Q: In a certain high-level language program, variable $X$ is type char. The program reads a character typed by the user into $X$. Assuming the system uses ASCII coding to represent characters

(a) Write a conditional expression that tests to see if the character is a lower case letter.

(b) Write an if statement using your answer to (a) that changes the character stored in $X$ from lower case to upper case.
A:

(a) We know that the ASCII codes for the lower case letters are consecutive so we just need to check the ends of the range

\[ X \geq 'a' \text{ } && \text{ } X \leq 'z' \]

(b) We also know that the codes for both upper and lower case are in order so there is a constant difference between the code of a lower case letter and its upper case equivalent.

\[
\text{if } (X \geq 'a' \text{ } && \text{ } X \leq 'z') \quad X = X - 32;
\]
or

\[
\text{if } (X \geq 'a' \text{ } && \text{ } X \leq 'z') \quad X = X - 'a' + 'A';
\]