

NAME:

ADM NO:

CLASS:

GATTU SECONDARY SCHOOL, P.O. BOX 327 – 01030, GATUNDU.**FORM 4 MATHEMATICS P1 END OF TERM 1 EXAMINATION. 2014.**121/1 Mathematics Paper 1. Time: $2\frac{1}{2}$ hours.

Instructions to Candidates.

- i) This Paper contains two sections A and B
- ii) Answer all the questions in A and any five in B.
- iii) Use the space provided below each question to answer the questions.
- iv) All working must be shown.
- v) Slovenly work is highly penalized.
- vi) KNEC Mathematical tables and non-programmable calculators (SILENT) may be used unless where stated otherwise.

SECTION a A (50 marks)

1. Evaluate:-

$$\sqrt{\frac{0.64 \times (1.69)^{\frac{1}{2}}}{(0.04)^{\frac{1}{2}} \times 38.44}}$$

(4mks)

$$\sqrt{\frac{0.64 \times 1.3}{0.2 \times 38.44}}$$

$$\sqrt{\frac{0.832}{7.688}}$$

$$\sqrt{0.10822}$$

$$= \underline{\underline{0.329}}$$

2. Given that $\log y = 3.142$ and $\log x = 2.421$ evaluate $\log x^4 - \frac{3}{4} \log y^3$ (4mks)

$$4 \log x - \frac{3}{4} \log y$$

$$4 \times 3.142 - \frac{3}{4} \times 2.421$$

$$12.568 - 1.818$$

$$= \underline{\underline{10.75}}$$

3. The scale of a map is 1:125,000. What is the actual distance in kilometres represented by 16.8cm on the map? (3mks)

$$16.8 \times 125,000$$

$$\frac{2,100,000}{100 \times 1000}$$

$$\underline{\underline{21 \text{ km}}}$$

4. A line L is perpendicular to the line $y = 3x$. If the line passes through point (0, 4) Find:

a) the gradient of L (1mk)

$$y = 3x$$

$$c = 3$$

$$c_1 = \underline{\underline{-\frac{1}{3}}}$$

b) the equation of L (3mks)

$$\frac{y-4}{x-0} = -\frac{1}{3}$$

$$y-4 = -\frac{1}{3}x$$

$$y = \underline{\underline{-\frac{1}{3}x + 4}}$$

5. A Kite whose vertices are P(0,8) Q(3,3), R(0,1) and S(-3,3) is rotated about the origin through 180° . Find the co-ordinates of its image. (4mks)

$$2 \begin{pmatrix} 0 \\ 0 \end{pmatrix} - \begin{pmatrix} 0 \\ 8 \end{pmatrix} = P'(0, -8)$$

$$\begin{pmatrix} 0 \\ 0 \end{pmatrix} - \begin{pmatrix} 3 \\ 3 \end{pmatrix} = Q'(-3, -3)$$

$$R'(0, -1)$$

$$S(3, -3)$$

6. Factorise completely

a) $2x^2 - 32$

92MKS

$$2(x^2 - 16)$$

$$2 \underline{\underline{\{ (x-4)(x+4) \}}}$$

B) $t^3 + 8t^2 + 12t$

(3mks)

$$t(t^2 + 8t + 12)$$

$$t^2 + 6t + 2t + 12$$

$$t(t+6) + 2(t+6)$$

$$t \underline{\underline{\{ (t+6)(t+2) \}}}$$

7. Solve the following inequalities and illustrate your answer on a number line. (4mks)

$$12 - x \geq 5 \quad \& \quad 5 \leq 2x - 2$$

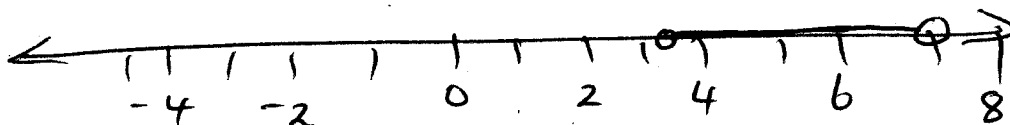
$$12 - x \geq 5$$

$$7 \geq x$$

$$5 \leq 2x - 2$$

$$7 \leq 2x$$

$$3.5 \leq x \leq 7$$



8. Evaluate $\log_5 12.89$ leaving your answer correct to four significant figures. (3mks)

$$\log_5 12.89 = y \quad y = \underline{\underline{1.588}}$$

$$5^y = 12.89$$

$$y \log 5 = \log 12.89$$

$$y = \frac{\log 12.89}{\log 5}$$

$$y = \frac{1.1103}{0.6990}$$

9. Make B the subject of the formula $D = \frac{B^2 A^2 - E^2}{B^2}$ (3mks)

$$D = \frac{B^2 A^2 - E^2}{B^2}$$

$$D B^2 = B^2 A^2 - E^2$$

$$D B^2 - B^2 A^2 = -E^2$$

$$B^2 (D^2 - A^2) = -E^2$$

$$B^2 = \frac{-E^2}{(D^2 - A^2)}$$

$$D = \frac{B^2 A^2 - E^2}{B^2}$$

$$B = \sqrt{\frac{-E^2}{(D^2 - A^2)}}$$

10. Without using calculator evaluate $3^{1/3} - 2^{2/3} \div 1^{5/9}$ (3mks)

$$\frac{10}{3} - \frac{8}{3} \div \frac{14}{9}$$

$$\frac{3}{7} \text{ of } \frac{11}{3} + \frac{25}{7}$$

$$\frac{10}{3} - \frac{8}{3} \times \frac{3}{14}$$

$$\frac{10}{3} - \frac{12}{7} = \frac{70 - 36}{21}$$

$$\frac{11}{28} + \frac{25}{7} = \frac{11 + 100}{28}$$

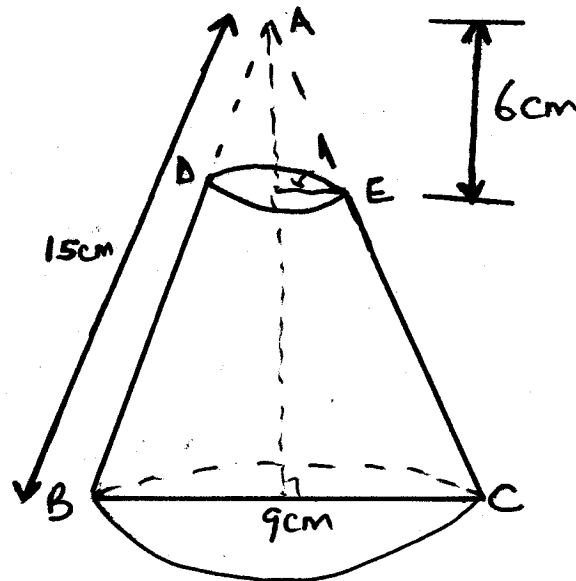
$$3^{1/3} - 2^{2/3} \div 1^{5/9}$$

$$\frac{34}{21} \div \frac{111}{28}$$

$$\frac{34}{21} \times \frac{4}{111}$$

$$= \frac{136}{333} \text{ or } 0.4084$$

11. The figure below is a cone with the vertex at A and diameter BC. The cone is cut off along DE



- a) Find the base radius of the cone ADE

(3mks)

$$h^2 = 15^2 - (4.5)^2$$

$$h^2 = 225 - 20.25$$

$$h^2 = 204.75$$

$$h = 14.3$$

$$\frac{4.5}{r} = \frac{14.3}{6}$$

$$\frac{4.5 \times 6}{14.3} = r$$

$$\frac{27}{14.3} = r$$

$$r = \underline{\underline{1.9 \text{ cm}}}$$

- b) Find the volume of the frustum.

(4mks)

$$V = \frac{1}{3} \pi R^2 H - \frac{1}{3} \pi r^2 h$$

$$V = \frac{1}{3} \times 4.5 \times 4.5 \times 3.142 \times 14.3$$

$$= \underline{\underline{303.28 \text{ cm}^3}}$$

$$\frac{1}{3} \times (1.9)^2 \times 3.142 \times 6$$

$$= 22.69 \text{ cm}^3$$

$$\Rightarrow \begin{array}{r} 303.28 \text{ cm}^3 \\ - 22.69 \text{ cm}^3 \\ \hline \underline{\underline{280.59 \text{ cm}^3}} \end{array}$$

12. Find the sum of eight terms of the series below.

2 + 6 + 18 + _____

(2mks)

$$s_n = \frac{a(r^n - 1)}{r - 1}$$

$$s_8 = \frac{2(3^8 - 1)}{3 - 1}$$

$$\frac{2(6561 - 1)}{2}$$

$$\cancel{2} \times \frac{6560}{\cancel{2}} = \underline{\underline{6560}}$$

13. Points A*(2,4), B(3, 7) and C(5, 13) are three points. State whether the points are collinear.

are three points. State whether the points are collinear. (3mks)

$$AB = \begin{pmatrix} 7 - 2 \\ 3 - 4 \end{pmatrix} = \begin{pmatrix} 5 \\ -1 \end{pmatrix}$$

$$BC = \begin{pmatrix} 5 - 3 \\ 13 - 7 \end{pmatrix} = \begin{pmatrix} 2 \\ 6 \end{pmatrix}$$

$$AC = \begin{pmatrix} 5 - 2 \\ 13 - 4 \end{pmatrix} = \begin{pmatrix} 3 \\ 9 \end{pmatrix}$$

SECTION 'B'

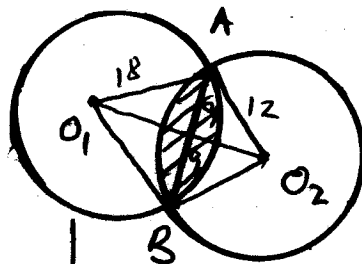
14. The circles with centres O₁ and O₂ have radii 18cm and 12cm respectively and the chord AB is 18cm long.

$$\sqrt{18^2 - 9^2}$$

$$324 - 81$$

$$\sqrt{243}$$

$$\underline{\underline{15.6cm}}$$



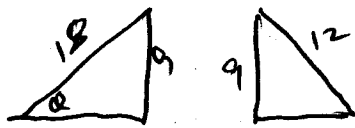
$$\sqrt{44 - 81}$$

$$\sqrt{63} = 7.9$$

$$\begin{array}{r} O_1 O_2 = 7.9 \\ + 15.6 \\ \hline \underline{\underline{23.5cm}} \end{array}$$

a) Find the length $O_1 O_2$

(3mks)



$$\sin \alpha = \frac{9}{18}$$

$$\alpha = 26.6 \times 2$$

$$\alpha = \underline{\underline{53.1^\circ}}$$

$$\sin \alpha = \frac{9}{12}$$

$$\sin \alpha = 0.75$$

$$\underline{\underline{73.7^\circ}}$$

b) Find the common area between the two intersecting circles.

(7mks)

$$\frac{53.1}{360} \times 18 \times 18 \times 3.142$$

$$= \underline{\underline{150.16 \text{ cm}^2}}$$

$$\frac{1}{2} \times 18 \times 18 \sin 53.1$$

$$= 162 \times 0.7996$$

$$= \underline{\underline{129.5 \text{ cm}^2}}$$

$$150.16$$

$$- 129.55$$

$$\hline$$

$$\underline{\underline{20.61 \text{ cm}^2}}$$

$$\frac{73.7}{360} \times 144 \times 3.142$$

$$= \underline{\underline{92.63 \text{ cm}^2}}$$

$$\frac{1}{2} \times 144 \sin 73.7$$

$$= 72 \times 0.9598$$

$$= \underline{\underline{69.11 \text{ cm}^2}}$$

$$92.63 \text{ cm}^2$$

$$- 69.11$$

$$\hline$$

$$\underline{\underline{23.52 \text{ cm}^2}}$$

$$20.61$$

$$+ 23.52$$

$$\hline$$

$$\underline{\underline{44.13 \text{ cm}^2}}$$

15. Find the vertices of a triangle defined by the intersection of the lines.

(5mks)

$$y = x, \quad y - 1 = -3, \quad 3y - 6 = 2 - x$$

$$x = 5$$

$$\underline{\underline{y = x}}$$

x	0	1	2	3	4
y	0	1	2	3	4

$$y - 1 = -3x + 15$$

$$y = -3x + 16$$

x	0	3	4	5
y	16	7	4	1

$$3y = 2 - x + 6$$

$$3y = 8 - x$$

$$y = -\frac{1}{3}x + \frac{8}{3}$$

x	2	5
y	2	1

b) Find the equations of the tangents to the circle $2x^2 + 2y^2 - 4x + 2y - 10 = 0$ which are parallel to the y-axis. (5mks)

$$2x^2 - 4x + 2y^2 + 2y - 10 = 0$$

$$\left(\frac{2}{2}\right)^2 = 2C$$

$$\left(\frac{-4}{2}\right)^2 = 2C$$

$$\frac{16}{4} = 2C$$

$$C = 2$$

$$1 = 2C$$

$$C = \frac{1}{2}$$

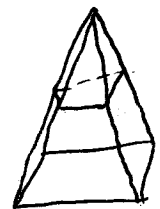
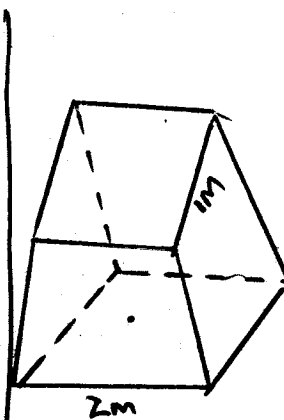
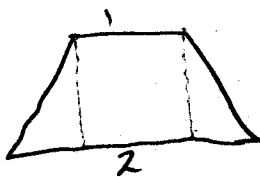
$$(2, 0.5)$$

16) A hopper used in building construction is a frustum of a right pyramid with a square bottom and a square top of side 2m and 1 m respectively. If the height of the hopper is 1.5m, find surface area. (10mks)

$$2 \times 2 = 4 \text{ m}^2$$

$$1 \times 1 = 1 \text{ m}^2$$

$$\underline{\underline{5 \text{ m}^2}}$$

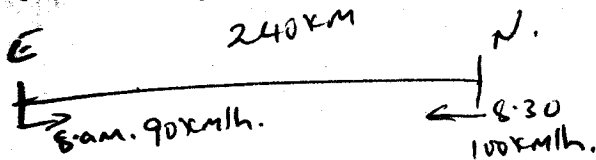


$$s = \frac{d}{t}$$

17. A motorist left Embu for Nairobi a distance of 240 km at 8 a.m. and travelled at an average speed of 90 kph. Another motorist left Nairobi for Embu at 8.30 a.m and travelled at 100 kph. Find

a) The time they met.

(6mks)



$$45 \text{ km.}$$

$$240 - 45 = 195 \text{ km}$$

$$R.S. = 190 \text{ km/h.}$$

$$T = \frac{195}{190} = 1 \text{ hr } 2 \text{ min.}$$

$$\begin{array}{r} 8.30 \\ 1.02 \\ \hline 9.32 \text{ AM} \end{array}$$

b) How far they met from Nairobi.

(4mks)

$$100 \times 1.0263$$

$$\underline{\underline{102.6 \text{ km}}}$$

18. The following are masses of fish in kilogrammes caught by fishermen in one day.

Mass	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39
No of Fish	2	6	20	12	10	5	6	2

Using a frequency distribution table find

a) Mean

(4mks)

b) Median

Class	x	f	fx
0-4	2	2	4
5-9	7	6	42
10-14	12	20	240
15-19	17	12	204
20-24	22	10	220
25-29	27	5	135
30-34	32	6	192
35-39	37	2	74
		$\Sigma f = 63$	$\Sigma fx = 1111$

$$\bar{x} = \frac{1111}{63}$$

$$\bar{x} = \underline{\underline{17.63}}$$

Median

$$14.5 + \left(\frac{4}{12} \times 5\right)$$

(5mks)

$$14.5 + \frac{20}{12}$$

$$14.5 + 1.67$$

$$= \underline{\underline{16.17}}$$

c) State the modal class

10-14

(1mk)

19. Given $y = \sin 3x$ and $y = \cos^2 \frac{1}{3}x$ draw their graphs on the same axis for $0 \leq x \leq 360^\circ$ (6mks)

i) From your graph find:-

a) the period of $y = \sin 3x$

(2mks)

b) the value (s) of x for which $\sin 3x = \cos^2 \frac{1}{3}x$

(2mks)

20. Solve the following pairs of simultaneous equations

i) $4x - 2y = 3$

$3x + y = -3$

$$4x - 2y = 3$$

$$6x + 2y = -6$$

$$\hline 10x = -3$$

$$x = \underline{\underline{-\frac{3}{10}}}$$

$$3x - \frac{3}{10} + y = -3$$

$$-\frac{9}{10} + y = -3$$

$$y = \underline{\underline{-3 + \frac{9}{10}}}$$

$$y = \underline{\underline{-\frac{30+9}{10}}}$$

$$y = \underline{\underline{-\frac{21}{10}}}$$

$$x = \underline{\underline{-\frac{3}{10}}}$$

(3mks)

$$\text{ii) } 3a + 5b = 20$$

$$6a - 5b = 12$$

$$\begin{array}{r} 3a + 5b = 20 \\ 6a - 5b = 12 \\ \hline 9a = 32 \end{array}$$

$$a = \frac{32}{9}$$

$$3\left(\frac{32}{9}\right) + 5b = 20$$

$$\frac{9b}{9} + 5b = 20 \quad (3\text{mks})$$

$$5b = 20 - \frac{9b}{9}$$

$$5b = \frac{180 - 9b}{9}$$

$$5b = \frac{84}{9}$$

$$b = \frac{84}{45}$$

$$b = \frac{84}{45} = 1.87$$

$$a = \frac{32}{9} = 3.5$$

b) Mary has 20 shilling more than Eunice. After Mary spends a $\frac{3}{4}$ of her money and Eunice a $\frac{1}{5}$ of hers, they find that Eunice has ten shillings more than Mary. How much money did each person have at the beginning. (4mks)

$$E = x$$

$$M = 20 + x$$

$$\frac{3}{4}(20 + x) \text{ M.}$$

$$\frac{4}{5}x = E$$

$$\frac{4}{5}x - \frac{3}{4}(20 + x) = 10$$

$$\frac{4}{5}x - \frac{60}{4} - \frac{3}{4}x = 10$$

$$\frac{4}{5}x - \frac{3}{4}x = 10 + \frac{60}{4}$$

$$\frac{16x - 15x}{20} = 25$$

$$\frac{1}{20}x = 25$$

$$x = 25 \times 20$$

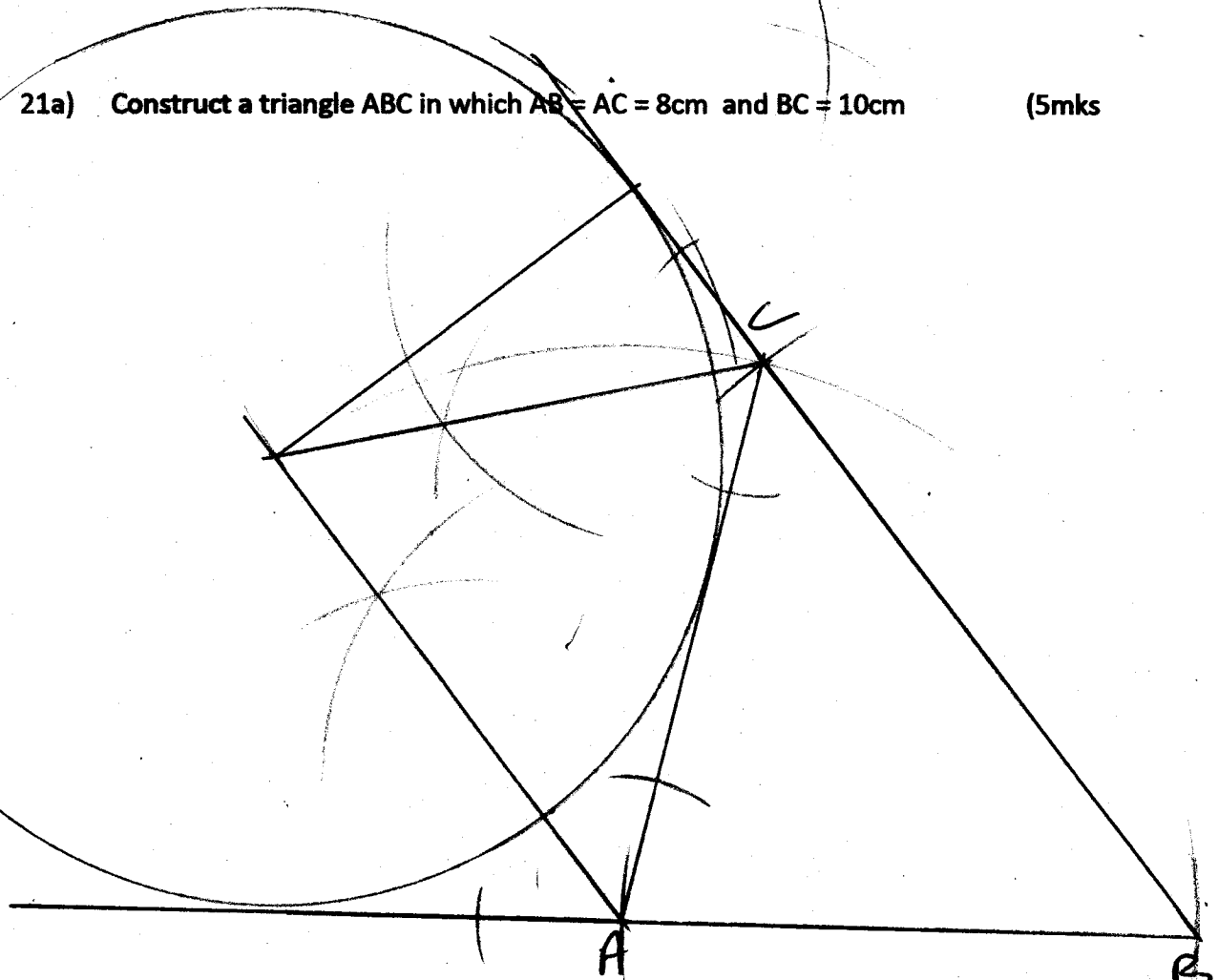
$$x = 500$$

$$E = 500$$

$$M = \underline{\underline{520}}$$

21a) Construct a triangle ABC in which $AB = AC = 8\text{cm}$ and $BC = 10\text{cm}$

(5mks)



b) On the side AC draw an escribed circle and state the radius of the circle.

(5mks)

$$r = \underline{\underline{6.2\text{ cm.}}}$$

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