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Stats Y1 - Exam Question Bank SOLUTIONS

(6) b) $(114.5 \times 7) + (124.5 \times 8) + (134.5 \times x) + (144.5 \times 10) + (154.5 \times 4)$

$\sum fx = 3860.5 + 134.5x$

$\sum f = 7 + 8 + x + 10 + 4 = x + 29$

$\bar{x} = 133.5$

$$133.5 = \frac{3860.5 + 134.5x}{x + 29}$$

$$3871.5 + 133.5x = 3860.5 + 134.5x$$

$$11 = x$$

$$\therefore x = 11$$

c) $$\sigma = \sqrt{\frac{719050}{40} - \left(\frac{5340}{40}\right)^2}$$

$$= 12.4\,g$$

(10) b) $2x + 0.65 = 1$

$2x = 0.35$

$x = 0.175$

c) $P(A) \times P(B) = P(A \cap B)$

$0.475 \times 0.35 = 0.16625 \neq 0.175$

(13) c)

	UCB	CF	
	4.5	0	
	9.5	1	
	12.5	4	← 6.25
$Q_1 \rightarrow$	16.5	11	← 18.75
$Q_3 \rightarrow$	25.5	23	
	40.5	25	

$$\frac{Q_1 - 12.5}{16.5 - 12.5} = \frac{6.25 - 4}{11 - 4}$$

$$Q_1 = 13.7857$$

$$\frac{Q_3 - 16.5}{25.5 - 16.5} = \frac{18.75 - 11}{23 - 11}$$

$$Q_3 = 22.3125$$

$IQR = Q_3 - Q_1 = 8.53$ hours (3 sf)

(14) c) $P(X \geq 10) = 0.0713 > 0.05$

$P(X \geq 11) = 0.0296 < 0.05$

$X \sim B(25, 0.25)$

$\therefore x = 11$

(15) b)

	UCL	CF	
	6	5	← 15
$Q_2 \rightarrow$	8	18	
	10	26	
	12	30	

$$\frac{Q_2 - 6}{8 - 6} = \frac{15 - 5}{18 - 5}$$

$$Q_2 = 7.54$$

(16) a) $$K + \frac{K}{2} + \frac{K}{3} = 1$$

$$\frac{11K}{6} = 1$$

$$K = \frac{6}{11}$$

b)

x	1	2	3
$P(X=x)$	$\frac{6}{11}$	$\frac{3}{11}$	$\frac{2}{11}$

$P(2 \cap 1) + P(3 \cap 1) + P(3 \cap 2)$

$$\left(\frac{3}{11} \times \frac{6}{11}\right) + \left(\frac{2}{11} \times \frac{6}{11}\right) + \left(\frac{2}{11} \times \frac{3}{11}\right) = \frac{36}{121}$$

(18) b) $X \sim B(24, 0.1)$

$P(X \geq 2) = 0.7075$

c) $Y \sim B(15, 0.7075)$

$P(Y = 9) = 0.1392$

(20) a)

	UCL	CF
$Q_1 \rightarrow$	4	0 ← 7.5
	6	8 ← 15
$Q_2 \rightarrow$	8	17 ← 22.5
$Q_3 \rightarrow$	10	23
	12	30

$$\frac{Q_1 - 4}{6-4} = \frac{7.5-0}{8-0} \qquad Q_1 = 5.875$$

$$\frac{Q_2 - 6}{8-6} = \frac{15-8}{17-8} \qquad Q_2 = 7.56$$

$$\frac{Q_3 - 8}{10-8} = \frac{22.5-17}{23-17} \qquad Q_3 = 9.83$$

IQR = 9.83 - 5.875 = 3.96

Median = 7.56

(21) a) 20 + 1.5(20 - 18) = 23 < 31 outlier

(22) c) From CF graph 51g → Freq of 89

0%	52.5
25%	60
50%	64
75%	67 ← x
89% → 100%	70

$$\frac{x-67}{70-67} = \frac{89-75}{100-75}$$

$$x = 68.68$$

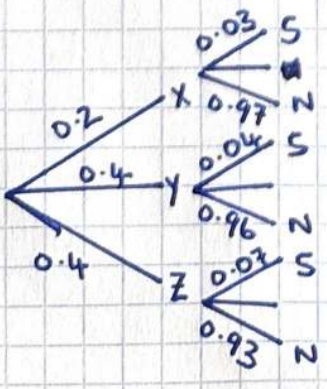
(24) a) $\bar{y} = \frac{21}{10} = 2.1$

$$\sigma_y^2 = \frac{44.625}{10} - (2.1)^2 = 0.0525$$

b) $\bar{x} = 4(2.1) + 1010 = 1018.4$ hpa

$\sigma_x = 4(\sqrt{0.0525}) = 0.917$ hpa

(25) a)



$p(X \cap S) + p(Y \cap S) + p(Z \cap S) = 0.05$

$(0.2 \times 0.03) + (0.4 \times 0.04) + 0.4x = 0.05$

$0.4x = 0.05 - 0.022$

$$x = \frac{0.028}{0.4} = 0.07 = 7\%$$

b) $P(X) \times P(S) = 0.2 \times 0.05 = 0.01$

$0.01 \neq P(X \cap S) = 0.06$

(26)

Time	FD	EW	F
2 - 2.5	14	0.5	7
2.5 - 2.8	40	0.3	12
2.8 - 3	124	0.2	24.8
3 - 3.2	150	0.2	30
3.2 - 3.5	60	0.3	18
3.5 - 4	12	0.5	6
4 - 5	2	1	2
			99.8

$99.8 \approx 100 \xrightarrow{\times 10} 1000$ athletes

a) 2h + 36 mins = 2.6 h

$(0.5 \times 14) + (0.1 \times 40) = 11 \xrightarrow{\times 10} 110$ athletes

b) $\bar{x} = \frac{304.27}{99.8} = 3.05$

$$\sigma = \sqrt{\frac{943.455}{99.8} - \left(\frac{304.27}{99.8}\right)^2} = 0.398$$

(27) b) $H_0 : p = 0.3$ SL = 0.05

$H_1 : p \neq 0.3$ 0.025 0.025

$X \sim B(25, 0.3)$

$P(X \geq 12) = 0.0442$

$P(X \geq 13) = 0.0174$ ← closest to 0.025

$P(X \leq 3) = 0.0332$ ← closest to 0.025

$P(X \leq 2) = 0.0089$

CR: $X \leq 3$, $X \geq 13$

c) SL = 0.0174 + 0.0332 = 0.0506 = 5.06%

d) X = 4 In acceptance region

There is evidence to suggest she is late.

(28) b) $X \sim B(30, 0.2)$

$P(X \geq 7) = 0.393$

c) $(X \geq 7 \cap X < 7) + (X < 7 \cap X \geq 7)$

$0.393 \times (1 - 0.393) \times 2 = 0.4771$

(29) a) $X \sim B(15, 0.34)$

$P(X \geq 8) = 0.0977$
$P(X \geq 9) = 0.035 \leftarrow$ closest to 0.05

$P(X \leq 2) = 0.0718 \leftarrow$ closest to 0.05
$P(X \leq 1) = 0.0171$

b) $SL = 0.035 + 0.0718 = 0.1068 = 10.68\%$

(30) a)

	UCL	CF
	2	3
$Q_2 \rightarrow$	5	14 $\leftarrow 16$
	10	21
	15	29
	20	32

$\frac{Q_2 - 5}{10 - 5} = \frac{16 - 14}{21 - 14}$ $\therefore Q_2 = 6.43$

b) $\sigma_y = \sqrt{\frac{2700.25}{32} - \left(\frac{246.5}{32}\right)^2} = 5.004$

c) $\bar{x} = 2(6.43) + 10 = 22.86$ mins

$\sigma_x = 2(5.004) = 10$ mins

(32) a) $\bar{x} = \frac{366}{30} = 12.2$

$\sigma_x = \sqrt{\frac{4975.5}{30} - (12.2)^2} = 4.12$

b) $\bar{x} + \sigma_x = 12.2 + 4.12 = 16.32$

	UCL	CF
	8	7
	11	12
	14	18 $\leftarrow x$
$16.32 \rightarrow$	17	26
	20	30

$\frac{x - 18}{26 - 18} = \frac{16.32 - 14}{17 - 14}$

$x = 24.186$

Greater than $x = 30 - 24.186 = 5.81$

(33) a) $3a + 0.45 = 1$

$a = \frac{11}{60}$

b) Lowest denominator = 60

c) i) $(0.15)^2 = \frac{9}{400}$

ii) $P(2 \cap 3) + P(3 \cap 2) + P(1 \cap 4) + P(4 \cap 1)$

$2 \times \left(0.15 \times \frac{22}{60}\right) + 2 \times \left(\frac{11}{60} \times 0.2\right)$

$= \frac{11}{60}$

(36) d) $IQR = 9.5 - 5 = 4.5$

e) $\bar{x} = \frac{385}{50} = 7.7$

$\sigma_x = \sqrt{\frac{3517}{30} - (7.7)^2} = 3.32$

f) Q_2 and IQR as data is skewed.