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Problem Set Wk 12

P1

(a)

We can write this out as $(1, 2, 2, 2, 3, 4, 5, 5, 6)$. There are 9 total outcomes in this sample space. So $1 = 1/9, 2 = 3/9, 3 = 1/9, 4 = 1/9, 5 = 2/9, 6 = 1/9$

(b)

Add the probabilities of every odd number. $p(1) + p(3) + p(5) = (1/9) + (1/9) + (2/9) = 4/9$

(c)

Our sample space $= (1, 6), (2, 5), (3, 4), (4, 3), (5, 2), (6, 1)$

For (2,5) and (5,2), you get a probability of 6/81. Add up the probability of every other combo which is $(1/81) + (6/81) + (1/81) + (1/81) + (6/81) + (1/81) = (16/81)$

(d)

$p(7 \mid even) = \frac{p(7 \cap even)}{p(even)}$

$p(even) = 5/9$

$p(7 \cap even) = (8/81)$

$\frac{8/81}{5/9} = 8/45$ or 0.178

(e)

No, they don't equal. So they are not independent.

P2

(a)

First draw is at $13/52$. Second draw is at $12/51$ because we have one less to choose from. Mulitply both probabilities and we get 0.0588

(b)

First draw is at $13/51$ because we have one less card. Second draw is $12/50$. Multiply both to get 0.0612

(c)

Use Bayes rule. We know our $p(2spades \mid diamond) = .0612$ and our probability of 2 spades is 0.0588. And $p(diamond) = 13/52$.

So

$\frac{.0612*(13/52)}{0.0588} = 0.26$

(d)

No, $13/52\ != .26$, therefore they are not independent.

P3

(a)

The probability that an ESP guess a card right is $7/8$. Multiply $7/8$ by itself 5 times. Answer is 0.5129

(b)

$C(5,4)*(7/8)^4*(1/8) = .366$

(c)

$(1/4)^5 * .9 + (7/8)^5 * .1 = 0.0521$

(d)

$p(esp \mid 5) = \frac{p(5|esp)*p(esp)}{p(5)}$

$= \frac{.5129*.1}{.0521} = .985$

(e)

They are independent. Regardless of what happens with the first card, guessing the second card will always be either 1/4 if they are not esp or 7/8 if they are.