NANDI EAST, NANDI SOUTH & TINDERET SUB-COUNTIES JOINT EVALUATION 2016

121 / 2
MATHEMATICS ALT. A
PAPER 2
JULY / AUGUST 2016
TIME: 2½ HOURS

SECTION I: (50 MARKS)
Answer ALL the Questions in this section in the spaces provided

1. Evaluate using logarithms:

$$\sqrt{\frac{0.03215 \times 1.439}{0.0485}}$$

2. The surface area of a sphere is given as $4\pi r^2$. If there is an error of 0.24% in r and an error of 0.15% in π, calculate the percentage error in its surface area. (3mks)

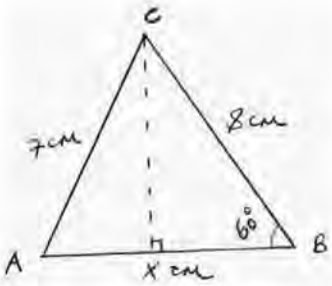
3. Simplify $\frac{3}{\sqrt{7}-2} + \frac{1}{\sqrt{7}}$ leaving your answer in the form $a + b\sqrt{c}$, where a, b and c are rational numbers. (3mks)

4. Make s the subject of the formula:

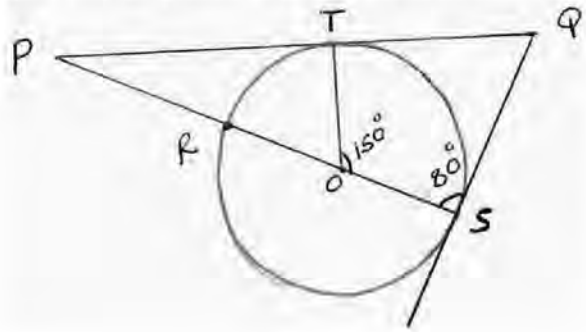
$$\sqrt{p} = r\sqrt{w - as^2}$$

5. Solve the equation $2sin^2 30 = \frac{1}{2}\ for - 90^0 \leq \theta \leq 90^0$ (3mks)

6. The figure below shows triangle ABC where AB = xcm, BC = 8cm, AC = 7cm and $< ABC = 60^0$. Calculate the area of the triangle correct to 2 significant figures. (3mks)



7. In the figure below, PQ is the tangent to the circle centre O and SORP is a straight line. Angle PSQ = 80° and TOS = 150°



(a) Find angle SPQ. (2mks)
(b) Find angle RTO. (1mk)

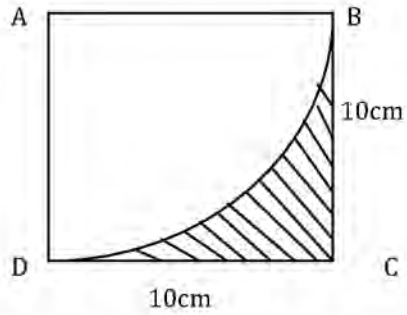
8. Solve for x in; $3 - log_{10}x^2 = \left(\frac{1}{log x^{10}}\right)^2$ (4mks)

9. A hosepipe can fill water butt in 5 minutes; the outlet tap can empty it in 6 minutes. The hosepipe is started with the tank empty and the tap opened, but this is noticed after three minutes and the tap is closed. How much longer does the butt take to fill? (3mks)

10. P, Q and R are three quantities such that P varies directly as a square of Q and inversely as a square root of R. If Q increases by 10% and R decreases by 25%, find the percentage increase in P. (3mks)
11. Calculate the standard deviation for the following set of data: (3mks)
    34, 61, 49, 57, 53, 37, 59
12. Expand and simplify the expression: (3mks)

$$\left(x+\frac{1}{x}\right)^2-\left(x-\frac{1}{x}\right)^4$$

13. Find the equation of the normal curve $y=(x-1)(x+3)$ at point where the curve cuts the y-axis. (3mks)
14. Calculate the area of the shaded region in the square below, given that BD is an arc of a circle whose center is at A. (3mks)



15. Three grades of tea: A, B and C costing shs. 280, shs. 190 and shs. 170 per kg respectively are mixed in the ratio 3:4:k. Find the value of k for which when the mixture is sodl at shs. 250per kg, 25% profit is realized. (3mks)
16. The points A(-6,-2) and B(2,-4) are ends of a diameter of a circle. Find:-
    (a) Find the co-ordinates of the centre. (1mk)
    (b) The equation of the circle in the form $x^2+y^2+ax+by+c=0$ where a, b and c are constants. (2mks)

SECTION II (50 MARKS)

Answer any five questions in this section

17. The table below shows the tax rates for the year 2015.

TAXABLE MONTHLY INCOME IN (KSHS)	TAX PAYABLE RATES (%)
1 – 9860	10
9,861 – 18,800	15
18,801 – 27,920	20
27,921 – 37,040	25
37,041 – And above	30

Tonny's monthly earnings in 2014 were as follows:-

Basic salary	Kshs. 35,000
House allowance	Kshs. 12,000
Medical allowance	Kshs. 2,800
Commuter allowance	Kshs. 5,000

If Tonny is entitled a tax relief of kshs. 1162, calculate:-

(a) His monthly taxable income (2mks)
(b) Tax he paid. (6mks)
(c) Tonny joins an insurance cover and he is further given 8% tax relief. Calculate his net pay. (2mks)

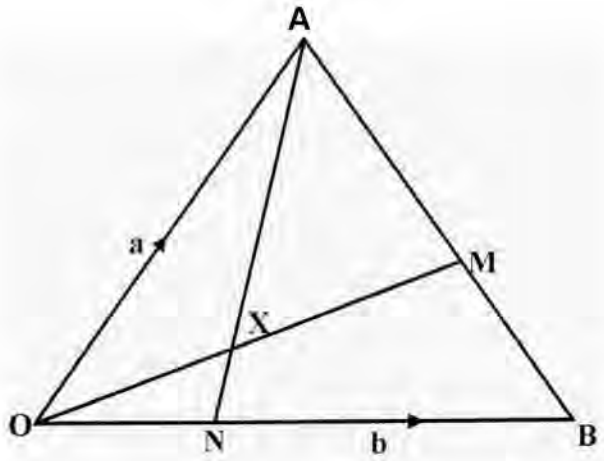
18. The first term of an arithmetic sequences is (2x + 1) and the common difference is (x+1). The product of the first and second term is zero.
(a) Find the value of x. (2mks)
(b) Find the three terms of the two possible sequences. (4mks)
(c) The first 3 terms of a geometric progression are the first, fourth and tenth terms of an arithmetic sequence. Given that, the first term of a geometric progression is 6, find the common difference (d) of the arithmetic progression. (4mks)

19. An aeroplane left town $P(65^0N, 15^0E)$ to another town $Q(65^0N, 165^0W)$ at a speed of 200 knots using the shortest route.
(a) (i) Find the distance travelled in nautical miles. (2mks)
    (ii) The time taken to travel from P to Q in hours. (2mks)
(b) Another aeroplane left P at 1:30p.m. local time and travelled to $T(65^0N, 60^0E)$ along the parallel of latitude. Find:-

(i) The distance between towns P and T to the nearest km. $\left(Take\ \pi = \frac{22}{7}\ and\ R = 6370km\right)$ (3mks)

(ii) The local time of arrival at town T; if the plane flew at a speed of 470km/hr. (3mks)

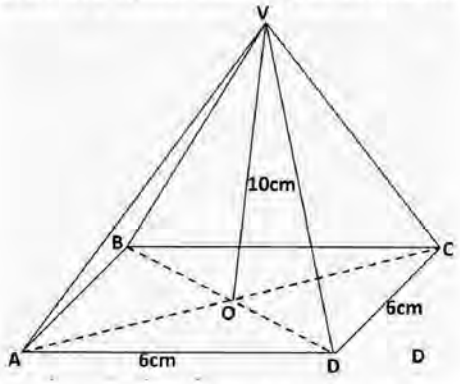
20. In the figure below OAB is a triangle, OA =a, OB = b. point M lies on AB such that AM:MB=1:3 and N lies on OB such that OB:BN = 7:-5. Line OM and AN intersect at X.



(a) Express in terms of a and b;
(i) OM (2mks)
(ii) AN (1mk)

(b) Given that OX = kOM and AX = hAN where k and h are scalars.
(i) Write down two expressions for OX in terms of a, b, h and k. (2mks)
(ii) Find the values of h and k. (4mks)

21. The figure below is a square based pyramid ABCDV with AD = DC = 6cm, and height VO = 10cm.



(a) State the projection of VA on the base ABCD. (1mk)

(b) Find:
(i) The length of VA. (3mks)
(ii) The angle between VA and ABCD. (2mks)
(iii) The angle between the planes VDC and ABCD. (2mks)
(iv) Volume of the pyramid. (2mks)

22. A shop is stocked with plates, which come from two suppliers A and B. They are bought in the ration 3:5 respectively 10% of plates from A are defective and 6% of plates from B are defective.

(a) A buyer chooses a plate at random. Find the probability that:
(i) It is from A. (2mks)
(ii) It is from B and it is defective. (2mks)
(iii) It is defective. (2mks)

(b) Two plates are chosen at random. Find the probability that:
(i) Both are defective. (2mks)
(ii) At least one is not defective. (2mks)

23. (a) Using only a ruler and a pair of compasses draw a line AB of length 8cm long. Hence draw the locus of all points P such that angle APB = 52.50. (5mks)

(b) If the region above represents a map of an estate drawn to a scale of 1cm representing 1km. Show the region to be fenced if AMB $\leq 90^0$ by shading the unwanted region. (3mks)

(c) Find the area of this region. (2mks)

24. During installation of electricity bulbs in street lighting, a dealer is required to supply two types of bulbs A and B. The total number of bulbs should not be more than 400. He must supply more of A than B and type A bulbs should not be more than 300 and B should not be less than 80.
    (a) Write down in terms of x and y all inequalities representing the information above. (3mks)
    (b) On the grid provided draw all the inequalities and shade the unwanted region. (4mks)
    (c) If type A costs Kshs. 450 per piece and B Kshs. 350 per piece and that the higher the cost the higher the profit:
    (i) Use the graph to determine the number of each type of bulb that he should supply to maximize profit. (1mk)
    (ii) Calculate the maximum cost of lighting the streets. (2mks)