

UNEB U.C.E MATHEMATICS (PAPER 2) 2004

SECTION A

- Express 784 as a product of prime factors. Hence find the square root of 784.
- If the exchange rate of a Kenya shilling to Uganda shilling is 1 K.shs=24 Ushs. And an American dollar to Uganda shilling is \$1=ush1, 950 how many American dollars would one get in exchange for Ksh9, 750?
- In the diagram below, \overline{BC} is a tangent to the circle with centre **O** and angle $\mathbf{BAO} = 30$.

CIRCLE

Find the size of the angles **x** and **y**.

- Given that the representative fraction of a map is $\frac{1}{250,000}$, find the length of a horizontal road on the map whose length on the ground is 66.25 km long.

- The transformation described by the matrix $\begin{bmatrix} 2 & b \\ c & 3 \end{bmatrix}$ maps the point **P** (-1, 3) onto its image **P'** (10, 8). Find the values of **b** and **c**.

- In the figure below, $\overline{DE} = 8.0\text{cm}$, $\overline{BC} = 12.0\text{cm}$ and $\overline{BD} = 5.0\text{cm}$.

TRIANGLE

Given that \overline{DE} is parallel to \overline{BC} , find length \overline{AD} .

- Solve the equation $3x^2 + 10x = 8$
- Given that $133_n = 43_{ten}$, find the value of **n**.
- A fair die with faces marked 1, 2, 3, ..., 6 and a fair coin with one side showing a court of arms (c) and the other side a fish (F) are tossed together once.
 - Construct a possibility space showing all the possible outcomes.
 - Find the probability that a six and a fish will show up.
- The angle of depression of the sun's rays to a man's head is 14° . If the man, whose height is 1.7 m, is standing upright on horizontal ground, find the length of his shadow, correct to 2 significant figures.

SECTION B

- At the beginning of the year 2000, a customer deposited shs1, 900,000 in a bank which offers a compound interest rate of 2.75% per four months. Find how much interest he earned at the end of the year.
 - a cooking oil factory offers a trade discount of 2% to its customer. It also offers a 1% cash discount to any customer who pays cash for the oil bough. If the factory price for a 20-litre jerrican of cooking oil is shs30, 000. Find the amount of money a customer saves by paying cash for 100 jerricans of the oil.
- The coordinates of the vertices of a triangle **OAB** are **O** (0, 0), **A** (1, 0) and **B** (1, 1).
 - find the coordinates of the image formed when

(i) Triangle **OAB** undergoes a translation of $\begin{bmatrix} 3 \\ 2 \end{bmatrix}$ to form **O'A'B'**.

(ii) O'A'B' is transformed by the matrix $\begin{bmatrix} -2 & 0 \\ 0 & -3 \end{bmatrix}$ to form **O''A''B''**.

b) (i) plot triangle **OAB** and its images on the same graph.

(ii) use your graph to find the area of triangle **O''A''B''**.

13. Two cyclists **C₁** and **C₂** start at the same time from trading centre **P** travelling to trading centre **Q** which is 24 km apart. Cyclist **C₁** starts at a steady speed of 10kmh^{-1} greater than that of cyclist **C₂** who also travels at a steady speed. When **C₁** has covered half the distance, he delays for three quarters of an hour, after which he travels at a speed 25% less his original speed and arrives in trading centre **Q** fifteen minutes earlier than cyclist **C₂**.

a) determine the speeds of cyclists **C₁** and **C₂**

b) If cyclist **C₂** started from trading centre **Q** at the same time as cyclist **C₁** started from trading centre **P**, both of them travelling non stop on the way, find how far from **Q** the two cyclists would meet. After how long would they meet?

14. a) Plot the graph $y = 3x^2 + 2x - 16$ of for values of $x: -3 \leq x \leq 3$

b) Use your graph to solve the equation $3x^2 + 2x - 8 = 0$.

15. The bearing of tower **A** from point **O** is 060° and that of tower **B** from **O**, 200° . $\overline{OA} = 24\text{km}$ and $\overline{OB} = 33\text{km}$. Tower **C** is exactly halfway between towers **A** and **B**.

a) Using a scale of 1 cm to represent 5km, draw an accurate diagram showing the positions of the towers.

b) use your diagram to find

(i) distances \overline{AB} and \overline{OC} .

(ii) the bearing of tower **B** from tower **A**,

(iii) the bearing of tower **C** from **O**.

c) Find (i) the average speed of a cyclist who takes $2\frac{1}{4}$ hours to travel directly from **A** to **B**

(ii) How long it takes another cyclist to travel from **A** to **B** via **O** at a steady speed of 4.5kmh^{-1} faster than that of the cyclist in (c)(i) above.

16. The diagram below shows a quadrilateral **OSRQ**. $\overline{OS} = \mathbf{q}$, $\overline{OP} = \mathbf{p}$ and $\overline{SX} = \mathbf{k}$ (**SP**)

QUADRILATERAL

(i) Express vectors **SP** and **OX** in terms of **p**, **q** and **k**.

(ii) If $\overline{OQ} = 3\mathbf{p}$ and $\overline{QR} = 2\mathbf{OS}$, and $\overline{OX} = l\mathbf{OR}$, find the values of **k** and **l**. hence find the ratio **SX: XP**.

17. In the diagram below **VABCD** is a rectangular base **ABCD** and **V**, the vertex. **O** is the centre of

the base **ABCD**. $\overline{AB} = 8\text{m}$. $\overline{BC} = 6\text{m}$. $\overline{VC} = \overline{VB} = \overline{VA} = \overline{VD} = 13\text{m}$. **M** is a point on **VO** such

that $3\overline{MV} = \overline{OV}$. **M** is also the centre of base **EFGH** of a small pyramid **VEFGH** similar to **VABCD** which is to be cut off from the original pyramid **VABCD**.

PYRAMID

Find the:

(i) Dimensions of the base **EFGH**.

(ii) Height of pyramid **VABCD**.

(iii) Volume of the remaining part of pyramid **VABCD** when **VEFGH** is cut off.

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