

Big-step semantics with assignment overview sheet

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Programming language

$$\begin{aligned} M ::= & x \\ & | (M_1 M_2) \\ & | \lambda x.M \\ & | n \\ & | !V \\ & | \text{ref } V \\ & | V_1 := V_2 \\ & | M_1 + M_2 \end{aligned}$$

Big-step evaluation for call-by-value with assignment

$$\boxed{s_1 \vdash M \Downarrow V, s_2}$$

$$\frac{n \notin \text{dom}(s)}{s \vdash \text{ref } V \Downarrow n, s[n \mapsto V]} \quad \frac{}{s \vdash !n \Downarrow \text{lookup } n \text{ in } s, s}$$

$$\frac{}{s \vdash (n := V) \Downarrow V, s[n \mapsto V]} \quad \frac{}{s \vdash V \Downarrow V, s}$$

$$\frac{s_1 \vdash M_1 \Downarrow (\lambda x.M_3), s_2 \quad s_2 \vdash M_2 \Downarrow V_1, s_3 \quad s_3 \vdash M_3[x \mapsto V_1] \Downarrow V_2, s_4}{s_1 \vdash (M_1 M_2) \Downarrow V_2, s_4}$$

$$\frac{s_1 \vdash M_1 \Downarrow n_1, s_2 \quad s_2 \vdash M_2 \Downarrow n_2, s_3}{s_1 \vdash (M_1 + M_2) \Downarrow (n_1 + n_2), s_3}$$