

NAME _____ INDEX NUMBER _____

CANDIDATE'S

SIGNATURE _____

DATE _____

121/2
MATHEMATICS
PAPER 2
JULY/AUGUST 2018
2 ½ HRS

EMBU NORTH SUB-COUNTY

FORM 4 END OF TERM 2 EXAM 2018

INSTRUCTIONS TO CANDIDATES

- a) write your name and index number in the spaces provided above
- b) Sign and write the date of the examination in the spaces provide above
- c) This paper consists of two sections: Section I and II
- d) Answer all the questions in section I and only five questions from section II
- e) Show all the steps in your calculations, giving your answers at each stage in the spaces provided below each questions
- f) Mark may be given for correct working even if the answer is wrong
- g) Non-programmable silent electronic calculators and KNEC mathematical tables may be used, except where stated otherwise.
- h) This paper consists of 15 printed pages as indicated and that no questions are missing
- i) Candidates should check the question paper to ascertain that all pages are printed as indicated that no questions are missing
- j) Candidates should answer the questions in English

For Examiner's use Only

Section I

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total

Section II

17	18	19	20	21	22	23	24	Total

Grand total

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SECTION 1 (50MKS)

Answer all the questions from this section 1

1. Use tables of logarithms to evaluate

(4mks)

$$\sqrt[3]{\frac{58.32 \times (0.9823)^2}{693.5}}$$

2. Simplify $\frac{3}{\sqrt{7}-2} + \frac{1}{\sqrt{7}+2}$

(3mks)

3. Make y the subject of the formula given

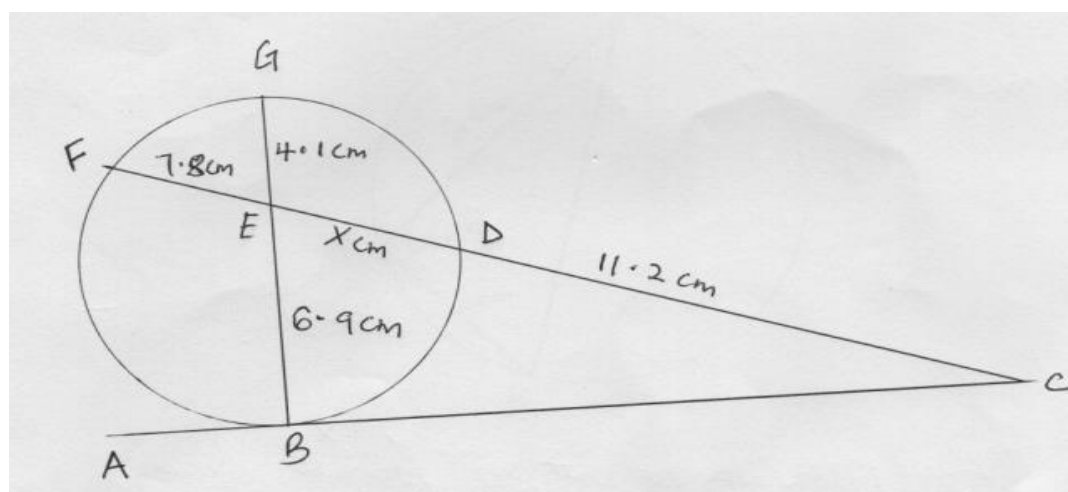
$$q = m \sqrt{\frac{r^2 - y^2}{y^2 + 3}}$$

(3mks)

4. Find the percentage error in the area of a parallelogram whose base is 23.2m and height is 11.5cm. (3mks)

5. In what ratio should grade P of tea costing sh 450 per kg be mixed with grade Q of tea costing sh 350 per kg so that a profit of 10% is made by selling the mixture at sh 451 per kg? (3mks)

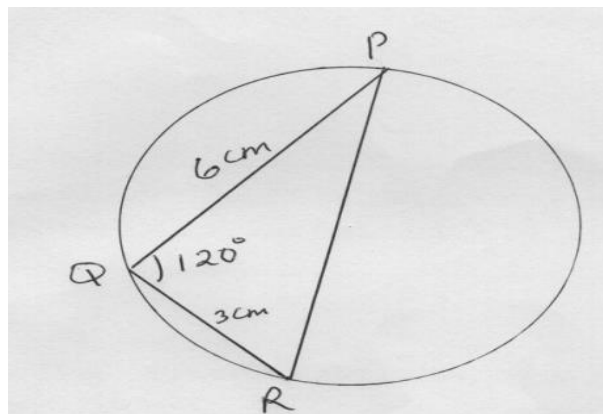
6. In the figure below ABC is a tangent to the circle at point B. Given that $BE = 6.9\text{cm}$, $FE = 7.8\text{cm}$, $GE = 4.1\text{cm}$, $DC = 11.2\text{cm}$ and $ED = x\text{cm}$. Determine the length BC, give your answer to four significant figures. (3mks)



7. Find Y without using tables. If $2 + \text{Log}_2 3 + \text{Log}_2 y = \text{Log}_2 5 + 1$
(3mks)

8. Three quantities X, Y and Z are such that X varies directly as the square of Y and inversely as the square root of Z. Given that Y increases by 5% and Z decreases by 36%. Find the percentage change in X. (3mks)

9. The figure below shows triangle PQR inscribed in a circle PQ=6cm, QR = 3cm and angle PQR= 120°



Calculate the length PR and the radius of the circle (4mks)

10. Given that the matrix $\begin{pmatrix} 5-x & 2 \\ 3x & 4 \end{pmatrix}$ has no inverse. Find x (2mks)

11a. Expand and simplify the first four terms $(2 - \frac{1}{2}x)^6$ (2mks)

b. Use the first three terms of the expansion above to find the approximate value of $(1.97)^6$
(2mks)

12. Determine the quartile deviation for the set of data given below (3mks)
20, 40, 30, 42, 10, 18, 26, 32

13. The points A (-4,2) and B (-8,-4) are the end points of a diameter of a circle. Find the equation of the circle and leave your answer in the form $ax^2 + bx^2 + cx + dy + e = 0$ where a,b,c,d and e are constants (4mks)

14. Solve for θ in the equation

$$6 \cos^2 \theta - \sin \theta - 4 = 0 \text{ in the range } 0^\circ \leq \theta \leq 180^\circ$$

(3mks)

15. Mrs. Kazi deposits shs 15,000 in a bank that pays compound interest at 12% p.a If the interest is compounded quarterly, Calculate the amount at the end of 2 years (Round off your values to 4 decimal places) (3mks)

16. The probability that a student gets grade A in Mathematics is $\frac{9}{10}$. If she gets grade A in mathematics then the probability that she gets A in physics is $\frac{4}{5}$. If she does not get grade A in mathematics then the probability that she get grade A in physics is $\frac{3}{8}$. Calculate the probability that she gets grade A in physics only. (2mks)

SECTION II (50 MARKS)

Answer any five questions from this section

17. Mr. Njagi, a civil servant earns a basic salary of sh 38,300 house allowance of sh 12,000 and medical allowance of shs 3600 every month. He claims a family relief of sh 1172 and insurance relief of 3% of the premium's paid. Using tax table below

Taxable income (£)p.a	Tax Ksh/£
1 - 8800	2
8801 -16800	3
16801 - 24800	5
24801 - 36800	7
36801 - 48800	9
Over 48800	10

a) Calculate Mr. Njagi's annual taxable income in Kenya pounds per annum (2mks)

b) Tax due every month from Mr. Njagi to 2 decimal places (5mks)

c) If further deductions are made every month from his salary

- WCPS of 2 % of basic salary
- Life insurance premium of shs. 4600
- Sacco loan repayment shs. 14200

Calculate

i) Total deductions (1mk)

ii) His net pay per month (2mks)

18. Complete the table below for the trigonometric function $y=2 \text{ Cos } \theta$ and $y = \sin \frac{1}{2} \theta$
(2mks)

θ	0	30	60	90	120	150	180	210	240	270	300	330	360
$Y=\text{Sin } \frac{1}{2} \theta$	0			0.71									
$Y=2 \text{ Cos } \theta$	2						-2				1.73		

b. Using the table above draw the graph of $y = \text{Sin } \frac{1}{2} \theta$ and $y = 2 \text{ cos } \theta$ on the same axes

(5mks)

(Use the scale: 1cm to represent 30° on the x axis and 2cm to represent 1 unit on the y axis)

c. Use your curves to find solution to the equation $\text{Sin } \frac{1}{2} \theta - 2 \text{ Cos } \theta = 0$

(1mk)

d. State the

i) Amplitude of the curve $y = 2 \text{ Cos } \theta$

(1mk)

ii) Period of the curve $y = \text{Sin } \frac{1}{2} \theta$

(1mk)

19. A point P (50°N , 10°W) is on the earth's surface. A plane flies from P due east on a parallel of latitude for 6 hours at 300 knots to port Q.

a) Determine the position of Q to the nearest degree. (4mks)

b) If the time at Q when the plane lands is 11.20a.m what time is it at P. (2mks)

c) The plane leaves Q at the same speed and flies due north for 7 hours along a longitude to airport R. Determine the position of R . (4mks)

20) . The sum of 21st and 65th terms of an arithmetic sequence is 368. Given that the seventh term of the sequence is 40. Find

a) The common difference (3mks)

b) The first term (2mks)

c)The sum of the first 16 terms of the A.P. (2mks)

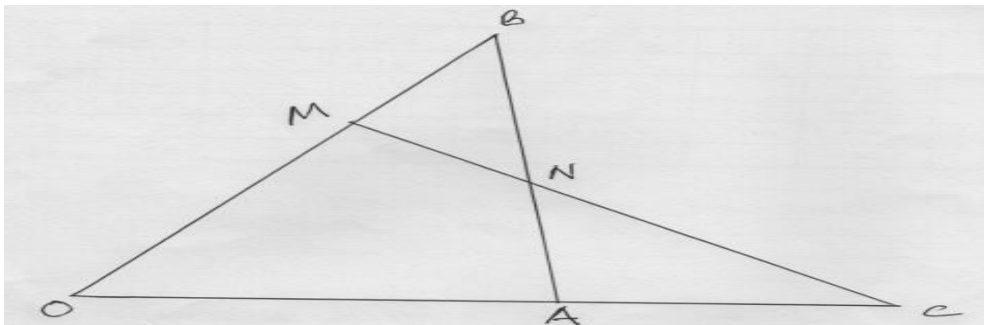
d) Given further that the 1st, 5th and 13th terms of the arithmetic sequence form the first three consecutive terms of a geometric progression,

Find

i) The common ratio . (1mk)

ii) The sum of the first 20 terms of the G.P. (2mks)

21. In the figure below $\vec{OA} = \vec{a}$ $\vec{OB} = \vec{b}$ and $\vec{OC} = 3\vec{OA}$. Point M divides OB in the ratio 3:2



a) Express in terms of \vec{a} and \vec{b}

i) \vec{AB} (1mk)

ii) \vec{MC} (1mk)

iii) \vec{MA} (1mk)

b. Given that $\vec{MN} = k\vec{MC}$ and $\vec{AN} = h\vec{AB}$ where k and h are scalars, express \vec{MN} in two ways hence find

i) The value of k and h (5mks)

ii) The ratio of $AN:NB$ (1mk)

iii) Express \vec{MN} in terms of \vec{a} and \vec{b} only (1mk)

22a. Complete the following table for the equation $y = 2x^3 + 3x^2 - 6x - 4$

x	-4	-3	-2	-1	0	1	2
$2x^3$	-128		-16		0	2	16
$3x^2$	48	27	12	3	0		12
$-6x$	24				0		-12
-4	-4	-4	-4	-4	-4	-4	-4
y	-60		4		-4		12

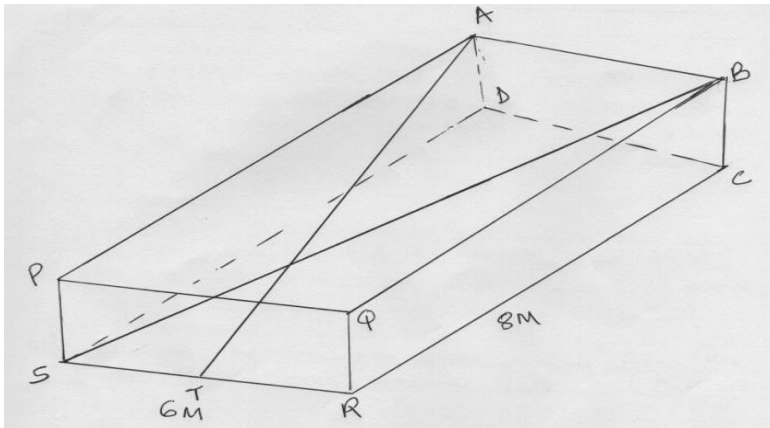
b. On the grid provided draw the graph of $y = 2x^3 + 3x^2 - 6x - 4$ (3mks)

c) By drawing a suitable straight line use your graph to solve the equations

i) $2x^3 + 3x^2 - 4x - 2 = 0$ (3mks)

ii) $2x^3 + 3x^2 - 6x - 4 = 0$ (2mks)

23. The figure below shows a rectangular tank of length 8m, width 6m and height 4m. SB is a diagonal of the tank and T is the midpoint of SR.



Calculate

a) The length SB (3mks)

b) The angle between SB and the plane CDSR (2mks)

c) The length AT to 1 d.p (3mks)

d) Angle ATD (2mks)

24a) Complete the table below for the function $y = x^2 + 3$ (2mks)

x	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
y	4		7			15.25	19		28		39

b) Use the mid-ordinate rule with five strips to estimate the area bounded by the curve, the line $x = 1$ and the line $x = 6$ (2mks)

c) Use integration to find the exact area in (b) above (3mks)

d) Calculate the percentage error arising from the use of the mid-ordinate rule (3mks)