

NAME \_\_\_\_\_ CLASS \_\_\_\_\_ ADMNO \_\_\_\_\_

**ALLIANCE HIGH SCHOOL**  
**FORM 3 END OF YEAR EXAMINATION 2HRS 30MINS**

**P 2**

**SECTION A ANSWER ALL THE QUESTIONS IN THIS SECTION**

1. Without using mathematical tables or a calculator, evaluate.

(2 marks)

$$2 \log_3 9 - \frac{1}{2} \log_3 144 + \log_3 972$$

2. Give that  $A = 2i + j - 2k$ ,  $B = -3i + 4j - k$  and  $C = -5i + 3j + 2k$  and that  $P = 3A - B + 2C$ , Find the magnitude of the vector P to three significant figures.

(3 marks)

3 A(-6, -2) and B(2, -4) are the end points of a diameter of a circle.

a) Find the co-ordinates of the centre of the circle.

(1 mark)

b) Find the equation of the circle expressing it in the form  $x^2 + y^2 + ax + by + c = 0$ , where a, b and c are integers.

(2 marks)

4 Tap P can fill a tank in 2 hours and tap Q can fill the same tank in 4 hours. Tap R can empty the tank in 3 hours.  
a) If tap R is closed, how long would it take taps P and Q to fill the tank? (2mks)

b) Calculate how long it would take to fill the tank when the three taps P, Q and R are left running. (2mks)

5. Onchwati deposited Ksh.50,000 in a financial institution in which interest is compounded Quarterly. If at the end of the second year he received a total of Ksh.79,692.40. Calculate the rate of interest per annum. (3mks)

6 Town A is 240km from town B. A car travels at a speed of 60km/h from town A starting at 1000hrs. A cyclist leaves town B at 0900hrs and travels at a steady speed to town A. If they pass each other at 1300hrs, calculate the speed of the cyclist. (3mks)

- 7 From the roof of a house, a boy can see an avocado tree which is 20m away from the house. He measures the angle of elevation of the top of the tree as  $21^\circ$  and the angle of depression of the bottom of tree as  $31^\circ$ . Find the height of the avocado tree. (3 marks)

- 8 Calculate the value of  $x$  in the equation given below.  
 $3^{2x} - 10(3^x) + 9 = 0$

(4mks)

- 9 Form the quadratic equation whose roots are  $x = -\frac{5}{3}$  and  $x = 1$ .

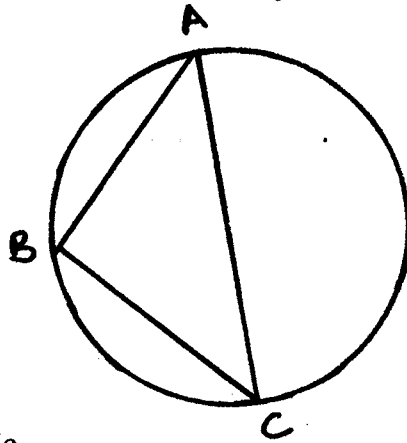
(2 mks)

- 10 Solve for  $x$  in the equation  
 $\sin(4x - 10)^\circ - \cos(x + 60)^\circ = 0$

(3 marks)

- 11 A radio cassette is offered for sale at a deposit of shs. 1,000 and 15 monthly repayments of shs 840 each. Find the rate of interest compounded monthly that is being charged under hire purchase terms. (4 marks)
12. Determine the term independent of  $x$  in the expansion of (3mks)
- $$\left(3x + \frac{1}{8x}\right)^4$$
13. There are two grades of tea, grade A and grade B. Grade A costs sh.80 per kg. While Grade B costs Sh.60 per kg. In what ratio must the two be mixed in order to produce a blend costing Ksh.75 per Kg (3mks)
- 14 Ann, Betty and Caro agreed to share some amount of money in the ratio 3:4:2. If Betty got twice as much as Caro and Ann got Sh 6000 more than Caro, then how much money was being shared? (3marks)

15. The figure below (not drawn to scale) shows a triangle ABC inscribed in a circle.  $AB=6\text{cm}$ ,  $BC=9\text{cm}$  and  $AC=10\text{cm}$



Calculate;

- (a) The radius of the circle

(4mks)

- 16 State all the intergral values of  $x$  that satisfy the following inequality.  
 $2x-3 \leq 3x+5 \leq 7x+6$

(3mks)

**SECTION 11 ANSWER FIVE QUESTIONS ONLY (50 MARKS)**

17. a) Three boys and three girls sit in a row of six seats. Find the probability that:

i) the 3 girls sit together. (2mks)

ii) the girls and the boys sit in alternate seats. (2mks)

b) In an examination, one hundred candidates took papers in physics and chemistry. Twenty five candidates failed in physics, twenty candidates failed in Chemistry and Fifteen candidates failed in both physics and chemistry. A candidate is selected at random, find the probability that,

i) he failed in Chemistry if it is known that he failed in Physics. (2mks)

ii) he failed in physics if it is known that he failed in chemistry. (2mks)

iii) he failed either in Physics or in Chemistry but not in both. (2mks)

3. Three quantities R, S, T are such that R varies directly as S and inversely as the square of T.  
(a) Given that  $R = 480$  when  $S = 150$  and  $T = 5$ , write an equation connecting R, S and T

(4mks)

(b)(i) Find the value of R when  $S = 360$  and  $T = 1.5$

(2mks)

(ii) Find the percentage change in R if S increases by 5% and T decreases by 20%

(4mks)

9. (a) The first term of a G.P is 4. If the common ratio is 2, find the greatest number of terms that will give a sum less than 40

(4mks)

(b) The 2<sup>nd</sup>, 4<sup>th</sup> and 7<sup>th</sup> terms of a A.P are the first 3 consecutive terms of a G.P. Find

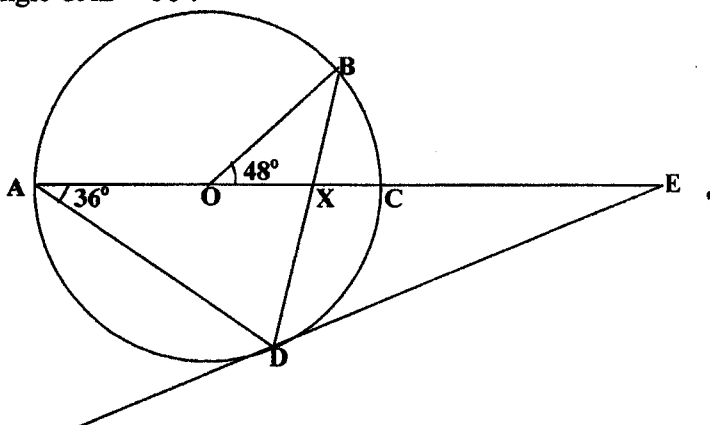
(i) The common ratio

(3mks)

(ii) The sum of the first eight terms of the G.P if the common difference of AP is 2

(3mks)

20. In the figure below, O is the centre of the circle. A, B, C and D are points on the circumference of the circle. A, O, X and C are points on a straight line. DE is a tangent to the circle at D. Angle BOC =  $48^\circ$  and angle CAD =  $36^\circ$ .



(a) Giving reasons, find the value of the following angles:-

(i) Angle CBA

(1 mk)

(ii) Angle BDE

(2 mks)

(iii) Angle CED

(3 mks)



(b) It is also given that  $AX = 12$  cm,  $XC = 4$  cm,  $DB = 14$  cm and  $DE = 15$  cm.

Calculate:

(i)  $DX$  (2 mks)

(ii)  $AE$  (2 mks)

21 The table below shows income tax rates for a certain year.

| Monthly income in Kenya Shillings (Kshs.) | Tax rate in each shilling |
|---|---------------------------|
| 0-10164                                   | 10%                       |
| 10165-19740                               | 15%                       |
| 19741-29316                               | 20%                       |
| 29317-38892                               | 25%                       |
| Over 38892                                | 30%                       |

A tax relief of Kshs. 1162 per month was allowed. In a certain month of the year, an employee's taxable income in the fifth band was Kshs. 2108.

a) Calculate:

i) Employees total taxable income in that month (2mks)

ii) The tax payable by the employee in that month (5mks)

(b) The employees income includes a house allowance of Kshs. 15,000 per month. The employees contributed 5% basic salary to a cooperative society. Calculate the employees net pay for that month. (3mks)

22 (a) PQRS is a quadrilateral with vertices  $P(1, 4)$ ,  $Q(2, 1)$ ,  $R(2, 3)$  and  $S(6, 4)$ . On the grid provided plot the quadrilateral

(1 mk)

b) Draw  $P^1Q^1R^1S^1$  the image of PQRS under a positive quarter turn about the origin and write down its co-ordinates.

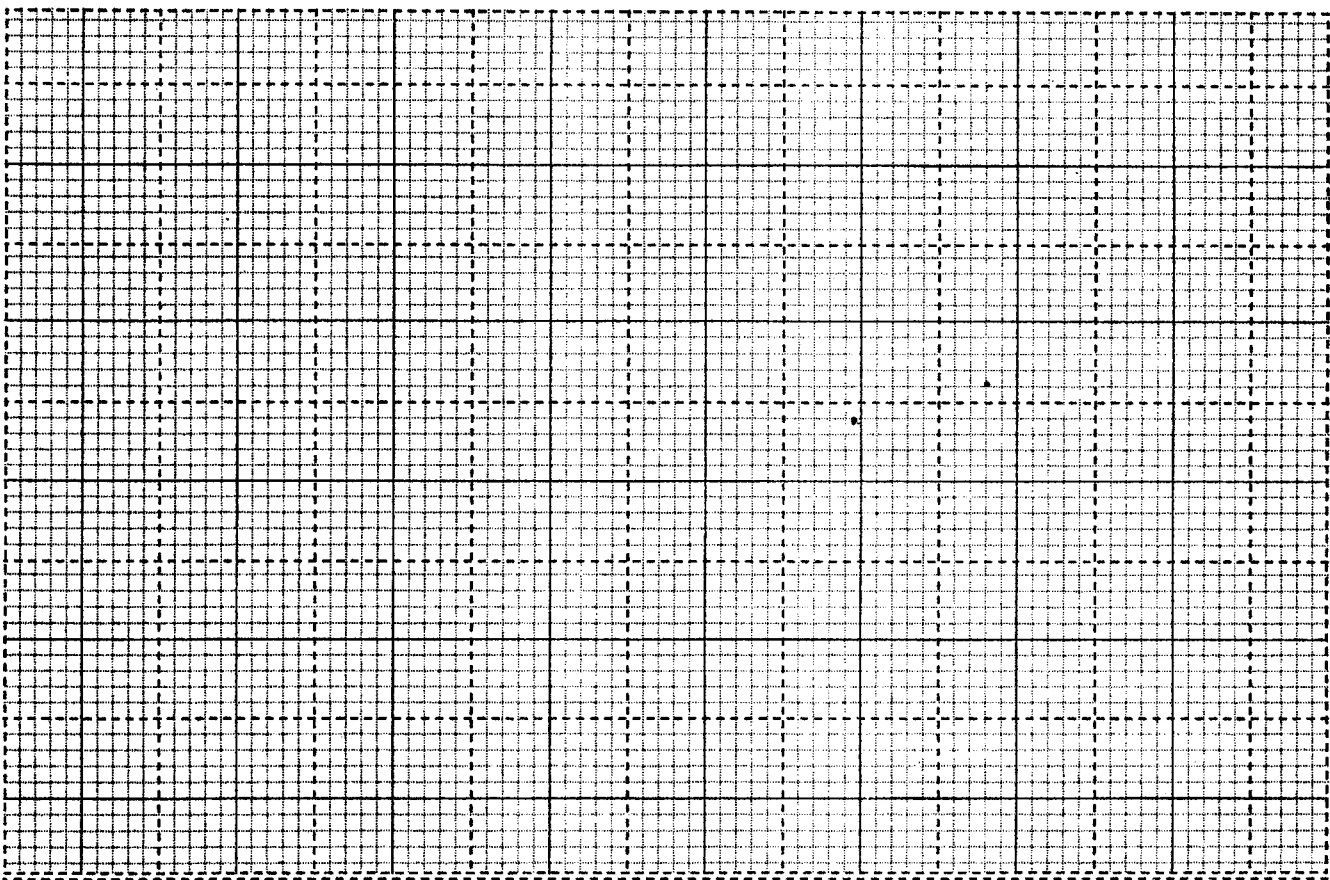
(3 mks)

c) Draw  $P^{11}Q^{11}R^{11}S^{11}$  the image of  $P^1Q^1R^1S^1$  under the transformation whose matrix is  $\begin{pmatrix} 1 & 0 \\ -2 & 1 \end{pmatrix}$  and write down its co-ordinates.

(3 mks)

d) Determine the matrix T of a single transformation that maps PQRS onto  $P^{11}Q^{11}R^{11}S^{11}$

(3 mks)



A trader bought 8 cows and 12 goats for a total of Ksh.294,000. If he had bought 1 more cow and 3 more goats he would have spend Ksh.337,500.

(a) Form two equations to represent the above information.

(2 marks)

(b) Use matrix method to determine the cost of a cow and that of a goat.

(4 marks)

(c) The trader sold the animals he had bought making a profit of 40% per cow and 45% per goat.

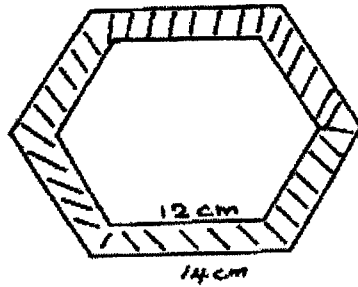
(i) Calculate the total amount of money he received.

(2 marks)

(ii) Determine his profit in Kenya shillings.

(2 marks)

24. The diagram below (not drawn to scale) shows the cross-section of a regular hexagonal solid metal prism length 20cm.



Calculate:

- (a) the area of the shaded region.

(5 marks)

- (b) the volume of the material used to make the metal in  $\text{cm}^3$ .

(2 marks)

- (c) If the density of the metal prism is  $3.5\text{g/cm}^3$ . Find its mass in kg.

(3 marks)