Alec Portelli
Intro to RL

Assignment 1

①

Ⓐ If I pick and <u>do not</u> switch, the prob. is $1/3$ chance I win because there are 3 doors, and sticking with my choice is just saying I chose randomly $1/3$ doors, even though I know the option of the other door. By me <u>not</u> switching, I am not improving odds, so it is the same as randomly picking the one of 3 doors.

Ⓑ If I pick and switch, I have a $2/3$ chance of winning. Monty will <u>always</u> show a door with the empty prize, which leaves us with two doors. However, $2/3$ of the time I will choose the wrong door, so $2/3$ of the time I pick the wrong door and Monty exposes the <u>second</u> bad door, meaning that the remaining door <u>must</u> have the prize $2/3$ of the time, giving a $2/3$ chance of winning when switching.

②

Ⓐ By using $\binom{r}{n} = \frac{n!}{r!(n-r)!}$, we can first solve for selecting 2 men out of 10

To calculate # of permutations, we do: $\binom{2}{10} = \frac{10!}{2!(8!)} = 45$

For women, selecting 2 out of 5 yields: $\binom{2}{5} = \frac{5!}{2!(3!)} = 10$

Total combinations is $10 \cdot 45 = 450$ permutations for 2 men & 2 women

Total combinations is $\binom{15}{2} = \frac{15!}{2!(15!)} = 1365$

$\frac{450}{1365} = \boxed{32.97\%}$

Ⓑ Since Bob and Sue are already selected, we now have 13 people and 2 slots. $\binom{2}{13}$ yields us 78 possible combinations, thus $\frac{78}{1365}$ is $\boxed{5.71\%}$

$\frac{13!}{2!(11!)} = 78$

ALEC PARZELLI

INTRO TO RL - MODULE 1

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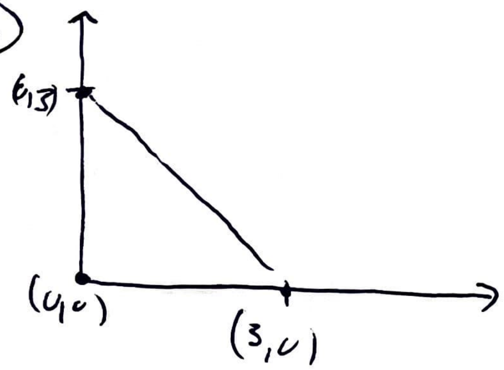
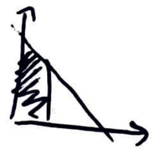


A) Area of triangle is $3 \cdot 3 \cdot \frac{1}{2} = 4.5$

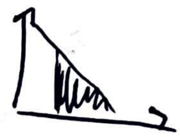
Less than 1 is the area from 0 to 1

Line is $y = -x + 3$, so $\int_0^1 -x + 3 \, dx = \frac{5}{2}$

$5/2 = 2.5$, $2.5/4.5 = \boxed{55.5\%}$



B) More than 1 is $1 - 55.5\% = 45.5\%$



4) A) Total dice = 10 6 Sided = $\frac{1}{10}$, 8 = $\frac{2}{10}$, 10 = $\frac{3}{10}$, 20 = $\frac{4}{10}$

Chance of 5 on 6 is $\frac{1}{6}$, $\frac{1}{8}$ on 8, $\frac{1}{10}$ on 10, $\frac{1}{20}$ on 20

$P(5) = (\frac{1}{10})(\frac{1}{6}) + (\frac{2}{10})(\frac{1}{8}) + (\frac{3}{10})(\frac{1}{10}) + (\frac{4}{10})(\frac{1}{20})$

$\boxed{P(5) = 9.1\%}$

B) 9/10 dice are eligable b/c a 6 can't roll a 7.

$P(7) = (\frac{2}{10})(\frac{1}{8}) + (\frac{3}{10})(\frac{1}{10}) + (\frac{4}{10})(\frac{1}{20})$

$\boxed{P(7) = 0.075}$

5) For this question we can use Baye's Formula! $P(A|B) = \frac{P(A \cap B)}{P(B)}$

$P(1) = 0.6$, $P(2) = .4$, P(Defective | 1) = 0.1, P(Defective | 2) = .2

P(non defective | 1) = .9, P(non defective | 2) = .8

$P(2 \mid \text{Non defective } 2) = \frac{.4 \cdot .8}{0.9 \cdot 0.6 + 0.8 \cdot 0.4} = \boxed{37.21\%}$

6) A) $X \leq 3$ means $X = 1, 2, 3$, which means $\frac{1}{7} + \frac{1}{14} + \frac{3}{14} = \frac{6}{14} = \frac{3}{7}$

B) $X < 3$ means $X = 1, 2$, so $\frac{1}{7} + \frac{1}{14} = \frac{3}{14}$

(7) $E(x) = 3$

$var(x) = 4$

$E[(2x)+3)^2] = E[(2x)^2 + 2(2x)(3) + 3^2]$

$E[4x^2 + 4 \cdot 3 \cdot x + 9]$

$E[4x^2 + 12x + 9]$

$E[4 \cdot \cancel{3}^2 + 12 \cdot 3 + 9]$

$E[x^2] = 4 + 9 \longrightarrow E[x^2] = Var(x) + [E(x)]^2$

$E[x^2] = 4 + 9$

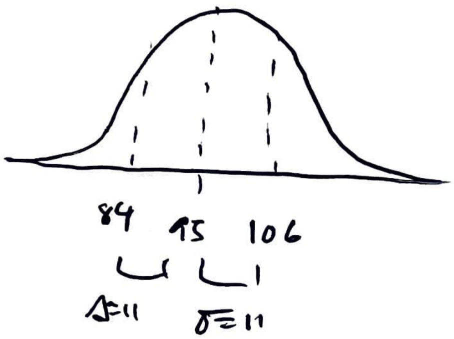
$E[x^2] = 13$

$4 \cdot 13 + 36 + 9$

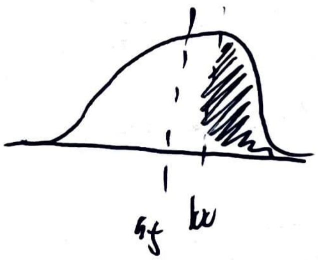
$52 + 36 + 9$

$\boxed{97}$

(8)



$P(x \geq 100)$ =>



$100 - 95 = 5$

$5/11 = 45\%$ of one std

First std = 34% to each side

$34\% \cdot 45\% = .153$

$.50 - .153 = .3454$ → when using book/table and calculator, it yields .3581, so pretty close