Task 1

Mark	1st	2:1	2:2	3 (Pass)	Fail
# students	4	10	12	5	3

Total students : $4+10+12+5+3 = 34$

a) $P(\text{Mark} = 1st) = 4/34 = 0.11764$
b) $P(\text{Mark} = 2:1) = 10/34 = 0.29411$
c) $P(\text{Mark} = 2:2) = 12/34 = 0.35294$
d) $P(\text{Mark} = 3) = 5/34 = 0.147058$
e) $P(\text{Mark} = \neg\text{fail}) = (4+10+12+5)/34$
$= 31/34 = 0.91176$

	Pass	Fail	
male	20	2	22
Female	11	1	12
	31	3	34

	Pass	Fail
Male	0.5882	0.05882
Female	0.3235	0.0294

f) $P(\text{Pass}) = \text{Pass}/\text{total} = 31/34 = 0.91176$
g) $P(\text{Pass}, \text{female}) = 0.3235$

	Sunny	Rainy
hot	0.3	0.1
Cold	0.1	0.5

h) $P(\text{sunny}) = 0.3 + 0.1 = 0.4$
i) $P(\text{hot}) = 0.3 + 0.1 = 0.4$
j) $P(\text{hot} \mid \text{sunny}) = \text{hot}/\text{sunny} = 0.3/0.4 = 0.75$
k) $P(\text{rainy} \mid \text{cold}) = \text{rain}/\text{cold} = 0.5/0.6 = 0.8333$

X	Y	P(X, Y)
x	y	0.2
x	¬y	0.3
¬x	y	0.4
¬x	¬y	0.1
		= 1.0

becomes:

	y	¬y	
x	0.2	0.3	0.5
¬x	0.4	0.1	0.5
	0.6	0.4	1.0

$\leftarrow \sum_{e \in S} P(e) = 1$

l) $P(x \wedge y) = 0.2$ intersection of x and y

m) $P(x) = P(x \wedge y) + P(x \wedge \neg y) = 0.2 + 0.3 = 0.5$

n) $P(x \vee y) =$

$= P(x) + P(Y) - P(x \wedge y)$

$= 0.5 + P(y) - P(x \wedge y)$

$= 0.5 + P(y \wedge x) + P(y \wedge \neg x) - 0.2$

$= 0.5 + 0.6 - 0.2$

$= 0.9$

o) $P(x) = 0.5$

p) $P(y) = 0.6$

q) $P(x|y) = P(x \wedge y) / P(y)$

$= 0.2 / 0.6$

$= 0.333\dot{3}$

r) $P(\neg x|y) = P(\neg x \wedge y) / P(y)$

$= 0.4 / 0.6$

$= 0.6666$

s) $P(\neg y \mid x) =$

	y	$\neg y$	
x	0.2	0.3	0.5
$\neg x$	0.4	0.1	0.5
	0.6	0.4	1.0

$= P(x \wedge \neg y) \;/\; P(x)$
$= 0.3 \;/\; 0.5$
$= 0.6$

t) $P(\text{sun}) = P(W = \text{sun})$

$= P(0.3 + 0.1 + 0.1 + 0.15)$

$= 0.65$

u) $P(\text{sun} \mid \text{winter}) = P(W = \text{sun} \mid S = \text{winter})$

$= 0.1 + 0.15 \;/\; 0.1 + 0.05 + 0.15 + 0.2$

$= 0.25 \;/\; 0.5$

$= 0.5$

v) $P(\text{sun} \mid \text{winter}, \text{hot}) = P(W = \text{sun} \mid S = \text{wint}, T = \text{hot})$

$= 0.1 \;/\; 0.15$

$= 0.66667$

Task 2

HAMBURGER EATER = HE

a) $P(HE \mid KJ) = 0.9$

$P(KJ) = 1/100{,}000$

$P(HE) = 0.5$

$P(KJ \mid HE) = \underline{2/100{,}000}$

d = disease + = ~~test~~

b) $P(d) = 1/10000$

$P(+ \mid d) = 0.99$

$P(-t \mid -d) = 0.95$

$P(d \mid t) = \underline{1.976285 \times 10^{-3}}$

Task 2b)

$P(+|d) = P(+ \wedge d) / P(d) = 0.99$

$P(\neg +|\neg d) = P(\neg + \wedge \neg d) / P(\neg d) = 0.95$

(a) $P(d) = 1/10{,}000$

Therefor:

(b) $P(\neg d) = \frac{9999}{10{,}000} = 0.9999$

$= 1 - P(d)$

	D	¬D
T	(c) 9.9×10^{-5}	
¬T	(d) 1×10^{-6}	

(a) 1×10^{-4} (b) 0.9999

(c) $= P(+|d) = P(+ \wedge d) / P(d) = 0.99$

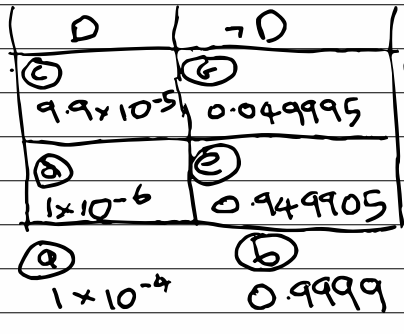
$= \frac{t}{d} = 0.99$

$= \frac{t}{1 \times 10^{-4}} = 0.99 \rightarrow t = 0.99 \times 1 \times 10^{-4}$

$= 9.9 \times 10^{-5}$

(d) $= 1 \times 10^{-4} - 9.9 \times 10^{-5} = 1 \times 10^{-6}$

PTO



(e) $P(\neg t \mid \neg d) = P(\neg t \wedge \neg d) / P(\neg d) = 0.95$

$= \frac{\neg t}{P(\neg d)} = 0.95$

$= \frac{\neg t}{0.9999} = 0.95$

$= \neg t = 0.95 \times 0.9999$

$\neg t = 0.949905$

(F) $= 1\times10^{-6} + 0.949905 = 0.949906$

(G) $= 0.9999 - 0.949905 = 0.049995$

(h) $= 0.049995 + 9.9\times10^{-5} = 0.0500094$

(i) $= 1\times10^{-4} + 0.9999 = 1$

(j) $= 0.0500094 + .949906 = 1$

$\therefore P(d \mid t) = P(d \wedge t) / P(t)$

$= \frac{9.9\times10^{-5}}{0.0500094}$

$= 1.976285 \times 10^{-3}$