

## Project teams.

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team 2 BUI, ALEXIS . BARRERA, JACK .

team 3 ASAKI, JAMES . LI, VINCENT .

team 4 MARTINEZ, AARIN . LEE, EDDIE .

team 5 WORDLAW, ANDREA . BERGMAN-TURNBULL, LIANA .

team 6 SHOURYA, SHIVESH . CHENG, LU .

team 7 JACKSON, SOFIE . NGUYEN, TIFFANY .

team 8 ZHUO, MATTHEW . REN, DIANA .

team 9 HUANG, STELLA . BADDLEY, COOPER .

R project. teams, emails, and bruin.

The project is problem 8.2, page 249.

You need to write code to go all in or fold. In R, try:

```
install.packages(holdem)
```

```
library(holdem)
```

```
library(help="holdem")
```

gravity, timemachine, tommy, ursula, vera, william, and xena are examples.

crds1[1,1] is your higher card (2-14).

crds1[2,1] is your lower card (2-14).

crds1[1,2] and crds1[2,2] are suits of your higher card & lower card.

```
help(tommy)
```

```
tommy
```

```
function (numattable1, crds1, board1, round1, currentbet, mychips1,  
  pot1, roundbets, blinds1, chips1, ind1, dealer1, tablesleft)
```

```
{ a1 = 0
```

```
  if (crds1[1, 1] == crds1[2, 1])
```

```
    a1 = mychips1
```

```
  a1
```

```
}
```

```
help(vera)
```

All in with a pair, any suited cards, or if the smaller card is at least 9.

```
function (numattable1, crds1, board1, round1, currentbet, mychips1,  
        pot1, roundbets, blinds1, chips1, ind1, dealer1, tablesleft)
```

```
{a1 = 0
```

```
  if ((crds1[1, 1] == crds1[2, 1]) || (crds1[1, 2] == crds1[2,2]) ||  
      (crds1[2, 1] > 8.5)) a1 = mychips1
```

```
  a1
```

```
}
```

You need to email me your function, to [frederic@stat.ucla.edu](mailto:frederic@stat.ucla.edu), by Sun Dec 2, 8pm. It should be written (or cut and pasted) simply into the body of the email. If you write it in Word, save as text first, and then paste it into the email. Just submit one email per team.

For instance, if your function is named "bruin", you might do:

```
bruin = function (numattable1, crds1, board1, round1, currentbet,
    mychips1, pot1, roundbets, blinds1, chips1, ind1, dealer1,
    tablesleft) {
## all in with any pair higher than 7s, or if lower card is J or higher,
## or if you have less than 3 times the big blind
a1 = 0
if ((crds1[1, 1] == crds1[2, 1]) && (crds1[1, 1] > 6.5)) a1 = mychips1
if (crds1[2,1] > 10.5) a1 = mychips1
if(chips1 < 3*blinds1) a1 = mychips1
a1
} ## end of bruin
```

## Luck and skill in poker. ♠ ♣ ♥ ♦

Let equity = your expected portion of the pot after the hand, assuming no future betting.

= your expected number of chips after the hand - chips you had before the hand

= pot \* p, where p = your probability of winning if nobody folds.

I define luck as the expected profit gained during the dealing of the cards,

= equity gained during the dealing of the cards.

Skill = expected profit gained during the betting rounds.

Example.

You have Q♣ Q♦. I have 10♠ 9♠. Board is 10♦ 8♣ 7♣ 4♣. Pot is \$5.

The river is 2♦, you bet \$3, and I call.

On the river, how much expected profit did you gain by luck and how much by skill?

Expected profit by luck on river = your equity after 2♦ is exposed – your equity just pre-2♦

= 100% (\$5) - 35/44 (\$5) = \$1.02.

Why 35/44? I can win with a 10, 9, 6, or J that is not a club. There are 1 + 2 + 3 + 3 = 9 of these cards, so the remaining 35 cards give you the win.

Expected profit by skill on river

= increase in pot on river \* P(you win) - your cost

= \$6 \* 100% - \$3 = \$3.

## Luck and skill in poker, continued. ♠ ♣ ♥ ♦

Example.

You have  $Q♣ Q♦$ . I have  $10♠ 9♠$ . Board is  $10♦ 8♣ 7♣ 4♣$ . Pot is \$5.

The river is  $2♦$ , you bet \$3, and I call.

On the river, how much expected profit did you gain by luck and how much by skill?

Alternatively, let  $x$  = the number of chips you have after your \$3 bet on the river.

Before this bet, you had  $x + \$3$  chips.

Expected profit gained by skill on river = your equity after all the betting is over - your equity when the  $2♦$  is dealt  
= your expected number of chips after all the betting is over – your expected number of chips when the  $2♦$  is dealt  
=  $(100\%)(x + \$11) - (100\%)(x + \$3 + \$5)$   
= \$3.

Lederer and Minieri.

I define luck as the expected profit gained during the dealing of the cards.

Skill = expected profit gained during the betting rounds.

Are there any problems with these definitions?

Mike Cloud raised to 15,000 with  $A\clubsuit A\spadesuit$ , Hellmuth called with  $A\heartsuit K\spadesuit$ , Daniel Negreanu called from the big blind with  $6\diamondsuit 4\heartsuit$ , and the flop came  $K\clubsuit 8\heartsuit K\heartsuit$ . Before the flop, the pot was 57,000 chips.

After the flop, all three players checked, the turn was the  $J\heartsuit$ , Negreanu checked, Cloud bet 15,000, Hellmuth called, and Negreanu folded.

The river was the  $7\spadesuit$ , Cloud checked, Hellmuth bet 37,000, and Cloud called. How much expected profit did Hellmuth gain due to luck and how much due to skill on the river?

Answer— When the turn was dealt, Hellmuth's probability of winning in a showdown was  $41/42 \sim 97.62\%$ . After the betting on the turn was over, the pot was 87,000 chips. When the  $7\spadesuit$  was revealed on the river, Hellmuth's equity increased from  $97.62\% \times 87,000 = 84,929.4$  to  $100\% \times 87,000$ , for an increase of 2070.6 chips due to luck.

Hellmuth's expected profit gained due to skill on the river is simply 37,000 chips: the pot size increased by 74,000 while Hellmuth had a 100% chance of winning, but the cost to Hellmuth was 37,000, so his profit was 37,000.