MEMO – STATS PAPER
PRELIM – 2021

QUESTION 1:

a) $6C_2 + 6C_4 = 30$ (3)

or $6C_2 \times 4C_4 \times 2 = 30$

b. Mark, Jon and Sarah in taxi P:

$(5C_1 \times 2! \times 2!) \times 4P_4$

$= 480$ (4)

b) $P(X \cap Y) = P(4;8;8)$

$= 1/4 \times 2/5 \times 4/7$

$= 2/35$

$P(Y) = 1/4$

$\therefore 2/35 \neq 1/4 \times 47/140$

not independent. (4)

c) $P(2;2 / same)$

$= (1/4 \times 1/7) \div 47/140$

$= 5/47\ (0,106)$ (3)

QUESTION 2

a) $P(X) = P$(exactly 2 balls have same number)

$P(2;N2;2) = 1/4 \times 1 \times 1/7 = 1/28$

$P(8;8;N8) = 1/4 \times 2/5 \times 3/7 = 3/70$

$P(8\ N8;8) = 1/4 \times 3/5 \times 4/7 = 3/35$

$P(N8;8;8) = 3/4 \times 2/5 \times 4/7 = 6/35$

$\therefore P(X) = 47/140\ (0,3357)$ (6)

QUESTION 3

a) $2k + 4k + 6k + 6k = 1$

$k = 1/18$ (5)

b) $E(X) = 2 \times 2k + 4 \times 4k + 6 \times 6k + 8 \times 6k = 104k$

$= 104 \times 1/18 = 52/9\ (5,7778)$

$E(X^2) = 4 \times 2k + 16 \times 4k + 36 \times 6k + 64 \times 6k$

$= 112/3\ (37,3333)$ (7)

c) $Var(X) = 112/3 - (52/9)^2 = 320/81\ (3,95)$ (2)

4). a. $P(X \geq 1)$

$= 1 - P(X=0)$

$= 1 - {}^{3}C_0 \, {}^{17}C_5 \,/\, {}^{20}C_5$

$= \frac{137}{228}(0,6009)$ (6)

b1. $P(X > 3900)$

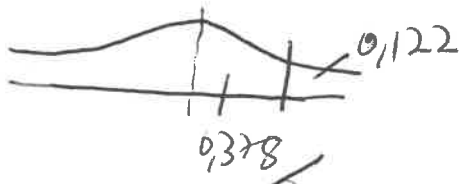
$= P(z > \frac{3900-4520}{560})$

$= P(z > -1,107) = 0,8665$

$\therefore$ Number of days $= 365 \times 0,8665$

$= 316$ (6)

2.



$z = 1,165$ (or 1,16 or 1,17)

$1,165 = \frac{8000-m}{560}$ (4)

$m = 7347,6$

3. $P(X=0) + P(X=1)$

$= {}^{6}C_0 (0,122)^0 (0,878)^6$

$+ {}^{6}C_1 (0,122)^1 (0,878)^5$

$= 0,8400$ (5)

QUESTION 5

a) i. $\frac{20}{100} \pm 1,88\sqrt{\frac{0,2 \times 0,8}{100}}$

$[0,1248 ; 0,2752]$ (6)

$= [12,48\% ; 27,52\%]$

2. 1/6 is within this range so no evidence of bias concerning 2. (1)

b. $\bar{x} \pm z \cdot \frac{\sigma}{\sqrt{n}}$

$= 2,4 \pm 2,33 \cdot \frac{1,3}{\sqrt{20}}$

$= [1,7226 ; 3,0773]$

$\therefore$ margin of error $= 0,6773$ (6)

5G1. $P(SLL) = 0,3 \times 0,55 \times 0,55$

$= 0,09075 \left(\frac{363}{4000}\right)$

$P(SRR) = 0,3 \times 0,15 \times 0,15$

$= 0,00675 \left(\frac{27}{4000}\right)$

$\therefore T8121 = 3C_1(0,09075) + 3C_1(0,00675)$

$= 0,2925 \left(\frac{1117}{4000}\right)$ (5)

2. $P(S \mid \text{same direction})$

$= \frac{0,3 \times 0,3 \times 0,3}{(0,15)^3 + (0,55)^3 + (0,3)^3}$

$= 0,1372 \left(\frac{108}{787}\right)$ (5)

3. $P = 0,55$

$E(x) = 49,5$ $Var(x) = 22,275$

$P(42 < x < 54)$

$= P\left(\frac{42,5 - 49,5}{\sqrt{22,275}} < z < \frac{58,5 - 49,5}{\sqrt{22,275}}\right)$

$= P(-1,48 < z < 1,907)$

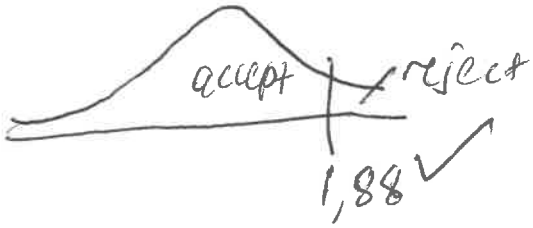
$= 0,4306 + 0,4719$

$= 0,9025$ (7)

QUESTION 6:

a) $H_0: \mu = 140$

$H_1: \mu > 140$ (7)

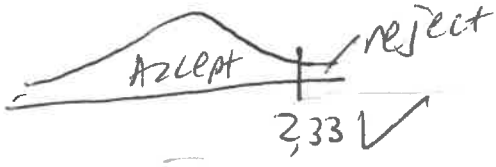


$z = \frac{146 - 140}{\frac{27}{\sqrt{157}}} = 2,78$

$\therefore$ We reject H_0 and conclude the mean systolic blood pressure for African men is greater than 140

b) $H_0: \mu_S \leq \mu_U$

$H_1: \mu_S > \mu_U$



(8)

$z = \frac{5,5 - 5,3}{\sqrt{\frac{0,4^2}{50} + \frac{0,3^2}{100}}} = 3,123$

Reject H_0 and conclude that the U scan method is faster.