**EASTERN PROVINCE**

**GATSIBO DISTRICT**

**SECOND TERM EXAMINATION**

**ORDINAL LEVEL: SENIOR 3**

**A/Y: 2022/2023**

**MATHEMATICS EXAMINATION SENIOR THREE**

**MARKS: ……../100 marks**

**PERIOD: THREE HOURS.**

**INSTRUCTIONS:**

1. **Write your names.**
2. **Do not open this paper until you are told to do so.**
3. **This paper has two sections A and B.**

**SECTION A: Attempt ALL questions. (55 marks)**

**SECTION B: Attempt any THREE questions.(45 marks)**

1. **You must use mathematical instruments and a calculator where necessary.**
2. **Show clearly all your working steps. Marks will not award for the answer without all working steps.**
3. **Use a blue or black ink pen only to write your answers and a pencil to draw diagrams.**

**SECTION A: ATTEMPT ALL QUESTIONS. (55 Marks)**

1. Given that $\frac{a+b\sqrt{2}}{c}=\frac{4+\sqrt{2}}{4-\sqrt{2}}$ , find the values of ***a, b*** and ***c. (2 marks)***
2. a) Josephine obtained 95% in a test which was marked out of 60 marks. How many marks did she score out of 60?  ***(2 marks)***

b) A person paid 23,000 FRW for an article whose marked price was 43,000FRW. Calculate the percentage discount. ***(2 marks)***

1. The coordinates of points A and B are $\left(-4,-5\right)$ and $\left(x,y\right)$ respectively. The coordinates of the midpoint of $\overline{AB}$ are $\left(-3,1\right)$. Determine the values of ***x*** and ***y*** . ***(2 marks)***
2. Solve $:\frac{x+1}{x+2}=\frac{x+3}{x-4}$ ***(3 marks)***
3. a) Solve the equation: $81^{x-3}×27^{2-x}=\frac{1}{243^{x}}$ ***(3 marks)***

b) Find the value of *n* when $134\_{n}=54\_{eight}$ ***(3 marks)***

1. solve the inequality and present the set of solution on a number line.

$^{1}/\_{2}\left(x-2\right)\geq 6+x$***(2 marks)***

1. a) Simplify $\frac{12m^{2}-27}{2m+3}$ ***( 2marks)***

b) a regular polygon has an exterior angle of 24o. Determine the number of sides of the polygon. ***(2 marks)***

1. Given the vectors $\vec{a }=\left(\begin{matrix}2\\3\end{matrix}\right), \vec{b }=\left(\begin{matrix}1\\-4\end{matrix}\right) and \vec{c }=\left(\begin{matrix}5\\2\end{matrix}\right)$
2. Calculate the magnitude of $\vec{a }+\vec{b }-\vec{c }$ ***(3 marks)***
3. If $x\vec{a }+y\vec{b }=\vec{c }$, find the values of ***x*** and ***y***. ***(3 marks)***
4. a) The perimeter of triangle below is 30cm. find the value of ***x***. ***(2 marks)***

 A

 $\left(x+1\right)cm \left(4x-7\right)cm$

 B

 $(2x+1)cm$ C

b)Angles A, B and C of the triangle above are in the ratio 2:3:4 respectively. Find the value of each angle.  ***(2 marks)***

1. Given that $f\left(x\right)=x^{2}-4$ and $g\left(x\right)=\sqrt{x}$
2. Evaluate $fg(4)$ ***(3 marks)***
3. Determine the inverse function of $f(x)$ ***(2 marks)***
4. a) a bag contains 12 blue pens and 8 black pens. Find the probability of selecting at random a blue pen.  ***(2 marks)***

b)A man is 24 years older than his son. In two years , his ages will be twice the age of his son. Calculate their ages. ***(2 marks)***

1. Given that ***y*** is inversely proportional to the square of ***x*** and that ***y = 1.25*** hen ***x = 2.*** Determine the value of y when $x=\frac{1}{4}$ ***(3 marks)***
2. Find the total amount of money accumulated after 2 years if 200,000Frw is invested at 5% p.a compound interest. ***(3 marks)***
3. The population of one of the villages in Gatsibo District is approximately linearly related to time. The population was 2,000 in 2010 and 2,600 in 2018. Determine the equation of the line representing this increasing population and estimate the population in 2023. ***(3 marks)***
4. a) Solve $4x^{2}=64$ ***(2 marks)***

b)A set has 128 subsets. How many elements are there in the set? ***(2 marks)***

**SECTION B: ATTEMPT ANY THREE QUESTIONS**. (45 Marks)

1. a)Solve simultaneously by using substitution method : $\left\{\begin{matrix}x+y=5\\x^{2}+y^{2}=13\end{matrix}\right.$ ***(5 marks)***

 b)Solve the equation $ 3x^{3}-2x^{2}-12x+8=0$ ***(10 marks)***

1. Given that of $f(x)=\left(x+1\right)^{2}$ is a quadratic function.
2. Find the vertex of the function and state the axis of symmetry. ***(2 marks)***
3. Show the intercept of the graph of the function. ***(3 marks)***
4. Prepare the table of values for the function for $-4\leq x\leq 2$ ***(6 marks)***
5. Sketch the graph of function *f(x).* ***(4 marks)***
6. a)The perimeter of a rectangle is 28cm. if the diagonal is 10cm. ***(10 marks)***
7. find the area
8. Calculate the value of angle formed by the diagonal and the length of rectangle.

b)Calculate the total surface area and the volume of a ball whose diameter is 28cm. ($π=\frac{22}{7}$)

1. Points $A \left(5,4\right), B\left(2,2\right) $and $C(6,2)$ are vertices of triangle ABC.
2. Represent triangle ABC on the Cartesian plane. ***(3 marks)***
3. Triangle ABC is transformed to $A^{'}B'C'$ under a rotation about the origin of axes, through an angle of 90oanticlockwise.
4. Find the coordinates of $A^{'},B^{'}and C'$. ***(3 marks)***
5. Represent triangle $A'B'C'$ on the Cartesian plane used in part a).  ***(3 marks)***
6. Under a translation , point $A(5,4)$ is transformed to $A''(3,3)$. Find the images of $B\left(2,2\right)and C\left(6,2\right)$ under the same translation.  ***(3 marks)***
7. Under a reflection in a line, point $C(6,2)$ transformed to $C'''(-6,2).$ Find the equation of the mirror line and the images of A and B. ***(3 marks)***
8. The ages of 30 students in form Three class are:

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 17 | 18 | 20 | 20 | 16 | 16 | 16 | 16 | 17 | 18 |
| 20 | 20 | 17 | 20 | 18 | 17 | 16 | 16 | 15 | 17 |
| 18 | 18 | 16 | 16 | 17 | 20 | 20 | 17 | 17 | 17 |

1. Complete the table below ***(12marks)***

|  |  |  |  |
| --- | --- | --- | --- |
| Ages (x) | Frequency (f) | f.x | Cumulative frequency (cf) |
| 15 |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
| 19 |  |  |  |
|  |  |  |  |
|  | $$\sum\_{}^{}f=$$ | $$\sum\_{}^{}fx=$$ |  |

 b) Determine : ***(3 marks)***

1. The model age
2. The range
3. The median age
4. Mean