Assignment: Write a paper in which you

1. Complete the grammar above for Contexts.
2. Give all the typing rules and run-time semantics rules.
3. Prove Type Soundness with the method we have seen in class.
   *(theorems are repeated in the next slide)*
An expression $e$ progresses whenever either
- $e$ is a value,
- $e$ is an error, or
- there exists $e'$ such that $e \rightarrow e'$.

**Progress Theorem:**
For all expressions $e$ and types $T$, if $\emptyset \vdash e : T$ then $e$ progresses.

**Type Preservation Theorem :**
For all expressions $e$, $e'$ and types $T$, if $\emptyset \vdash e : T$ and $e \rightarrow e'$ then $\emptyset \vdash e' : T$.

**Type Soundness Theorem:**
For all expressions $e$, $e'$, and types $T$, if $\emptyset \vdash e : T$ and $e \rightarrow^* e'$ then either
- $e'$ is a value $v$ such that $\emptyset \vdash v : T$,
- $e'$ is an error, or
- there exists $e''$ such that $e' \rightarrow e''$. 