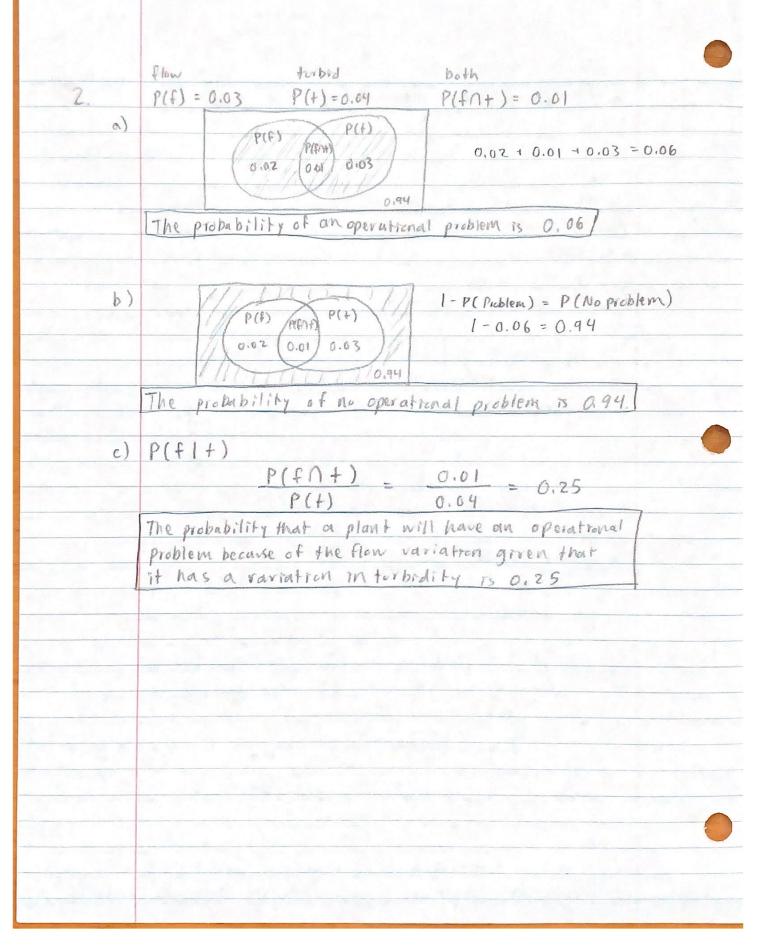
	On my honor, I have neither received nor given any unanthorized Ethan Wong assistance on this examination. Agreed & Ethan Wong 4129121 TA: Kai Yang CEE 110 Midterm
1.	119 83 8 74 3/3 5/8 2/2 40 3/1 3/0 8
	5 5 22 30 33 37 40 58 74 83 119 Total :11
a)	Mean: (5+5+22+30+33+37+40+58+74+83+119)+11=46
	Median: 37
	The sample mean is 46 mg/L; the sample median is 87 mg/L,
	They're different because the overage of a data set is
	not necessarily the same as the middle value of
	the sorted data set.
b)	Water quality standard: 100 mg/L
	The quality of the effluent on average is 46 mg/L. This
	Is significantly lower than the standard of 100mg/L,
	so that means the quality of efficient is much befor
	than required. Overall the data shows good-quality efflient.
()	5 5 22 30 33 37 40 58 74 83 119
	Qi G2 d3
	The lower quartile is the median of the first half.
	The upper quartite is the median of the second half.
	The Fourth's Spread is Q3-Q1.
	Lower Quartile (Q1) = 22 Upper Quartile (Q3) = 74
	Fourths Spread = 52
d)	Mm whisker: 1.5IQR + Q1 = 56 -> Min = 5
	Max whisker: 1.5 IaR + Q3 = 152 -> Max = 119
	Q1 = 22 Q3 = 74 Median : 37
	MIN [Max
	5 119
	22 37 74
	There are no outliers because no values are less than
	the minimum whisker or greater than the maximum whisker.



```
3.
         P(C) = 0.2 P(N) = 0.45 P(T) = 0.35
        P(AIC) = 0.55 P(AIN) = 0.3 P(AIT) = 0.8
    a) Apple: P(A) = P(A) + P(A) + P(A)T)
                P(A) = [P(AIC) · P(C)] · [P(AIN) · P(N)] + [P(AIT) · P(T)]
               P(A) = [0.55 × 0.2] + [0.3 × 0.45] + [0.8 * 0.35]
               P(A) = 0.525
        The probability of the next student buying an Apple product is 0,525
                       0.55 A 0.2 x 0.55 = 0.11
                                                          0.11 + 0.135 + 0.28
                             · A' 0.45 x 0.7 = 0.315
                                                             = 0.525
                 7 = 0.2 \quad A^{1} \quad 0.35 \times 0.8 = 0.28
    b) P(C|A) = \frac{P(C \cap A)}{P(A)} = \frac{P(A|C) \cdot P(C)}{0.525} = 0.2095 \approx 0.21
        P(NIA) = \frac{P(NA)}{P(A)} = \frac{P(AIN) \cdot P(N)}{0.525} = 0.3 \times 0.45 = 0.2571 \approx 0.26
        P(T|A) = \frac{P(T \cap A)}{P(A)} = \frac{P(A|T) \cdot P(T)}{0.525}
                                                  0.8 × 0.35
                                                     0.525
         P(CIA) = 0.21
                                P(NIA) = 0.26
                                                    P(TIA) = 0.53
    c) P(C|A') = \frac{P(C \cap A')}{P(A')}
          P(A') = 1 - P(A) \rightarrow 1 - 0.525 = 0.475
          P(C) = P(C) A) + P(C) A')
          0.2 = [P(AIC) . P(C)] + P(()A1)
         0.2 = [0.55 · 0.2] + P(CAA')
         0.09 = P(()A')
         P(CIA') = P(CNA')
                                        0.09 = 0.1895 20.19
                                                                  P(CIA') = 0.19
                          P(A')
                                        0.475
```

	Green Irght
4.	4 traffic lights P(G) = 0.7 Lights are independent
a)	Because the lights are independent:
	P(All 4 green) = P(6) * P(6) * P(6)
	= 0.7 * 0.7 * 0.7 = 0.240
	The probability that all four lights are given is 0.240)
b)	This is a binomial distribution.
	b(x; n, p)
	X: number of times (out of 5) that all 4 lights are green
2	n: total number of times bus visits campus
	p: probabilite of all four green lights
	x= 80,1,2,3,4,53 n=5 p=0.240
c)	If X = 4 then: x n p
	b(x; 5,0.240) -> b(4; 5, 0.240)
	If $X = 4$ then: $\times n$ p $b(X; 5, 0.240) \rightarrow b(4; 5, 0.240)$ $= (\frac{5}{4}) 0.240^{4} (1-0.240)^{5-4}$
	$= 5 \times 0.00332 \times 0.76$ $= 0.12616$ $(5) - 5! = 120$ $-4! (5-4)! = 24 \times 1$
	≈ 0.126 $\binom{5}{4} = 5$
	If X=4, the probability +5 0.126
3	

5. It total students II first-timers 4 of 17 assigned to set A X: number of first-timers among them a) This is a hypergeometric distribution. P(x) = h(x) n, M, N) X: # of first-timens in set A X=\(\xi \), 1, 2, 3, 4\(\xi \) M: # of first-timens in set A N=\(\xi \) N: # of students in set A N=\(\xi \) P(x) = \(\frac{(n)}{2} \int \frac{(n-n)}{2} \right) = \(\frac{(n)}{2} \int \frac{(n)}{2} \right) = \((n		
a) This is a hypergeometric distribution, $P(x) = h(x)n, M, N)$ $X! = 10 \text{ first-times in set } A \qquad X = \{0, 1, 2, 3, 4\}$ $M! = 10 \text{ first-times in set } A \qquad M = 11$ $N! = 10 \text{ first-times in set } A \qquad N = 11$ $N! = 10 \text{ first-times in set } A \qquad N = 11$ $N! = 10 \text{ first-times in set } A \qquad N = 11$ $N! = 10 \text{ first-times in set } A \qquad N = 17$ $P(x) = \binom{x}{1}\binom{x}{N-x} = \binom{x}{1}\binom{x-x}{1-x} = \binom{x}{1}\binom{x-x}{1-x} = h(x), 4, 11, 17$ $P(x) = \binom{x}{1}\binom{x-x}{1-x} = \binom{x}{1}\binom{x-x}{1-x} = 2330 = 0.35$ $P(x = 2) = 0.35 \text{ first-times in set } A \qquad N = 11$ $P(x) = \binom{x}{1}\binom{x-x}{1-x} = \binom{x}{1}\binom{x}{1-x} = 2330 = 0.35$ $P(x = 2) = \frac{1}{2} \cdot 1 = \frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} = \frac{1}{2} \cdot \frac{1}{2} $	5,	17 total students 11 first-timers
$P(x) = h(x), n, M, N$ $X : \exists t \text{ of } first-timers \text{ in } \text{ set } A \qquad X = \{0,1,2,3,4\}$ $M : \exists t \text{ of } first-timers \text{ in } \text{ set } A \qquad M = 11$ $N : \exists t \text{ of } students \text{ in } \text{ set } A \qquad M = 4$ $N : \exists t \text{ of } students \text{ in } \text{ set } A \qquad N = 17$ $P(x) = \binom{m}{x} \binom{n-m}{n-x} = \binom{1}{x} \binom{17-1}{y-x} = h(x), 4, 11, 17$ $P(x) = \binom{n}{x} \binom{17-1}{y-x} = \binom{n}{y} \binom{17-1}{y-x} = h(x), 4, 11, 17$ $P(x) = \binom{n}{x} \binom{17-1}{y-x} = \binom{n}{y} \binom{17-1}{y-x} = h(x), 4, 11, 17$ $P(x) = \binom{n}{x} \binom{17-1}{y-x} = \binom{n}{y} \binom{17-1}{y-x} = h(x), 4, 11, 17$ $P(x) = \binom{n}{x} \binom{17-1}{y-x} = \binom{n}{y} \binom{17-1}{y-x} = h(x), 4, 11, 17$ $P(x) = \binom{n}{y} \binom{17-1}{y-x} = \binom{n}{y} \binom{17-1}{y-x} = 2380$ $P(x) = \binom{n}{y} \binom{17-1}{y-x} = \binom{n}{y} \binom{17-1}{y-x} = 2380$ $P(x) = \binom{n}{y} \binom{17-1}{y-x} = \binom{n}{y} \binom{17-1}{y-x} = \binom{n}{y} \binom{17-1}{y-x} = \frac{1\times 15}{2380} = 0.0063025$ $\frac{ 1 !}{ 1 !} = \frac{6!}{3!3!} = 1$ $0.0063025 + \binom{n}{y} \binom{17-1}{y-x} = \binom{n}{y} \binom{17-1}{y-x} = \binom{n}{y} \binom{17-1}{y-x} = \frac{1\times 20}{2380} = 0.092436$ $P(x) \ge 1 - P(x) = 0.10$ $P(x) \ge 1 - P(x) = 0.10$ $P(x) \ge 1 - P(x) = 0.10$		4 of 17 assigned to set A X: number of first-timers among them
$\begin{array}{c} \chi: \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ $	a)	This is a hypergeometric distribution,
M: # of first -times		P(x) = h(x; n, M, N)
M: # of first -times		X: # of first-timers in set A X= 80, 1, 2, 3, 43
N: # of students (total) $P(x) = \frac{\binom{m}{2}\binom{m}{N-m}}{\binom{m}{N-m}} = \frac{\binom{11}{12}\binom{17-11}{12}}{\binom{17}{12}} = h(x; 4, 11, 17)$ b) $P(x=2) = h(2; 4, 11, 17)$ $P(x) = \frac{\binom{11}{2}\binom{17-11}{12-2}}{\binom{17}{2}} = \frac{\binom{11}{2}\binom{12}{2}}{\binom{12}{2}} = \frac{55 \times 15}{2380} = 0.35$ $\frac{11!}{2!\cdot 4!} = \frac{15}{5} = \frac{6!}{2!\cdot 4!} = \frac{15}{4!\cdot 15!} = \frac{17!}{2380}$ $P(x=2) = 0.35$ c) $P(x=2) = 0.35$ $P(x=2) = 0.35$ $P(x=2) = P(x=0) + P(x=1)$ $\frac{x=0}{(17)} = \frac{\binom{n}{2}\binom{17-11}{12}}{\binom{17}{2}} = \frac{\binom{n}{2}\binom{6}{4}}{\binom{17}{4}} = \frac{1 \times 15}{2380} = 0.0063025$ $\frac{11!}{0!11!} = \frac{6!}{4!2!} = \frac{15}{2380}$ $\frac{11!}{0!11!} = \frac{6!}{3!\cdot 3!} = \frac{\binom{n}{2}\binom{6}{4}}{\binom{17}{4}} = \frac{1 \times 20}{2380} = 0.092436$ $\frac{11!}{1!11!} = \frac{6!}{3!\cdot 3!} = \frac{6!}{3!\cdot 3!} = \frac{10}{200}$ $0.0063025 + 0.092436 = 0.0987 \approx 0.10$ $P(x < 2) = 0.10$ $P(x \ge 2) = 1 - P(x \le 2)$ $= 1 - 0.1$ $= 0.9$	* **	
b) $P(x=2) = h(2; 4, 11, 17)$ $P(x) = \frac{\binom{n}{2}\binom{n}{4-2}}{\binom{n}{4}} = \frac{\binom{n}{2}\binom{n}{2}}{\binom{n}{4}} = \frac{55 \times 15}{2380} = 0.35$ $\frac{11!}{2! \cdot 9!} = \frac{55}{2! \cdot 4!} = \frac{6!}{4! \cdot 13!} = \frac{7380}{2380}$ $P(x=2) = 0.35$ c) $P(x=2) = P(x=0) + P(x=1)$ $\frac{x=0}{4!} = \frac{1}{4!} = \frac{15}{4! \cdot 2!} = \frac{1 \times 15}{2380} = 0.0063025$ $\frac{11!}{0! \cdot 1!} = \frac{6!}{4! \cdot 2!} = \frac{15}{4! \cdot 2!} = \frac{1 \times 15}{2380} = 0.0063025$ $\frac{11!}{0! \cdot 1!} = \frac{6!}{4! \cdot 2!} = \frac{15}{4! \cdot 2!} = \frac{11 \times 20}{4! \cdot 2!} = 0.0063025$ $\frac{11!}{1! \cdot 1!} = \frac{6!}{3! \cdot 3!} = 0$ $0.0063025 + 0.092436 = 0.0987 \approx 0.10$ $P(x < 2) = 0.10$ $P(x < 2) = 1 - P(x < 2)$ $= 1 - 0.1$ $= 0.9$		
b) $P(x=2) = h(2; 4, 11, 17)$ $P(x) = \frac{\binom{n}{2}\binom{n}{4-2}}{\binom{n}{4}} = \frac{\binom{n}{2}\binom{n}{2}}{\binom{n}{4}} = \frac{55 \times 15}{2380} = 0.35$ $\frac{11!}{2! \cdot 9!} = \frac{55}{2! \cdot 4!} = \frac{6!}{4! \cdot 13!} = \frac{7380}{2380}$ $P(x=2) = 0.35$ c) $P(x=2) = P(x=0) + P(x=1)$ $\frac{x=0}{4!} = \frac{1}{4!} = \frac{15}{4! \cdot 2!} = \frac{1 \times 15}{2380} = 0.0063025$ $\frac{11!}{0! \cdot 1!} = \frac{6!}{4! \cdot 2!} = \frac{15}{4! \cdot 2!} = \frac{1 \times 15}{2380} = 0.0063025$ $\frac{11!}{0! \cdot 1!} = \frac{6!}{4! \cdot 2!} = \frac{15}{4! \cdot 2!} = \frac{11 \times 20}{4! \cdot 2!} = 0.0063025$ $\frac{11!}{1! \cdot 1!} = \frac{6!}{3! \cdot 3!} = 0$ $0.0063025 + 0.092436 = 0.0987 \approx 0.10$ $P(x < 2) = 0.10$ $P(x < 2) = 1 - P(x < 2)$ $= 1 - 0.1$ $= 0.9$		N: # of students (total) N=17
$\frac{\ 1\ }{2! \cdot 4!} = 55 \frac{6!}{2! \cdot 4!} = 15 \frac{17!}{4! \cdot 13!} = 2580$ $P(X = 2) = 0.35$ $x = 0 P(x) = \frac{1}{12!} = 15 \frac{11!}{12!} = \frac{1}{12!} = \frac{1}{12$		$P(x) = \frac{\binom{M}{x} \binom{N-M}{N-x}}{\binom{N}{n}} = \frac{\binom{11}{x} \binom{17-11}{4-x}}{\binom{17}{4}} = h(x; 4, 11, 17)$
$\frac{\ 1\ }{2! \cdot 4!} = 55 \frac{6!}{2! \cdot 4!} = 15 \frac{17!}{4! \cdot 13!} = 2580$ $P(X = 2) = 0.35$ $x = 0 P(x) = \frac{1}{12!} = 15 \frac{11!}{12!} = \frac{1}{12!} = \frac{1}{12$		
$\frac{\ 1\ }{2! \cdot 4!} = 55 \frac{6!}{2! \cdot 4!} = 15 \frac{17!}{4! \cdot 13!} = 2580$ $P(X = 2) = 0.35$ $x = 0 P(x) = \frac{1}{12!} = 15 \frac{11!}{12!} = \frac{1}{12!} = \frac{1}{12$	b)	P(x=2) = h(2; 4, 11, 17)
$\frac{\ 1\ }{2! \cdot 4!} = 55 \frac{6!}{2! \cdot 4!} = 15 \frac{17!}{4! \cdot 13!} = 2580$ $P(X = 2) = 0.35$ $x = 0 P(x) = \frac{1}{12!} = 15 \frac{11!}{12!} = \frac{1}{12!} = \frac{1}{12$		$P(x) = {\binom{11}{2}} {\binom{11-11}{4-2}} {\binom{11}{2}} {\binom{11}{2}} = 55 \times 15 = 0.35$
$\frac{\ 1\ }{2! \cdot 4!} = 55 \frac{6!}{2! \cdot 4!} = 15 \frac{17!}{4! \cdot 13!} = 2580$ $P(X = 2) = 0.35$ $x = 0 P(x) = \frac{1}{12!} = 15 \frac{11!}{12!} = \frac{1}{12!} = \frac{1}{12$		(4) (4) 2380
$P(x=2) = 0.35$ c) $P(x<2) = P(x=0) + P(x=1)$ $x=0 P(x) = \frac{\binom{n}{0}\binom{17-11}{4-0}}{\binom{17}{4}} = \frac{1 \times 15}{2380} = 0.0063025$ $ 1! = 1 6! = 15$ $0! 1! = 1 4!2!$ $x=1 P(x) = \frac{\binom{11}{1}\binom{17-11}{4-1}}{\binom{17}{4}} = \frac{\binom{n}{1}\binom{6}{5}}{2380} = 0.092436$ $ 1! = 1 \frac{6!}{3!3!} = 0$ $0.0063025 + 0.092436 = 0.0987 \approx 0.10$ $ P(x<2) = 0.10$ $P(x \ge 2) = 1 - P(x \le 2)$ $= 1 - 0.1$ $= 0.9$		11! = 55 6! = 15 = 7380
c) $P(x < 2) = P(x = 0) + P(x = 1)$ $\frac{x = 0}{(1)^{2}} P(x) = \frac{\binom{n}{0} \binom{17-11}{14-0}}{\binom{17}{4}} = \frac{\binom{n}{0} \binom{4}{4}}{\binom{17}{4}} = \frac{1 \times 15}{2380} = 0.0063025$ $\frac{11!}{0!1!!} = \frac{6!}{4!2!} = \frac{15}{4!2!}$ $x = 1 P(x) = \frac{\binom{n}{1} \binom{n-1}{4-1}}{\binom{17}{4-1}} = \binom{n}{1} \binom{6}{5}}{\binom{17}{4}} = \frac{11 \times 20}{2380} = 0.092436$ $\frac{11!}{1!1!!} = \frac{6!}{3!3!} = \frac{6!}{3!3!}$ $0.0063025 + 0.092436 = 0.0987 \approx 0.10$ $P(x < 2) = 0.10$ $P(x \ge 2) = 1 - P(x < 2)$ $= 1 - 0.1$ $= 0.9$		
$ \frac{x=0}{(\frac{1}{4})} = \frac{(\frac{1}{6})(\frac{1}{4})}{(\frac{1}{4})} = \frac{(\frac{1}{6})(\frac{4}{4})}{(\frac{1}{4})} = \frac{1 \times 15}{2380} = 0.0063025 $ $ \frac{11!}{0!11!} = \frac{6!}{4!2!} = \frac{6!}{(\frac{1}{4})} = \frac{(\frac{1}{4})(\frac{5}{6})}{(\frac{1}{4})} = \frac{11 \times 20}{2380} = 0.092436 $ $ \frac{11!}{1!11!} = \frac{6!}{3!3!} = \frac{6!}{3!3!}$		
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	c)	P(x<2) = P(x=0) + P(x=1)
$x = 1 P(x) = \frac{\binom{11}{4-1} \binom{7-11}{4-1}}{\binom{17}{4-1}} = \frac{\binom{11}{1} \binom{6}{5}}{\binom{17}{4}} = \frac{11 \times 20}{2380} = 0.092436$ $\frac{11!}{1! 1!!} = \frac{6!}{3! 3!} = \frac{6!}{3! 3!}$ $0.0063025 + 0.092436 = 0.0987 \approx 0.10$ $P(x < 2) = 0.10$ $2) P(x \ge 2) = 1 - P(x < 2)$ $= 1 - 0.1$ $= 0.9$		$\frac{\chi=0}{(\frac{17}{4})} \frac{(\frac{17}{4})(\frac{17}{4})}{(\frac{17}{4})} = \frac{(\frac{17}{4})(\frac{17}{4})}{(\frac{17}{4})} = \frac{1 \times 15}{2380} = 0.0063025$
$x = 1 P(x) = \frac{\binom{11}{4-1} \binom{7-11}{4-1}}{\binom{17}{4-1}} = \frac{\binom{11}{1} \binom{6}{5}}{\binom{17}{4}} = \frac{11 \times 20}{2380} = 0.092436$ $\frac{11!}{1! 1!!} = \frac{6!}{3! \cdot 3!} = \frac{6!}{3! \cdot 3!}$ $0.0063025 + 0.092436 = 0.0987 \approx 0.10$ $P(x < 2) = 0.10$ $2) P(x \ge 2) = 1 - P(x < 2)$ $= 1 - 0.1$ $= 0.9$	Marca 195	11! - 1 6! - 15
$\frac{11!}{1!1!!} = \frac{6!}{3!3!} = \frac{6!}{3!3!}$ $0.0063025 + 0.092436 = 0.0987 \approx 0.10$ $P(x < 2) = 0.10$ $P(x \ge 2) = 1 - P(x < 2)$ $= 1 - 0.1$ $= 0.9$		0:11! 4:2!
1! ! $3!,3!$ $0.0063025 + 0.092436 = 0.0987 \approx 0.10$ $P(x < 2) = 0.10$ $c) P(x \ge 2) = 1 - P(x < 2)$ $= 1 - 0.1$ $= 0.9$		$x = 1$ $P(x) = \frac{\binom{11}{1}\binom{17-11}{4-1}}{\binom{17}{1}} = \frac{\binom{11}{1}\binom{6}{3}}{\binom{17}{1}} = \frac{11 \times 20}{2380} = 0.092436$
$P(x < 2) = 0.10$ c) $P(x \ge 2) = 1 - P(x < 2)$ $= 1 - 0.1$ $= 0.9$		
$P(x < 2) = 0.10$ c) $P(x \ge 2) = 1 - P(x < 2)$ $= 1 - 0.1$ $= 0.9$		$0.0063025 + 0.092436 = 0.0987 \approx 0.10$
= 1-0.1		
= 1-0.1	c)	$P(X \ge 2) = 1 - P(X < 2)$
= 0.9		= 1 - 0.1
$P(x \ge 2) = 0.90$		= 0.9
		$P(x \ge 2) = 0.90$

	CEE 110 Middern Reference Sheet Ethan Wong 4/29/21 Min whister - lowest value in category for Q1-1.5 IQR (minimum information mark) TA: Kai Yang Max whister - langest value that is less than or equal to 1.5 IQR + Q3
	Lower Quartile - median of lower half
- 475	
	Pourths Spread (Interquartile Range) - Qz-Q,
[] 1 - 00	Mutually Exclusive - two events that can't happen at the same time
INTERPOLIER (1-AND	· P(A) = 1 - P(A')
	· P(AUR) = P(A) + P(B) - P(AOR) // P(AOR) = P(A) + P(B) - P(AUB)
	· P(AUB) = P(A) + P(B) - P(ANB) // P(ANB) = P(A) + P(B) - P(AUB) Odds - Earnings from win - Losings for loss probability to win: WIL
	Tree Diagram - Good for drawing out all possibilities
	Permutations: order matters
	# of permutations of size k from n objects is $P_{K,N} = \frac{n!}{(n-K)!}$
	Combination : order does not matter
	If of combinations of size k from n objects is $C_{k,n} = \frac{n!}{(n-k)!k!}$
	X chose Y - "randomly select X objects from population of Y things"
) 4	Curditional probability (AIB) - Probability of Agren B
	$P(A B) = \frac{P(A B)}{P(B)}$
	Independence - events are independent of P(A 1B) = P(A)
	Limplies that P(ANB) = P(A) x P(B)
	Bayes Theoren - P(AIB) = P(BIA)P(B)
	$P(A) = P(B \cap A) + P(B' \cap A)$ $P(B) = P(B \cap A) + P(B \cap A')$
	[pmf = P(x)] - probability of an event, written in a table
	cdf = F(x) 11 - adding up pmf over time, final cdf =1
	Expected Value = E(x) - long run expected mean E(x) = Nx = Zx p(x)
	$E(ax+b) = Q \cdot E(x) + b$
	Variance = V(x) - V(x) = 02 = E(x2) - [E(x)]2
	$\sqrt{V(x)} = \sigma = standard devrotion$
	$V(a \times + b) = a^2 V(x) = a^2 o^2 x$
	Jaxob = lalox
	Binomal Distribution - b(x; n, p) x: number of successes in n trials p: probability
	$= {\binom{N}{N}} {\binom{N}{N}} {\binom{N}{N}} = \frac{N!}{N!(n-s)!}$
	Expected Value: E(x) = n x p
	Variance: V(x) = np(1-p)