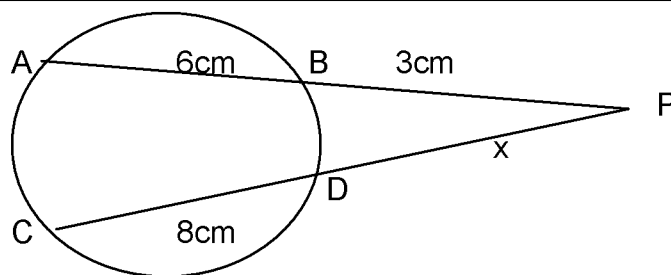


NANDI NORTH AND NANDI CENTRAL JOINT EXAMINATIONS 2016**121/2****MATHEMATICS ALT. A****PAPER 2****JULY / AUGUST 2016****TIME: 2½ HOURS****SECTION 1: (50 MARKS)****Answer ALL Questions in this section**

1. Given that $2 \leq A \leq 4$ and $0.1 \leq B \leq 0.2$. Find the minimum value of $\frac{AB}{A-B}$ (3mks)
2. Calculate the shortest distance between X ($40^\circ N, 80^\circ W$) and Y ($40^\circ N, 100^\circ E$) in kilometers taking $\pi = \frac{22}{7}$ and radius = 6370km. (Give your answer to the nearest whole number. (3mks)
3. Evaluate the following leaving your answer in surd form. (3mks)
- $$\frac{11}{\sqrt{7}-\sqrt{3}} - \frac{5}{\sqrt{7}+\sqrt{3}}$$
4. Given the arithmetic sequence 4, 11, 18, Find:
- (a) The common difference. (1mk)
- (b) The sum of the first eight terms. (2mks)
5. (a) Find the expansion in ascending powers of x of $\left(1 - \frac{x}{3}\right)^7$ up to the term in x^2 . (2mks)
- (b) Hence evaluate $(0.99)^7$ to four significant figures. (2mks)
6. The cost of maize flour and millet flour is Ksh. 40 and Ksh. 52 respectively. Calculate the ratio in which they were mixed if a profit of 15% was made by selling the mixture at ksh. 52.90 per kilogram. (3mks)
7. The matrix $\begin{pmatrix} x & -3 \\ 0 & x-1 \end{pmatrix}$ is a singular matrix. Find the values of x. (3mks)
8. Every week the number of absentees in a school was recorded. This was done for 39 weeks. These observations were tabulated as shown below:-
- | | | | | | | |
|---------------------|-----|-----|------|-------|-------|-------|
| Number of absentees | 0-3 | 4-7 | 8-11 | 12-15 | 16-19 | 20-23 |
| (Number of weeks) | 6 | 9 | 8 | 11 | 3 | 2 |
- Estimate the median absentee rate per week in the school. (3mks)
9. Alicent Jepkoech bought a machine at sh. 110,000. If depreciation is 15%p.a, calculate the number of years it will take for the value to depreciate to sh. 60,000. (4mks)
10. Find the value of x without using mathematical tables in the following:- (3mks)
- $$\log_8(x+5) - \log_8(x-3) = \frac{2}{3}$$
11. Use table of logarithms to evaluate: (4mks)
- $$\left(\frac{6.79 \times 0.391}{\log 5} \right)^{\frac{3}{4}}$$
12. What must be added to $x^2 + 10x$ to make it a perfect square? (2mks)
13. A boy at the top of a cliff 30m high observes two boats P and Q at the sea. The boats and the foot of the cliff are in the same straight line. The angle of depression from the boy to P and Q are 42° and 27° respectively. Calculate the distance between the two boats. (3mks)
14. A body is moving in a straight line such that its velocity Vm/s after t seconds is given by $v = 5t^2 - \frac{1}{2}t + 3$. Find the distance traveled during the third second. (4mks)
15. Find the length of DP in the figure below. (3mks)

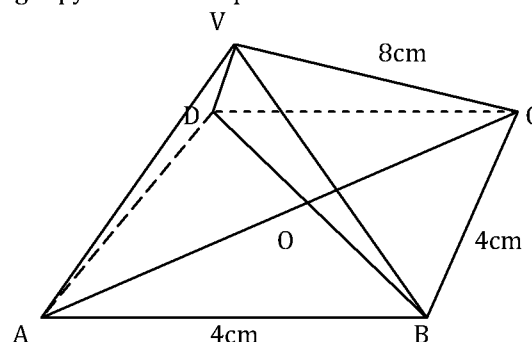


16. If θ is an obtuse angle, solve the equation:
 $\sin \theta = \log(\tan 75^\circ)$

(2mks)

SECTION II (50 MARKS)**Answer any five questions in this section**

17. The figure below shows a right pyramid on a square base ABCD of sides 4cm.
 $VA=VB=VC=VD=8\text{cm}$.



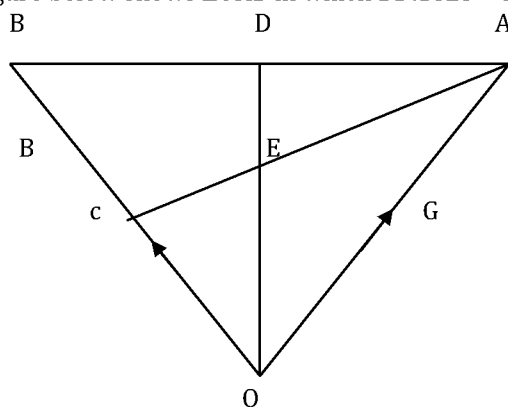
- (a) Find the height VO of the pyramid.
 (b) The angle between slant edge and the base ABCD.
 (c) The angle between the planes VCB and ABCD.
 (d) Find the volume of the pyramid in litres.
18. The figure below shows $\triangle OAB$ in which $BD:DAA = 1:2$, $OE:ED = 3:2$ and c is the midpoint of OB.

(3mks)

(3mks)

(2mks)

(2mks)



- (a) Given that $OA = a$ and $OB = b$ express the following vectors in terms of:
 (i) AB
 (ii) OD
 (iii) AE
- (b) Show that points A, E and C lie on a straight line. Hence, determine the ratio of CE:EA.
19. Two quantities P and n, are connected by the equation $P = AK^n$, where A and K are constants. The table below shows some corresponding values of n and P.

n	2	4	6	8	10
P	9.8	19.4	37.4	74.0	144.0

- (a) State the linear equation connecting P and n.
 (b) On the grid provided, draw a suitable straight line.
 (c) Use your graph to estimate the value of A and k.
20. The points P(2,1), Q(4,1), R(4,3) and S(3,3) are co-ordinates of a quadrilateral.
 (c) On the grid provided and using a scale of 2cm to represent 2 units on both axes and taking $-8 \leq x \leq 8$ and $-5 \leq y \leq 8$, draw and label the quadrilateral PQRS.

(2mks)

(5mks)

(3mks)

(1mk)

- (d) Find the co-ordinates of $P'Q'R'S'$ under the transformation $M = \begin{pmatrix} 1 & 1 \\ 2 & 0 \end{pmatrix}$ of the object. (2mks)
- (e) The image of PQRS under the transformation represented by the matrix, M is $P'Q'R'S'$. Draw and label $P'Q'R'S'$ on the same grid. (1mk)
- (f) The matrix $N = \begin{pmatrix} -2 & 1 \\ 0 & 1 \end{pmatrix}$. The image of quadrilateral $P'Q'R'S'$ under the transformation represented by the matrix N is $P''Q''R''S''$. Draw and label $P''Q''R''S''$ on the same grid. (3mks)
- (g) Determine the matrix that maps PQRS directly onto $P''Q''R''S''$. (3mks)
21. Three athletes Peter, Mark and John have the probability of $\frac{1}{3}$, $\frac{3}{4}$ and $\frac{2}{5}$ respectively to qualify for the finals of the high jump. If their attempts are independent, determine the probabilities that:-
- (a) All will qualify for the final. (2mks)
- (b) At least two of them will qualify. (2mks)
- (c) Neither will qualify. (2mks)
- (d) Only one will qualify. (2mks)
- (e) Only Peter will qualify. (2mks)
22. Two types of bread type x = 200cm², type y = 300cm². The pan is 1.5m by 1.2m and number of type y should be more than twice the number of type x. Profit of type x is sh. 2 and that of type y is sh.1. Form all the inequalities and determine the maximum profit. (10mks)
23. The table below shows monthly income tax rates.

Monthly taxable pay (in K£)	Rate of tax (Ksh. per £)
1 – 342	2
343 – 684	3
685 – 1026	4
1027 – 1368	5
1369 – 1710	6
1710 and above	7

Sylvia Mukeza who is a civil servant earns a monthly salary of Ksh. 20,000 and is provided with a house at a nominal rent of Ksh. 700 per month.

- (a) Calculate Mukeza's taxable monthly pay in K£. (2mks)
- (b) Calculate the total tax Mukeza pays in K£. (4mks)
- (c) If Mukeza is entitled to a personal tax relief of Ksh. 600 per month, what is the payable tax? (1mk)
- (d) Mukeza has the following deductions made on her pay:
 Loan repayments of Ksh. 2100 per month, NSSF Ksh. 200 per month and WCPS calculated a 2% of the monthly salary.
 Calculate Mukeza's net pay. (2mks)
24. (a) Use the trapezoidal rule to find the area under a curve $y = x^2 + 1$ from $x=1$ to $x=15$ using seven strips. (5mks)
- (b) Using the method of integration, find the actual area under the curve $y=x^2+1$ from $x=1$ to $x=15$. (3mks)
- (c) Find the percentage error involved in using the trapezoidal rule to find the area under the curve to 4d.p. (2mks)