UTM

UNIVERSITI TEKNOLOGI MALAYSIA

FACULTY OF COMPUTING

SEMESTER 2 2023/2024

SECI1143 – PROBABILITY & STATISTICAL DATA ANALYSIS

SECTION 3

ASSIGNMENT 2

LECTURER: DR. NOR HAIZAN BT MOHAMED RADZI

GROUP MEMBERS

STUDENT NAME	MATRIC NO
JOANNE CHING YIN XUAN	A23CS0227
EVELYN GOH YUAN QI	A23CS0222
CHUA JIA LIN	A23CS0069

No. _____

Date _____

1)

Class Interval	Mid point, x	Frequency, f	Cummulative frequency	fx
$150 \leq x < 160$	155	12	12	1860
$160 \leq x < 170$	165	20	32	3300
$170 \leq x < 180$	175	5	37	875
$180 \leq x < 190$	185	3	40	555
Total				6590

a) mean $= \frac{6590}{40} = 164.75$

b) median

$\frac{40}{2} = 20$ Median class : $160 \leq x < 170$

Median $= 160 + \frac{\frac{40}{2} - 12}{20}(10) = 164$

c) Mode $= 160 + 10 \times \frac{20-12}{2(20)-12-5} = 163.478$

d) Modal class : $160 \leq x < 170$

No. _____

Date _____

2) 75, 80, 82, 85, 85, 85, 88, 90, 90, 92

a) mean = $\frac{75+80+82+85+85+85+88+90+90+92}{10}$

= 85.2

median = $\frac{85+85}{2}$ = 85

mode = 85

b) Mean shows that the average quiz scores of students is 85.2.
Median shows that the middle value when all scores are arranged in order from smallest to largest. The median score of students in a class is 85, means that 50% of students scored below 85 and 50% scored above 85.
Mode shows that 85 is the score that appears most frequently in class, so means that more students scored 85 than any other score.
Median is the most appropriate statistic to represent summary of score because it doesn't affect by outlier.

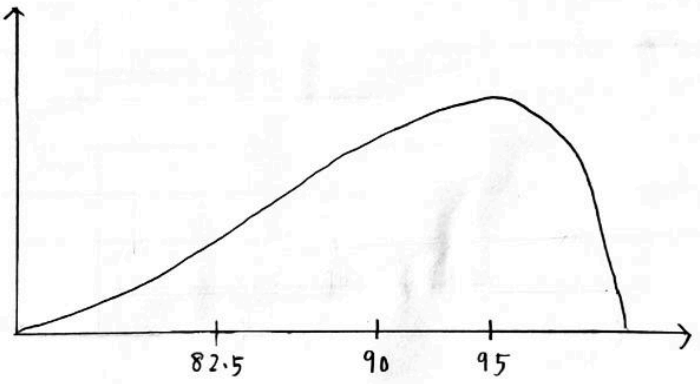
c)i) mean $= \frac{55+65+65+70+85+95+95+95+100+100}{10}$

$= 82.5$

median $= \frac{85+95}{2} = 90$

mode $= 95$

ii)



iii) New mean is lower than previous mean shows that the average score is decreasing. New median is higher than previous shows that half of students score above 90 compared to previous 85. New mode is higher than the previous mode, shows that most students score higher mark compare to previous. Increase in median and mode suggest that there is an improvement in overall performance of students

3ai. Range = 40 - 25
= 15

ii. Mean = $\frac{25+30+38+35+32+27+40+38+33+36+31+29}{12}$
= $\frac{384}{12}$
= 32

Variance = $\frac{(25-32)^2+(30-32)^2+(38-32)^2+(35-32)^2+(32-32)^2+(27-32)^2+(40-32)^2+(38-32)^2+(33-32)^2+(36-32)^2+(31-32)^2+(29-32)^2}{12}$
= $\frac{230}{12}$
= 19.167

iii. Standard deviation = $\sqrt{19.167}$
= 4.378

b. - The range of 15 means that the difference between highest and lowest monthly sales is 15, showing that the sales vary throughout the year. The variation may due to seasonal changes and special promotions.
- The standard deviation of 4.378 shows that, on average, the monthly sales figures differ about 4.378 units from the mean of 32. This also indicates that the sales are not consistent at all time.

c. - Understanding the variability in the business's monthly sales performance throughout the year can help the business to choose the best time to launch new products or running promotion so that the sales can be maintained and improved.

4a. $X \sim N(50, 10)$

Assume that the increase in productivity means any score above the mean.

$Z = \frac{50-50}{10}$

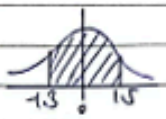
$= 0$

$P(Z=0) = 0.500$

Percentage of employee showed an increase in productivity $= 0.500 \times 100\%$

$= 50\%$

b. $P(37 \leq X \leq 65)$



when $X=37$, $Z = \frac{37-50}{10} = -1.3 = 1.3$

when $X=65$, $Z = \frac{65-50}{10} = 1.5$

$P(Z=1.3) = 0.4032$

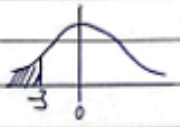
$P(Z=1.5) = 0.4332$

$P(37 \leq X \leq 65) = 0.4032 + 0.4332$

$= 0.8364$

≈ 0.836

c. $P(X \leq 20)$



when $X=20$, $Z = \frac{20-50}{10} = -3.0 = 3.0$

$P(Z=3.0) = 0.4987$

$P(X \leq 20) = 0.5 - 0.4987$

$= 0.0013$

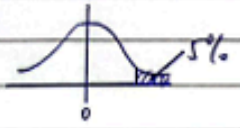
Number of employee $= 0.0013 \times 1000$

$= 1.3 \approx 2$

Budget $= 2 \times RM200$

$= RM400$

d. $0.5 - X = 0.05$



$X = 0.45$

$Z = 1.645$

$\frac{X-50}{10} = 1.645$

$X = 66.450$

$\therefore$ Minimum score $= 66.45$

No:

Date: .....

5. a) $X = 0, 1, 2, 3, 4, 5, 6$

The random variable X represent the number of correct answer a student gets on the exam.

b)

X	0	1	2	3	4	5	6
P(x)	0.178	0.356	0.297	0.132	0.033	0.004	0

$P(X=0) = {}_6C_0 (0.25)^0 (0.75)^6$

$= 0.178$

c) Mean $= np$

$= 6(0.25)$

$= 1.5$

d) $P(X \geq 3) = P(X=3) + P(X=4) + P(X=5) + P(X=6)$

$= 0.132 + 0.033 + 0.004 + 0$

$= 0.169$

e) $P(X=4) = (1-0.75)^{4-1}(0.75)$

$= 0.012$

6. a) Negative binomial distribution

b) Standard deviation $= \sqrt{\frac{r(1-p)}{p^2}}$

$= \sqrt{\frac{4(1-0.7)}{0.7^2}}$

$= 1.565$

c) $b^*(6, 4, 0.7) = \binom{6-1}{4-1} (0.7)^4 (0.3)^2$

$= 0.216$

d) $P(X=7) = {}_{12}C_7 (0.7)^7 (0.3)^5$

$= 0.158$