41.)

a.) DEFINE GLOBAL

$$\frac{\langle e, \rho, \sigma \rangle \quad \Downarrow \quad \langle v, \sigma' \rangle}{\langle \text{VAL}(x,e), \rho, \sigma \rangle \rightarrow \langle \rho\{x \rightarrow \ell'\}, \sigma'\{\ell' \rightarrow v\} \rangle}$$

always $x$ is mapped to new location

Notice that $x \in dom\,\rho$ or $x \notin dom\,\rho$ doesn't matter in this case.


b.)
```
(val x 5)                    ; line 1
(define sum (y) (+ x y))     ; line 2
(val x 10)                   ; line 3
(sum 1)                      ; line 4
```

- If sum returns 11 then line 3 is used to overwrite the value of $x$. (Standard scheme)
- If sum returns 6 then line 3 creates a new binding as in this DEFINE GLOBAL case.


c.) I prefer the old scheme semantics because it helps in managing the scoping issues. It is very confusing to have new bindings of val $(x,e)$ everytime than a single binding that can be updated because we don't know which $x$ we are manipulating. This may lead to memory leak as well.