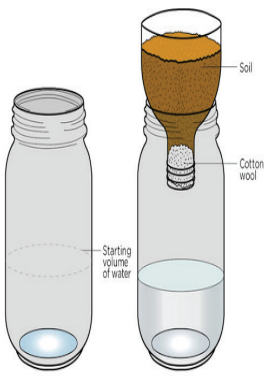
Use a piece of cotton wool to plug each funnel

Step 2: Put clay in one funnel and the sand in the other funnel

Step 3: Place the funnels with their contents over the receivers.



Step 4: Pour (at the same time) an equal volume (50cm^3) of water on each of the soil samples. Look at your clock or watch and let the experiment run for 20 minutes

Step 5: Observe and take note of the following:

i. The soil from which water started dripping first.
ii. The volume of water collected after the experiment.

Step 6: Record your findings in a table of your choice.

What explained conclusions can you draw about:

i. Drainage in:
   - Clay soil
   - Sandy soil
ii. Water retention:
   - Clay soil
   - Sandy soil

Follow-up activity

Comment on how the knowledge of drainage and water retention of clay and sand is used in the following areas:

i. Agriculture
ii. Building construction
iii. Craft making

MATHEMATICS

Class: SENIOR TWO

Mathematics

Topic: Numerical Concepts

Lesson 1

Learning outcome

By the end of this lesson, you should be able to know the Rational, Irrational and Real Numbers. You will work out problems involving these numbers and apply them in real life situations.

Materials: You will need grid papers. The grid papers will be used when dealing with Square numbers and Square roots.

Introduction

You have already learnt about some types of numbers like Natural numbers, Whole numbers, Fractions, Decimals, Integers and many others. All these numbers can be expressed in different bases.

In term one of Senior one, you learnt *Bases* where you carried mathematical operations, converted numbers from one base to another and vice versa. **Remember** that Integers have positions on a number line.

Activity 1

Represent the following numbers on the same number line

(a) -3, -1, 1, 2, 5, 10
(b) 0.1, 0.4, 0.5, 0.8
(c) 1/3, 1/2, 1/4, 2/5, 1/7

Rational Numbers

Remember, Integers and decimal numbers can easily be represented on a number line.

In the previous activity, you might have converted fractions to decimals in order to present them on a number line.

When fractions are converted into decimals, **they** are terminating, recurring and others are neither terminating nor recurring.

Note. Terminating and recurring decimals can be expressed in form of **a/b** where **a** and **b** are integers. This means that all integers can be written in form of **a/b**

Activity 2.

Express the following numbers in form of **a/b**

(a) 2, 7, 9, 11, 15, -3, -5

(b) $1\frac{1}{3}, 1\frac{1}{3}, 3\frac{11}{55}$, 2.2, 4.8, 1.02

You have seen that integers, terminating and recurring decimals can be written in form of **a/b** where **a** and **b** are integers.

Numbers which can be expressed in form of **a/b** are called Rational numbers.

Activity3.

Are all Decimal Numbers Rational numbers? With examples, justify your answer.

Irrational Numbers

Activity 4: Using a Calculator, find the square roots of the following numbers

(a) 1 (b) 4 (c) 9 (d) 3 (e) 2 (f) 13

Write the answers for (a)……(f) in form of **a/b** where **a** and **b** are integers

Have you been able to write your answers for (a) …..(f) in form of **a/b**?

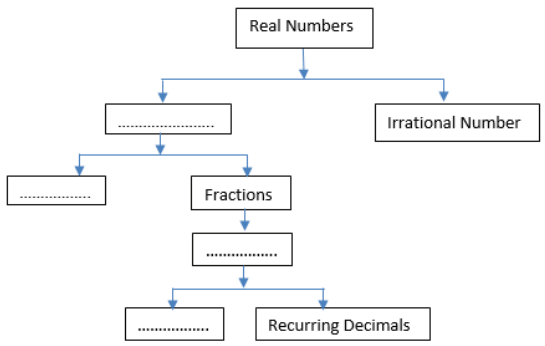
Note: All numbers which cannot be written in form of **a/b** are called irrational numbers

All Irrational numbers have corresponding positions on the Number line

Real Numbers

Remember Rational and Irrational numbers have positions on the Number line

Activity 5: Complete the following chart of Real numbers



Converting Recurring Decimals into Fractions

Activity 6: Convert $\frac{2}{5}, \frac{1}{8}, \frac{3}{505}, \frac{2}{8}, \frac{1}{50}, \frac{3}{50}, \frac{11}{33}$ into decimals.

Note that decimals can be converted into Fractions.

Example: Convert 0.2, 0.5 into fractions

Solutions: $0.2 = \frac{2}{10} \frac{2}{10} = \frac{11}{55}$

$0.5 = \frac{5}{10} \frac{5}{10} = \frac{11}{22}$

Convert $\frac{22}{33}$ into decimal

Answer: $\frac{22}{33} = 0.6666\ldots$.

The answer 0.666… is a non-terminating **but a** recurring decimal

0.666 can be converted to fractions.

The recurring number is 6 and it starts recurring after the tenth position

So, take r to be 0.6666 i.e. r = 0.666 equation (i)

Multiply equation (i) by 10 i.e. 10r = 6.666 equation (ii)

Subtract equation (i) from equation (ii) i.e. 10r – r = 6.666 – 0.666 = 6.0

$9r = 6$

$r = \frac{66}{99} = \frac{22}{33}$

Activity 7

Convert the following recurring decimals into fractions

(a) 0.77…
(b) (b) 0.2424…
(c) (c) 0.01666….
(d) (d) 0.185353…
(e) (e) 4.203203…

Class: Senior Two

Topic: Algebra:

Lesson 1: Use of Symbols, substitution

Learning outcome : By the end of this lesson, you should be able to:

- interpret word problems
- Write a formula using symbols and correct.

Materials:

You will need a note book, pen, paper, razor blade or scissor to help you explore relationships between different shapes and how they can be used to build a formula.

Introduction

In your primary school and S.1, you were introduced to a number of mathematical symbols representing mathematical statements.

Activity 1

1. What are some of the symbols that you regularly interact with?
2. What do these symbols mean**? (MISSING SYMBOLS)**

SYMBOL	MEANING

Look around your homestead and construct a statement. Use the statements drawn from situations in your homestead and represent it using symbols.

Statement	Symbol
Number of boys in my family is **not equal to** the number of girls	≠

Exercise

1. Which of the symbols is not used to show multiplication?
   a. @ b. * c. × d. ( )
2. Which of the following statements is true?
   a. π is a special number
   b. There is only one way to show multiplication symbol
   c. 90^0 is the symbol for representing a right angle in a triangle.
   d. √ is a square root.

Lesson 2:

Learning outcome

By the end of this lesson, you should be able to:

- Write statements in algebraic form using symbols.

An Algebraic expression is formed from variables and constants using different operations.

Expressions are used to write word problems in math terms.

Expressions are like instructions that tell you what you have to do to a number or variable.

Words (statement)	Algebraic Expression
A number b is added to 6	b+6
9 is subtracted from x	x-9
A number t is multiplied by 8	t×8
A number z is divided by 3	z÷3 or $\frac{z}{33}$

Activity

Choose the correct answer for each of the questions

1. The subtraction of 5 times of y from x is

(a) 5x – y

(b) y – 5x

(c) x – 5y

(d) 5y – x

(a) –1 × b

(b) 1 – b – 0

(c) 0 – (–1) × b

(d) – b – 0 – 1

3. The length of a side of square is given as 2x + 3. Which expression represents the perimeter of the square?

(a) 2x + 16

(b) 6x + 9

(c) 8x + 3

(d) 8x + 12

4. A fruit basket contains the same number of mangoes and oranges. If Eric eats 5 mangoes and 1 pear, there will be twice as many oranges as mangoes. How many oranges remain in the basket?

(a) 4
(b) 8
(c) 9
(d) 10
(e) 11

Lesson 3:

Learning outcome

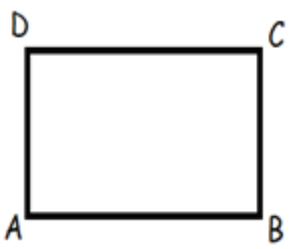
By the end of this lesson, you should be able to express one variable term in terms of another.

Activity 1

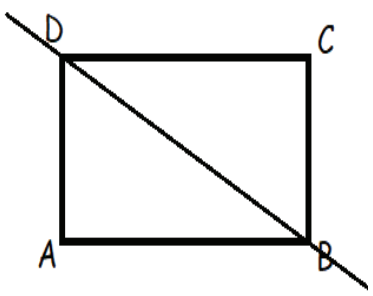
Let us use the area of a square to generate the formula of finding the area of a right-angled triangle.

Hint

Here is a piece of paper in a square shape labelled ABCD



Cut the piece/ fold the paper along diagonal from one end of the vertex to its opposite.



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You will observe there are two equal right-angled triangles formed.

Use the Length, width and the area of the shape ABCD to derive a formula for finding the area of triangle.

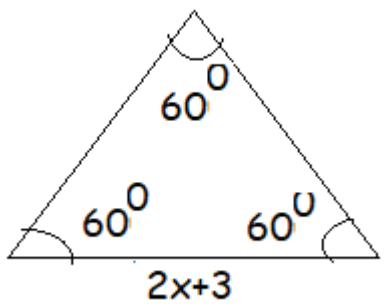
Activity

1. Use the formula you have generated to obtain solutions to the following
a. Base = 4 units, Height = 10units
b. Base =12units, Height= 3units

2. Use the following information to obtain the;
c. Height, when Area= 16square units, Base= 6units
d. Base when Area= 24 square units, Height = 10units
3. Find the values of the following algebraic expressions when a = – 2 and b = 3:
   a. 8a
   b. 5b
   c. a+3b
   d. 4a-2b
   e. $a^2 + 2ab + b^2$
4. Make x the subject in the following algebraic equations
   a. y=x+a
   b. y=2x-a
   c. y=2x+7
   d. ax-y=2y
5. Make x the subject of the formula in each of the following cases**.**
   a) a (x+b) =c
   b) $\frac{x}{a} = 1 + \frac{yx}{ba} = 1 + \frac{y}{b}$
   c) $\frac{x+y}{y} = \frac{y}{a} + \frac{ax+y}{y\ y} = \frac{y}{a} + \frac{a}{y}$

Follow up Activity

1. Find each side of an equilateral triangle given below, if the perimeter of the equilateral triangle is 240 cm.



2. Cut out shapes of two right angled triangles and a rectangle, Join them to form a shape of a trapezium
a. Paste the shape in your exercise book.
b. Draw the shape of the trapezium.
c. Use the right-angled triangles and a rectangle to derive a formula for **the** area of a Trapezium.
d. Write the formula in your notebook.
e. Use the formula to;
   (i) Express the base of the trapezium in terms of the height and Area
   (ii) Express the height of the trapezium in terms of the base and Area

Now, try to reflect on issues discussed above with the following activity.

Activity 1

1. A bicycle bought for 180,000/= was sold for 150,000/=.
   i. What was the cost price?
   ii. What was the selling price?
   iii. Was the bicycle sold at a profit or loss? Give a reason for your answer.

2. Musa bought a radio at 60,000 UGX and sold it to his brother at 55,000 UGX. Calculate the profit or loss made on this item.

3. A box of mineral water has 24 bottles. A shopkeeper bought it from the wholesale shop at 18,000 UGX. He sold each bottle at 1000 UGX. Calculate the profit or loss made by the shopkeeper.

Lesson 2: Percentage loss and profit

Materials: a pen/ pencil and a rough book to try out the exercises.

Topic: Business arithmetic

Lesson 1: Calculating Profit and Loss.

Learning outcomes:

By the end of this lesson, you should be able to:

i. Calculate profit and loss
ii. Express profit and loss as a percentage
iii. Calculate discount and commission
iv. Calculate simple interest.

Materials:

For this lesson, you will need to collect items that are used in a home, those that were bought from a shop. You will need receipts, price tags, a pen/ pencil and a rough book to try out the exercises.

Introduction:

Dear student, you must agree with me that buying and selling is part of any trade. The goods we use at home are bought from shops, markets and supermarkets. People who sell to us also buy from other wholesalers and sell them to us at a higher price. The extra money the goods are sold for is the **profit**. If the goods are sold at a *lower price* than the price at which they were bought, the difference is the **loss**.

The price at which the goods are bought is called the **cost price *(C.P)***

The price at which the goods are sold is called the **selling price (S.P)**

Introduction

In the previous lesson, you were able to calculate the profit or loss made by reselling an item. In this lesson, you will learn to express the profit or loss as a percentage. You can determine the percentage profit or loss using the formulae below;

$$\text{Percentage profit} = \frac{Profit}{Cost\ Price} \times 100$$

$$\text{Percentage loss} = \frac{Loss}{Cost\ Price} \times 100$$

Example 1:

A bicycle bought at 180,000/= was sold for 150,000/=. Calculate the percentage loss.

$$\text{Percentage loss} = \frac{Loss}{Cost\ Price} \times 100$$

$$= \frac{C.P - S.P}{C.P} \times 100$$

$$= \frac{180{,}000 - 150{,}000}{150{,}000} \times 100$$

$$= \frac{30{,}000}{150{,}000} \times 100$$

$$= \frac{\cancel{30{,}000}}{\cancel{150{,}000}} \times 100$$

$$= 20\%$$

The loss on the bicycle is 20%.

Activity 2

1. Mangoes are bought by a fruit shop for 300 shillings each and resold at 500 shillings each.
    a. What is the cost price?
    _____
    b. What is the selling price?
    _____
    c. What is the profit?
    _____
    d. Calculate the percentage profit on the cost price. _____

2. Josephine makes school uniforms. It costs her 30,000/= to make a girl's skirt. She then sells them for 48,000/= each.
    a. What is the cost price?
    _____
    b. What is the selling price?
    _____
    c. What is the profit?
    _____
    d. Calculate the percentage profit._____

3. Ahmed bought a used car for $14 500, spent another $2000 on repairs, before selling it for $19 000. Find:
    a. the total amount Ahmed spent on the car _____
    b. the profit he made
    _____
    c. the percentage profit on the total amount he spent. _____

4. A company selling newspapers spends 15,00/= to produce a copy of the newspaper and sells it at 2,000/=. On a given day, **the** company produced 2000 copies and managed to sell 1000 copies only.
    a. Did the company make a profit or loss on that day?
    b. Calculate the percentage profit/ loss for the day.

5. Copy the table shown below and fill in the missing values.

Item	C.P	S.P	Profit/ Loss	comment	% Profit/ loss
Dress	20000	30000			
Shirt	18000	22000			
Cow	700000	900000			
House	80 million	72 million			
TV	300000	360000			
Smart phone	250000	200000			
Bag of Irish potatoes	100000	120000			
Pair of shoes	45000	40000			

Lesson 3: Discount

Materials: a pen/ pencil and a rough book to try out the exercises.

Introduction

In the areas of competition, shops find ways of encouraging customers to buy. One way of encouraging customers is offering them a discount. This is done by reducing an amount from the usual price of an item. This reduction in price is called **Discount.** It is usually calculated as a percentage of the selling price.

Example: Sarah buys a dress for cash whose marked price is shillings 50,000. A shopkeeper offers 10% discount for cash payments.

a) How much is the discount?
b) How much does she actually pay for the dress?

a) $Discount = \frac{10}{100}\frac{10}{100} \times 50{,}000$
$= 5{,}000 \text{ shillings}$

b) *She pays* $50{,}000 - 5{,}000$
$= 45{,}000 \text{ shillings}$

Activity 3

1. The marked price of a watch is 46,500. The shopkeeper offers an off-season discount of 18% on it. Find its selling price.

2. The price of a sweater was slashed from 9600 shillings to 8160 shillings by a shopkeeper in a rainy season. Find the rate of discount given by him.

3. Find the percentage discount being given on a shirt whose selling price is 54,600 shillings after deducting a discount of 10,400 on its marked price.

Hint. Market Price = (SP) + (discount).

4. After allowing a discount of 8% on a toy, it is sold for $ 216.20. Find the marked price of the toy.

5. A set of kitchen utensils was bought for 52,800 after getting a discount of 12% on its marked price. Find the marked price.

6. A dealer marks his goods at 35% above the cost price and allows a discount of 20% on the marked price. Find his gain or loss per cent.

7. A cell phone was marked at 40% above the cost price and a discount of 30% was given on its marked price. Find the gain or loss percent made by the shopkeeper.

8. A dealer purchased a fan for UGX 10800. After allowing a discount of 25% on its marked price, he gains 25%. Find the marked price of the fan.

Lesson 4: Commission

Materials: You will need a pen/ pencil and a rough book to try out the exercises.

Introduction

Commission is a fee paid for services. It is usually calculated as a percentage of the total cost of the goods. This amount can be paid to salesmen as sales commission. Sales commissions is the amount of money paid to employees or companies that sell goods in stores or by calling on customers. The commission is meant to motivate sales persons to sell more.

For example, if a salesperson receives a 10% commission on their sales, a salesperson sells goods worth 15,000 shillings, they would earn 1,500 shillings in commissions.

So, commission $= \frac{10}{100} \times 15000$

$=$ 1500 shillings

Activity 4

1. A salesman gets a fixed salary of $2000 per month and a commission of 2% on sale. If total sale for the month of April was $30,000, find his total salary for that month?

2. Joan makes a commission of 2% when a house is sold by his company. How much money will Joan make as a commission if her company sells the house for 300,000,000 shillings?

3. Mike makes **a** commission of 10% on each TV set sold at store. Each TV costs $120. How much money will he make as commission if **the** store sells 25 TV sets?

4. John is selling sets of knives and makes a 10% commission on all sales. What would his commission be on the sale of a $3250 set of knives?

5. Sonny works as a furniture salesman and earns a base salary of $350 per week plus 6% commission on sales. What was Sonny's weekly gross salary if his total sales were $3750?

Lesson 5: Simple Interest

Materials: a pen/ pencil and a rough book to try out the exercises.

Introduction

Dear students, do you know that Money is not borrowed for free?

When money is borrowed from the bank, the bank

charges for the use of the money. This charge is called **interest** usually denoted by **(I)**.

Also when money is deposited with the bank, the bank **pays interest to** the owner of the money. The amount borrowed is called the **Principal** usually denoted by **(P).**

The interest is usually calculated as a **Percentage Rate** usually denoted by **(R).** Interest also depends on the length of **Time (T)** that the money is borrowed or invested for. The principal together with the interest is called the **Amount (A)**

Simple interest can be calculated using the formula

$I = P \times R \times TI = P \times R \times T$

For example: Annette deposited 500000 shillings on her fixed account in a financial institution which pays an interest rate of 12% per annum. How much interest will she earn after 2 years?

In this example, the principal is 500,000

The rate is 12% per annum which is the same as $\frac{12}{100}$ per annum.

The time of investment is 2 years.

Using the formula $I = P \times R \times T$|

$$I = 500{,}000 \times \frac{12}{100} \times 2$$

I = 120,000 shillings.

Activity 5

1. If you borrow 675,000 shillings for six years at an interest rate of 10%, how much interest will you pay?
2. If the balance at the end of eight years on an investment of $630 that has been invested at a rate of 9% is $1,083.60, how much was the interest?
3. How much interest is earned on 5,000,000 at 4% for seven years?
4. Jane borrowed 2,250,000 shillings from the bank for eight years at an interest rate of 6%. How much interest will she pay?
5. If you put 624,000 shillings into a savings account that earns 5%, how much money will you have at the end of four years?

Topic: Numerical Concepts

Lesson 1

Learning outcome

By the end of this lesson, you should be able to know the Rational, Irrational and Real Numbers. You will work out problems involving these numbers and apply them in real life situations.

Materials: You will need grid papers. The grid papers will be used when dealing with Square numbers and Square roots.

Introduction

You have already learnt about some types of numbers like Natural numbers, Whole numbers, Fractions, Decimals, Integers and many others. All these numbers can be expressed in different bases.

In term one of Senior one, you learnt *Bases* where you carried mathematical operations, converted numbers from one base to another and vice versa. **Remember** that Integers have positions on a number line.

Activity 1

Represent the following numbers on the same number line

(d) -3, -1, 1, 2, 5, 10
(e) 0.1, 0.4, 0.5, 0.8
(f) 1/3, 1/2, 1/4, 2/5, 1/7

Rational Numbers

Remember, Integers and decimal numbers can easily be represented on a number line.

In the previous activity, you might have converted fractions to decimals in order to present them on a number line.

When fractions are converted into decimals, **they** are terminating, recurring and others are neither terminating nor recurring.

Note. Terminating and recurring decimals can be expressed in form of **a/b** where **a** and **b** are integers. This means that all integers can be written in form of **a/b**

Activity 2.

Express the following numbers in form of **a/b**

(c) 2, 7, 9, 11, 15, -3, -5
(d) $1\frac{1}{3}, 3\frac{1}{5}$, 2.2, 4.8, 1.02

You have seen that integers, terminating and recurring decimals can be written in form of **a/b** where **a** and **b** are integers.

Numbers which can be expressed in form of **a/b** are called Rational numbers.

Activity3.

Are all Decimal Numbers Rational numbers? With examples, justify your answer.

Irrational Numbers

Activity 4: Using a Calculator, find the square roots of the following numbers

(b) 1 (b) 4 (c) 9 (d) 3 (e) 2 (f) 13

Write the answers for (a)……(f) in form of **a/b** where **a** and **b** are integers

Have you been able to write your answers for (a) …..(f) in form of **a/b**?

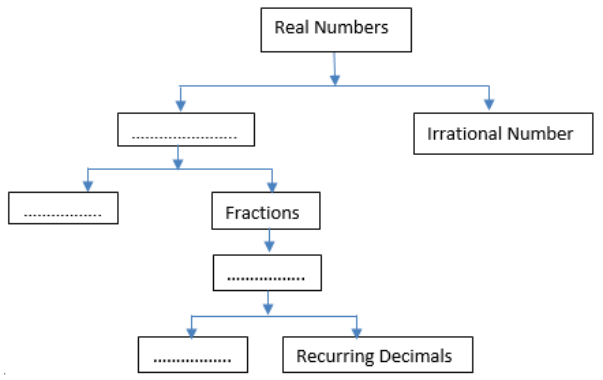
Note: All numbers which cannot be written in form of **a/b** are called irrational numbers

All Irrational numbers have corresponding positions on the Number line

Real Numbers

Remember Rational and Irrational numbers have positions on the Number line.

Activity 5: Complete the following chart of Real numbers



Converting Recurring Decimals into Fractions

Activity 6: Convert $\frac{2}{5}, \frac{1}{8}, \frac{3}{505}, \frac{2}{8}, \frac{1}{50}, \frac{3}{33}, \frac{11}{33}$ into decimals.

Note that decimals can be converted into Fractions.

Example: Convert 0.2, 0.5 into fractions

Solutions: $0.2 = \frac{2}{10} = \frac{1}{5}$

$0.5 = \frac{5}{10} = \frac{1}{2}$

Convert $\frac{2}{3}$ into decimal

Answer: $\frac{2}{3} = 0.6666..$

The answer 0.666… is a non-terminating **but a** recurring decimal

0.666 can be converted to fractions.

The recurring number is 6 and it starts recurring after the tenth position

So, take r to be 0.6666 i.e. r = 0.666 equation (i)

Multiply equation (i) by 10 i.e. 10r = 6.666 equation (ii)

Subtract equation (i) from equation (ii) i.e. 10r – r = 6.666 – 0.666 = 6.0

$$9r = 6$$

$$r = \frac{6}{9} = \frac{2}{3}$$

Activity 7

Convert the following recurring decimals into fractions

(f) 0.77…
(g) (b) 0.2424…
(h) (c) 0.01666….
(i) (d) 0.185353…
(j) (e) 4.203203…

Class: Senior Two

Topic: Algebra:

Lesson 1: Use of Symbols, substitution

Learning outcome : By the end of this lesson, you should be able to:

- interpret word problems
- Write a formula using symbols and correct.

Materials:

You will need a note book, pen, paper, razor blade or scissor to help you explore relationships between different shapes and how they can be used to build a formula.

Introduction

In your primary school and S.1, you were introduced to a number of mathematical symbols representing mathematical statements.

Activity 1

3. What are some of the symbols that you regularly interact with?
4. What do these symbols mean**? (MISSING SYMBOLS)**

SYMBOL	MEANING

Look around your homestead and construct a statement. Use the statements drawn from situations in your homestead and represent it using symbols.

Statement	Symbol
Number of boys in my family is **not equal to** the number of girls	≠

Exercise

3. Which of the symbols is not used to show multiplication?
   b. @ b. * c. × d. ( )
4. Which of the following statements is true?
   e. π is a special number
   f. There is only one way to show multiplication symbol
   g. 90^0 is the symbol for representing a right angle in a triangle.
   h. √ is a square root.

Lesson 2:

Learning outcome

By the end of this lesson, you should be able to:

- Write statements in algebraic form using symbols.

An Algebraic expression is formed from variables and constants using different operations.

Expressions are used to write word problems in math terms.

Expressions are like instructions that tell you what you have to do to a number or variable.

Words (statement)	Algebraic Expression
A number b is added to 6	b+6
9 is subtracted from x	x-9
A number t is multiplied by 8	t×8
A number z is divided by 3	z÷3 or $\frac{zz}{33}$

Activity

Choose the correct answer for each of the questions

2. The subtraction of 5 times of y from x is

(a) 5x – y

(b) y – 5x

(c) x – 5y

(d) 5y – x

(a) –1 × b

(b) 1 – b – 0

(c) 0 – (–1) × b

(d) – b – 0 – 1

3. The length of a side of square is given as 2x + 3. Which expression represents the perimeter of the square?

(a) 2x + 16

(b) 6x + 9

(c) 8x + 3

(d) 8x + 12

4. A fruit basket contains the same number of mangoes and oranges. If Eric eats 5 mangoes and 1 pear, there will be twice as many oranges as mangoes. How many oranges remain in the basket?

(a) 4
(b) 8
(c) 9
(d) 10
(e) 11

Lesson 3:

Learning outcome

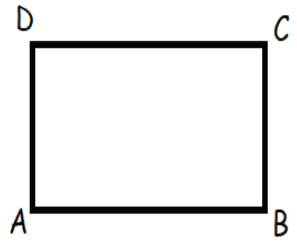
By the end of this lesson, you should be able to express one variable term in terms of another.

Activity 1

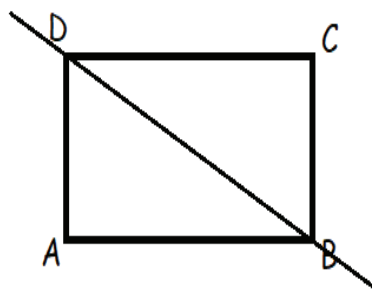
Let us use the area of a square to generate the formula of finding the area of a right-angled triangle.

Hint

Here is a piece of paper in a square shape labelled ABCD



Cut the piece/ fold the paper along diagonal from one end of the vertex to its opposite.



.

You will observe there are two equal right-angled triangles formed.

Use the Length, width and the area of the shape ABCD to derive a formula for finding the area of triangle.

Activity

6. Use the formula you have generated to obtain solutions to the following
   e. Base = 4 units, Height = 10 units
   f. Base =12 units, Height= 3 units

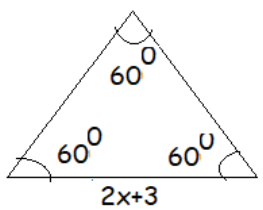
7. Use the following information to obtain the;
   g. Height, when Area= 16 square units, Base= 6 units

h. Base when Area= 24 square units, Height = 10 units

8. Find the values of the following algebraic expressions when a = – 2 and b = 3:
   f. 8a
   g. 5b
   h. a+3b
   i. 4a-2b
   j. $a^2 + 2ab + b^2$
9. Make x the subject in the following algebraic equations
   e. y=x+a
   f. y=2x-a
   g. y=2x+7
   h. ax-y=2y
10. Make x the subject of the formula in each of the following cases**.**
    d) a (x+b) =c
    e) $\frac{x}{a} = 1 + \frac{yx}{ba} = 1 + \frac{y}{b}$
    f) $\frac{x+y}{y} = \frac{y}{a} + \frac{ax+y}{y\ y} = \frac{y}{a} + \frac{a}{y}$

Follow up Activity

1. Find each side of an equilateral triangle given below, if the perimeter of the equilateral triangle is 240 cm.



2. Cut out shapes of two right angled triangles and a rectangle, Join them to form a shape of a trapezium
f. Paste the shape in your exercise book.
g. Draw the shape of the trapezium.
h. Use the right-angled triangles and a rectangle to derive a formula for **the** area of a Trapezium.
i. Write the formula in your notebook.
j. Use the formula to;
   (iii) Express the base of the trapezium in terms of the height and Area
   (iv) Express the height of the trapezium in terms of the base and Area

TOPIC: VECTORS AND TRANSLATIONS.

Lesson 1

Learning Outcome: By the end of this lesson you should be able to describe a translation.

Materials:

- Squared paper
- Sisal/Thread
- Mat/table
- Cup
- Plain paper

Introduction

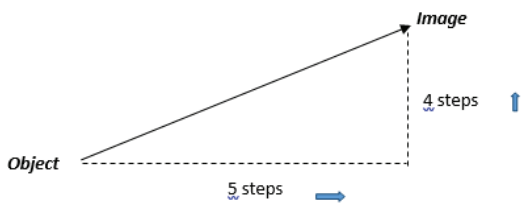
In senior one, you handled how to change the position of a shape by reflection. You are now going to handle translation. Translations is sliding or moving a shape in a straight line. In life, we move objects but the direction should be put into consideration. In reflection, you looked at "object" and "Image". In translation, we have "object" and "image". We describe the translation using specific values. Translations are also shown geometrically using the **X** and **Y** axes on the coordinate plane.

Instructions

I place a book on a table and I move it to another position in a straight line. This is a **translation.** The first position is the "object" position and the second position is the "image" position.

SPECIFIC VALUES

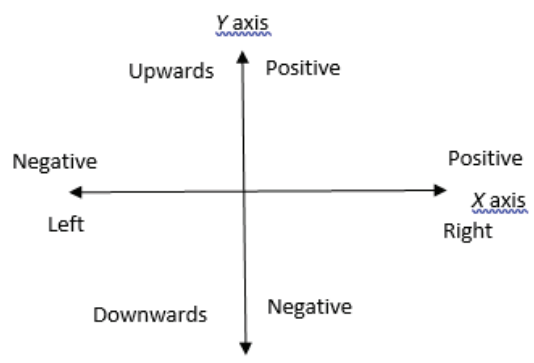
I move from one corner of a room to another. My former position is the "object" position and the new one is the "Image" position. I draw a line to connect the object to the image position. I count the steps from the object position to the right and upwards towards the image position.



The translation is described as 5 steps to the right and 4 steps upwards.

Cartesian plane

On the X and Y axes we represent the X direction (for left and right) and Y direction. (For upwards and downwards)



From the illustration above:

- Right 5 steps is +5 in the x direction.
- Upward 4 steps is +7 in the y direction.

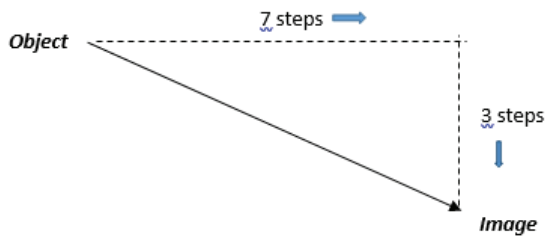
In coordinates, you write the X coordinate first ,then the Y-coordinate ,next like (x,y) with normal brackets but for the translation, it is written with longer brackets with the x-value first on top and the y-value on below.

$\begin{pmatrix} x \\ y \end{pmatrix}$

My translation with 5 steps to the right which is+5 and 4 steps forward which is +4 is written as

$\begin{pmatrix} 5 \\ 4 \end{pmatrix}$

We can also have



7 steps to the right which is +7

3 steps downwards which is -3

ACTIVITY

a) Place a cup on one corner of the mat/ table and then move it to the other corner in a straight line. Connect the two positions with a straight line using a thread or sisal. Use your hands and count the steps to the right and upwards and write the translation as a column vector.
b) Move the cup to any point on the mat/ table and repeat the above steps but count the steps to left and upwards depending on the direction you took.

Write these translations in column vector.

a) 4 steps to the right and 2 steps upwards.
b) 3 steps to the left and 5 steps downwards

Describe these vectors translations using left, right, upwards, downwards.

a) $\begin{pmatrix} -9 \\ 6 \end{pmatrix}\begin{pmatrix} -9 \\ 6 \end{pmatrix}$

b) $\begin{pmatrix} 8 \\ -3 \end{pmatrix}\begin{pmatrix} 8 \\ -3 \end{pmatrix}$

Topic: TRANSLATION

LESSON 2

Lesson Outcome: **By the end of this lesson, you should be able to:**

1. **Represent a translation on axes.**
2. **Show coordinates of the object and image.**
3. **Determine image for a given object and translation, Object for a given image and translation, Translation for given object ad image.**

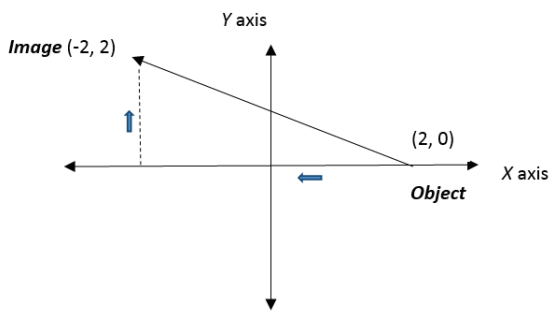
Materials: Graph paper, Ruler, Pencil.

Introduction:

A translation is represented on axes and the image and objects are identified by the coordinates. A line is drawn between the two and this is a vector for the translation. Using a graph paper, the position of the object or **image is** obtained when the vector of the translation is given. Likewise, get the translation vector when coordinates of either object or image are given.

Instruction:

Representation on the axes:

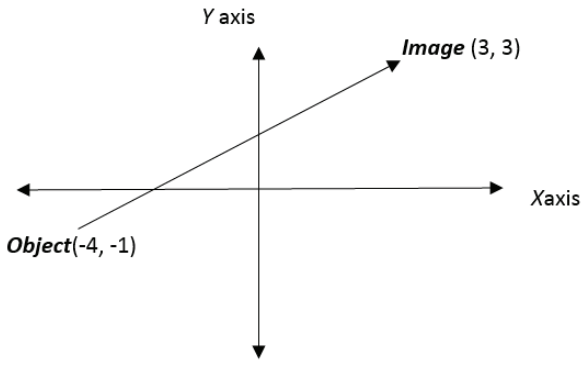


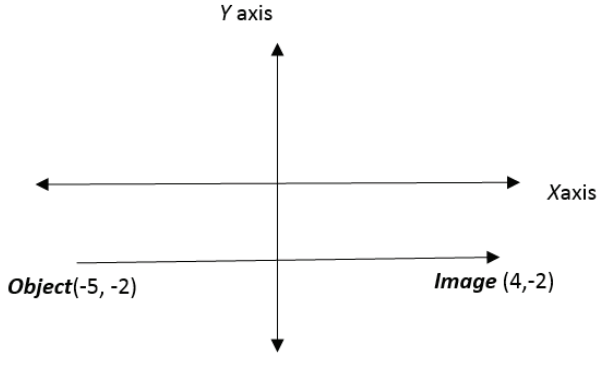
The translation of the object (2, 0) to the image (-2, 2) is then described as four steps to the left, -4 and two steps upward, 2 whose column vector is $\begin{pmatrix}-4\\2\end{pmatrix}$ $\begin{pmatrix}-4\\2\end{pmatrix}$.

ACTIVITY 1

Use your graph paper for this activity. Draw the X and Y axes on the graph paper.

1. Show the following column vectors on the graph axes:
$\begin{pmatrix}3\\5\end{pmatrix};\begin{pmatrix}-4\\9\end{pmatrix};\begin{pmatrix}-2\\-6\end{pmatrix};\begin{pmatrix}8\\-3\end{pmatrix}$.
2. Write the column vectors of the following translations.





3. An object at a point (1,-5) is translated by a vector $\begin{pmatrix}-3\\7\end{pmatrix}\begin{pmatrix}-3\\7\end{pmatrix}$. Write the coordinates of the image.
4. The object at (-3,-2) is translated to a point (-4,-6). What is the column vector of the translation?

LESSON 3: **VECTOR NOTATION**

Learning Outcome.

By the end of this lesson, you should be able to identify:

- A vector using letters and geometrically;
- Equal and opposite vectors.

Materials: Plate, Mat/Table, Squared paper, Ruler.

Introduction

You have drawn translations with arrows and also written them as column vectors. So vectors which represent translations are also represented using letters on lines with arrows on axes. We also have vectors that are equal vectors and opposite vectors.

Instructions

Notations

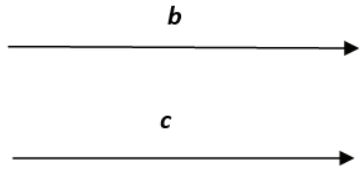
This represents a vector which is written as ***AB*** (bold in text books) or $\underline{AB}$ or $\overrightarrow{AB}\overrightarrow{AB}$ that you write in your exercise books.

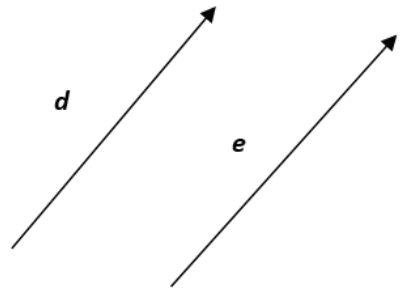
The tail of the vector is at A and the head is at B hence the direction AB. Using translation, A is the object position and B is the image position.

A vector can also be written with only one small letter e.g. $\underline{a}$, $\underline{b}$ or $\underline{c}$ and in text books, they will be bold **a, b** and **c.**

EQUAL VECTOR

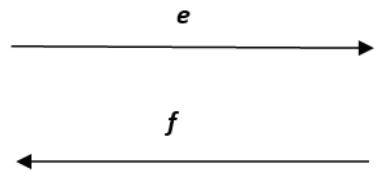
We identified vectors by their length and the direction.





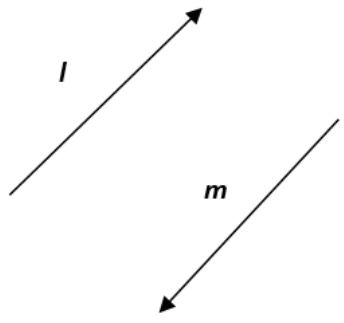
Vectors b and c have the same length and are facing in the same direction then we say the two vectors are equal. Also vectors d and e are equal. Therefore we write **b**=**c** and **d**=**c**

Look at the vectors ***e*** and ***f***. Comment on their length and direction.

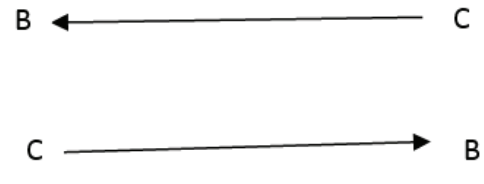


Did you notice that ***e*** and ***f*** have the equal length but facing opposite direction**?** Then we say that they are equal but opposite vectors and we write ***e*** = -***f***.

Write a math statement for vectors ***l*** and ***m***.



We have also seen that when writing vectors, we also use capital letters. For equal and opposite vectors, we write ***BC*** = -***BC*** as shown in the diagram below.



Column Vectors

If$\boldsymbol{AB} = \begin{pmatrix}2\\7\end{pmatrix}\boldsymbol{AB} = \begin{pmatrix}2\\7\end{pmatrix}$, then vectors ***PQ*** and ***RT*** that are equal to ***AB*** are also written as $\boldsymbol{PQ} = \begin{pmatrix}2\\7\end{pmatrix}$ $\boldsymbol{PQ} = \begin{pmatrix}2\\7\end{pmatrix}$ and $\boldsymbol{RT} = \begin{pmatrix}2\\7\end{pmatrix}\boldsymbol{RT} = \begin{pmatrix}2\\7\end{pmatrix}$.

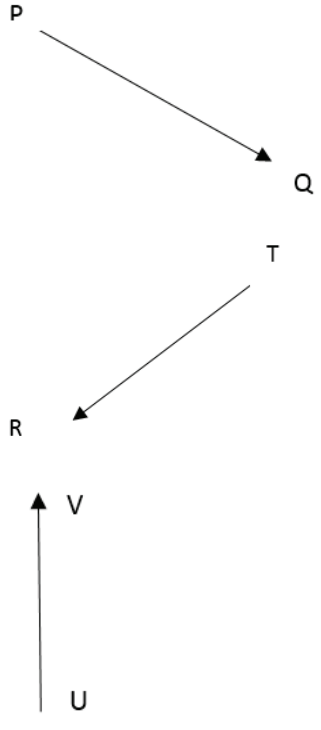
Then vectors ***DE*** and ***FG*** that are equal but opposite to ***AB*** are written as $\boldsymbol{DE} = \begin{pmatrix}-2\\-7\end{pmatrix}\boldsymbol{DE} = \begin{pmatrix}-2\\-7\end{pmatrix}$ and

$\boldsymbol{FG} = \begin{pmatrix}-2\\-7\end{pmatrix} \boldsymbol{FG} = \begin{pmatrix}-2\\-7\end{pmatrix}$ since $\boldsymbol{BA}$=-$\boldsymbol{AB}$=-$\begin{pmatrix}2\\7\end{pmatrix}\begin{pmatrix}2\\7\end{pmatrix}$=$\begin{pmatrix}-2\\-7\end{pmatrix}$ $\begin{pmatrix}-2\\-7\end{pmatrix}$.

ACTIVITY 1

1. Draw the following vectors: ***CD,DC*** using arrows**.**

2. Name the vectors below.



3. Draw on a plain paper

- Two equal vectors and write the vector notation of the vectors
- Two equal and opposite vectors. Write down their vector notations.

4. Place a plate **in** one corner of a mat or table. Slide the cup in a straight line to any position on the mat right down the column vector of the translation. Slide the plate in a straight line back to its original position. Write down the column vector of the translation. What do you observe between the two column vectors**?**

LESSON 4

Topic: Combined vectors

Learning outcomes:

By the end of this lesson you should be able to:

- Write a math statement showing a combination of vectors.
- Represent the combined vectors on a graph paper.
- Write combined vectors using column vectors

Materials

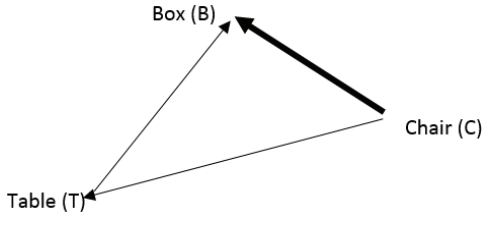
- Charts with letters A, B, C, D, E, F
- Graph paper

Introduction

We combine two or more vectors to form one vector. We also combine translations to obtain one translation. These combinations may be represented using letters, column vectors or graphs.

Instruction:

In my room, there is a table (T), a chair (C) and a box (B) that are not arranged in a straight line as shown in the figure below.



- Am sitting on the chair (C), then I move in a straight line to the table (T).
- From the table (T), I then move to the box (B) in a straight line.

This is a combination of two translations and the result is that I have moved from **the** chair to the box passing the **table.**

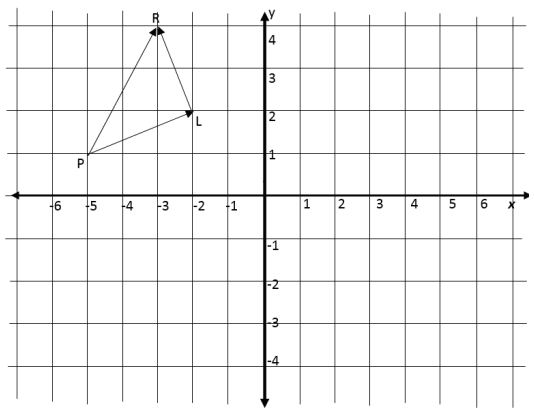
However, I can also move from the chair (C) directly to the box (B) without first going to the table.

Let use the letters to write the vectors of each translation.

- Chair to table is written ***CT***
- Table to box is written ***TB***
- Chair to box is ***CB***

We write the mathematical statement for the combined translations using vectors as $\boldsymbol{CT}+\boldsymbol{TB}=\boldsymbol{CB}$

Graphically:



Combinations of vectors

Mathematical Statement is $\boldsymbol{PL}+\boldsymbol{LR}=\boldsymbol{PR}$

From the graph, the column vectors are

$\boldsymbol{PL} = \begin{pmatrix}3\\1\end{pmatrix}$, $\boldsymbol{LR} = \begin{pmatrix}-1\\2\end{pmatrix}$, $\boldsymbol{PR} = \begin{pmatrix}2\\3\end{pmatrix}$

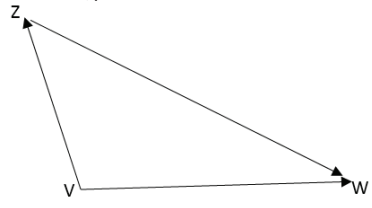
We now substitute the column vectors in the mathematical statement

$\boldsymbol{PL} + \boldsymbol{LR} = \boldsymbol{PR}$

$\begin{pmatrix}3\\1\end{pmatrix} + \begin{pmatrix}-1\\2\end{pmatrix} = \begin{pmatrix}2\\3\end{pmatrix}$

ACTIVITY 2

1. Write a mathematical statement to represent the combined vectors in the diagram below.



2. Identify any three objects inside your house or outside in the compound beginning with different letters. **Place them on papers** with the first letter of each object like Tree put 'T', shirt put 'S' and Hole 'H'
   a) Write different mathematical statements which represent the combined vectors **you have** form out of three objects.
   b) Draw the combinations on a piece of paper.
3. Draw the following column vectors on axes of a squared paper.

$\boldsymbol{EF} = \begin{pmatrix}3\\5\end{pmatrix}$ and $\boldsymbol{FG} = \begin{pmatrix}-2\\1\end{pmatrix}$

   a) Obtain from the graph the column vector of ***EG***
   b) Write the **mathematical** statement from the graph using both letters and column vectors.

Class: Senior Two

Lesson 5

Learning outcomes: By the end of this lesson, you should be able to add vectors and obtain a single vector which represents the other vectors.

Materials: Graph paper.

INTRODUCTION

We earlier in Lesson 4 looked at combined vectors. These are represented as addition of two vectors. A combination of vectors can also be more than two vectors.

INSTRUCTIONS

a) We add vectors by adding the x values and y values then finally obtain the vector.

$\begin{pmatrix}3\\1\end{pmatrix} + \begin{pmatrix}9\\4\end{pmatrix} = \begin{pmatrix}3+9\\1+4\end{pmatrix} = \begin{pmatrix}12\\5\end{pmatrix}$

Or

$\begin{pmatrix}-6\\8\end{pmatrix} + \begin{pmatrix}7\\-3\end{pmatrix} = \begin{pmatrix}-6+7\\8+-3\end{pmatrix} = \begin{pmatrix}1\\5\end{pmatrix}$

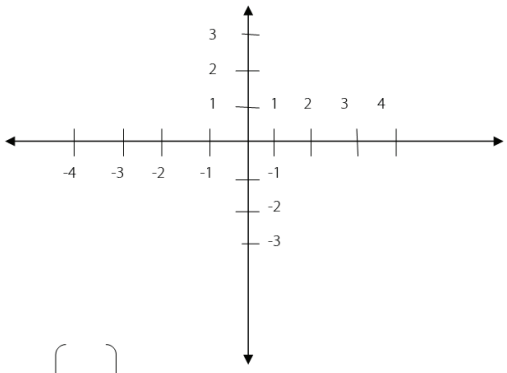
Or

$\begin{pmatrix}-5\\-2\end{pmatrix} + \begin{pmatrix}1\\-1\end{pmatrix} = \begin{pmatrix}-5+1\\-2+-1\end{pmatrix} = \begin{pmatrix}-4\\-3\end{pmatrix}$

a) On axes, draw these vectors and find the

vector that result from the combination.

$$\begin{pmatrix} -1 \\ 3 \end{pmatrix} + \begin{pmatrix} 4 \\ 2 \end{pmatrix}$$



$$= \begin{pmatrix} 3 \\ 5 \end{pmatrix}$$

Do you observe that in the last lesson that combined vectors were added? Check and confirm.

ACTIVITIY 1

1. Draw axes on squared paper and add the following vectors.

a) $\begin{pmatrix} 5 \\ -1 \end{pmatrix} + \begin{pmatrix} 7 \\ 2 \end{pmatrix}$

b) $\begin{pmatrix} -3 \\ 4 \end{pmatrix} + \begin{pmatrix} -2 \\ -8 \end{pmatrix}$

1) Add the following vectors without drawing.

a) $\begin{pmatrix} 2 \\ 11 \end{pmatrix} + \begin{pmatrix} -9 \\ -4 \end{pmatrix}$

b) $\begin{pmatrix} 8 \\ -10 \end{pmatrix} + \begin{pmatrix} -2 \\ 3 \end{pmatrix}$

Topic: Business arithmetic

Lesson 1: Calculating Profit and Loss.

Learning outcomes:

By the end of this lesson, you should be able to:

v. Calculate profit and loss
vi. Express profit and loss as a percentage
vii. Calculate discount and commission
viii. Calculate simple interest.

Materials:

For this lesson, you will need to collect items that are used in a home, those that were bought from a shop. You will need receipts, price tags, a pen/ pencil and a rough book to try out the exercises.

Introduction:

Dear student, you must agree with me that buying and selling is part of any trade. The goods we use at home are bought from shops, markets and supermarkets. People who sell to us also buy from other wholesalers and sell them to us at a higher price. The extra money the goods are sold for is the **profit**. If the goods are sold at a *lower price* than the price at which they were bought, the difference is the **loss**.

The price at which the goods are bought is called the **cost price *(C.P)***

The price at which the goods are sold is called the **selling price (S.P)**

Now, try to reflect on issues discussed above with the following activity.

Activity 1

4. A bicycle bought for 180,000/= was sold for 150,000/=.
   iv. What was the cost price?
   v. What was the selling price?
   vi. Was the bicycle sold at a profit or loss? Give a reason for your answer.

5. Musa bought a radio at 60,000 UGX and sold it to his brother at 55,000 UGX. Calculate the profit or loss made on this item.

6. A box of mineral water has 24 bottles. A shopkeeper bought it from the wholesale shop at 18,000 UGX. He sold each bottle at 1000 UGX. Calculate the profit or loss made by the shopkeeper.

Lesson 2: Percentage loss and profit

Materials: a pen/ pencil and a rough book to try out the exercises.

Introduction

In the previous lesson, you were able to calculate the profit or loss made by reselling an item. In this lesson, you will learn to express the profit or loss as a percentage. You can determine the percentage profit or loss using the formulae below;

$$\text{Percentage profit} = \frac{Profit}{Cost\ Price} \times 100$$

$$\text{Percentage loss} = \frac{Loss}{Cost\ Price} \times 100$$

Example 1:

A bicycle bought at 180,000/= was sold for 150,000/=. Calculate the percentage loss.

$$\text{Percentage loss} = \frac{Loss}{Cost\ Price} \times 100$$

$$= \frac{C.P - S.P}{C.P} \times 100$$

$$= \frac{180{,}000 - 150{,}000}{150{,}000} \times 100$$

$$= \frac{30{,}000}{150{,}000} \times 100$$

$$= \frac{\cancel{30{,}000}}{\cancel{150{,}000}} \times 100$$

$$= 20\%$$

The loss on the bicycle is 20%.

Activity 2

6. Mangoes are bought by a fruit shop for 300 shillings each and resold at 500 shillings each.
   a. What is the cost price? _____
   b. What is the selling price? _____
   c. What is the profit? _____
   d. Calculate the percentage profit on the cost price. _____

$\text{Profit} = S.P - C.P$

$\text{Loss} = C.P - S.P$

7. Josephine makes school uniforms. It costs her 30,000/= to make a girl's skirt. She then sells them for 48,000/= each.
   a. What is the cost price? _____
   b. What is the selling price? _____
   c. What is the profit? _____
   d. Calculate the percentage profit._____ ____

8. Ahmed bought a used car for $14 500, spent another $2000 on repairs, before selling it for $19 000. Find:
   a. the total amount Ahmed spent on the car _____
   b. the profit he made _____
   c. the percentage profit on the total amount he spent. _____

9. A company selling newspapers spends 15,00/= to produce a copy of the newspaper and sells it at 2,000/=. On a given day, **the** company produced 2000 copies and managed to sell 1000 copies only.
   a. Did the company make a profit or loss on that day?
   b. Calculate the percentage profit/ loss for the day.

10. Copy the table shown below and fill in the missing values.

Item	C.P	S.P	Profit/Loss	comment	% Profit/loss
Dress	20000	30000			
Shirt	18000	22000			
Cow	700000	900000			
House	80 million	72 million			
TV	300000	360000			
Smart phone	250000	200000			
Bag of Irish potatoes	100000	120000			
Pair of shoes	45000	40000			

Lesson 3: Discount

Materials: a pen/ pencil and a rough book to try out the exercises.

Introduction

In the areas of competition, shops find ways of encouraging customers to buy. One way of encouraging customers is offering them a discount. This is done by reducing an amount from the usual price of an item. This reduction in price is called **Discount.** It is usually calculated as a percentage of the selling price.

Example: Sarah buys a dress for cash whose marked price is shillings 50,000. A shopkeeper offers 10% discount for cash payments.

c) How much is the discount?
d) How much does she actually pay for the dress?

c) $Discount = \frac{10}{100} x\ 50{,}000$
$= 5{,}000\ shillings$

d) $She\ pays\ \ 50{,}000 - 5{,}000$
$= 45{,}000\ shillings$

Activity 3

1. The marked price of a watch is 46,500. The shopkeeper offers an off-season discount of 18% on it. Find its selling price.

2. The price of a sweater was slashed from 9600 shillings to 8160 shillings by a shopkeeper in a rainy season. Find the rate of discount given by him.

3. Find the percentage discount being given on a shirt whose selling price is 54,600 shillings after deducting a discount of 10,400 on its marked price.

Hint. Market Price = (SP) + (discount).

4. After allowing a discount of 8% on a toy, it is sold for $ 216.20. Find the marked price of the toy.

5. A set of kitchen utensils was bought for 52,800 after getting a discount of 12% on its marked price. Find the marked price.

6. A dealer marks his goods at 35% above the cost price and allows a discount of 20% on the marked price. Find his gain or loss per cent.

7. A cell phone was marked at 40% above the cost price and a discount of 30% was given on its marked price. Find the gain or loss percent made by the shopkeeper.

8. A dealer purchased a fan for UGX 10800. After allowing a discount of 25% on its marked price, he gains 25%. Find the marked price of the fan.

Lesson 4: Commission

Materials: You will need a pen/ pencil and a rough book to try out the exercises.

Introduction

Commission is a fee paid for services. It is usually calculated as a percentage of the total cost of the goods. This amount can be paid to salesmen as sales commission. Sales commissions is the amount of money paid to employees or companies that sell goods in stores or by calling on customers. The commission is meant to motivate sales persons to sell more.

For example, if a salesperson receives a 10% commission on their sales, a salesperson sells goods worth 15,000 shillings, they would earn 1,500 shillings in commissions.

So, commission = $\frac{10}{100}\ \frac{10}{100}$ x 15000

= 1500 shillings

Activity 4

6. A salesman gets a fixed salary of $2000 per month and a commission of 2% on sale. If total sale for the month of April was $30,000, find his total salary for that month?

7. Joan makes a commission of 2% when a house is sold by his company. How much money will Joan make as a commission if her company sells the house for 300,000,000 shillings?

8. Mike makes **a** commission of 10% on each TV set sold at store. Each TV costs $120. How much money will he make as commission if **the** store sells 25 TV sets?

9. John is selling sets of knives and makes a 10% commission on all sales. What would his commission be on the sale of a $3250 set of knives?

10. Sonny works as a furniture salesman and earns a base salary of $350 per week plus 6% commission on sales. What was Sonny's weekly gross salary if his total sales were $3750?

Lesson 5: Simple Interest

Materials: a pen/ pencil and a rough book to try out the exercises.

Introduction

Dear students, do you know that Money is not borrowed for free?

When money is borrowed from the bank, the bank charges for the use of the money. This charge is called **interest** usually denoted by **(I)**.

Also when money is deposited with the bank, the bank **pays interest to** the owner of the money. The amount borrowed is called the **Principal** usually denoted by **(P).**

The interest is usually calculated as a **Percentage Rate** usually denoted by **(R).** Interest also depends on the length of **Time (T)** that the money is borrowed or invested for. The principal together with the interest is called the **Amount (A)**

Simple interest can be calculated using the formula
$I = P \times R \times TI = P \times R \times T$

For example: Annette deposited 500000 shillings on her fixed account in a financial institution which pays an interest rate of 12% per annum. How much interest will she earn after 2 years?

In this example, the principal is 500,000

The rate is 12% per annum which is the same as $\frac{12}{100}$

$\frac{12}{100}$ per annum.

The time of investment is 2 years.

Using the formula $I = P \times R \times TI = P \times R \times T$

$$I = 500{,}000 \times \frac{12}{100} \times 2$$

I = 120,000 shillings.

Activity 5

1. If you borrow 675,000 shillings for six years at an interest rate of 10%, how much interest will you pay?
2. If the balance at the end of eight years on an investment of $630 that has been invested at a rate of 9% is $1,083.60, how much was the interest?
3. How much interest is earned on 5,000,000 at 4% for seven years?
4. Jane borrowed 2,250,000 shillings from the bank for eight years at an interest rate of 6%. How much interest will she pay?
5. If you put 624,000 shillings into a savings account that earns 5%, how much money will you have at the end of four years?

Topic: **Numerical Concepts**

Lesson 1

Learning outcome

By the end of this lesson, you should be able to know the Rational, Irrational and Real Numbers. You will work out problems involving these numbers and apply them in real life situations.

Materials: You will need grid papers. The grid papers will be used when dealing with Square numbers and Square roots.

Introduction

You have already learnt about some types of numbers like Natural numbers, Whole numbers, Fractions, Decimals, Integers and many others. All these numbers can be expressed in different bases.

In term one of Senior one, you learnt *Bases* where you carried mathematical operations, converted numbers from one base to another and vice versa. **Remember** that Integers have positions on a number line.

Activity 1

Represent the following numbers on the same number line

(g) -3, -1, 1, 2, 5, 10
(h) 0.1, 0.4, 0.5, 0.8
(i) 1/3, 1/2, 1/4, 2/5, 1/7

Rational Numbers

Remember, Integers and decimal numbers can easily be represented on a number line.

In the previous activity, you might have converted fractions to decimals in order to present them on a number line.

When fractions are converted into decimals, **they** are terminating, recurring and others are neither terminating nor recurring.

Note. Terminating and recurring decimals can be expressed in form of **a/b** where **a** and **b** are integers. This means that all integers can be written in form of **a/b**

Activity 2.

Express the following numbers in form of **a/b**

(c) 2, 7, 9, 11, 15, -3, -5
(d) $1\frac{1}{3}, 3\frac{1}{5}$, 2.2, 4.8, 1.02

You have seen that integers, terminating and recurring decimals can be written in form of **a/b** where **a** and **b** are integers.

Numbers which can be expressed in form of **a/b** are called Rational numbers.

Activity3.

Are all Decimal Numbers Rational numbers? With examples, justify your answer.

Irrational Numbers

Activity 4: Using a Calculator, find the square roots of the following numbers

(c) 1 (b) 4 (c) 9 (d) 3 (e) 2 (f) 13

Write the answers for (a)……(f) in form of **a/b** where **a** and **b** are integers

Have you been able to write your answers for (a) …..(f) in form of **a/b**?

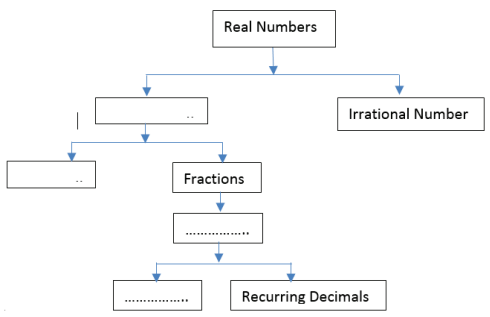
Note: All numbers which cannot be written in form of **a/b** are called irrational numbers

All Irrational numbers have corresponding positions on the Number line

Real Numbers

Remember Rational and Irrational numbers have positions on the Number line.

Activity5: Complete the following chart of Real numbers



Converting Recurring Decimals into Fractions

Activity 6: Convert $\frac{2}{5}, \frac{1}{8}, \frac{3}{50}, \frac{1}{3}$ into decimals.

Note that decimals can be converted into Fractions.

Example: Convert 0.2, 0.5 into fractions

Solutions: $0.2 = \frac{2}{10} = \frac{1}{5}$

$$0.5 = \frac{5}{10} = \frac{1}{2}$$

Convert $\frac{2}{3}$ into decimal

Answer: $\frac{2}{3} = 0.6666\ldots$

The answer 0.666… is a non-terminating **but a** recurring decimal

0.666 can be converted to fractions.

The recurring number is 6 and it starts recurring after the tenth position

So, take r to be 0.6666 i.e. r = 0.666 equation (i)

Multiply equation (i) by 10 i.e. 10r = 6.666 equation (ii)

Subtract equation (i) from equation (ii) i.e. 10r – r = 6.666 – 0.666 = 6.0

9r = 6

$$r = \frac{6}{9} = \frac{2}{3}$$

Activity 7

Convert the following recurring decimals into fractions

(k) 0.77…
(l) (b) 0.2424…
(m) (c) 0.01666….
(n) (d) 0.185353…
(o) (e) 4.203203…

Class: Senior Two

Topic: Algebra:

Lesson 1: Use of Symbols, substitution

Learning outcome : By the end of this lesson, you should be able to:

- interpret word problems
- Write a formula using symbols and correct.

Materials:

You will need a note book, pen, paper, razor blade or scissor to help you explore relationships between different shapes and how they can be used to build a formula.

Introduction

In your primary school and S.1, you were introduced to a number of mathematical symbols representing mathematical statements.

Activity 1

5. What are some of the symbols that you regularly interact with?
6. What do these symbols mean**? (MISSING SYMBOLS)**

SYMBOL	MEANING

Look around your homestead and construct a statement. Use the statements drawn from situations in your homestead and represent it using symbols.

Statement	Symbol
Number of boys in my family is **not equal to** the number of girls	≠

Exercise

5. Which of the symbols is not used to show multiplication?
   c. @ b. * c. × d. ( )
6. Which of the following statements is true?
   i. π is a special number
   j. There is only one way to show multiplication symbol
   k. 90^0 is the symbol for representing a right angle in a triangle.
   l. √ is a square root.

Lesson 2:

Learning outcome

By the end of this lesson, you should be able to:

- Write statements in algebraic form using symbols.

An Algebraic expression is formed from variables and constants using different operations.

Expressions are used to write word problems in math terms.

Expressions are like instructions that tell you what you have to do to a number or variable.

Words (statement)	Algebraic Expression
A number b is added to 6	b+6
9 is subtracted from x	x-9
A number t is multiplied by 8	t×8
A number z is divided by 3	z÷3 or $\frac{zz}{33}$

Activity

Choose the correct answer for each of the questions

3. The subtraction of 5 times of y from x is

(a) 5x – y
(b) y – 5x
(c) x – 5y
(d) 5y – x
(a) –1 × b
(b) 1 – b – 0
(c) 0 – (–1) × b
(d) – b – 0 – 1

3. The length of a side of square is given as 2x + 3. Which expression represents the perimeter of the square?

(a) 2x + 16
(b) 6x + 9
(c) 8x + 3
(d) 8x + 12

4. A fruit basket contains the same number of mangoes and oranges. If Eric eats 5 mangoes and 1 pear, there will be twice as many oranges as mangoes. How many oranges remain in the basket?

(a) 4
(b) 8
(c) 9
(d) 10
(e) 11

Lesson 3:

Learning outcome

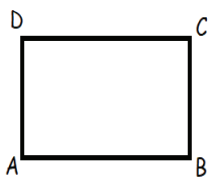
By the end of this lesson, you should be able to express one variable term in terms of another.

Activity 1

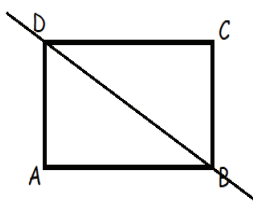
Let us use the area of a square to generate the formula of finding the area of a right-angled triangle.

Hint

Here is a piece of paper in a square shape labelled ABCD



Cut the piece/ fold the paper along diagonal from one end of the vertex to its opposite.



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You will observe there are two equal right-angled triangles formed.

Use the Length, width and the area of the shape ABCD to derive a formula for finding the area of triangle.

Activity

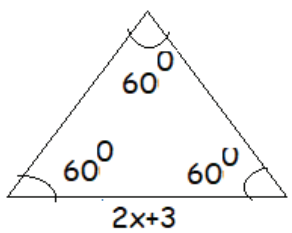
11. Use the formula you have generated to obtain solutions to the following
i. Base = 4 units, Height = 10 units
j. Base =12 units, Height= 3 units

12. Use the following information to obtain the;
k. Height, when Area= 16 square units, Base= 6 units
l. Base when Area= 24 square units, Height = 10 units
13. Find the values of the following algebraic expressions when a = – 2 and b = 3:
    k. 8a
    l. 5b
    m. a+3b
    n. 4a-2b
    o. $a^2 + 2ab + b^2$
14. Make x the subject in the following algebraic equations
    i. y=x+a
    j. y=2x-a
    k. y=2x+7
    l. ax-y=2y
15. Make x the subject of the formula in each of the following cases**.**

g) **a (x+b) =c**
h) $\frac{x}{a} = 1 + \frac{y}{b}$
i) $\frac{x+y}{y} = \frac{y}{a} + \frac{a}{y}$

Follow up Activity

3. Find each side of an equilateral triangle given below, if the perimeter of the equilateral triangle is 240 cm.



4. Cut out shapes of two right angled triangles and a rectangle, Join them to form a shape of a trapezium
k. Paste the shape in your exercise book.
l. Draw the shape of the trapezium.
m. Use the right-angled triangles and a rectangle to derive a formula for **the** area of a Trapezium.
n. Write the formula in your notebook.
o. Use the formula to;
   (v) Express the base of the trapezium in terms of the height and Area
   (vi) Express the height of the trapezium in terms of the base and Area