**THE TOP SCHOOLS MULTILATERAL SERIES 2 FORM 4 MIDTERM 1 EXAMS 2024**

**NAME………………………………………………….ADM.NO………….CLASS………….**

**Date …………………**

 **END OF TERM ONE EXAM**

**121/2**

**MATHEMATICS**

Paper 2

March /April

2 ½ Hours

**Instructions to candidates**

1. *Write your* ***name, admission number*** *and* ***class*** *in the spaces provided above.*
2. *sign and write the date of examination in the spaces provided above.*
3. *The paper contains two sections:* ***Section I*** *and* ***Section II****.*
4. *Answer* ***All*** *the questions in* ***section I*** *and* ***strictly any five*** *questions* ***from Section II.***
5. *All answers and working must be written on the question paper in the spaces provided below each question.*
6. *Show all the steps in your calculations, giving your answers at each stage in the spaces below each question.*
7. *Marks may be given for correct working even if the answer is wrong.*
8. *Non-programmable silent electronic calculators and* ***KNEC*** *mathematical tables may be used, unless stated otherwise.*

**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**

**SECTION A ( 50 MARKS )**

***Answer all the questions in this section***

1. Use logarithm table to evaluate. (4 mks)

$$\sqrt[3]{\frac{0.52 ×0.312}{2.12^{2}}}$$

1. 200 cm3 of acid is mixed with 300 cm3 of alcohol. If the densities of acid and alcohol are 1.08g/cm3 and 0.8 g/cm3 respectively, calculate the density of the mixture.

(3 mks)

1. The coordinates of P and Q are P(5, 1) and Q(11, 4) point M divides line PQ in the ratio

2 : 1. Find the magnitude of vector OM. (3 mks)

1. The table below shows income tax rates in a certain year.

|  |  |
| --- | --- |
| Monthly income in Ksh | Tax rate in each Ksh |
| 1 – 9680 | 10% |
| 9681 – 18800 | 15% |
| 18801 – 27920 | 20% |
| 27921 – 37040 | 25% |
| Over 37040 | 30% |

In that year, a monthly personal tax relief of Ksh. 1056 was allowed. Calculate the monthly income tax paid by an employee who earned a monthly salary of Ksh 32500. (4 mks)

1. Make $w$ the subject of the formulae. (3mks)

$$2x = \sqrt{\frac{2w +8}{3w-5}}$$

1. A line passes through points (2, 5) and has a gradient of 2.
2. Determine its equation in the form $y=mx+c$. (2mks)
3. Find the angle it makes with x-axis. (1mk)
4. A quantity **P** is partly constant and partly varies as the cube of **Q**. When **Q**=1, **P**=23 and when **Q** =2, **P**= 44. Find the value of **P** when **Q** = 5. (3mks)
5. The vertices of a triangle are A(1, 2) , B(3, 5) and C(4, 1). The co-ordinates of C’ the image of C under a translation vector T are (6, -2).
6. Determine the translation vector T. (1mk)
7. Find the co-ordinates of A’ and B’ under the translation vector T. 2mks
8. (a) Expand $\left(1 -x\right)^{4}$ using the binomial expansion. 1mk

Use the first three terms of the expansion in (a) above to find the value of (0.98)4

correct to nearest hundredth. 2mks

1. Find the centre and radius of a circle with equation:

 χ² + y² - 6χ + 8y – 11 = 0 (3mks)

1. Two grades of coffee one costing sh.42 per kilogram and the other costing sh.47 per kilogram are to be mixed in order to produce a blend worth sh.46 per kilogram in what proportion should they be mixed. (3mks)
2. Pipe A can fill an empty water tank in 3 hours while pipe B can fill the same tank in 5 hours. While the tank can be emptied by pipe C in 15 hours. Pipe A and B are opened at the same time when the tank is empty. If one hour later pipe C is also opened. Find the total time taken to fill the tank. 4 mks.
3. Simplify the expression: 3mks.

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

1. A business bought 300 kg of tomatoes at Ksh. 30 per kg. He lost 20% due to waste. If he has to make a profit 20%, at how much per kilogram should he sell the tomatoes.

3mks.

1. Evaluate without using a Mathematical table or a calculator.

  (2mks

1. Given that the ratio $x: y = 2:3$, find the ratio $(5x-2y) : (x+y)$ (3 mk)

**SECTION II (50mks)**

**Answer only *five* questions in this section in the spaces provide**

1. Draw the graph of $y= x^{3}+2x^{2}-5x-8$ for values of x in the range $-4\leq x\leq 3$

 5mks

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| $$x$$ | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 |
| $$x^{3}$$ | -64 |  |  |  |  |   |  | 27 |
| $$2x^{2}$$ |  |  |  |  |  |  |  |  |
| $$-5x$$ |  |  |  |  |  |  |  |  |
| $$-8$$ |  |  |  |  |  |  |  |  |
| $$y$$ | -20 |  |  |  |  |  |  |  |



1. By drawing suitable straight line on the same axis, solve the equations.
	* + 1. $x^{3}+2x^{2}-5x-8=0$ 1mks
			2. $ x^{3}+2x^{2}-5x-7=0$ 2mks
			3. $3+3x-2x^{2}-x^{3}=0$ 2mks
2. A transformation represented by the matrix  maps the points A(0, 0), B(2, 0), C(2, 3) and D(0, 3) of the quad ABCD onto A¹B¹C¹D¹ respectively.
3. Draw the quadrilateral ABCD and its image A¹B¹C¹D¹. (3mks)



1. Hence or otherwise determine the area of A¹B¹C¹D¹. (2mks)
2. Another transformation  maps A¹B¹C¹D¹ onto A¹¹B¹¹C¹¹D¹¹.

Draw the image A¹¹B¹¹C¹¹D¹¹. (2mks)

1. Determine the single matrix which maps A¹¹B¹¹C¹¹D¹¹ back to ABCD. (3mks)
2. In the figure **below** (not drawn to scale) AB = 8cm, AC = 6cm, AD = 7cm, CD = 2.82cm and

angle CAB = 50°.

50°

6cm

7cm

8cm

2.82cm

A

D

C

B

Calculate (to 2d.p.)

(a) the length BC. (3 marks)

(b) the size of angle ABC. (3 marks)

(c) size of angle CAD. (3 marks)

(d) Calculate the area of triangle ACD. (2 marks)

1. Three variables P, Q and R are such that P varies directly as Q and inversely as the square of R.
2. When P = 18, Q = 24 and R = 4.

Find P when Q = 30 and R = 10. (3mks)

* 1. Express P in terms of Q and R. (1mk)
	2. If Q is increased by 20% and R is decreased by 10% find:
		1. A simplified expression for the change in P in terms of Q and R. (3mks)
		2. The percentage change in P. (3mks)
1. A surveyor recorded the following information in his field book after taking measurement in metres of a plot.

|  |  |  |
| --- | --- | --- |
|  | To E |  |
| 720 to F240 to G | 1000880640480400200 | 320 to D600 to C400 to B |
|  | From A |  |

1. Sketch the layout of the plot. 4 mks.
2. Calculate the area of the plot in hectares. 6mks
3. A line L passes through points (-2, 3) and (-1,6) and is perpendicular to a line P at (-1,6).
4. Find the equation of L. (2 mks)
5. Find the equation of P in the form ax + by = c, where a, b and c are constant. (2 mks)
6. Given that another line Q is parallel to L and passes through point (1,2) find the x and y intercepts of Q. (3 mks)
7. Find the point of intersection of lines P and Q. (3 mks)
8. The figure below shows a square ABCD point V is vertically above middle of the base ABCD. AB = 10cm and VC = 13cm.



Find;

(a) the length of diagonal AC (2mks)

(b) the height of the pyramid (2mks)

(c) the acute angle between VB and base ABCD. (2mks)

d) the acute angle between BVA and ABCD. (2mks)

e) the angle between AVB and DVC. (2mks)

1. The diagram below represents a conical vessel which stands vertically. The which stands vertically,. The vessels contains water to a depth of 30cm. The radius of the surface in the vessel is 21cm. (Take π=22/7).



 a) Calculate the volume of the water in the vessels in cm3 3mks

b) When a metal sphere is completely submerged in the water, the level of the water in the vessels rises by 6cm.

 Calculate:

 (i) The radius of the new water surface in the vessel; (2mks)

 (ii) The volume of the metal sphere in cm3 (3mks)

 (iii) The radius of the sphere. (3mks)