Unit 1: FUNDAMENTALS OF TRIGONOMETRY.

1. Convert into degrees:

(a) $3\pi/8$ rad

(B)$\pi/20$ rad

2. Convert into radians:

(a) 15° (b) 36°

3. Convert each angle to a decimal in degrees:

(a) 40°10′25″ (b) 9°9′ 9″

4. Convert each angle to degree, minute, second form:

(a) 40.32° (b) 18.255

5. Complete the following table:

	0^0	30^0	45^0	60^0	90^0
Sin					
Cos					
Tan					
Sec					
Cosec					
Cot					

6. Show, on a unit circle, 135°, sin135°, cos135° and tan135°.

7. Without using a calculator, determine the value of:

4sin30° cos45°

8. Given that the terminal side of angle θ in standard position passes through point (–1,1) find:

(a) sin θ (b) cos θ (c) tan θ

9. In which quadrant is the terminal side of angle θ located?

(a) 225° (b)$85\pi/6$ rad.

10. State the sign of each of the following trigonometric ratio if the terminal side of

θ lies in quadrant III

(a) sec θ (b) tan θ (c) cot θ

11. Given that cos θ =- 2/5 where π/2< θ < π, find

(a) sin θ (b) sec θ (c) cot θ

(d) tan θ (e) cosec θ

12. Show that $\frac{cosec\, x}{\cot x + \tan x} = cosx$

13. Given that tan θ = 3, where π< θ <3π/2 find:

(a) cos θ (b) sin θ (c) cot θ

(d) sec θ (e)cosec θ

14. Determine, without using a calculator, the exact value of:

(a) tan(–135°)–cos180° (b)2sin120°+tan150°

(c) cos(–210°)–tan135° (d) sin120°cos210°–sin270°cos315°

15. In triangle ABC, right angled at A, BC=6 and B =30° Find AC and AB

16 In triangle ABC, right angled at B, A=30°, BC = 3 and AC =5.

Find sin A and tanA

17 In triangle ABC, right angled at C, B = 60° and BC = 3 Find AC and AB.

18 The sides of a triangle ABC area=6cm, b=8cm and c=5cm.

Find the angles of the triangle. Find also the area of the triangle.

19. From a point A, an observer finds that the angle of elevation of the top of a tree Is 21°. If he walks 10 metres towards the foot of the tree to a point B, he finds that the angle of elevation of the top of the treeis 34°. Calculate the height of the tree above the level of observation.

20. In triangle ABC, a=10cm, A=30°, B =40°, Find c.

21. In triangle ABC, a=8cm, b=10m and A=30°. Find the size of angle C

UNIT 2: PROPOSITIONAL AND PREDICATE LOGIC

1. Find the truth table of each of the following:

(a) $[(P \vee Q) \Rightarrow Q] \Rightarrow \sim P \vee Q$

(b) $[\sim \boldsymbol{PVQ}) \Rightarrow Q] \Leftrightarrow Q$

(c) $[(P \vee Q) \Rightarrow P] \Rightarrow P$

2. P,Q and R represent the statements

"He is a candidate", "He is preparing for examinations" and "He will pass"

respectively. Find appropriate sentences which describe each of the following.

(a) $P \wedge Q$ (b) $\sim(P \vee R)$

(c) $(P \wedge \sim Q) \Rightarrow R$ (d) $R \Leftrightarrow Q$

(e) $\sim (P \wedge \sim R)$

3. Use the truth table to show that $(P \wedge Q) \Rightarrow [(P \wedge Q) \wedge (Q \vee \sim R)] \vee R$ is a tautology

4. Show that $(P \wedge Q) \wedge \sim(P \vee Q)$ is a contradiction

5. Draw the truth table of the proposition $(P \wedge Q) \Rightarrow R \vee Q$

6. Determine, using a truth table whether $[(P \vee Q) \wedge \sim Q] \Leftrightarrow (P \vee Q)$ is a contradiction or not.

7. Given the propositions

P :"John reads New Vision"

Q: "John reads Imvaho"

R: "John reads Uvugizi"

Write each of the following propositions in symbolic form.

(a) John reads New Vision or Imvaho but not Uvugizi

(b) John reads New vision and Uvugizi, or he reads neither New vision nor Imvaho.

(c) It is not true that John reads New vision but not Uvugizi

(d) It is not true that John reads Uvugizi or Imvaho but not New vision.

8. Show that the following propositions are equivalent

(a) $P \Rightarrow Q$ and $\sim P \vee Q$

(b) $P \Leftrightarrow Q$ and $(P \Rightarrow Q) \wedge (Q \Rightarrow P)$

(c) $P \Leftrightarrow Q$ and $(P \wedge Q) \vee (\sim P \wedge \sim Q)$

9. Write the negation of:

(a) $x \geq 2$

(b) $x = 2$ and $x \neq 3$

(c) $x \geq 3$ or $x \leq -9$

10. Consider the propositional function:

If $x = 3$ then $X^2 = 9$

(a) Write down the converse of the proposiional function.

(b) Write down the contrapositive of the propositional function.

11. Complete

(a) $(x,y) = (a,b) \Leftrightarrow$ …

(b) $(x,y) \neq (a,b) \Leftrightarrow$ …

(c) $ab = 0 \Leftrightarrow$ …

(d) $ab \neq 0 \Leftrightarrow$ …

12. Consider the proposition.

«If Munyeshuri is a student and is not working hard, then he will fail».

Let M, H and S be propositions

M: Munyeshuri is a student

H: Munyeshuri is working hard

S: Munyeshuri will succeed

Express the sentence above in logical formula.

13. Find the converse of each of the following implications and its truth value.

14. Consider the propositions:

A: Munyeshuri is a student

B. Munyeshuri is revising

C. Munyeshuri will succeed

Give appropriate sentences which describe the following logical formulas:

(a) A^B

(b) ~(B ∧~C)

15. Write down the negation of:

(a) If y is a factor of 24 then y is a factor of 12.

(b) If Munyeshuri does not work hard then he will be discontinued or he will repeat.

16. Consider the following:

" If you work hard, then you will succeed. And you are working hard".

(a) Express the statement in symbolic form, stating the meaning of each letter.

(b) What conclusion can you draw from the statement?

(c) Which law allows you to draw such a conclusion?

(d) Express the law in symbolic form.

17. Consider the following:

" If you had workedhard then you would have succeeded. And you failed."

(a) Express the statement in symbolic form, stating the meaning of each letter.

(b) What conclusion can you draw from the statement?

(c) Which law allows you to draw such a conclusion?

(d) Express the law in symbolic form.

18. Consider the following statement:

"If you have a job, then you have an income, and if you have an income, then you must pay taxes".

(a) Express the statement in symbolic form, stating the meaning of each letter.

(b) What conclusion can you draw from the statement?

(c) Which law allows you to draw such a conclusion?

(d) Express the law in symbolic form.

19. The indirect reasoning is based on the principle which states that:

«If the negation of an implication is false, then the original implication is true».

Use indirect reasoning to prove that: «If n^2

is an even integer, then n is an even integer»

20. Consider the following:

«Any negative integer is less than or equal to 0".

(a) What is the truth value of the proposition?

(b) What is the propositional function?

(c) What is the universal set?

(d) Express the proposition using logical symbols.

21. Consider the proposition:

"For any natural number x, there exists a natural number y, such that x+ y = 0"

(a) What is the truth value of the proposition?

(b) Express the proposition using logical symbols.

(c) Express the negation of the proposition in words and by using logical

symbols

UNITY 3: BINARY OPERATION

1. Determine whether the set of all non zero real numbers is closed or not under:

(a) addition

(b) multiplication

2. Determine whether or not:

(a) N is closed under division

(b) N* is closed under multiplication.

3. Binary operator * is defined in E = {a, b, c} by

*	A	B	C
A	A	B	C
B	B	C	A
C	C	A	B

(a) Calculate: (a*a)*b and a*(a*b)

(b) Find x and y such that:

(i) x*b= b

(ii) y* b= a

4. Consider the operations * and Δdefined in A={1, 2, 3, 4, 6, 12} by:

X*y = LCM (x, y), x Δy = HCF (x, y)

(a) Dr aw the tables for the operations

(b) Find the identity element for each operation

(c) Determine whether the inverse property is verified or not

5. Find the inverse of the real number a with respect to operation defined on

in each of the following:

(a) aΔb= 2a b+ a+ b

(b) a*b= ab+ 2a+ 2b

6. Binary operators and are defined in by a b= Inf (a,b) and a b= (a b) + 2,

where Inf (a,b) denotes the smaller of aand b, or the common value if a= b. Calculate

4 7 and 6 6.

7. Given that A = {x, y}. Write down the elements in the power set of A and draw

the table for union in the power set of A.

8. Determine whether the binary operator defined in is commutative or not in each of the following cases:

(a) x*y = x – y (b) x*y = x^2+ y^2

(c) x*y= x+ xy (d) x*y= $(x– y)^2$

9. Binary operator * is defined in the set of real numbers by x* y = xy – (x+ y) + 2,

where x≠ 1 and y≠ 1. Find the identity element and the inverse of –1.

10. Let S be the set of all real numbers, except

–1. Define * on S by a*b= a+ b+ ab

(a) Show that (S,*) is a group.

(b) Find the solution of the equation 2*x*3 = 7 in S.

11. Let H = {1, –1}. Determine whether (H, multiplication) is a group or not.

12. E is the set of even integers. Detemine whether :

(a) E is a subgroup of (Z , +) or not.

(b) E is closed under multiplication or not.

13. Explain the properties used in solving in the set of real numbers, the equation

5x+ 2 = 0.

14. The binary operator T is defined in R –{1} = E by xT y= xy – x – y + 2.

(a) Show that (E,T) is an abelian group.

(b) Solve for x the equation

½ T x=3/2

Unit 4: Set R of real numbers.

1.Simplify: $(0.42)^2 - (0.58)^2$ without using a calculator.

2. Solve: a) $\boldsymbol{log_4^{x^2} - 6log_x^4 - 1 = 0}$

b) $\boldsymbol{9^x - 3^{(x+1)} = 10}$

3. Express $\boldsymbol{f(x) = \frac{x^3}{(x+4)(x-1)}}$ in partial fractions.

4. After giving the entire definition, simplify the following rotational functions:

a) $D(x) = \frac{1}{x-2} + \frac{2}{x(x+1)} - \frac{3}{(x+1)(x-2)}$

b) $Q(x) \frac{4}{x+3} + \frac{7}{x-1} + \frac{11}{x^2+3x} - \frac{28}{(x+3)(x-1)}$

c) $R(x) = 2 - \frac{1}{2x-1} + \frac{9}{2x-3} - \frac{18}{(2x-1)(2x-3)}$

d) $T(x) = \frac{x^2 - 3x + 3}{x-2} + \frac{2x}{x+1} - \frac{3}{(x-2)(x+1)}$

5. Solve in rational IR following equations

a) $\frac{3}{(x+2)(x-1)} + \frac{1}{(x-2)(x-1)} = \frac{4}{x^2-4}$

b) $\frac{x^2-3x}{x-2} + \frac{2x+3}{x+1} + \frac{6}{(x+1)(x-2)} = 0$

c) $\frac{1}{x+1} - \frac{1}{x-1} = \frac{-2}{x^2-1}$

d) $\frac{2x-1}{x^2-x} + \frac{2x+1}{x^2+x} = \frac{x^2+2x-1}{x^2-1}$

UNITY 5: LINEAR EQUATION AND INEQUALITIERS

1.Find the numerical value of:

a) my -4n for m = 4; n= -2 and y=5
b) $m^2x + 2m - mnx$ for m= -2, n= 5 and x= -3

2.Given that a) $3203_{four} + 1121_{three} = X_{five}$; Find X

b) $235_x = 95_{ten}$; Find the value of x

3. Given two sets A and B such that

n(A)= 12, n(B)=13 and n(AUB)= 20

Find n (A∩B)

4.a) if $\frac{5}{\sqrt{5}} + \sqrt{20} = a\sqrt{5}$; Find the value of a.

c) Rationalize the denominator

i) $\frac{5\sqrt{7}-3\sqrt{7}}{\sqrt{3}}$

ii) $\frac{2}{2+\sqrt{7}}$

5.If m=2, n=2, p=2. Find the value of:

a) $\frac{m^3+n^2}{mnp}$

b) $\frac{1}{m} + \frac{1}{n} + \frac{1}{p}$

6.In a class, 15 students play cricket, 11play hacked, 6 play both games and everyone plays at least one of the games.

Fin the total number of students in the class

7.Per form the indicated operations

a) $\frac{5}{2x}+\frac{2}{3}$
b) $\frac{4}{x^3y}+\frac{2}{xy^3}$
c) $\frac{a+1}{6}-\frac{a-2}{8}$

8.The length of the diagonal of a rectangle is 23.7cm and the length of one side is 18.8cm

Find its perimeter.

9.Solve for x in:

a) $4^{5x} \div (2^{3x})^2 = 256$
b) $3^{3x-1} = 27$

10.If h=$\begin{pmatrix}1\\3\end{pmatrix}$; S=$\begin{pmatrix}3\\-4\end{pmatrix}$; and t=$\begin{pmatrix}1\\3\end{pmatrix}$.

Determine:

a) 4h – t
b) 2S – 3h
c) 3h + S + $\frac{1}{2}t$

11.a).What value of x satisfying the following condition:

$$4(x+5)-6(2x+3)=3(x+14)-2(5-x)+9$$

b) Find the distance between the points (1, 3) and (-3, 0).

12.a) Show that the points (3,-4) and (8, 1) are equidistant from point (7,-3).

b) If the distance between (a,-1) and (3, 4) is 5, find the value(s) of a.

13.a) Find the equation of straight line passing through the points (-2, 3)

and (-4, -7).

b) Find the equation of the line with x-intercept 3 and y-intercept 2.

c) Find the equation of a straight line parallel to the line 2x-y-3=0 and passing through (1,-5).

14. b) Find the equation of the line through (2, 3) perpendicular to the line that passes through

(-1, 7) and (3, 3).

b) Prove that points (2, 3), (-2,-5) and (0,-1) are collinear.

15. a) Find the point of intersection between lines 2x-3y-3=0 and 5x-2y-13=0.

b) Show that the lines 3x-y+1=0, x+2y+12=0 and 4x-3y-7=0 are concurrent

16. a) Find the equation of the line through (-1, 2) that passes through the intersection of lines 2x+y-5=0 and x-3y+1=0.

b) Find the angle between the lines 3x-2y+1=0 and x-3y=0.

17. Find the perpendicular distance of (4, -3) from the line 3x-4y-1=

Unit 6: Quadratic equations and inequalities.

1.Consider the following quadratic function $f(x) = 3x^2+12x+8$

i) Find equation of axis of symmetry
ii) Write the coordinates of vertex
iii) Find x-intercepts and y-intercept
iv) Find some points

Plot a parabola of $f(x) = 3x^2+12x+8$ by joining the calculated points.

2. m command one real parameter, solve the following equations in IR

a) $(m^2-1)x-m-1=o$

b) $4x+2=9m^2x+3m$

c) $\frac{x-m}{m}=1+x$

d) $\frac{m}{x-1}=\frac{1}{x-m}$

3. Solve the following equations in IR

a) $9x^2-54x+81=0$

b) $\frac{\sqrt{2}}{2}x^2+\sqrt{6}x+\sqrt{\frac{18}{2}}=0$

c) $(z^2-1)^2=z(z^3+5)$

d) $\frac{x^2}{x-2}-\frac{x+8}{x+2}=\frac{16}{x^2-4}$

e) $\frac{4x-1}{x-1}-\frac{4x+1}{x+1}=\frac{9}{4}$

f) $(2x^2+x+3)^2=(x^2-3x-4)^2$

g) $\left(\frac{x+1}{x-3}\right)^2 - 5\left(\frac{x+1}{x-3}\right) + 6 = 0$

4. Solve the following equations in IR unknown real parameter x and m.
- The unknown:

a) $mx^2 + (2m+1)x + 2 = 0$

b) $(m+3)x^2 - (2m+3)x - 6 = 0$

c) $(m+3)x^2 - (2m+3)x - 6 = 0$

5. Solved in following equations:

a) $27x^3 + 54x^2 + 36x + 8 = 0$

b) $(x^2 - 1)^3 + 2(x^2 - 1) - 3 = 0$

c) $x^4 + 6x^3 - 5x - 30 = 0$

d) $x^4 - 10x^2 + 21 = 0$

e) $x^2 - 2\sqrt{x^2 - 3} - 2 = 0$

6. Solving the following equations

a) $|x+1| + |x-1| = 2 - x$

b) $|x+1| \pm |x-2| = 3$

c) $x^2 - |x-3| = 0$

d) $|x-5| - |x^2 - 25| = 0$

7. Solving equations irrational following

a) $\sqrt{x^2 - 4x + 4} - |x| = 0$

b) $\sqrt{x-3} = \sqrt{2x-2} - 2$

c) $2\sqrt{x^2 + 4x + 5} = x + 3 + \sqrt{x^2 - 1}$

d) $2x^2 + 3x - 7 + \sqrt{2x^2 + 3x - 5 = 0}$

8. Discuss the following values the parameter m, the existence and sign of the roots of the following equations (we do not ask I expression raciness)

a) mx2 + 2x + 1 = 0

b) mx2 - (m +1) x + m = 0

c) (2m +1) x2 + (m-3) x - m + 3 = 0

9. for what values of m the equation (m2 + 1) x2 - 2 (m - 1) x - (m - 1) = 0
it has two distinct positive racines?

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10. For what values of m the equation
$(2m-1)x^2+2mx+m=0$
it has two raciness of opposite signs.
12. Determine according to the values of the parameter m, the number of the position α with respect to the following equations raciness
a) $x^2-4x+2m=0 \quad ; \alpha=2$

b) $mx^2-2(m+2)x+4m+3=0 \quad ; \alpha=3$

c) $4mx^2-4(m+2)x+2m+1=0 \quad ; \alpha=1$
13. For what values of the parameter m, each of the following equations admits her raciness x 'and x "satisfying the conditions indicated please
a) $mx^2+2x-m=0,\ x' < 0 < 1 < x''$

b) $x^2+mx-m+1=0,\ x' < x'' < 2$
14. Solving following inequalities irrational
a) $\sqrt{x^2-1} \geq \sqrt{x^2-2}$
b) $x^2+1 \leq 3x+\sqrt{12x^2-12x+1}$

29.Solve each inequality. Use interval notation to describe the solution set.

a) $\frac{2x}{3}-\frac{6x-1}{6} \leq -\frac{1}{2}$
b) $\left|\frac{1-2y}{3}\right| \leq 1$

Unit 7: Limits of polynomial, rational and irrational functions.

1. Determine the limits and left and right, as x tends to x0, the functions f in the following cases:
a) $x_\circ=2\,;\ f(x)=\frac{3x-7}{x-2}$
b) $x_\circ=-2\,;\ f(x)=\frac{x^2+3x+5}{x^2+2x}$
c) $x_\circ=-3 \quad ; \quad f(x)=\frac{2x+1}{(x-1)(x+3)}$
d) x0 = 3, $f(x)=\frac{1}{x+2^{\frac{1}{x-3}}}$
2. Determine the following limits:

a) $\lim\limits_{x\to 1}\dfrac{3x-2-\sqrt{4x^2-x-2}}{x^2-3x+2}$

b) $\dfrac{\sqrt{x+3}-\sqrt{3x+1}}{\sqrt{x-1}}$

c) $\lim\limits_{x\to 0}\dfrac{1-\sqrt[3]{1-x}}{3x}$

d) $\lim\limits_{x\to +\infty}\dfrac{2x^2-5+\sqrt{x^4-3x+1}}{x-1+\sqrt[3]{4x^6+3x-2}}$

e) $\lim\limits_{x\to +\infty}\dfrac{\sqrt{x^2+x+1}+\sqrt{x^2-x+1}}{x+\sqrt{x^2+1}}$

f) $\lim\limits_{x\to +\infty}\left(\sqrt{x^2-x+1}-ax\right)$

k) $\lim\limits_{x\to +\infty}\left(\sqrt[3]{x+1}-\sqrt[3]{x}\right)$

l) $\lim\limits_{x\to 0}\dfrac{\sqrt[3]{(1+x)^3}-1}{(1+x)\sqrt[3]{(1+x)^2}-1}$

m) $\lim\limits_{x\to 3}\left(\dfrac{1}{x-3}-\dfrac{6}{x^2-9}\right)$

3.Consider the following quadratic function f(x) = $3x^2+12x+8$

i) Find equation of axis of symmetry
ii) Write the coordinates of vertex
iii) Find x-intercepts and y-intercept
iv) Find some points

Plot a parabola of f(x) = $3x^2+12x+8$ by joining the calculated points

4. Show that $\boldsymbol{U=(1,1,1)}$, $\boldsymbol{V=(1,2,3)}$and $\boldsymbol{W=(2,-1,1)}$ are linearly independent.

Unit 8: Combinatorics.

1. Simplify the following expressions

a) $\dfrac{(2n)!}{2n!}$

b) $\dfrac{(n!)^2}{(n-2)!(n+1)!}$

c) $\dfrac{(n+1)!-n!}{n!=(n-1)!}$

d) $\dfrac{n!-(n-1)(n-1)!}{(n-1)!n!-(n-1)!}$

2 Show that for n $\in$I $\mathbb{N}$

a) $\dfrac{k!}{r!(k-r)!}+\dfrac{k!}{(r-1)!(k-r+1)!}=\dfrac{(k+1)!}{r!(k-r+1)!}$

b) r (n – 1) ! + (n – r) ! [(n – 1) (n – 2) … (n – r)] = n !

3) Resolve in N, the equations where x is the unknown

a) $C_x^2=\dfrac{x^2}{2}+x+4$

b) $C_x^4=\dfrac{14}{3}C_x^2$

c) x ! = (x – 2) !

d) $x!-7+\dfrac{6}{x!}=0$

e) $x!=12\sqrt{x!-20}$

4. In a high school or trios languages, French, English and Swahili are taught, there notes the following information:

- while at least one pupil studied trios languages;
- 320 pupils learn French and among them 250 are also studying English and Swahili 70;
- 650 students study English and among them 300 assistant in Swahili;
- 420 students following courses in Swahili and 40 of them learn trios languages.
- In a helping diagram, determine the total number of high school students.

5. The Statistics on the four plants A, B, C and D of a same company, employing more 3200 people, the following information is extracted:

- 1200 employees working in the factory A;
- B and C plants use 10% and 25% respectively of total staff;
- The 1120 women employed by the firm are distributed as follows: 45% in plant A, 224 in the same factory D and the other two have the same number of women.

a) Copy and complement the table below indicating in each case the number of People

Factory / Sex	A	B	C	D	Total
F				224	1120
M					
Total	1200				3200

b) What is the percentage of men working in the factory D?
What percentage of the employees of the plant D are men?

6) E is the set of four-digit numbers containing only the digits 1, 2,3,4,5 and6 (each digit can be repeated up to four times).
a) Indicate card (E)
b) What is the number of elements of E whose numbers are pair wise distinct?
c) What is the number of elements of E with two 1 and two separate numbers?
d) What is the number of elements of E starting with an odd number, this number is set by then?

7. In a set of 32 cards, how many are there hands
a) 8 cards
b) 8 cards with an ace, a king, the queen of spades and two servants?
c) 8 cards including at least one ace?
d) 8 cards with two aces and five hearts?

8 A diet of family allowances is designed for a way that the amount paid to a family increases with the number of children in this family. This diet proposes to double the monthly payment (in RWF) at each new birth and establishes a monthly payment of 2,000 Frw for the first child. Calculate the monthly payment for a family of "n" children.

9 Develop the following expressions using the binomial formula of Newton.

a) $\left(x^3 - x^4\right)^5$ b) $\left(\frac{x}{2} - \frac{2}{x}\right)^8$

10. Give the general term of the binomial development of following expressions:

a) $\left(t - t^{\frac{1}{2}}\right)^{10}$ b) $\left(\frac{1}{m} - 2m^2\right)^{20}$

11. Calculate the coefficients x^4 and x^{16} of development $\left(x + \frac{1}{x}\right)^{24}$.

12. Does there exist a term independent of x in the binomial development $\left(\frac{1}{x} + x^3\right)^{12}$?

13. a) How many distinct numbers statistics 4 can be formed using only 2, 4, 5, 6, 8, and 9?
b) How many distinct 4 digit numbers can be formed using the digits 2, 4, 5, 6, 8, and 9 each command Utilize more than once?

14. a) combines ways can park 2 cars in a parking lot at 5 places?
b) Combines ways can park 5 cars in a parking 5 places?
c) Combines ways can park 5 cars in parking lot 2 places?

15. How many eight digit integers can be formed using the five times number three times the number 2?

16. Solve the equations in N:

a) $C_n^5 = C_n^7$, b) $C_{n-1}^{n-5} = 3 \text{ x } C_{n-3}^{n-7}$

17. a) Use the binomial theorem of Newton, developer:

i) $(a - 1)^5$ ii) $\left(1-\sqrt{3}\right)^6$

b) i) What is the coefficient of x^5 in $(x^2 + 1)^7$?

ii) What is the coefficient of x^5 in $(x + 2)^{12}$?

18. A property of Cpn.

It simultaneously pulls 3 balls in an urn contains 4 black balls and 5 white balls.

a) What is the number of prints that you can get?

b) Of these prints, combined contain:

i) 0 3 white and black?

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ii) 1 black and 2 white

iii) 2 black and 1 white?

iv) 3 black and white 0?

c) What link is there between the response of a and b responses)?

$C_4^0 \text{ x } C_5^3 + C_4^1 \text{ x } C_4^2 + C_5^1 + C_4^3 \text{ x } C_5^0 = C_9^3$

Deduce that d) generalization: Let n, m and p integers with trios $p \leq n$ et $p \leq m$.

Write more simply: $C_n^0 \text{ x } C_m^p + C_n^1 \text{ x } C_m^{p-1} + C_n^2 \text{ x } C_m^{p-2} + \ldots + C_n^p \text{ x } C_m^0$.

19. Ways of combining and 4 girls they can sit alternately on ranks of 8 chairs, if a girl is always in the last chairs?

20. An inspection number phone consists of 3 letters followed by 5 digits. Numerous tells how if they exist:

a) we can repeat the letters and numbers?

b) The letters can be repeated?

c) Can be repeated or the letters or numbers?

21. How many 4-digit numbers that are less than 3000 peers can be formed using the digits 0, 2, 4, 5, 7, 8

a) without any repetition?

b) With one or more repetitions?

22. a) Using the formula of Developing the Bonome Newton developer the following pairs:

i) $(a + b)^7$ ii) $(2x + 3y)^4$ iii) $(x^2 + \frac{1}{x})^4$

Establish the development of the following pairs:

i) $(a - 2b)^5$ ii) $\left(x^3\sqrt{2} - \frac{1}{\lambda\sqrt{2}}\right)^4$ iii) $\left(\frac{\sqrt{2}}{x} - \frac{x^2}{2}\right)^6$

23. Calculate: $S_n = 1 + 3.\ C_n^1 + 3^2 .\ C_n^2 + \ldots + 3^p .\ C_n^p + \ldots 3^n$ et $S_{,}^{'} = \sum_{p-0}^{n} (-3)^p C_n^p$.

24. Calculate: $(1 + 1)^a$ and $(1 - 1)^n$

Deduce the expression in function of n:

$Sn = C_n^0 + C_n^1 + C_n^2 + ... + C_n^n$ $\qquad$ $S'_n = C_n^0 + C_n^2 + C_n^4 + ...$

$S''_n = C_n^1 + C_n^3 + ...$

25. Establish that: $C_n^p = \frac{n}{p} C_{n-1}^{p-1}$ Deduce the calculation: $\sum_{p=0}^{n} p.C_n^p$.

26. Establish that: $C_m^p \,.\, C_{m-p}^{n-p} = C_m^n.C_n^p$ avec $p \leq n \leq m$

27. Solve the system x, y, $\begin{cases} C_x^y = C_x^{y+1} \\ 4.C_x^y = 5C_x^{y-1} \end{cases}$

28. Establish: $C_n^p = C_{n-2}^{p-2} + 2C_{n-2}^{p-1} + C_{n-2}^p$.

29. Prove that for any integer n and p, we have:

$C_{n+1}^p = C_n^p + C_{n-1}^{p-1} + C_{n-2}^{p-2} + ... + C_{n-p+1}^1 + C_{n-p}^0$.

30. Calculate that n secant $C_{2n}^1 + C_{2n}^2 + C_{2n}^3 - 387^n = 0$

31. Show that the whole matter quell natural n,

$$\frac{C_n^1}{C_n^0} + \frac{2C_n^2}{C_n^1} + \frac{3C_n^3}{C_n^2} + ... + \frac{nC_n^n}{C_n^{n-1}} = \frac{n(n+1)}{2}$$

32. a) Show the relationship

$kC_n^k = nC_{n-1}^{k-1}$, si $n \geq k \geq 1$.

b) Deduce the value of the sum

$C_n^1 + 2C_n^2 + 3C_n^3 + ... + nC_n^n$.

Deduce the value of the sum

Unit 9: Elementary probability

1. In a class, 15 students play cricket, 11play hacked, 6 play both games and everyone plays at least one of the games.
   Fin the total number of students in the class.
2. . In a high school or trios languages, French, English and Swahili are taught, there notes the following information:

- while at least one pupil studied trios languages;
- 320 pupils learn French and among them 250 are also studying English and Swahili 70;
- 650 students study English and among them 300 assistant in Swahili;
- 420 students following courses in Swahili and 40 of them learn trios languages.
- In a helping diagram, determine the total number of high school students.

3. . The Statistics on the four plants A, B, C and D of a same company, employing more 3200 people, the following information is extracted:

- 1200 employees working in the factory A;
- B and C plants use 10% and 25% respectively of total staff;
- The 1120 women employed by the firm are distributed as follows: 45% in plant A, 224 in the same factory D and the other two have the same number of women.

b) Copy and complement the table below indicating in each case the number of People

Factory / Sex	A	B	C	D	Total
F				224	1120
M					
Total	1200				3200

b) What is the percentage of men working in the factory D?
What percentage of the employees of the plant D are men?

3. E is the set of four-digit numbers containing only the digits 1, 2,3,4,5 and6 (each digit can be repeated up to four times).
a) Indicate card (E)
b) What is the number of elements of E whose numbers are pair wise distinct?
c) What is the number of elements of E with two 1 and two separate numbers?
d) What is the number of elements of E starting with an odd number, this number is set by then?

4. In a set of 32 cards, how many are there hands
a) 8 cards
b) 8 cards with an ace, a king, the queen of spades and two servants?
c) 8 cards including at least one ace?
d) 8 cards with two aces and five hearts?

5. A diet of family allowances is designed for a way that the amount paid to a family increases with the number of children in this family. This diet proposes to double the monthly payment (in RWF) at each new birth and establishes a monthly payment of 2,000 Frw for the first child. Calculate the monthly payment for a family of "n" children.