S475/ 1
Subsidiary
Mathematics
Paper 1
2 1/5 hours

## Uganda Advanced Certificate of Education <br> SUBSIDIARY MATHEMATICS <br> Paper 1 <br> TIME: 2 HOURS 40 MINUTES

## Instructions:

- Attempt all questions in section $A$ and any four from section $B$.
- All working must be shown clearly.
- No papers should be given for rough work.
- Squared papers and Mathematical tables are provided.
- Silent, non-programmable scientific calculators may be used.
- Where necessary, use $g=9.8 \mathrm{~ms}^{-2}$.

SECTION A (40 MARKS)

1. Show that $\left(\frac{15^{n}-7.3^{n}}{5^{2 n}-7.5^{n}}\right)=\left(\frac{3}{5}\right)^{n}$

Hence or otherwise calculate the value of $\sqrt[n]{\frac{15^{n}-7.3^{n}}{5^{2 n}-7.5^{n}}}$
2. Find a vector which has a magnitude of $4 \sqrt{5}$ and is parallel to $4 i-$ $2 j$ (5 marks)
3. Mrs. X goes to a shop with a 50,000 shilling note and buys 3 kg of beans at shs 2000 per kg, 5 kg of posho at shs 1500 per kg and 2 kg of sugar at shs 3500 per kg.
a) Write the;
i) Quantities bought as a row matrix.
ii) Prices as a column matrix.
b) Use the matrices in (a) above to find the balance Mrs. X received from the shop keeper.
4. Solve the equation $3 \cot ^{2} \theta-2 \cot \theta \operatorname{Cosec} \theta=0$ for $0^{0}<\theta<180^{0}$.
(5 marks)
5. Two events A and B are independent such that $P(A \cap B)=\frac{1}{4}$ and
$P(A \cup B)=\frac{3}{4}$. Find; $P(A)$ and $P(B)$
(5 marks)
6. The table below shows the monthly expenditure in ugs " 000 " of a middle class family.

| Commodity | Food | Rent | Water | Fuel | Medical | Transport |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| Cost | 180 | 150 | 90 | 120 | 132 | 144 |

Using fuel as the base, determine the cost of living and comment on your results.
7. An Examination paper of 14 numbers is divided into sections, A and B containing 8 and 6 questions respectively. If 27300 candidates sat for the paper, determine the number that attempted all questions in section A and any 4 in section B.
8. The diagram shows a smooth pulley fixed on the top of a ceiling.


The system is moving freely with strings tant and vertical. If the acceleration of the system is $4.2 \mathrm{~ms}^{-2}$, find the;
a) Value of $m$
b) Tension in the string

## SECTION B

9. a) A differential equation of a certain curve is given by $\frac{d y}{d x}=5 y$ Given that the curve passes through a point $P(1,1)$, show that $y=e^{5(x-1)}$
b) The cost of manufacturing a radio is a function of $x$ given by shs $\left(\frac{3}{4} x^{2}-20 x-50\right)$. A radio is sold at $\operatorname{shs}\left(400-\frac{1}{2} x\right)$. If $x$ radios are sold, determine the;
i) The value of $x$ for which the profit is maximum
ii) Maximum profit (8 marks)
10. a) Given that one root of the equation $a x^{2}-9 x+9=0$ is twice the other, find the value of $a$.
(5 marks)
b) If $a+b=6$ and $a^{2}+b^{2}=28$, find the;
i) The value of $a b$
ii) Equation in terms of $x$ whose roots are $a$ and $b$
(5 marks)
c) Solve the equation in $b$ (ii) above. (Leave your answer in surd form).
(5 marks)
11. A certain Junior School admitted 160 children in a particular year. The ages of the children are given in the table below;

| Age in <br> years | $4.25-$ | $4.50-$ | $4.75-$ | $5.00-$ | $5.25-$ | $5.50-$ | $5.75-$ | $6.00-$ | $6.25-$ |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| No. of <br> children | 0 | 20 | 70 | 36 | 14 | 6 | 10 | 4 | 0 |

a) Calculate the;
i) Mean age
ii) Quartile range
iii) Probability that a child selected from the school is above 5 years.
b) Draw a histogram and use it to find the model age.
12. 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 1 st Term of 2016.
13. The following table shows the marks obtained in economics and sub-maths by 8 students in the end of Term Two Examinations.

| Sub Maths $(x)$ | 14 | 18 | 29 | 32 | 55 | 61 | 74 | 79 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| Economics (y) | 96 | 93 | 81 | 74 | 57 | 50 | 38 | 35 |

a) Draw a scatter diagram for the data and comment on your results.
b) Calculate $\bar{x}$ and $\bar{y}$ hence draw a line of best fit and use it to find:
i) $x$ when $y=30$
ii) $y$ when $x=70$
c) Calculate a rank correlation coefficient of the performance of the students in the two subjects and comment on your results. (5 marks)
14. a) A force of F Newton's is used to drag a body of mass 2 kg up a rough plane of inclination $30^{\circ}$ to the horizontal whose coefficient of friction is 0.25 at a steady speed. If the force drags the body through a distance of 5 m , calculate the amount of work done by the force.
(8 marks)
b) A lorry of mass 2000kg travels against a constant friction resistance of 2600 N . The lorry is traveling along level road at a constant speed of $45 / \mathrm{kmh}^{-1}$. Find the power at which the engine is working.
(7 marks)

