

Name \_\_\_\_\_ Adm. No: \_\_\_\_\_ Class: \_\_\_\_\_

Index No: \_\_\_\_\_

## KASSU JET EXAMINATION

*Kenya Certificate of Secondary Education*

**121/1**

**MATHEMATICS**

**PAPER I**

**JUNE 2016**

**2 ½ HOURS**

### INSTRUCTIONS TO CANDIDATES

1. Write your name, admission number, class and index number.
2. The paper contains two sections: Section I and II
3. Answer ALL questions in section I and ANY FIVE questions from section II.
4. All working and answers must be written on the question paper in the spaces provided below each question.
5. Marks may be awarded for correct working even if the answer is wrong.
6. Negligent and untidy work will be penalized.
7. Non-programmable silent electronic calculators and four figure mathematical tables are allowed for use.
8. This paper consists of printed pages. Candidates should check the question paper to ensure that all the pages are printed indicated and no questions are missing.

### 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 A 50 MARKS**

1. Evaluate  $\frac{\frac{3}{4} + 1\frac{5}{7} \div \frac{4}{7} \text{ of } 2\frac{1}{3}}{\left(1\frac{3}{7} - \frac{5}{8}\right) \times \frac{2}{3}}$  (3marks)

2. Solve for  $x$  in  $\sin(x - 15) - \cos(x + 5) = 0$  (2marks)

3. The LCM of two numbers is 328,600 and the GCD is 20. If one of the numbers is 1240, use prime factorization method, find the other number. (3 marks)

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4. A spherical solid lead of diameter 12cm weighs 6.4kg. How much would a similar solid of a diameter 10cm weigh? (3marks)

5. Without using a calculator or mathematical tables evaluate,

$$\frac{\left(\frac{1}{81}\right)^{\frac{1}{4}} \times (256)^{\frac{1}{2}} \times 3^5}{(729)^{\frac{1}{3}} \times 72^2}$$

(3marks)

6. On arrival to Kenya a Canadian tourist exchanged his Canadian dollars for Ksh 199 690. Given that the currency exchange rate was 1 Canadian dollar = Ksh 52.55 and that the bank charged him 5% commission, find the number of dollars he exchanged. (3 marks)

7. By using completing square method, solve for  $x$  in  $4x^2 - 3x - 6 = 0$  (3marks)

8. Simplify the following.

$$\frac{2x-4}{12-3x^2} - \frac{1}{3x+6}$$

(3 Marks)

9. The matrix  $\begin{bmatrix} x & 1 \\ x+5 & x+5 \end{bmatrix}$  maps a triangle ABC onto a straight line. Determine the possible values of  $x$ . (3 marks)

10. Using the tables of squares, square roots and reciprocal  $3.0452 \times \frac{6}{\sqrt{49.24}}$  (4marks)

11. Find the percentage error in the quotient in  $9.16\text{cm} \div 2.0\text{cm}$  (4marks)

12. The position vectors  $\mathbf{a} = \begin{pmatrix} -1 \\ 5 \\ 2 \end{pmatrix}$ ,  $\mathbf{b} = \begin{pmatrix} 2 \\ 1 \\ -3 \end{pmatrix}$  and  $\mathbf{c} = \begin{pmatrix} -8 \\ 7 \\ 13 \end{pmatrix}$ . Find the scalars S and T such that  $S\mathbf{a} + T\mathbf{b} = \mathbf{c}$  (3 marks)

13. The following data represents the enrolment of students in 12 colleges

564	553	566	554	563	563
657	556	553	554	651	559

Calculate the quartile deviation

(3 marks)

14. The density of a sphere of diameter  $p$  cm is  $2.68 \text{ g/cm}^3$  and that of another sphere is diameter  $Q$  cm is  $14.23 \text{ g/cm}^3$ . Determine the volume of sphere  $Q$  that would have the same mass as  $80\text{cm}^3$ . (3marks)

15. Solve and represent the integral values of the linear inequalities given below on a number line.

$$\frac{4}{3} - \frac{x-2}{x} \geq 1$$

$$-2 - \frac{2}{3}x < x + 8$$

(3marks)

16. Find the equation of the normal to the curve  $y = x^3 - 2x^2 + 3x - 1$  at the point  $(2,5)$   
(3marks)

**SECTION B (50 MARKS)**

17. A straight line  $L_1$  has its x-intercept and y-intercept as -6 and 4 respectively.

a) Write its equation in the form  $ax + by + c = 0$  where a, b, and c are integers (3marks)

b) Another line  $L_2$  which is parallel to  $L_1$  in (a) above passes through  $(2, 3k)$  and  $(-k, 8)$ . Find the value of k. (2marks)

c) Find the equation of the perpendicular bisector to the line  $L_1$  (3marks)

d) Calculate the angle which  $L_1$  makes with the x-axis (2marks)

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18. A man spent  $\frac{1}{9}$  of his salary on food and  $\frac{1}{4}$  of the remainder on electricity and water bills. He paid fees with 20% of his salary and invested 16% of what was left into a business. After taking a game drive on which he spent Ksh 2000, he saved Ksh 5350. Calculate:
- (a) His total monthly earnings. (4 marks)

- (b) How much he spent on fees. (2 marks)

- (c) How much he invested. (2 marks)

- (d) The percentage of the salary saved. (2 marks)

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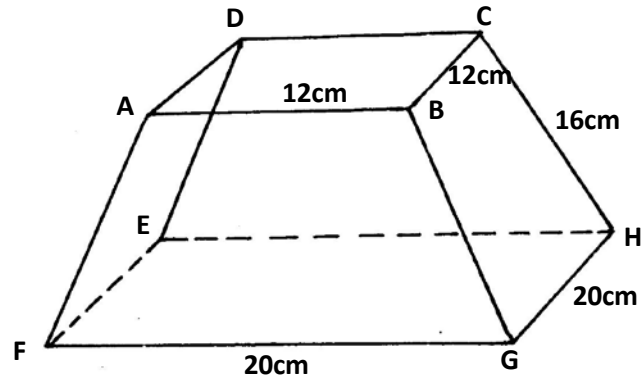
19. Every Sunday Alex drives a distance of 80km on a bearing of  $074^{\circ}$  to pick up his brother John to go to church. The church is 75km from John's house on a bearing of  $S50^{\circ}E$ . After church they drive a distance of 100km on a bearing of  $260^{\circ}$  to check on their father before Alex drives to John's home to drop him off then proceeds to his house.

- (a) Using a scale of 1cm to represent 10km, show the relative positions of these places. (4 marks)

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- (b) Use your diagram to determine:
- (i) the true bearing of Alex's home from their father's house. (1 mark)
  - (ii) the compass bearing of the father's home from John's home. (1 mark)
  - (iii) the distance between John's home and the father's home. (2 marks)
  - (iv) the total distance Alex travels every Sunday. (2 marks)

20. The figure below shows solid frustum of a pyramid with a square top of side 12cm and a square base of side 20cm. The slant edge of the frustum is 16cm.



a) Calculate the total surface area of the frustum (4marks)

b) Calculate the volume of the solid frustum. (4marks)

c) Calculate the angle between the planes **BCHG** and the base **EFGH**. (2marks)

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21. (a) A radio station tower was built in two sections. From a point 870m from the base of the tower, the angle of elevation of the top of the first section is  $25^{\circ}$  and the angle of elevation of the top of the second section is  $40^{\circ}$ . What is the height of the top section of the tower? (5marks)

(b) Two vertical poles on horizontal ground are 60m apart. The shorter pole is 3m high. The angle of depression of the top of the shorter pole from the top of the longer pole is  $20^{\circ}$ . Using scale drawing, find the length of the longer pole. (5 marks)

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22. Coast bus left Nairobi at 8.00a.m. and traveled towards Mombasa at an average speed of 80km/hr. at 8.30am, Lamu bus left Mombasa towards Nairobi at an average speed of 120km/h. Given that the distance between Nairobi and Mombasa is 400km; determine:

(i) The time Lamu Bus arrived in Nairobi. (2marks)

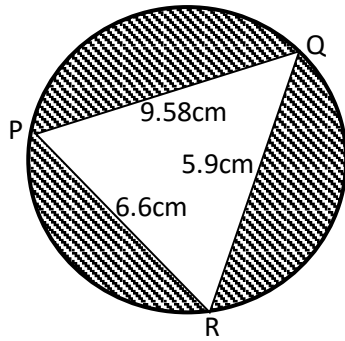
(ii) The time the two buses met. (4marks)

(iii) The distance from Nairobi to the point where the buses met. (2marks)

(iv) How far Coast Bus is from Mombasa when Lamu bus arrives in Nairobi. (2marks)

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23. Triangle PQR is inscribed in the circle.  $PQ = 7.8\text{cm}$ ,  $PR = 6.6\text{cm}$  and  $QR = 5.9\text{cm}$ .



Find;

(a) size of angle QPR

(3 Marks)

(b) the radius of the circle.

(3 Marks)

(c) the area of the shaded region.

(4 Marks)

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24. (a) Find the stationary points of the curve to (1 d.p) (6 marks)

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

- (b) Find the x and y intercepts of the curve above. (2 marks)

- (c) Sketch the curve. (2 marks)

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