Elementary Mathematical Logic

Exercises

1.
Identify each of the following as a proposition or not a proposition. In the case of a proposition, determine its value:

1. Lagrange was a mathematician.
2. $5 \cdot 2 = 11$.
3. How will the US economy develop in the next decade?
4. Every integer greater than 5 can be written as the sum of three primes.

2.
Three companies $C_1, C_2,$ and C_3 have been suspected of having started a "price war".
An expert believes:

a) At least one of the companies started the „price war".
b) If C_1 and C_2 were not responsible for the "price war", then C_3 should be excluded as suspect.
c) If C_1 was responsible or C_3 not, then C_2 should be excluded as suspect.

Denote by:

$p_1 :$ "C_1 is responsible".

$p_2 :$ "C_2 is responsible".

$p_3 :$ "C_3 is responsible".

1. Use $p_1, p_2,$ and p_3 to describe the expert's belief.
2. Formulate a propositional connector including *all* three expert's propositions.
3. Try to find the company truly responsible for having started the "price war".

3.
Let x be a real number. The validity of the inequality

$$e^x \geq 2$$

should be investigated.
Are the following conditions sufficient, necessary or necessary and sufficient for the above inequality to hold?

1. $x \geq 0$,
2. $x > 4$,
3. $x \geq \ln 2$,
4. x is integer.

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