$\mathcal{E}1 \quad 2/1000$

$\mathcal{E}2 \quad 1/1000$

$\mathcal{E}3 \quad 4/1000$

a) $P(x) \rightarrow$ getting a disc w/ error =

$P(\mathcal{E}_1)\, P(X_1|\mathcal{E}_1) + P(X|\mathcal{E}_2) + P(X|\mathcal{E}_3)P(\mathcal{E}_3) = \boxed{\frac{7}{3{,}000}}$

b/c $P(\mathcal{E}_1) = P(\mathcal{E}_3) = P(\mathcal{E}_2)$

b) $P(\mathcal{E}_1|X) = \dfrac{\overset{2/1000}{P(X|\mathcal{E}_1)}\ \overset{1/3}{P(\mathcal{E}_1)}}{P(x) \rightarrow \frac{7}{3000}}$

$= \dfrac{2\,(3)}{7 \cdot 3} \quad \boxed{= \frac{2}{7}}$

Bayes Rule

c.) $\mathcal{E}_2$ culprit given $\mathcal{E}3$ on vacation.

$\mathcal{E}_3$ on vacation so $P(x) = P(X|\mathcal{E}_2)P(\mathcal{E}_2) + P(X|\mathcal{E}_1)(\mathcal{E}_1)$

$\therefore \mathcal{E}_1 = \mathcal{E}_2 = \frac{1}{2} \quad \therefore \frac{1}{2000} + \frac{2}{2000} = \frac{3}{2000}$

$\therefore P(\mathcal{E}_2|X) = \dfrac{P(X|\mathcal{E}_2)P(\mathcal{E}_2) = \frac{1}{2000}}{P(x) = \frac{3}{2000}} = \boxed{\frac{1}{3}}$

8.4.7) a) 99% accurate for ~~A~~ B $P(A) = 0.1$
50% accurate for ~~B~~ A $P(B) = 0.9$

$P(C) = P(C|A)\,P(A) + P(C|B) \cdot P(B)$

$\therefore P(C) = 0.5(0.1) + (0.99)(0.9) = 0.941$

b.) given misclassified → chance from A

$\therefore$ Find $P(A|m) = \dfrac{P(m|A)\,P(A)}{P(m)}$

$P(C|A) = 0.5 \quad \therefore P(m|A) = 0.5$

$P(C|B) = 0.99 \quad \therefore P(m|B) = 0.01$

$\therefore P(m) = P(m|A)\,P(A) + P(m|B)\,P(B)$

$= 0.059$

$\therefore P(A|m) = \dfrac{0.5 \times 0.1}{0.059} \approx 84.7\%$

$P(S) = 0.9 \rightarrow$ 90% chance showup

324 tickets :.

for each $S \rightarrow P(S) = 0.9$

:. probability that all showup =

$(0.9)^{324}$

-> Probability that all but one showup

$\binom{324}{1} (0.9)^{323} \, 0.1$

-> Prob that all but 2 showup

$\binom{324}{2} (0.9)^{322} (0.1)^2$

$\vdots$

:. Prob that all but 24 showup

$\binom{324}{24} (0.9)^{300} (0.1)^{24}$

:. Prob(overlooked) =

$$\sum_{i=1}^{24} \binom{324}{i} 0.9^{(324-i)} (0.1)^i$$

= 4.47% from python!

Q.3

Part 2 → suppose they travel in groups →

let's assume extreme cases → groups of 300 → the likelyhood of overbooking >> ; most likely overbooked always.

Hence pairs ↑

Part 3 : Pairs : instead of 324 seats → 162 and 12

$$\therefore \sum_{n=1}^{12} \binom{162}{n} 0.9^{162-n} \, 0.1^{162} = \text{calculator} \Rightarrow 16\%$$

9.) Lukemia

9.1) A = Pateint in A, B = in B S = success

$\therefore P(A|S) = \dfrac{P(S|A) \cdot P(A)}{P(S)}$

$P(S) = P(S|A) \cdot P(A) + P(S|B)\, P(B) \approx 0.3534 \;//\; \dfrac{10.25}{29}$

$\therefore P(A|S) = \dfrac{0.25 \times 17/29}{10.25/29} = 41.46\%$

9.2.) All 4 Success full $= P(S)^4 = (0.3534)^4 =$
$0.0156 \approx 1.56\%$

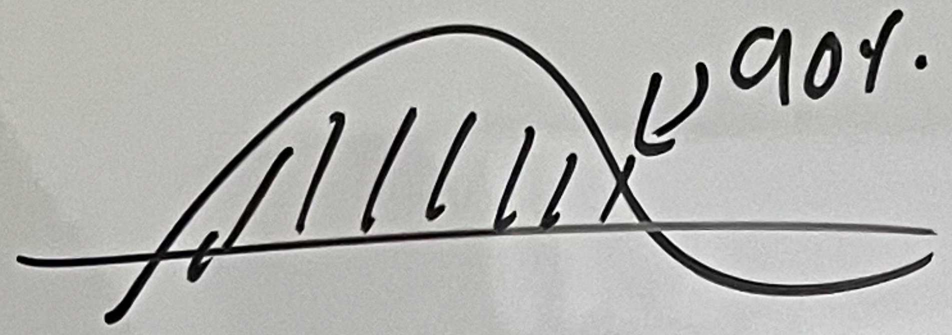
Q.2) $P(|\hat{P}_n - P_n| > 0.05) < 0.01$

from previous example → $n \geq \frac{a^2}{4}$ $\quad a = \frac{(1.96)^2}{(0.01)^2} \frac{1}{4} \approx 9604$

if $n = 5000$, what's the δ for $P(|\hat{I} - I| \leq \delta) > 0.9$

Area = 16

$\therefore p = \frac{I}{16} \quad \therefore \delta = \frac{1.645\sqrt{pq} \cdot 16}{\sqrt{n}}$ → 5000



∴ 5%

$\delta = 2 \cdot \frac{\sigma}{\sqrt{n}} = \frac{1.645\sigma}{\sqrt{n}}$

$\therefore \delta = 0.373\, p(1-p)$ → test back max at p=0.5

$\therefore 0.373(0.5) = 0.1865$!

Q.4.) $P(|\hat{I} - I| \leq 0.25) > 0.90$

we know $p = \frac{8.662}{16} \simeq \underline{0.5418}$

$\therefore n = \left(\frac{z \cdot \sigma}{\delta}\right)^2 =$

$\sigma = \sqrt{pq}$

$z = 1.645 \quad \delta = 0.25$

$\therefore n = \left(\frac{1.645 \sqrt{0.54(1-0.54)}}{0.25}\right)^2 \simeq \underline{2746}\ !$

$$\int_0^8 [\cos x \sin(2x) + 1]\, dx$$

$\sin 2x = 2\cos x \sin x$

$\therefore \int \cos x \, 2 \sin x \cos x \, dx + \int 1 \, dx$

$2\int \cos^2 x \sin x \, dx + \int 1 \, dx \rightarrow$ IBP

IBT x work

$u = \cos x \quad du = -\sin x \, dx$

$\therefore -2\int u^2 du = \frac{2u^3}{3} + C = \frac{2\cos^3(x)}{3} + x$

$= -\frac{2}{3}\cos^3(x) + x \Big|_{x=0}^{x=8} = -\frac{2}{3}\cos^3(8) + 8$

$-\frac{2}{3} + 0$

$\therefore -\frac{2}{3}\cos^3(8) + 8 - \frac{2}{3} \approx 8.667$

Product rule $\rightarrow$

$\frac{d}{dx}[f(x)g(x)] = f'(x)g(x) + g'(x)f(x)$

antideriv $\downarrow$

$f(x)g(x) = \int f'(x)g(x)dx + \int g'(x)f(x)dx$

$$\boxed{\therefore f(x)g(x) - \int f'(x)g(x)\,dx = \int g'(x)f(x)\,dx}$$

IBP $\therefore$

$\int g(x)f'(x)dx = f(x)g(x) - \int f'(x)g(x)\, dx$