

Solution to CS421 Homework 10
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Problem 1

a) Natural Semantics

$$\frac{(B,m) \Downarrow \text{True} \quad (C,m) \Downarrow m'}{(if\ B\ then\ C\ fi,m) \Downarrow m'}$$

$$\frac{(B,m) \Downarrow \text{False} \quad (skip,m) \Downarrow m}{(if\ B\ then\ C\ fi,m) \Downarrow m}$$

$$\frac{(B,m) \Downarrow \text{False} \quad (skip,m) \Downarrow m}{(do\ C\ while\ B\ od,m) \Downarrow m}$$

$$\frac{(B,m) \Downarrow \text{True} \quad (C,m) \Downarrow m'}{(do\ C\ while\ B\ od,m) \Downarrow m'}$$

b) Transitional Semantics

$$\frac{(B,m) \Rightarrow (B',m)}{(if\ B\ then\ C\ fi,m) \Rightarrow (B',m)}$$

$$\frac{(C,m) \Rightarrow (C',m')}{(if\ True\ then\ C\ fi,m) \Rightarrow (C',m')}$$

$$\frac{(skip,m) \Rightarrow m}{(if\ False\ then\ C\ fi,m) \Rightarrow m}$$

$$\frac{(B,m) \Rightarrow (B',m)}{(do\ C\ while\ B\ od,m) \Rightarrow (B',m)}$$

$$\frac{(C,m) \Rightarrow (C',m')}{(do\ C\ while\ True\ od,m) \Rightarrow (C',m')}$$

$$\frac{(skip,m) \Rightarrow m}{(do\ C\ while\ False\ od,m) \Rightarrow m}$$