

S475/1
SUBSID. MATHEMATICS

Paper 1
Nov./ Dec. 2018
 $2 \frac{2}{3}$ hours



UGANDA NATIONAL EXAMINATIONS BOARD

Uganda Advanced Certificate of Education

SUBSIDIARY MATHEMATICS

Paper 1

2 hours 40 minutes

INSTRUCTIONS TO CANDIDATES:

Answer all the eight questions in section A and only four questions in section B.

Any additional question(s) answered 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.

Where necessary, take acceleration due to gravity $g = 9.8 \text{ ms}^{-2}$.

Squared paper is provided.

Silent, non programmable scientific calculators and mathematical tables with a list of formulae may be used.

SECTION A: (40 MARKS)

Answer all the questions in this section.

1. The roots of the equation $4x^2 + 9x - k = 0$ are α and 2 .
Find the values of α and k . (05 marks)
2. A random variable X has a probability distribution given by

$$P(X=x) = \begin{cases} \frac{x}{10}, & x = 1, 2, 3, \\ 0, & \text{elsewhere} \end{cases}$$

 Calculate:
 (a) $P(1 \leq X < 3)$. (03 marks)
 (b) the mean of X , $E(X)$. (02 marks)
3. Show that $\frac{1-\cos^2\theta}{\sec^2\theta-1} = \cos^2\theta$.
 Hence, solve the equation $\frac{1-\cos^2\theta}{\sec^2\theta-1} = \frac{3}{4}$ for $0^\circ \leq \theta \leq 90^\circ$. (05 marks)
4. Events A and B are such that $P(A) = \frac{6}{13}$, $P(B) = \frac{2}{5}$ and $P(A/B) = \frac{1}{4}$.
 Find:
 (a) $P(A \cap B)$. (02 marks)
 (b) $P(A \cup B)$. (03 marks)
5. Express $\frac{4}{\sqrt{3}+\sqrt{2}} + \frac{4}{\sqrt{3}-\sqrt{2}}$ in the form $b\sqrt{c}$ where b and c are integers. (05 marks)
6. The marks scored in the test by 8 students are : 5, 9, 11, 15, 19, 15, 10, 14.
 Determine the:
 (a) mean mark. (02 marks)
 (b) variance. (03 marks)
7. Evaluate
$$\int_{-1}^2 \frac{2x^4 - x^5}{x^2} dx$$
 (05 marks)
8. A force of $65N$ is inclined at an angle of θ to the horizontal. The horizontal component of the force is $25N$.
 Calculate the:
 (a) angle θ . (03 marks)
 (b) vertical component of the force. (02 marks)

SECTION B: (60 MARKS)

Answer only four questions from this section.

9. The table below shows scores by 10 students (*A* to *J*) in Physics and Mathematics tests.

Student	<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>G</i>	<i>H</i>	<i>I</i>	<i>J</i>
Mathematics (x)	28	20	40	28	21	31	36	29	33	24
Physics (y)	30	20	40	28	22	35	35	27	31	23

- (a) (i) Plot a scatter diagram for the given data.
(ii) Draw a line of best fit on the scatter diagram.
(iii) Estimate the score in Mathematics for a student who scored 37 in Physics. (08 marks)
- (b) Calculate the rank correlation coefficient for the data and comment on your result. (07 marks)
10. Points *A*, *B* and *C* have position vectors, $2\mathbf{j}$, $4\mathbf{i}$ and $2\mathbf{i} - 2\mathbf{j}$ respectively in the $x-y$ plane.
- (a) Find $2OA + 3OB - 4OC$. (04 marks)
- (b) Determine;
- (i) AB and AC . (04 marks)
(ii) $AB \cdot AC$. (02 marks)
(iii) angle BAC . (05 marks)
11. A factory sells animal food in bags. The weights of the bags are normally distributed with mean weight 50kg and standard deviation 2.8 kg.
- (a) Find the probability that the weight of any bag selected at random;
- (i) is more than 52 kg. (04 marks)
(ii) lies between 46 and 55 kg. (05 marks)
- (b) Determine the percentage of bags whose weights are less than 54 kg. (06 marks)
12. The equation of a curve is $y = 3x^2 + 2$.
- (a) (i) Determine the turning point of the curve.
(ii) Find the nature of the turning point.
(iii) Sketch the graph of the curve. (07 marks)
- (b) The curve and the line $y = 14$ intersect at the points $(-2, 14)$ and $(2, 14)$. Calculate the area of the region enclosed between the line and the curve. (08 marks)

13. The table below shows the sales in thousands of copies by a local Newspaper over a period of 12 weeks.

Week	1	2	3	4	5	6	7	8	9	10	11	12
Number of copies sold	315	378	490	430	510	580	565	595	640	660	628	670

- (a) Calculate the 3-week moving averages for the copies sold. (06 marks)
(b) (i) On the same axes, plot the original data and the 3-week moving averages. (06 marks).
(ii) Use your graphs to estimate the number of copies sold in the 13th week. (03 marks)

14. A body of mass 4 kg is initially at rest at a point P whose position vector is $(3\mathbf{i} + 4\mathbf{j}) \text{ m}$. A constant force $\mathbf{F} = (8\mathbf{i} + 4\mathbf{j}) \text{ N}$ acts on the body causing it to move. The body passes through another point Q after 4 seconds.

Find the;

- (a) acceleration of the body. (02 marks)
(b) velocity of the body as it passes through Q . (03 marks)
(c) kinetic energy of the body after the 4 seconds. (04 marks)
(d) distance between the points P and Q . (06 marks)

S475/1
SUBSID. MATHEMATICS
PAPER 1
July/August 2019
 $2\frac{2}{3}$ hours



WAKISSHA JOINT MOCK EXAMINATIONS

Uganda Advanced Certificate of Education

SUBSIDIARY MATHEMATICS

PAPER 1

2hours 40minutes

INSTRUCTIONS TO CANDIDATES:

- Answer all the eight questions in section A and any four questions from section B.
- Any additional question(s) answered will not be marked.
- All working must be shown clearly.
- Each question in section A carries 5 marks while each question in section B carries 15 marks.
- Begin each answer on a fresh page.
- Graph papers are provided.
- Silent non-programmable scientific calculators and mathematical tables with a list of formulae may be used.
- Where necessary take $g = 9.8ms^{-2}$.

SECTION A (40 marks)

Answer all questions in this section.

1. Given that $\log_2 128^x = \frac{1}{\sqrt{3}}$. Find the value of x . (05 marks)
2. Events A and B are independent such that $P(B) = 0.3$ and $P(A \cup B) = 0.79$, Find $P(A)$. (05 marks)
3. The first term of an A.P is -12 and the last term is 40. If the sum of the progression is 196. Find the number of terms and the common difference. (05 marks)
4. It was discovered that 30% of a sample of patients recovered from a UTI infection after treatment. In a random sample of 10 patients, find the;
 - (i) Expected number of patients who recovered. (03 marks)
 - (ii) Probability that there are more than 8 patients who recovered. (02 marks)
- * 5. The remainder obtained when $3x^3 - 6x^2 + Px - 1$ is divided by $(x + 1)$ is equal to the remainder obtained when the same expression is divided by $(x + 3)$. Find the value of P. (05 marks)
6. Solve the differential equation: $\frac{dy}{dx} + 5 = 6x$, given that when $x = 1$, $y = 2$. (05 marks)
7. The prices in shillings of commodities X, Y and Z in the years 1990 and 2000 are given in the table below.

Commodity	1990	2000
X	1,800	2,500
Y	2,500	3,500
Z	3,000	4,500
- * 8. Using 1990 as the base year; find the;
 - (i) Price relative of each commodity.
 - (ii) Simple aggregate price index. (05 marks)
- * 8. A particle of mass 10kg is released from rest at top of a smooth plane inclined at an angle of 30° to the horizontal. Find the velocity of the particle after 3 seconds. (05 marks)

SECTION B (00 marks)

Answer any four questions from this section.

The table below shows the weights of 52 students in kgs.

Weights	Cumulative frequency
40 -	3
45 -	5
50 -	12
55 -	30
60 -	48
65 -	51
70 - 74	52

- a) Calculate the:
- (i) Mean weight.
 - (ii) Variance of their weights.
- b) Draw a cumulative frequency curve and estimate:
- (i) Median.
 - (ii) Number of students whose weights exceed 58kg. (15 marks)

10. a) Solve the equation $\cot^2 \theta - 3\cot \theta + 2 = 0$ for θ between 0° and 360° . (06 marks)
- b) If $\sin A = \frac{3}{5}$ and A is obtuse, and $\tan B = \frac{-7}{24}$ and B is acute. Find without using tables, the value of $\tan(A + B)$. (05 marks)
- c) Eliminate θ from the equations
 $x = \cos \theta$ and $y = 2 \tan \theta$. (04 marks)

11. A random variable Y has a P.d.f given by

$$f(y) = \begin{cases} \alpha y & , 0 < y < 3 \\ \alpha(5-y) & , 3 < y < 6 \\ 0 & , \text{else where.} \end{cases}$$

Find the:

- (i) Value of α .
- (ii) Expected value of y .
- (iii) Standard deviation of y .

12. Ten students scored the pair of marks in economics and mathematics as follows. (15 marks)

A(62,75) B(54,58) C(46,46) D(34,37) E(54,37) F(36,45)
 G(24,11) H(17,22) I(47,49) and K(70,70).

- a) (i) Draw a scatter diagram of economics (X) against mathematics (Y). (2 marks)
- (ii) Draw a line of best fit and estimate the score in mathematics for a student who scored 52 in economic. (08 marks)
- b) Calculate the rank correction coefficient between the score of economics and mathematics and hence comment on your result. (07 marks)
13. The rate of mortality of women (rate at which women are dying) is directly proportional to number of women dying at a given time t in years. Given that initially 20 women were dying and after 4 years it reduce to 10 women dying.
If N is number of women dying at any time t , and A is proportionality constant,
- (i) Form a differential equation connecting N , t and A .
 - (ii) Solve the differential equation formed in (i) above.
 - (iii) Find the time taken for the number of women dying to be reduced to 5 women. (15 marks)
14. a) A packet of biscuits has a mass of 0.5kg and is thrown along a table with a velocity of 10ms^{-1} . If the resistance of the table to the packet's motion is 20N .
- (i) How far will it travel before coming to rest?
 - (ii) What must be the resistance if it travels 2m only? (10 marks)
- b) A force acting on a body of mass 20kg moves along a straight line. The rate at which work is done by the force is 80W at the time when velocity is 5ms^{-1} . If the body starts from rest. Find the time it takes to move a distance of 100m . (05 marks)

END

S475/1
SUBSID. MATHEMATICS
PAPER I
July/August 2018
 $2\frac{2}{3}$ hours

F130



WAKISSHA JOINT MOCK EXAMINATIONS

Uganda Advanced Certificate of Education

SUBSIDIARY MATHEMATICS

PAPER I

2hours 40minutes

INSTRUCTIONS TO CANDIDATES:

- Answer all the eight questions in section A and any four questions from section B.
- Any additional question(s) answered will not be marked.
- All working must be shown clearly.
- Each question in section A carries 5 marks while each question in section B carries 15 marks.
- Begin each answer on a fresh page.
- Graph papers are provided.
- Silent non-programmable scientific calculators and mathematical tables with a list of formulae may be used.
- Where necessary take $g = 9.8ms^{-2}$.

Answer all questions in this section.

1. Express $\sqrt{5} + \frac{1-\sqrt{5}}{\sqrt{5}-2}$ without surd in it. (05 marks)
2. Two events M and N are such that $P(M) = \frac{1}{3}$, $P(N) = \frac{3}{5}$ and $P(M \cap \bar{N}) = \frac{2}{7}$.
Find;
(i) $P(M \cap N)$ (02 marks)
(ii) $P(M/N)$ (03 marks)
3. Vectors $\underline{a} = 3x\hat{i} + 9\hat{j}$ and $\underline{b} = x\hat{i} - 12\hat{j}$ are perpendicular vectors. Find the value of x . (05 marks)
4. A traveller finds that the price index for breakfast (B), lunch (L) and Supper(S) in Kampala and Mbarara were as shown in the table.

Town	Price index		
	B	L	S
Kampala	120	130	125
Mbarara	115	135	110

If the actual quantities consumed by the traveler for B, L and S were 300g, 400g and 300g respectively. Calculate the weighted index for each town.
(05 marks)
5. Solve the equation $2\sec^2 \theta + \tan \theta = 3$ for $0^\circ \leq \theta \leq 360^\circ$. (05 marks)
6. Mr. Mukasa makes a set of chairs. Each new set produced costs shs. 20,000 more than the previous set. Given that cost of first set produced is shs. 250,000.
Find; (i) cost of the sixth set produced. (03 marks)
(ii) the total cost of the first five sets produced. (02 marks)
7. The mass of animals on a certain farm is normally distributed with mean 60kg and variance 25kg. Find the percentage of the animals that weigh at least 52.5 kg.
(05 marks)
8. A body of mass 5kg rests on a rough horizontal table. If the coefficient of friction between the body and the table is 0.35. Find the magnitude of the minimum force, P, acting on the body at an angle of 40° to the horizontal which will move the body. (05 marks)

SECTION B (60 MARKS)

9. The data below shows the marks scored by students in a certain test.

40	44	56	45	44	35	53	54
54	30	57	50	46	48	60	67
61	31	41	39	56	38	62	53
46	55	36	48	39	64	42	62
56	49	39	43	54	51	56	40

- a) Construct a grouped frequency table for the data using equal classes of width 4 marks starting with 30- 33 as the first class. (07 marks)
- b) Use the table in (a) above to calculate the;
 - i) Mode. (03 marks)
 - ii) Median. (03 marks)
 - iii) Variance. (02 marks)

10. A gradient function for a certain curve is given by $\frac{dy}{dx} = x - 1$.

Given that the curve passes through point $\left(0, \frac{-3}{2}\right)$.

- a) Determine the equation of the curve. (05 marks)
- b) Find the intercepts of the curve at x-axis and y-axis. (03 marks)
- c) Determine the turning point on the curve. (05 marks)
- d) Sketch the curve. (02 marks)

11. A certain market operates on Monday, Wednesday and Friday. The table below shows the sales made by a trader in February 2018.

Week	Days		
	Monday	Wednesday	Friday
1	201	222	243
2	234	246	225
3	252	261	207
4	216	237	240

- (a) Calculate a 3point moving averages for the data. (06 marks)
- (b) Plot the graph of the 3point moving averages for the data. (05 marks)
- (c) Use the graph in (b) above to estimate the sales for;
 - i) First Monday in March 2018. (02 marks)
 - ii) Last Friday in January 2018. (02 marks)

12. (a) Solve the equation $3(2^{2x}) - 8(2^x) + 4 = 0$ (08 marks)
- (b) If $p + q = 5$ and $p^2 + q^2 = 20$, find the;
 - i) Value of pq. (05 marks)
 - ii) equation in terms of x whose roots are p and q. (02 marks)

Turn Over

$$p+q=5 \quad p = \begin{cases} 5-q \\ q-p \end{cases}$$

$$(5-q)^2 + q^2 = 20$$

13. The table below shows the probability distribution of the number of decoders sold by a GO – TV agent in a certain town.

Number of decoders sold (x)	0	1	2	3	4	5
Probability $p(x = x)$	0.02	0.34	d	0.41	0.10	0.06

Determine;

- Value of d. (03 marks)
- $E(x)$. (05 marks)
- Standard deviation. (05 marks)
- $P(x \leq 3)$. (02 marks)

14. (a) A train starts from rest at station A and accelerates uniformly to a speed of 15ms^{-1} in 1 minute. It maintains the speed for 5 minutes after which it decelerates to rest to station B in 2 minutes. Sketch a velocity – time graph for the motion of the train. (05 marks)

Use the graph to find;

- Distance between stations A and B. (02 marks)
- Acceleration and deceleration of the train. (04 marks)

- (b) A particle is projected vertically upwards with a speed 5ms^{-1} . Find
- time taken to reach the maximum height. (02 marks)
 - the maximum height attained. (02 marks)

END

S475/1
SUBSID. MATHEMATICS
PAPER 1
July/August 2017
 $2\frac{2}{3}$ hours



WAKISSHA JOINT MOCK EXAMINATIONS
Uganda Advanced Certificate of Education
SUBSIDIARY MATHEMATICS
PAPER 1

2hours 40minutes

INSTRUCTIONS TO CANDIDATES:

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

SECTION A (40 MARKS)

Answer all questions in this section.

1. The roots of the equation $x^2 - 4x + 7 = 0$ are α and β . Form an equation whose roots are $\frac{-2}{\alpha}$ & $\frac{-2}{\beta}$. (5 marks)
2. The 10th term of an arithmetic progression is greater than the 5th term by 5. If the sum of the first fourteen terms is 147. Find the common difference and the first term of the series. (5 marks)
3. The probability that Jane answers a quiz correctly is 0.8. If she is given 12 similar quizzes to answer, find the probability that she answers;
 - (i) more than 10 quizzes correctly, (3 marks)
 - (ii) at most 2 quizzes correctly. (2 marks)
4. The sales (in kg) of a firm were recorded as follows; 38, 66, P, 28, 47, 56, 60, 48 and 56. If the corresponding four point moving averages were 44.0, 46.3, 43.8, 44.8, 51.8, 55.5 and Q, calculate the values of P and Q. (5 marks)
5. The gradient function of a curve at the point (-2, 10) is given by $9x^2 - 8x - 4$. Find the equation of the curve. (5 marks)
6. When the polynomial $p(x) = mx^4 + nx^3 - x^2 + 2x + 3$ is divided by $x^2 - x - 2$, the remainder is $3x + 5$. Find the values of m and n. (5 marks)
7. Two independent events A and B are such that $P(A) = 0.5$ and $P(B) = 0.25$. Find
 - (i) $P(A \cup B)$, (3 marks)
 - (ii) $P(\bar{A} \cap \bar{B})$. (2 marks)
8. Points A, B and C lie along a straight line such that $AB = 100m$ and $BC = 140m$. A train moving with constant acceleration takes 20 seconds and 40 seconds to cover the successive distances. Find the;
 - (i) acceleration of the train, (3 marks)
 - (ii) speed of the train at A. (2 marks)

SECTION B (60 MARKS)

Answer any **four** questions from this section.

9. The table below shows the relationship between the variables x and y .

Variable x	10	60	80	30	20	45	50	55	40
Variable y	95	42	30	75	90	70	60	50	60

- (a) Draw a scatter diagram and use it to comment on the relationship between x and y . (6 marks)
- (b) By drawing a line of best fit, estimate x when $y = 67$. (2 marks)
- (c) Calculate the rank correlation coefficient between the variables and comment on the relationship. (7 marks)

10. A continuous random variable x has a probability density function $f(x)$ given by

$$f(x) = \begin{cases} cx & ; 0 < x < 1, \\ c(4 - x) & ; 1 < x < 3, \\ 0 & ; \text{Otherwise.} \end{cases}$$

Calculate the:-

- (a) value of c , (4 marks)
- (b) mean of x , (4 marks)
- (c) standard deviation of x . (7 marks)

11. (a) Given that $M = \begin{pmatrix} 1 & 3 \\ 2 & 0 \end{pmatrix}$ and $N = \begin{pmatrix} -3 & 1 \\ 3 & -2 \end{pmatrix}$, find MN . (3 marks)

- (b) Tom and Jane went for shopping. Tom bought 2kg of posho, 1.5kg of sugar and 3kg of meat while Jane bought 1kg of posho, 0.5kg of tea-leaves and 4kg of meat. The cost per kg of sugar was 4,500/=, meat was 10,000/=, posho was 3,000/= and tea leaves 1,500/=.

- (i) Write down the matrices for the items bought and for the prices of the items. (2 marks)
- (ii) Using the matrices, determine the difference in expenditure of Tom and Jane. (10 marks)

12. The table below shows the cost of items used in baking bread and the corresponding weights in 2010 and 2017.

Year	2010		2017		
	Items	Price(Shs)	Weight	Price(Shs)	Weight
Wheat	3,000	2	5,000	4	
Sugar	2,500	3	4,500	2	
Milk	1,600	5	2,000	3	
Eggs	400	8	500	6	

Taking 2010 as the base year,

- (a) Calculate the simple aggregate price index for the items in 2017. (8 marks)
- (b) Find the weighted aggregate price index for the items used for baking bread. (4 marks)
- (c) If the price of a loaf of bread is 2,000/= in 2017, find the price of a loaf of bread in 2010 to the nearest shillings. (3 marks)
13. (a) Sketch the curve $y = 5 + 4x - x^2$. (10 marks)
- (b) Calculate the area bounded by the curve and the x-axis. (5 marks)
14. A block of mass 5kg in contact with a smooth horizontal table is connected by a light inelastic string passing over a light smooth pulley fixed at the edge of the table. The other end of the string carries another block of mass 8kg hanging freely under gravity. If the 8kg mass is 60cm above ground level and the system is released from rest calculate the;
- (i) acceleration of the system, (8 marks)
 - (ii) tension in the string, (2 marks)
 - (iii) speed with which the 8kg mass hits the ground. (3 marks)
 - (vi) time of motion for the 8kg mass. (2 marks)

END

S475/1
SUBSIDIARY MATHEMATICS
PAPER 1
2 HOURS 40 MINUTES

DEPARTMENT OF MATHEMATICS
UACE EXAMINATIONS, 2018
S475/1 SUBSIDIARY MATHEMATICS
TIME: 2 HOURS 40 MINUTES

INSTRUCTIONS:

- Attempt ALL questions in Section A and any 4 from Section B.
- All working must be shown clearly.
- No paper should be given for rough work.
- Squared papers and mathematical tables are provided.
- Silent, non programmable scientific calculators may be used.
- Where necessary, use $g = 9.8ms^{-2}$

SECTION A

1. Given that $ax^2 + bx + c = (3x - a)^2$, find the values of a, b and c . (05mks)
2. If $4\tan\theta = 3$, find the value of $\cos^2\theta - \sin^2\theta$ (05mks)
3. Given $a = 3i + 2xj$, $b = xi + (x - 2)j$. If $a \cdot b = 3$, find the:
 - (i) possible values of x
 - (ii) angle between a and b .
 (05mks)
4. (a) Without using a calculator, simplify 4P_2
 (b) Solve the equation $\binom{n+2}{n} = 6$ (05mks)
5. Eight candidates seeking to join a certain school were given Maths (x) and English (y) tests ad their scores were recorded as follows:

x	54	35	62	87	53	71	50	55
y	60	47	65	83	56	74	63	57

- (a) Draw a scatter diagram and comment on your results.
 (b) Find x when $y = 55$. (05mks)
6. A discrete random variable x has a probability distribution given below.

$X = x$	-1	0	1	2	3
$P(X = x)$	$\frac{1}{8}$	a	$\frac{1}{8}$	$\frac{3}{8}$	$\frac{3}{2}a$

Find the: (i) value of a (ii) $E(x^2)$ (05mks)

7. A continuous random variable x has a probability function $f(x)$ give by:

$$f(x) = \begin{cases} kx; & 0 < x \leq 1 \\ 0.5k(3-x); & 1 \leq x \leq 3 \\ 0 & elsewhere \end{cases}$$

8. A pump raises water at a rate of 1200 litres per minute through a vertical distance of 10m and projects it into a reservoir at 4ms^{-1} . Given that the mass of 1 litre of water is equal to 1kg, find the power developed by the pump. (05mks)

SECTION B

Attempt any 4 questions

9. The cumulative marks scored by 100 students in a Maths tests.

Marks(%)	< 10	< 20	< 30	< 40	< 50	< 60	< 70	< 80	< 90	< 100
Cumulative frequency	5	15	30	45	50	60	80	90	97	100

- (a) Calculate the:
 (i) Mean mark (ii) variance (09mks)

- (b) Draw a cumulative frequency curve and use it to estimate the:
 (i) Median mark
 (ii) Pass mark if 60 students passed. (06mks)

10. (i) Solve the differential equation $\frac{dy}{dx} = x - 2$.
 (ii) Given that $x = 0$, when $y = 0$. Express y in terms of x .
 (iii) Determine the co-ordinates and nature of turning points on the curve in (ii)
 (iv) above, hence sketch the curve.
 (iv) Use the curve to find the area enclosed between the curve and the x-axis. (15mks)

11. The following table shows the quarterly oil production in millions of barrels of a certain country for a period of three years.

Year	1 st quarter	1 st quarter	1 st quarter	1 st quarter
2012	3172	6632	5267	4157
2013	3377	6892	5522	4362
2014	3482	7017	5642	4492

- (a) Calculate the four point moving averages. (06mks)
 (b) (i) On the same axes, plot and draw graphs of the original data and the four-point moving average.
 (ii) Comment on the trend of oil production.
 (iii) Use your graph to estimate the amount of oil produced by the country in the 1st quarter of 2015. (09mks)

12. (a) Given that $M = \begin{pmatrix} 1 & 0 \\ 3 & -1 \end{pmatrix}$, find x and y if $M^3 - xM + yI = 0$, where I is an identity matrix. (06mks)

- (b) Two ladies A and B bought the following items from a super market. A bought 3kg of sugar, 4 bars of soap and 2 packets of tea leaves and B bought 2kg of sugar, 3 bars of soap and 3 litres of milk. The cost of sugar was shs. 4,800 per kg, soap shs. 2,500, tea leaves shs. 800 a packet and shs. 1,800 a litre.
- (i) Form a matrices of order 2×4 for the items bought and a 4×1 for the cost.
(ii) Use matrix multiplication to find the total expenditure of the ladies. (09mks)

13. The prices of unit values and quantities consumed of four commodities A, B, C and D by a certain family were recorded as shown in the table below.

YEAR	2014		2015		
	Commodity	Prices(shs)	Quantity	Prices(shs)	Quantity
A		30,000	40	40,000	45
B		30,000	35	35,000	40
C		27,000	25	33,000	30
D		12,000	10	15,000	15

Taking 2014 as the base year, calculate for 2015, the

- (a) percentage increase in prices and quantities consumed. (08mks)
(b) weighted aggregate price relative and comment of your results. (07mks)
14. A cyclist starts from rest at point O and accelerates uniformly at $2ms^{-2}$ for 10 seconds until he reaches point A. he then moves at the attained speed for 20 seconds up to point B, before decelerating uniformly to rest at point C for a further 30 seconds.
- (a) Draw a velocity time graph. (04mks)
(b) Calculate the:
(i) velocity at point A.
(ii) distances OA, AB and BC hence determine the total distance OC. (11mks)

END

S475/1

.6 SUB – MATHEMATICS

Paper 1

June, 2017

2½ hours

Uganda Advanced Certificate of Education

MOCK EXAMINATIONS 2017

SUB – MATHEMATICS

Paper 1

2 hours 45 minutes

INSTRUCTIONS

- Answer all questions in section A and any four questions from sections B.

SECTION A

1. Simplify $\sqrt{72} + \sqrt{200} - 4\sqrt{18}$ (05 marks)
2. Solve $4^{x-1} = 16^{x+1}$ (05 marks)
3. A box contains 4 black pens (B) and 5 red pens (R). Two pens are picked at random, one after the other without replacement. Find the probability that both pens are of the same colour. (05 marks)
4. The roots of the equation $3x^2 - 5x + 1 = 0$ are α and β . Find the value of $\frac{\alpha}{\beta} + \frac{\beta}{\alpha}$ (05 marks)
5. Find the equation of the tangent to the curve $y = x^3$ at the point A (2, 8) (05 marks)
6. A particle moving along a straight line between points A and B with a velocity of 105m/s starts at A with velocity of 10ms^{-1} , with a constant acceleration, find the acceleration of the particle at point B if the particle takes 6 seconds to reach point B. (05 marks)
7. Solve the equation for $0^\circ \leq x \leq 360^\circ$
$$1 + \sin x + \cos^2 x = 0.$$
 (05 marks)
8. Given the matrices A and B below;
$$A = \begin{pmatrix} x & 1 \\ -1 & y \end{pmatrix}, B = \begin{pmatrix} 2+y & 1 \\ -1 & x-y \end{pmatrix}$$

Find the values of x and y if $A = B.$ (05 marks)

SECTION B

9. Given that $y = x^2 - 2x - 3$
 (i) find the intercepts
 (ii) determine the nature of turning points and hence sketch the curve. (15 marks)
10. (a) Given that $P(\bar{A}) = \frac{2}{3}$, $P(B) = \frac{1}{2}$ and $P(A \cap B) = \frac{1}{12}$, find $P(A \cup B)$. (05 marks)
 (b) Events A and B are such that $P(A) = \frac{1}{2}$, $P(B) = \frac{3}{8}$ and $P\left(\frac{A}{B}\right) = \frac{1}{2}$. Find
 (i) $P(A \cap B)$ (ii) $P(B/A')$ (05 marks)
 (c) Two events A and B are independent. Given that $P(A \cap B') = \frac{1}{4}$ and $P\left(\frac{A'}{B}\right) = \frac{1}{6}$. Find the following probabilities;
 (i) $P(A)$ (ii) $P(B)$ (iii) $P(\bar{A} \cap B)$ (05 marks)
11. (a) A random variable X has a probability distribution given below
- | | | | | | | | |
|-----|---|---|----------------|-----------------|-----|----------------|----------------|
| x | 0 | 1 | $\frac{2}{10}$ | $\frac{10}{20}$ | B | $\frac{5}{20}$ | $\frac{1}{20}$ |
|-----|---|---|----------------|-----------------|-----|----------------|----------------|
- Find;
 (i) the constant B
 (ii) mode of the distribution
 (iii) $P(x \geq 3)$
 (iv) Expectation of x .
12. (a) An Arithmetic progression (A.P) has a first term of 2 and common difference 5. Given that the sum of the first n terms of the progression is 119, calculate the value of n . (05 marks)
 (b) A geometric progression (G.P) has a 3rd term 7 and a 5th term 847. Find the possible values of the common ratio and the corresponding values of the fourth term. (05 marks)
 (c) A G.P and A.P have the same first term. The sum of their first, second and third terms are 6, 10.5 and 10 respectively. Calculate the sum of their fifth terms. (05 marks)
13. If $\sin A = \frac{3}{5}$ and $\sin B = \frac{5}{13}$, where A and B are acute angles, find the values of;
 (a) $\sin(A + B)$
 (b) $\cos(A + B)$
 (c) $\tan(A - B)$ (15 marks)
14. The times corrected to the nearest seconds, taken by 100 athletes to cover a lap of running track were recorded as follows;
- | | | | | | | |
|-----------------|---------|---------|---------|---------|---------|----------|
| Time (s) | 70-< 75 | 75-< 80 | 80-< 85 | 85-< 90 | 90-< 95 | 95-< 100 |
| No. of athletes | 8 | 20 | 26 | 30 | 9 | 7 |
- (a) using a working mean of 87.5, calculate the mean.
 (b) draw the cumulative frequency curve and use it to estimate;
 (i) median time
 (ii) semi-interquartile range. (15 marks)

END

S475/1
SUBSID. MATHEMATICS
PAPER 1
July/August 2015
 $2\frac{2}{3}$ hours



WAKISSHA JOINT MOCK EXAMINATIONS
Uganda Advanced Certificate of Education
SUBSIDIARY MATHEMATICS
PAPER 1

2hours 40minutes

INSTRUCTIONS TO CANDIDATES:

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

SECTION A (40 MARKS)

Answer all questions in this section.

SECTION A

1. Given that $\log_2 x + \log_2 x^2 + \log_2 x^3 = 24$. Find the value of x . (05marks)
2. Events A and B are independent such that $P(A) = 0.3$ and $P(B) = 0.2$, Find;
(i) $P(A \cup B)$
(ii) $P(A \cap B)$

(05marks)
3. Given that matrix $P = \begin{pmatrix} 1 & 2 \\ 4 & 5 \end{pmatrix}$, $Q = \begin{pmatrix} -1 & 1 \\ 3 & 2 \end{pmatrix}$ and $R = \begin{pmatrix} 4 & 6 \\ 10 & 15 \end{pmatrix}$.
Find the matrix M if $M + R = P^2 + 3Q$ (05marks)
4. The mean of n number is 5. If the number 13 is included with the n numbers, the new mean becomes 6. Find the value of n. (05marks)
5. Solve the differential equation $\frac{dy}{dx} = \frac{x+1}{y}$.
Hence find the solution given that $y = 5$ at $x = 2$. (05marks)
6. The monthly price of a bunch of banana in 2014 was as follows;

Months	Jan	Feb	March	April	May	June	July	Aug
Price (Shs)	4500	5000	5200	5500	6000	6500	5700	7000

Calculate the 4-months moving average for the data. (05marks)
7. Show that $\sin(x + 60^\circ) + \sin(x - 120^\circ) = 0$
8. A particle travelling in a straight line passes through points A, B and C. Given that AB = 40m, BC = 20m and the particle take 12 seconds and 8 seconds to travel between AB and BC respectively. Find the
(i) initial velocity,
(ii) acceleration
of the particle. (05marks)

SECTION B

Answer only four questions from this section.

9. In an investigation carried out, the masses of 50 animals were noted and recorded as below.

88	108	113	103	104	100	105	86
92	116	117	102	100	110	99	106
116	101	105	85	103	100	95	109
92	108	92	99	107	98	105	113
101	96	107	101	118	106	102	97
93	101	111	96	93	92	87	118
114	101						

- a) Construct a frequency distribution table with equal class intervals of 5kg taking 85-89 as the first class. (05marks)
- b) Calculate the modal weight. (05marks)
- c) Draw a cumulative frequency curve and use it to estimate.
- (i) Semi-interquartile range.
 - (ii) The 80th percentile.
10. a) By completing squares, solve the equation $2x^2 - 3x - 5 = 0$ (04marks)
- b) Find the equation whose roots are $\frac{3}{5}$ and $\frac{1}{2}$. (04marks)
- c) The roots of the equation $3x^2 + 2x - 4 = 0$ are a and b.
Find the equation whose roots are $\frac{1}{a}$ and $\frac{1}{b}$ (07marks)
11. In a certain class, the expected number of students offering sub maths is 5 and the variance is 2.5.
- a) Find the probability (P) of choosing a student who offers sub maths.
Hence determine the number(n) of students in the class. (08marks)
- b) Calculate the probability that;
- (i) exactly 5 students offer sub maths.
 - (ii) no student offers sub maths.
 - (iii) at least 8 students offer sub maths. (07marks)
12. Given the curve $y = 6 - x - x^2$.
- a) Find the turning point of the curve and determine its nature.
Hence sketch the curve. (10marks)
- b) Find the area bound by the curve and the x - axis between $x = -3$ and $x = 2$. (05marks)

13. Eight candidates seeking to join a certain school were given physics and mathematics tests and their scores were shown below.

Physics (x)	55	54	35	62	87	53	71	50
Maths (y)	57	60	47	65	83	56	74	63

- a) Calculate the rank correlation coefficient and hence comment on the relationship between physics and mathematics. (07marks)
- b) (i) Draw a scatter diagram for the data.
(ii) Draw a line of best fit on your diagram.
(iii) Use the line of best fit to find the value of y when $x = 60$. (08marks)

14. (a) A particle A of mass 9kg resting on a horizontal table is connected by a light inelastic string passing over a smooth pulley fixed at the edge of the table to another particle B of mass 4Kg hanging freely. Given that the coefficient of friction between the particle A and the table is 0.2 and the system is released from rest, find the;
(i) acceleration of the system.
(ii) tension in the string.

(07marks)

- (b) A particle of mass 0.1kg is released from rest at a height of 25 m above the ground and falls freely under gravity.
Assuming the ground level is the zero level potential energy, find the sum of the kinetic and potential energy of the particle 2 seconds after being released.

(08marks)

END

Subsidiary
Mathematics
Paper 1
 $2\frac{2}{3}$ hours.

James Peter

Uganda Advanced Certificate of Education

Subsidiary Mathematics Paper 1

Time: 2 Hours 40 Minutes

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.

Section A (40 Marks)

Answer all the questions in this section.

Qn 1: Without using tables or a calculator, simplify:

$$\frac{1}{2} \log_{10} 1600 - 2 \log\left(\frac{x}{5}\right) + \log x^2. \quad [5 \text{ marks}]$$

Qn 2: A sample of ten students were given a test at the beginning of the term and their scores, X , were compared with their scores, Y , obtained in an examination at the end of the term as shown in the table below.

X	35	65	55	25	45	75	20	90	51	60
Y	86	70	84	92	79	68	96	58	86	77

Calculate the rank correlation coefficient and comment on your result.

[5 marks]

Qn 3: Find the gradient of the curve $y = 2x^3 - 4x^2 + 5x - 6$ at the point $(-2, 4)$

[5 marks]

Qn 4: Three events A , B and C are such that $P(B) = \frac{3}{5}$, $P(C) = \frac{4}{5}$, $P(C/B) = \frac{9}{20}$ and

$$P(A \cap C) = \frac{7}{25}. \text{ Find:}$$

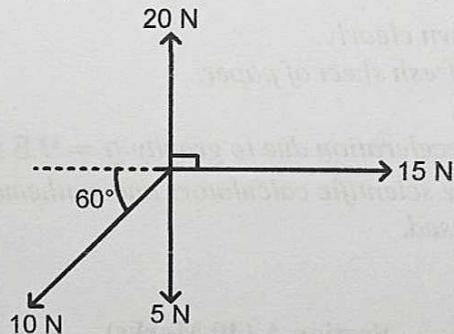
- (a). $P(B \cap C)$, [2 marks]
(b). $P(A/C)$. [3 marks]

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

Qn 6: Find the number of ways in which the letters of the word **PROBABILITY** can be arranged in a straight line so that the **B**'s are separated. [5 marks]

Qn 7:
$$\int_{-1}^3 (3x^2 - 2) dx$$
 [5 marks]

Qn 8: The figure below shows a system of four forces in acting in the directions shown below.



Find the magnitude of the resultant force in the above system.

[5 marks]

Section B (60 Marks)

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

Question 9:

A discrete random variable X , has a probability density function (pdf) given by:

$$f(x) = \begin{cases} k(4x - x^2); & 1, 2, 3, 4 \\ 0; & \text{otherwise} \end{cases}$$

Where k is a constant.

Determine the:

- (a). value of k . [4 marks]
(b). $P(X > 1)$. [4 marks]
(c). expectation, $E(X)$. [3 marks]
(d). variance, $Var(X)$. [4 marks]

Question 10:

John sold food stuff to a certain school in March on weekly basis as follows:

- Week 1: He sold 20 kg of sugar (S), 30 kg of maize flour (M) and 10 kg of rice (R).
- Week 2: He sold 14 kg of sugar, 25 kg of maize flour and 18 kg of rice.
- Week 3: He sold 30 kg of sugar, 20 kg of maize flour and 5 kg of rice.
- Week 4: He sold 15 kg of maize flour and 10 kg of rice.

If a kg of sugar costs shs. 4,000; of maize flour shs. 3,000; and of rice shs. 3,500.

- (a). (i). Write a 4×3 matrix for the food stuff quantity.
 (ii). Write a 3×1 matrix for the cost.
- (b). By matrix multiplication, determine the value of the sales in each week.
- (c). If John made a profit of 25% by selling all the items, determine the total cost price of the items. [15 marks]

Question 11:

The table below shows the prices of some food items and their corresponding weights in years 2000, 2005 and 2010.

Commodity	Unit	Price(in UgShs)			Weight
		2000	2005	2010	
Matooke	Bunch	17,000	15,000	20,000	5
Meat	kilogram	7,500	8,000	8,500	4
Posho	kilogram	3,000	2,800	2,600	3
Beans	kilogram	3,200	3,000	2,800	2
Vegetables	kilogram	1,000	1,500	2,000	1

Using 2000 as the base year, calculate the:

- (a). Simple aggregate price index for 2005. Comment on your result. [5 marks]
- (b). Price relative for each food item for 2010. [5 marks]
- (c). Weighted average price index for 2010. [5 marks]

Question 12:

Given the curve $y=2x^2 - x - 15$.

(i) determine the turning point and its nature.

(ii) Sketch the curve.

(iii) Find the area of the region enclosed by the curve and x-axis between $x = 2.5$ and $x = 3$. (15marks)

Question 13:

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

Week	Mon	Tue	Wed	Thur	Fri
I	200	250	310	320	260
II	300	340	400	380	360
III	380	380	400	400	370
IV	380	400	400	400	400

- (a). Using a suitable table, calculate the five-day moving totals and moving averages. [6 marks]
- (b). On the same axes, plot the number of customers per visit and moving averages. [5 marks]
- (c). Using your graph in (b) above,
- (i). comment on the trend of the number of customers who visit the bank over the three weeks. [1 marks]
 - (ii). estimate the number of customers who will visit the bank on Monday of the fifth week. [3 marks]

Question 14:

A car initially at rest accelerated uniformly to a speed of 20ms^{-1} in 16s. The car then travelled at the attained speed for 20 minutes. The car then accelerated uniformly at 2.5ms^{-2} for 8 seconds. It finally decelerated uniformly at 2.5ms^{-2} to rest.

- (a). Find the.
- (i). Greatest speed attained by the car
 - (ii). Total time taken by the car to come to rest. *6mks*
- (b). Sketch the velocity time graphs of the motion of the car. *4mks*
- (c). Use your graph to find the total distance travelled by the car. *5mks*

END

S475/1
SUBSID. MATHEMATICS
Paper 1
Nov./ Dec. 2019
 $2 \frac{2}{3}$ hours



MINISTRY OF EDUCATION
NATIONAL HIGH SCHOOL
EXAMINATIONS

UGANDA NATIONAL EXAMINATIONS BOARD

Uganda Advanced Certificate of Education

SUBSIDIARY MATHEMATICS

Paper 1

2 hours 40 minutes

INSTRUCTIONS TO CANDIDATES:

Answer all the eight questions in section A and only four questions in section B.

Any additional question(s) answered 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.

Where necessary, take acceleration due to gravity $g = 9.8 \text{ ms}^{-2}$.

Squared paper is provided.

Silent, non programmable scientific calculators and mathematical tables with a list of formulae may be used.

SECTION A: (40 MARKS)

Answer all the questions in this section.

1. Show that $\sqrt{\frac{25^3 + 5^6}{5^7 - 5^6}} = \frac{\sqrt{2}}{2}$. (05 marks)

2. Two events A and B are such that $P(A) = \frac{19}{30}$, $P(B) = \frac{2}{5}$ and $P(A \cap \bar{B}) = \frac{2}{5}$.

Find:

(a) $P(A \cap B)$. (03 marks)

(b) $P(A \cup B)$. (02 marks)

3. Determine the possible values of a for which the equation $2x^2 + (a+2)x + (a+2) = 0$ has equal roots. (05 marks)

4. A random variable X has the probability distribution shown in the table below.

x	0	1	2	3	4	5
$P(X=x)$	0.01	0.15	$2b$	0.20	b	0.10

Calculate the;

(a) value of b . (02 marks)

(b) expectation of X , $E(X)$. (03 marks)

5. Evaluate $\int_1^2 \frac{x^4 - 1}{x^2} dx$. (05 marks)

6. The ages of eight students in a class are: 12, 13, 14, 15, 12, 17, 13, 16.

Find the;

(a) mean age. (02 marks)

(b) variance. (03 marks)

7. Solve the equation $\cos\theta = \sin 2\theta$ for values of θ from 0° to 360° .

(05 marks)

8. A particle of mass 5 kg rests in limiting equilibrium on a rough plane inclined at 20° to the horizontal.

Calculate the;

(a) normal reaction. (03 marks)

(b) coefficient of friction between the particle and the plane. (02 marks)

SECTION B: (60 MARKS)

Answer only four questions from this section.

9. The table below shows the tax collection of a town council in millions of shillings for six consecutive months.

Month	Jan	Feb	Mar	Apr	May	June
Tax (in millions)	21.5	24.3	21.8	26.2	22.7	28.9

- (a) Construct the 3-month moving averages for the given data. (06 marks)
 - (b) Plot the 3-month moving averages and the original data on the same axes. (06 marks)
 - (c) Use your graphs to estimate the town council's tax collection for the month of July. (03 marks)
10. The equation of a curve is $y = 3 + 2x - x^2$.
- (a) Determine the;
 - (i) coordinates and nature of the turning point of the curve. (06 marks)
 - (ii) y - and x - intercept of the curve. (04 marks)
 - (b) (i) Sketch the curve. (02 marks)
 - (ii) Find the area enclosed by the curve and the x -axis. (03 marks)
11. The marks scored by candidates in an examination are normally distributed with a mean score of μ and standard deviation of δ . Given that 37.5% of the candidates scored below 40 and that 12.5% scored above 60, find the;
- (a) values of μ and δ . (09 marks)
 - (b) probability that a candidate scored between 46 and 55. (06 marks)
12. If $OA = \begin{pmatrix} 6 \\ 5 \end{pmatrix}$, $OB = \begin{pmatrix} 9 \\ 2 \end{pmatrix}$ and $OC = \begin{pmatrix} 7 \\ 0 \end{pmatrix}$,
- (a) find the vectors;
 - (i) BC . (06 marks)
 - (ii) AB . (03 marks)
 - (b) show that the vectors AB and BC are perpendicular. (06 marks)
 - (c) determine the magnitude of the vector $2BC - 3AB$. (03 marks)

13. The table below shows the heights to the nearest cm and masses to the nearest kg of 10 students, A to J.

Student	A	B	C	D	E	F	G	H	I	J
Mass (kg)	53	68	57	52	66	64	63	58	57	68
Height (cm)	148	172	156	139	163	158	168	151	144	170

- (a) (i) Plot the given data on a scatter diagram.
(ii) Draw a line of best fit on the scatter diagram.
(iii) Estimate the height of a student whose mass is 60 kg. (08 marks)
- (b) Calculate the rank correlation coefficient for the data.
Comment on your result. (07 marks)
14. A car of mass 1200 kg has a maximum speed of 180 kmh^{-1} on a level road when the power of the engine is 50 kw. When the car ascends an incline of 1 in 5 with the same engine power, the resultant force is 1648 N. Determine the;
- (a) resistance force along the level road. (05 marks)
(b) maximum speed of the car up the incline. (06 marks)
(c) acceleration of the car up the plane when its speed is 8 ms^{-1} . (04 marks)

456/1
MATHEMATICS
Paper 1
Oct. / Nov. 2020
2½ hours



UGANDA NATIONAL EXAMINATIONS BOARD

Uganda Certificate of Education

MATHEMATICS

Paper 1

2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES:

Answer all questions in section A and any five questions from section B.

Any additional question(s) answered will not be marked.

*All necessary calculations must be done in the answer booklet(s) provided.
Therefore, no paper should be given for rough work.*

Graph paper is provided.

Silent, non-programmable scientific calculators and mathematical tables with a list of formulae may be used.

SECTION A: (40 MARKS)

Answer all the questions in this section.

- The sum of three consecutive odd numbers is 69. If the first number is n , find the three numbers. (04 marks)
- Solve the simultaneous equations:

$$2x - 3y = 12$$

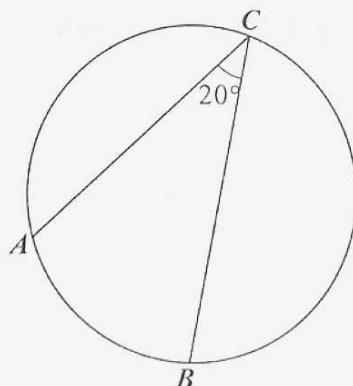
$$7x + 5y = 11 \quad (04 \text{ marks})$$
- Given that $\tan \theta = \frac{12}{5}$, find the value of $\sin \theta$ without using mathematical tables or a calculator. (04 marks)
- The ages of students who were treated in a day at a school clinic are shown in the table below.

Age (years)	12	13	14	15
Number of students	1	2	4	n

Their mean age was 13.9 years. Find the value of n . (04 marks)

- Determine the value of x in the equation

$$16^x = 8^{4x-2} \quad (04 \text{ marks})$$
- Solve the equation: $x^2 + 10x - 24 = 0 \quad (04 \text{ marks})$
- If $\begin{pmatrix} 3 & x \\ 5 & 6 \end{pmatrix} \begin{pmatrix} 2 \\ -1 \end{pmatrix} = \begin{pmatrix} 2 \\ y \end{pmatrix}$, find the values of x and y . (04 marks)
- In the diagram below, the minor arc AB subtends an angle of 20° at the circumference of the circle.



If the radius of the circle is 7 cm, find the length of the minor arc AB . (Give your answer to 1 decimal place) (04 marks)

9. A rectangle whose area is 16 cm^2 is given a transformation represented by the matrix $\begin{pmatrix} 3 & 6 \\ 2 & 5 \end{pmatrix}$. Find the area of the image of the rectangle. (04 marks)

10. The table below shows the weights of 35 students.

Weight (Kg)	25-29	30-34	35-39	40-44	45-49
Number of students	5	8	12	6	4

- (a) Draw a histogram for the data.
 (b) Use the histogram to estimate the modal weight of the students.

(04 marks)

SECTION B: (60 MARKS)

Answer any five questions from this section. All questions carry equal marks.

11. Town A is at a distance of 400 km and on a bearing of 076° from town C . Town B is at a distance of 250 km and on a bearing of 045° from town C .
- (a) Draw an accurate diagram showing the positions of the three towns.
 Use a scale of 1 cm to represent 50 km. (05 marks)
- (b) Determine the distance and bearing of town B from town A using your diagram. (03 marks)
- (c) Jane leaves town C for town B and drives at an average speed of 80km/h. At the same time, Rose leaves town A for town B and drives at 75km/h. Who arrived at town B earlier? (04 marks)
12. (a) Given that $R = 1.21 \times 10^{-4}$ and $S = 4.4 \times 10^{-6}$, without using mathematical tables or a calculator, find in standard form the value of $\frac{2\sqrt{R}}{S}$. (04 marks)
- (b) Simplify $\sqrt{2^x \times 5^{2x} \times 2^x}$ (04 marks)
- (c) Factorise completely : $27x^2 - 12y^2$. (04 marks)
13. Three companies A , B and C bought vehicles for sale as follows:
 Company A bought 4 buses, 8 taxis and 6 saloon cars.
 Company B bought 10 buses, 2 taxis and 8 saloon cars.
 Company C bought 5 buses, 3 taxis and 9 saloon cars.
 Each bus was bought at 200 million shillings, a taxi at 64 million shillings and a saloon car at 18 million shillings.
 The buses are to be sold at 240 million shillings each, taxis at 72 million shillings each while each saloon car at 20 million shillings.

S475/1

SUBSID. MATHEMATICS

Paper 1

Nov./Dec. 2017

2 $\frac{2}{3}$ hours



UGANDA NATIONAL EXAMINATIONS BOARD

Uganda Advanced Certificate of Education

SUBSIDIARY MATHEMATICS

Paper 1

2 hours 40 minutes

INSTRUCTIONS TO CANDIDATES:

*Answer all the **eight** questions in section A and only **four** questions in section B.*

*Any additional question(s) answered 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.

Silent, non-programmable scientific calculators and mathematical tables with a list of formulae may be used.

Where necessary, take acceleration due to gravity, $g = 9.8 \text{ ms}^{-2}$

SECTION A: (40 MARKS)

Answer all the questions in this section.

1. Given that $\log_3 x = 2 \log_3 4 - \log_3 5 + \log_3 9$, find the value of x . (05 marks)
2. A father and a mother with their five children are to sit on a bench. What is the probability that the father and mother will sit next to each other? (05 marks)
3. The vector $\mathbf{a} = 3\mathbf{i} + 2\mathbf{j}$ and $\mathbf{b} = 4\mathbf{i} - 5\mathbf{j}$.
Determine
 (a) $|\mathbf{b}|$
 (b) $\mathbf{a} \cdot \mathbf{b}$ (05 marks)

4. The table below shows the expenditures in shillings of a University student for the years 2005 and 2006.

ITEM	EXPENDITURE (Shs)		WEIGHT
	2005	2006	
Text books	100,000	120,000	3
Pocket money	50,000	70,000	2
Research	40,000	50,000	1

Using the year 2005 as the base year, calculate the weighted aggregate price index. (05 marks)

5. Solve the differential equation:

$$3y \frac{dy}{dx} = \frac{1}{x^2} \quad \text{given that } y = 2 \text{ when } x = 1.$$

(05 marks)

6. It was observed that 3 seeds in every 4 seeds planted germinate. If 16 seeds were planted, calculate the
 - (a) expected number of seeds that will germinate. (03 marks)
 - (b) probability that exactly 14 seeds will germinate. (02 marks)

7. Using the matrix method, solve the simultaneous equations:

$$\begin{aligned} 3x - y &= 16. \\ x + 2y &= 3. \end{aligned} \quad \text{(05 marks)}$$

8. A man of mass 80 kg carries a 50 kg bag of cement for a distance of 7 metres up a slope. The slope is inclined at an angle of 30° to the horizontal.
 - (a) Find the work done against gravity. (03 marks)

12. (a) Triangle OAB is such that angle $AOB = 90^\circ$, angle $ABO = \theta$, $\overline{OB} = 14.4$ cm and $\overline{OA} = 6$ cm. Find $\sin \theta + \cot \theta$. (07 marks)

- (b) Solve: $2\cos^2 x = \sin x + 1$ for $0^\circ \leq x \leq 360^\circ$ (08 marks)

13. A continuous random variable X , has a probability density function (pdf) given by

$$f(x) = \begin{cases} k(x^2 + 6), & 0 \leq x \leq 3 \\ 0, & \text{Otherwise} \end{cases}$$

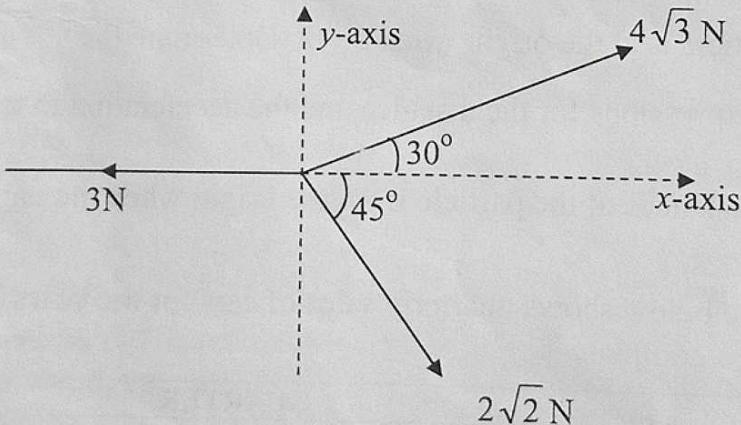
where k is a constant.

Determine the:

- (a) value of k . (04 marks)
- (b) $P(X > 1)$. (04 marks)
- (c) expectation, $E(X)$. (03 marks)
- (d) variance, $\text{Var}(X)$. (04 marks)

14. (a) Forces $P = 10\text{N}$ and $Q = 4\text{N}$ act away from a point A . The magnitude of their resultant is 8N . Find the angle between P and Q . (05 marks)

- (b) The diagram below shows three forces 3N , $4\sqrt{3}\text{ N}$ and $2\sqrt{2}\text{ N}$ acting on a particle at the origin.



Calculate the,

- (i) magnitude of the resultant force.
- (ii) angle the resultant makes with the x -axis.

(10 marks)

- (b) The man took 42 seconds to do the work. Calculate the power he developed. *(02 marks)*

SECTION B: (60 MARKS)

Answer only four questions from this section.

All questions carry equal marks.

9. The data below shows the weights in kg of 50 cattle on a farm.

60	81	76	68	84	112	76	102	86	67
65	98	107	110	72	99	87	92	76	77
94	102	87	86	73	118	98	120	62	87
65	92	104	116	91	93	78	122	102	92
80	111	73	120	106	123	94	109	80	96

- (a) Form a grouped frequency table for the data with classes of equal intervals, starting with the class 60 – 69. *(06 marks)*
- (b) Draw a cumulative frequency curve (Ogive) for the given data. *(04 marks)*
- (c) Use your Ogive to estimate the;
- (i) lower and upper quartiles.
 - (ii) median weight.
 - (iii) number of cattle which weigh 118 kg and above. *(05 marks)*

10. A particle moves with velocity $V = 2t^2 - 9t + 10$ where t is time.

The particle is at the origin when $t = 0$. Determine the

- (a) expressions for the distance and the acceleration in terms of t . *(07 marks)*
- (b) distances of the particle from the origin when the particle is at rest. *(08 marks)*

11. The table below shows quarterly sales of cars for the years 2000, 2001 and 2002 by a company.

YEAR	QUARTER			
	1 st	2 nd	3 rd	4 th
2000	390	310	280	355
2001	420	320	305	410
2002	460	350	315	425

- (a) Calculate a four-point moving average for the data. *(06 marks)*
- (b) (i) Plot the original data and the four-point moving averages on the same axes. *(06 marks)*
- (ii) Comment on the trend of the sales of the cars. *(01 mark)*
- (iii) Use your graph to estimate the number of cars sold in the first quarter of 2003. *(02 marks)*

S475/1
SUBSID. MATHEMATICS

Paper 1
Nov./Dec. 2020
 $2\frac{2}{3}$ hours



UGANDA NATIONAL EXAMINATIONS BOARD

Uganda Advanced Certificate of Education

SUBSIDIARY MATHEMATICS

Paper 1

2 hours 40 minutes

INSTRUCTIONS TO CANDIDATES:

Answer all the eight questions in section A and only four questions from section B.

Any additional question(s) answered will not be marked.

Each question in section A carries 5 marks while each question in section B carries 15 marks.

All necessary working must be shown clearly.

Begin each answer on a fresh sheet of paper.

Graph paper is provided.

Silent, non programmable scientific calculators and mathematical tables with a list of formulae may be used.

Where necessary, take acceleration due to gravity, $g = 9.8 \text{ ms}^{-2}$.

SECTION A: (40 MARKS)

Answer all the questions in this section.

1. Without using a calculator, evaluate

$$\frac{6\sqrt{10} + 2\sqrt{40}}{\sqrt{2} \times \sqrt{20}}. \quad (05 \text{ marks})$$

2. The mean of eight numbers 13, 5, 6, 10, k , 11, 8, and 7 is 9. Find the;
- value of k . (02 marks)
 - standard deviation. (03 marks)
3. The sum of the first 16 terms of an arithmetic progression (A.P) is 1088. The 16th term is twice the 8th term. Determine the value of the first term of the A.P. (05 marks)
4. A school students' council consists of 7 girls and 5 boys. Two students are selected at random from the council. Find the probability that;
- both are girls. (02 marks)
 - the first is a boy and the second is a girl. (03 marks)
5. Determine the equation of the tangent to the curve $y = 2x^3 + 3x$ at the point when $x = 2$. (05 marks)
6. The table below shows the enrollment of students in an institution over a period of 5 years.

Year	2003	2004	2005	2006	2007
Number of students	145	182	170	155	213

Calculate the;

- three-year moving averages. (03 marks)
 - number of students enrolled in 2008, given that the fourth moving average is 203. (02 marks)
7. Given $\mathbf{a} = \begin{pmatrix} 5 \\ -12 \end{pmatrix}$ and $\mathbf{b} = \begin{pmatrix} -3 \\ 4 \end{pmatrix}$, find the;
- dot product of \mathbf{a} and \mathbf{b} . (02 marks)
 - angle between the vectors \mathbf{a} and \mathbf{b} . (03 marks)
8. A train moving in a straight line passes a point P with a velocity of 20 ms^{-1} . It then moves for 5 seconds with an acceleration of 2.5 ms^{-2} . Determine the;
- velocity of the train after 5 seconds. (03 marks)
 - distance of the train from P after 5 seconds. (02 marks)

SECTION B: (60 MARKS)

Answer only four questions from this section.

All questions carry equal marks.

- 9.** The table below shows marks obtained in Sub-Math and Physics by nine students.

Sub-Math (X)	51	62	64	47	54	44	68	61	56
Physics (Y)	45	54	58	46	49	43	59	56	53

- (a) (i) Draw a scatter diagram for the data.
 (ii) On your scatter diagram, draw a line of best fit.
 (iii) Use the line of best fit to estimate the value of X when $Y = 55$. (09 marks)
- (b) Calculate the Spearman's rank correlation coefficient and comment on the result. (06 marks)
- 10.** (a) Given that α and β are the roots of the quadratic equation $x^2 - 3mx + n^2 = 0$, show that $\alpha + \beta = 3m$ and $\alpha\beta = n^2$. (06 marks)
- (b) If α and β are the roots of the equation $x^2 - 9x + 4 = 0$, find the;
- (i) value of $\alpha^2 + \beta^2$. (03 marks)
 - (ii) value of $\frac{1}{\alpha^2} + \frac{1}{\beta^2}$. (03 marks)
 - (iii) quadratic equation whose roots are $\frac{1}{\alpha^2}$ and $\frac{1}{\beta^2}$. (03 marks)
- 11.** (a) Find the number of all the possible arrangements of all the letters in the word DISAPPEAR. (05 marks)
- (b) In a school, there are nine A-level teachers. In the Science department, there is a teacher for each of the following subjects: Mathematics, Physics, Chemistry and Biology. In the Arts department, there is a teacher for each of the following subjects: Economics, Geography, History, Literature and Fine Art. Three teachers are to be sent for a workshop.
- (i) Find the number of all possible combinations of teachers that may be sent for the workshop. (02 marks)
 - (ii) What is the probability that at least two teachers from the Science department are sent for the workshop? (06 marks)
 - (iii) If a Mathematics teacher must attend the workshop, determine the number of possible combinations of teachers to be sent. (02 marks)

12. (a) Given that $M = \begin{pmatrix} 4x & 6 \\ -5 & -2x \end{pmatrix}$, $N = \begin{pmatrix} -1 & -2 \\ 3 & 3y \end{pmatrix}$, $K = \begin{pmatrix} y & 4 \\ -2 & 12 \end{pmatrix}$ and $K = M + N$, find the values of x and y . (07 marks)

- (b) In a football tournament, three teams Arsenal, Chelsea and Liverpool had the following results:

- Arsenal won two matches, drew once and lost one match.
- Chelsea won two matches and lost two matches.
- Liverpool won 1 match, drew twice and lost one match.

The teams are awarded 3 points for a win, 1 point for a draw and no point for a loss.

- (i) Write a 3×3 matrix for the results and a column matrix for the points. (04 marks)
- (ii) By matrix multiplication, determine the winner of the tournament. (04 marks)

13. A discrete random variable W has a probability distribution shown below.

w	-3	-2	-1	0	1
$P(W=w)$	0.1	0.25	0.3	0.15	d

Find;

- (a) the value of d . (02 marks)
- (b) $P(-3 \leq W \leq -1)$. (03 marks)
- (c) $P(W > -1)$. (02 marks)
- (d) (i) the mode, (01 mark)
- (ii) the mean, (02 marks)
- (iii) the variance of the distribution. (05 marks)

14. A mass of 6 kg is lying on a smooth horizontal table. The mass is connected by two light inextensible strings passing over smooth pulleys at the edges of the table, to two masses of 5 kg and 9 kg on opposite sides of the table. With the strings taut and the masses hanging vertically, the system is released from rest.

Calculate the;

- (a) acceleration of the masses. (10 marks)
- (b) tensions in the strings. (08 marks)