S475/1
SUBSID. MATHEMATICS
Paper 1
July/August 2019
$2\frac{2}{3}$ *Hours.*

MOCK EXAMINATIONS 2019

Uganda Advanced Certificate of Education

Subsidiary Mathematics Paper 1

Time: 2 Hours 40 Minutes

NAME: _____ **COMBINATION:** _____

INSTRUCTIONS TO CANDIDATES:

- Answer all the **eight** questions in section **A** and only **four** questions in section **B**.
- Any additional question(s) will not be marked.
- Each question in section **A** carries **5** marks while each question in section **B** carries **15** marks.
- **All** working **must** be shown clearly.
- Begin each answer on a fresh sheet of paper.
- Graph paper is provided.
- Where necessary, take acceleration due to gravity $g = 9.8 \text{ m s}^{-2}$.
- Silent non-programmable scientific calculators and mathematical tables with a list of formulae may be used.

Question		Mark
Section		
Section B		
Total		

Section A (40 Marks)

Answer **all** *the questions in this section.*

Qn 1: If $5\log_x(10+3x) = 10$, find the value of x. [5]

Qn 2: For a set of 10 numbers, $\sum x = 290$ and $\sum x^2 = 8469$. Find:
(a). the mean,
(b). the standard deviation. [5]

Qn 3: Given the polynomial $P(x) = 3x^3 + ax^2 + bx - 20$ where $P(1) = -14$ and $P(2) = 14$. Find the values of a and b. [5]

Qn 4: The table below shows the number of text books owned by 10 students of a certain class and their total marks in an exam.

Student	Number of text books	Total marks in an exam
A	5	290
B	8	370
C	2	184
D	9	366
E	7	277
F	5	190
G	3	385
H	10	200
I	1	281
J	4	331

Calculate the rank correlation coefficient between the number of text books and the total marks. Comment on your result at 5% level of significance. [5]

Qn 5: Given the vectors $\underset{\sim}{\boldsymbol{p}} = 3\underset{\sim}{\boldsymbol{i}} - 2\underset{\sim}{\boldsymbol{j}}$, $\underset{\sim}{\boldsymbol{q}} = 4\underset{\sim}{\boldsymbol{i}} + 2\underset{\sim}{\boldsymbol{j}}$ and $\underset{\sim}{\boldsymbol{r}} = \underset{\sim}{\boldsymbol{i}} + 2\underset{\sim}{\boldsymbol{j}}$, find the length of the vector $\underset{\sim}{\boldsymbol{p}} - 4\underset{\sim}{\boldsymbol{q}} + 3\underset{\sim}{\boldsymbol{r}}$. [5]

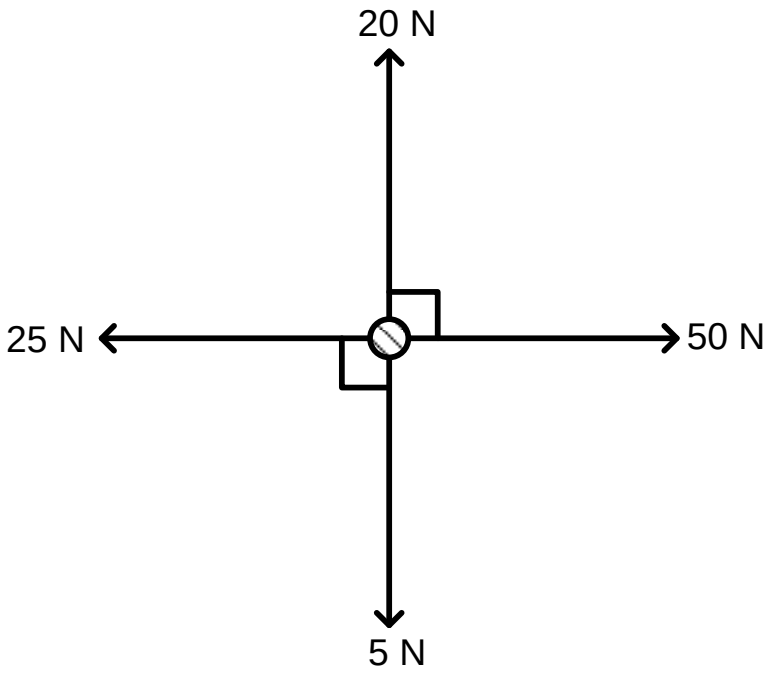
Qn 6: Three bags X, Y and Z, each contain black, red and blue pens as follows:

	Black pens	Red pens	Blue pens
Bag X	3	1	3
Bag Y	2	3	3
Bag Z	5	6	4

A bag is chosen at random and then a pen is randomly picked from the selected bag. Determine the probability that the pen picked is:
(i). a blue pen,
(ii). Not a blue pen. [5]

Qn 7: Given that $\sin\theta = \frac{-15}{17}$ and $180° \leq \theta \leq 360°$, find the value of $6\tan\theta + 8\,\text{cosec}\,\theta$. [5]

Qn 8: Find the magnitude and direction of the resultant force of the system of forces acting on a particle as shown below:



[5]

Section B (60 Marks)

Answer only **four** *questions from this section. All questions carry equal marks.*

Question 9:

The table below represents the length of leaves in millimetres (mm).

Length (mm)	Number of leaves
18.0 – 18.9	5
19.0 – 19.9	15
20.0 – 20.9	20
21.0 – 21.9	19
22.0 – 22.9	16

23.0 – 23.9	15
24.0 – 24.9	7
25.0 – 25.9	3

(a). Calculate the:
(i). mean length.
(ii). standard deviation. [6]

(b). Draw a cumulative frequency curve (ogive) and use it to estimate the:
(i). median length.
(ii). 80^{th} percentile length.
(iii). number of leaves whose length is below 22.45 mm. [9]

Question 10:

(a). Given that $P = \frac{1-\sin\theta}{1+\sin\theta}$,show that $P = (\sec\theta - \tan\theta)^2$. Hence deduce that if $\theta = 60°$, then $P = 7 - 4\sqrt{3}$. [8]

(b). Solve the equation $3\cos^2 x - 2\sin^2 x - \sin x + 1 = 0$ for $0° \leq x \leq 360°$. [7]

Question 11:

The cost of building a house is calculated from the price of cement, sand, bricks, roofing materials and labour. The table below gives the prices and price relatives of the items in the months of March and April respectively of 2019; and weights.

Item	March	April Price Relatives	Weight

	Unit Price (Ushs)	(March = 100)	
Cement	25,000	1.4	3
Sand	120,000	1.2	3
Bricks	230,000	0.65	2
Roofing materials	100,000	0.25	1
Labour	400,000	0.55	1

(a). Taking "Cement" as the base, calculate the price relatives for April.
(b). Determine the price of each item in April.
(c). Calculate the weighted aggregate price index for April using March as the base. Comment on your result. [15]

Question 12:

T is the tangent to the curve $y = x^2 + 6x - 4$ at $(1, 3)$ and N is the normal to the curve $y = x^2 - 6x + 18$ at $(4, 10)$. Find:
(a). the equation of the tangent T.
(b). the equation of the normal N.
(c). the coordinates of the point of intersection of T and N. [15]

Question 13:

The table below shows the monthly sales of a certain product in (shs "000") for the year 2018.

Month	Sales	Month	Sales
January	220	July	175
February	210	August	186
March	200	September	176
April	207	October	170
May	196	November	159
June	189	December	168

(a). Calculate 6-point moving totals and hence the moving averages. [6]
(b). (i). Plot on the same axes actual sales and moving averages. Comment on the trend of sales during the year.

(ii). Determine the sales in January 2019. [9]

Question 14:

(a). A boy pulls a box of mass 25 kg by means of a light inextensible string attached to it across a rough horizontal ground. The coefficient of friction between the box and the ground is 0.4. If the string is inclined at 30° to the horizontal and the box accelerates at 5 m s^{-2}, find the tension in the string. [7]

(b). A cyclist travels 100 m as he accelerates uniformly at a rate of Qm s^{-2} ; from a speed of 18 km h^{-1} to a speed of 36 km h^{-1}. Find:

(i). the value of Q.

(ii). the time taken to cover this distance. [8]

*****END*****