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Adm No _____ Class _____

Index Number _____

121/2

MATHEMATICS ALT. A

Paper 2

Time: 2½ Hours**December 2021****BUNAMFAN CLUSTER EXAMINATION 2021***Kenya Certificate of Secondary Education*

121/2

MATHEMATICS ALT. A**Paper 2****Time: 2½ Hours****Instructions to Candidates**

1. Write your name, Admission Number and Stream in the spaces provided at the top of this page.
2. Show all your workings in the spaces provided below each question.
3. This paper contains two sections, Section I and Section II.
4. Answer all the questions in section I and any five questions in section II.
5. All the questions in section II carry equal marks.
6. Negligence and slovenly work will be penalized.
7. Mathematical tables and non-programmable electronic calculators maybe used.

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

17	18	19	20	21	22	23	24	Total

GRAND TOTAL

SECTION I (50 Mks)
(Answer all questions in this section)

1. Use logarithms tables to **evaluate**. $\left(\frac{130.9}{27.68 \times 100.9}\right)^{2/3}$ (4 marks)
2. A trader mixes grade A coffee costing sh 600 per kg, with grade B coffee costing sh. 280 per kg in the ratio 3 : 5. Find the price at which he must sell 1 kg of the mixture to make a profit of 20 % . (4 marks)
3. Given that $\cos \theta = \frac{1}{\sqrt{3}}$, find the value of $\frac{\tan \theta + \sin \theta}{\cos \theta}$ in its simplest form. (Leave your answer in surd form) (3 marks)

4. Determine the equation of the normal to the curve $y = 3x^2 - 4x + 5$ at the point (1, 4).

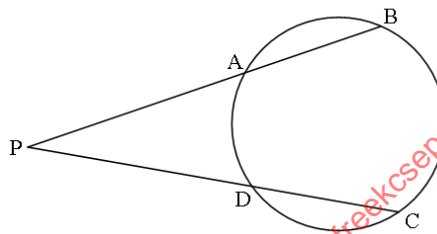
(3 marks)

5. Water flows from a pipe at the rate of 250 litres per minute. If the pipe is used to drain a tank full of water measuring 3.2m by 2.5m by 2m, how long would it take to drain the tank completely when it is $\frac{3}{4}$ full? (3 marks)

6. Make N the subject of the formula $t = \frac{5P - N}{3N - P}$ (2 marks)

7. Determine the period and amplitude of the function. $y = 4 \sin (2x - 20^\circ)$ (2 marks)

8. In the figure below, **PA** is 1.2cm shorter than **PD**. Given that **AB** = 15.6cm, **CD** = 9.6cm,



Determine the length of **PA**.

(3 marks)

9. Without using logarithms table or calculator, solve for x in;

$$\log 5 - 2 + \log(2x + 10) = \log (x - 4)$$

(3 marks)

10. In an arithmetic progression, the 20th term is 92 and the sum of the first 20 terms is 890.
Calculate;

(a) The first term (2 marks)

(b) The common difference (1 mark)

11. Solve for θ in the equation $\sin(3\theta + 120^\circ) = \frac{\sqrt{3}}{2}$ for $0 \leq \theta \leq 180^\circ$. (3 marks)

12. (a) **Expand** and **simplify** the expression $\left(4x - \frac{y}{2}\right)^5$ up to the third term. (2 marks)

(b) Hence use the expansion in (a) above to **approximate** the value of $(39.6)^5$ (2 marks)

13. The cost per head for catering for a party is partly constant and partly varies inversely as the number of people expected. The cost per head for a party of 100 people is Sh. 1860 and that for 180 people is sh. 1060. **Find** the cost per head for 200 people. (3 marks)

14. A body is moving along a straight line and its acceleration after t seconds is $(5 - 2t) \text{ ms}^{-2}$. Its initial velocity $V \text{ ms}^{-1}$ is 4 ms^{-1} . Find V in terms of t . (3 marks)

15. **Determine** the turning points for the curve $y = 5x - 8x^2 + x^3$. (4 marks)

16. Draw a line $PQ = 7.2\text{cm}$ and on one side of the line, use a ruler and pair of compasses only to draw the locus of a point A such that $\angle PAQ = 60^\circ$ and on it mark point A such that $PA = QA$ (3 marks)

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SECTION II (50 Mks)
(Answer any FIVE questions from this section)

17. The table below represents marks scored in a mathematics test.

Marks	10-19	20-29	30-39	40-49	50-59	60-69	70-79
No. of students	2	6	7	13	6	4	2

Using an assumed mean of **44.5**, Determine

- i) Mean marks for the test (3 marks)

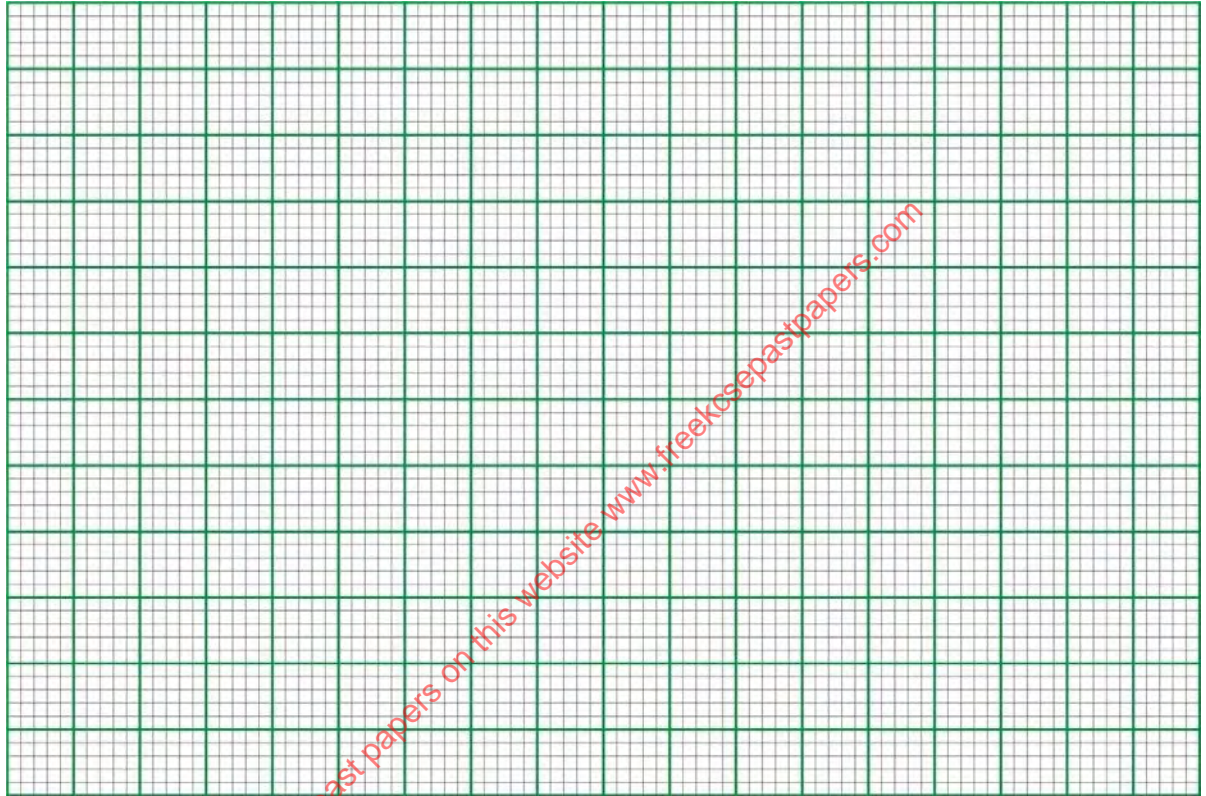
- ii) Standard deviation (4 marks)

- iii) Determine the pass mark if 30% of the students failed the exam. (3 marks)

18. (a) Draw the curve of the function $y = 18 + 3x - x^2$ for $-3 \leq x \leq 5$. (3 marks)

Use a scale of 2cm to represent 1 unit on x axis and 1cm to represent 2 unit on y axis.

x	-3	-2	-1	0	1	2	3	4	5
y									



- (b) Find the actual area bounded by the curve, the x-axis and the line $X=5$. (2 marks)

- (c) By using trapezoidal rule with five ordinates, Estimate the area bounded by the curve, the x-axis and the line $X= 5$. (3 marks)

- (d) Find the percentage error introduced by the approximation. (2 marks)

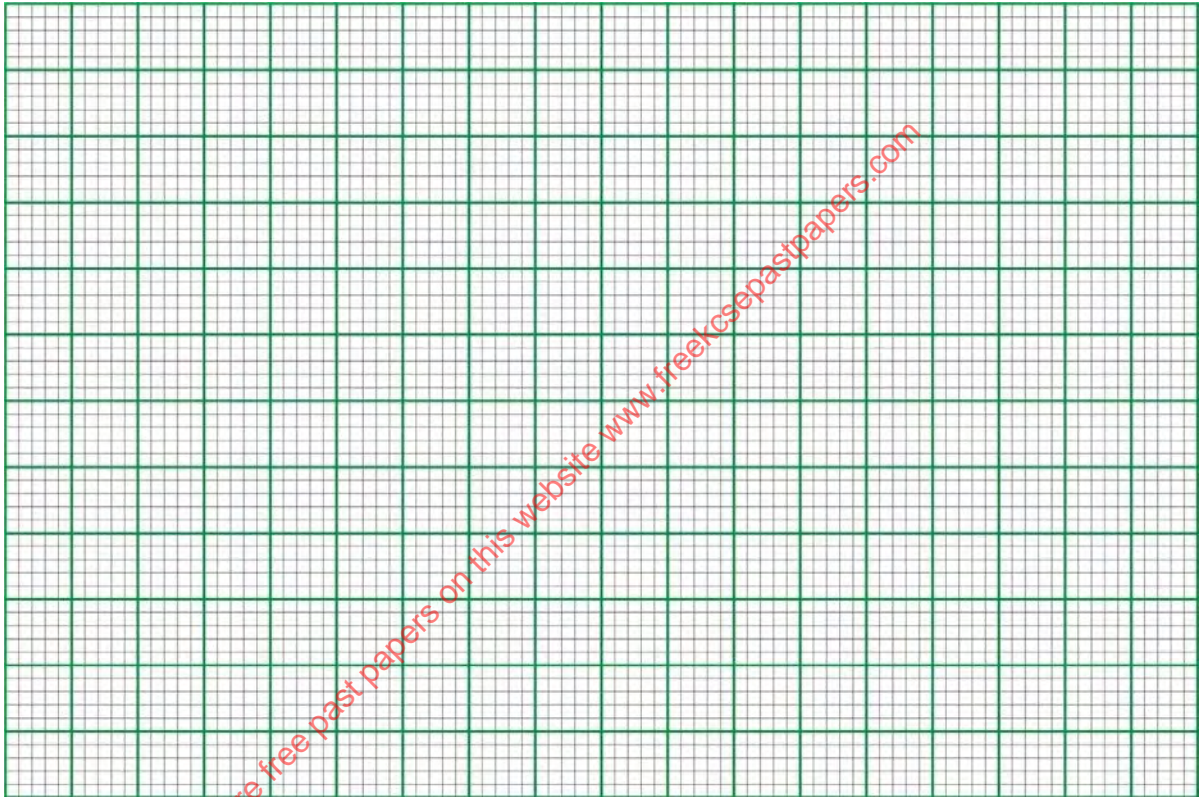
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19. An airplane leaves town **A** (83°N , 155°W) to town **B** (40°N , 25°E) using the shortest route at a speed of 450 knots. (Take $\pi = \frac{22}{7}$ and radius of the earth $\mathbf{R} = 6370\text{km}$).
- (a) (i) Calculate the distance between **A** and **B** in nautical miles. (2 marks)
- (ii) Calculate the time taken to travel from town **A** to **B**. (2 marks)
- (b) From **B**, the plane flies westwards along the latitude to town **C** (40°N , 13°W). Calculate the distance **BC** in kilometers. (3 marks)
- (c) From town **C**, the plane took off at 3:10 pm towards town **D** (10°N , 13°W), at the same speed. At what time did the plane land at **D**? (3 marks)

20. The matrix $\begin{bmatrix} 1 & 2 \\ 0 & 1 \end{bmatrix}$ represent a transformation T, triangle ABC where A(1,1) B(5,1) and C(2,4) is mapped onto $A^1B^1C^1$ by T.

a) i) Find the coordinates of the image $A^1B^1C^1$ of ABC under T. (2 marks)

ii) On the grid provided draw ABC and its image $A^1B^1C^1$ (2 marks)



iii) Describe the transformation T (1 mark)

b) Draw $A^2B^2C^2$ image $A^1B^1C^1$ under an enlargement center (0, 0) scale factor $-\frac{1}{2}$. (2 marks)

c) Find a single matrix that would $A^2B^2C^2$ onto ABC. (3 marks)

21. The probability that Hilda, Lucy and Caroline will be late for breakfast on any one morning are $\frac{1}{4}$, $\frac{1}{3}$ and $\frac{1}{5}$ respectively.

a) Using a probability tree diagram find the probability that:-

(i) None of them will be late (2 marks)

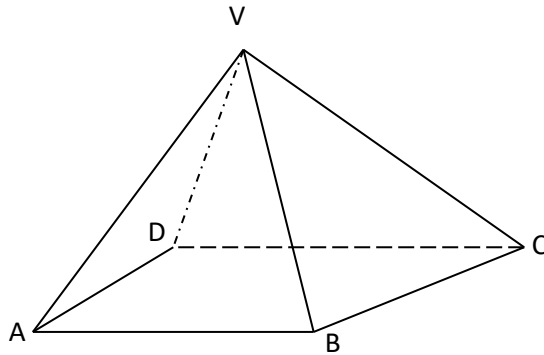
(ii) Only one of them will be late (3 marks)

(iii) At least one of them will be late (3 marks)

(iv) At most one of them will be late (2 marks)

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22. The figure below represents a square based pyramid with equilateral triangles $AB=5\text{cm}$



Calculate the

a) Height of the triangular faces (2 marks)

b) Length of AC (1 mark)

c) Angle between VA and ABCD (2 marks)

d) Angle between VAD and ABCD (2 marks)

e) Angle between VAB and VCD (3 marks)

23. A triangular plot ABC is such that $AB = 36\text{m}$, $BC = 40\text{m}$ and $AC = 42\text{m}$

(a) Calculate

(i) Area of the plot in square metres (3 marks)

(ii) Acute angle between the edges AB and BC (2 marks)

(b) A circular fence passes through vertices A, B and C. A water tap is to be installed inside the plot such that the tap is equidistant from each of the vertices A, B and C. Calculate

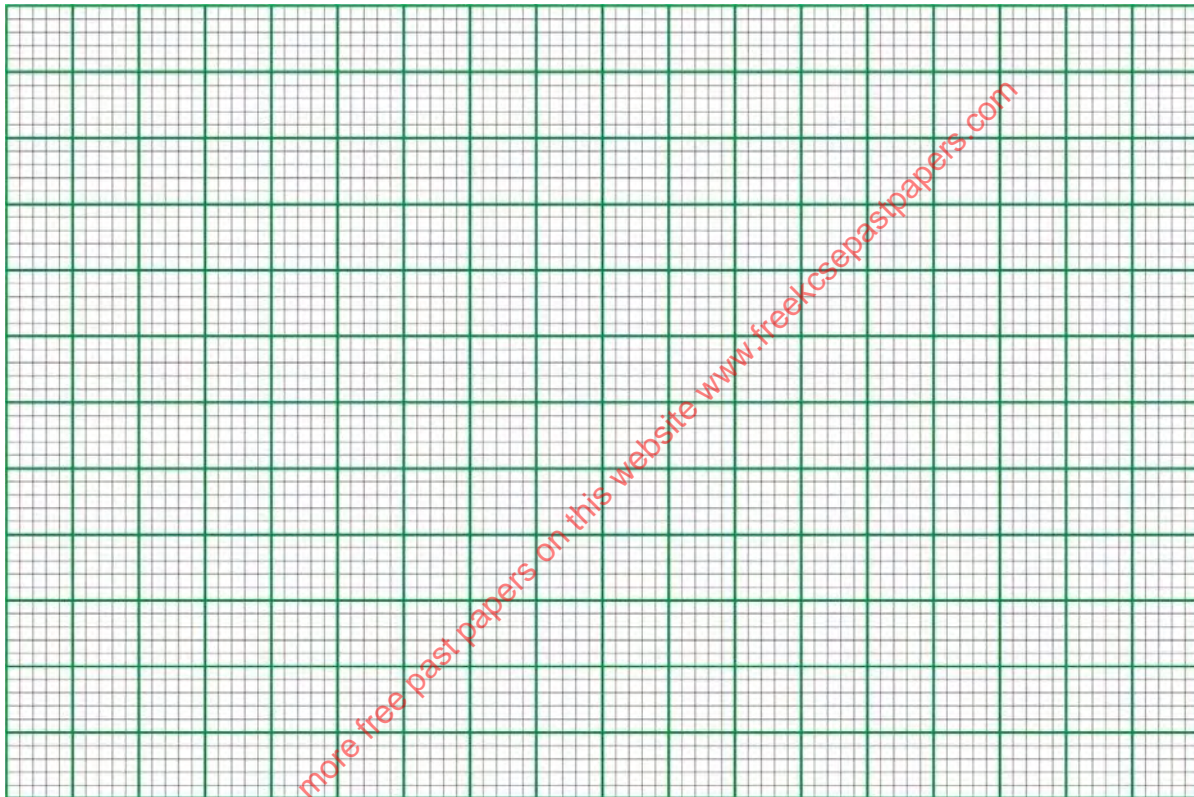
(i) The distance of the tap from vertex A (2 marks)

(ii) The area between the circular fence and the triangular plot (3 marks)

24. Fill the table below for the function $y=x^3+4x^2-x-6$ for $-5 \leq x \leq 3$. (2 marks)

X	-5	-4	-3	-2	-1	0	1	2	3
Y	-26								

a) On the grid provided draw the graph of $y=x^3+4x^2-x-6$ for $-5 \leq x \leq 3$. Use the scale of 1cm to represent 1 unit horizontally and 1cm to represent 10 units vertically. (3 marks)



b) Use your graph to solve the following;

i. $x^3+4x^2-x-6=0$ (2 marks)

ii. $3x^3+12x^2-15x-21=0$ (3 marks)