# Syntax and Semantics of $D$

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## 1 Syntax

We present a grammar of $D$, the language of decision trees:

| | | | | |
|---|---|---|---|---|
| Programs | $P$ | ::= | $\{d\}$ | definition |
| Definitions | $d$ | ::= | `val` $x$`=` $e$ | bind name to expression |
| Expressions | $e$ | ::= | $x$ | name |
| | | \| | $\mathcal{D}_\alpha$ | decision trees |
| | | \| | $K\{e\}$ | value constructor application |
| | | \| | $e_1$ $e_2$ | function application |
| Decision Tree | $\mathcal{D}_\alpha$ | ::= | `case` $x$ `of` $\{\|$ $K\{x\}$ `=>` $\mathcal{D}_\alpha\}[\|$ $x$ `=>`$\mathcal{D}_\alpha]$ | test node |
| | | \| | $\alpha$ | match node |
| | | \| | `if` $x$ `then` $\mathcal{D}_\alpha$ `else` $\mathcal{D}_\alpha$ | condition with two children |
| | | \| | `let` $x$ `=` $knf$ `in` $\mathcal{D}_\alpha$ | let-bind a name |
| Value Constructors | $K$ | ::= | `::` | cons |
| | | \| | `[]` | empty list |
| | | \| | `#`$x$ | name beginning with `#` |
| | | \| | `A-Z`$x$ | name beggining with capital letter |
| | | \| | [`-`\|`+`](`0` − `9`)+ | signed integer literal |

## 2 What is a decision tree?

Scott, Ramsey 2000:
A decision tree is a pattern-matching automaton in which every state except the initial state has a unique predecessor.

*More details will go here as needed.*