

Name..... Index No.....

Candidate's Signature.....

Date 21/08/2018



121/2
MATHEMATICS

YESMARK EDUCATION CENTRE-THIKA
Kenya certificate of secondary education (K.C.S.E)

Paper 2

MOCK EXAMINATION 2018

August 2018

2 ½ Hours

Instructions to candidates

1. Write your name and index number in the spaces provided above.
2. Sign and write the date of examination in the spaces provided above.
3. The paper contains two sections: **Section I** and **Section II**.
4. Answer **All** the questions in **section I** and **strictly any five** questions from **Section II**.
5. All answers and working must be written on the question paper in the spaces provided below each question.
6. Show all the steps in your calculations, giving your answers at each stage in the spaces below each question.
7. Marks may be given for correct working even if the answer is wrong.
8. Non-programmable silent electronic calculators and **KNEC** mathematical tables may be used, unless stated otherwise.

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

SECTION 1 (50 MARKS)

Answer all questions in this section.

1. The position vectors of points A and B are $5i + 4j - 6k$ and $2i - 2j$ respectively. A point X divides AB in the ratio -2.5: 5. Find the coordinates of X. (3marks)

$AB = B - A$

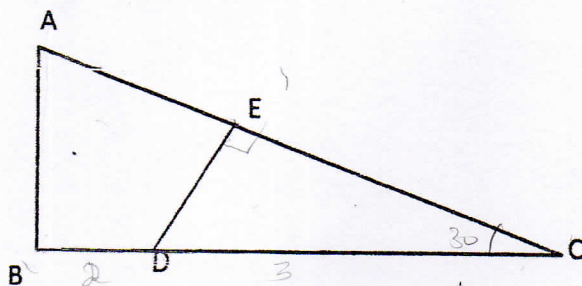
2. Make R the subject of the formula $p^2 = \sqrt{\frac{1+R^2}{M^2}} + \frac{M}{2}$ (3marks)

3. Using logarithms evaluate to 4 d.p $\sqrt[3]{\frac{1.23 \times \sin^2 86.31}{\log 7.9}}$ (4marks)

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

4. Fruit juice mixture with 40% concentrated juice and 60% water is put in one litre bottles. The mixture is further diluted by removing 200ml of the mixture and replacing with water. Determine the new concentrated juice in the mixture. (3marks)

5. In triangle ABC below $AC = 8\text{cm}$, $BC = 5\text{cm}$ and angle $BCA = 30^\circ$. Point D divides BC in the ratio 1:4 and E divides AC in the ratio 2:3. Find the area of ABDE. (3marks)

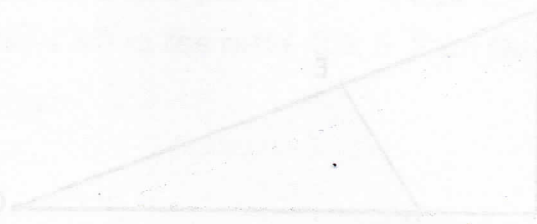


6. Find the equation of a circle located in the first quadrant of a cartesian plane such that its centre is on the line $5x - 2y = 0$, its radius is 5 units and its tangent is the x-axis. (3marks)

7. A closed box has a square base of side x metres and its height h metres. The total surface area of the box is 24m^2 .

- (i) Find the expression of h in terms of x . (4 marks)
- (ii) Hence find the value of x that would make the volume of the box maximum.

8. Find the value of t if the gradient of the graphs of the functions $y = x^2 - x$ and $y = x - tx^2$ are equal at $x = \frac{1}{3}$. (3marks)



9. (a) Solve the inequalities $2x - 5 > -11$ and $3 + 2x \leq 13$ giving your answer as a combined inequality. (3marks)
(b) List the integral values of x that satisfy the combined inequality in (a) above. (1mark)

10. A point Q is 4km due north of another point P . A man starts from P and walks in the direction 030° . Calculate how far he walks when he is;
(i) Equidistant from P and Q .
(ii) North-east of Q . (4marks)

11. A stone falling freely under gravity in some planet falls approximately 16m in the first second, 48m in the next and 80m in the third and so on. How long does it take to fall a total of 3600m? (3marks)

12. Solve the equation $\log_{16}(3x-1) = \log_4 3x + \log_4 0.5$ (3marks)

13. F is directly proportional to the square root of T and inversely proportional to L and D. If T is increased by 50% and L is halved, Find the percentage change in F. (3marks)

14. The image of $A(0, 2)$ under enlargement scale factor -3 is $A'(4, 6)$. Find the centre of enlargement. (3marks)

15. The distance S moved by a particle along a straight line after t seconds is given by $S = 7 + 8t^2 - 2t^3$. Find the velocity attained after 3 seconds. (2marks)

16. Given that $\sin(x + 20)^\circ = -0.7660$, Find x , to nearest degree, for $0^\circ \leq x \leq 360^\circ$. (3marks)

14. The image of $A(0, 2)$ under enlargement scale factor -3 is $A'(4, 6)$. Find the centre of enlargement. (3marks)

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16. Given that $\sin(x + 20)^\circ = -0.7660$, Find x , to nearest degree, for $0^\circ \leq x \leq 360^\circ$. (3marks)

SECTION II (50 MARKS)

Answer any five questions from this section

17. A car was purchased for Ksh. 1800000 on 1st January 2010. On 1st January each following year the value of the car is 90% of its value on 1st January in the previous year.

(a) Find the value of the car on 1st January 2013. (2marks)

(b) The value of the car falls to Ksh. 1000000 for the first time in n years after it was purchased. Find the value of n giving your answer to 2 decimal places. (3marks)

(c) An insurance company has a scheme to cover the maintenance of the car. The cost is Ksh. 20000 for the first year and for every following year the cost increase by 12%.

(i) Find the cost of the scheme for the 5th year giving your answer to the nearest shilling. (2marks)

(ii) Find the total cost of the scheme for the first 15 years. (3marks)

18. The figure below is a sketch of a circle with centre N and equation

$$(x-2)^2 + (y+1)^2 - \frac{169}{4} = 0$$

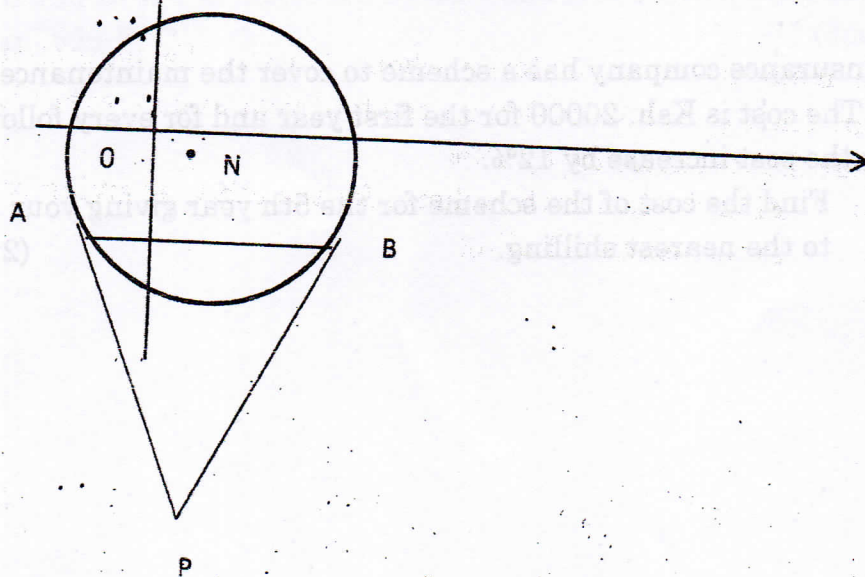
(a) Write down the coordinates of N. (1mark)

(b) Find the radius of the circle (1mark)

(c) The chord AB of the circle is parallel to the x-axis, lies below the x-axis and is of length 12 units.

(i) Find the coordinates of A and B. (4marks)

(ii) The tangents to the circle at A and B meet at P. Find the length AP giving your answer to 3 significant figures. (4marks)



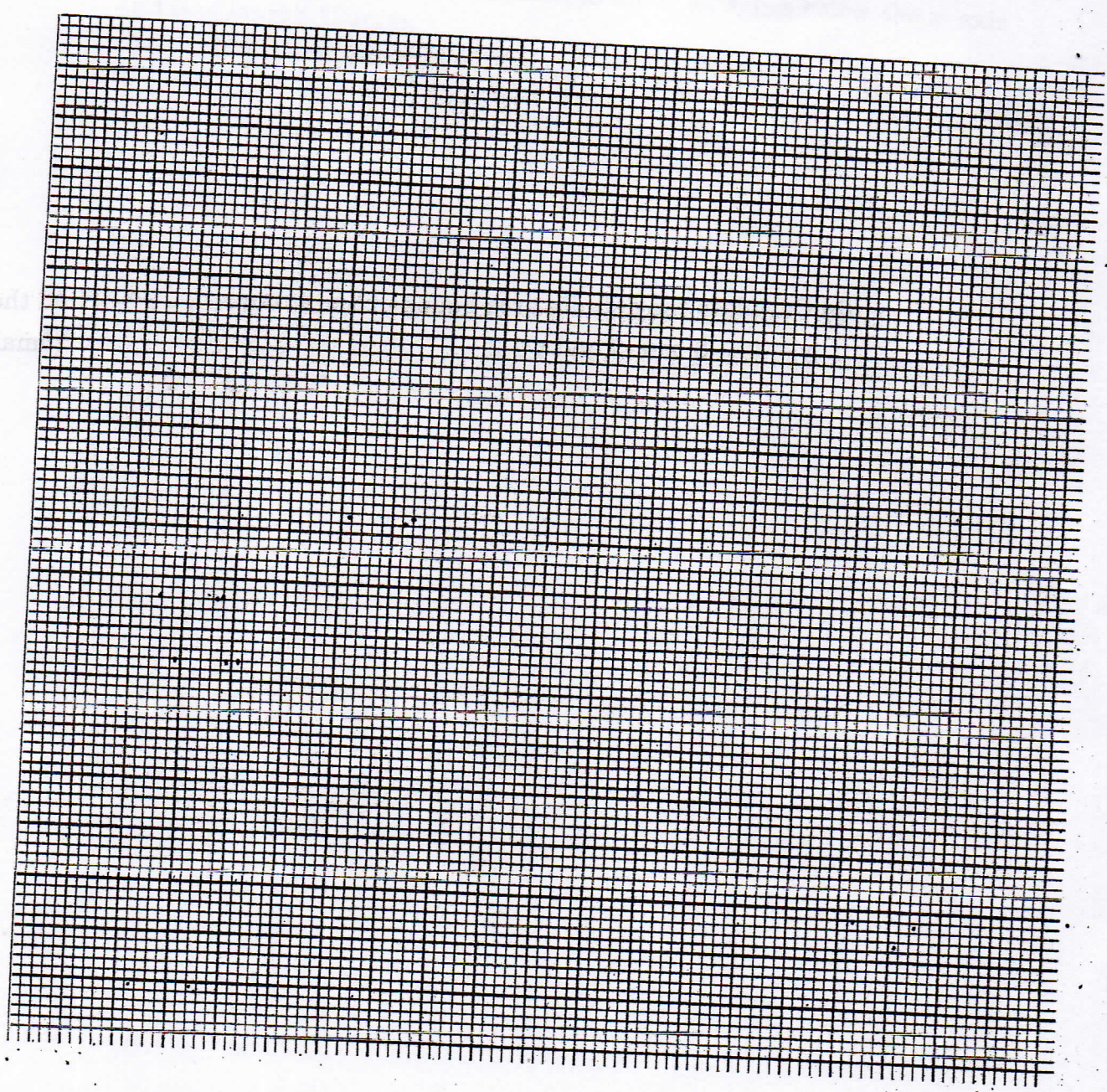
19. (a) Sketch the graph of $y = x^3 - 8$.

(4marks)

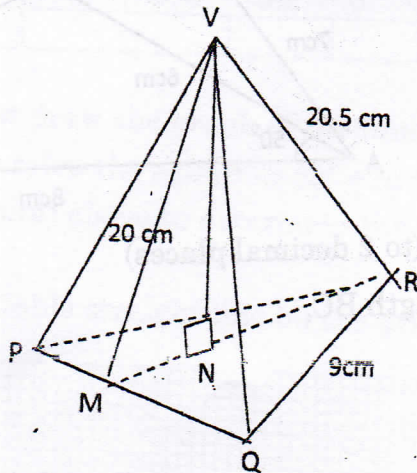
(b) Calculate the definite area bounded by the curve $y = x^3 - 8$ and the lines $y = 4x - 8$, $x = -3$ and $x = 2$.

(6marks)

20. (a) A triangle T with vertices $A(0, 0)$; $B(3, 0)$ and $C(3, 4)$ is stretched parallel to the x -axis with stretch factor 3 to give triangle T^1 . Draw T and T^1 . (3marks)
- (b) T^1 is rotated through -90° about the origin to give T^2 . Draw T^2 . (2marks)
- (c) Under a shear with y -axis invariant the point C^2 is mapped onto $C^3(4, -1)$. Draw T^3 . (2marks)
- (d) State the three matrices of transformations in (a), (b) and (c) above. Hence find a single matrix that would map T^3 onto T . (3marks)



21) The figure below represents a model of a tower VPQR. The horizontal base PQR is an equilateral triangle of sides 9cm. The length of the edges are $VP = VQ = VR = 20.5\text{cm}$. Point M is the mid-point of PQ and $VM = 20\text{cm}$. Point N is on the base and vertically below V



Calculate

(a) The length RM

(2marks)

(b) The length of the model.

(4marks)

(c) The angle between

(i) Plane VPR and the base

(2marks)

(ii) Line VR and the base

(2marks)