1 ───────────────── MODULE *Poker* ─────────────────

3 EXTENDS *Naturals*, *TLC*

5   *TODO*: redefine ' > '

7 *NonType* $\triangleq$ 0
8 *Single* $\triangleq$ 1
9 *Double* $\triangleq$ 2

11 CONSTANTS
12   *MaxFace*,
13   *MaxDuplicate*,
14   *NumberOfPlayers*,
15   *InitCard*   *InitCard[p]*: Initial cards at the hand of player $p \in Player$

17 *Face* $\triangleq$ 1 .. *MaxFace*
18 *Hand* $\triangleq$ UNION $\{[f \to 0 .. MaxDuplicate] : f \in$ SUBSET *Face*$\}$

20 *Player* $\triangleq$ 1 .. *NumberOfPlayers*
21 *NextPlayer(p)* $\triangleq$
22   IF $p <$ *NumberOfPlayers*
23   THEN $p + 1$
24   ELSE 1

26 *Type* $\triangleq$ $\{NonType, Single, Double\}$

28 ASSUME
29     $\wedge$ *NumberOfPlayers* $\in Nat \setminus \{0\}$
30     $\wedge$ *InitCard* $\in [Player \to Hand]$

32 VARIABLES
33   *card*,
34   *type*,
35   *turn*,
36   *max*,
37   *skipno*

39 *vars* $\triangleq$ $\langle card, type, turn, max, skipno \rangle$

41 *TypeOK* $\triangleq$
42     $\wedge$ *card* $\in [Player \to Hand]$
43     $\wedge$ *type* $\in Type$
44     $\wedge$ *turn* $\in Player$
45     $\wedge$ *max* $\in Face \cup \{0\}$
46     $\wedge$ *skipno* $\in 0 .. (NumberOfPlayers - 1)$

48 *Init* $\triangleq$
49     $\wedge$ *card* = *InitCard*

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50        ∧ type = NonType
51        ∧ turn ∈ Player
52        ∧ max = 0
53        ∧ skipno = NumberOfPlayers − 1

55   IsDealer(p) ≜
56        ∧ turn = p
57        ∧ skipno = NumberOfPlayers − 1

59   IsNotDealer(p) ≜
60        ∧ turn = p
61        ∧ skipno ≠ NumberOfPlayers − 1

63   DealType(p, t) ≜
64        ∧ IsDealer(p)
65        ∧ ∃f   ∈ (DOMAIN card[p]) : card[p][f] ≥ t
66        ∧ max′ ∈ {f ∈ (DOMAIN card[p]) : card[p][f] ≥ t}
67        ∧ card′ = [card EXCEPT ![p][max′] = @ − t]
68        ∧ type′ = t
69        ∧ turn′ = NextPlayer(p)
70        ∧ PrintT(turn′)
71        ∧ skipno′ = 0

73   Deal(p) ≜      TODO: Is this correct when used in Next?
74        ∨ DealType(p, Single)
75        ∨ DealType(p, Double)

77   CallType(p, t) ≜
78        ∧ IsNotDealer(p)
79        ∧ ∃f ∈ (DOMAIN card[p]) :
80            ∧ card[p][f] ≥ t
81            ∧ f > max
82        ∧ max′ ∈ {f ∈ (DOMAIN card[p]) : card[p][f] ≥ t ∧ f > max}
83        ∧ card′ = [card EXCEPT ![p][max′] = @ − t]
84        ∧ turn′ = NextPlayer(p)
85        ∧ UNCHANGED ⟨type, skipno⟩

87   Call(p) ≜ CallType(p, type)

89   Pass(p) ≜
90        ∧ IsNotDealer(p)
91        ∧ turn′ = NextPlayer(p)
92        ∧ skipno′ = skipno + 1
93        ∧ UNCHANGED ⟨card, type, max⟩

95   Next ≜ ∃p ∈ Player :
96             ∨ DealType(p, Single)
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97                    ∨ DealType(p, Double)
98                    ∨ Call(p)
99                    ∨ Pass(p)

101   Spec  ≜  Init ∧ □[Next]_vars ∧ WF_vars(Next)

103   Win  ≜
104       ∃ p ∈ Player :
105          ∧ ∀ f ∈ (DOMAIN card[p]) : card[p][f] = 0
106          ∧ ∀ q ∈ Player :
107             q ≠ p ⇒ ∃ f ∈ (DOMAIN card[q]) : card[q][f] > 0
108
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\ * Modification History
\ * Last modified Sun *Aug* 19 15:45:07 *CST* 2018 by *hengxin*
\ * Created Sat *Aug* 18 14:38:31 *CST* 2018 by *hengxin*

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