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HW4

HW4

3.2 $Pr[D] = \frac{1}{6}$ $Pr[N] = \frac{5}{6}$

Prob(sum) {possible rolls} => Probability

$P(2) = \{(1,1)\} \Rightarrow \frac{1}{36}$
$P(3) = \{(2,1),(1,2)\} \Rightarrow \frac{1}{18}$
$P(4) = \{(2,2),(1,3),(3,1)\} \Rightarrow \frac{1}{12}$
$P(5) = \{(1,4),(4,1),(2,3),(3,2)\} \Rightarrow \frac{1}{9}$
$P(6) = \{(1,5),(5,1),(2,4),(4,2),(3,3)\} \Rightarrow \frac{5}{36}$
$P(7) = \{(1,6),(6,1),(5,2),(2,5),(3,4),(4,3)\} \Rightarrow \frac{1}{6}$
$P(8) = \{(2,6),(6,2),(3,5),(5,3),(4,4)\} \Rightarrow \frac{5}{36}$
$P(9) = \{(3,6),(6,3),(4,5),(5,4)\} \Rightarrow \frac{1}{9}$
$P(10) = \{(4,6),(6,4),(5,5)\} \Rightarrow \frac{1}{12}$
$P(11) = \{(5,6),(6,5)\} \Rightarrow \frac{1}{18}$
$P(12) = \{(6,6)\} \Rightarrow \frac{1}{36}$

$Pr[x, y]$

odds have no chance of rolling doubles

y \ x	2	3	4	5	6	7	8	9	10	11	12
D	$\frac{1}{36}$	0	$\frac{1}{36}$	0	$\frac{1}{36}$	0	$\frac{1}{36}$	0	$\frac{1}{36}$	0	$\frac{1}{36}$
N	0	$\frac{1}{18}$	$\frac{1}{18}$	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{9}$	$\frac{1}{18}$	$\frac{1}{18}$	0

For each $Pr[x, D]$, only the even x's have exactly one double pair.
For each $Pr[x, N]$, the evens must remove the double pair to find the odds.

$Pr[x|y]$

y \ x	2	3	4	5	6	7	8	9	10	11	12
D	$\frac{1}{6}$	0	$\frac{1}{6}$	0	$\frac{1}{6}$	0	$\frac{1}{6}$	0	$\frac{1}{6}$	0	$\frac{1}{6}$
N	0	$\frac{1}{15}$	$\frac{1}{15}$	$\frac{2}{15}$	$\frac{2}{15}$	$\frac{3}{15} = \frac{1}{5}$	$\frac{2}{15}$	$\frac{2}{15}$	$\frac{1}{15}$	$\frac{1}{15}$	0

For each $Pr[x, D]$, there is a $\frac{1}{6}$ chance because there are only 6 items in our set of only doubles. Odds, again, have no double.
For each $Pr[x, N]$, we are saying "what's the chance that it will be this number given there are no doubles?", thus we take the (possible rolls − doubles) / 30 for the number of non-doubles.

$Pr[y|x]$

y \ x	1	2	3	4	5	6	7	8	9	10	11	12
D	/	1	0	$\frac{1}{3}$	0	$\frac{1}{5}$	0	$\frac{1}{5}$	0	$\frac{1}{3}$	0	1
N	/	0	1	$\frac{2}{3}$	1	$\frac{4}{5}$	1	$\frac{4}{5}$	1	$\frac{2}{3}$	1	0

For each $Pr[D|x]$, we are asking for the Pr of doubles given the set of rolls for x.
For each $Pr[N|x]$, we are asking for the Pr of non-doubles in the set of rolls for x.
These two should add up to 1.

3.8 One-time pad => $(pt + key) \% n = ct$

$(x + Key) \% 2 = y$
$(x' + Key) \% 2 = y'$
if $\substack{y = y' \\ x = x'} \Rightarrow (2x + Key) \% 2 = 2y$
if $Key = 0 \Rightarrow \frac{(2x) \% 2 = 2y}{2}$
$x = y$ ✓

$x + x = y + y$

$x + x' = y + y'$