

**GATTITU SECONDARY SCHOOL P.O. BOX 327 - 01030, GATUNDU.**  
**FORM 3 MATHEMATICS MID TERM EXAMINATION, TERM 2 2013.**

**INSTRUCTIONS:**

NAME: MARION SCHEMBE ADM: \_\_\_\_\_ CLASS: \_\_\_\_\_

- Write your name and admission number in the spaces provided above.
- The paper consists of two sections.
- Answer all the questions in section A and only THREE questions from section B.
- All answers and working must be written on the question paper in the spaces provided.
- Show all the steps in your calculations giving your answer at each stage.
- Marks may be given for correct working even if the answer is wrong.
- Non-programmable silent electronic calculators and KNEC Mathematical tables may be used except where stated otherwise.

**SECTION 'A' (40 marks)**

1. The mean of five numbers is 15 and the mean of further eight nos is 2. Calculate the mean of all the thirteen numbers. (3mks)

$$\begin{aligned}
 15 \times 5 &= 75 \\
 8 \times 2 &= 16 \\
 \hline
 &91 \\
 \\
 \frac{91}{13} \\
 &= 7
 \end{aligned}$$

2. Make X the subject of the formula in  $y + x^2 = (x+t)(x+y)$  (3mks)

$$\begin{aligned}
 y + x^2 &= x^2 + xy + xt + ty \\
 x^2 - x^2 - xy - xt &= ty - y \\
 -x(y+t) &= ty - y \\
 -x &= \frac{ty - y}{y+t} \\
 x &= -\frac{ty - y}{y+t} \\
 x &= \frac{-ty + y}{y+t}
 \end{aligned}$$

3. Find the value of X in the equation  $\log_3 X - 4\log_3 3 = -3$

(4mks)

$$\log_3 x - \frac{1}{4\log_3 x} = -3$$

$$\log_3 x \cdot \log_3 x^4 - 1 = -3 \cdot \log_3 x^4$$

4. Rationalize and simplify

a)

$$\frac{10}{2\sqrt{3} - \sqrt{7}}$$

(2mks)

$$\frac{10(2\sqrt{3} + \sqrt{7})}{(2\sqrt{3} - \sqrt{7})(2\sqrt{3} + \sqrt{7})}$$

$$\frac{-10\sqrt{3} - 10\sqrt{7}}{4}$$

$$\frac{10\sqrt{3} + 10\sqrt{7}}{2 \cdot 3 - 7}$$

$$2 \cdot 3 - 7$$

$$\frac{10\sqrt{3} + 10\sqrt{7}}{4}$$

b)

$$\frac{1}{\sqrt{7} - \sqrt{3}}$$

(2mks)

$$\frac{1(\sqrt{7} + \sqrt{3})}{(\sqrt{7} - \sqrt{3})(\sqrt{7} + \sqrt{3})}$$

$$\frac{\sqrt{7} + \sqrt{3}}{4}$$

$$\frac{\sqrt{7} + \sqrt{3}}{7 - 3}$$

c) Simplify  $(1 + \sqrt{3})(1 - \sqrt{3})$  and hence evaluate

giving your

$$1 - \sqrt{3} + \sqrt{3} - 3$$

$$1 - 3 = -2$$

$$\frac{1(1 - \sqrt{3})}{-2}$$

$$\frac{1}{1 + \sqrt{3}}$$

$$\frac{1 - \sqrt{3}}{-2}$$

$$\frac{-1 + \sqrt{3}}{2}$$

$$\frac{-1 + 1.7321}{2}$$

$$0.7321$$

$$\frac{0.7321}{2} = 0.3660$$

Answer correct to 3 significant figures.

(4mks)

5. Given that  $\log_5 3 = 0.6813$  and  $\log_5 2 = 0.4368$  evaluate  $\log_5 1.5$

(2mks)

$$\log_5 1.5 = \frac{\log_5 3}{\log_5 2}$$

$$\begin{array}{r} 0.6813 \\ - 0.4368 \\ \hline 0.2445 \end{array}$$

$$\underline{\underline{0.2445}}$$

ii)  $\log_5 500$

(2mks)

$$\log_5 5^2 \times 5 \times 2 \times 2$$

$$\begin{array}{r} 2 \cdot 1 \\ \log_5 = 5^3 \times 2^2 \end{array}$$

$$\begin{array}{r} 3.000 \\ 0.4368 \\ 0.4368 \\ \hline 3.8736 \end{array}$$

$$\underline{\underline{3.8736}}$$

6. Given that three numbers X, Y and Z are in the ratio 6:4:5, find the value of

$$\frac{3X - Y}{4Y - Z}$$

(3mks)

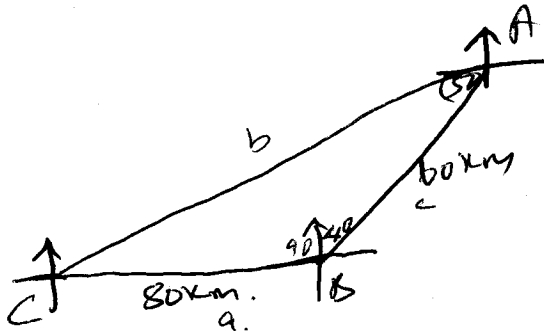
$$\frac{18 - 4}{16 - 5} = \frac{12}{11}$$

7. The dimensions of a rectangle are 20.0cm and 25.0cm. Find the percentage error in calculating the area. (3mks)

$$\begin{array}{r} 20.05 \quad 19.95 \\ 25.05 \quad 24.95 \\ \frac{0.05}{20.0} + \frac{0.05}{25.0} \\ \hline 0.0025 + 0.002 \end{array}$$

$$\begin{array}{r} 0.0045 \times 100 \\ \hline 500 \\ 20.05 \times 25.05 = 502.2525 \\ 19.95 \times 24.95 = 497.7525 \\ \text{W.A.} \quad \hline 500 \\ 2.2525 + 2.2475 \times 100 \\ \hline 500 \\ \frac{4.5}{500} \times 100 = 0.009 \\ = 0.9\% \end{array}$$

8. A ship covers 60km on a bearing of 230°. It then changes course and heads due west for 80km, determine its direct distance from the starting point. (3mks)



$$\begin{aligned} b^2 &= 80^2 + (60)^2 - 2 \times 80 \times 60 \cos 130 \\ b^2 &= 6400 + 3600 - 9600 \times -0.6428 \\ b^2 &= 10,000 + 6,170.76 \\ \sqrt{b^2} &= \sqrt{16,170.76} \\ b &= \underline{\underline{127.16 \text{ km}}} \end{aligned}$$

9. Evaluate

$$43.25 \times 0.9371$$

(3mks)

	Log
$4.325 \times 10^1$	1.6360
$9.371 \times 10^{-1}$	<u>7.9718</u>
	<u>1.6078</u>
$2.64 \times 10^0$	<u>0.4216</u>
	0.2108
$8.43 \times 10^0$	<u>0.9258</u>
	<del>4.1366</del>
	<u>1.2850</u>

$$\begin{array}{r} 0.6078 \\ - 1.1366 \\ \hline 0.4712 \end{array}$$

$$\begin{array}{r} 10^2 \times 2.1028 \\ \hline 210.28 \end{array}$$

$$\begin{array}{r} 10^0 \times 2.9594 \\ \hline 2.9594 \end{array}$$

$$\begin{array}{r} 1.6078 \\ - 1.2850 \\ \hline 2.3228 \end{array}$$

10. Simplify without using tables or a calculator.

(3mks)

$$\frac{\sin 480 - \cos 765}{\tan 225 - (\cos - 330)}$$

$$\frac{\sin 60 - \cos 45}{\tan 45 - (\cos 30)}$$

$$\sin 60 = \frac{\sqrt{3}}{2}$$

$$\cos 45 = \frac{1}{\sqrt{2}}$$

$$\tan 45 = 1$$

$$\cos 30 = \frac{\sqrt{3}}{2}$$

$$\frac{\frac{\sqrt{3}}{2} - \frac{1}{\sqrt{2}}}{1 - \frac{\sqrt{3}}{2}}$$

$$\frac{\frac{\sqrt{6}-2}{2\sqrt{2}} \div \frac{2-\sqrt{3}}{2}}{\frac{\sqrt{6}-2}{2\sqrt{2}} \times \frac{2}{2-\sqrt{3}}}$$

$$\frac{\sqrt{6}-2}{2\sqrt{2}-\sqrt{6}}$$

$$\frac{(\sqrt{6}-2)(2\sqrt{2}+\sqrt{6})}{(2\sqrt{2}-\sqrt{6})(2\sqrt{2}+\sqrt{6})} = \frac{2\sqrt{12}-6-4\sqrt{2}-2\sqrt{6}}{8}$$

11. Find the accumulated amount for sh 20000 invested for 2 years at 12% p.a compounded quarterly.

(3mks)

$$A = P \left(1 + \frac{r}{100}\right)^n$$

$$A = 20,000 \left(1 + \frac{12}{400}\right)^8$$

$$A = 20,000 \left(1.03\right)^8$$

$$20,000 (1.03)^8$$

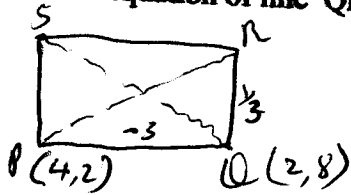
$$20,000 \times 1.26677$$

$$\text{sh } \underline{\underline{25,335.40}}$$

d) Find the co-ordinates of the circumcentre of the triangle ABC. (2mks)

2. A rectangle PQRS has co-ordinates P(4,2) and Q(2,8). Given that the equation of the line PR is  $y = x - 2$ , Find.

3. A) The equation of line QR (3mks)



$$\frac{8-2}{2-4} = \frac{-6}{-2} = 3$$

$$\begin{aligned} \frac{y-8}{x-2} &= \frac{1}{3} \\ y-8 &= \frac{1}{3}x - \frac{2}{3} \\ y &= \frac{1}{3}x - \frac{2}{3} + 8 \\ y &= \frac{1}{3}x + \frac{22}{3} \end{aligned}$$

b) The co-ordinates of R and S (4mks)

$$\begin{aligned} y &= x - 2 \\ y &= \frac{1}{3}x + \frac{22}{3} \\ \hline 0 &= x - \frac{1}{3}x - 2 - \frac{22}{3} \\ \frac{2}{3}x - \frac{28}{3} &= 0 \\ \frac{2}{3}x &= \frac{28}{3} \end{aligned}$$

$$\begin{aligned} x &= 14 \\ y &= 12 \\ R &= (14, 12) \\ P &= (4, 2) \\ \left( \frac{14+4}{2}, \frac{12+2}{2} \right) \\ &= (9, 7) \end{aligned}$$

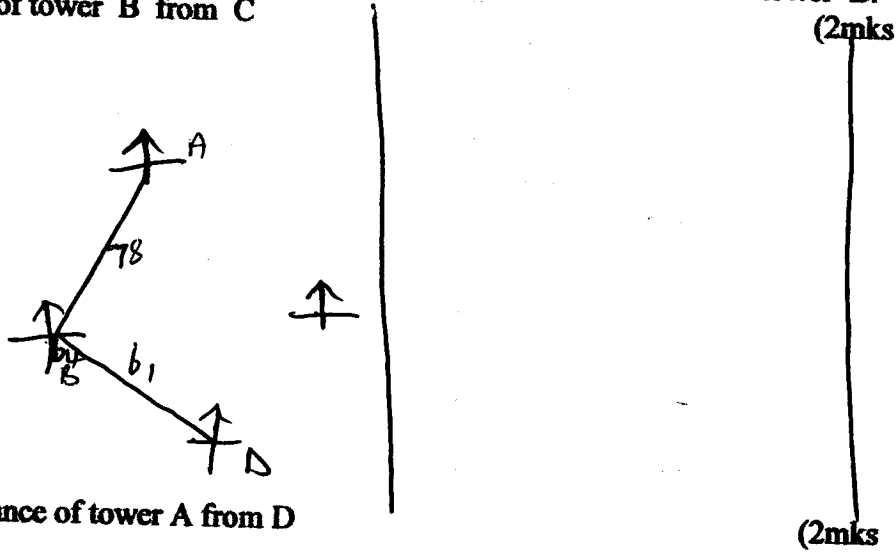
$$\begin{aligned} \frac{7-8}{9-2} &= \frac{-1}{7} \\ \frac{y-8}{x-2} &= -\frac{1}{7} \\ y-8 &= -\frac{1}{7}x + \frac{2}{7} + 8 \\ y &= -\frac{1}{7}x + \frac{58}{7} \end{aligned}$$

c) The area of the rectangle PQRS (3mks)

$$\begin{aligned} \frac{y-2}{x-4} &= \frac{1}{3} \\ y-2 &= \frac{1}{3}x - \frac{4}{3} \\ y &= \frac{1}{3}x - \frac{4}{3} + 2 \\ y &= \frac{1}{3}x + \frac{2}{3} \\ y &= -\frac{1}{7}x + \frac{58}{7} \\ \hline 0 &= \frac{1}{3}x + \frac{1}{7}x + \frac{2}{3} - \frac{58}{7} \\ \frac{7x+3x}{21} + \frac{14-174}{21} & \\ 10x &= +160 \\ x &= 16 \end{aligned}$$

$$\begin{aligned} \frac{16-2}{16-4} &= \frac{14}{12} = \frac{7}{6} \\ y &= \frac{1}{3} \times 16 + \frac{2}{3} \\ y &= \frac{16+2}{3} \\ y &= \frac{18}{3} \\ y &= 6 \\ S &= (16, 6) \end{aligned}$$

3. Four towers A, B, C, and D on a flat ground are in close proximity of each other in a park. Tower B is 78m and on a bearing of  $262^\circ$  from tower A. Tower A is 42m on a bearing of  $288^\circ$  from tower C. Tower D is 61m on a bearing of  $S\ 64^\circ\ E$  from tower B. Calculate:-



i) Distance of tower B from C  
ii) Distance of tower A from D

iii) Given that tower C is 70m high, calculate the angle of depression of the bottom of tower B from the top of tower C. (3mks)

iv) Calculate the shortest distance from the top of tower C to the top of tower A which is 36m high. (3mks)

4. A civil servant earns a basic salary of sh 42,500 p.m. travelling allowance of sh 1950 p.m. and medical allowance of sh 2200 p.m. He is entitled to a tax relief of 1162 p.m. If he pays sh 12,540 as P.A.Y.E, Calculate his taxable house allowance. Use the table below in your calculation. (10mks)

Income Ksh p.a.		Rate per ksh
1	-	5808
5809	-	11280
11281	-	16752
16753	-	22224
22225	and	above

$$\begin{aligned}
 &12,540 \\
 &+ 13,944 \\
 &\hline
 \text{sh } 26,484 \times 12 = 317,808
 \end{aligned}$$

$$\begin{aligned}
 5808 \times 2 &= 11,616 \\
 5472 \times 3 &= 16,416 \\
 5472 \times 4 &= 21,888 \\
 5472 \times 5 &= 27,360 \\
 40,080 \times 6 &= 240,528 \\
 \hline
 &317,808
 \end{aligned}$$

Kf 62,312

$$62,312 \times 20 = \frac{1,246,240}{12}$$

sh 103,853 p.m

$$\begin{aligned}
 &42,500 \\
 &+ 11,950 \\
 &+ 12,200 \\
 &\hline
 \text{sh } \underline{66,650}
 \end{aligned}$$

$$\begin{aligned}
 &103,853 \\
 &- 66,650 \\
 &\hline
 \text{sh } \underline{37,203 \text{ p.m}}
 \end{aligned}$$

