TRIALS 2019. P2. STATS MEMO. A.P.M.

1.1. $P(A/B) = \frac{P(A \cap B)}{P(B)}$ ✓

A → B → $P(A \cap B) = 0,29$
A → B'
A' → B → $P(A' \cap B) = 0,35$
A' → B'

$= \frac{0,29}{0,29 + 0,35}$ ✓m ✓a

$= \frac{0,29}{0,64} = 0,4531$ ✓ (4)

1.2. a.) 10! ways ✓ = 3628800 ✓ (2)

b.) if 3 next to ∴ treat as one thing
∴ 1 + 7 = 8 things to place in 8 places ✓
8! ways ✓
But in each of these 8! ways 3 can be mutt
in 3! ways ✓
∴ no. of ways = 8! ✓ × 3!
= 241320
∴ if not next to, then 10! − 8!3! (4)
= 3386880 ways.

1.3. a.) DAZZLEDUDE
3 D's
2 Z's
2 E's
1 A
1 U
1 L
10

∴ no. "words" = $\frac{10!}{3!2!2!}$ ✓ diff all diff ✓ repetitions
= 151200 ✓ (3)

b.) if both E's : E — $\frac{8!}{3!2!}$ — E ✓ option
or
if A & U : A {8! ×2 U} ✓
U {3!2!2! A}
or
if A & E } → A — E {8! ×2! ×2 ✓
or U & E } → E — A {3!2!
U — E
E — U

P.T.O.

2.

$\therefore n(\text{Vowels at end})$

$= \frac{8!}{3!2!} + \frac{8!}{3!2!2!} \times 2 \; (+) \; \frac{8!}{3!2!}, 2! \times 2$ ✓

$= 3360 + 3360 + 13440$ ✓

$= 20160$ ✓ (7)

$\therefore P(\text{Vowels @ ends}) = \frac{20160}{151200} = \underline{0,1333}$ ✓

(Q2.) 2.1. ✱ edit - ALL method marks. Wrong equation given. [20]

a.) $\sum P(X=x) = 1$. ✓m

$\therefore 1 - \frac{4}{k} + 1 - \frac{6}{k} + 1 - \frac{8}{k} + 1 - \frac{10}{k} = 1$ ✓a.

$\therefore 4 - \frac{(4+6+8+10)}{k} = 1.$

$\therefore 3 = \frac{28}{k}$ ✓ca.

$k = \frac{28}{3}$ (3)

b.) $P(X>3) = P(X=4) + P(X=5)$ ✓m

$= 1 - \frac{8}{k} + 1 - \frac{10}{k}.$

$= 2 - \frac{18}{k}.$ ✓a

$= 2 - \frac{18}{28} \times 3$ ✓ca

$= \underline{0,0714}$ $\left(\frac{357}{5000}\right)$ ✓ (3).

c.) $E[X] = \sum x.P(X=x)$ ✓

$= 2\left(1 - \frac{4}{\left(\frac{28}{3}\right)}\right) + 3.\left(1 - \frac{6}{28/3}\right) + 4\left(1 - \frac{8}{28/3}\right) + 5\left(1 - \frac{10}{28/3}\right)$ ✓

$= \underline{2,4206}$ ✓ ✓ (3).

d.) mode = $\underline{2}$ ✓ (1)

2.2. a.) $n = 8$.

X = no. who buy cappachino.

$p = 0,6$ Binomial ✓

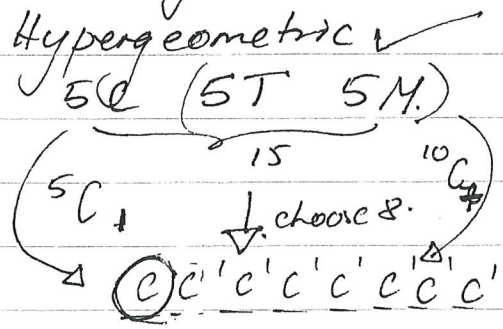
$P(X=6) = {}^{8}C_{6} \cdot 0,6^{6} \cdot 0,4^{2}$ ✓ ✓m.

$= 0,2090$ ✓ (7)

b.) $P(X \geq 2)$ X = no. who buy coffee.

$= 1 - P(X=1) - P(X=0)$ ✓m Hypergeometric ✓

$= 1 - \frac{{}^{5}C_{1} \cdot {}^{10}C_{7}}{{}^{15}C_{8}} - \frac{{}^{5}C_{0} \cdot {}^{10}C_{8}}{{}^{15}C_{8}}$ ✓ ✓ ✓

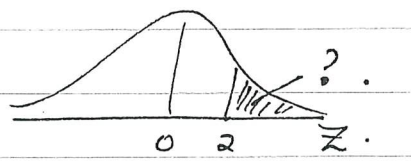


$= 1 - 0,09324 - 0,00699$

$= 0,89998$ ✓ (8)

2.3. $X \sim N(110; 20^2)$.

a.) $P(X > 150)$ ✓



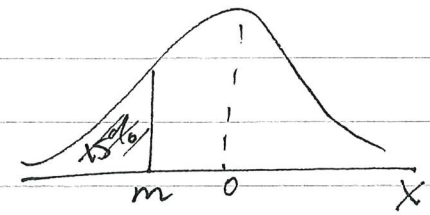
ii. $P\left(Z > \frac{150-110}{20}\right)$ ✓ ✓

$= P(Z > 2)$ ✓

$= 0,5 - 0,4772$ ✓

$= 0,0228$ (6)

b.) (i.)



a. ✓ (1)

(ii.) $P\left(Z < \frac{m-110}{20}\right) = 0,15$. ✓

$\therefore P\left(\frac{m-110}{20} < Z < 0\right) = 0,5 - 0,15 = 0,35$ ✓

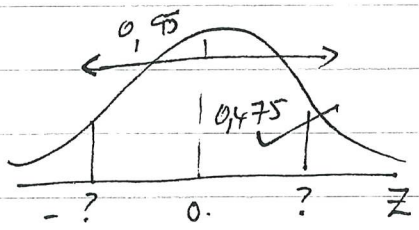
4.

2.3.b) ii) cont. $\therefore \quad \frac{m-110}{20} = \pm 1,04$ ✓ ✓

$\therefore m = -1,04(20) + 110$

$= 89,20g$ ✓ (5)

2.3.c.) $P\left(\hat{p} - z\sqrt{\frac{\hat{p}(1-\hat{p})}{n}} < p < \hat{p} + z\sqrt{\frac{\hat{p}(1-\hat{p})}{n}}\right) = 0,95$



$\hat{p} = \frac{400}{600} = \frac{2}{3}$ ✓

$\rightarrow \therefore z = \pm 1,96$ ✓

✓m ✓

$\therefore$ true pop. prop. $p \in \left(\frac{2}{3} - 1,96\sqrt{\frac{\frac{2}{3}(\frac{1}{3})}{600}} ; \frac{2}{3} + 1,96\sqrt{\quad}\right)$

$= (62,89\% ; 70,44\%)$ ✓ (5)

[42]

Q3.

3.1.a.) A: $28(0,1) < 5 \quad \therefore$ no

B: $8(0,7) > 5$ and $8(0,3) < 5 \quad \therefore$ no

C: $20(0,3) > 5$ and $20(0,7) > 5 \quad \therefore$ yes!

D: $7(0,6) < 5 \quad \therefore$ no

✓m ✓m ✓

$\therefore$ only C ✓a (3)

b.) C: $\mu = np = 6$ ✓ca ✓m

$\sigma^2 = np(1-p) = 6(0,7) = 4,2$ ✓ca ✓ (3)

3.2 a.) $P(2,5 < Y < 3,5)$ ✓

b.) $P(Y < 3,5)$ ✓

c.) $P(Y > a + 0,5)$ ✓

d.) $P(3,5 < Y < 7,5)$ ✓

✓ (4)

3.3. a.) $X \sim B(25; 0,35) \longrightarrow X \sim N(25(0,35); 25(0,35)(0,65))$

ie. $X \sim N(8,75; 5,6875)$

$\therefore \mu = 8,75$ (2)

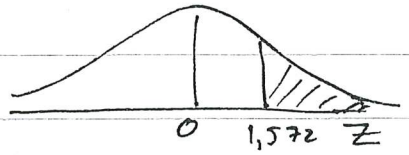
b.) $P(X > 12)$? Bin. $\rightarrow$ Norml. $\sigma^2 = 5,6875$

$= P(X > 12 + 0,5)$

$= P(X > 12,5)$

$= P\left(Z > \frac{12,5 - 8,75}{\sqrt{5,6875}}\right)$

$= P(Z > 1,572)$



$= 0,5 - 0,4418$

$= 0,0582$ (5)

3.4 a.) "sample means" ... "n is sufficiently large" (or $n \geq 30$. (2)

b.) A. Yes. Given as normal.

B. No. Not normal & $n \neq 30$.

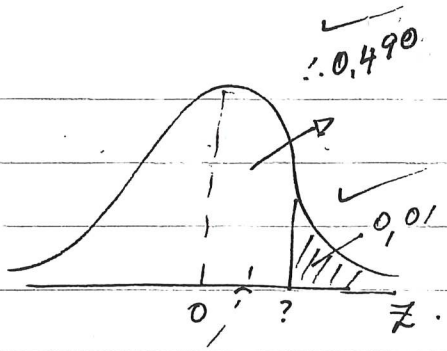
C. Yes. Not normal but $n > 30$ (6)

[25]

Q4.

4.1. $H_0: \mu = 5\text{ mg}/100\text{ml}$ ✓

$H_1: \mu > 5\text{ mg}/100\text{ml}$ ✓



$\sigma = 3{,}2\text{ mg}/100\text{ml}$

$n = 50.$

$\bar{X} = 5{,}88\text{ mg}/100\text{ml}.$ ✓

α = sig. level = 1% = 0,01

∴ critical Z = 2,33 ✓ (tables).

Test stat, $Z = \dfrac{\bar{X} - \mu}{\sigma/\sqrt{n}}$ ✓

$= \dfrac{5{,}88 - 5}{\left(\frac{3{,}2}{\sqrt{50}}\right)}$

$= 1{,}9445 < 2{,}33$ ✓

(not in rejection region) ✓

∴ We fail to reject the null hypothesis @ the 1% level of significance ∴ cannot support the claim at this 1% level. ✓ (10)

4.2. if critical Z value $< 1{,}9445$. ✓

i.e. prob. $< 0{,}4738$

∴ sig. level $\geq 0{,}5 - 0{,}4738$ ✓

i.e. $\alpha \geq 0{,}026$

∴ min α so that H_0 is rejected must be $\alpha = 3\%$ ✓ (3)

[13].