Specification and Verification I

The command \texttt{REPEAT ($E$) $S$} is executed by repeating $S$ exactly $n$ times, where $n$ (assumed greater than zero) is the value of $E$ in the initial state.

Devise a Floyd–Hoare style proof rule for establishing partial correctness specifications of the form \{\emph{P}\} \texttt{REPEAT ($E$) $S$} \{\emph{Q}\}. \quad [6 \text{ marks}]

Justify the correctness of your rule informally. \quad [4 \text{ marks}]

What verification conditions should \texttt{REPEAT ($E$) $S$} generate? \quad [4 \text{ marks}]

Prove
\[
\text{\{Y} \geq 0\} \; Z := 0; \; \text{REPEAT (Y) Z := Z} + X \; \{Z = X \times Y\}
\] \quad [6 \text{ marks}]

1