

UNEB U.C.E MATHEMATICS (PAPER 1) 2004

SECTION A

1. Simplify
$$\frac{3^3 \times 9^2 \times 125^{1/3}}{9^3}$$

2. If
$$\frac{\sqrt{2}}{\sqrt{3} + \sqrt{2}} = a + \sqrt{b}$$
, find the values of **a** and **b**.

3. **ABCD** is a quadrilateral in which angles **ABC** and **CDA** are 90° each. If $\overline{AB} = 6\text{cm}$, $\overline{AC} = 10\text{cm}$ and $\overline{CD} = 5\text{cm}$, find

a) length \overline{BC}

b) Angle **ACD**.

4. Factorize $x^3 - 9xy^2$ completely.

5. Given that $\mathbf{A} = \begin{bmatrix} 2 & 2 \\ 1 & 3 \end{bmatrix}$ and $\mathbf{B} = \begin{bmatrix} 1 & 1 \\ 1 & 2 \end{bmatrix}$, find

a) the matrix **P** such that $\mathbf{AB} = \mathbf{P}$,

b) \mathbf{P}^{-1}

6. Use the fact that $\log_{10} 2 = 0.301$ and $x = 4$, to find the value of $\log_{10} x^2$.

7. Given that $f(x) = \frac{x^2}{3} + 5$, find the value of **x** for which $f(x) = 17$.

8. find the equation of the line passing through the points $(-1, 3)$ and $(4, 2)$

9. A food store has enough food to feed 200 students for 15 days. For how long will the food last if 50 more students join the group

10. The pie chart below represents the number of students who attend various courses in a commercial college.

CIRCLE

If the number of students studying accountancy is 120,

a) Determine the student population of the college.

b) Find the number of students who study marketing.

SECTION B

11. a) The diagram below shows a rectangle **ABCD** of length 44 cm and width 15cm.

RECTANGLE

If it was curved in such a way the **AD** and **BC** come together to hollow cylindrical figure, find the volume of the cylindrical figure formed.

b) A rectangular piece of cardboard measuring 27 cm long and 15 cm wide rests against a vertical wall as shown in the diagram below.

RECTANGLE

If angle DAY = 25° , find the height of **C** above the ground.

12. Using a pair of compasses and ruler only,

a) construct triangle **ABC** such that $\overline{BC} = 10.6$ cm and angles **ACB** = 75° and **ABC** = 60° ,

b) construct a circumcircle of triangle **ABC** with **O** as its centre,

c) Measure lengths \overline{AB} and \overline{AC} the radius of the circle.

13. Three secondary schools football teams **X**, **Y** and **Z** qualified for a football tournament, which was played on two rounds with other teams. In the first round:

Team **X** won one game, drew one and lost three games.

Team **Y** won three and lost two games.

Team **Z** won two drew two and lost one game.

In the second round:

Team **X** won two drew two and lost one game.

Team **Y** won four and drew one game while team **Z** won three games, drew one and lost one.

a) write down

(i) A 3x3 matrix to show the performance of the three teams in each of the two rounds.

(ii) A matrix which shows the overall performance of the teams in the two rounds.

b) If three points are awarded for a win, two points for a draw and no point for a loss, use matrix multiplication to determine the winner of the tournament.

c) Given that shs1, 475,000 is to be shared by the three teams according to the ratio of the points scored in the tournament, find how much money each team will get.

14. The distance from town **A** to town **B** is 360 km. An express bus leaves town **A** at 6.30 a.m. And travels at a steady speed of 80kmh^{-1} towards town **B**. at the same time, a taxi omnibus leaves town **B** travelling non-stop towards town **A**, at a steady speed of 100km^{-1} . On the same axes draw a distance time graph for the journey of two vehicles. Use a scale of 2cm to represent 1 hour and 2 cm to represent 50kmh^{-1} . From the graph

a) Find the difference in the time of arrival of the bus and the taxi.

b) Determine when, and at what distance from town **A** the two vehicles will meet.

15. A packet has 60 different vitamin tablets. Each tablet contains at least one of the vitamins **A**, **B** and **C**. twelve of the tablets contain only vitamin **A** seven contain vitamin **B** only and eleven contain only vitamin **C**; six contain all the three vitamins.

Given that $n(A \# B \# C) = n(B \# A \# C) = n(C \# A \# B)$, find the

a) number of tablets that contain vitamins **A**,

b) probability that a tablet picked at random from the packet contains vitamins **C**,

c) Probability both vitamins **A** and **B**.

16. The table below shows the weight (in kg) of 40 students of a class and their corresponding cumulative frequencies.

Weight (kg) cumulative frequency

30 - 34 2

35 - 39 7

40 - 44 12

45 - 49 21

50 - 54 28

55 - 59 34

60 - 64 38

65 - 69 40

a) Draw a cumulative frequency curve. Use your graph to estimate the

(i) median weight of the students,

(ii) 25th and 75th percentile weights.

b) Calculate the mean weight of the students.

17. A private car park is designed in such a way that it can accommodate x pickups and y mini-buses at any given time. Each pick up is allowed 15m^2 of space and each mini-bus 25m^2 of space. There is only 400m^2 of space available for parking. Not more than 35 vehicles are allowed in the park at a time. Both types of vehicles are allowed in the park, but at most 10 mini-buses are allowed at a time.

a) (i) Write down all the inequalities to represent the above information.

(ii) On the same axes plot graphs to represent the inequalities in (i) above. Shading out the unwanted regions.

b) If the parking charges for a pick up is shs500 and that for a minibus is shs800 per day, find how many vehicles of each type should be parked in order to obtain maximum income. Hence find the maximum parking income per day.