

9. [10] Prove correct with respect to precondition that a , b , and c are defined and postcondition $(\max = a \vee \max = b \vee \max = c) \wedge (\max \geq a) \wedge (\max \geq b) \wedge (\max \geq c)$:

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max := a
if b > a then
  {if b > c then
    max := b
  else
    max := c}
else
  {if c > a then
    max := c}

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max := a _____ max = a
if b > a then _____ (max = a) ∧ (b > a)
  {if b > c then _____ (max = a) ∧ (b > a) ∧ (b > c)
    max := b _____ (max = b) ∧ (b > a) ∧ (b > c)
  else _____ (max = a) ∧ (b > a) ∧ (b ≤ c)
    max := c} _____ (max = c) ∧ (b > a) ∧ (b ≤ c)
  _____ ((max = b) ∧ (b > a) ∧ (b > c)) ∨ ((max = c) ∧ (b > a) ∧ (b ≤ c))
else _____ (max = a) ∧ (b ≤ a)
  {if c > a then _____ (max = a) ∧ (b ≤ a) ∧ (c > a)
    max := c} _____ (max = c) ∧ (b ≤ a) ∧ (c > a)
  _____ ((max = c) ∧ (b ≤ a) ∧ (c > a)) ∨ ((max = a) ∧ (b ≤ a) ∧ (c ≤ a))
  _____ ((max = c) ∧ (b ≤ a) ∧ (c > a)) ∨ ((max = a) ∧ (b ≤ a) ∧ (c ≤ a))
  _____ ∨ ((max = b) ∧ (b > a) ∧ (b > c)) ∨ ((max = c) ∧ (b > a) ∧ (b ≤ c))
  _____ ((max = c) ∧ (c > a ≥ b)) ∨ ((max = a) ∧ (b ≤ a) ∧ (c ≤ a))
  _____ ∨ ((max = b) ∧ (b > a) ∧ (b > c)) ∨ ((max = c) ∧ (c ≥ b > a))
  _____ (max = a ∨ max = b ∨ max = c) ∧ (max ≥ a) ∧ (max ≥ b) ∧ (max ≥ c)

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wp(if x > y then x := y, x ≤ y) = ((x > y) ⇒ true) ∧ ((x ≤ y) ⇒ (x ≤ y))
= true ∧ true
= true

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