

KIGUMBA ROYAL SECONDARY SCHOOL

03.JULY.2019

S475/1 S.6 SUBSIDIARY MATHEMATICS

1. a) Given that $\mathbf{p} = i + 2j$ and $\mathbf{q} = 3i - 3j$, find

i) $\mathbf{p} \cdot \mathbf{q}$

ii) the angle between $\mathbf{p}$ and $\mathbf{q}$. correct to 2 d.ps

b) show that vectors $\mathbf{a} = 2i + 6j$ and $\mathbf{b} = (6i - 2j)$ are perpendicular

2. A, B and C are points on a straight road such that $AB = BC = 20\text{m}$. A cyclist moving with uniform acceleration passes A and then notices that it takes him 10 seconds and 15 seconds to travel between A and B, and A and C respectively.

Find:

i) his acceleration

ii) the velocity with which he passes A.

3. a) Sketch the curve $y = 5 + 4x - x^2$

b) Find the area enclosed between the curve and x – axis from $x = -1$ and $x = 5$

4. a) The table below shows the price of commodities in the year 2000 and 2003 per kg.

Year	Rice	Sugar	Posho	Beans
2000	1200	1300	800	700
2003	1800	2000	1300	1000

Find:

i) the price relative in 2003 using 2000 as the base year

ii) simple aggregate price index in 2003 using 2000 as the base year.

b) In 2000, the price of a commodity using 1999 as the base year was 166. In 2006, the index using 2000 as the base year was 123. What is the index in 2006 using 1999 as the base year?

5. solve the equations:

i) $3\cos x + 2 = 0$ for x between 0° and 360°

ii) $2\cos^2\theta + \sin\theta - 1 = 0$ for $0^\circ \leq \theta \leq 360^\circ$

6. The sales of a certain radio – company are given for the period of years in the table below:

Year	First half	Second half
2000	230	810
2001	241	852
2002	259	902
2003	272	934
2004	288	966

Calculate the:

- i) two - point moving averages
- ii) graph both the raw data and superimpose on it the 2– point moving averages
- iii) comment on your graph
- iv) Estimate from the graph the sales of the company in the first half of 2005.

7. The table below shows the marks obtained by 10 students in the Biology and Chemistry tests.

Chemistry(x)	35	75	50	10	20	35	55	90	45	65
Biology(y)	80	40	65	115	100	85	60	25	70	50

- a)i) Draw a scatter diagram for the data and comment on the diagram.
- ii) Calculate the rank correlation coefficient and comment on your result.
- iii) Estimate a mark Odrin would have scored if:
 - a) He scored 30 in Biology
 - b) He scored 25 in Chemistry.

8. a) Solve the simultaneous equations using the matrix method,

$$5x - 3y = -1$$

$$X + y = 11$$

b) Show that $x + 3$ is a factor of the polynomial, $P(x) = x^3 - 7x + 6$. Hence find the other factors of the polynomial.

9. a) Solve for n : $\frac{8^{n+2} \times 4^{2n-1}}{2^n \times 4^{\frac{n}{2}}} = 16$

b) Express $\frac{3\sqrt{2} - 2\sqrt{3}}{3\sqrt{2} + 2\sqrt{3}}$ in the form $a + b\sqrt{c}$ and hence state the values of a, b, c .

10. a) Events A and B are independent where $P(A \cap B) = \frac{1}{4}$ and $P(A \cup B) = \frac{1}{4}$.

Find $P(A)$ and $P(B)$.

b) If $A = \begin{pmatrix} 5 & 1 \\ 4 & 2 \end{pmatrix}$ and $B = \begin{pmatrix} 1 & -1 \\ 24 & \end{pmatrix}$ find A^{-1} and hence find x given that $Ax = B$.

c) Determine the equation of the normal to the curve $y = x^3 - x^2 + x + 1$ at the point $(1, 0)$.

11. a) Solve the equation: $3^{2x} - 12(3^x) + 27 = 0$.

b) Solve the equation: $\log_2 x - \log_x 8 = 2$

12.a)

A Bag contains 4 red and 3 white balls. A ball is drawn from it without replacement. Another ball was then drawn. Find the probability that both balls are of the same colour.

b) A random variable of a discrete p.d.f is defined as

$$f(x) = \begin{cases} yx, & x = 1, 2, 3 \\ 0, & \text{elsewhere} \end{cases}$$

Find

- i) The value of the constant y
- ii) $P(X=3)$
- iii) $P(X \leq 2)$
- iv) $P(1 < x \leq 3)$

c) . Evaluate; $\int_2^3 (6x^2 - 1) dx$

13. The table below shows the age at which women marry in a certain country;

19	20	19	22	28	22
30	31	36	21	29	24
34	33	39	23	26	21
32	18	21	37	25	27
17	35	24	25	27	22
16	38	36	26	38	21

a) Form a frequency distribution table with class intervals of 5 with the lowest age of 16.

b) Calculate;

- i) Mean
- ii) Modal age

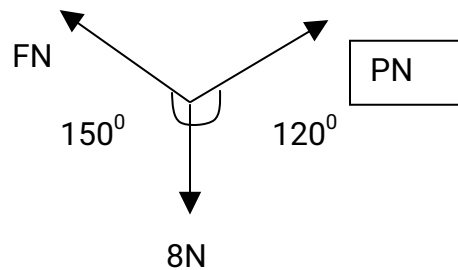
d) Draw a cumulative frequency curve and use it to estimate the inter - quartile range

14. The points P and Q have position vectors $OP = -2i - 5j$ and $OQ = i - 2j$ respectively. R is a point such that $OR = OP + \lambda PQ$

(a) Find the;

- (i) value of $OP \cdot OQ$
- (ii) angle between the two vectors OP and OQ . (7mks)
- (b) Determine the;
- (i) vector PQ (ii) vector OR in terms of λ .
- (iii) value of λ for which OR is perpendicular to PQ . (8mks)

15. The system of forces shown below is said to be in equilibrium.



Find the values of P and F

16. The table below shows the 3-point termly moving total scores of a student from S.1 over a period of three years.

Year	Term one	Term Two	Term Three
2013		1380	1215
2014	1020	915	870
2015	840	795	

- a) Calculate the 3-point moving averages for data.
- b) Represent the moving averages on a graph and comment on the trend of performance.
- c) Determine the moving totals in 1st Term of 2016. (15 marks)

17. The table below shows a frequency distribution of marks scored by 60 students in a

Prepared by: Oryema Walter

Email: waltercanoon@gmail.com,

Telephone: +256753062008 Page

sub maths test.

Marks	10 -	20 -	30 -	40 -	50 -	60 -	70 -	80-≤90
Number of students	2	6	12	20	10	6	3	1

a) Draw a histogram for the data and use it to estimate the modal mark.
(05mks)

b) Calculate the;
 i) Mean
 ii) Standard deviation
 (10mks)

18. (a) Find the equation of the tangent and normal to the curve $y=4+x - 2x^2$ at the point where $x=1$.

b) Sketch the curve of the equation $y=4+x - 2x^2$, clearly indicating on your sketch the coordinates of any turning point.

(09mks)

19.(a) A random variable x has probability distribution given in the table below;

Marks (x)	1	2	3	4
P(X=x)	K	2k	3k	4k

Find the;

i) Value of constant k
 ii) Variance $\text{var}(x)$

iii) Median of X

b) The continuous random variable X has a p.d.f $f(x)$ where

$$f(x) = \begin{cases} \frac{3x^2}{8} : 0 \leq X \leq 2 \\ 0 : \text{elsewhere} \end{cases}$$

Find the;

i) Expectation of the distribution

ii) $P(0.5 \leq X \leq 1.5)$ (06mks)

20. (a) Differentiate $y = 2x - 5x^2$ with respect to x. (02mks)

b) Find the minimum value of S if $S = 4t^2 - 7t + 11$. (05mks)

c) Given that $\frac{dy}{dx} = 3x - 5$.

$y = 4$ where $x = 0$

Find

i) y in terms of x

ii) x where $y = 8$ (08mks)

21. (a) Prove that $\frac{\cot^2 X}{1 + \cot^2 X} = \cos^2 X$ (05mks)

b) Find x in the range $0 \leq x \leq 360^\circ$ if $\sec^2 x - 3 \tan x + 1 = 0$ (06mks)

(Hint : $1 + \tan^2 x = \sec^2 x$)

c) Given that $\cos A = \frac{4}{5}$

Find $\sin A + \tan A$

22. A car initially at rest accelerated uniformly to a speed of 15ms^{-1} in 20 seconds. The car then traveled at the attained speed for 2 minutes after which the car accelerated uniformly at 2.5ms^{-2} for 10 seconds, it finally decelerated uniformly at 2.5ms^{-1} to rest.

a) Find the;

i) greatest speed attained by the car (03mks)

ii) total time taken by the car to come to rest. (03mks)

b) Sketch the velocity –time graph for the motion of the car. (04mks)

c) Use your graph to find the total distance traveled by the car. (05mks)

THE END

“What we do for ourselves alone dies with us. What we do for others and the world remain forever”