**SCHEME OF WORK FOR MATHEMATICS JSS 3 2017/2018 SESSION**

WEEK TOPIC

1 Revision of JSS 2 work

2 The Binary number system

3 Binary number system continued

4 Algebraic Processes

5 Word problems

6 Change of subject of formulae

7 Revision of first half terms work and periodic test

8 Statistics

9 Statistics Continued

10 Simple equations involving fraction and simultaneous equations

11 Revision of 2nd half term’s lesson and periodic test

12-13 First term examination

REFERENCE MATERIALS

ESSENTIAL MATHEMATICS for junior secondary school, book 3 by A. J. S Oluwasanmi

EFFECTIVE MATHEMATICS for junior secondary school book 3 by M.K.Akinsola, M.C.Ejike and A.Tella

**WEEK 1**

REVISION OF JS S 2 WORK

**WEEK TWO**

**BINARY NUMBERS**

Numbers in base two are called binary numbers at is made up two digit is 0 and 1

**Converting base 10 numbers to base two number**

We do this by dividing the base ten number repeatedly by 2, writing down the remainder until we get to zero and reading the remainder upwards.

Example: (a) Write 810 to a number in base two

b) Express 85 in a binary number

c) Convert 10710 to a number in the base two

d) Convert 152ten to a number in base two

e) Convert 3/8ten to a binary fraction (bicimal)

f) Express 15.12510 in binary notation

**SOLUTION**

(a) 2 8

2 4 R 0

2 2 R 0

0 R 1

810 = 10002

(b) 2 85

2 42 R 1

2 21 R 0

2 10 R 1

2 5 R 0

2 2 R 1

1 R 0

0 R 1

8510 = 1010101two

(c) 2 107

2 53 R 1

2 26 R 1

2 13 R 0

2 6 R 1

2 3 R 0

2 1 R 1

0 R 1

10710 = 110100112

(d) 2 152

2 76 R 0

2 38 R 0

2 19 R 0

2 9 R 1

2 4 R 1

2 2 R 0

2 1 R 0

0 R 1

152ten = 100110002

(e) 2 3

2 1 R 1

0 R 1

310 = 112

2 8

2 4 R 0

2 2 R 0

2 1 R 0

2 0 R 1

810 = 1000two

First express 3 and 8 in binary, 10 = 112/10002= 0.0112

(f) 15.125 = 15 = 15= 10

2 121

2 60 R 1

2 30 R 0

2 15 R 0

2 7 R 1

2 3 R 1

1 R 1

0 R 1

12110 = 11110012

2 8 R

2 4 0

2 2 0

2 1 0

2 0 1

810 = 10002

(= 2 = 1111.0012

**Exercise:** Convert the following binary numbers.

(a) 72 (b) (c) 0.875 (d) 32

**Converting Base Two Numbers to Base 10 Numbers**

We express the given binary numbers as a sum of multiples of powers of two 20, 21, 22, 23 etc.

Example: Convert (i) 101two (ii) 10.10012 (iii) 1112

**SOLUTION**

1. 1012 = 1x22 + 0x21 + 1x20

= 4 + 0 + 1

= 510

1. 1112 = 1x22 + 1x21 + 1x20

= 4 + 2 + 1

= 910

1. 10.10012 = 1x21 + 0x20 + 1 x 2 -1 + 0 x 2-2 + 0 x 2-3 + 1 x 2-4

= 2 + 0 + + 0 + 0 +

=

= 210

1. 101012 = 1 x 24 + 0 x 23 + 1 x 22 + 0 x 21 + 1 x 20

= 16 + 0 + 4 + 0 + 1

= 2710

Exercise: If 1102 = P10. Find the value of P

**Assignment**

1. Write 1-10 in binary numbers
2. Convert to base 10 (a) 111012 (b) 11.01012  (c) 10110012
3. Convert to binary number (a) 43ten (b) 1280ten (c) 17610

**ADDITION, SUBTRACTION, MULTIPLICATION AND DIVISION IN BINARY NUMBERS**

**Examples**

1. Add 1011112 and 100112
2. Subtract 100112 from 1011112
3. 11012 x 1112
4. 100100012 1012

**Solution**

1. 1011112 2. 1011112 3. 11012

* 100112 +100112 x1112

111002  10000102 1101

1101

1101

1011011

4.Convert to base 10 to have 14510 510 = 2910 = 111012 or

111

1012 10010012

101

1000

101

101

101

0

Exercise: (1) add 1001102, 1010102 and 1110112

(2) Multiply 100112 x 112

(3) 10110102 – 1001112

(4) 10101112 1112

**WEEK THREE**

**APLLICATION OF BINARY NUMBERS**

Bunch Cards: it is used in business farms, examining from boards and other organization as a solution for sorting information.

Example: suppose that a failure in a subject is represented by the digit zero. Then for any 5 subjects English, Mathematics, French, Agric and C.R.K. The number 10110 represent a pass in English, a failure in mathematics, a pass in French, a pass in agric and a failure in C.R.K.

**Bunch Tape**

**Letters Decimal No Binary Code**

A 1 1

B 2 10

C 3 11

D 4 100

E 5 101

F 6 110

G 7 111

H 8 1000

I 9 1001

J 10 1010

K 11 1011

L 12 1100

M 13 1101

N 14 1110

O 15 1111

P 16 1000

Q 17 10001

R 18 10010

S 19 10011

T 20 10100

U 21 10101

V 22 10110

W 23 10111

X 24 11000

Y 25 11001

Z 26 11010

French tapes are used to enter information and instruction into some computers.

Exercise:

1. Using a letter per line code and with the words represented by the following

(a) 1 (b) 10000 (c) 100

100 101 101

100 10100 1100

10010 101 1001

101 10010 10110

10011 101

10011 10010

1. Write the following in a letter per line code.

(a) S (b) D (c) A (d) S (e) E

U I N C L

N V G H I

D I E O A

A N L O S

Y E L

1. Code your surname in binary

**WEEK 4**

**ALGEBRAIC PROCESSES**

Objective: Use letter to generalize statements

* Interpret mathematical symbols
* Solve simple and problems

**Generating statement**

The following symbols are generally used in mathematics

1. “=” means is equal to”

Example: 13 – 6 = 7 means thirteen minus six is equal to seven

1. “>” means is greater than”

Example: 18 > 10 means eighteen is greater than ten”

1. “<” means is less than”

Example: -10 < 2 mean negative ten is less than two

1. “ ” means is approximately equal to”

Example: is approximately equal to 3.142 that is 3.14

1. “” means not equal to”

Example: 2 3 means two is not equal to three.

Exercise

1. Write the following using symbols
2. M is equal to 8 (ii) y lies between 8 and 12

(iii) Twice y equals fourteen, therefore y equals seven.

**OPERATION IN ALGEBRA**

EXAMPLE

Write down the meaning of the following and find the values if x = 8, y = 3, z = 9

(a) 2x (b) 2 + x (c) (d) x – 5 (e) x2 (f) x + yz

**Solution**

(a) Multiply x by 2 (b) Add two to (c) Divide x by 2

I.e. 2 x 8 = 16 i.e. 8 + 2 = 10 = = 4

(d) Subtract five from (e) Square (f) multiply y by z

– 5 = 8 - 5 = 3 2 = 8 x 8 = 64 + yz = 8 + 3(9) = 8 + 27 = 35

Exercise: If a = 5, b = -3 and c = 2. Find the value of (a) 2a + b – c (b) 5a – 8 (c) 8ac – 2b (d)

**LIKE AND UNLIKE TERMS (WORD PROBLEMS)**

Examples 1: A fence is made up of 3 different bundles of length 3m each, 5 different hurdles of lengths 5m each and 2 different hurdles of length 2m each. What is the total length?

**SOLUTION**

Let the 3 hurdles be, y and z

Then total length force = 3x + 5y – 2z

2) A tourist walked km an hour for 3 hours on the first day and km an hour for y hours on the second day. How far did he walk in the two days?

Ans. (3x + y) km

Exercise

A family eats a loaves of bread a day. How many loaves are need for (a) M-days (b) Kweeks (c) How long will p loaves last? (a) 4m loaves (b) 28k Loaves (c) days

**Use of brackets**

**Examples 1:**  The angles of a triangle measured in decrees’ are 2, 3+ 5, 4 (+ 10). What are the values of the angles?

**SOLUTION**

2 + (3 + 5) + 4 ( + 10) = 180

2 + 3 + 5 + 4+ 40 = 180

9x + 45 + 180 – 45

=

= 150

The angles are 300, 500 and 1000

2. The results of adding three consecutive numbers is one hundred and twenty. Find the number.

**SOLUTION**

Let the numbers be, + 1,+ 2

++ 1 + + 2 = 120

3 + 3 = 120

3 (+1) = 120

+ 1 + 40

+ 40 -1

= 39o

Exercise: The greatest of 5 consecutive even numbers is 2a. What is the sum of all the five numbers?

**WEEK 5**

**WORD PROBLEMS**

Sum and Difference

1. When 30 is added to a number the result is -18. Find the number.

**SOLUTION**

The number be

+ 30 = -18

= - 48

1. The difference between a number and 5 is 20 what are the two positive numbers

**SOLUTION**

Let the number be

– (-5) = 20

+ 5 = 20

– 15

If is less than -5

-5 – = 20

= -5 – 20

= -25

1. The sum of three consecutive integers is 138. Find the numbers.

**SOLUTION**

Let the numbers be n, n + r, and n + 2

n + (n + 1) + (n + 2) = 138

3n + 3 + 138

3n = 138

n = 45

n + 1 = 46

n + 2 = 47

The numbers are 45, 46, and 47

Exercise: Ex 2.1 No 6, 7, 8

**Product**

Examples: (1) Find the product of 1, -0.8 and - 2 (2) what number must be multiplied by 25 to make ? (3) The product of 3 numbers is 3600. If two of the numbers are equal and the third number are 25. Find the two equal numbers.

**SOLUTION**

1. () x (2) Let the number be (3) 25 x x = 3600

= 25 = 252 = 3600

= 3 100x = 3 2 =

= 2 = 144

= 0.03 = 12

**Solving combine products with sum and difference**

Examples: (1) Add the sum of the 20 and 30.5 to the position difference between 25 and 45. (2) From the sum of 8 ad 7 subtract the negative difference between 15 and 24 (3) find the product of 3 and

**SOLUTION**

1. (20 + 30.5) + (45 – 25) (2) -8 + 7 – 115 – 25 (3) Sum = +

= 50.5 + 20 = -8 + 7 + 9

= 70.5 = 8 =

Product = x

= = 1

**Exercise:** Ex. 2.3 No 1, 2, 3, page 17.

**Word problems with fractions**

Examples:

1. Find the three-fifth of the sum of 45 and -60. (45 – 60) = (-15) = -9
2. Divide the difference between 25 and 10 by the product of 6 and 5. = = 0.5
3. Find one-quarter of the sum of the product of 2 and 3 and the product of 1 and

**Solution:**  = = 1

**Exercise:** Ex 2.4 No 1, 2, 3, page 18

**Problems leading to equations**

Examples

1. When of a number is added to 30. The result is 20 added to the number find the number.
2. When the sum of 28 and a certain number is divided by 5. The result is equal to treble the original number. What is the number?

**SOLUTION**

(1) Let the number be (2) Let the number be

Hence + 30 = + 30 = 3

Multiply each term by 5 15 = 28 +

3 + 150 = 5 + 100 =

5 - 3 = 150 -100 = 2

2 = 50

= 25

**ASSIGNMENT**

**EXERCISE 2.6; NO 1, 2, AND 3 PAGE 20.**

**WEEK 6**

**CHANGE OF SUBJECT OF A FORMULA**

**Subject of formula:** A formula is always written in terms of the subject e.g. **V** = 2h is a formula for volume of a cone, r is the radius, height (h) =.

Examples 1: Make r the subject of the formula in A = 2 (2) Make T the subject of the formula in = K (3) Make x the subject of the formula in y =km/x

**SOLUTION**

a) A = 2 b) = K c) y =

2 = PT = KV xy = km

2 = T =  x =

Exercise

1. Make b the subject of the formula in A = (a + b) x
2. Make x the subject of the formula in a = b ( 1 – x)
3. Make w the subject of the formula in L =

**Substitution in formula**

Examples: The total surface area of a closed cylinder of base radius rcm and height hcm is given by A = 2(r+h)

1. Write in terms of A and r
2. Find the height of the cylinder of base radius 7cm and the total surface area of 396cm2. = .

**SOLUTION**

1. A = 2(r+h) b) h = - 7

r + h = h = 2m

h = - r

Exercise: The mass of water in a rectangular tank 1m long. 6m wide and him deep is Mkg where M = 1000 lbh (a) What is the mass of water in a tank 5m long, 4m wide and 5m deep? (b) What is the depth of the water in a tank 5m long and 3m wide of its mass is 24000kg?

**Assignment**

1. if T = (a) Express m in terms of T an K (b) Find m when T = 20 and K = 50, =
2. make h the subject of the formula **V** = 2h
3. hence find the value of h when V = 256, = , r = 21

**WEEK 8**

**EVERYDAY STATISTICS**

**Data Presentation**

**Frequency Table**

Example: The raw data below show the number of mobile phone calls made by a group of students in a certain day.

5 6 7 8 4 4 5 7 8 10

7 6 5 8 5 7 8 7 10 7

6 5 6 7 7 5 4 5 7 8

1. Use a tally mark to prepare a frequency table for this data
2. What calls occur most often?
3. What percentage of students made 8 calls?

**SOLUTION**

1. No of calls made Tally Frequency

4 3

5 7

6 4

7 9

8 5

9 0

10 2

1. 7 calls
2. x 100

= 16%

**Pictogram**

**Example:** The following table shows the colour of cars in a car park one morning. Draw pictogram to illustrate this data.

Colours of car frequency

Black 20

White 17

Red 8

Yellow 5

Green 10

**SOLUTION**

**Colour of cars**

Black

White

Red

Yellow

Green

Key: = 2 = 1

**Bar Chart**

Bar charts consist of series of bars with equal width.

Example: Draw bar chart to illustrate the data of the example above

Frequency colour of cars of the park

**Compound bar chart**

It is used to compare two or more different sets of information.

Example:

The following table shows the number of candidates who gained admission into higher institutions at a certain town over a period of years.

Year Boys Girls

1997 65 46

1998 50 55

1999 80 73

2000 70 92

2001 45 64

1. Illustrate this information on dual bar chart
2. Illustrate what year did girls leave the highest admission?
3. Illustrate what year did boys have the least admission?
4. How many more boys had admission than girls in 1999?
5. How many more candidates gained admission in 2000 than 1998?

**SOLUTION**

No of candidates

**ASSIGNMENT**

**EXERCISE 22.1; NO 1, 2, AND 3 PAGE 226.**

**Pie charts**

A pie chart is a circle divided into sectors whose angle are used to display data

Example:

1. In a certain year, the expenditure of a university is shown in the table below.

Items Expenditure in Million Naira

Equipment 20

Salaries and wages 25

Building projects 70

Maintenance 25

Miscellaneous 10

1. Draw a pie chart to illustrate the information
2. What percentage of total expenditure goes on project

**SOLUTION**

Items Expenditure in Million Naira Angles

Equipment 20 x = 48o

Salaries and wages 25 x = 60o

Building Project 70 x = 168o

Maintenance 25 x = 60o

Miscellaneous 10 x = 24o

Total 150 360o

b) x = 46.7o

Example 2

History 40% , Geography 30% , Further Mathematicss10% and Physics 20%

The pie chart shows the percentage of students taking Further Mathematics, Physics, History and Geography

1. What angle represented subject?
2. What fraction of students are taking history
3. If the total number of students is 500, how many students are taking physics?

**SOLUTION**

**Subject Percentage Angles**

Further Maths 10% x = 36o

Physics 20% x = 72o

History 40% x = 144o

Geography 30% x = 108o

Total 100% 360o

(b) Fraction for history = =

(c) No of Physics Students = x 500 = 100 Students

Exercise: Ex. 22.2 No 1 and 5 page 228 and 229

**WEEK 9**

**MEASURE OF CENTRAL TENDENCY (MEAN, MEDIAN, MODE)**

Example

1. In a test 10 pupils obtained the following marks 5, 7, 4, 8, 5, 7, 10, 9, 3. Find (a) The mean mark (b) Median mark (c) Modal mark.

**SOLUTION**

1. Mean = = =

Mean = 6.4

1. Arrange the marks in ascending order of magnitude 3, 4, 5, 5, 6, 7, 8, 9, 10

Median = = = 6.5

1. The mode is the value that occurs most the mode are 5 and 7 this is bimodal.

**Calculating average from frequency tables**

Examples: In a science test. The following score shown in the table below were obtained out of 10 by some students.

**Marks No of Students (Frequency)**

0 2

1 1

2 2

3 4

5 1

6 7

7 3

8 4

9 1

1. Find (i) the mode (ii) the median (iii) the mean of the frequency distribution
2. How many students scored at least 5 marks

**SOLUTION**

1. (i) Mode = 8

(ii) 0, 0, 1, 2, 2, 3, 4, 4, 5, 6, 6, 7, 7, 7, 8, 8, 8, 8, 9

Median = = 5.5

(iii) Sum of values = 0 + 0 + 1 + 2 + 2 + 3 + 4 + 4 + 5 + 6 + 6 + 7 + 7 + 7 + 8 + 8 + 8 + 8 + 9 = 99

Mean = = = 4.95

**ALTERNATIVELY**

**Scores frequency (f) frequency x score**

0 2 2 x 0 = 0

1 1 1 x 1 = 1

2 2 2 x 2 = 4

3 1 1x 3 = 9

4 3 3 x 4 = 12

5 1 1 x 5= 5

6 2 2 x 6 = 12

7 3 3 x 7 = 21

8 4 4 x 8 = 32

9 1 1 x 9 = 99

= 20 = 99

Mean = = = 4.95

Exercise: Ex 22.3 No 1 and 2 page 231

**Range:** It gives a measure of how spread and the values are. Range = Highest value – Lowest value

Examples

1. Find the range of these numbers 9, 4, 7, 6, 12, 8, 15, 10

Solution: Range = 15 – 4 = 11

1. A student obtained the following marks each out of 100 in different geography test 42, 44, 50 40, 54, 48, 10 88. Find (a) The mean (b) the range (c) make a comment why the range in this case is not good to measure the spread.

**SOLUTION**

1. Mean = =

Mean = 48

1. Range = 88 – 10

= 78

1. The two extreme values i.e. 10 and 88 affects the range, so at it not a good measure of spread in this particular case.

Exercise

Find the range of the following

1. 35cm, 50cm, 45cm, 90cm, 30cm
2. 67km, 50km, 20km, 48km, 55km
3. 5.2, 4.7, 8.2, 9.3, 6.4, 5.5

**ASSIGNMENT**

**EXERCISE 22.4; NO 8, 9 AND 10. PAGE 240.**

**WEEK 10**

**SIMPLE EQUATIONS INVOLVING FRACTIONS**

Examples: Solve the following equations

1. –
2. P =
3. = 5 +

**SOLUTION**

1. The L.C.M of 5 and 10 is 10 multiply both sides by 10

10 x = 10 () **OR** we cross multiply

2 x = 8 – =

= 10 x = 5 x (8 –)

= 1 = 40 -

=

= 1

(b) P = (c) Multiply both sides by 6

2p = 35 – 3p 6 x = 6 x 5 + 6 x

= 3 (a-5) = 30 + 2a

P = 7 3a – 15 = 30 + 2a

a = 45

Exercise: Solve the following equations

(a) = 5 (b) = (c) = 8 (d) + = 0

**Fraction with binomial denominator**

Examples

a) - 4 = 0 (b) - = 0 (c) =

**SOLUTION**

1. - 4 = 0 (b) - = 0 (c) =

- 4 = 3 (2y – 1) = 5 (y + 2)

4 (5 -) = 2 3 (2y – 3) = 20 6y – 3 = 5y + 10

20 - 4 = 2 6y - 9 = 20 Y = 13

4 = 18 =

= 45 y = 4

**EXERCISE**

a) + 8 = -3 (b) = 4 (c) = 1 (d) =

**Simultaneous linear Equations**

These are equations such as = 8 and = 6

**Graphical Method**

To solve simultaneous equations graphically

* Make a table of values for both equations
* Draw the graphs of both equations on the same axes
* Find the coordinate where both graph interest. This values () are the solutions of both axes

Examples: Solve the following simultaneous equations graphically (a) and (b) and r

**SOLUTION**

1. Y = -2 + 0.5

0 2 4 -1 0 5 = 2

-2 -1 0 -7 -5 5 = -1



-1 0 2 -2 0 2 = 2

12 10 6 -6 -2 2 = -1

Exercise

1. (b)

**SUBSTITUTION METHOD**

Examples (a) , 2X – Y = 52 (b)

**SOLUTION**

1. …………1

………….2

Step 1: Rearrange one of the equations so that are variable is made the subject

That is from eqn I 3

Step 2: Substitute into the second equation. That is substitute and solves the resulting equation.

Into eqn…………2

- y = 5

=

Y = -1

Step 3: Substitute your answer into 3 to find the other variable

That is

From eqn……..1 ……... 3

Substitute eqn3 into eqn 2 gives

=

= 2

From Eqn 3

**EXERCISE:** (b)

**ELIMINATION METHOD**

Examples: (a)

**When one of the unknown has equal coefficient**

**SOLUTION**

1. …………. 1

+…………... 2

= - a = -5

a = 5

From eqn 1 from Eqn 1

=

**Example 2 (When none of the unknown has equal coefficient)**

Example: (b)

**SOLUTION**

1. To make the coefficients of x equal multiply eqn 1 by 2 and eqn 2 by 1

2 x 1 ……….. 3

1 x 2 …………. 4

=

From Eqn 1

1. -------1

-------2

4 x 1 --------3

3 x 2 …………….4

From Eqn (1)

=

**EXERCISE:** ,

**WORD PROBLEMS**

**EXAMPLES**

1. The sum of two numbers is 30 and their difference is 15. Find the two numbers
2. 3 boxes and 2 packages weigh 1240g while 5 boxes and 7 packages weigh 2800g. What is the weight of a box and a package?

**SOLUTION**

1. (2)

=

From (1)

**Exercise:**

1. The sum of two numbers is 18 and their difference is 12. Find the two numbers
2. This shape is an equilateral triangle with dimension show finds its perimeter.

-2 4x – y + 1

1. Andre has more money than Bob. If Andre gave Bob $20, they would have the same amount. While if Bob gave Andre $22, Andre would then have twice as much as Bob. How much does each one actually have?
2. In a two digit number. The units digit is thrice the tens digit. If 36 is added to the number, the digits interchange their place. Find the number.
3. If 2 is added to the numerator and denominator it becomes 9/10 and if 3 is subtracted from the numerator and denominator it become 4/5. Find the fractions.

**ASSIGNMENT:**

**EXERCISE 15.5; NO 2 – 5.PAGE 127**

**WEEK 11**

**REVISION and EXAMINATION**