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MATHEMATICS PAPER 2 FORM 4 JULY SERIES TERM 2 2017 TIME 2¹/₂ HOURS.

INSTRUCTIONS

- Write your name, admission number, stream and class number in the spaces provided above.
- * This paper consists of two sections: Section I and Section II.
- Answer all the questions in Section 1 and only FIVE from section II.
- Show all the steps in your calculations, giving your answer at each stage in the spaces provided below each question.
- ✤ Marks are given for correct working even if the answer is wrong.
- Non-programmable silent electronic calculators and KNEC mathematical tables may be used.

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

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SECTION I ANSWER ALL QUESTIONS (50 MARKS)

1. Using logarithm tables, evaluate;

(4mks)

$$\left(\frac{log8}{79.81 \times 0.00675}\right)^{\frac{1}{3}}$$

2.	By expressing in surd form, rationalize the denominator.	(3mks)
	$\sqrt{7} + tan60^{\circ}$	
	$\overline{cos30^{\circ}-sin45^{\circ}}$	

3. .Make P the subject in

$$p = \sqrt[3]{\left(\frac{p^2 + n}{M^2} + R\right)}$$

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4. The total cost of making a solid metal sphere is made up of an amount which is independent of the size of the sphere and an amount which varies as the cube of its radius. The total cost is sh.126 and sh.200 when the radius is 6cm and 8cm respectively. Find the total cost of a sphere of radius 12cm. (4mks)

5. Calculate the interest on ksh.10,000 invested for 1 ½ years at 12% p.a compounded quarterly. (Give your answer to the nearest 50cts) (3mks)

6. A town R is 1800nm West of town $P(60^{\circ}N, 170^{\circ}E)$ find the position of town R. (3mks)

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7. Solve the equation; $2 \cos \theta + 5 \sin^2 \theta = 2 \text{ for } 0^0 \le \theta \le 180^0$. (4mks)

8. Triangle ABC with vertices A(-1,4), B(-1,2) and C(5,2) is mapped onto the image, triangle $A^{1}B^{1}C^{1}$ after transformation whose matrix is $\begin{pmatrix} -1 & 2 \\ 2 & -6 \end{pmatrix}$ Find the vertices of $A^{1}B^{1}C^{1}$ (3mks)

9. (a) Expand $(1 + 3x)^5$ in ascending powers of x up to the term x^3 and simplify. (1mk)

(b)Hence estimate the value of $(0.97)^5$ correct to 4 decimal places. (2mks)

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10. Chords AB and CD in the figure below intersect externally at Q. if AB=5cm, BQ=6cm and DQ=4cm, calculate the length of chord CD. (3mks)



11. Solve for x in the given equation. $64^{x} - 121 = 7 - 4^{3x}$

12. Given that
$$y = \frac{x(x^2 - 1)}{x + 1}$$
, find $\frac{dy}{dx}$ at the point (2,4) (3mks)

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13. John buys and sells rive in packets. He mixes 30 packets of rive A costing sh.400 per packet with 50 packets of another kind of rive B costing sh.350 per packet. If he sells the mixture at a gain of 20%, at what price does he sell a packet? (3mks)

14. Determine the inverse, T⁻¹of the matrix T
$$\begin{pmatrix} 4 & 6 \\ 6 & -2 \end{pmatrix}$$
 hence solve (3mks)
 $2x + 3y = 30$
 $3x - y = 10$

15. Find the centre and radius of the circle whose equation is $4x^2 + 4y^2 - 6x + 4y - 4\frac{1}{4} = 0$ (3mks)

16. A number n is such that when 2 is added to it and squared the result is always 4. Find n. (2mks)

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SECTION II (50 MARKS)

17. The table below shows the Kenya tax rates in a year.

Income (Ksh, p.a)	Tax rate (%)
1 – 116160	10%
116161 - 225600	15%
225601 - 335040	20%
335041 - 444480	25%
OVER 444481	30%

In that year, Ushuru earned a basic salary of Kshs, 30,000 p.m. in addition, he was entitled to a medical allowance of ksh.2,800 p.m and a travelling allowance of ksh.1,800 p.m. He is housed by the employer and pays a nominal rent of ksh.2,000. He also claimed a family relief of ksh.1056 p.m.

Calculate;

(a) Ushuru's annual taxable income.

(2mks)

(5mks)

(b) The tax paid by Ushuru in that year.

(c) Ushuru's net income in that year, given that his other monthly deductions were

Union dues	Ksh.445
WCPS	Kshs. 490
NHIF	Kshs.320
Coop shares	Kshs 1,000
Risk fund	Ksh 100

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18. (a) Complete the table for the function $y = \frac{1}{2} \sin 2x$ where $0^{\circ} \le x \le 360$.									(2mks)					
Х	0	30°	60°	90^{0}	120^{0}	150°	180^{0}	210°	240°	270°	300°	330°	360°	
2x	0	60°	120^{0}	180^{0}	240^{0}	300°	360°	420°	480^{0}	540^{0}	600^{0}	660°	720°	
Sin 2x	0.00	0.87			0.00				0.87		0.87			
$Y=1/2 \sin \theta$	0.00	0.44			0.00									

18. (a) Complete the table for the function y	$y = \frac{1}{2} \sin 2x$ where $0^0 \le x \le 360$.	(2mks)
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(b) On the grid provided, draw a graph of the function $y = \frac{1}{2} \sin 2x$ for $0^0 \le x \le 360$ using the scale of 1cm for 30^0 on the horizontal axis and 4cm for 1 unit of y axis. (3mk (3mks)

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(c) Use your graph to determine the amplitude and period of the function $y = \frac{1}{2} \sin 2x$ (2mks)

(d) Use the graph to solve:	
(i) $\frac{1}{2} \sin 2x^0 = 0$	(1mk)

(ii) $\frac{1}{2} \sin 2x^0 - 0.5 = 0$ (2mks)

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- 19. A businessman wants to buy machines that make plastic chairs. There are two types of machines that make these chairs, type A and type B. Type A makes 120 chairs a day, occupies 20m² of space and is operated by 5 men. Type B make 80 chairs a day, occupies 24m² of space and is operated by 3 men. The businessman has 200m² of space on 40men.
- (a) List all inequalities representing the above information given that the business man buys x machines of type A and y machines of type B.(3mks)

(b) Represent the inequalities above on the grid provided.

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- (c) Use your graph to find the number of machines of type A and type B that the business man should buy to maximize the daily chair production. (2mks)
- (d) Given that the price of a chair is Ksh. 250, determine daily sales the businessman can make. (2mks)

20. Below is a sketch of the area bounded by the curve $y = x^2 + 3$ and the line x = -2, x = 4 and y = 0.



(a) Estimate the area of the shaded region using 6 strips by the trapezoidal rule. (3mks)

(b) Taking the area by integration as the actual area find the area. (4mks)

(c) Find the percentage error in the approximation in (a) above. (3mks)

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21. Two biased pentahendrons have their faces numbered 1, 2, 3, 4 and 5. The probability that one of the pentahendron shows a particular face when tossed is shown below.

Face	1	2	3	4	5
Probability	$^{1}/_{5}$	1/ 10	$^{3}/_{10}$	1⁄4	$^{3}/_{10}$

(a) One pentahendron is tossed once. What is the probability that the pentahendron.

(i) Shows an odd number. (2mks)

(3mks)

(ii) Shows a number less than 3.

- (b) The two pentahendrons are thrown at once. Find the probability that;
 - (i) The two pentahendron show the same number. (3mks)

(ii) The sum on the two faces is equal to 5. (3mks)

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22. The figure below shows a cube ABCDEFGH of length 8cm, 6cm and height 5cm. M is the midpoint of DE.



(a) State the projection of the line BE on plane ABGH. (1mk)

(b) Calculate the length AF. (2mks)

- (c) Calculate the length ME. (2mks)
- (d) Calculate the angle between GD and the plane ABGH. (2mks)

(e) Calculate the angle between plane BGM and the base ABGH. (3mks)

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- 23. A body moves in a straight line in such a way that at any time, t seconds its distance 5 metres from the starting point is given by $S = 8t - t^2$ (3mks)
- (a) How fast is the body moving at;
 - (i) t = 1 second

(ii) t = 3 seconds

(b) What is the maximum displacement from the starting point that the body achieves (4mks)

(c) Find the acceleration of the body.

(1mk)

(d) After how long will the body be back to the starting point? (2mks)

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- 24. Two variables R and P are connected by a function $\log R = \log K + \log P^n$ where k and n are constants. The table below shows date involving the two variables.
- (a) Complete the table.

Р	3	3.5	4	4.5	5
Log p					
R	36	49	64	81	100
Log R					

(b) Draw a line graph to represent the information above.

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(c) Find the values of constant k and n.

(2mks)

(2mks)

(3mks)

(d) Find the value of P when R=900 given that $R=KP^{n}$