Poker Simulation

This program shows how you can generate poker hands for Texas Hold 'Em. For simplicity, this program assumes nine players.

1. The beginning of the program specifies the number of hands to be generated. A standard deck of cards has 13 ranks (ace, 2, 3, 4, 5, 6, 7, 8, 9, 10, jack, queen, and king) and four suits (clubs, diamonds, hearts, and spades). Create the deck as the combination of every rank with every suit and print the deck.

```
proc iml;
   nHands=10; *Specify number of hands;

   *Create deck;
   rank={A,2,3,4,5,6,7,8,9,10,J,Q,K};
   suit={C D H S}; *Clubs diamonds hearts spades;
   deck=concat(right(repeat(rank,1,4)),repeat(suit,13,1));
   print deck;
```

deck			
AC	AD	AH	AS
2C	2D	2H	2S
3C	3D	3H	3S
4C	4D	4H	4S
5C	5D	5H	5S
6C	6D	6H	6S
7C	7D	7H	7S
8C	8D	8H	8S
9C	9D	9H	9S
10C	10D	10H	10S
JC	JD	JH	JS
QC	QD	QH	QS
KC	KD	KH	KS

2. In Texas Hold 'Em, the dealer provides two face-down cards to each player and deals five face-up community cards. For a nine-player game, the dealer deals a total of 23 cards for each hand. Use the SAMPLE function to generate a sample of 23 cards for each of **nhands** hands without replacement.

```
   *Sample cards from deck;
   cards=sample(deck,(23//nhands),"WOR");
```

3. To simplify the results of the simulation, combine the first and second card dealt to each person in each hand into a single cell. This reduces the number of columns in the hands matrix from 23 to 14 (for a simulation of nine players).

```
   *Combine 1st and 2nd card for each person into single cell;
   card1=cards[,1:9];
   card2=cards[,10:18];
   community=cards[,19:23];
   hands=concat(card1,",",card2) || community;
```

4. Create a vector of column names.

```
   *Create column names;
   do i=1 to 9;
     name=name || ("p"+strip(char(i)));
   end;

   name=name || {c1 c2 c3 c4 c5};
```

5. Finally, print the first 10 hands from the **names** matrix.

```
   print (hands[1:10,]) [colname=name];
quit;
```

	p1	p2	p3	p4	p5	p6	p7	p8	p9	C1	C2	C3	C4	C5
ROW1	7D, 7S	AS, 6S	JS, AC	4C, 2C	6H, QC	6C, 3C	5C, KD	JC,10H	4D, 2S	3H	8C	10C	8H	AH
ROW2	QH, 4H	4S, KC	6S,10H	3H, 8S	10D, 2D	2S, KS	10C, AD	QD, JH	8D, 7C	4D	3D	KD	3C	8H
ROW3	4D, JC	AD, JD	9S, 7S	AS, 4H	2S, 9D	2C, 5H	3S, 5C	6C, 5S	9C, 7C	10C	3H	6D	KD	KH
ROW4	4H, 3S	7D, 4D	KS, 6C	AC, KC	JS, 7H	9H, QH	7C, QD	6D, 4S	8H, 2C	10C	2H	5D	KH	AH
ROW5	2C, AD	3C, 9C	5C, 9H	10C, 6S	7S, 2D	10D, KH	3H, 4H	5H, QC	JH, 9S	JC	KC	KD	4S	8D
ROW6	9H, 3H	JH, 5S	2S, QH	7D, 7S	JS,10C	KC, 6H	AD, 2C	KH, 3D	7H, 9S	5D	AH	2H	6D	3C
ROW7	7S, 3S	9C, 6H	5D, 8C	5C, 3D	4S, 3H	6C, QC	8D, JS	2D, QH	KD, 9H	10D	AD	5S	3C	10S
ROW8	7S,10C	6D, KC	10H, JS	QS, KH	3D, 9C	QH, AS	KS, JH	3S, JC	8S, AD	2D	3H	6H	4S	2C
ROW9	6H,10D	QH, AC	3S, 8D	6C, 2H	7C, AS	JD, 9D	2S,10S	8C, 7H	JH, 2D	QD	4C	2C	4H	KH
ROW10	KS, 5C	9C, 4D	5S, JC	3C, 8H	5H, QD	AD, 3H	9D, 2D	KD,10S	QH, 4C	3S	JD	4H	2H	AH

6. Find the probability of the best starting hand in Texas Hold ‘Em, the illusive pocket aces. To do so, create a new deck that ignores the suit and holds only the rank of the 52 cards. Next, set the number of hands to be simulated to 10,000.

```
   deck = repeat(rank,4);
   hands=10000;
```

7. Create a loop that simulates the 10,000 hands and initialize the variable **Count** to *0*. If any hand inside the loop is dealt pocket aces, increment the **Count** variable by *1*.

```
   *Sample many hands and count the number of pocket aces;
   count = 0;
   do i=1 to hands;
      sam = sample(deck,2,"WOR");
      aces= (sam[1]='A' & sam[2]='A');
      if aces=1 then do;
   print sam;
         count=count+1;
      end;
   end;
```

8. Find the probability of pocket aces by dividing the **Count** variable by the number of hands and print the result.

```
   p=count/hands;
   print count hands p;
quit;
```

```
                                count      hands          p

                                   48      10000     0.0048
```

Notice that of the 10,000 simulations, only 48 hands were dealt two aces. This gives an empirical estimate of 0.0048 for pocket aces.