1. What do you understand by the following terms?

   a) Set c) Set $\mathbb{N}$

   b) Whole numbers d) octal system e) one to one function

2. Let D be a set such that
   D= {Even numbers that are greater than 5 but less or equal than 10}

i) Use Roaster form to represent these numbers

ii) Represent the numbers in Venn diagram

3. The Venn diagram shown in the following figure shows the number of students of senior one in G.S. Marie- Reine who study Mathematics (M), Physics (P), and Kinyarwanda

(K).

a) How many students study both Kinyarwanda and Physics?

b) How many students study all 3 subjects?

c) How many students study Physics or Math?

d) How many students study Mathematics only?

4. The relation $\mathcal{R}$ is defined from D= $\{x; x \in \mathbb{N}\ and 0 \leq x < 7\}$to E= $\{y; y \in \mathbb{N}\ and\ y \leq 8\}\ by\ \ y = x + 1$

   a) Define, in roaster form, D and E.

   b) Draw the sagittal diagram of $\mathcal{R}$

   c) Which type of application is there in $\mathcal{R}$

P

K

d) Find the domain of definition and range of $\mathcal{R}$

5. The function f is defined as f: x→ $5x - 3$

   a) Evaluate the following: f(1) =

      f(0) =

   b) Solve the following equations : f(q) = 7

      f(r) = 0

6. Given that f(x) = 2x+3 and g(x) = 3(x+5), Find (gof) (x) + (fog)(-2) + $[g(g(x))]^{-1}$ (-4)

7. The Cartesian product of sets A and B is $A \times B = \{(2,3), (6, a)(7,3), (4, a), (5,3)\}$

   i. Use a Venn diagram to represent the relation of A and B

   ii. Determine whether A and B are jointed sets or not.

   iii. Find $(A \times B)^{-1}$

   iv. Find $(A \cup B) \cap C$ if the set C $= \{even\ numbers\ less\ than\ 7\}$

8. The relation $\mathcal{R}$ is defined in the universal set $\mathscr{E} = \{a, b, d, i, 3,4,5,6,7,8,9\}$ by

$\{(a, b), (b, d), (d, d), (i, b), (3,3), (a, d), (i, i), (b, b), (a, a), (i, d), (8,9)\}$

   - Draw the papygram of $\mathcal{R}$
   - Is $\mathcal{R}$ reflexive, symmetric, anti-symmetric, transitive or equivalence relation?

a) Find $\bar{A}$ if $A = \{1,3, b, 4,6,7, d\}$

b) Find n($\bar{A}$)?

c) For $A\Delta B = \{b, d, 1,4,3,6,9,7,12,0\}$, list all elements of the set B.

d) Show that $\overline{A \cup B} = \bar{A} \cap B$ (referring to De Morgan's law)

9. Find the **HCF** and **LCM** of 80 and 36

a) Find the area of square whose perimeter is 196 dm

b) Find the square root of 343396 without using calculator

c) If Z= 10^2 , Q=10^{-2} and R= 10^{-1} Find the value of $\frac{ZQ}{R}$

10. Simplify without using calculator

$$\left(\frac{5^6}{5^2}\right)\frac{\frac{1}{3}(5^3 \times 2^3 \times 5^{-2} \times 2^{-3})}{5^2}$$

11. Given three collinear points A,B, and C such that A is between B and C. If BC= 17cm, BA= 6x+3 and AC=-2(-X+2). Find: a. the value of x b. BA c. BC

12. Find the value of x

$$-[-(-x+3)]+4-3(3x-2)+12x-1=-2x(-2x-1)$$

13. Work out: $7ADD_{forteen}-352_{seven}+361=$ ……$_{two}$

14. The interior angle of a polygon is 120 degrees more than the exterior angle. Find:
    a) The size of each angle of that polygon if it is regular
    b) How many sides have the polygon?
    c) Find its interior angles sum
    d) Name that polygon

15. Use the method of continued division to find the HCF of 162,248 and 1032

16. Given that $x = 2.\overline{25}$
    a) Name the type of decimal fraction represented by x
    b) Is x recurring or terminating?
    c) Find : $(3.252525 \ldots - x)$
    d) Express x as a fraction
    e) Write x in standard form (Scientific notation)

17. Find the value of x . If; $\frac{2(2x-1)}{3} = 5 - \frac{3(x+3)}{2} + \frac{x}{4}$

18. If $m = -2,\ n = 3\ and\ p = 5$, find the value of $\frac{2m^2 - 3n + 2p}{mnp}$

19. Find the perimeter of square whose area is 22201 dm^2

20. a) Change 178_{nine} in base two

    b) $64_p = 1000000_{two}$, find the value of base p

    c) Work out: $eet_{twelve} + 998C_{fifteen} + 774_{eight} =$……$_{six}$

    d) Find the answer in *the octal system (base eight)* $790_{ten} + 235_{six} - 102_{three} =$

21. Given the function $f(x) = \frac{2x-4}{4}$ find the inverse function $f^{-1}(x)$

22. The following figure is a square ABCD with length of side is 7m. The arcs have centers A and C. The radius is equal to the length of side of the square. If $\pi = \frac{22}{7}$, calculate the area of shaded part.

23. Write in expanded form

$(3 - x^2)(3 - 2x)(1 + x)$

24. In 5 days, five men take 14 hours a day to mow the school compound. How long will it take 10 men working for 7 hours a day to mow that school compound?

25. Peter invests 1 000 000 frw at a compound interest rate of 7% per month for 5 months. After 5 months he withdraws all his money and invests it for 7 months in another bank that gives 9% compound interest rate per month. How much money will he get?

26. The following graph shows how the man spends his monthly salary.

i. Calculate the man's salary if he spends 60 000 frw for rent.
ii. What is the angle of savings?
iii. What is total he spends on food?
iv. How much more did the man spend on cloths than transport?
v. What's percentage of money he spends trasport?

27. ABCD as shown in figure is a rectangle, where the length is 44cm and the width is 15cm.

I f it is curved in such way that AD and BC come together and they form the cylindrical figure within the cone.

a) Calculate the area and volume of the cone formed
b) Calculate the area and volume of the cylinder formed

28. The figure below is a tetrahedron pyramid

Given that AB = 13cm,AD = 4.5cm, DO = OX = 7.5cm, AX = 11cm and DX=7cm, Find its volume

29. ABCDE as shown in figure is a polygon. Find the value of x and the sizes of angles $\hat{A}$, $\hat{C}$ and $\hat{E}$

30. The figure below is trapezoidal prism:

Calculate : i) the volume

ii) the surface area of the prism

31. Given the following figure

Calculate: a) The area

b) The perimeter

32. Simplify completely

$$\frac{[(a)^b \div c^m]c^e \times f}{c^k}$$

If a =128 ,b = $\frac{1}{6}$, c =2 , m = $\frac{6}{7}$, e = $-\frac{13}{42}$, f =4096 , k =12

33. Show that

$$\frac{(2a)^2 + 2a\,[-2a + 4ab(a+b)^3]}{4a^2(2a^3b + 6a^2b^2 + 6ab^3 + 2b^4)} = 1$$

34. Factorize the following expressions

i. $4x^2-16$

ii. $x^2+ 10xy +25y^2$

35. Below are marks obtained by senior one students after doing a test out of 20 marks.

10 5 0 19 17 5 12 10 10

19 9 0 12 10 9 10 0 5

a) Complete the following frequency table using the above marks

Number of pupils (x)	Frequency (f)	Fx
0		
5		
9		
10		
12		
17		
19		

b) Find the sum of fx

c) Calculate the mean mark

36. a) John's home is about 200m North East for his school. Draw the diagram showing john's home (use the scale 1cm = 50m)

b) Peter's home is about 150m further, and on the bearing of S45^{0}E, from John's home. Use a scale drawing to find the distance between Peter's home and John's school.

37. In 5 days, five men take 14 hours a day to mow the school compound. How long will it take 10 men working for 7 hours a day to mow that school compound?

38. The major arc of a circle is 343cm. The minor sector of that circle is constructed on 60^0 and the perimeter of circle (circumference) is 471cm. Use π= 3.14 and find:
    i. The area of a circle
    ii. The area of major sector

39. Without using calculator, calculate the square root of 9773892769

40. M(x,y) and N(5,3)are points in a Cartesian plane. If N is joined to M, the midpoint K of MN is (7, 2).

    a) Find the value of x and y

b) Find the length MK

41. An island has the diameter of 96 km.

a) If the same diameter is represented by 48cm on the map, what is the scale of the map?

b) What is the diameter of the larger island whose diameter on the map is 72 cm?

42)Simplify completely

$$\frac{2}{x+2}+\frac{x-6}{4-x^2}$$ 4 marks

43) (a)Find n if $103_n+26_n=131_n$

(b) Simplify $\frac{3\sqrt{5}.\sqrt{20}}{\sqrt{50}.\sqrt{18}}$

(c) Simplify , without using calculator:

$$2\frac{1}{2}:\frac{4\frac{1}{3}-2\frac{1}{4}}{4\frac{1}{6}}$$ 6 marks

44)Use elimination method to solve the simultaneous equations

$$\begin{cases}3x+y=8\\x-3y=0\end{cases}$$ (6marks)

45) Write an equation for each of the following lines (8marks)

a) Line passing through the point (-1,3)and perpendicular to line y =5x -3
b) Line passing through point (o,-2) and parallel to the 2y-3x-3=o
c) Vertical line passing through the point (5,-3)
d)The line passing through the point A (1,0)and B(a,2) is parallel to the line 2y = 3x + 4,Find the value of a. 8 marks

46) Given the functions f (x) = 3x-1 and g(x) = $\frac{x+1}{3}$ (5marks)

a) Find (gof) (x)
b) What is the composite function gof called?
c) Graph (gof) (x) for x $\in$ {-2,-1,0,1,2} 6 marks

47)In a class of 40 pupils, 26 play football and 20 play volleyball, 17 play both games. How many pupils play no game at all? 6 marks

48)a) Solve $2x^4+4x^3-10x^2-12x=0$

b) One of the roots of $ax^2+5x+2=0$ is -2 , find the other root. 8 marks

49)(a) Find a , b and c in the following equation $ax^2+(b-3)x+2c-1=x^2-5x+7$

(b) Factorize $2x^3+9x^2+7x-6$

(c) Simplify completely : $\frac{4x^2-1}{4x^2-4x+1}$ 6 marks

50)Find the base n if $201_n-34_n=134_n$, where $n \epsilon N$ 6 marks

51)The expression $2x^3+ax^2+bx+6$ is exactly divisible by x-2, and on division by x+1 gives a remainder of -12 . Calculate the values of a and b and factorize the expression completely. 6 marks

52)Solve the simultaneous equations

$$\begin{cases} x+y=3 \\ 2x^2+y^2+3x=15 \end{cases}$$ 8 marks

53) Given the polynomial

$P(x)=2x^5+4x^4-5x^3-1ox^2+3x+6$,

(a) Show that x+2 is a factor of p(x)

(b) Use synthetic division to find the other factor q(x)

(c) Use long division to find the quotient and the remainder of the division of q(x) by $2x^2-3$

(d) Hence, factorize completely p(x) 15 marks

(e) Solve the equation p(x)=0 15 marks

54) Given the points in Cartesian plane A(1,2) ; B(-2,1) and C(O,-3)

a) Represent the triangle ABC

b) Find the equation of line AB

C) Determine the intersection points of the line AB with x-axis and y-axis 15 marks

55) A stone was thrown vertically upwards and its height above the ground was measured at various times . The table below shows the results obtained :

Time (s)	o	1	2	3	4	5	6	7	8
Height (m)	o	35	60	75	80	75	60	35	0

(a) Plot a graph of height on the y-axis against time on the x-axis.

(b) From the graph, find:

i) The maximum height reached

ii) The time taken to reach the maximum height

iii) The speed of the stone at the maximum height 15 marks

56. Show that the points P(1,2) ,Q(o,-1) and R(-2,-7) are collinear

57. Given that vectors $\vec{u} = \binom{2}{x}$ and $\vec{v} = \binom{x+y}{3}$ are equal, find the values of x and y. Hence, calculate $\|\vec{u} + \vec{v}\|$

58.Given the points A(9,7) ; B(1,5) ; C(-1,-3) and D(7,-1) , use vectors to show that lines AC and BD are perpendicular

59. Find the mid-point M of the line joining the points A(1,0) and B(9,6) . Find length $\overline{MB}$

60. Given triangle ABC, where A(-5,-1), B(-2,-1) and C(-3,-4)

a) Plot points A,B and C in the plane

b) Draw :

i) Triangle A'B'C', the image of ABC under central symmetry about the origin.

ii) Triangle A"B"C", image of ABC under the reflection in the y- axis.

iii) Triangle MNP, image of ABC under reflection in the line AC.

iv) Triangle RST under the translation of triangle ABC through vector $\vec{u} = \binom{0}{4}$

v) Find the coordinates of UVW, the image of triangle about the origin of axes, through -90^0.

61 . Points A(1,1) , B(3,4) and C(3,1) are vertices of triangle ABC .

(a) Use the graph paper and represent triangle ABC on the Cartesian plane.

(b) Triangle ABC is transformed to A'B'C' under a rotation about the vertex C , through an angle of -90^0 .

(i)Find the coordinates of A', B' and C'

(ii) Represent triangle A'B'C' on the Cartesian plane used in part 18 (a).

(c) Under a translation , point A(1,1) is transformed to (3 , -2) . Find the images of B(2,2) and C(6,2) under the same translation.

(d) Under a reflection in a line , point C is transformed to (3,4) . Find the equation of the mirror line and the images of A and B.

61. The vertices of triangle ABC are :A(-3,0), B(-1,-2) and C(1,1) (14marks)

a. On a cartesian plane plot points A,B and C. Join the points to form triangle ABC.

b. T = $\begin{pmatrix} 6 \\ 2 \end{pmatrix}$ is a translation ;

i. Write the coordinates of points A',B'and C' the images of A, B, and C under translation T.

ii. Plot the coordinates A',B'and C'on the same cartesian plane as that of question 2(a) . Join the points to form triangle A'B'C'

iii. What has changed about triangle ABC after translation

iv. Which properties of triangle ABC have remained the same under translation T?

c. i) Write the coordinates of A", B" and C" the images of points A, B and C under reflection in y-axis

ii) Plot the points on the same Cartesian plane as of 6(a). Join the points to form triangle A"B"C"

1. Triangle ABC such that A(5,1), B(1,2), C(3,4) is rotated through 90º about K(1,0) as the centre of rotation to give the image A',B',C'.
Determine the Coordinates of the vertices of the image.

23. Simplify , without using calculator:

$$A=\frac{(-2)^{13}(-6)^{11}(-3)^{16}}{18^{10}(-12)^{9}}$$

64. . if n(PUQ)=17 , n(P) =13 and n(Q) = 8 , find n(P∩Q)

65. If $5^x.25^{2y} = 1$ and $3^{5x}.9^y = \frac{1}{9}$ Calculate the value of x and y

66. The mean of three numbers is 3 and the sum of the smallest and the middle is 5. Find the largest number.

67. Rationalize the denominator: $\frac{10}{3\sqrt{2}-\sqrt{3}}$

68. Solve in R : $\frac{6}{x}+\frac{x}{2}=4$

69 . Solve in R^2 : $a)\begin{cases} 3x-2y \leq -2 \\ 2x+3y > -6 \end{cases}$ b) $\frac{x^2-4}{x^2-9} \leq 0$ c)$x^5=x$

70 .In a class of 40 students , 24 like Mathematics and 30 like Kinyarwanda . All students like at least one of the subjects. Draw a Venn diagram to represent this information. How many students like both Mathematics and Kinyarwanda ?

71. The cubic polynomial $6x^3+7x^2+ax+b$ has a remainder of 72 when divided by (x-2) and is exactly divisible by (x+1) .Calculate a and b. Show that (2x-1) is also a factor of the polynomial and obtain the third factor.

72Simplify : $\frac{8^{n+2}X2^{2n-2}}{2^nX4^{\frac{n}{2}}}$ 3 marks

73. A student got 80; 65; 78 and 92 in four tests. What is the minimum score he must get in his next test to ensure an average of 80? 3 marks
74. In a school there is enough food to feed 200 students for 15 days. For how long will the food last if 50 more students join the school? 3 marks
75. Solve the following inequality and illustrate the solution on the number line : $\frac{1}{3}x-(x+1)\geq 3$. 3 marks
76. Given that the operation * is defined by the relation a*b = a+b+ab , evaluate 2*(1*3) 3 marks
77. $\frac{6}{3\sqrt{2}-2\sqrt{3}} = a\sqrt{2} + b\sqrt{3}$, find the values of a and b. 3 marks
78. Find the point of intersection of the lines y=2x-3 and y=-x-3. Calculate the area of triangle enclosed between the two lines and the x-axis .

! Hint: construct the above situation in Cartesian plan 3 marks

79. The functions f(x) and g(x) are defined as f(x) = x+2 , and g(x) = $\frac{x^2}{4}$. find the values of x for which fg(x) = 3 3 marks
80. (i) find the equation of the line parallel to 2y-3x-3=0 which passes through point (0;-2)

(ii) find the equation of the line perpendicular to x-2y+4=0 which passes through point (2;-1)

(iii) find the equation of the line passing through A(2;3) and B(4;3)

(iv) find the equation of horizontal line passing through A(-7;-2) 7 marks

81. A:B:C is a ratio . A:B=5:3 and B:C = 4:7 . Divide 212 kg in the ratio A:B:C.

82. a)Solve for x and y : $\begin{cases} x+y=2a \\ x-y=2b \end{cases}$ 3 marks

b) solve graphically : $\begin{cases} 2x + y \succ 2 \\ x + y \leq 1 \end{cases}$ 3 marks

83. The expression $2x^3+ax^2+bx+6$ is exactly divisible by x-2, and on division by x+1 gives a remainder of -12 . Calculate the values of a and b and factorize the expression completely. 5 marks
84. Calculate the distance between the origin and the point p(6,8) 3 marks
85. Given 2 positive numbers x and y .

Assume that $A=\frac{1}{2}(x+y)$: arithmetic mean

$G=\sqrt{xy}$ geometric mean

and $\frac{2}{H}=\frac{1}{x}+\frac{1}{y}$: harmonic mean

Prove that $G^2 = A.H$ 3 marks

86. A family spends its income on the following items in a month.

Item	Food	Rent	transport	Others
Amount(frw)	35,000	12,000	10,000	15,000

Show the family's expenditure in a pie-chart. 4 marks

87. A stone was thrown vertically upwards and its height above the ground was measured at various times. The table below shows the results obtained:

Time (s)	0	1	2	3	4	5	6	7	8
Height(m)	0	35	60	75	80	75	60	35	0

(a) Plot a graph of height on the y-axis against time on the x-axis .

(b) From the graph , find :

(i) the maximum height reached.

(ii) the time taken to reach the maximum height

(iii) the speed of the stone at the maximum height. 15 marks

88. . The table below shows the ages of 31 secondary school students :

15	14	15	16	17	18	14	20	17
16	20	17	19	19	14	15	20	14
18	19	17	20	17	14	14	15	18
20	19	14	19					

(a) Copy the table below and complete it .

Ages (x)	Frequency (f)	Fx	Commutative frequency
	$\sum f =$	$\sum fx =$	

(b) State the mode.

(c) Find the median age .

(d) Calculate the average age. 15 marks

89. . Given the polynomial $p(x) = 9x^4 - 36x^3 + 29x^2 + 14x$

a) Determine 2 real numbers a and b if $p(x) = a(x^2-2x)^2 + b(x^2-2x)$

b) Deduce the factorization of p(x) and solve p(x) = 0 15 marks

90. . i)Find the simultaneous inequalities which correspond to the following no dashed region

10 marks

ii) Calculate the area of dashed region

5 marks

91. . i)Solve the simultaneous equations: $\begin{cases} x+y=3 \\ 2x^2+y^2+3x=15 \end{cases}$ 10 marks

ii)Solve for x in the equation : $\frac{x}{3} - \frac{3x-7}{5} = \frac{x-2}{6}$ 5 marks

92. . Given that $x^2-y^2 = 135$, and x-y = 9. Find the values of x and y.

93. . Write an equation for each of the following lines (8marks)

d) Line passing through the point (-1,3)and perpendicular to line y =5x -3

e) Line passing through point (2,1) and parallel to the y = $\frac{2x}{3}+\frac{5}{8}$

f) Vertical line passing through the point (5,-3)

d)The line passing through the point A (1,0)and B(a,2) is parallel to the line 2y = 3x + 4,Find the value of a.

94. Use Crammer's rule to solve the simultaneous equations

$\begin{cases} 3x+y=5 \\ 2x+3y=8 \end{cases}$ (8marks)

95. Show on a graph the region that contains the solutions of the following simultaneous in equalities,

$\begin{cases} 2x+3y \prec 6 \\ y-2x \leq 2 \end{cases}$ (9marks)

96. I n a group of 10 people , 7 people speak English , 4 speak French and 2 speak neither of the two languages . How many people speak both languages?

(b) Given that $124_n = 52_{ten}$, determine the value of the natural number n. (9marks)

97. The vertices of triangle ABC are :A(-3,0), B(-1,-2) and C(1,1) (14marks)

a. On a cartesian plane plot points A,B and C. Join the points to form triangle ABC.

b. T = $\begin{pmatrix} 6 \\ 2 \end{pmatrix}$ is a translation ;

i. Write the coordinates of points A',B'and C' the images of A, B, and C under translation T.

ii. Plot the coordinates A',B'and C'on the same carte sian plane as that of question 2(a) . Join the points to form triangle A'B'C'

iii. What has changed about triangle ABC after translation

iv. Which properties of triangle ABC have remained the same under translation T?

c. i) Write the coordinates of A", B" and C" the images of points A, B and C under reflection in y-axis

ii) Plot the points on the same Cartesian plane as of 6(a). Join the points to form triangle A"B"C" 13 marks

98. Triangle ABC such that A(5,1), B(1,2), C(3,4) is rotated through 90º about K(1,0) as the centre of rotation to give the image A',B',C'. Determine the Coordinates of the vertices of the image. 13 marks

99. In a class of 40 pupils, 26 play football and 20 play volleyball, 17 play both games. How many pupils play no game at all? 13 marks

100. a) Solve $2x^4+4x^3-10x^2-12x=0$

b) One of the roots of $ax^2+5x+2=0$ is -2 , find the other root. 13 marks

101. (a) Find a , b and c in the following equation $ax^2+(b-3)x+2c-1=x^2-5x+7$

(b) Factorise $2x^3+9x^2+7x-6$

(c) Simplify completely : $\frac{4x^2-1}{4x^2-4x+1}$ 13 marks

102. . (a) Evaluate and simplify $2\frac{1}{2} : \frac{4\frac{1}{3}-2\frac{1}{4}}{4\frac{1}{6}}$

8 marks

(b) Evaluate without using a calculator $\sqrt{27}-\sqrt{3}-\sqrt{12}-\sqrt{2}.\sqrt{8}+\frac{\sqrt{75}}{\sqrt{3}}$

103. Rationalize the denominator: $\frac{3-\sqrt{3}}{1+\sqrt{3}}$ 5 Marks

104. Given the proportion $\frac{6x-3y}{7x+2y} = \frac{3}{4}$, calculate the value of $\frac{x}{y}$ 5 marks

105. . Assume $f(x) = 4x^3-7x^2-21x+18$, a polynomial

a) Calculate f (-2)

b) Factorise f(x) 10 Marks

106. Consider f(x) = ax + b find the value of f(-2) if f(0) = -3 and f(-4) = 13 5 marks

107. Find the base n if $201_n-34_n=134_n$, where $n \epsilon N$

108. Given that f(x)=5x-2 and g(x)=-x-1

Find: i)$(f_o g)(x)$ ii) $g(f(\frac{2}{5}))$ iii) $(g_o f)(x)$

b)Given $f(x)=2x^2-2x$ and g(x)=x+3 , solve the equation f[g(x)]=0

109. . a)Factorise $A(x)=x^3-5x^2+2x+8$

$B(X)=(X+1)^2-(4X-3)^2$ 5 marks

110. a) If m=-2 , n=5 and x=-3 , calculate the value of $xm^2+2n-mnx$

b) Simplify completely the following expression: $\frac{x(2x+3)-(2x+3)(x-3)}{2x+3}$

c) Given that : $27^{3x}=81^{2+x}$, find the value of x

d) Demonstrate that $A=\frac{1}{7+\sqrt{2}}+\frac{1}{7-\sqrt{2}}$ / 15 marks

111. .a) Solve in R: i)$(3x+10)^2=25$

ii)$\frac{x+2}{x} < 3$

b) Solve the inequality $\frac{1}{3}x - (x+1) \geq 3$ and illustrate the answer on graph.

/15 marks

112. .

a) Complete the table below

X	0	2	3		10	15
Y	3	7	9	15		

b) Establish the equation between x and y .

c) Represent graphically the answer 12(b). .

113. . Without using calculator , evaluate : $\frac{32.135^2-17.865^2}{0.7135}$ **(3marks)**

114. **.**A map is drawn to a scale of 1 :250,000.Find actual distance in km , of a piece of a road represented by 3.6cm on the map. **(3marks)**

115. . Given that a^2-b^2 = 63 and (a+b) = 21 find the values of a and b. (3marks)

116. **. i)** Given that f(x) = ax^2+bx , f(1) = 5 and f(2) = 14 , find the values of a and b. **(3marks)**

ii) Given that x :y = 6 :4 and that x+y=30 , determine the value of y. **(2marks)**

117. . A man barrowed frw 200,000 from the bank at a simple interest rate of 2.5 % per annum. He paid back the money in 24 equal monthly installments over a period of two years . How much money did he pay every month ? (3marks)

118. . Solve the inequality : $\frac{x}{4}+5\geq 1+\frac{x}{2}$ (3marks)

119. **.** Express 784 as a product of prime factors .Hence find the square root of 784. **(3marks)**

120. Given that 133n=43 $_{ten}$, find the value of n. **(4.5 marks)**

121. **.** Given two sets A and B such that $n(A) = 12,\ n(B) = 13,$ $n(A \cup B) = 20$ and $n(E) = 24$ Find **i)** $n(A \cap B')$

ii) $n(A \cup B')$ where E is the universal set and B' represent the complement of B. **(5marks)**

80. Simplify : $\frac{\sqrt{45}+\sqrt{125}}{\sqrt{80}-\sqrt{20}}$ completely **(3marks)**

81. Solve the equation $10^{6-x} = (20x0.5)^{x^2}$ **(3marks)**

82. Solve : $\sqrt{x^2+2x+1}$ = 3 **(4.5marks)**

83. Given that r*s = $\frac{r^2+s^2}{10s}$ find : (a) 4*-8 (b) 7*(4*-8) **(4marks)**

84**.** In a class of 40 students , 24 like Mathematics and 30 like Kinyarwanda . All students like at least one of the subjects. Draw a Venn diagram to represent this information. How many students like both Mathematics and Kinyarwanda ? **(4marks)**

85**.**Solve the inequality : $\frac{1}{4}m-(m+1)\geq 2$ and illustrate the answer on the number graph **(4marks)**

86. (a) Simplify : $\frac{2x+1}{3} - \frac{x+3}{2} + \frac{x+1}{6}$ **(6marks)**

(b) simplify completely : $\frac{3x^3-4x^2-x+2}{3x^2-6x+3}$ **(9marks)**

87. Given that $P(x) = 2x^3 - 5x^2 - 9x + 18$

a) Determine $P(-2)$ **(3marks)**

b) Factorise completely $P(x)$ **(8marks)**

c) Solve the equation $P(x) = 0$ **(4marks)**

88. A sample of 100 men was taken to find out how many were literate (L) , married (M) or had an income generating project (P) .

The following were the findings :

n(L) = 47 , n(M) = 59 , n(P) =52 , n(L∩ M) = 30 , n(L∩ P) = 24 and n(M∩ P) = 34

14 of the men were literate , unmarried and without an income generating project .

(a) Represent this information on venn diagriam . **(9marks)**
(b) Determine the number of men who were
  (i) Literate , married and had an income generating project. **(3marks)**
  (ii) Neither literate nor married. **(3marks)**

89. (a) Work out the values of y in the table below given that y = x^2-x-2 . complete the table

X	-3	-2	-1	0	1	2	3

(b) Draw the graph of the function y = x^2-x-2 for -3≤x≤3.

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

(c) From the graph determine :

(i) The value of y when x = 0.5
(ii) The values of x when y = -1

90. .a) Solve in R: i)$(3x+10)^2=25$
ii)$\frac{x+2}{x} < 3$

b) Solve in R^2 : $\begin{cases} x + y = 10 \\ x^2 - 2xy + y^2 = 16 \end{cases}$

91. (a) Evaluate and simplify $2\frac{1}{2} : \frac{4\frac{1}{3} - 2\frac{1}{4}}{4\frac{1}{6}}$ 8 marks

(b) Evaluate without using a calculator $\sqrt{27} - \sqrt{3} - \sqrt{12} - \sqrt{2}.\sqrt{8} + \frac{\sqrt{75}}{\sqrt{3}}$

92. Rationalize the denominator: $\frac{3-\sqrt{3}}{1+\sqrt{3}}$ 5 Marks

93. Consider f(x) = ax + b find the value of f(-2) if f(0) = -3 and f(-4) = 13 5 marks

94. Find the base n if $201_n - 34_n = 134_n$, where $n \epsilon N$ 7 marks

95. Given $f(x)=2x^2-2x$ and $g(x)=x+3$, solve the equation $f[g(x)]=0$ 6 marks

96.Given that f(x) = 3x-5 , find :

(a) f(3)

(b) the value of x such that f(x) = -17

(c) $f^{-1}(x)$ 6 marks

97. In a school there is enough food to feed 200 students for 15 days. For how long will the food last if 50 more students join the school? 4 marks

98. Gashugi , Musoni and Nduwayo shared 60 000 Frw in the ratio 11 ; 10 ; 9 .

How much did each get? 5 marks

99. if n(PUQ)=17 , n(P) =13 and n(Q) = 8 , find n(PnQ) 4 marks

10 . m is inversely proportional to n. When m = 3 , n = 4 . Find n when m = 2 5 marks

100.a) If m=-2 , n=5 and x=-3 , calculate the value of $xm^2+2n-mnx$

b) Simplify completely the following expression: $\frac{x(2x+3)-(2x+3)(x-3)}{2x+3}$

c) Given that : $27^{3x}=81^{2+x}$, find the value of x 15 marks

101.a) Solve in R: i)(x+3)(x-4)=18 5 marks

ii)$\frac{x-2}{2x+6} \geq 0$ 5 marks

b) Solve the inequality $\frac{1}{3}x - (x+1) \geq 3$ and illustrate the answer on graph. 5 marks

102 (a)Solve the simultaneous equations: $\begin{cases} 2x - y = 7 \\ 4x + 3y = 1 \end{cases}$ 5 marks

(b) Simplify : $\frac{2x+1}{3} - \frac{x+3}{2} + \frac{x+1}{6}$ 5 marks

(c) Find a , b and c in the following equation $ax^2+(b-3)x+2c-1=x^2-5x+7$ 5 marks

1 03. Assume $f(x) = 4x^3-7x^2-21x+18$, a polynomial

a) Calculate f (-2)

b) Factorise f(x)

c)Solve f(x)=0 15 Marks

104. (a) Given the proportion $\frac{6x-3y}{7x+2y} = \frac{3}{4}$, calculate the value of $\frac{x}{y}$ 5 marks

(b) Solve $2x^4+4x^3-10x^2-12x=0$ 7 marks

(c) One of the roots of $ax^2+5x+2=0$ is -2 , find the other root. 3 marks

105. Rationalize the denominator: $\frac{10}{3\sqrt{2}-\sqrt{3}}$ **(3marks)**

106.(a) Determine the equation of a line which passes through points (2,3) and (3,4) **(3marks)**

(b) The equation of a line A is y=-2x+4 . Line B passes through points (1,2) and (a,4). If line A is parallel to line B, find the value of a. **(3marks)**

107.**Solve in R : 2x-4=4x+6** . **(3marks)**

108. **i)** Given $f(x)=2x^2-2x$ and g(x)=x+3 , solve the equation f[g(x)]=0 **(3marks)**

ii) the solution of $x^2-sx+6=0$ is 3 . Find s and other solution **(3marks)**

109.Find the equation of line l through point P(0,2) and perpendicular to line 2y-4x+3=0. **(3marks)**

110. Find the solution set of the equation : $(x+3)^2 = 5^2$ **(3marks)**

111. Find a , b and c in the following equation $ax^2+(b-3)x+2c-1=x^2-5x+7$ **(3marks)**

112. . Find the base n if $201_n-34_n=134_n$, where $n \epsilon N$ **(5 marks)**

113 solve the simultaneous equations

(5marks)

$$\begin{cases} x+2y=4 \\ 2x-3y=1 \end{cases}$$

114. Given that f(x) = ax^2+bx , f(1) = 5 and f(2) = 14 , find the values of a and b **(5marks)**

115. if n(PUQ)=17 , n(P) =13 and n(Q) = 8 , find n(P∩Q) **(5marks)**

116. Evaluate without using a calculator $\sqrt{27}-\sqrt{3}-\sqrt{12}$ -$\sqrt{2}.\sqrt{8}$+$\frac{\sqrt{75}}{\sqrt{3}}$ **(5marks)**

117. Given that a^2-b^2=16 and a+b=8 find a and b. **(5marks)**

118. (a)Find the gradient of a line whose equation is 3y-9x+12=0,

(b)Write the coordinates of the point where the line in (a) cuts the y-axis.

(c) Write the coordinates of the point where the line in (a) cuts the x-axis. **(5marks)**

119.Solve the inequality : $\frac{1}{4}m-(m+1)\geq 2$ and illustrate the answer on the number graph (**4marks)**

120. a) If m=-2 , n=5 and x=-3 , calculate the value of xm^2+2n-mnx

b) Simplify completely the following expression: $\frac{x(2x+3)-(2x+3)(x-3)}{2x+3}$

c) Given that : $27^{3x}=81^{2+x}$, find the value of x

d) Demonstrate that A=$\frac{1}{7+\sqrt{2}}+\frac{1}{7-\sqrt{2}}$ is an integer / 15 marks

121. Given that $P(x)=2x^3-5x^2-9x+18$

a) Determine $P(-2)$ **(3marks)**

b) Factorise completely $P(x)$ **(8marks)**

c) Solve the equation $P(x)=0$ **(4marks)**

122. Given the points in Cartesian plane A(1,2) ; B(-2,1) and C(O,-3)

a) Represent the triangle ABC

b) Find the equation of line AB

C) Determine the intersection points of the line AB with x-axis and y-axis 15 marks

123. (a)Solve the simultaneous equations: $\begin{cases} x+y=3 \\ 2x^2+y^2+3x=15 \end{cases}$ **10 marks**

(b) Simplify : $\frac{2x+1}{3} - \frac{x+3}{2} + \frac{x+1}{6}$ **5 marks**

124. (a) Factorize and simplify completely the algebraic fraction : $\frac{4x^4+24x^3+36x^2}{x^4-9x^2}$, $(0,3,-3 \notin x)$ **6 marks**

(b) Solve for x: $3x^3+28x^2+63x+18=0$, $x \in \mathbb{R}$ **9 marks**

125. Simplify $\frac{\sqrt{162}+\sqrt{18}}{\sqrt{32}}$ **(3marks)**

126.(a) Determine the equation of a line which passes through points (0,-1) and (3,5) **(3marks)**

(b) The equation of a line A is 2y=3x+4 . Line B passes through points (1,0) and (a,2). If line A is parallel to line B, find the value of a. **(3marks)**

127. Given that $a^2-b^2=16$ and a+b=8 find a and b. **. (3marks)**

128. i) Given that $f(x) = x^2 + 1$ and $g(x) = x - 1$,
find the value of a for which $fg(a) = gf(a)$ **(3marks)**

ii) the solution of $x^2+ax+6=0$ is -2 . Find a and other solution **(3marks)**

129. Find the equation of line l through point P(0,2) and perpendicular to line 3y-4x+1=0. Determine the intercepts of line l. **(3marks)**

130. Find the solution set of the equation : $(x-3)^2 = 4^2$ **(3marks)**

131. Given that $a + b = 10$ and $ab = 5$, find the values of **i)** $\frac{1}{a} + \frac{1}{b}$ **ii)** $b \div \frac{1}{a}$. **(3marks)**

132. Given that $235n=95_{ten}$, find the value of n. **(5 marks)**

133. solve the simultaneous equations

$$\begin{cases} 3x + y = 5 \\ 2x + 3y = 8 \end{cases}$$ **(5marks)**

134. Function f(x)=ax+b verifies f(-4) =5 and f(-1) =6 .Find f(7) **(5marks)**

135. In a class of 40 students , 26 play football and 20 play volley ball . 17 pupils play both games .How many pupils play no game at all ? **(5marks)**

136.Given that m=5 , n=1 , x=6 and y=9, find the value of ($\frac{m}{y}$ - $\frac{n}{x}$): ($\frac{m}{x}$ + $\frac{n}{y}$)
(5marks)

137. Simplify the expression : $\frac{3a^3}{3a^3-6ab} + \frac{4b^3}{2b^2-ab}$ assuming the denominator is not zero **(5marks)**

138. (a)Find the gradient of a line whose equation is 2y+3x-8=0,

(b)Write the coordinates of the point where the line in (a) cuts the y-axis.
(c) Write the coordinates of the point where the line in (a) cuts the x-axis. **(5marks)**

139. Solve the inequality : $\frac{1}{3}x - (x+1) \geq 3$ and illustrate the answer on the number graph **(4marks)**

140. The cubic polynomial $6x^3+7x^2+ax+b$ has a remainder of 72 when divided by (x-2) and is exactly divisible by (x+1) .Calculate a and b. Show that (2x-1) is also a factor of the polynomial and obtain the third factor. 15 marks

141. Given that $P(x) = 2x^3 - 5x^2 - 9x + 18$

a) Determine $P(-2)$ **(3marks)**

b) Factorise completely $P(x)$ **(8marks)**

c) Solve the equation $P(x) = 0$ **(4marks)**

142. (a) Given the equation 2y+x=6

(i) Complete the table below : **(4 marks)**

X	-2		2	4
Y		3		

(ii) Plot these points and join them with a line (6 marks)

(iii) Use a letter A to indicate where you read the value of x when y=0 **(1 marks)**

(iv) Write the value of x when y=0 **(1 mark)**

(b) On the same graph as that of 16(a) (ii) draw the graph of y=2.
Find the coordinates of intersection of y=2 and 2y+x=6 **(3 marks)**

143. (a)Solve the simultaneous equations: $\begin{cases} x+y=3 \\ 2x^2+y^2+3x=15 \end{cases}$ **10 marks**

(b) Simplify : $\frac{2x+1}{3} - \frac{x+3}{2} + \frac{x+1}{6}$ **5 marks**

144. (a) Factorize and simplify completely the algebraic fraction : $\frac{4x^4+24x^3+36x^2}{x^4-9x^2}$, $(0,3,-3 \notin x)$
6 marks

(b) Solve for x: $3x^3+28x^2+63x+18=0$, $x \in \mathbb{R}$ **9 marks**

145 .Using a ruler , pencil and a pair of compasses only ,

(i) Construct a triangle PQR with angles RPQ = 60^0 , PQR=45^0 and PQ=8.4cm , measure the length of PR and QR.

(ii) Construct the line ST 12.6cm long bisecting and perpendicular to QR and meeting PQ at T. what is the size of angle STQ.

(iii) Join S to R and Q . Draw the circle circumscribing the triangle QRS . From your diagram determine the radius of the circle. P.17Q18

146 .A circle passes through the points A(-3.5 , 1) B(0.5 ,5) and C(4,3).

(i) Using 2cm to represent one unit , plot the points A , B and C on a graph paper.

(ii) By construction find the centre and radius of the circle.

(iii) Calculate the area of part of the sector (segment) cut off by the line segment AB. P.36Q19

147 . Using a ruler , pencil and a pair of compasses only ,

(i) Construct a triangle ABC where BC=7.2 cm ,AC=8.4 cm and angle ABC=75^0 . Measure AB and angle ACB.

(ii) Draw a circle circumscribing triangle ABC . State the radius of the circle.P75Q12

148 . Using a ruler , pencil and a pair of compasses only ,

Construct the triangle PQR , where angle QPR=135^0 , PQ=8.4cm and QR =12.5cm .State the length of PR.

S and T are points such that TS bisects QR , where T is on QR and , S on the same side as PQ . Draw circle to circumscribe the points P , Q , R and S. Measure and state the (i) length ST (ii) Radius of the circle (iii) radius of the circle . P.127Q11

149 . Using a ruler, pencil and a pair of compasses only,

Construct a triangle ABC where AB=8 cm , angle ABC=$60^0$and BCA =45^0 . Construct the perpendicular from C onto AB to meet it at D. Measure the length CD. Draw a circle circumscribing triangle ABC.Measure its radius. Find the area of triangle ABC. P.140Q13

150 . Using a ruler , pencil and a pair of compasses only ,

(a) Construct a triangle ABC where BC=9.2 cm ,AC=12 cm and angle ABC=105^0 . Measure and state length AB and angle BAC.

(b) Draw a circle circumscribing triangle ABC . State the radius of the circle. P150 Q11

151 . Using a ruler , pencil and a pair of compasses only ,

Construct a triangle PQR with angles PQR = 60^0 , QR=9.0cm and PR=8.5cm , measure the length of QP.

Bisect the sides PQ and PR.Produce the line bisectors to intersect at point M. Using M as the centre , draw a circle to circumscribe triangle PQR . Measure the radius of the circle .Hence calculate the area of the circle (correct to 2 significant figure).P161Q12

152 . Using a ruler , pencil and a pair of compasses only ,

Construct a triangle ABC where BC=10.6 cm , and angles ACB=75^0 and ABC=60^0. Draw a circumcircle of triangle ABC with O as its centre. State the radius of the circle and length AB and AC.P.173Q12

153 . Using a ruler , pencil and a pair of compasses only ,

Construct a triangle ABC where AB=8.7 cm ,AC=10.6 cm and angle BAC=60^0 inscribe a circle on the triangle ABC. Construct a perpendicular from B onto AC to meet at point D.Measure length BC and radius of the circle.Measure BD and calculate the area of triangle ABC.P185Q13

154 . Using a ruler , pencil and a pair of compasses only ,

a)(i) Construct a triangle ABC where AB=10.0 cm ,BC=9.2 cm and angle ABC=105^0 . (ii) Measure AC.

b) Draw an inscribed circle of triangle ABC with centre O . (ii)State the radius of the circle.P195Q13

155. Simplify : $\frac{3^3\times9^2\times125^{1/3}}{9^3}$

156.Simplify : $\frac{\sqrt{2}}{\sqrt{3}+\sqrt{2}}$ =a+ $\sqrt{b}$, find the values of a and b.

157.Factorize x^3-$9xy^2$ completely

158.Find the equation of the line passing through the points (-1,3) and (4,2)

159. Given that f(x) = $\frac{x^2}{3}$+5 , find the value of x for which f(x)=17

160. The pie – chart below represents the number of students who attend various courses in commercial college.

If the number of students studying Accountancy is 120.

i) Determine the student population of the college.

ii) Find the number of students who study marketing.

161. A food store has enough food to feed 200 students for 15 days . For how long will the food last if 50 students join the group? Ans. =144

162. Express 784 as a product of prime factors .Hence find the square root of 784.

163.

This diagram shows a right circular cone ABC of vertical height h cm and slant side AC =BC=17cm and base diameter AB = 16cm.

Find (i)h

(ii)The capacity of the cone (volume).

Using π=3.142

164. The bearing of P from C is 080° . What is the bearing of C from P. p.16

165. Given that 133n=43 $_{ten}$, find the value of n.

166. In the diagram below ,DE = 8.0cm , BC = 12.0cm and BD=5.0cm

Given that DE is parallel to BC , find length AD.

167. Given that the representative fraction of a map is $\frac{1}{250,000}$, find the length of a horizontal road on the map whose length on the ground is 66.25 km long.

168. If the exchange rate of a Kenya shilling to Uganda shilling is 1K.sh=24Ush,and an American dollars to Uganda shilling is $1=Ush1,950.How many American dollars would one get in exchange for Ksh9,750?

169. In the diagram below , BC is a tangent to the circle with centre O and angle BAO=30^0

Find the size of the

Angles x and y.

170. Simplify : $\frac{2^{-2}\times 3^{-3}}{2^{-4}\times 3^{-6}\times 18}$ Ans. =6

171. Simplify : $\frac{\sqrt{63}+\sqrt{28}}{\sqrt{175}-\sqrt{63}}$ Ans. =2.5

172. The diagonals of a rhombus are 20cm and 48cm respectively .Determine the length of the side of the rhombus. Ans. =26cm

173. Find the equation of the line passing through the points (2,-1) and (5,8) Ans. y=3x-7

174. Given that f(x) = ax-7 and f(8)=17 , find the value of : (i) a (ii) f(4)

175. There enough chicken feeds to feed 360 chicken for 21 days. Find how many more chicken would be needed for the same feeds to last 15 days. Ans. =144

176. Without using calculator , evaluate : $^{-}\ (\frac{1}{16})^{-1/2} \times (\frac{1}{64})^{-1/3}$

177. Without using calculator , evaluate : 7.46^2-2.54^2

178. Given that a*b=$a^2+\sqrt{ab}$, find (1*4)*3 Ans. =12

179. Given that y is proportional to x^3 and that y is 250 when x = 10 , find the equation connecting x and y .Hence the value of y when x=4.

Ans. =y=$\frac{x^3}{4}$ if x=4 then y=16

180. Given that A={x: -2$\leq x \leq$ 1} and B={x: 0$\leq x \leq$ 5} represent A∩B on a number line. State A∩B .

181. A student wrote $(p+q)^2$ as p^2+q^2 .Find the percentage error the student made in evaluating $(p+q)^2$ when p=7 and q=3 Ans. =42%

182. A lake of area 120km^2 is represented by area of 4.8 cm^2 on a map. Find the length (in km) of an horizontal road measuring 6cm on the map.

Ans. =30km

183. Mary is five years younger than John and Peter is twice as old as Mary .The sum of their ages is 49.

Find Peter's age. Ans. =22 years

184. The pie – chart below shows the fruits popularly sold in a daily super market in Kampala

If 420 apples were sold on a given day, determine the number:

iii) The total number of the fruits that were sold that day Ans. =2800

How many mangoes were sold that day? Ans. =700

185. Evaluate: $\frac{2.5\times\sqrt{18}}{3\times\sqrt{12.5}}$ without using a calculator. **3marks**

186. The mean of the numbers $3, 4, a, 5, 7, a, 5, 8, 5, 9$ is equal to the mode. Find the average of a and hence the median of the data. **4 marks**

187. The area of the shaded region is 75 square units. Calculate the area of the largest circle.

3marks

188. Given that two sets A and B such that $n(A) = 12$; $n(B) = 13$; $n(A \cup B) = 20$ and $n(\varepsilon) = 24$, find **i)** $n(A \cap B')$ **ii)** $n(A \cup B')$ where ε is the universal set and B' represents the complement of B. **4marks**

189. A quantity y varies partly as x and partly as the inverse of x^2. If $x = 2$ when $y = 4$ and $x = 4$ when $y = 6.25$, find the equation connecting x and y. **5marks**

190. Given that $a + b = 10$ and $ab = 5$, find the values of **i)** $\frac{1}{a} + \frac{1}{b}$ **ii)** $b \div \frac{1}{a}$. **3marks**

191. Given that lengths of the three sides of right-angled triangle are x, $x + 1$, and $x + 2$ units; find the value of x. **3marks**

192. A rectangle of $6cm$ long and $5cm$ wide is enlarged so that its area becomes $270cm^2$. Find the linear scale factor of the enlargement. **4marks**

193. Solve the simultaneous equation: $\begin{cases} 5x + 2y = 5 \\ 3x - 0.2y = 10 \end{cases}$ **4marks**

194. A student wrote $(p + q)^2$ as $p^2 + q^2$. Find the percentage error the student made in evaluating $(p + q)^2$ where $p = 7$ and $q = 3$. **4marks**

195. In the figure below, find the size of the angle marked x^o giving reasons if $< BCD = 110^o$ and $< ABD = 75^0$. **4marks**

196.In a parallelogram $OBCA$, $\overrightarrow{OA} = \binom{4}{1}$ and $\overrightarrow{OB} = \binom{1}{3}$ where $O$is the origin.
Find: i) vector $\overrightarrow{BC}$

ii) The co-ordinates of C. **4marks**

197. In the diagram below, C and O are centers of two intersecting circles. Angle $CQS = 37^o$. Find the values of x and y. **4marks**

198. Given that $x^3 - 4x^2 + x + 6 = (x-a)(x+b)(x-c)$. Find the values of a, b and c. **3marks**

199. In the figure below, ABC is a right angled triangle and BD is perpendicular to AC. Calculate BD if $AB = 9$ and $AC = 15$. **3marks**

200.**a)** Calculate the values of m, n if the polynomial $P(x) = 2x^3 + mx^2 + nx + 10$ has -2 as the root and also $2x - 1$ is factor of $P(x)$.

b) Factorize completely $P(x)$ **15 marks**

c) Deduce the roots of the equation $P(x) = 0$

201.a) The points $(-1, q)$ and $(r, 2)$ lie on the line $y = 2 - x$. Find the values of q and r.**4marks**

b) In the figure below, P is 4 units from O. The equation of the line MN is $4y + x = 12$.

Find the perimeter and area of $OPMN$. **11marks**

202.a) The mean of four numbers is 25 ,their median is 23. If the largest number exceeds the smallest by 30, and the largest number is one and half times the second largest number, determine the four numbers. **7marks**

b) The table below shows rainfall amounts at 50 weather stations. There are two missing frequencies; Calculate a and b given that the mean rainfall is $33.2mm$. **8marks**

Rainfall in mm	$[0,10[$	$[10,20[$	$[20,30[$	$[30,40[$	$[40,50[$	$[50,60[$	$[60,70[$
Frequencies	4	7	10	a	9	b	2

203.A school has a teaching staff of 22 teachers. 8 of them teach Mathematics,7 teach Physics and 4 teach Chemistry. Three teach both Mathematics and Physics and one teaches Mathematics and Chemistry. No teacher teaches all the three subjects. The number of teachers who teach Physics and Chemistry is equal to that of those who teach Chemistry but not Physics.

a) Represent the above informations on a Venn diagram. **7.5 marks**

b) Find the numbers of teachers who teach:

i) Mathematics only **2marks**

ii) Physics only **3marks**

iii) None of the three subjects **2.5marks**

204. Given that $A(1,2)$, $B(3,2)$ and $C(2,1)$ **15marks**

a) Draw the triangle ABCon a Cartesian plane.

b) The image of A by the translation is $A'(-3,2)$. Find the coordinates of B' and $C'$the images respectively of B and C by the same translation and draw triangle $A'B'C'$ in the same Cartesian plane.

c) The image of B by reflection is $B''(-7,2)$

i) Determine the coordinates of A'' and C''images of A and C respectively by the same reflection.

ii) Indicate the equation of the line of reflection and draw the triangle $A''B''C''$ in the same Cartesian plane.

d) Let the rotation of centre O, origin of axes, angle -90°. Find the coordinates of A''',B''' and C'''image respectively of A ,B and C by this rotation. Draw the triangle $A'''B'''C'''$ in the same Cartesian plane.

205. Without using a calculator , evaluate

(a) 3.142^2-3.042x3.142

(b) $\frac{1.21\times10^{-2}\times40}{2.2\times11}$

206. Given that a^2-b^2 = 63 and (a+b) = 21 find the values of a and b.

207. Given that P={ the square of all prime numbers } and Q = { the first ten square numbers }.Write down the members of (P∩Q)

208. Solve the pair of simultaneous equations

2x+3y=8

2y-x=3

209. A straight line of gradient -1 , passes through the point (3,-2)

(a) Determine the equation of the line

(b) Through which point does the line cut the y-axis

210. Three boys John, Michael and Tom share Frw 4,000 .Given that Tom gets six times as much as Michael and John gets half of what Tom gets, find how much money each boy gets.

211. Two points P (5, 2) and Q (2, 4) are in a plane. Find the

(a) Coordinates of M , the mid-point of PQ

(b) $|\overrightarrow{OM}|$, where O is the origin

212. Factorize completely $16x^3y+2y$

213. Given that r*s = $\frac{r^2+s^2}{10s}$: (a) 4*-8 (b) 7*(4*-8)

214. Solve the inequality : $\frac{1x}{4}+5\geq 1+\frac{x}{2}$

215. Given that $\overrightarrow{OA}=\binom{3}{5}$, $\overrightarrow{OB}=\binom{2}{0}$, where $\overrightarrow{OA}$ and $\overrightarrow{OB}$ are the position vectors of A and B respectively, find the area of the triangle OAB.

216. Given that f(x) = $\frac{1}{2}$(3x+5) find the value of x such that f(x) = 10.

217. Under an enlargement, the volume of a cube is 216 cm^3. I f the volume of the object cube is 27 cm^3 , find :

(a) The scale factor

(b) The total surface area of the enlarged cube.

218. Write down the similar triangles in figure below .Find BC and AD.

219. (a) Find the value of each letter x , y and z in figure below :

220. The marks obtained by the class of 40 pupils in an English test are given below:

50	71	40	48	61	70	30	62
44	63	60	51	55	25	32	65
54	62	65	50	45	40	25	45
48	45	30	38	30	28	24	48
30	48	28	35	50	48	50	60

(a) Using a class internals of 5 marks, construct a frequency table starting with the 20-24 class group.
(b) Represent this information on a histogram.
(c) Estimate the mean using a working mean of 47.

221. (a) (i) Plot on a graph the triangle ABC whose vertices are (1,1) , (3,2) and (2,4) respectively .

(ii) On the same graph, enlarge the triangle ABC using (-1,-1) as the centre of enlargement and a scale factor of 2 to obtain its image A_1 B_1 C_1.
(iii) State the coordinates of A_1 B_1 C_1 the image of triangle ABC.
(c) Using your graph, find the area of the triangle ABC. Hence, determine the area of the triangle A_1 B_1 C_1.

202.Simplify : $\frac{\sqrt{30}+\sqrt{35}}{\sqrt{6}+\sqrt{7}}$ Ans. $=2\sqrt{5}$

203. If the point (2,-1) undergoes a translation represented by T = $\binom{11}{-4}$, find the image of P. Ans. $=\binom{13}{-5}$

204. Calculate the simple interest on FRW 96,000 for 10 months at rate of $8\frac{1}{3}$ % per annum. (2dp) . Ans. =6,666.67FRW

205. A stretch of land of map of scale 1:15,000 has an area of 300cm^2 . Determine the actual area of the land in km^2.

206. Find the highest common factor (HCF) of 18,45 and 42

207. Without using calculator , evaluate : $^-$ $(\frac{1}{16})^{-1/2} \times (\frac{1}{64})^{-1/3}$

208. Without using calculator , evaluate : $7.46^2-2.54^2$

209. Given that $a*b=a^2+\sqrt{ab}$, find (1*4)*3 Ans. =12

210. Given that y is proportional to x^3 and that y is 250 when x = 10 , find the equation connecting x and y .Hence the value of y when x=4.
Ans. $=y=\frac{x^3}{4}$ if x=4 then y=16

211. Given that A={x: $-2\leq x \leq 1$} and B={x: $0\leq x \leq 5$} represent A∩B on a number line. State A∩B .

212. A student wrote $(p+q)^2$ as p^2+q^2 .Find the percentage error the student made in evaluating $(p+q)^2$ when p=7 and q=3
Ans. =42%

213. A lake of area 120km^2 is represented by area of 4.8 cm^2 on a map. Find the length (in km) of an horizontal road measuring 6cm on the map.
Ans. =30km

214. Mary is five years younger than John and Peter is twice as old as Mary .The sum of their ages is 49.

Find Peter's age. Ans. =22 years

215. .The figure QRSTUV below , is a plan of Mr. Rukidi's farm . The area marked A is in form of an equilateral triangle, area B is rectangular and C is a semi-circle .$\overline{RQ}$ = 14 m and $\overline{RS}$ = 100 m P. 217

2.The table below show the weight in kilograms of 28 children sampled in a Primary school :

Weight	Number of children
15-19	
20-24	
25-29	
30-34	
35-39	
40-44	
45-49	

(a) State the modal class

(b) Calculate the cumulative frequency and hence, estimate the mode and the median weight correct to one decimal place.

(c) Calculate the mean weight of the children

216. using a pencil , a ruler and a pair of compasses only , construct a triangle ABC in which AB=9.2cm , angle CAB=45^0 and angle ABC=75^0

(a) Measure the length of BC

(b) Draw a circumscribing circle through the points A,B and C.

(c) Measure the radius of the circle.

217. Given that a^2-b^2=16 and a+b=8 find a and b.

218. If 125_n=82_{ten} , find n.

219. Solve the inequality : 10-3x<4(x-1)

220. Two quantities y and x are related by the equation y a+bx. When y=4, x=2 and when y=6, x=4 . Find the values of a and b.

221. Find the equation of the line passing through a point (2,o) and perpendicular to the line joining the points (-10,3) and (6,9)

222. A rectangle 6cm long and 5cm wide is enlarged so that its area becomes $270cm^2$. Find the linear scale factor of the enlargement.

223. Given that a=$\binom{-2}{-9}$, b=$\binom{7}{2}$ and m=a+2b , find the magnitude of m.

224. If n=x $\sqrt{(\frac{2}{4m^2-1})}$, express m in terms of n and x.

225. In figure below O is the centre of the circle . Angle UTW = 70^0 , angle TWO = 40^0 angle VUO=35^0 , angle UOW=y , angle TUO=z and angle UVW=x.

(a) Find the size of angle x,y,z and angle UWT

(b) Arc $\widehat{UVW}$ has length 10.99cm. Find the area of the circle . Take π=3.14

226. Given that F={all factors of 24} and G={all factors of 30}, find n$\left(F^{'} \cap G\right)$ where $F^{'}$ is the complement of F .P270

227. .A cylinder has a radius of 3 cm and a height of 5 cm .Find the area of curved surface.

228. Find the value of x

229. (a) Given that f(x)=4x-3 , find : i)f(2) ii)$f^{-1}(x)$ iii)$f^{-1}(-1)$

(b) Given that $g(x)=x^2+1$ and h(x)=x-3, find the value of x for which gh(x)=hg(x)

230. Paul and Mary invested RWF 600,000 each in a savings society for 2 years .Paul opted for simple interest while Mary opted for compound interest . Both interests were at 12% per annum.

a) Find the interest earned by each of them

b) Who earned more interest and by how much?

231. Triangle ABC has its vertices at A(2,0) , B(4,0) and C(4,3).

i)construct the triangle in Cartesian plane

ii) find the coordinates of $A^1B^1C^1$ image of A,B and C by reflection in the line x+y=0

iii) find the coordinates of $A^1B^1C^1$ image of A,B and C by rotation on origin of angle 90^0