Consider the following formal specification of a program that is intended to reverse an array $A$ from $A[0]$ up to $A[N]$.

\[
\{ 0 \leq N \land \forall i. \ 0 \leq i \land i < N \Rightarrow A[i] = a[i] \} \\
I := 0; \ J := N; \\
\text{WHILE} \ I < J \ \text{DO} \\
\begin{align*}
\text{BEGIN} \\
\text{VAR TEMP;} \\
I := I + 1; \ J := J - 1 \\
\text{END} \\
\{ \forall i. \ 0 \leq i \land i < N \Rightarrow A[i] = a[N-i] \}
\]

(a) What is the purpose of the array variable $a$ occurring in the precondition and postcondition? [2 marks]

(b) How does the program work? Explain your answer in English, using diagrams or example runs to make your description as clear as possible (marks will be given for clarity). [6 marks]

(c) Write down and carefully explain an invariant for the \texttt{WHILE}-loop that could be used to verify that the program meets its specification (marks will be given for clarity). [8 marks]

(d) Does the program always terminate? Justify your answer. [4 marks]