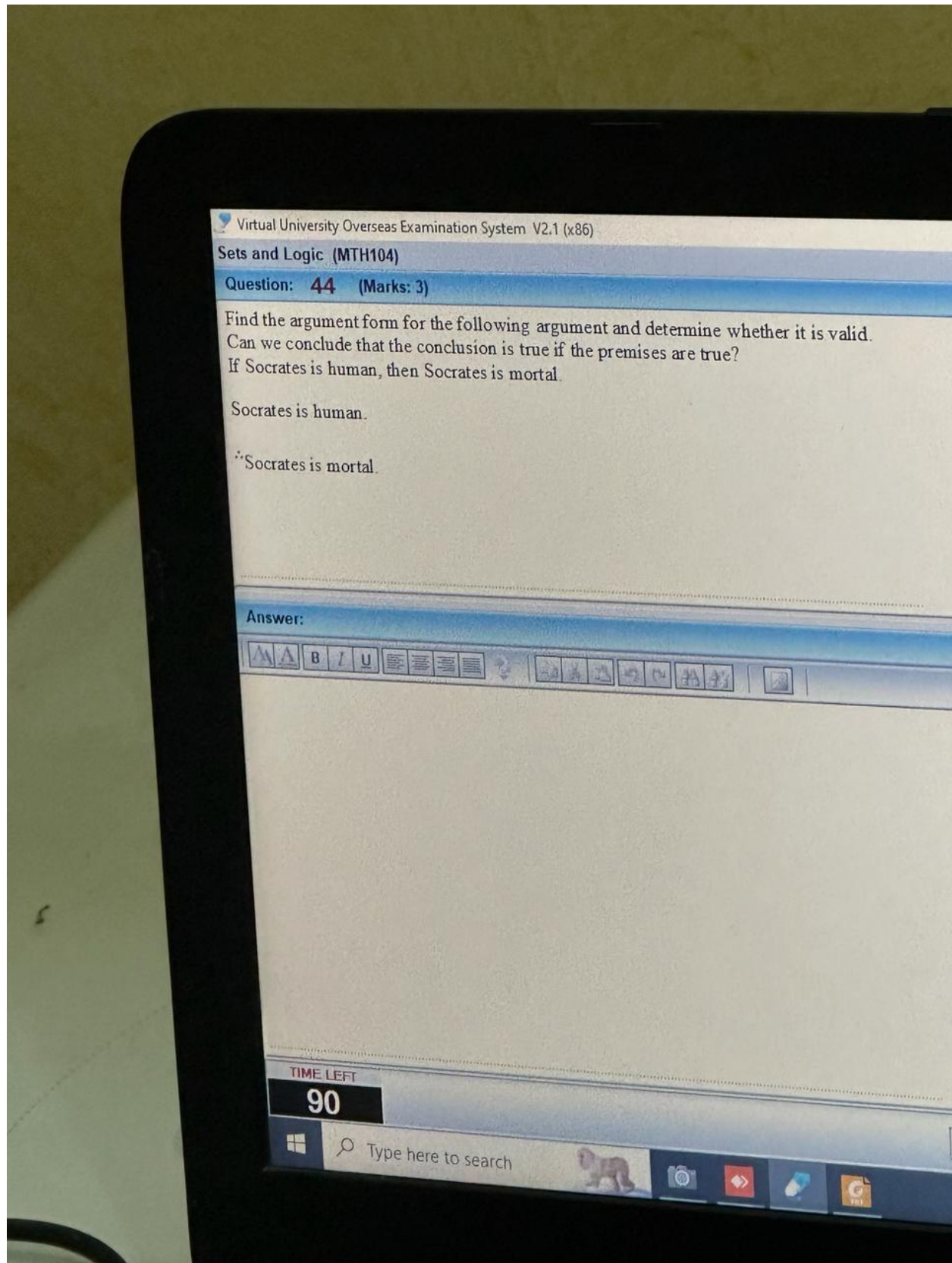
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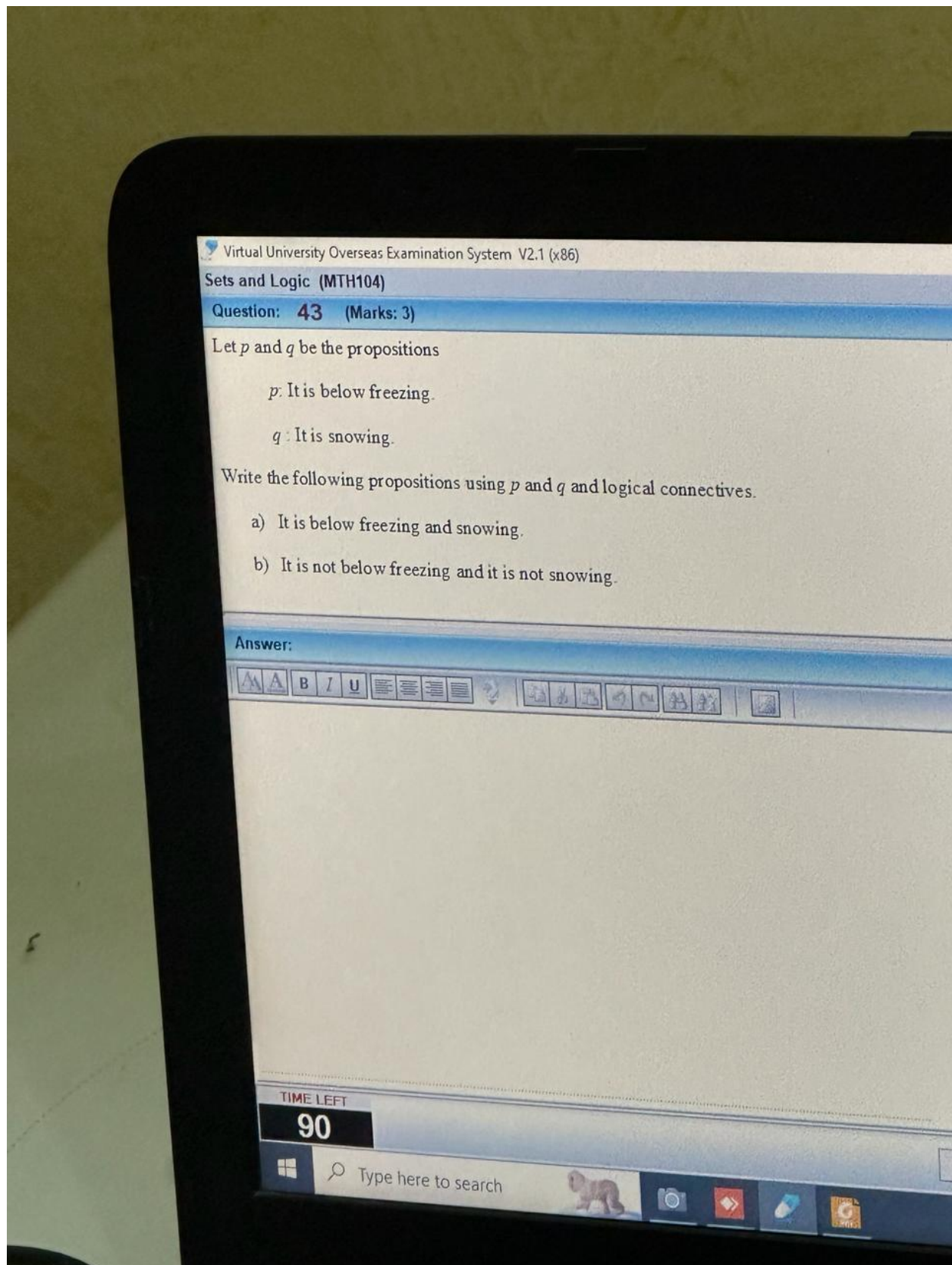
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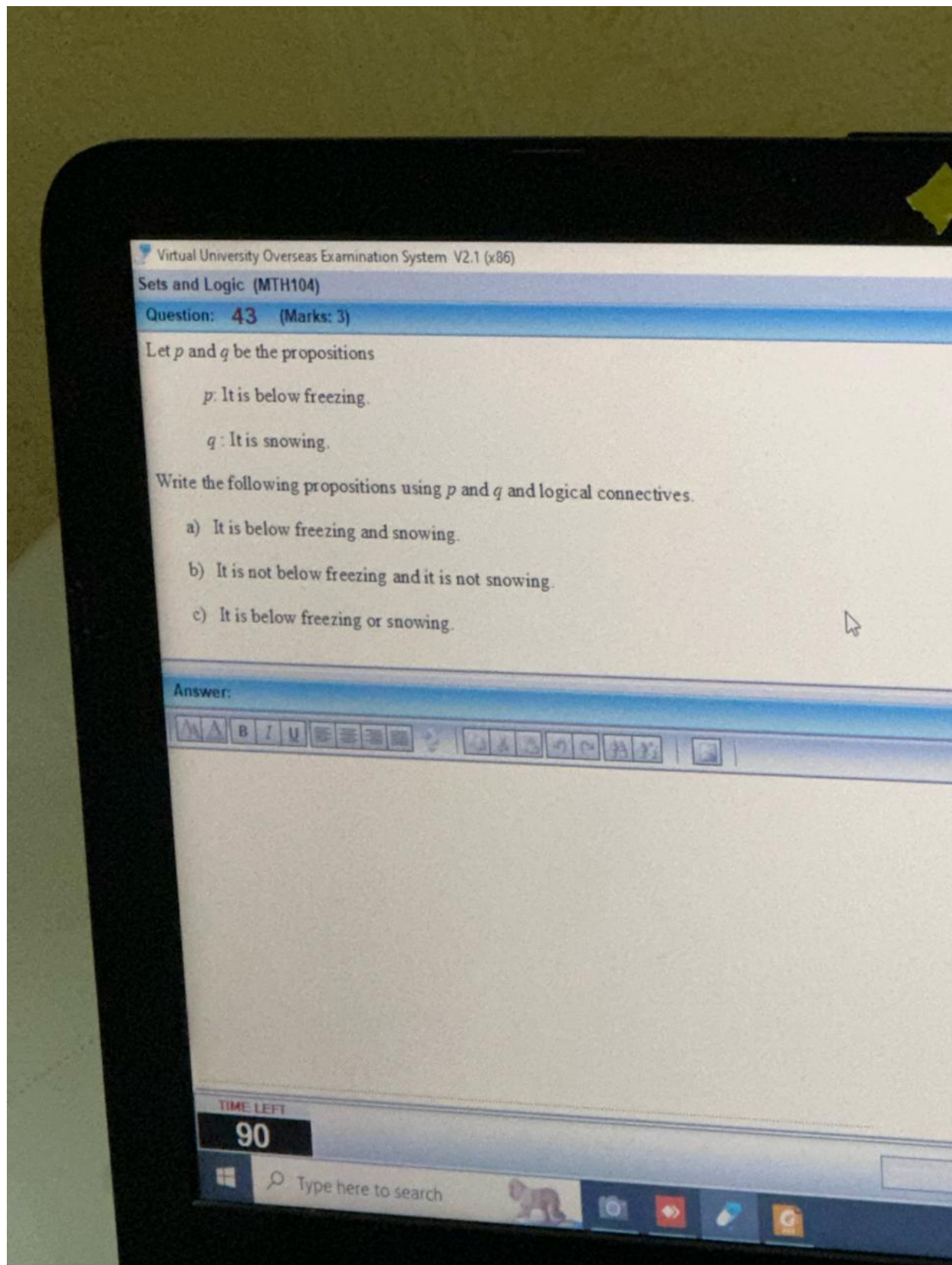
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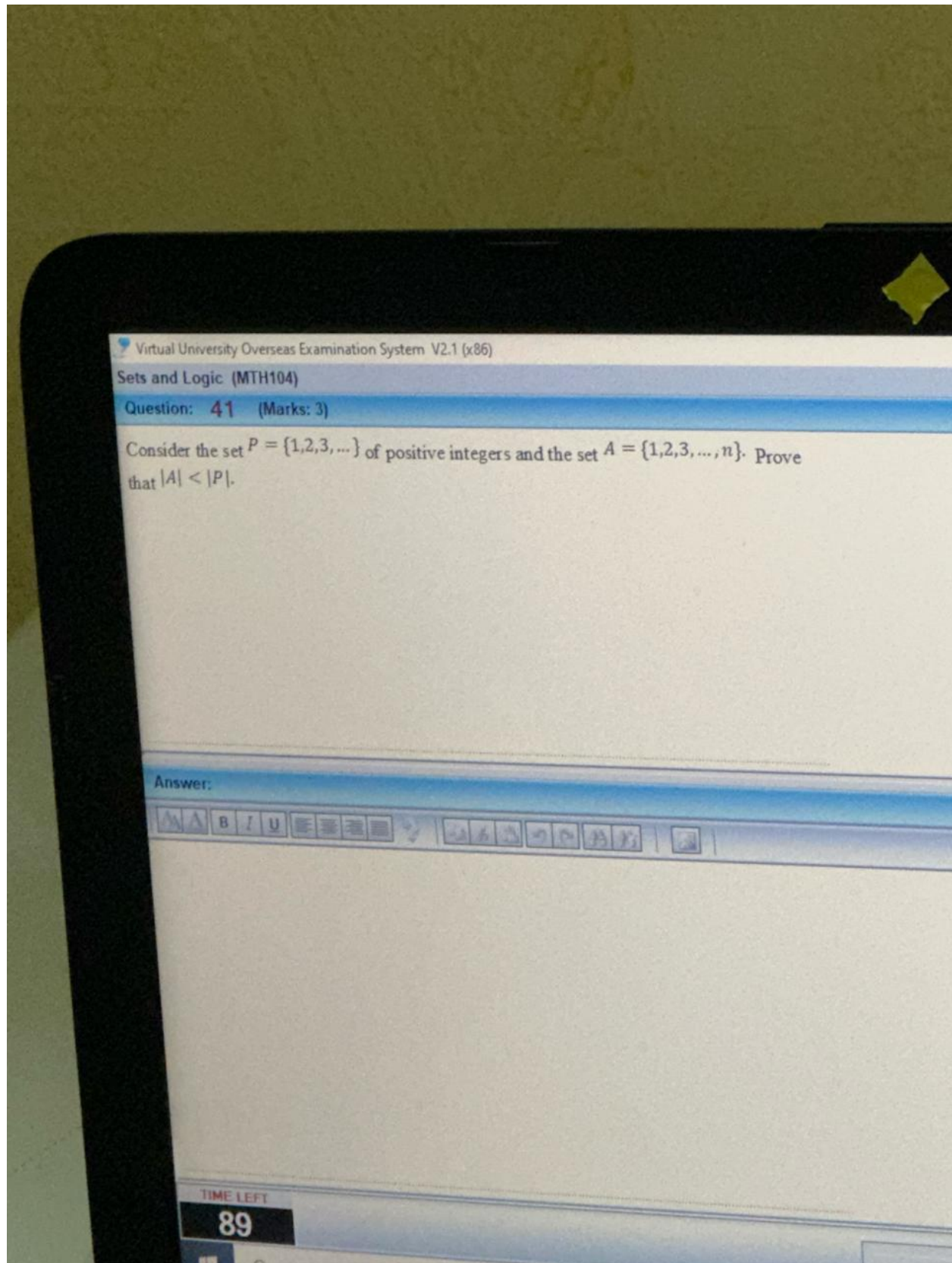
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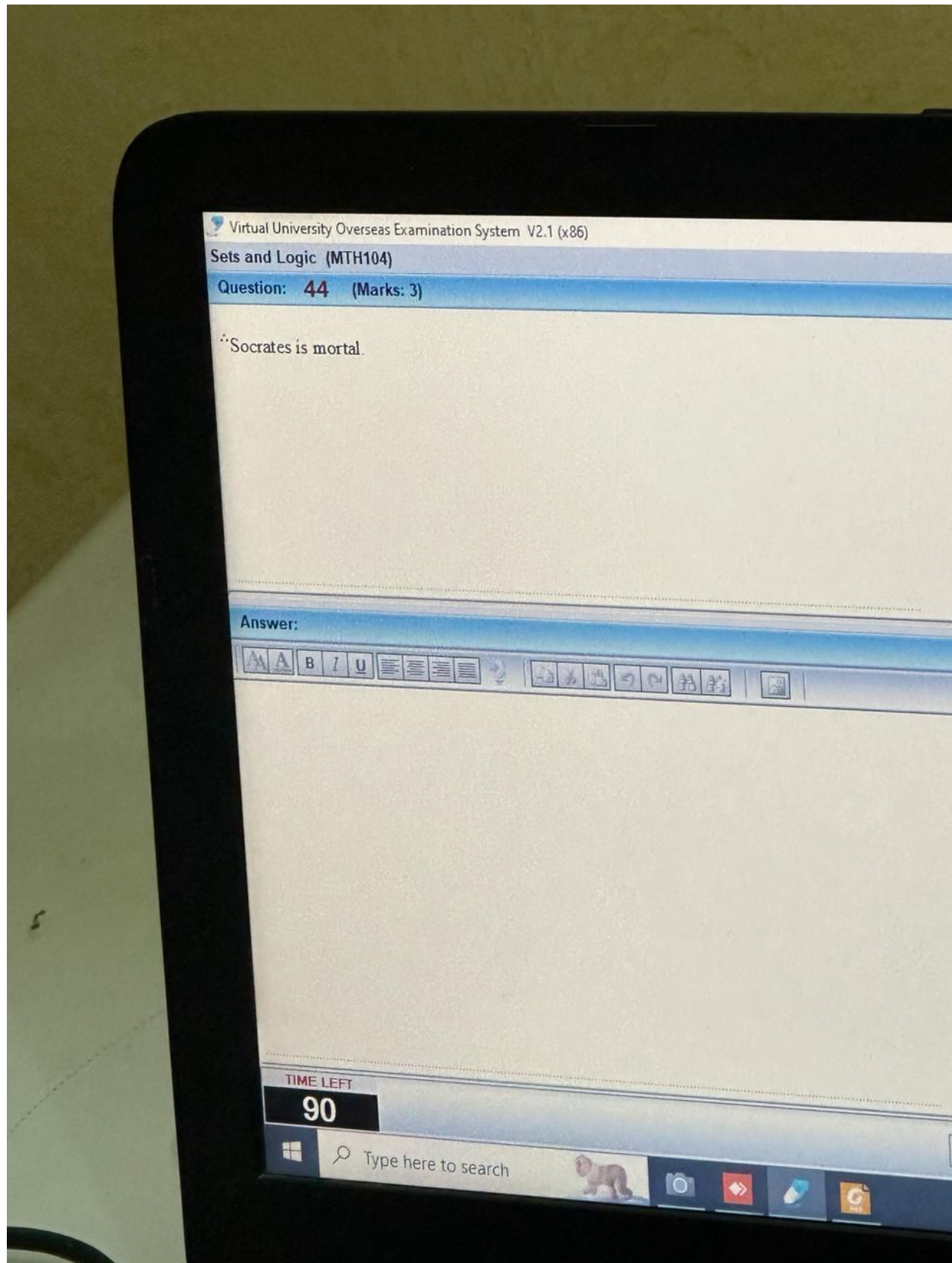
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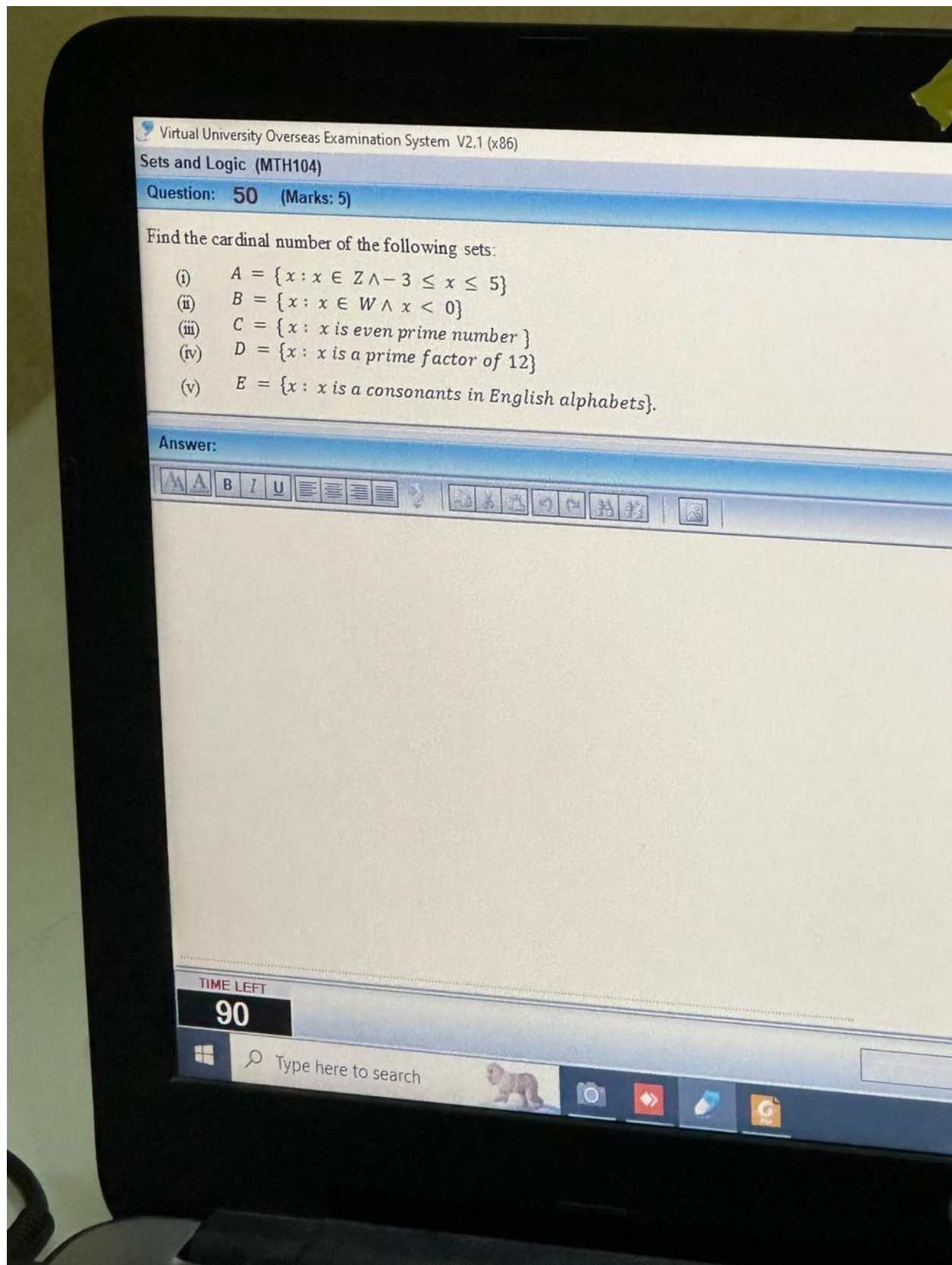
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# MTH104 FINAL TERM BY IQRA AZHAR



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# Solution



# MTH104 FINAL TERM BY IQRA AZHAR

Q45

If  $S$  is infinite, then  $S$  may have no minimal and maximal element. For instance, the set  $\mathbb{Z}$  of integers with the usual order  $\leq$  has no minimal and maximal element.

First element = 1

Last element = no last element

Q48

## Example 2

Show that  $\sim(p \vee (\sim p \wedge q))$  and  $\sim p \wedge \sim q$  are logically equivalent by developing a series of logical equivalences.

$$\begin{aligned}
 \sim(p \vee (\sim p \wedge q)) &\equiv \sim p \wedge \sim(\sim p \wedge q), && \text{by the 2nd De Morgan Law} \\
 &\equiv \sim p \wedge [\sim(\sim p) \wedge \sim q], && // \\
 &\equiv \sim p \wedge [p \wedge \sim q], && \text{by the double negation law.} \\
 &\equiv (\sim p \wedge p) \vee (\sim p \wedge \sim q), && \text{by the distributive Law.} \\
 &\equiv F \vee (\sim p \wedge \sim q) \\
 &\equiv \sim p \wedge \sim q, && \text{by the identity Law.}
 \end{aligned}$$

### Example 3

Show that  $\underline{(p \rightarrow q) \wedge (p \rightarrow r)} \equiv \underline{p \rightarrow (q \wedge r)}$  and  ~~$p \rightarrow (q \vee r)$~~  are logically equivalent.

| $\checkmark$<br>$p$ | $q$ | $r$ | $\checkmark$<br>$p \rightarrow q$ | $\checkmark$<br>$p \rightarrow r$ | $\downarrow$<br>$(p \rightarrow q) \wedge (p \rightarrow r)$ | $\checkmark$<br>$q \wedge r$ | $\downarrow$<br>$p \rightarrow (q \wedge r)$ |
|---------------------|-----|-----|-----------------------------------|-----------------------------------|--------------------------------------------------------------|------------------------------|----------------------------------------------|
| T                   | T   | T   | T                                 | T                                 | T                                                            | T                            | T                                            |
| T                   | T   | F   | T                                 | F                                 | F                                                            | F                            | F                                            |
| T                   | F   | T   | F                                 | T                                 | F                                                            | F                            | F                                            |
| T                   | F   | F   | F                                 | F                                 | F                                                            | F                            | F                                            |
| F                   | T   | T   | T                                 | T                                 | T                                                            | T                            | T                                            |
| F                   | T   | F   | T                                 | T                                 | T                                                            | F                            | T                                            |
| F                   | F   | T   | T                                 | T                                 | T                                                            | F                            | T                                            |
| F                   | F   | F   | T                                 | T                                 | T                                                            | F                            | T                                            |

Proved

(a)  $x+2 > 8$

$P = \{1, 2, \dots\}$

when  $x = 7$

$7+2 > 8 \Rightarrow 9 > 8$

True

$8+2 > 8 \Rightarrow 10 > 8$

True

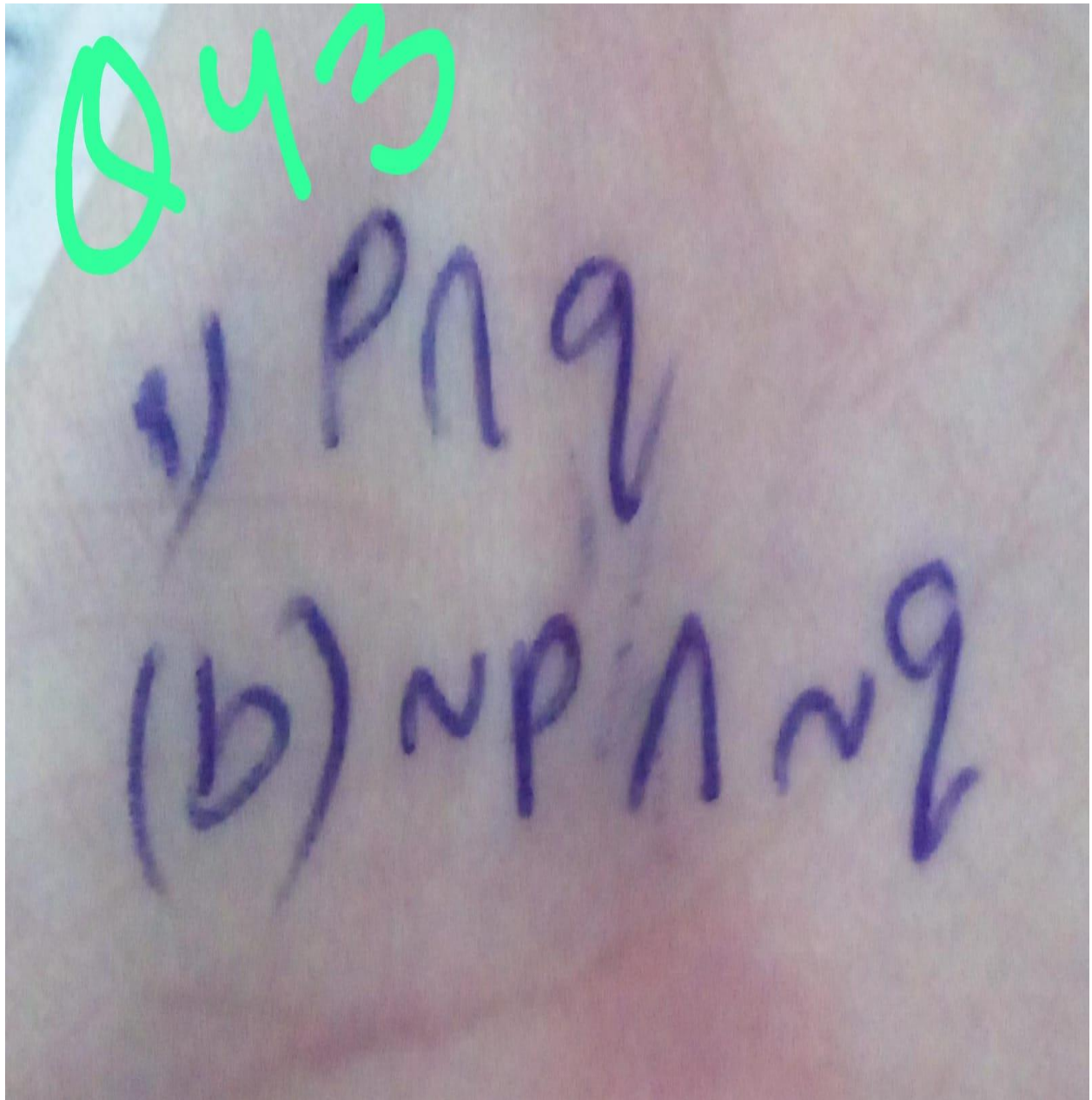
$\neg P = \{7, 8, 9, \dots\}$

(b)  $x-1 < 2$

$P = \{1, 2, \dots\}$

Q4b

# MTH104 FINAL TERM BY IQRA AZHAR



## Example 1

Q44

Find the argument form for the following argument and determine whether it is valid. Can we conclude that the conclusion is true if the premises are true?

If Socrates is human, then Socrates is mortal.

→ Socrates is human.

∴ Socrates is mortal. (conclusion)

Let  $p$ : Socrates is human.

$q$ : Socrates is mortal.

$$\left\{ \begin{array}{l} p \rightarrow q \quad \checkmark \\ p \quad \checkmark \\ \hline \therefore q \quad \checkmark \end{array} \right.$$

This is Modus ponens.

Here the conclusion is true if the premises are true because it is a valid argument.

low  
lity.

## Example 2

The set of positive integers  $P = \{1, 2, 3, \dots\}$  is order-isomorphic to the set of even positive integers  $E = \{2, 4, 6, \dots\}$  since the function  $f: P \rightarrow E$  defined by  $f(x) = 2x$  is an isomorphism between  $P$  and  $E$ .

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Q50

(i)  $A = \{-3, -2, -4, 0\}$

~~Card~~ Card  $(A) = 4$

(ii) ~~B~~ = whole number less than 0 not exist

Card B = Not exist

(iii)  $C = \{2\}$  Card C = 1

(iv)  $D = \{2, 3\}$  Card D = 2

(v) Card E = 26