FIRST TERM E-LEARNING NOTE

SUBJECT: MATHEMATICS **CLASS: JSS 2**

SCHEME OF WORK

WEEK	TOPIC
1.	Basic Operation of Integers
2.	Whole Numbers and Decimal Numbers, Multiples and Factors
3.	LCM & HCF and Perfect Squares
4.	Fractions as Ratios, Decimals and Percentages
5.	Household Arithmetic Relating to Profit, Interest, Discount and Commission
6.	Approximation of Numbers Rounding off to Decimal Places, Significant Figures
7.	Multiplication and Division of Directed and Non Directed Numbers
8.	Algebraic Expressions
9.	Algebraic Fractions (Addition and Subtraction)
10.	Simple Algebraic Equations
11.	Revision of First Term Lessons
12.	Examination

WEEK ONE
BASIC OPERATION OF INTEGERS

- Definition
- Indices
- Laws of Indices

Definition of Integer
An integer is any positive or negative whole number

Example:
Simplify the following
(+8) + (+3) (ii) (+9) - (+4)
Solution
(+8) + (+3) = +11 (ii) (+9) - (+4) = 9-4 = +5 or 5

Evaluation
Simplify the following
(+12) –(+7) (ii) 7-(-3)-(-2)

Indices
The plural of index is indices
$10 \times 10 \times 10 = 10^3$ in index form, where 3 is the index or power of 10. $P^5 = p \times pxpxpxp$. 5 is the power or index of p in the expression P^5.

Laws of Indices
1. Multiplication law:
$a^x \times a^y = a^{x+y}$
E.g. $a^5 x a^3 = a \times a \times a \times a \times a \times a \times a \times a = a^8$
$y^1 \times y^4 = y^{1+4}$
$= y^5$
$a^3 \times a^5 = a^{3+5} = a^8$
$4c^4 \times 3c^2$
$= 4 \times 3 \times c^4 \times c^2 = 12 \times c^{4+2} = 12c^6$

Class work
Simplify the following
(a) $10^3 \times 10^4$ (b) $3 \times 10^6 \times 4 \times 10^2$ (c) $p^3 \times p$ (d) $4f^3 \times 5f^7$

Division law
(1) $a^x \div a^y = a^x \div a^y = a^{x-y}$

Example
Simplify the following
(1) $a^7 \div a^3 = a \times a \times a \times a \times a \times a \times a \div a \times a \times a$
$a^{7-3} = a^4$
(2) $10^6 \div 10^3 = 10^6 \div 10^3 = 10^{6-3} = 10^3$
(3) $10a^7 \div 2a^2 = 10a^7 \div 2a^2 = 5a^{7-2} = 5a^5$

Class work
Simplify the following
1. $10^5 \div 10^3$ 2. $51m^9 \div 3m$ (3) $8 \times 10^9 \div 4 \times 10^6$

Zero indexes
$a^x \div a^x = 1$

By division law $a^{x-x} = a^0$
$a^0 = 1$
E.g. $100^0 = 1$
$50^0 = 1$

Negative index
$a^0 \div a^x = 1/a^x$
But by division law, $a^{0-x} = a^{-x}$
Therefore, $a^{-x} = 1/a^x$

Example
1. Simplify (i) b^{-2} (ii) 2^{-3}

Solution
$b^{-2} = 1/b^2$ (ii) $2^{-3} = 1/2^3 = 1/2 \times 2 \times 2 = 1/8$

Class work
(1) 10^{-2} (2) $d^0 \times d4 \times d^{-2}$ (3) $a^{-3} \div a^{-5}$ (4) $(1/4)^{-2}$
(5) $[a^m]^n = a^{m \times n} = a^{mn}$.
[Power of index]
E.g. $[a^2]^4 = \times a^2 \times a^2 \times a^2 = a \times a \times a \times a \times a \times a \times a \times a = a^8$
Therefore. $a^{2 \times 4} = a^{8.}$
(6) $[mn]^a = m^a \times n^a = m^a n^a$. e.g. $[4+2x]^2 = 4^2 + 2^2 x x^2 =$
$16 + 4x^2 = 4[4 + 1xx^2] = 4[4 + x^2]$.
7 Fractional indexes
$a^{m/n} = a^{1/n} x^m = {}^n\sqrt{} \text{ am}$

Example
$(a^{1/2})^2 = a^{2/2} = a^1 = a$
$(\sqrt{a})^2 = \sqrt{a} \times \sqrt{a} = \sqrt{a} \times a = \sqrt{a^2} = a$e.g.$32^{1/5} = {}^5\sqrt{32^1}$
1. $32^{3/5} = {}^5\sqrt{2^{5 \times 3}} = 2^3 = 2 \times 2 \times 2 = \underline{8}$
2. $27^{2/3} = {}^3\sqrt{27^2} = 3^2 = 3 \times 3 \times 3 = 9$
3. $4^{-3/2} = \sqrt{1/4^3} = \underline{1/2^3}$
4. $(0001)^3$

$=1x10^{-3}$
$=(10^{-3})^{3}=10^{-3x3}=10^{-9}$
$= \frac{1}{1000000000}$
$=0.000000001$

8. $(a^m)^{p/q}=a^{mp}=\sqrt{(a)^p}$
e.g. $(16^2)^{3/4}=\sqrt{(16^2)^3}$
$= (2^2)^3$

$(4)^3=4x4x4 = 64$

9. Equator of power for equal base
$A^x=A^y$ That is x = y

READING ASSIGNMENT
New General Mathematics, UBE Edition, chapter 2 Pages 24-26
Essential Mathematics by A J S Oluwasanmi, Chapter 3 pages 27-29

WEEKEND ASSIGNMENT
1. Simplify (+13) – (+6)
(a)7 (b) -7 (c) 19 (d) 8
2. Simplify (+11) – (+6)- (-3)
(a)7 (b)8 (c)9 (d)10
3. Simplify $5x^3 \times 4x^7$ (a) $20x^4$ (b) $20x^{10}$ (c) $20x^7$ (d) $57x^{10}$
4. Simplify $10a^8 \div 5a^6$ (a) $2a^2$ (b) $50a^2$ (c) $2a^{14}$ (d) $2a^{48}$
5. Simplify $r^7 \div r^7$ (a) 0 (b) 1 (c) r^{14} (d) $2r^7$

THEORY
1. **Simplify**
(a) $5y^5 \times 3y^3$
(b) $\frac{24x8}{6x}$
2. **Simplify** $(1/2)^{-3}$

WEEK TWO

WHOLE NUMBERS AND DECIMAL NUMBERS

- Whole Difference between Whole Numbers and Decimal Numbers
- Whole numbers in Standard Form and Decimal Numbers in Standard Form
- Factors, Multiples and Prime Numbers

Difference between Whole Numbers and Decimal Numbers

Whole number is a number without fraction. For example 1, 2, 3, 4…1000, 38888 are examples of whole numbers.71/2 is not a whole number. A decimal number is a fractional number less than 1. It is smaller to a whole number. Examples - 0.1,0.01,0.001etc

Whole Numbers in Standard Form and Decimal Numbers in Standard Form

Whole numbers in standard form are expressed in the form of A x 10^n such that A is a number between 1 and 10, n is a whole number.

Example

Express the following in standard form (a) 200 (b) 4100 (c) 300000

Solution

(a) $200 = 2 \times 100 = 2 \times 10^2$
(b) $4100 = 4.1 \times 1000 = 4.1 \times 10^3$
(c) $300000 = 3 \times 100000 = 3 \times 10^5$

Evaluation

Express the following in standard form (a) 500 (b) 36000 (c) 7200000

Decimal fractions such as 0.00 and 0.000001 can be expressed as powers of 10 e.g. $0.0001 = 1/10000 = 1/10^4 = 10^{-4}$

Thus, any decimal fraction can be expressed in a standard form e.g. $0.008=8/1000=8/10^3 =8 \times 1/10^3=8 \times 10^{-3}$

Therefore, the number 8×10^{-3} is in standard form ax10 and n is a negative integer while A is a number between1 and 10

Example

Express the following in standard form (a) 0.0023 (b) 0.00034 (c) 0.125

Solution

(a) $0.023 = 23/1000 = 2.3/10^2 = 2.3 \times 10^{-3}$
(b) $0.00034\ \ 34/100000= 3.4/10^4 = 3.4 \times 10^{-4}$
(c) $0.125 = 125/1000 = 1.25/10^1 = 1.25 \times 10^{-1}$

Evaluation

Express the following in standard form (a) 0.0067 (b) 0.00082 (c) 0.012

READING ASSIGNMENT

New General Mathematics, UBE Edition, chapter 1, pages 27-28
Essential Mathematics by A J S Oluwasanmi, Chapter 1, pages 1-4

FACTORS, MULTIPLES AND PRIME NUMBERS

The factors of a number are the whole numbers that divide the number exactly. For example the factors of 10 are 1, 2 and 5.

A prime number has only two factors, itself and 1. The following are examples of prime numbers 2, 3, 5, 7, 11,13…. However, 1 is not a prime number.
A multiple of a whole number is obtained by multiplying it by any whole number.

Example

a. Write down all the factors of 18.
b. State which of theses factors are prime numbers
c. Write the first three multiples of 18
d. Express 18 as a product of its prime factors in index form

Solution:

a. Factors of 18:1, 2,3,6,9 and 18.
b. Prime numbers of the factors of 18:2 and3
c. The first three multiples of 18 are 1x18 = 18, 2x18=36, 3x18=54 => 18, 36 and 54.
d. 18 = 2x3x3 = 2×3^2 in index form

Example 2:

a. Write down all the factors of 22.
b. State which of theses factors are prime numbers
c. Write the first three multiples of 22

Solution:

a. Factors of 22:1, 2, and 11.
b. Prime numbers of the factors of 22: 2 and11
c. The first three multiples of 22 are 1x22 = 22, 2x22=44, 3x22=66 => 22, 44 and 66.

Evaluation

a. Write down all the factors
b. State which of theses factors are prime numbers
c. Write the first three multiples of each of the following numbers below
d. Express each as a product of its prime factors in index form

(1) 12 (2) 30 (3) 39 (4) 48

READING ASSIGNMENT

New General Mathematics, UBE Edition, Chapter, 1 pages 13-14
Essential Mathematics by A J S Oluwasanmi, Chapter 1, pages 1-4

WEEKEND ASSIGNMENT

1. Which of these is not a prime number (a) 2 (b) 5 (c) 7 (d) 1
2. Express 360000 in standard form (a) 3.6×10^5 (b) 3.6×10^6 (c) 3.6×10^3 (d) 3.6×10^4
3. Express 0.000045 in standard form (a) 4.5×10^{-2} (b) 4.5×10^3 (c) 4.5×10^{-5} (d) 4.5×10^{-6}
4. Which of these is not a factor of 42 (a) 9 (b) 6 (c) 7 (d) 2
5. Express 50 is product of its prime factor (a) 2×5^2 (b) 2×5 (c) $2^2 \times 5^2$ (d) 2×5

THEORY

1. For each number 42,45,48,50
   a. Write down all its factors.
   b. State which factors are prime numbers?
   c. Express the number as a product of its prime factors.
2. Express the following in standard form (a) 345000 (b) 0.00034 (c) 0.125

WEEK THREE
H.C.F & L.C.M AND PERFECT SQUARES

Highest Common Factors

Highest common factor is the greatest number which will divide exactly into two or more numbers. For example 4 is the highest common factor (HCF) of 20 & 24.

i.e. 20 = 1, 2, (4), 5, 10, 20
24= 1, 2, 3, (4), 6, 8, 12, 24

Example 1:

Find the H.C.F of 24 & 78

<u>Method 1</u>

Express each number as a product of its prime factors

Workings

2	24	2	78
2	12	2	36
2	6	2	18
3	3	3	9
		3	3

$24=2^3x3$

$78=(2^3 \text{ x } 3) \text{ x } 3$

The H.C.F. is the product of the common prime factors.

$HCF=2^3x3$

=8x3=24

<u>Method II</u>

24=2x2x2x3

78=2x2x2x3x3

Common factor=2x2x2x3

HCF=24

<u>LCM: Lowest Common Multiple</u>

Multiples of 2 are =2,4,6,8,10,12,14,16,18,20,22,24…

Multiples of 5 are 5,10,15,20,25,30,35,40

Notice that 10 is the lowest number which is a multiple of 2 & 5.10 is the lowest common multiple of 2& 5

Find the LCM of 20, 32, and 40

Method 1

Express each number as a product of its prime factors

$20=2^2x5$

$32=2^5$

$40=2^2x2x5$

The prime factors of 20, 32 and 40 are 2 & 5 .The highest power of each prime factor must be in the LCM

These are2^5 and 5

Thus LCM $=2^5$ x5

=160

Method II

2	20	32	40
2	10	16	20
2	5	8	10
4	5	4	5
5	5	1	5
	1	1	1

LCM =2 x 2 x 2 x 4 x 5 = 160

Class work

Find the HCF of:

(1) 28 and 42

(2) 504 and 588

(3) Find the LCM of 84 & 210

READING ASSIGNMENT

New General Mathematics, UBE Edition, chapter 1, pages 20-21

Essential Mathematics by A J S Oluwasanmi, Chapter 1, Pages 1-4

PERFECT SQUARES

A perfect square is a whole number whose square root is also a whole number .It is always possible to express a perfect square in factors with even indices.

9 = 3x3

25= 5x5

225 = 15x15

= 3x5x3x5

= 3^2 x 5^2

9216 =96^2

=3^2 x 32^2

=3^2 x 4^2 X 8^2

=3^2x2^4 x2^6

=3^2 x2^{10}

Workings

2	9216
2	4608
2	2304
2	1152
2	576
2	288
2	144
2	72
2	36
2	18
3	9
3	3

9216= 3^2x2^{10}

Example

Find the smallest number by which the following must be multiplied so that their products are perfect square

a. 540

b. 252

Solution

2	540
2	270

3	135	
3	45	
3	15	$54=2^2 \times 3^3 \times 5$
5	5	
	1	

The index of 2 even. The index of 3 and 5 are odd .One more 3 and one more 5 will make all the indices even. The product will then be a perfect square .The number required is 3x5 =**15**

b.

2	252
2	126
3	63
3	21
7	7
	1

$252= 2^2 x 3^2 x 7$

Index of 7 is odd, one more "7" will make it even.

Indices i.e. $2^2 x\ 3^2 x\ 7^2$

Therefore 7 is the smallest numbers required

READING ASSIGNMENT

New General Mathematics, UBE Edition, chapter 1, pages 20-21

Essential Mathematics by A J S Oluwasanmi, Chapter 1, pages 1-4

WEEKEND ASSIGNMENT

1. The lowest common multiple of 4, 6 and 8 is (a) 24 (b) 48 (c) 12 (d) 40
2. Find the smallest number by which 72 must be multiplied so that its products will give a perfect square (a) 3 (b) 2 (c) 1 (d) 5
3. The lowest common multiple of 4, 6 and 8 is (a) 24 (b) 48 (c) 12 (d) 40
4. The H.C.F. of 8, 24 and 36 is ___ (a) 6 (b) 4 (c) 18 (d) 20
5. The L.C.M. of 12, 16 and 24 is ___ (a) 96 (b) 48 (c) 108 (d) 24

THEORY

1. Find the smallest number by which 162 must be multiplied so that its product will give a perfect square.
2. Find the HCF and L.C.M. of the following figures

   30 & 42

   64 & 210

WEEK FOUR
FRACTIONS, RATIOS, DECIMALS AND PERCENTAGES

- Fractions and Percentages
- Proportion
- Ratio
- Rate

Fractions and percentages

A fraction can be converted to decimal by dividing the numerator by its denominator. It can be changed to percentage by simply multiplying by 100.

Example 5.1

1) Change 3/8 into a decimal and percentage
2) Convert 0.145 to percentage

Solution

1) 3/8 = 0.375 in decimal

   3/8 x 100% = 37.5%

2) 0.145x100=14.5%

Example 5.2

To change percentage to decimal fraction, simply divide by 100 and then convert to decimal fraction. E.g. convert 92% to decimal

Solution

92
100
920
900
200
200 =0.92

Example 5.3

1. Change the following to percentages
(a) 0.125 (b) 0.002

Solution

(a) 0.125x100% = 12.5%
(b) 0.002 = 0.002x100% = 0.2%

2. Change the following to decimal fractions
(A) 45 % (b) 8/3%

Solution

a. 45/100=0.45
b. 8/3= 8/3 ÷100/1= 8/3 x 1/100 = 8/300 = 4/150 = 2/75

0.02666
75 200
150
500
450
500
450
500

=0.0267

Class work

1. Change the following to percentage
(a) 0.264 (b) 0.875

2. Change the following to decimal fractions
(A) 60% (b) 52/3%

APPLICATION OF DECIMAL FRACTIONS AND PERCENTAGES

Consider the following examples.

a. Find 15% of 2.8kg
b. Express 3.3 mass a percentage of 7.5
c. Find 331/3 % of8.16litres

Solution

a. 15/100 of 2.8kg
15/100 x 2.8 x 1000g
15/100 x 2800
=420g
=420/1000
=0.420kg

b. 3.3/7.5 x 100/1
33/75 x 100/1
11x4 = 44%

c. 331/3% of 8.16litres
100/3 of 8.16litres
100/3 of 8.16litres
100/3 x 8.16litres
100/3 x 8.16 x 1000 (1litre=1000cm$^{3)}$
100/3 x 8160
100/3 ÷100/1 x 8160
100/3 x 1/100 x 8160
=2700/1000= **2.720litres**

Class work
1. Express1.5 as a percentage of 2.5 m
2. Find 662/3 % of2.4m

READING ASSIGNMENT
New General Mathematics, UBE Edition, chapter 1 Pages 78-79
Essential Mathematics by A J S Oluwasanmi, Chapter 1 pages 61-64

Proportion
Proportion can be solved either by unitary method or inverse method. When solving by unitary method, always

- write in sentence the quantity to be found at the end.
- decide whether the problem is either an example of direct or inverse method
- find the rate for one unit before answering the problem.

Examples
1. A worker gets ₦ 900 for 10 days of work, find the amount for (a) 3 days (b) 24 days (c) x days

Solution
For 1 day = ₦ 900
1 day = 900/10 = N90
a. For 3 days =3 x 90 = 270
b. For 24 days = 24x90 = ₦ 2,160
c. For x days =X x 90 = ₦ 90 x

Inverse Proportion
Example
1. Seven workers dig a piece of ground in 10 days. How long will five workers take?

Solution
For 7 workers =10 days
For 1 worker =7x10=70 days
For 5 workers=70/5 =14 days

2. 5 people took 8 days to plant 1,200 trees, How long will it take 10 people to plant the same number of trees

Solution
For 5 people =8 days
For 1 person =8x5=40 days
For 10 people =40/10 =4 days

Class Work

1. A woman is paid ₦ 750 for 5 days, Find her pay for (a) 1 day (b) 22 days
2. A piece of land has enough grass to feed 15 cows for x days. How long will it last (a) 1 cow (b) y cows
3. A bag of rice feeds 15 students for 7 days .How long would the same bag feed 10 students

Note on direct proportion: this is an example of direct proportion .The less time worked (3 days) the less money paid (#270) the more time worked (24 days) the more money paid (₦ ₦ 2,160)

Ratio

Ratio behaves the same way as fraction. Ratios are often used when sharing quantities..

Example

600/800=600/800=3/4
300-400=600-800=1200-1600=3=4

Example

1. Express the ratio of 96 c: 120c as simple as possible

Solution 96c: 120c=96/120=4/5=4.5

2. Fill in the gap in the ratio of 2:7=28

Solution

let the gap be X
2/7 = X/28
7X =2 x 28
X=2 x 28/7
X=2 x 4
X = 8

3. Two students shared 36 mangoes in the ratio 2:3 How many mangoes does each student get?

Solution

Total ratio =2+3=5
First share=2/5x35/1=21 mangoes

Rate

Rate is the change in one quantity to the other. Examples are 45km/hr, a km, 1 litre etc
Worked examples

1. A car goes 160 km in 2 hrs what is the rate in km/hr?

Solution

In 2 hrs the car travels 160 km
In 1 hr the car travels 160/2=80km
Therefore the rate of the car is 80km/hr

2. A car uses 10 litres of petrol to travel 74 km. Express its petrol consumption as a rate in km per litre.

Solution

10 litres =74 km
1 litres = 74/10 km
=7.4 km

Class work

1. A car factory made 375 cars in 5 days, Find its rate in cars per day.
2. A car travels 126 km in 11/2 hrs. Find the rate in km per hr.

READING ASSIGNMENT
New General Mathematics, UBE Edition, Chapter 1, pages 80-85
Essential Mathematics by A J S Oluwasanmi, Chapter 1, pages 69-72

WEEKEND ASSIGNMENT

1. 5 men build in 10 days, how long would it take 25 men?
   (a) 3 days (b) 2 days (c) 5 days (d) 10 days
2. A girl buys 7 pens for ₦ 210. How would ten pens cost? (a)#300(b)#30(c)#3(d)#200
3. Fill in the gap in m: a =16:24 (a) 10 (b) 12 (c) 4 (d) 6
4. Express 90km /hr: 120km /hr as simple as possible (a) 4:3 (b) 3:4 (c) 2:3 (d) 3:2
5. A factory makes ₦ 2000 pencils in 10 days, Find its production rate of pencils per day (a) ₦ 20 per day (b) ₦ 100 per day(c) ₦ 50 per day (d) ₦ 200 per day

THEORY
1. Find 50% of 3.5m
2. A bag of corn can feed 100 chicks for 12 days. How long would the same bag feed 80 chickens?

WEEK FIVE
SIMPLE INTEREST

Interest is the money paid for saving a particular amount of money.
Simple interest can be calculated using the formula
Simple interest $I = \frac{PRT}{100}$
Where P= principal, R=rate & T= time
Also total amount =principal +interest

Example 1
Find the simple interest on ₦60, 000 for 5 years at 9% per annum
Solution
Applying $I=\frac{PRT}{100}$ P= ₦ 60,000 R=9% T=5 years

$I = \frac{60,000x9x5}{100}$

= ₦ 27,000

Example 2
A man borrows ₦ 1,600,000 to buy a house .He is charged interest at the rate of 11% per annum. In the first year, he paid the interest on the loan. He also paid back ₦ 100,000 of the money borrowed. How much did he pay back altogether? If he paid this money by monthly instalment, how much did he pay per month?

Solution
P= ₦ 1,600,000 R=11% T=1 year
Interest on ₦ 1,600,000 $I = \frac{PRT}{100} = \frac{1'600,000 \text{ x}11\text{x}1}{100}$ = ₦ 176,000
The total amount paid in the first year= ₦ 100,000 + ₦ 176,000 = ₦ 276,000
Monthly payment $=\frac{276.000}{12}$ = ₦ 23,000

Class work
1. Find the simple interest on the following:
a. ₦ 10,000 for 31/2 years at 4% per annum
b. ₦ 20,000 for 4 years at 4% per annum

2. A man got ₦ 1,800,000 loan to buy a house .He paid interest at a rate of 9% per annum. In the first year, he paid the interest on the loan. He also paid back ₦ 140,000 of the money he borrowed. (a) How much did he pay in the first year altogether.

Profit and loss percent
Profit means gain, while loss is the inverse of profit.
% Profit is the percentage of the gain made from a particular product or item
% Profit = $\frac{\text{profit}}{\text{Cost price}}$ x 100
To find the selling price of an article
At loss = cost price – loss
At gain= cost price + profit

Example
1. A trader buys a kettle for ₦ 800 and sells at a profit of 15%. Find the actual profit and the selling price

Solution
Profit =15 of ₦ 800
=15 x800
=₦ 120

Selling price = C. + profit
= 800+120
= ₦ 920

2. A hat is bought for ₦ 250 and sold for ₦ 220, what is the loss percent

Solution
Cost price C.P = ₦ 250
Selling price = N 220
Lost= ₦ 250- ₦ 220 = ₦ **30**
% Loss = $\frac{\text{loss}}{\text{C.P}}$ **x100%**
=30/250 x100%
=300/25 =12%

Class work
1. Find the actual profit and the selling price of a material which cost #1000 sold at a profit of 15%
2. A farmer buys a land for #40,000 and sells it for ₦ 33,000 what is the percentage loss?
3. A car that cost ₦ 336,000 was sold at a loss of 17½%. What is the selling price

Discount and Commission
A discount is a reduction in price of goods or items. Discount are often given for paying in cash
Commission: this is the payment for selling an item.
Examples
1. Find the discount price, if a discount of 25% is given on a market price of #9,200

Solution
Discount =25% of ₦ 9,200
=25/100 x9, 200=2,300
2. A radio cost ₦ 5,400 .A 12½% discount is given for cash. What is the cash price

Solution
Discount =12 ½% of ₦ 5,400
= 25/2x100 x 5400
=25/2x100 x5400=675
Cash price = ₦ 5,400-675 =₦ 4725

3. A bank charges **2**½ % commission for issuing a bank draft to its customers, if a customer obtained a bank draft for ₦ 84,000 from the bank, calculates the total cost of the bank draft.

Solution

Commission =22% of ₦ 84,000
5/2/100 x 84,000
=5/2x100 x84, 000
= ₦ 2,100
Total cost of bank draft =84,000+ ₦ 2,000 = ₦ 86,100

Class work

1. Find the discount price if a discount of 20% is given on a market of ₦ 2,915
2. The selling price of a table is ₦ 14,000, the trader gives a 25% discount for cash, what is the cash price
3. An insurance agent sells ₦ 284,000 worth of insurance, his commission is 20% .How much money does he get

READING ASSIGNMENT

New General Mathematics, UBE Edition, Chapter 1, pages 78-79
Essential Mathematics by A J S Oluwasanmi, Chapter 1, pages 61-64

WEEKEND ASSIGNMENT

1. Calculate the simple interest on ₦ 200 in 2 years at 4% per annum (a) ₦ 160n (b) ₦ 240 (c) ₦ 16 (d) ₦ 260
2. Calculate the simple interest on ₦ 20,000 for $2^{1/2}$ years at 2% per annum (a) ₦ 10 (b) ₦10, 000 (c) ₦ 1000 (d) ₦ 2000
3. Find the simple interest on ₦ 40,000 for 1 year at 5% per annum (a) ₦ 100 (b) ₦ 250 (c) ₦ 2,590 (d) ₦ 50
4. What is the simple interest on #70,000 for 1 year at 4% per annum (a) ₦ 2,800 (b) ₦ 2,000 (c) ₦ 2,400 (d) ₦ 2,300
5. Find the simple interest on ₦ 10,000 for 3 years at 6% per annum (a) ₦ 1,800 (b) ₦ 1000 (c) ₦ 1,850 (d) ₦ 1,200

THEORY

1. Find the simple interest on the following
(a) ₦ 55,000 for 4 years at 60% per annum
(b) ₦ 25,000 for 3 years at 5% per annum

WEEK SIX

APPROXIMATION OF NUMBERS ROUNDING OFF TO DECIMAL PLACES

Digits 1,2,34 are rounded down to Zero, while digits 5, 6, 7, 8, and 9 are rounded up to 1 e.g. 126=130 to 2 digits
A significant figure begins from the first non-zero digit at the left of a number. Digit should be written with their correct place values.
Worked example
1. Round off the following to the nearest
i. Thousand (ii) hundred (ii) ten
(a) 8615 (b) 16,560

Solution

a.
i) 8615 ≈ 9000 {to the nearest thousand}
ii) 8615 ≈8600 {to the nearest hundred}
iii) 8615 ≈8620 {to the nearest ten}

b.
(i) 16560≈17000 {to the nearest thousand}
(ii) 1660≈16, 600 {to the nearest hundred}
(iii) 16560 ≈16560 {to the nearest ten}

2. Round off the following to the nearest (i) whole number (ii) tenth (iii) hundred
(a) 3.125 (b) 0.493

Solution
a.
(I) 3.125≈3 {to the nearest whole number}
(ii) 3.125≈3.1{to the nearest tenth}
(iii) 3.125≈3.13{to the nearest hundredth}

b.
(i) 3.125≈3 {to the nearest whole number}
(ii) 3.125≈3.1{to the nearest tenth}
(iii) 3.125≈3.13{to the nearest hundredth

Evaluation
Round off the following to
a) 1d.p. (b) 2 d.p. (c) 3 d.p.
(1) 12.9348 (2) 5.0725 (3) 0.9002

Square Roots of Numbers

The symbol '√' means "square root of". To find the square root of a number, first find its factors.

Examples

1. Find the square root of 11025

Solution

(a) √11025

3	11025
3	3675
5	1225
5	245
7	49
7	7

$\sqrt{11025} = \sqrt{(3^2 \times 5^2 \times 7^2)} = 3 \times 5 \times 7 = 105$

Example

Find the square roots of √54/9

Solution:

√54/9 =√49/9=√49/√9=7/3=**2** 1/3

READING ASSIGNMENT

New General Mathematics, UBE Edition, Chapter 2, pages 28-32, 20-21
Essential Mathematics by A J S Oluwasanmi, Chapter 1, pages 42-45

WEEKEND ASSIGNMENT

1. What is 0.003867 to 3 significant figure (a)0.004 (b)0.00386 (c)0.00387 (d)386
2. The square root of 121/2 is ____(a)1 3/4 (b)3 1/2 (c)3 3/4 (d)6 1/4
3. 9852 to 3 S.F. is _____(a)990 (b) 9850 (c) 9580 (d) 986
4. 7.0354 to 2 d.p is _____(a) 7.03(b) 7.04 (c) 7.40 (d)7.13
5. 59094 to the nearest hundred is ____(a) 59100(b)59104 (c) 60094 (d) 60194

THEORY

1. Find the square root of 1296
2. a. What is 0.046783 to 3 significant figure
   b. 45.34672 to 2 d.p. is ______

WEEK SEVEN
DIRECTED NUMBERS

CONTENT

(i) Addition and subtraction of directed numbers
(ii) Multiplication of directed numbers
(iii) Division of directed numbers

ADDITION AND SUBTRACTION OF DIRECTED NUMBERS

Directed numbers are the positive and negative numbers in any given number line e.g

-4 -3 -2 -1 0 1 2 3 4

The (+) and (-) signs show the direction from the origin (o). To add a positive number move to the right on the number line

Addition

-2 -1 0 +1 +2 +3 +4

To subtract a positive number, move to the left on the number line

Subtraction

-2 -1 0 +1 +2 +3 +4

Worked examples

Simplify the following

i. (-2_+(-4)
ii. (-6)+(+6)+0
iii. 6-(-3)-(-4)

Solution

1) 1) (-2)+(-4)=2+4=-6

-6 -5 -4 -3 -2 -1 +1 +2

2) (-6)+(-6)+0= 6+6+0 =- 0

-6 -5 -4 -3 -2 -1 0 +1 +2 +3

3) -(-3)-(-4)= 6+3+4 =- 13

-1 0 +1 +2 +4 +5 +6 +7 +8 +9 +10 +11 +12 +13

EVALUATION

Simplify the following

a. (+6)-(+10)
b. 12-(+3)-8
c. (-5)+(-5)+(-5)
d. (-8)-(-2)+(-2)

MULTIPLICATION OF DIRECTED NUMBERS

Multiplication is a short way of writing repeated addition e.g. 3x4=4+4+4 =12.

When directed numbers are multiplied together, two like signs give a positive result, while two unlike signs give a negative result in general

(i) (+a) x (-b) =+ab
(ii) (-a) x (-b) =+ab
(iii) (+a) x(-b)=-ab
(iv) (-a) x (+b) =-ab

Worked examples

Simplify the following

(a) (+1/2) x (+1/4) = +1/8
(b) (+17) x (-3) = -51
(c) (- 91/3) x (+2/5) = -56/15 = -311/15

DIVISION OF DIRECTED NUMBERS

The rules of multiplication of directed numbers also apply to the division of directed numbers

i. (+a) ÷ (+b)=+(a/b)
ii. (-a) ÷ (-b)=+(a/b)
iii. (+a) ÷ (-b) = -(a/b)
iv. (-a)÷(+b) = -(a/b)

Class work

1. Simplify the following

a. (-36) ÷ (+4)
b. (-4) ÷(-12)
c. $\dfrac{(-6) \times (-5)}{-10 \times 3}$

2. Complete the following
a. (+6) + (5) = $\boxed{}$
b. (+6) + (9) = $\boxed{}$
c. (-6) + (=5) = $\boxed{}$
d. (+7) + (=4) = $\boxed{}$
e. (+8) - (+6) = $\boxed{}$

WEEKEND ASSIGNMENT
1. Simplify 12 - (+3) - 8= ____ a) -1 (b) +1 (c)-2 (d)+2
2. Simplify (-3) – (-1)= ____ a) -2 (b) -1 (c)+1 (d) +2
3. Simplify (+15) x (-4)= ____ a) -20 (b) -60 (c)+20 (d) +60
4. Divide -18 by -3 = ____ a) -6 (b) +6 (c)-21 (d) +15
5. Divide -5 by -15 = ____ a) +1/3 (b) -1/3 (c) +1/5 (d) -1/5

THEORY
1a). Simplify 4/9 of (-2 4)
b) Simplify (-2) + (-7) using number lines.
2 Simplify
a) 7 x (-6.2)
b) -112 ÷ -4

WEEK EIGHT
ALGEBRAIC EXPRESSION

Definition with examples
Expansion of algebraic expression
Factorization of simple algebraic expressions

Definition with examples
In algebra, letters stand for numbers. The numbers can be whole or fractional, positive or negative.
Example
Simplify the following
1) -5 x 2y
2) -3a x -6b
3) -14a/7
4) -1/3 of 36x^2

Solution
1) -5 x 2y = -5 x (+2) x y
= -(5 x 2) x y = -10y
2) -3a x -6b = (-3) x a (-6) x b
= (-3) x (-6) x a x b = 18ab
3) -14a/7 = $\frac{(-14) \times a}{+7}$ = (-14/7) x a
= -2 x a = -2a
4) -1/3 of 36x^2 = $\frac{(+36) \times x^2}{(-3)}$ = - (36/3) x x^2
= -12x^2

Evaluation
Simplify the following
1.-16x/8
2. (-1/10) of 100z
3. (-2x) x (-9y)

Removing brackets

Example
Remove brackets from the following
a.8 (2c + 3d) (b) 4y (3x-5) (c) (7a-2b) 3a
Solution
8(2c+3d) = 8 x 2c + 8 x 3d
= 16c + 24d
b.4y(3x-5) = 4y x 3x – 4y x 5
= 12xy – 20y
c.(7a-2b)3a = 7a x 3a – 2b x 3a
$=21a^2 - 6ab$

Evaluation
Remove brackets from the following
1.-5x(11x – 2y)
2.-p(p – 5q)
3.(2c + 8d)(-2)

Expanding algebraic expressions
The expression (a+b)(b-5) means (a+2) x (b-5)
The terms in the first bracket, (a+2), multiply each term in the second bracket, b-5.

Example
Expand the following

a. (a+b) (c+d)
b. (6-x) (3+y)
c. (2p-3q) (5p-4)

Solution
a.(a+b)(c+d) = c(a+b) + d(a+b)
= ac+bc+ad+bd
b.(6-x)(3+y) = 3(6-x) + y (6-x)
= 18 -3x +6y – xy
c.(2p-3q)(5p-4) = 5p(2p – 3q)-4(2p-3q)
$= 10p^2 - 15pq - 8p + 12q$

Evaluation
Expand the following
(a) (3+d)(2+d) (b) (3x+4)(x-2) (c) (2h-k)(3h+2k) (d) (7m-5n)(5m+3n)

Factorization of algebraic expression
Example:
Factorize the following
(a) 12y + 8z (b) $4n^2 - 2n$ (c) $24pq - 16p^2$

Solution

a) 12y +8z
The HCF of 12y and 8z is 4
12y +8z = 4(12y/4 + 8z/4)
= 4(3y + 2z)
b) $4n^2 - 2n$
The HCF of $4n^2$ and 2n is 2n
$4n^2 - 2n = 2n(4n^2/2n - 2n/2n)$
= 2n (2n-1)
c) $24pq - 16p^2$
The HCF of 24pq and $16p^2$ is 8p
$24pq - 16p^2 = 8p(24pq/8p - 16p^2/8p)$
= 8p(3q – 2p)

Evaluation

Factorize the following:

a) $2abx + 7acx$ (b) $3d^2e + 5d^2$

b) $12ax + 8bx$

READING ASSIGNMENT

New General Mathematics, UBE Edition, Chapter 1, pages 20-21
Essential Mathematics by A J S Oluwasanmi, Chapter 1, pages 1-4

WEEKEND ASSIGNMENT

1. Simplify $(-6x) \times (-x) =$______ a) $6x$ (b) $6x^2$ (c) $-6x$ (d) $-6x^2$
2. Remove brackets from $-3(12a - 5)$ a) $15-36a$ b) $15a-36$ c) $15a + 36$ d) $36a - 15$
3. Expand $(a+3)(a+4)$ (a) $a^2+7a+12$ (b) $a^2+12a+7$ (c) $a^2+12a-7$ (d) $a^2+7a-12$
4. Factorize $abc + abd$ (a) $ab(c+d)$ (b) $ac(b+d)$ (c) $ad(b+c)$ (d) $abc(c+d)$
5. Factorize $5a^2 + 2ax$ (a) $a(5a+2x)$ (b) $5(2a^2+2x)$ (c) $a(5x+2ax)$ (d) $a^2(5+2x)$

THEORY

1. Expand the following:

a. $(p+2q)(p+3q)$

b. $(5r+2s)(3r+4s)$

2. Factorize the following

a. $-18fg - 12g$

b. $-5xy + 10y$

WEEK NINE

ALGEBRAIC FRACTIONS (ADDITION AND SUBTRACTION)

- Equivalent Fractions
- Addition and Subtraction of algebraic fraction
- Fractions with brackets

Equivalent Fraction

Equivalent fractions can be made by multiplying or dividing the numerator and denominator of a fraction by the same quantity.

For Example:

Multiplication

$$\frac{3}{d} = \frac{3 \times 2b}{d \times 2b} - \frac{6b}{2bd}$$

Division.

$$4x = \frac{4x \div 2}{6y \div 2} = \frac{2x}{3y}$$

Complete the boxes in the following :

(a) $\frac{3a}{2} = \frac{\square}{10}$ (b) $\frac{5ab}{12a} = \frac{\square}{12}$

Solution>

$$\frac{3a}{2} = \frac{\square}{10.}$$

Compare the two denomination

$2 \times 5 = 10$

The denominator of the first has been multiplied by 5. The numerator must also be multiplied by 5.

$$\frac{3a}{2} \quad \times \quad \frac{3a \times 5}{2 \times 5} = \frac{15a}{a0}$$

(b) $\frac{5ab}{12a} = \frac{\quad}{12}$

The denominator of the first has been divided by a. Therefore, divide the numerator by a .

$\frac{5ab}{12a} = \frac{5ab \div a}{12a \div a} = \frac{5b}{12}$.

Evaluation

1. $\frac{8b}{5} = \frac{\boxed{}}{15}$
2. $\frac{9ah}{6ak} = \frac{3h}{\boxed{}}$
3. $\frac{\boxed{}}{8yz} = \frac{3x}{sy}$.

Addition and subtraction of algebraic fractions

Algebraic fraction must have common denominator before they can be added or subtracted

Example:

$\frac{5}{2a} + \frac{7}{2a}$ (b) $\frac{4}{a} + b$ (c) $\frac{1}{u} + \frac{1}{v}$ (d) $\frac{5}{4c} - \frac{4}{3d}$

Solution

(a) $\frac{5}{2a} + \frac{7}{2a} = \frac{5+7}{2a} = \frac{12 \div 2}{2a \div 2} = \frac{6}{a}$

(b) $\frac{4}{a} + b = \frac{4}{a} + \frac{b}{1}$

The L.C. M of a and 1 is a

$\frac{4}{a} + \frac{b}{1} = \frac{a \times b}{a} = \frac{4}{a} + \frac{ab}{a}$

$= \frac{4 + ab}{a}$

(c) $\frac{1}{u} + \frac{1}{v}$

The L. C. M of u and v uuv

$\frac{1}{u} + \frac{1}{v} = \frac{1 \times v + 1 \times u}{uv}$ $\frac{1 \times v}{uv} + \frac{1 \times u}{uv}$.

$= \frac{v}{uv} + \frac{v}{uv} = \frac{u + v}{uv}$.

(d) $\frac{5}{4c} - \frac{4}{3d}$.

The L. C. M. of 4c and 3d is 12cd

$\frac{5}{4c} - \frac{4}{3d} = \frac{5 \times 3d}{12cd} - \frac{4 \times 4c}{12cd}$

$= \frac{15d}{12cd} - \frac{16c}{12cd}$

$= \frac{15d - 16c}{12cd}$.

Evaluation

Simplify the following :

(a) $\frac{4}{3a} - \frac{1}{3a}$ (b) $\frac{5}{4a} - \frac{2}{3b}$ (c) $2b + \frac{3}{4}$.

Fraction with brackets

Examples

Simplify.

(a) $\frac{x + 3}{5} + \frac{4x - 2}{5}$

(b) $\frac{7a - 3}{6} - \frac{3a + 5}{4.}$

Solution

(a) $\frac{x + 3}{5} + \frac{4x - 2}{5} = \frac{(x + 3) + (4x - 2)}{5}$

$= \frac{x + 3 + 4x - 2}{5}$

$= \frac{5x + 1}{5}$

(b) $\frac{7a - 3}{6} - \frac{3a + 5}{4}$

The L. C. M of 6 and 4 is 12

$\frac{7a - 3}{6} - \frac{3a + 5}{4} = \frac{2(7a - 3)}{2 \times 6} - \frac{3(3a + 5)}{3 \times 4}$

removing $= \frac{2(7a - 3)}{12} - \frac{3(3a + 5)}{12.}$

$= \frac{14a - 6 - 9a - 15}{12.}$

collecting the like terms $= \frac{5a - 21}{12}$

EVALUATION

Simplify the following

(a) $\frac{2a - 3}{2} + \frac{a + 4}{2}$

(b) $\frac{3x - 2d}{10} + \frac{2c - 3d}{15}$

(c) $\frac{2a + 3b}{a} + \frac{a - 4b}{6.}$

READING ASSIGNMENT

New General Mathematics pg 100-101 Ex. 11g 1 & 2 pg 101.

WEEKEND ASSIGNMENT

1. If $\frac{3}{12a} = \frac{?}{4}$ find ? (a) 0 (b) 1 (c) C
2. Simplify $\frac{1}{x} - \frac{1}{y}$ (a) $\frac{x + y}{xy}$ (b) $\frac{y - x}{xy}$ (c) $\frac{x - y}{xy}$ (d) $\frac{y + x}{xy}$
3. if $\frac{2c}{a} = \frac{6C^2}{?}$ find ? (a) 3c (b) 3ac (c) 3a (d) 2c
4. Simplify $\frac{4x}{a} + \frac{8x}{a}$ (a) $\frac{32x}{a}$ (b) $\frac{4x}{3}$ (c) $\frac{12x}{18}$ (d) $\frac{4x}{a}$
5. $\frac{7}{8y} + \frac{9}{8y}$ (a) $\frac{y}{2}$ (b) $\frac{8y}{3}$ (c) $\frac{y}{8}$ (d) $\frac{2}{y.}$

THEORY

1. Simplify $\frac{5}{4a} - \frac{2}{3b.}$
2. Simplify $\frac{2a + 3b}{7} + \frac{9 - 4b}{6.}$

WEEK TEN

SOLUTION OF PROBLEMS ON SIMPLE ALGEBRAIC EQUATION

CONTENT

Solving equation by balance method
Equation with bracket
Equation with fraction.
Solving Equation by Balance Method
To solve an equation means to find the values of the unknown in the equation that makes it true.

For example: $2x - 9 = 15$.
$2x - 9$ is on the left hand side (LHS) and 15 is on the right hand side (RHS) of the equals signs.

Worked examples

i. solve $3x = 12$
ii. $2x - 9 = 15$.

Solution
1.3x = 12
Divide both sides by 3

$$\frac{3x}{3} = \frac{12}{3}$$

$x = 4$.

2. $2x - 9 = 5$
add 9 to both sides since +9 is the additive inverse of (-9)
$2x - 9 + 9 = 15 + 9$
$2x = 24$
$x = 24/2 = 12$

EVALUATION
Use the balance method to solve the following
(a) $3x - 8 = 10$ (b) $20 = 9x + 11$ (c) $10y - 7 = 27$ (d) $9 + 2x = 16$.
Equation with bracket
Worked example
1. solve $3(3x - 1) = 4 (x + 3)$
2. Solve $5 (x + 11) + 2 (2x - 5) = 0$
Soluton
1. $3 (3x - 1) = 4 (x + 3)$
$9x - 3 = 4x + 12$
Collect like terms:
$9x - 4x = 12 + 3$
$5x = 15$
$x = 15/3$
$x = 3$

2. $5 (x + 11) + 2 (2x - 5) = 0$
$5x + 55 + 4x - 10 = 0$
collect like terms
$5x + 5x = 10 - 55$
$9x = -45$
$x = -45/9$
$x = -5$.

EVALUATION
Solve the following :
1. $2 (x + 5) = 18$ 2. $6 (2s - 7) = 5s$ 3. $3x + 1 = 2(3x+5)$
4. $8 (2d - 3) = 3 (4d - 7)$ 5. $(y + 8) + 2 (y + 1) = 0$.

Equation with Fraction

Before collecting like terms in a equation always clear the fraction. To clear fraction, multiply both sides of the equation by the L.C. M. of the denominators of the fraction.

Worked examples

Solve the equations.

1. $\frac{4m}{5} - \frac{2m}{3} = 4$

2. $\frac{3x-2}{6} - \frac{2x+7}{9} = 0$

Solution

1. $\frac{4m}{5} - \frac{2m}{3} = 4$

LCM of 5 and 3 is 15. Multiply both sides by 15

$15 \times \frac{4m}{5} - 15 \times \frac{2m}{3} = 15 \times 4$

$3 \times 4m - 5 \times 2m = 60$

$12m - 10m = 60$

$2m = 60$

$m = \frac{60}{2}$

$m = 30.$

2. $\frac{3x-2}{6} - \frac{2x+7}{9} = 0$

The LCM of 6 & 9 is 18. multiply both sides by 18

$\frac{18 \times (3x-2)}{6} - \frac{18(2x+7)}{9} = 0$

$3(3x-2) - 2(2x+7) = 0$

$9x - 6 - 4x - 14 = 0$

$9x - 4x = 14 + 6$

$5x = 20$

$x = 20/5$

$x = 4.$

EVALUATION

Solve the following equation

1. $\frac{7a}{2} - 21 = 0$
2. $\frac{x-2}{3} = 4$
3. $\frac{6m-3}{7} = \frac{2m+1}{7}$
4. $\frac{x}{2} - \frac{x}{3} = 2$

READING ASSIGNMENT

New General Mathematics chapt. 13 Ex 13d nos 1-20.

WEEKEND ASSIGNMENT

1. Solve 3x + 9 = 117
   (a) 38 (b) 36 (c) -36 (d) -38
2. If -2r = 18 what is 4?
   (a) -9 (b) 20 (c) 9 (d) -20
3. solve 2 (x + 5) = 16
   (a) 13 (b) 10 (c) 8 (d) 3
4. Solve $\frac{x}{3} = 5$ (a) -15 (b) 15 (c) 10 (d) -10

5. If $x/5 = ½$ What is x? (a) 2 ½ (b) 2 2/3 (c) -2 ½ (d) 2.

THEORY

1. Solve the following (a) $4(x + 2) = 2(3x - 1)$ (b) $19y - 2(6y + 1) = 8$
2. Solve the following:
   (a) $\frac{5e - 1}{4} - \frac{7e + 4}{8} = 0$
   (b) $\frac{2a - 1}{3} - \frac{a + 5}{4} = \frac{1}{2}$