Conditional Equations and Tuples

```
maxi(x, y) | x >= y       = x
           | otherwise    = y
```

Currying

```
plus :: (Int, Int) -> Int
plus (x, y) = x + y
```

$$\Downarrow$$

```
plus :: Int -> Int -> Int
plus x y = x + y
```

Pattern Declarations

```
pin :: Float
pin = 3.14159

suc :: Int -> Int
suc = plus 1

x0, y0 :: Int
(x0, y0) = (1,2)

x1, y1 :: Int
[x1,y1] = [1,2]

x2 :: Int
y2 :: [Int]
x2:y2 = [1,2]
```

HASKELL-**declarations**

$$\underline{\mathsf{decl}} \quad \to \quad \underline{\mathsf{typedecl}} \mid \underline{\mathsf{fundecl}}$$

$$\underline{\mathsf{typedecl}} \quad \to \quad \underline{\mathsf{var}}_1, \ldots, \underline{\mathsf{var}}_n \ :: \ \underline{\mathsf{type}}, \qquad n \geq 1$$

$$\underline{\mathsf{var}} \quad \to \quad \text{string starting with lower case symbol}$$

$$\underline{\mathsf{fundecl}} \quad \to \quad \underline{\mathsf{funlhs}}\ \underline{\mathsf{rhs}}$$

$$\underline{\mathsf{funlhs}} \quad \to \quad \underline{\mathsf{var}}\ \underline{\mathsf{pat}}_1 \ \ldots \underline{\mathsf{pat}}_n, \qquad n \geq 1$$

$$\underline{\mathsf{rhs}} \quad \to \quad = \ \underline{\mathsf{exp}} \mid \underline{\mathsf{condrhs}}_1 \ \ldots \underline{\mathsf{condrhs}}_n, \qquad n \geq 1$$

$$\underline{\mathsf{condrhs}} \quad \to \quad \mid \underline{\mathsf{exp}} \ = \ \underline{\mathsf{exp}}$$

HASKELL-**declarations**

$$\underline{\text{decl}} \quad \rightarrow \quad \underline{\text{typedecl}} \mid \underline{\text{fundecl}} \mid \underline{\text{patdecl}}$$

$$\underline{\text{typedecl}} \quad \rightarrow \quad \underline{\text{var}}_1, \ldots, \underline{\text{var}}_n \;::\; \underline{\text{type}}, \qquad n \geq 1$$

$$\underline{\text{var}} \quad \rightarrow \quad \text{string starting with lower case symbol}$$

$$\underline{\text{fundecl}} \quad \rightarrow \quad \underline{\text{funlhs}}\ \underline{\text{rhs}}\ [\texttt{where}\ \underline{\text{decls}}]$$

$$\underline{\text{funlhs}} \quad \rightarrow \quad \underline{\text{var}}\ \underline{\text{pat}}_1\ \ldots \underline{\text{pat}}_n, \qquad n \geq 1$$

$$\underline{\text{rhs}} \quad \rightarrow \quad = \ \underline{\text{exp}} \mid \underline{\text{condrhs}}_1\ \ldots \underline{\text{condrhs}}_n, \qquad n \geq 1$$

$$\underline{\text{condrhs}} \quad \rightarrow \quad \mid\ \underline{\text{exp}} \ = \ \underline{\text{exp}}$$

$$\underline{\text{patdecl}} \quad \rightarrow \quad \underline{\text{pat}}\ \underline{\text{rhs}}\ [\texttt{where}\ \underline{\text{decls}}]$$

$$\underline{\text{decls}} \quad \rightarrow \quad \{\ \underline{\text{decl}}_1; \ldots; \underline{\text{decl}}_n\ \}, \qquad n \geq 0$$

HASKELL-declarations (2)

$$\underline{\mathsf{decl}} \quad \rightarrow \quad \underline{\mathsf{typedecl}} \mid \underline{\mathsf{fundecl}} \mid \underline{\mathsf{patdecl}} \mid \underline{\mathsf{infixdecl}}$$

$$\underline{\mathsf{infixdecl}} \quad \rightarrow \quad \left\{ \begin{array}{c} \texttt{infix} \\ \texttt{infixl} \\ \texttt{infixr} \end{array} \right\} \; \left[\left\{ \begin{array}{c} 0 \\ 1 \\ \vdots \\ 9 \end{array} \right\} \right] \; \underline{\mathsf{op}}_1, \ldots, \underline{\mathsf{op}}_n, \qquad n \geq 1$$

$$\underline{\mathsf{op}} \quad \rightarrow \quad \underline{\mathsf{varop}} \mid \underline{\mathsf{constrop}}$$

$$\underline{\mathsf{varop}} \quad \rightarrow \quad \text{string of special symbols, not starting with :}$$

$$\underline{\mathsf{constrop}} \quad \rightarrow \quad \text{string of special symbols starting with :}$$

HASKELL-expressions

$$
\begin{array}{lcl}
\underline{\mathsf{exp}} & \rightarrow & \underline{\mathsf{var}} \\
 & | & \underline{\mathsf{constr}} \\
 & | & \underline{\mathsf{integer}} \\
 & | & \underline{\mathsf{float}} \\
 & | & \underline{\mathsf{char}} \\
 & | & [\underline{\mathsf{exp}}_1, \ldots, \underline{\mathsf{exp}}_n], \quad n \geq 0 \\
 & | & \underline{\mathsf{string}} \\
 & | & (\underline{\mathsf{exp}}_1, \ldots, \underline{\mathsf{exp}}_n), \quad n \geq 0 \\
 & | & (\underline{\mathsf{exp}}_1 \;\ldots\; \underline{\mathsf{exp}}_n), \quad n \geq 2 \\
 & | & \texttt{if}\ \underline{\mathsf{exp}}_1\ \texttt{then}\ \underline{\mathsf{exp}}_2\ \texttt{else}\ \underline{\mathsf{exp}}_3 \\
 & | & \texttt{let}\ \underline{\mathsf{decls}}\ \texttt{in}\ \underline{\mathsf{exp}} \\
 & | & \texttt{case}\ \underline{\mathsf{exp}}\ \texttt{of}\ \{\underline{\mathsf{pat}}_1 \rightarrow \underline{\mathsf{exp}}_1; \ldots; \underline{\mathsf{pat}}_n \rightarrow \underline{\mathsf{exp}}_n\}, \quad n \geq 1 \\
 & | & \backslash\ \underline{\mathsf{pat}}_1 \ldots \underline{\mathsf{pat}}_n \rightarrow \underline{\mathsf{exp}} \\
 & & \\
\underline{\mathsf{constr}} & \rightarrow & \text{string starting with upper case symbol}
\end{array}
$$