**MATHEMATICS JSS 3**

**THIRD TERM**

## SCHEME OF WORK

1. Revision of First term’s work
2. Methods of solving simultaneous Linear Equations in one or Two Variables

Elimination, Substitution and Graphical Methods

Methods of solving simultaneous Equation.

Application of Linear Equation

Graphical Method continued

Statistics II

Application of measure of central tendency on relevant current issues

Data collection from info on drug Abuse, voters Register, Producers (workers), consumers (children, aged etc)

Importance of data on drug. Abuse, HIV patients, Voters Register, Producers, consumers etc

The use of the statistical tools such as measures of central tendency in Drug abuse, voting and other related activities.

Variation

Concept and meaning

Types of variation with examples Direct, Inverse, Joint, and Partial.

1. Variation (continued)

Joint and Partial Variation on simple exercises

More exercise in the various types of variation

1. Revision
2. Trigonometric ratio of angles

Sine, cosine, tangent of acute angles

Application of trigonometrically ratios to solve problems on angles and sides of a

1. Angles of elevation and depression

Clinometers to measure distances.

1. Bearing and Distances.

Concept of bearing and distances

Taking of bearing

Instrumental for taking bearing

Scale drawing

11 – 13 Revision & Examination

**WEEK 2**

## SOLVING OF SIMULTANEOUS LINEAR EQUATIONS

A linear equation is an equation with one solution, in equation known as linear there is only one or two variable unknown variables. But in the case where we combine two equations (linear) thereby having what is known as Simultaneous equation. E.g

4x + y = 8 (1) are called simultaneous equations

3x – y = 6 (2)

Simultaneous Linear equations can be solved, graphically, algebraically. But in today’s class we shall be considering the algebraically method of solution.

ALGEBRAIC METHOD

There are two algebraic methods of solving simultaneous equations. These are:

1. Substitution method
2. Elimination method

Substitution Method

To use substitution method

* 1. Re-arrange one of the equations so that one variable is made the subject of the formula of the equation.
  2. Substitute this into the other equations.
  3. Solve the resulting equation to obtain one variable.
  4. The other variable is found by substituting your answer into the original equation.
  5. Check the solutions by substituting the two answers back into the original equation.

Example 1

Solve the following simultaneous equations by substitution method.

i. y = 5x + 2 ii. 2x + 3y = 5 x + 2y = 15 3x + y = 4 iii. 4m – 3n = 0 iv. x + 6y = -2 m + 2n = 3 3x + 2y = 10

Solution

II. 2x + 3y = 5 …………. (1)

3x + y = 4 …………. (2)

# Step (1)

Label the 1st equation (1) and the second equation (2) for easy reference later on.

Step (2)

From equation (2) make “y” subject of formulae 3x + y = 4

Y = 4 – 3x …………… (3)

Step (3)

Substitute y = 4 – 3x into equation (1)

2x + 3y = 5

2x + 3 (4 – 3x) = 5

Step (4)

Open the brackets and solve for x.

2x + 12 – 9x = 5

12 – 7x = 5

12 – 5 – 7x = 10

= x = 1

Step 5

Substitute for x = 1 into equation…………. (3) y = 4 – 3x; y = 4 – 3(1), y = 4 – 3

y = 4 – 3 check y = 1

Hence: x = 1, y = 1 2(1) + 3(1) is the solution to the equation 2 + 3 = 5

In Equation (2)

3(1) + (1)

3 + 1 = 4

Example II 4m – 3n = 0

# + 2n = 3

# Step (1)

Label the equations 4m – 3n = 0 ………. (1) m + 2n = 3 ………. (2)

Step 2

Make “m” subject of formula in equations (2) m + 2n = 3 m = 3 – 2n ………. (3)

Step 3

Substitute m = 3 – 2n into equation ………. (1)

4m – 3n = 0

4(3 – 2n) – 3n = 0

Step 4

# Open the bracket and solve for “n”

12 – 8n – 3n = 0

12 – 11n = 0

= n = 1

Step 5

Substitute the value on n = into equation………….. (3) m = 3 – 2

m =

=

Hence m = , n =

WRAP UP AND ASSESSMENT

Two equations are called simultaneous equations if they are to be solved at the same time. In substitution method make one variable the subject and then substitute this value in the other equation.

Solve the following simultaneously using substitution method.

(1) x + 6y = -2 (2) -2 = 5x – y

3x + 2y = 10 15 = x + 2y

(3) 4x + 7y = 20

3x + y = -2

TICKET OUT

Solve the following simultaneous Equation by substitution method.

Exercise 16.3 pg 149 No 11 – 1

**WEEK 3**

## ELIMINATION METHOD

This method is very useful to solve simultaneous equations especially when none of the coefficients of the unknown is 1.

Example III.

Solve the following simultaneous equations by elimination method.

(a) 6x + 5y = 15 (1) (b) 4c – 4d = 9

3x + 5y = 12 (2) 5c + 4d = 18

One of the unknown “Y” has equal coefficient and with the same signs so we subtract the two equations to eliminate y terms.

6x + 5y – (3x + 5y) = 15 – 12

6x + 5y – 3x – 5y = 3

6x – 3x + 5y – 5y = 3

3x + 0 = 3

= x=1

To find y, substitute x=1 in either (1) or (2) using equation

(1) 6x + 5y = 15

6(i) + 5y = 15

6 + 5y = 15

5y = 15 – 6

= y=

(b) 4c – 4d = 9 (1)

5c + 4d = 18 (2)

One of the unknown “d” has equal coefficient but with different sign so we add the two equations to eliminate “d”

4c – 4d + 5c + 4d = 9 + 18

4c + 5c – 4d + 4d = 27

=

1. = 3

To find d substitute c = 3 into (1)

4c – 4d = 9

4(3) – 4d = 9

4d = 12 – 9

=

1. =

## WRAP UP AND ASSESSMENT

In elimination method you may need to multiply one or both of the equations by a number in order to obtain a variable with e same coefficient in both equations. Then add both equations when the signs of the variables you want to eliminate are opposite but subtract them when the signs are the same.

Exercise: 16 4 No 2, 3, 7 – 11.

Use elimination method to solve the following simultaneous equations.

2. 6x + 7y = 15 3) 4x + 3y = 10 6x – 9y = 31 4x + 5y = 8

7) 2x + 3y = 8 8) 3x + 4y = 10

3x + 2y = 7 2x + 5y = 9

9) 4x + 3y = 11 10) 4a + 3b = 3

3x – 4y = 2 3a + 2b = 1

## TICKET OUT

Solve the following Simultaneous equation by Elimination method. Exercise 16.4 No 12 -1

**WEEK 4**

## SOLVING SIMULTANEOUS EQUATION GRAPHICALLY

To solve simultaneous equations graphically.

1. Make a table of values for both equations.
2. Draw the graphs for both equations on the same axes
3. Find the co-ordinate (i.e x and y values) where both graphs intersect these values are the solutions of both equations.
4. Check your solutions by putting these values into the original equations to make sure they satisfy them.

Example 16.3

Solve the simultaneous equations.

X – 2y = 4 and 2x – y = 5 graphically

Solution

In each equation make y the subject of the equation

(i) x – 2y = 4

-2y = 4 – x

y = -2 + 0.5x ……………… (1)

**WEEK 5**

## VARIATION

Variation may be described as the relationship that exist between two or more quantities in which a change in one quantity leads to a change in the other(s)

Variation can be classified into;

1. Direct
2. Inverse
3. Joint
4. Partial variation

DIRECT VARIATION

Direct Variation occurs when two variables x and y are related directly, here an increase or decrease in x results into a proportional increase or decrease in the other.

For example.

If y varies directly as x, then y x

The symbol ‘ ’ means “is proportion to” or “varies directly with”. This symbol can be change to an “= “sign by introducing a constant.

y x

Y = kx; where k is a constant

Example 1

The relationship between M and L

The value of L when M = 15

Solution

M L K = = 3

M = KL M = 3L

6 = K 2 M = 3L is the relationship ii. M = 3L, M = 15

=

L = 5

INVERSE VARIATION

Two variables are said to be inverse proportion when their product is a constant.

If the value of y varies as a result of the variation of Z such that y x Z is always a constant, then y is said to vary inversely with Z. Inverse variation is written as y , y = where K is the constant.

Example 2.

If P varies inversely with A where P = 4 and A = 8, find the constant and write down the equation.

Solution

P P =

P =

PA = K

4 x 8 = k K = 32 Mathematics Topics for Secondary school –

**WEEK 6**

## JOINT VARIATION

In joint variation, we usually have at least three variables.

If P qx, that means p is proportional to qx. This is called joint variation. The equation for such a variation is p = Kqx where k is a constant. For example, the mass of a sheet of metal is proportional to both the area and the thickness of the metal, i.e M At (where M, A and t are the mass, area and thickness). The mass varies jointly with the area and thickness.

Again, at mid-day, the temperature ToC inside a house is proportional to the outside temperature thickness of the house wall tcm.

Here T

T =

## PARTIAL VARIATION

When the variation of y depends partly on p and partly on V such that y = k, P + K2v, the variation is called a partial variation. The cost is partly constant and it partly varies with the amount of time taken. Hence, c = a + bt where c is the cost, t is time taken and a and b are constant.

**WEEK SEVEN**

MID TERM EXAMINATION

**WEEK 8**

THE TRIGONOMETRIC RATIOS

The 3 trigonometric ratios are sine (sin), cosine (cos) and tangent (tan)B

Consider the right-angled triangle below

Hypotenuse

Adjacent to

Opposite to

Hypotenuse: the longest side is called hypotenuse

1. Tangent of an Angle

In any right angle triangle tangent =

Example

Use the table of tangent to write down the values of the following (a) tan 36o (b) tan 23.5o

(c) tan 45o

Solution

Tan 36o. look for 36o under the column headed x tan 36o = 0.7265

Tan 23.5o look for 230 under the column headed x. then move across until under the column headed 0.5o to find 0.4348 tan 23.5o = 0.4348 Tan 450 = 1

Exercise: in ABC, Ĉ = 90, B = 28o and CA = 12cm. Find BC. Give your answer to 2.s.f

SINE AND COSINE OF AN ANGLE

Sine = , Cosine =

The three ratios can be summarized in the word SOH CAH TOA

Sin = , Cos , tan

**Example**: Use tables of sine and cosine to find (a) Sin 46.65o (b) cos 15.94o = 0.9615 **Solution**

Sin 46.65o = 0.7266 (b) cos 15.94o

B

A

**WEEK NINE**

## APPLICATION OF TRIGONOMETRIC RATIOS

Examples: a ladder of 10m is placed against a vertical wall such that the angle between the ladder and the horizontal ground is 30o

Calculate the distance up the wall the ladder reaches

Solution

Ladder 10

opp

hyp

adj

30o

Sin 30o =

X = 10 x sin 30o

x

X = 5m

Exercise

In a circle, point O is the centre AB is a chord with length 16cm. The radius of the circle is 10cm calculate

The angle AÔ**B**

The vertical line from the centre to the line AB

## ANGLE OF ELEVATION AND DEPRESSION

Tangent ratio can be used to solve real life problems such as angles of elevation and depression.

## Angle of Elevation

B

Example: A tower AB is 50m high if the distance from the point C is 80m from A on a level ground find the angle of elevation of B from C

C

80m

TowerRRr

50m

A

Let be the angle of elevation of B from C, tan = = 0.6250

= tan-1(0.6250) = 32o

## Angle of Depression

Example: From the top of a cliff of 150m high, John observes that the angle of depression of a boat at sea is 20o calculate the distance of the boat from the foot of the cliff (ignore

John’s height)

A

Solution

150m

20o

20o John

cliff

B

C

Tan 20o =

X =

X = 412m

Exercise

The angle of elevation of the top of a building is 35o from a point 55m away on a level ground. Calculate the height of the building

From the top of a mountain 150m high a girl notices that the angle of depression of an object at sea is 350o. find the distance of the object from the foot of the mountain (ignore the height of the girl)

**WEEK 10**

## BEARINGS

Bearings are measured from the north in the clock wise direction

NW NE

SE

SW

West

East

North

South

A

Examples of bearings using three digits

B

The bearing of point A from B is 090o

Q

P

210o

The bearing of point P from Q is 210o

## Exercise

Point P and Q are respectively 30km North and 20km west of point R. Work out the bearing of Q from P.

## Assignment

From point P Wisdom cycles 18km north to point Q, then east to point R. If the bearing of R from p is 065o. What is the distance from Q to R.?