MUSJET JOINT EXAMINATION 2024

Kenya Certificate of Secondary Education

121/1   **MATHEMATICS Alt. A**   **Paper 1**

s   **JULY 2024 - $2\frac{1}{2}$ hrs**

Exam Date;

Name: …………………………...…………….……… Admission Number: ………

Student's Signature: ………………… School: ……………………. Class:………

Instructions to candidates

(a) Write your name, Admission number and class in the spaces provided above.

(b) Sign and write the date of examination in the spaces provided above.

(c) This paper consists of **two** sections: **Section I** and **Section 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 question.**

(f) Marks 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.**

(i) **Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.**

(j) **Candidates should answer the questions in English.**

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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

Grant total

1. Evaluate $\dfrac{3\frac{1}{2}+\frac{10}{457}\left\{\frac{6}{13}-\frac{1}{4}\,of\,\frac{16}{21}+\frac{11}{15}\right\}}{\frac{1}{11}\left[\frac{8}{13}+\frac{5}{7}\right]-\frac{9}{91}}$ (3 marks)

2. Three bells ring at intervals of 9 minutes, 15 minutes and 21 minutes respectively. The bells will next ring together at 11:00 p.m. Find the time the bells had last rang together. (3 marks)

3. The exterior and interior angles of a regular polygon are $(x+10)^0$ and $(3x+50)^0$ respectively. Calculate the sum of interior angles of the polygon. (4 marks)

4. Solve the inequality $-8 < 5\,x - 3 \le 2\,x + 4$, hence illustrate your answer on a number line and state the integral values (4 marks)

5. A Kenyan commercial bank buys and sells foreign currencies at the rate shown below

	Buying (*Kshs*)	**Selling** (*Kshs*)
1 Euro	145.30	145.60
1 UAE Dirhams	36.68	36.92

A French tourist arrived in Kenya with 7000 Euros. She converted the whole

Amount to the local currency. While in Kenya she spent Kshs.426, 380 and changed

the balance to UAE Dirhams before leaving for Dubai. Calculate the amount,

In UAE Dirhams that she received? (3 marks)

6. Simplify the expression

$$\frac{9t^2-25a^2}{6t^2+19at+15a^2}$$

(3 marks)

7. During a practical exam, Jenny broke 4 beakers and 3 test-tubes while Zakayo broke 2 beakers and 5 test-tubes. If Jenny was charged ksh. 475 and Zakayo was charged ksh. 325 for breakages. Find the cost of each beaker and test-tube. (3 marks)

8. Solve the equation $125^{2y-5} \div 25^{y+4} = 625$ (3 marks

9. A football match lasts 90 minutes with a break of 15 minutes at half-time. If the referee allows 5 minutes for extra time for injuries and stoppages. At time does a match which kicks off at 4: 30 pm end? (2 marks)

10. The mass of a solid cone of radius 14 cm and height of 18 cm is 4.62 kg. find its density in g/cm^3 (3 marks)

11. Given that **OA** = $\begin{pmatrix} -2 \\ 10 \end{pmatrix}$, **OB** = $\begin{pmatrix} x \\ -2 \end{pmatrix}$ and that the magnitude of AB is 13 units, find the possible values of x. (4 marks)

12. In the figure below, AB = 6 cm, BE = 4 cm, CD = 9 cm, BE is parallel to CD and angle ABE = angle ACD = 90$^\text{O}$. Calculate the length of BC.
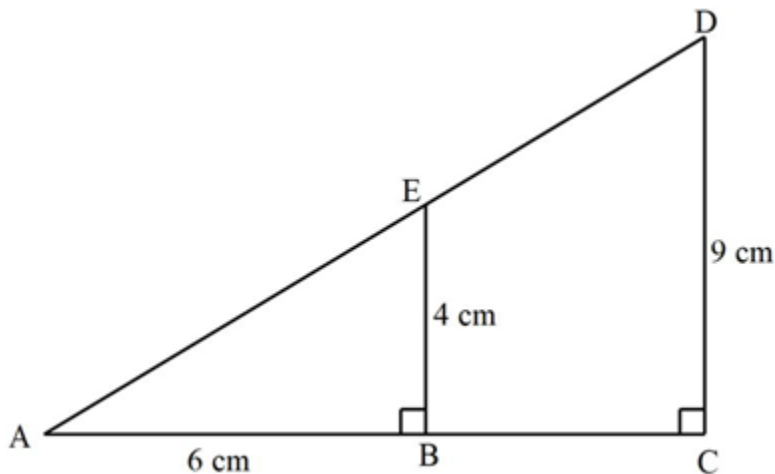
13. The figure below shows histogram of a certain set of data obtained from mathematics test.
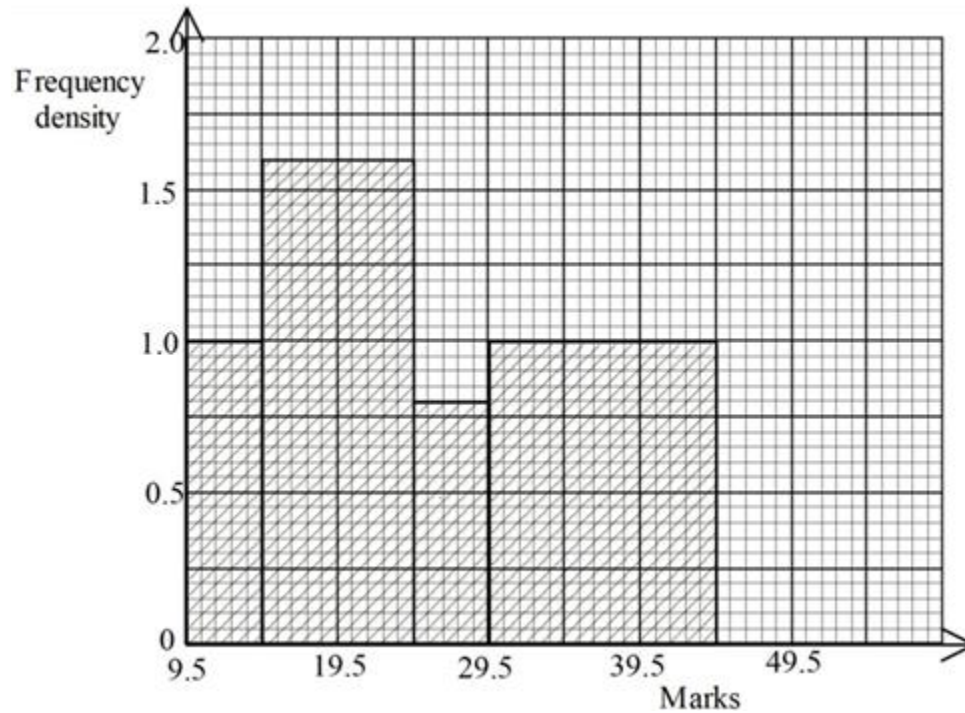
Develop a frequency distribution table from the above histogram   (3 marks)

14. Use tables of reciprocals and square roots only to evaluate $\frac{3}{0.05584}$ - $\sqrt{216.2}$ (3 marks)

15. Given that $\sin(2x + 15) = \cos(3x - 25)$. Find the exact value of sin 3x.   (3 marks)

16. A triangular plot of land of ABC is such that AB =34m, AC= 66m and angle BAC = 96.7^0. Calculate the length of BC to three significant figures.   (3 marks)

SECTION II (50 Marks)

17. a) A line L1 passes through the points (4,5) and (6, -7) find;
    i.   the equation of L1 in the form y= mx +c where m and c are constants (3 marks)

    ii.   x and y intercepts of L1 (2 marks)

    b) Another line L2 is perpendicular to L1 and passes through the point $(-21,7)$
        Find the equation of L2 in the form ax + by =c where a, b and c are integers (2 marks)

    c) Find the point of intersection of L1 and L2 (3 marks

18. The diagram below shows the speed – time graph for a bus travelling between two stations. The bus begins from rest and accelerates uniformly for 30 seconds. It then travelled at a Constant speed for 60 seconds and finally decelerates uniformly for 40 seconds.
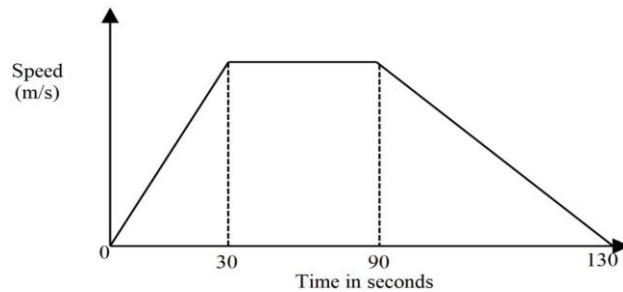
Given that the distance between the two stations is 2090 m, calculate;

(a) The maximum speed, in km/h the bus attained. (3 marks)

(b) The acceleration. (2 marks)

(c) The distance travelled during the last 20 seconds. (2 marks)

(d) The time the bus takes to travel the first half of the journey. (3 marks)

19. The diagram below shows a conical vessel which stands vertically.

The vessel contains water to a depth of 30 cm. The radius of the water surface in the vessel is 21 cm.
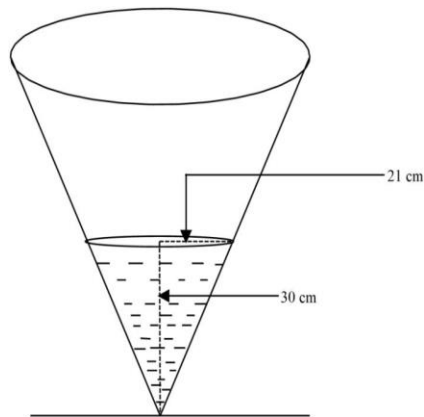
(a) Calculate the volume of the water in the vessel in cm^3 (2 marks)

(b) When a metal sphere in completely submerged in the water, the level of water in the vessel rises by 6 cm. calculate;

    (i) the radius of the new water surface in the vessel (2 marks)

    (ii) the volume of the metal sphere in cm^3 (3 marks)

    (iii) the radius of the sphere (3 marks)

20.a) Given that $p = \begin{pmatrix} 8 & 5 \\ 6 & 9 \end{pmatrix}$, find p^{-1} (2 marks)

b) Matawi bought 8 T-shirts and 5 pairs of shorts at a total cost of ksh. 4400.

   Had he bought 6 T-shirts and 9 pairs of shorts, he would have spent ksh.1000

   more.

(i) Form two equations to represent the above information (2 marks)

(ii) Use the matrix method to determine the cost of a T-shirt and a pair of shorts (3 marks)

c) Three months later the price of a pair of shorts went up. Matawi bought 5 T-shirts

   and 5 pairs of shorts at a total cost of ksh.3650. Find the percentage increase in

   the price of a pair of shorts. (3 marks)

21. Five points P, Q, R, V and T lie on the same plane. Point Q is 53 km on a bearing of N 55 E of P. Point R lies o S18 E of Q at a distance of 58 km. Given that point T is West of P and 114 km from R and point V is directly South of P and S 40 E from T.

(a) Using the scale 1cm to represent 10 km, draw a diagram showing the relative positions of the five points. (5 marks)
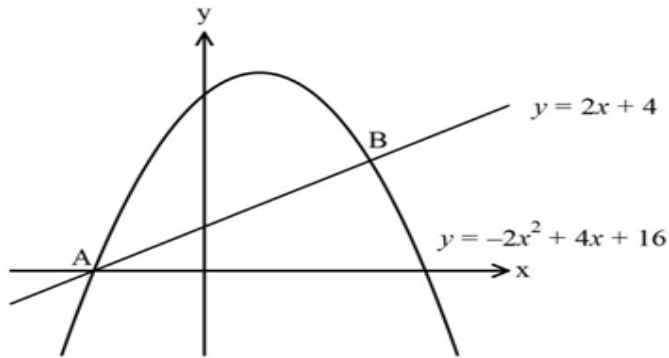
(b) From the scale drawing determine

(i) The distance, in km of point V from R. (1 mark)

(ii) The bearing of point V from Q (1 mark)

(c) Determine the area enclosed by the points PQRVT in square km. (3 marks)

22. The figure below, the graphs of $y = -2x^2 + 4x + 16$ and $y = 2x + 4$ intersect at points A and B.

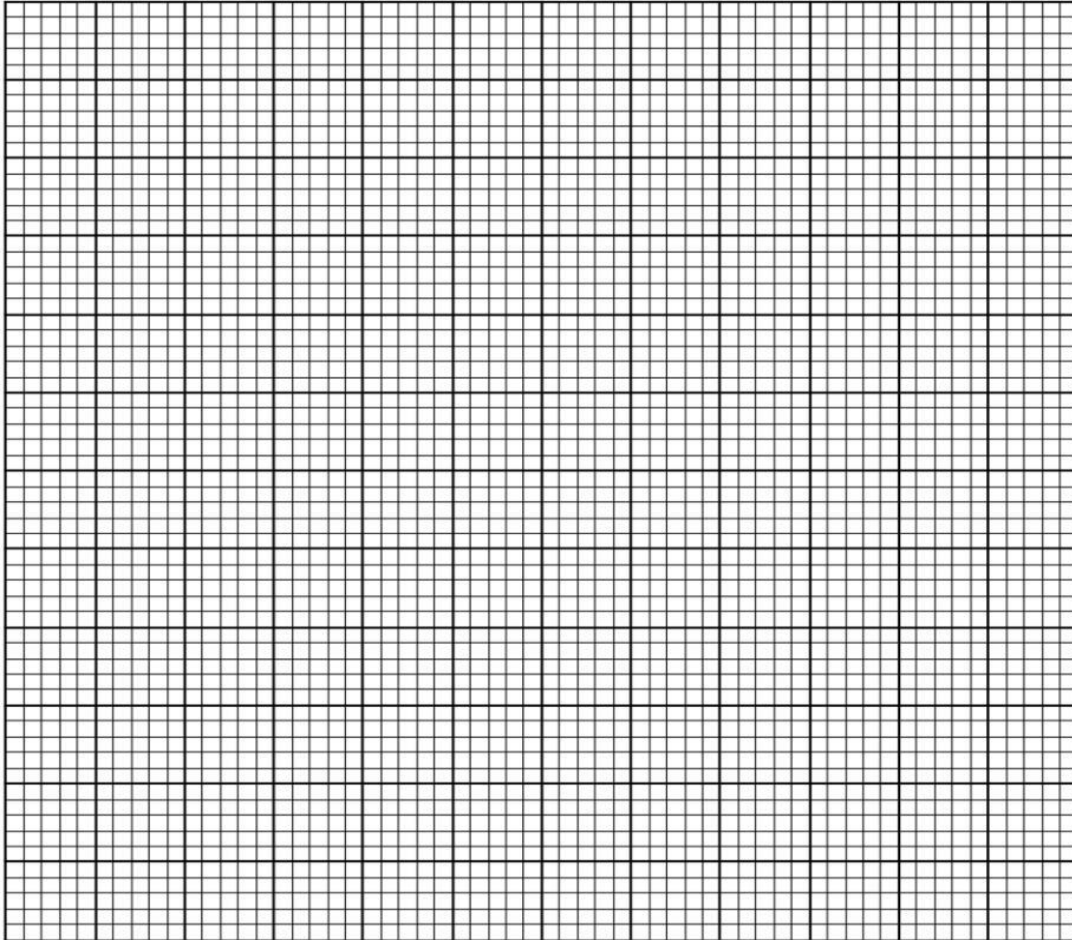(a) Find the coordinates of points A and B. (4 marks)

(b) Estimate the area bounded by the curve $y = -2x^2 + 4x + 16$ and the line $y = 2x+4$ using:

   i.   Trapezium rule with 6 ordinates. (3 marks)

   ii.   Mid – Ordinate rule with 5 strips. (3 marks)

23. A square ABCD has vertices A (-5,-5), B (-4, -5), C (-4,-4), and D (-5,-4)

  (a) On the grid below, draw the square ABCD   (1 mark)

(a) On the same axes, draw A′ B ′C′ D′ , the image of the square ABCD under a transformation described as enlargement, centre (4, 3) and scale factor −3. (2 marks)

(b) The square A″B″C″D″ with the vertices A (1, 5) ″, B (4, 5) ″, C (4, 2) ″ and D (1, 2) ″ is the image of A ′ B ′ C ′ D′ under a rotation. On the same axes, draw the square A″ B″ C″ D″ hence describe the rotation. (4 marks)

(c) On the same axes, draw the square A‴B‴C‴D‴ , the image of A″ B″ C″ D″ under reflection in the line y = 0. (1 mark)

(d) State a pair of squares that are:

(i) Directly congruent   (1 mark)

(ii) Oppositely congruent (1 mark)

24. The equation of a curve is y $= x^2(3 - x)$,
   a) find
      i.   ) the x intercept of the curve   (2 marks)

      ii.   ) the y intercept of the curve   (1 mark)

(b) (i) Determine the stationary points of the curve. (3 marks)

(ii) For each point in (b)(i) above, determine whether it is a maximum or a minimum. (2 marks)

(c) Sketch the curve. (2 marks)