Parametric polymorphism

```
id :: a -> a
id x = x
```

```
len :: [a] -> Int
len []       = 0
len (x:xs) = len xs + 1
```

```
(++) :: [a] -> [a] -> [a]
[]     ++ ys = ys
(x:xs) ++ ys = x:(xs ++ ys)
```

HASKELL-classes and instances

$$
\begin{array}{lll}
\underline{\textsf{topdecl}} \rightarrow & & \ldots \\
& \mid & \texttt{class}\ \underline{\textsf{tyconstr}}\ \underline{\textsf{var}}\ [\texttt{where}\ \{\underline{\textsf{cdecl}}_1; \ldots; \underline{\textsf{cdecl}}_n\}], \quad n \geq 1 \\
& & \\
& \mid & \texttt{instance}\ \underline{\textsf{tyconstr}}\ \underline{\textsf{instype}}\ [\texttt{where}\ \{\underline{\textsf{cdecl}}_1; \ldots; \underline{\textsf{cdecl}}_n\}]
\end{array}
$$

$$
\underline{\textsf{cdecl}} \quad \rightarrow \quad \underline{\textsf{typedecl}} \mid \underline{\textsf{fundecl}} \mid \underline{\textsf{infixdecl}} \mid \underline{\textsf{var}}\ \underline{\textsf{rhs}}
$$

$$
\begin{array}{lll}
\underline{\textsf{instype}} & \rightarrow & (\underline{\textsf{tyconstr}}\ \underline{\textsf{var}}_1 \ldots \underline{\textsf{var}}_n), \quad n \geq 0 \\
& \mid & [\underline{\textsf{var}}] \\
& \mid & (\underline{\textsf{var}}_1 \rightarrow \underline{\textsf{var}}_2) \\
& \mid & (\underline{\textsf{var}}_1, \ldots, \underline{\textsf{var}}_n), \quad n \geq 2
\end{array}
$$

$$
\underline{\textsf{idecl}} \quad \rightarrow \quad \underline{\textsf{fundecl}} \mid \underline{\textsf{var}}\ \underline{\textsf{rhs}}
$$

HASKELL-**contexts**

$$\underline{\mathsf{context}} \;\to\; (\underline{\mathsf{tyconstr}}_1\,\underline{\mathsf{var}}_1, \ldots, \underline{\mathsf{tyconstr}}_n\,\underline{\mathsf{var}}_n), \qquad n \geq 1$$

$$\underline{\mathsf{typedecl}} \;\to\; \underline{\mathsf{var}}_1, \ldots, \underline{\mathsf{var}}_n \;::\; [\underline{\mathsf{context}} \Rightarrow]\; \underline{\mathsf{type}}, \qquad n \geq 1$$

$$\begin{array}{lll}
\underline{\mathsf{topdecl}} & \to & \ldots \\
 & | & \mathtt{data}\; [\underline{\mathsf{context}} \Rightarrow]\; \underline{\mathsf{tyconstr}}\; \underline{\mathsf{var}}_1 \;\ldots\; \underline{\mathsf{var}}_n \;=\; \\
 & & \qquad \underline{\mathsf{constr}}_1\; \underline{\mathsf{type}}_{1,1} \ldots \underline{\mathsf{type}}_{1,n_1} \;| \\
 & & \qquad\qquad \vdots \\
 & & \qquad \underline{\mathsf{constr}}_k\; \underline{\mathsf{type}}_{k,1} \ldots \underline{\mathsf{type}}_{k,n_k}, \qquad n \geq 0, k \geq 1, n_i \geq 0 \\
 & & \\
 & | & \mathtt{class}\; [\underline{\mathsf{context}} \Rightarrow]\; \underline{\mathsf{tyconstr}}\; \underline{\mathsf{var}}\; [\mathtt{where}\; \{\underline{\mathsf{cdecl}}_1; \ldots; \underline{\mathsf{cdecl}}_n\}] \\
 & & \\
 & | & \mathtt{instance}\; [\underline{\mathsf{context}} \Rightarrow]\; \underline{\mathsf{tyconstr}}\; \underline{\mathsf{instype}} \\
 & & \qquad\qquad [\mathtt{where}\; \{\underline{\mathsf{cdecl}}_1; \ldots; \underline{\mathsf{cdecl}}_n\}]
\end{array}$$