

SUBSIDIARY MATHEMATICS SEMINAR AT NAMILYANGO COLLEGE

DATE: Saturday 14th October 2023

SENIOR SIX 2023

INSTRUCTIONS

- Subsidiary mathematics paper duration is 2 hours and 40 minutes
- All questions in section A are compulsory.
- You will be required to do four questions in sections B with at least one question from each part.
- All questions in each section carry equal marks

PURE MATHEMATICS QUESTIONS

MATRICES

Question One

Given the matrices; $A = \begin{bmatrix} 2 & 6 \\ -1 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 0 \\ 3 & -2 \end{bmatrix}$

Determine;

- (a) The matrix C such that $(AC) = B$
- (b) The inverse of T such that $T = C^2 - 7B + 3I$, where I is a 2×2 identity matrix.

(c) Solve the following simultaneous equations using Cramer's rule.

$$5x - 2y + 16 = 0$$

$$x + 3y - 7 = 0$$

Question Two

A poultry farm has three units A, B and C. Unit A produces 30 trays of eggs and 20 broilers every month. Unit B produces 40 trays of eggs and 15 broilers and Unit C, 35 trays of eggs and 10 broilers during the same period. If a tray of eggs costs Shs 3,000 and a broiler Shs 4,000;

- (i). Represent the above information in matrix form of order 3×2 for the eggs and broilers.
- (ii). Form a 2×1 cost matrix produced on the farm for the eggs and broilers.
- (iii). Using matrix multiplication, find the sales of the farm if all eggs and broilers were sold.

Question Three

(a) If $A = \begin{pmatrix} x & y \\ 1 & 2 \end{pmatrix}$ and $B = \begin{pmatrix} 0 & -1 \\ 2 & 3 \end{pmatrix}$, find the values of x and y such that $AB = BA$.

(b) Given the matrices $A = \begin{pmatrix} 2 & 1 \\ 3 & 2 \end{pmatrix}$ and $B = \begin{pmatrix} -1 & 3 \\ -3 & -2 \end{pmatrix}$, find

- (i). $(AB)^{-1}$,

- (ii). Hence determine the value of matrix **C** such that $\mathbf{ABC} = \begin{pmatrix} -6 & 8 \\ -13 & 10 \end{pmatrix}$.

INDICES /LOGARITHMS AND SURDS

Question Four

- (a) Simplify the following to their simplest form

(i) $\frac{\sqrt{9x^6y^2}}{(3x^3y^3)^2}$

(ii) $(125^{\frac{1}{3}} \times 25^{\frac{1}{2}} + 16^{\frac{3}{4}} \times 64^{\frac{1}{3}} + \frac{1}{\sqrt{49}})^{\frac{-2}{3}}$

(b) Solve for x : $\frac{(2^{x+1})(16^x)}{4^{x+2}} = 1$.

Question Five

- (a) Given that $y = 3x^2$,
 (i) Show that $\log_3 y = 1 + 2\log_3 x$
 (ii) Hence or otherwise, solve the equation $1 + 2\log_3 x = \log_3 (28x - 9)$
 (b) If $3 \log_t (10 + 3t) = 6$, find the value of t .
 (c) Given that $\log 2 = 0.3101$, $\log 3 = 0.4771$ and $\log 5 = 0.6990$. Evaluate without using tables or calculators the value of $\log 25 - \log 2.25$

Question Six

- (a) Without using tables or calculator simplify : $\frac{1}{3-\sqrt{7}} + \frac{1}{3+7\sqrt{2}}$
 (b) Given that $\frac{1}{\sqrt{2}} - \frac{\sqrt{2}+1}{1+3\sqrt{2}} = a\sqrt{2} + b$ where a and b are constants, find the values of a and b .
 (c) Without tables or calculator, simplify $\frac{(2+\sqrt{3})^2 - (2-\sqrt{3})^2}{2\sqrt{12}}$

QUADRATICS

Question Seven

- (a) The roots of the equation $2x^2 + 5x - 6 = 0$ are p and q . Determine the value of ;

(i) $p^2q + pq^2$

(ii) $\frac{p}{q} + \frac{q}{p}$

(iii) $(p - q)^2$.

(iv) $\frac{p+2}{q-2} + \frac{q+2}{p-2}$

- (v) Form a quadratic equation with integral coefficients in x whose roots are $\frac{1}{p-3}$ and $\frac{1}{q-3}$.

- (b) Determine the possible values of m if the roots of the equation $x^2 - 2mx + 4 = 0$ are α and $\alpha - 3$.

Question Eight

- (a). Express $10x^2 - 17x + 3$ in the form $a(x - b)^2 + c$. State the values of a , b and c .
- (b). Hence find the minimum value of $10x^2 - 17x + 3$ and the corresponding value of x for which it occurs.

Question Nine

- (a). State the sum and product of the roots of the quadratic equation $6x^2 + 9x + 4 = 0$.
- (b). Find the quadratic equation whose roots are $-\frac{2}{3}$ and $\frac{7}{3}$.

Question Ten

Solve for x in the following equations

- (i) $3(4^x) + 8(2^x) = -4$
- (ii) $7^{2x} - 4(7^x) + 3 = 0$

POLYNOMIALS

Question Eleven

- (a) Given the polynomial $P(x) = 2x^3 + ax^2 + bx - 36$ where $P(3) = 0$ and $P(2) = 26$. Find the values of a and b .
- (b) The polynomial $P(x) = 2x^3 + ax + bx - 1$ is exactly divisible by $(x - 1)$ and leaves a remainder of 15 when divided by $(x - 2)$.
- (i) Find the values of a and b .
- (ii) Find the roots of $P(x) = 0$.

VECTORS

Question Twelve

- (a) Given that $\mathbf{a} = 3\mathbf{i} + 4\mathbf{j} - \mathbf{k}$ and $\mathbf{b} = 2\mathbf{i} - \mathbf{j} + \mathbf{k}$
- (i) $(3\mathbf{a} + \mathbf{b}) \cdot \mathbf{b}$
- (ii) The angle between \mathbf{a} and \mathbf{b}
- (iii) Given that $\mathbf{p} = 3\mathbf{a} - \mathbf{b}$ and $\mathbf{q} = 2\mathbf{a} - 3\mathbf{b}$, find the values of x and y such that $x\mathbf{p} + y\mathbf{q} = \mathbf{a} + 9\mathbf{b}$.

Question Thirteen

- (a) If vectors $\mathbf{r}_1 = 3\mathbf{i} + 2\mathbf{j}$ and $\mathbf{r}_2 = 2\mathbf{i} + 4\mathbf{j}$. Find the angle between vectors \mathbf{r}_1 and \mathbf{r}_2 .

- (b) The vectors $\vec{m} = 5\vec{i} + 3\vec{j}$ and $\vec{n} = -6\vec{i} + p\vec{j}$ are perpendicular to each other.

Determine;

- (i). the value of p .
(ii). $|2\vec{m} + \vec{n}|$.

TRIGONOMETRY

Question Fourteen

- (a) Solve the equation $\cot^2(x) + 5\tan(x) = 14$ for $0^\circ \leq x \leq 360^\circ$.
(b) Solve the following equations for $0^\circ \leq \theta \leq 360^\circ$.
(i) $2 \sin \theta = \tan \theta$.
(ii) $3 \cos \theta = 2 \sin^2 \theta$.
(iv) $\sec^2 \theta - 3 \tan^2 \theta = -1$.

Question Fifteen

- (a) Prove that $(\sqrt{3} + 1)(3 - \cot 30^\circ) = \tan^3 60^\circ - 2 \sin 60^\circ$
(b) Prove the following identities:
(i) $(1 + \tan^2 \theta) \cos^2 \theta = 1$.
(ii) $(\sin \theta + \cos \theta)^2 = 1 + 2 \sin \theta \cos \theta$.
(iii) $\frac{1}{\cos^2 \theta} - \frac{1}{\cot^2 \theta} = 1$.

Question Sixteen

Given triangle ABC, where $b = 15.3$ cm, $c = 28.6$ cm and $\angle A = 39^\circ$.

Find:

- (a). the length of side BC.
(b). $\angle B$.
(c). The area of the triangle ABC.

Question Seventeen

- (a) Without using tables or calculator, Find the value of the following in surd form;
(i) $\tan 240^\circ$ (ii) $\cos 540^\circ$
(b) Solve the equation $2 \cos^2 \theta = 1 + \sin \theta$ for $0^\circ \leq \theta \leq 360^\circ$.
(c) Given that $x = 1 + \tan \theta$, $y = 2 \cos \theta$, Show that $y^2 [1 + (x - 1)^2] = 4$.

SERIES

Question Eighteen

- (a) An Arithmetic Progression has common difference of -3. The sum of the first 20 terms is ten times the second term. Find the sum of the first 16 terms of the progression.
(b) In an arithmetic progression (AP) of 21 terms, the 21st term is 252. Find the sum of the first 16 terms if the first term is 192.

- (c) In the year 2010, a shop sold 150 mattresses. Each year the shop sold ten more mattresses than the year before, so the shop sold 160 mattresses in 2011, 170 mattresses in 2012, and so on, forming an arithmetic sequence.
- (i) Show that they sold 250 mattresses in 2020.
- (ii) Calculate the total number of mattresses sold from 2010 to 2022 inclusive.

Question Nineteen

- (a) Determine the common ratio of a G.P. whose sum of infinite terms is 8 and its second term is 2.
- (b) The sum of some terms of G.P is three hundred fifteen. Its first term is five, and the common ratio is two.

Determine the ;

- (i) the number of its terms
- (ii) the last term.
- (iii) The third term of a geometrical progression (GP) is 10 and the sixth term is 80. Find the sum of the first six terms.

Question Twenty

- (a) Find the number of terms in the Arithmetic Progression

$$-10\frac{1}{2} - 2\frac{1}{4} + 6 + \dots + 88\frac{1}{2}.$$

- (b) The third term of a Geometric Progression is 10 and the sixth is 80. Find the sum of the first 8 terms.

DIFFERENTIATION AND INTEGRATION

Question Twenty-One

- (a) Sketch the graph of $y = (x-4)(x+2)$
- (b) Determine the area of the curve $y = (x-4)(x+2)$ below the x-axis .

Question Twenty-Two

The cost of making x cakes is shs. $\left(\frac{1}{2}x^2 - 50x - 50\right)$ and the selling price of each one is shs. $\left(80 - \frac{1}{4}x\right)$. Assuming that all the cakes made are sold, determine the:

- (i). number of cakes which will yield maximum profit.
- (ii). maximum profit.

Question Twenty-Three

The gradient of the curve at point $P(x, y)$ is $4x + 3$. If point $A(3, 25)$ lies on the curve,

- (i). Find the equation of the curve.

- (ii). Determine the coordinates and nature of its turning point.
- (iii). Sketch the curve in (i) above showing all the necessary points.
- (iii). Find the area enclosed by the curve and the x-axis.

Question Twenty-Four

(a) A particle travels in a straight line such that its acceleration at the time t seconds is given by $a = 6t + 4$. When $t = 2$ seconds, the displacement, S , is 10 metres. When $t = 4$ seconds, the displacement is 106 metres.

Determine the;

- (i) the displacement when $t = 5$ seconds
 - (ii) the velocity when $t = 3$ seconds
- (b) The velocity v of a point moving along a straight line is given in terms of the time t by the formula $v = 2t^2 - 9t + 10$, the point being at the origin when $t = 0$. Find the expression in terms of t for the displacement from the origin.

Question Twenty- Five

The derivative of the curve is given by $\frac{dy}{dx} = a - 2x$. The gradient of the curve at the point (1,4) is 3.

- (a) Find the value of a and equation of the curve.
- (b) Sketch the curve
- (c) Obtain the area enclosed between the curve and the x-axis.

DIFFERENTIAL EQUATIONS

Question Twenty-Six

A radioactive element decays at a rate proportional to the mass remaining. Initially, the mass is 10mg and after 20 days, it is 5mg.

- (i) Form a differential equation describing this situation
- (ii) Solve the differential equation formed in (i).
- (iii) Determine the time taken to reach 1 mg.

Question Twenty-Seven

Solve the differential equation $\frac{dy}{dx} = \frac{3x^2+2x-3}{3y^2-4y}$, given that $y(1) = 2$.

LINEAR PROGRAMMING

Question Twenty- Eight

Kajjansi clays produce two types of bricks, Hard(x) and soft (y). The contribution to profit is UGX.500 and UGX.400 respectively. The bricks have to pass through three departments during production. The labor hours required and available for each product in each department is given in the table below.

PRODUCT	Mixing	Packing	Molding
Hard	10	3	2
Soft	5	2	3
Maximum hours available	800	300	60

a(i) Write down all the inequalities to represent the above information.

(iv) Write down an expression for the profit, in terms of x and y .

(a) Determine how many units of each product should be produced to maximize profit.

Question Twenty-Nine

Denis is to have a rectangular swimming pool at his Villa Hotel. He wants its width to be at least 2 metres and its length to be at least 5 meters. He wants its length to be at least twice its width. He wants its length to be no more than three times its width. Each metre of the width of the pool costs UGX. 100000, and each metre of the length of the pool costs UGX. 50000. He has UGX. 900000 available. Let the width of the pool be x metres and the length of the pool be y metres.

(a) Write down all possible inequalities representing the above information.

(b) Plot a suitable graph to show the feasible region.

(c) Use your graph to determine the maximum width and corresponding length of the pool.

PERMUTATION AND COMBINATION

Question Thirty

(a) A committee of 5 persons has to be formed out of 3 women and six men, so that there should be at most three women. How many ways can such a committee be formed?

(b) Four letters are picked from the word **BREAKDOWN**. What is the probability that there is one of the letters selected is a vowel?

Question Thirty-One

(a) From a group of 6 men and 8 women, 5 people are chosen at random. Find the probability that there are more men than women.

(b) A students' committee consisting of nine members is to be formed from a group of six O' level students and 5 A' level. In how many ways can it be done if;

(i) there is no restriction.

(ii) the number of O' level students must outnumber those of A' level.

Question Thirty-Two

On a shelf there are 4 Mathematics text books and 8 English books.

(a). If the books are to be arranged so that the Mathematics text books are together, in how many ways can this be done?

(b). What is the probability that all the Mathematics text books will not be together?

Question Thirty -Three

- (a). In how many different ways can the letters in the word **ARRANGEMENTS** be arranged?
- (b). Find the probability that an arrangement chosen at random in (a) above begins with the letters **EE**.
- (c). In how many different ways can the letters of the word “ THOUGHTS” be arranged so that the vowels always come together?

STATISTICS AND PROBABILITY RELATED QUESTIONS

RANDOM VARIABLES

Question Thirty-Four

The probability distribution of the random variables X is ;

$$P(X = r) = K(r^2 - 1) \text{ for } r = 2, 3, 4, 5.$$

- (a) Calculate the value of the k
- (b) Construct a table showing the probability distribution of x.

Question Thirty-Five

The table below shows the probability distribution for a random variable X.

x	0	1	2	3
$P(X = x)$	c	c^2	$c^2 + c$	$3c^2 + 2c$

Calculate:

- (a). the value of the constant C .
- (b). $E(X)$.
- (c). $Var(X)$.
- (d). Mode.
- (e). Median.

Question Thirty-Six

The discrete random variable X can assume values 0, 1, 2 and 3 only. Given that $P(X \leq 2) = 0.9$, $P(X \leq 1) = 0.5$ and $E(X) = 1.4$, find:

- (a). $P(X = 1)$.
- (b). $P(X = 0)$.
- (c). $P(X > 1)$

Question Thirty-Seven

The discrete random variable X has a probability distribution function given by:

$$f(x) = \begin{cases} c(3 - x) & ; \quad x = 0, 1, 2, 3, \\ 0 & ; \quad \text{otherwise.} \end{cases}$$

Find:

- (a). the value of the constant C .

- (b). $E(X)$.
 (c). $Var(2X + 3)$.

Question Thirty-Eight

Two discs are drawn without replacement from a box containing 3 red and 4 white discs. If X is the random variable for the number of discs drawn, construct a probability distribution table and use it to find:

- (a). $E(X)$.
 (b). $E(X^2)$.
 (c). Standard- deviation of X

Question Thirty- Nine

Senior Six students sell a magazine that is produced to raise money for their project. The probability of making a sale is independently 0.09 for each person they approach. Given that they approach 40 people. Determine the probability that ;

- (a) They will make 2 or fewer sales.
 (b) More than 5 sales.

Question Forty

The continuous random variable X has a probability distribution function (p.d.f) given by $f(x)$ where:

$$f(x) = \begin{cases} k & ; 0 \leq x < 2, \\ k(2x - 3) & ; 2 \leq x \leq 3, \\ 0 & ; \text{elsewhere.} \end{cases}$$

- (a). Sketch the p.d.f, $f(x)$, and hence use it to find the value of k .
 (b). Find:
 (i). $P(X \leq 1)$.
 (ii). $P(X > 2.5)$.
 (iii). $P(1 \leq X \leq 2.3)$.

Question Forty-One

The continuous random variable X has a probability distribution function (p.d.f) given by $f(x)$ where:

$$f(x) = \begin{cases} kx; & 0 \leq x \leq 1 \\ k(2 - x); & 1 \leq x \leq 2 \\ 0; & \text{elsewhere} \end{cases}$$

Where k is a constant.

- (a) Determine the value of k
 (b). Find:
 (i). $E(X)$.
 (ii). $E(X^2)$.
 (iii). Standard deviation, σ , of X .

Question Forty-Two

The distribution of the amount of sand (in tons) sold by a particular construction supply company is a continuous random variable X with pdf given by

$$f(x) = \begin{cases} m(1 - x^2), & 0 \leq x \leq 1 \\ 0 & \text{otherwise} \end{cases}$$

- Determine the value of m
- What is the probability that X is greater than 0.75?
- What is the standard deviation of the distribution above.

PRICE INDICES

Question Forty-Three

The table below shows the prices of items and their corresponding quantity in 2018 and 2019.

Commodity	Base year (2018)		Current year (2019)	
	Price (UGX.)	Quality	Price (UGX.)	Quality
Pens	500	12	600	10
Pencils	100	12	200	12
Graph book	1500	10	2000	6
Rubber	300	3	500	5

Compute the value index number for the current year.

Question Forty-Four

The data below shows items with their corresponding weights and prices in 2020 and 2021.

Items	Weight	Price (2021)	Price (2022)
Food	130	10000	15000
Transport	115	20000	23000
Electricity	120	700	910
water	32	510	520

Compute the cost of living.

Question Forty-Five

- (a) The prices of unit values of four commodities A, B, C and D in the years 2014 and 2016 were as below:

Commodities	2014 Price	2016 Price	Weights
A	400	500	7
B	900	1100	2
C	600	700	3
D	600	800	6

Taking 2014 as the base year, calculate the

- simple price index for 2016,
 - weighted average price relative.
- (b). There are four grades of workers in a certain factory. The table below shows the average weekly wage in, £, of a worker in each grade in 2006 and in 2016. The final column shows the index number of these wages in 2016, taking 2006 as base year.

Grade	Weekly wage		Index number
	2006	2016	
1	120	192	160
2	150	285	x
3	y	350	200
4	170	z	250

Find the values of x , y and z .

PROBABILITY THEORY

Question Forty-Six

- (a) A and B are independent events such that $P(A) = 0.35$, $P(B) = x$ and $P(A \cup B) = 0.74$. Determine
- The value of x
 - $P(A \cap B)$
- (b) Two independent events M and N are such that $P(M) = 0.5$ and $P(N) = 0.7$, find
- $P(M \cup N)$
 - $(M \cup N)'$
- (c) Events A and B are such that $P(A^1 \cap B) = 0.3$, $P(A \cap B) = 0.55$ and $P(A^1 \cap B^1) = 0.1$, Find $P(A)$ and $P(A \text{ or } B)$.
- (d) A and B are events such that $P(A \cup B) = \frac{3}{4}$, $P(A \cap B^1) = \frac{1}{4}$ and $P(B \cap A^1) = \frac{1}{6}$, find $P(A / B^1)$.

Question Forty-Seven

- (a) A box contains 3 red balls and 2 blue balls. Two balls are picked randomly from the box in succession, determine the probability that the second ball picked is red if picking is done ;
- With replacement
 - Without replacement
- (b) The probability that Henry hits a target is 0.45 while the chance that Gorret misses it is 0.61 . Determine the probability that ; (i) Both hit the target (ii) Only one hits the target (iii) Either Henry or Gorret hits the target.

BINOMIAL DISTRIBUTION

Question Forty-Eight

- (a). If $X \sim B(n, 0.6)$ and $P(X < 1) = 0.0256$, find n .
- (b). A coin is biased so that it is twice as likely to show heads as tails. Find the probability that in five tosses of the coin,
- exactly three heads are obtained.
 - More than three heads are obtained.

Question Forty-Nine

- (a). X is a random variable such that $X \sim B(n, p)$. Given that $E(X) = 2.4$ and $p = 0.3$, find:
- n .
 - Standard deviation of X .
- (b). In a group of people, the expected number who wear glasses is 2 and the variance is 1.6. Find the probability that:
- a person chosen at random from the group wears glasses.
 - 6 people in the group wear glasses.

Question Fifty

The probability that a pen drawn from a box is defective is 0.2. If a sample of 8 pens is taken, Find the;

- expectation and standard deviation.
- probability that there are 2 defective pens.
- probability that there are atleast 3 defective pens.

Question Fifty-One

A biased coin is tossed six times .The coin is such that the ratio of obtaining a tail to a head in a single toss is 2:3.

- Find the probability of getting a head on a single toss.
- Obtain the expectation and variance of the number of heads obtained.
- Find the probability of getting at least 4 heads.

NORMAL DISTRIBUTION

Question Fifty-Two

- (a) If $X \sim N(84, 12)$, find:
- $P(80 < X < 89)$.
 - $P(|X - 84| < 2.9)$.
 - $P(76 < X < 82)$.
- (b) The time taken by a Fisherman to deliver fish in a market is normally distributed with mean 20 minutes and variance 25 minutes². If he delivers fish every day, Find the number of days in the year when he takes ;
- between 16 and 32 minutes.
 - greater than 12 minutes.

Question Fifty-Three

The table below shows the marks scored in a test by 50 pupils drawn at random from a large class.

Marks	Number of pupils
0 – < 10	8
10 – < 20	11

20–< 40	17
40–< 50	7
50–< 60	4
60–< 80	3

- (a) Calculate the estimates of the mean and standard deviation of the sample.
- (b) Given that the marks scored by pupils were normally distributed, determine the probability that a pupil chosen at random from the class scored between 17 and 48 marks.

Question Fifty-Four

- (a) The weight in grams of sacks of maize is normally distributed with mean μ and standard deviation 7.8. Given that 10% of sacks contain less than 200g.

Determine

- (i) The value of μ
- (ii) The percentage of sacks that contain more than 225g of maize
- (b) If the machine was adjusted so that the weight, in grams of sacks of maize, normally distributed with mean 205 and standard deviation σ . Determine the values of σ ; given that 98% of sacks contain between 200g and 210g.

SCATTER DIAGRAM AND CORRELATION

Question Fifty-Five

A set of bivariate data showing the height and weight of a football team.

Members	A	B	C	D	E	F	G	H	I	J
Heights(cm)	120	145	130	155	160	135	150	145	130	140
Weight(kg)	40	50	47	62	60	55	58	52	50	49

- (a) (i) Plot a scatter diagram for the data. Comment on your graph.
- (ii) Use the line of best fit to estimate the weight of the eleventh member of the team, whose height is 161cm.
- (b) Calculate Spearman's rank correlation coefficient. Comment on your results at 1 percent level of significance.

MOVING AVERAGES

Question Fifty-Six

The table below shows the data of sales of umbrellas in thousands for 12 months in 2022.

MONTHS	J	F	M	A	M	J	J	A	S	O	N	D
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Sales('000')	65	95	115	63	120	100	150	135	170	160	180	175
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- (a) Calculate the 6 monthly moving average for each month.
- (b) (i) On the same axes, plot the original data and the three-point moving averages.
- (ii) Describe the trend.
- (c) Estimate the number of umbrellas sold in January of 2023.

Question Fifty-Seven

The number of customers who visit a certain bank for the days Monday to Friday were recorded for 3 weeks.

Week	Monday	Tuesday	Wednesday	Thursday	Friday
1	142	177	213	171	138
2	125	172	191	170	131
3	114	158	192	155	127

- (a) Calculate the five point moving averages for the data
- (b) (i) On the same axes, plot the original data and the five point moving averages
- (ii) Comment on the trend of the number of customers who visit the bank over the 3 weeks.
- (iii) Use your graph to estimate the number of customers who will visit the bank on Monday week 4.

Question Fifty-Eight

The table below shows the number of bags of sugar sold by a certain whole sale shop from 2009 to 2012.

Year	Quarters			
	1 st	2 nd	3 rd	4 th
2009	192	280	320	260
2010	300	360	380	270
2011	342	420	430	320
2012	424	480	510	412

- (a) Calculate the four point moving averages.
- (b) (i) On the same axes, plot the original data and the four point moving averages.
- (ii) Comment on the trend of the number of bags of sugar sold over the four year period.
- (iii) Use your graph to estimate the number of bags to be sold in the first quarter of 2013.

DESCRIPTIVE STATISTICS

Question Fifty-Nine

- (a) The mean of 4 numbers is 5 and the mean of 3 different numbers is 12. What is the mean of the 7 numbers together?

- (b) A bag contained five balls each bearing one of the numbers 1, 2, 3, 4, 5. A ball was drawn from the bag, its number noted and then replaced. This was done 50 times in all and the table below shows the resulting frequency distribution.

Number	1	2	3	4	5
Frequency	x	11	y	8	9

If the mean is 2.7, determine the values of x and y .

Question Sixty

- (a). For the set of numbers below: 8.9, 7.2, 9.9, 9.8, 6.5, 2.4 and 5.5
Find:
(i). semi-interquartile range.
(ii). Standard deviation.
- (b). For a set of 9 numbers, $\sum (x - \bar{x})^2 = 60$ and $\sum x^2 = 285$. Find the mean of the numbers.

Question Sixty-One

- (a) Construct a frequency distribution using a class interval of 5 seconds of the following data on time (in seconds); it took athletics to complete a certain race.

31 21 19 29 22 38 38 34 32 15
16 25 21 16 28 19 28 12 28 23
11 16 28 30 17 22 29 18 29 25
15 18 17 17 10 15 24 25 21 22
23 26 20 21 23 28 17 15 16

- (b) Determine the;
(i) Mode
(ii) Average mark using a working mean of 22
(iii) Median
(iv) Standard deviation of the time for competing the race.
- (d) Draw a cumulative frequency curve and use it to estimate the quartile deviation and the 80th percentile.

Question Sixty-Two

The table below shows marks obtained by students in a subsidiary mathematics test marked out of 100.

Marks	20-<30	30-<40	40-<50	50-<60	60-<70	70-<80	80-<90
Number of students	35	5	10	10	25	10	5

- (a) Calculate the mean, median and standard deviation.
- (b) Draw a histogram for the data and use it to estimate the mode.

END

THE SECRET OF SUCCESS IS TO DO THE COMMON THINGS
UNCOMMONLY WELL 2023.

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