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1) i) $0.013 \times 1000 = 13$

ii) positive skew

iii) minimum mid-range $\dfrac{0+3000}{2}$

$= 1500\text{m}$

maximum mid-range $\dfrac{1000+4000}{2}$

$= 2500\text{m}$

2) i) Probability in order $= \dfrac{1}{5!}$

$= \dfrac{1}{120}$

ii) $P(AB) = \frac{1}{5} \times \frac{1}{4} = \frac{1}{20}$

$P(BA) = \frac{1}{5} \times \frac{1}{4} = \frac{1}{20}$

$P(\text{two by A and B}) = \frac{1}{20} + \frac{1}{20}$

$= \frac{1}{10}$

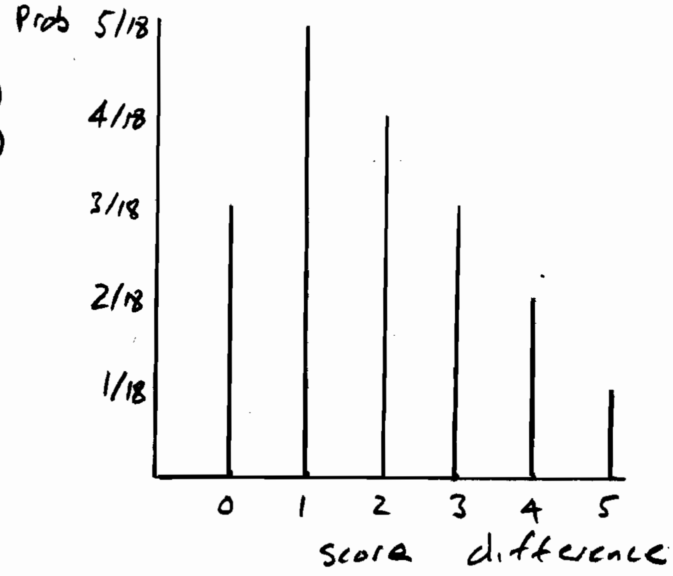
3) i) $0.75^6 = 0.1780$

ii) $E(X) = np$

$= 50 \times 0.1780$

$= 8.9$

4) i)



ii) Die A

−	1	2	3	4	5	6
Die B 1	0	1	2	3	4	5
2	1	0	1	2	3	4
3	2	1	0	1	2	3
4	3	2	1	0	1	2
5	4	3	2	1	0	1
6	5	4	3	2	1	0

A) 36 possible outcomes

10 of which are 1

so $P(X=1) = \dfrac{10}{36} = \dfrac{5}{18}$

B) 6 outcomes are 0

so $P(X=0) = \dfrac{6}{36} = \dfrac{1}{6}$

iii) $E(X) = \frac{1}{6} \times 0 + \frac{5}{18} \times 1$

$+ \frac{2}{9} \times 2 + \frac{1}{6} \times 3 + \frac{1}{9} \times 4$

$+ \frac{1}{18} \times 5$

$= \frac{1}{18}\left[0+5+8+9+8+5\right] = \frac{35}{18}$

or 1.944

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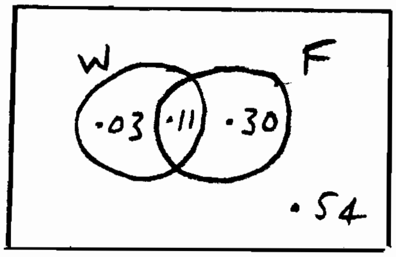
5) $P(W) = 0.14$ $P(F) = 0.41$

$P(W \cap F) = 0.11$

i)



ii) Independent if and only if

$P(W) \times P(F) = P(W \cap F)$

$0.14 \times 0.41 = 0.0574 \neq 0.11$

So W and F are not independent

iii) $P(W|F) = \dfrac{P(W \cap F)}{P(F)}$

$= \dfrac{0.11}{0.41} = 0.2683$

This is the probability a person works part-time given that the person is a female

6) i)

$\bar{x} = \dfrac{10\times1 + 40\times2 + 15\times3 + 5\times4}{70}$

$\bar{x} = \dfrac{155}{70} = 2.2143$

$sd_x = \sqrt{\dfrac{\Sigma f x^2 - n\bar{x}^2}{n-1}}$

$\Sigma f x^2 = 10\times1 + 40\times4 + 15\times9 + 5\times16 = 385$

$sd_x = \sqrt{\dfrac{385 - 70\left(\frac{155}{70}\right)^2}{69}}$

$sd_x = 0.7782$

ii) mean would be reduced

standard deviation would increase because 0 is more than one standard deviation from mean

7) $X \sim B(20, 0.15)$

i) A) $P(X=1) = {}^{20}C_1 \times 0.15^1 \times 0.85^{19}$

$= 0.1368$

B) $P(X \geq 2) = 1 - P(X \leq 1)$

$= 1 - 0.1756$

$= 0.08244$

ii) $H_0 : p = 0.15$

$H_1 : p < 0.15$

where p is prob a randomly selected patient is a no-show

$H_1 : p < 0.15$ because hospital expects number of no-shows to reduce.

iii) $X \sim B(20, 0.15)$

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7 iii) cont)

$P(X \leq 1) = 0.1756 > 5\%$

Not sufficient evidence to reject H_0

Conclude not sufficient evidence to suggest phone calls have reduced the proportion of no-shows

iv) If critical value is 8

then critical region is

$\{0, 1, 2, 3, 4, 5, 6, 7, 8\}$

Since 6 is in critical region

reject H_0 and accept H_1

Conclude that phone calls have reduced the proportion of no-shows to less than 0.1

v) For $X \sim B(18, 0.15)$

$P(X=0) = 0.0536 > 5\%$

so critical region would be empty.

For $X < 18$, $P(X=0)$ would

be even greater so again

critical region would be empty

This means H_0 would never be rejected.

8)

i)

Heating Qual	Freq	Cum Freq
$9.1 \leq x \leq 9.3$	5	5
$9.3 < x \leq 9.5$	7	12
$9.5 < x \leq 9.7$	15	27
$9.7 < x \leq 9.9$	16	43
$9.9 < x \leq 10.1$	7	50

See graph

ii)

Median ≈ 9.68

$IQR = Q_3 - Q_1$

$\approx 9.81 - 9.52$

≈ 0.29

iii)

Outliers top $> Q3 + 1.5\,IQR$

$> 9.81 + 1.5 \times 0.29$

> 10.245

No data > 10.1 so no outliers at top

Outlier $< Q_1 - 1.5\,IQR$

$< 9.52 - 1.5 \times 0.29$

< 9.085

No data < 9.1 so no outliers at bottom

8 iv) A) $P(1st > 9.5) = \frac{38}{50}$

$P(2nd > 9.5 \mid 1st > 9.5) = \frac{37}{49}$

$P(3rd > 9.5 \mid first\ 2 > 9.5) = \frac{36}{48}$

$P(All\ 3 > 9.5) = \frac{38}{50} \times \frac{37}{49} \times \frac{36}{48}$

$= 0.4304$

B) Find $P(Exactly\ 2 > 0.5)$

Say 1st > 9.5
2nd > 9.5
3rd ≤ 9.5

then $\times 3$ for possible orders

$= 3 \times \frac{38}{50} \times \frac{37}{49} \times \frac{12}{48}$

$= 0.4304$

$P(At\ least\ 2 > 9.5)$

$= P(Exactly\ 2 > 9.5)$

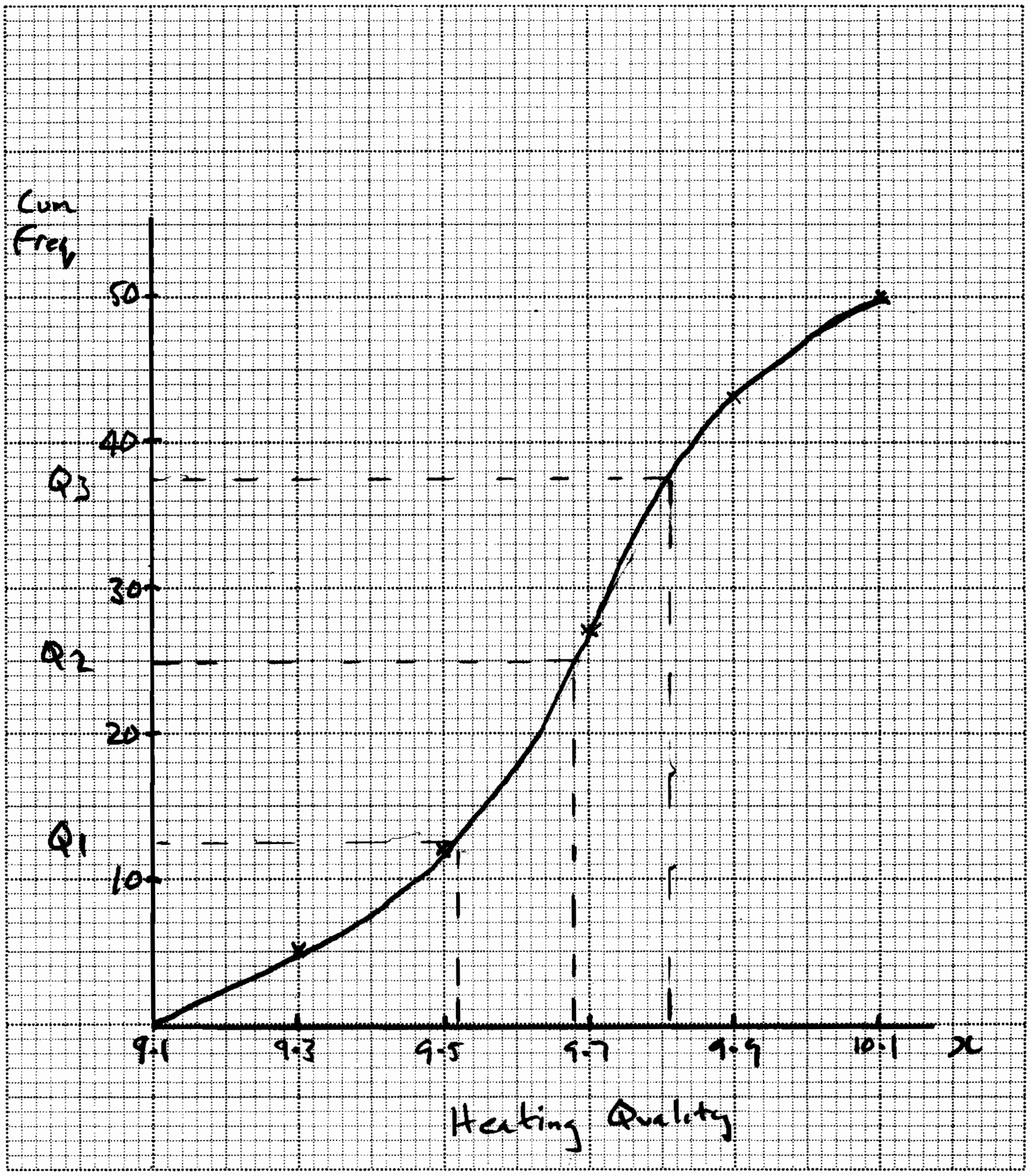
$+ P(All\ 3 > 9.5)$

$= 0.4304 + 0.4304$

$= 0.8608$

5

8 (i)


Cum Freq
50
40
Q3
30
Q2
20
Q1
10
9.1
9.3
9.5
9.7
9.9
10.1
x
Heating Quality