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**LAGOOZ SCHOOLS**

**FIRST TERM**

**LEARNER’S E-NOTE**

**SUBJECT: FURTHER MATHS**

**CLASS: SS1**

**First Term.**

1-2. Set I

i. Definition of set

ii. Set notation methods

iii. Types of set:

iv. Set Operations

v. Venn diagrams and applications up to 3 set problem.

3. Indices

i. Laws of indices

ii. Application of indices

iii. Indicial equations

4. Logarithms

1. Laws of logarithms and application
2. Solving calculations using logarithmic table.

5. Surds

i. Definition and laws of surds

ii. Rationalization of the denominators of surds

6. Coordinate Geometry

i. Distance between two points, midpoint of a line segment and gradient of a straight line.

ii. Angle between 2 intersecting straight lines, condition for parallelism and perpendicularity.

iii. Equation of a straight line

iv. Transforming non linear relationships into linear forms

7. Coordinate Geometry 2

i. Areas of triangles and quadrilaterals.

8. Logical Reasoning

i. The truth table

ii. Compound statements

iii. Implication and equivalence

iv. Rules of syntax, simple true or false statement.

v. Rule of logical application to argument.

vi. Implication and deduction.

9-10. Trigonometric Ratios of special angles and trigonometric functions

i. Trigonometric ratios of 300, 450 and 600.

ii. Application of trigonometric ratios of 300, 450 and 600 to problems without using tables.

iii. Trigonometric functions involving sine, cosine, tangent, cosec, sec and cot of angles.

iv. Amplitude, domain and period of a trigonometric function.

Date…………………..

Week: One

Period: Three

Duration: 45 minutes per period

Subject: Further Mathematics

Class: SS1

Topic: Sets

Subtopic: Types of Sets

Learning Objectives: At the end of the lesson, learners should be able to:

1. Define a set
2. List the 3 types of set notations
3. List five types of set with examples, and
4. Write the power set of a given set

Reference Materials: New Further Mathematics Project, Book 1.

Content

Period One

Definition

In mathematics, a set is a well-defined collection of objects. Sets are named and represented using a capital letter. In the set theory, the elements that a set comprises can be any kind of thing: people, letters of the alphabet, numbers, shapes, variables, etc.

Every item in the set is called an element or a member of the set. Curly brackets are used while writing a set. A very simple example of a set would be like this. Set A = {1,2,3,4,5}.

Cardinality of a set

The cardinal number, [cardinality](https://www.cuemath.com/algebra/cardinality/), or order of a set denotes the total number of elements in the set. For natural [even numbers](https://www.cuemath.com/numbers/even-numbers/) less than 10, n(A) = 4.

Representation of a set

There are different set notations used for the representation of sets. They differ in the way in which the elements are listed. The three set notations used for representing sets are:

* Semantic form
* Roster form
* Set builder form

Semantic Form

The semantic notation describes a statement to show the elements of a set. For example, Set A is the list of the first five odd numbers.

Roster Form

The most common form used to represent sets is the roster notation in which the elements of the sets are enclosed in curly brackets separated by commas. For example, Set B = {2,4,6,8,10}, which is the collection of the first five even numbers. …………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………To sum up the notation of the roster form, please take a look at the examples below.

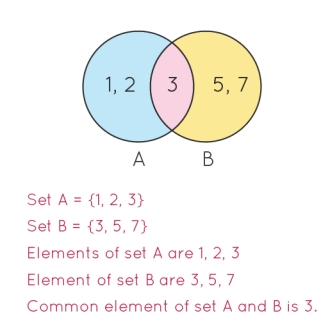
Finite Roster Notation of Sets : Set A = {1, 2, 3, 4, 5} (The first five natural numbers)  
Infinite Roster Notation of Sets : Set B = {5, 10, 15, 20 ....} (The multiples of 5)

Set Builder Form

The [set builder notation](https://www.cuemath.com/algebra/set-builder-notation/) has a certain rule or a statement that specifically describes the common feature of all the elements of a set. The set builder form uses a vertical bar in its representation, with a text describing the character of the elements of the set. For example, A = { k | k is an even number, k ≤ 20}. The statement says, all the elements of set A are even numbers that are less than or equal to 20. Sometimes a ":" is used in the place of the "|".

### Visual Representation of Sets Using Venn Diagram

[Venn Diagram](https://www.cuemath.com/algebra/venn-diagram/) is a pictorial representation of sets, with each set represented as a circle. The elements of a set are present inside the [circles](https://www.cuemath.com/geometry/circles/). Sometimes a rectangle encloses the circles, which represents the [universal set](https://www.cuemath.com/algebra/universal-set/). The Venn diagram represents how the given sets are related to each other.



Class Work

The New Further Mathematics Project, Page 3, Exercise 1A, no. 1.

Ticket Out

The New Further Mathematics Project, Page 3, Exercise 1A, no. 2

Period Two and Three

## Types of Sets

Sets are classified into different types. Some of these are singleton, finite, infinite, empty, etc.

### Singleton Sets

A set that has only one element is called a singleton set or also called a unit set. Example, Set A = { k | k is an integer between 3 and 5} which is A = {4}.

### Finite Sets

As the name implies, a set with a finite or countable number of elements is called a finite set. Example, Set B = {k | k is a prime number less than 20}, which is B = {2,3,5,7,11,13,17,19}

### Infinite Sets

A set with an infinite number of elements is called an infinite set. Example: Set C = {Multiples of 3}.

### Empty or Null Sets

A set that does not contain any element is called an empty set or a null set. An empty set is denoted using the symbol '∅'. It is read as 'phi'. Example: Set X = {}.

### Equal Sets

If two sets have the same elements in them, then they are called equal sets. Example: A = {1,2,3} and B = {1,2,3}. Here, set A and set B are equal sets. This can be represented as A = B.

### Unequal Sets

If two sets have at least one element that is different, then they are unequal sets.Example: A = {1,2,3} and B = {2,3,4}. Here, set A and set B are unequal sets. This can be represented as A ≠ B.

### Equivalent Sets

Two sets are said to be equivalent sets when they have the same number of elements, though the elements are different. Example: A = {1,2,3,4} and B = {a,b,c,d}. Here, set A and set B are equivalent sets since n(A) = n(B)

### Overlapping Sets

Two sets are said to be overlapping if at least one element from set A is present in set B. Example: A = {2,4,6} B = {4,8,10}. Here, element 4 is present in set A as well as in set B. Therefore, A and B are overlapping sets.

### Disjoint Sets

Two sets are disjoint sets if there are no common elements in both sets. Example: A = {1,2,3,4} B = {5,6,7,8}. Here, set A and set B are disjoint sets.

### Subset and Superset

### …………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………….Universal Set

A universal set is the collection of all the elements in regard to a particular subject. The universal set is denoted by the letter 'U'. Example: Let U = {The list of all road transport vehicles}. Here, a set of cars is a subset for this universal set, the set of cycles, trains are all subsets of this universal set.

### Power Sets

[Power set](https://www.cuemath.com/algebra/power-set/) is the set of all subsets that a set could contain. Example: Set A = {1,2,3}. Power set of A is = {{∅}, {1}, {2}, {3}, {1,2}, {2,3}, {1,3}, {1,2,3}}.

## Intersection of Sets

The intersection of two sets A and B, is the set which consists of elements that are in A as well as in B. The set notation for the operation of intersection is ∩. Thus A∩B means A intersection B. Example

Let

R = {all positive even integers less than or equal to 20}

Q = {all factors of 20}

Then,

R = {2,4,6,8,10,12,14,16,18,20}

Q = {1,2,4,5,10,20}

Therefore R∩Q = {2,4,10,20}

Union of Sets

The union of set A and B is the set which consists of elements that are either in A or B or in both. The set notation for the operation of union is U. Thus AUB means A union B.

Example:

Given that

G = {h,e,a,p}

H = {l,a,k,e} then,

GUB = {h,e,a,p,l,k}

## Sets Formulas

Sets find their application in the field of [algebra](https://www.cuemath.com/algebra/), [statistics](https://www.cuemath.com/data/statistics/), and [probability](https://www.cuemath.com/data/probability/). There are some important [set formulas](https://www.cuemath.com/sets-formula/) as listed below.  
For any two overlapping sets A and B,

* n(A U B) = n(A) + n(B) - n(A ∩ B)
* n (A ∩ B) = n(A) + n(B) - n(A U B)
* n(A) = n(A U B) + n(A ∩ B) - n(B)
* n(B) = n(A U B) + n(A ∩ B) - n(A)
* n(A - B) = n(A U B) - n(B)
* n(A - B) = n(A) - n(A ∩ B)

For any two sets A and B that are disjoint,

1. n(A U B) = n(A) + n(B)
2. A ∩ B = ∅
3. n(A - B) = n(A)

Class Work

Q 1.The symbol used to denote an element of a set is \_\_\_

1. U
2. £
3. C
4. N

Q2. Write the solution set of the equation x2 – 4=0 in roster form.

Q3. Write the set A = {1, 4, 9, 16, 25, . . . } in set-builder form.

Q4. Write an example of a finite and infinite set in set builder form.

Solution:

Finite set, A = {x : x ∈ N and (x – 1) (x – 2) = 0}

Infinite Set, B = {x : x ∈ N and x is prime}

Q5. Write an example of equal sets.

Ticket Out

5. Write the subsets of {1,2,3}.

6. Write {x: x ∈ R, 3 ≤ x ≤ 4} as an interval.

7. Write the interval (6, 12) in set builder form.

8. If set A = {1, 3, 5}, B = {2, 4, 6} and C = {0, 2, 4, 6, 8}. Then write the universal set for all three sets.

Date………………

Week: Two

Period: Three

Duration: 45 minutes per period

Subject: Further Mathematics

Class: SS1

Topic: Sets

Subtopic: Venn Diagram

Learning Objectives: At the end of the lesson, learners should be able to:

1. define Venn diagram

2. represent sets using Venn diagrams

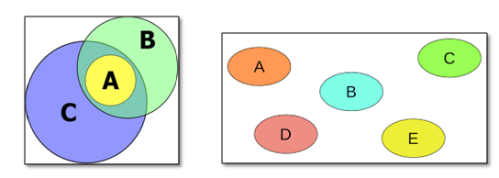
3. solve set problems using Venn diagram for up to three sets

Reference Materials: New Further Mathematics Project, Book 1

Periods 1 and 2

Definition:

A Venn diagram is a diagrammatic representation of ALL the possible relationships between different sets of a finite number of elements. Venn diagrams were conceived around 1880 by John Venn, an English logician, and philosopher. They are extensively used to teach Set Theory. A Venn diagram is also known as a Primary diagram, Set diagram or Logic diagram.



Solving problems by drawing a Venn diagram

Many counting problems can be solved by identifying the sets involved, then drawing up a Venn diagram to keep track of the numbers in the different regions of the diagram.

Example 1

A travel agent surveyed 100 people to find out how many of them had visited the cities of

Melbourne and Brisbane. Thirty-one people had visited Melbourne, 26 people had been to Brisbane, and 12 people had visited both cities. Draw a Venn diagram to find the number of people who had visited:

a Melbourne or Brisbane

b Brisbane but not Melbourne

c only one of the two cities

d neither city.

SOLUTION

Let M be the set of people who had

visited Melbourne, and let B be the set

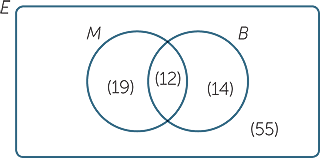
of people who had visited Brisbane.

Let the universal set E be the set of

people surveyed.

The information given in the question can now be rewritten as

| M | = 31, | B | = 26, | M ∩ B | = 12 and | E | = 100.



Hence number in M only = 31 − 12

= 19

and number in B only = 26 − 12

= 14.

a Number visiting Melbourne or Brisbane = 19 + 14 +12 = 45.

b Number visiting Brisbane only = 14.

c. Number visiting only one city = 19 + 14 = 33.

d. Number visiting neither city = 100 − 45 = 55.

Example 2

In a survey of 500 students of a college, it was found that 49% liked watching football, 53% liked watching hockey and 62% liked watching basketball. Also, 27% liked watching football and hockey both, 29% liked watching basketball and hockey both and 28% liked watching football and basket ball both. 5% liked watching none of these games.

a. How many students like watching all the three games?

b. Find the ratio of number of students who like watching only football to those who like watching only hockey.

c. Find the number of students who like watching only one of the three given games.

d. Find the number of students who like watching at least two of the given games.

Solution:

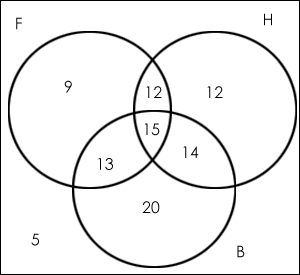
………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………..Now applying the basic formula,

95% = 49% + 53% + 62% -27% - 29% - 28% + n (F ∩ H ∩ B)

Solving, you get n (F ∩ H ∩ B) = 15%.

Now, make the Venn diagram as per the information given.

Note: All values in the Venn diagram are in percentage.



a. Number of students who like watching all the three games = 15 % of 500 = 75.

b. Ratio of the number of students who like only football to those who like only hockey = (9% of 500)/(12% of 500) = 9/12 = 3:4.

c. The number of students who like watching only one of the three given games = (9% + 12% + 20%) of 500 = 205

d. The number of students who like watching at least two of the given games=(number of students who like watching only two of the games) +(number of students who like watching all the three games)= (12 + 13 + 14 + 15)% i.e. 54% of 500 = 270.

Evaluation:

Pg. 15, Ex. 1C, no. 5

Ticket Out:

Pg. 15, Ex. 1C, no. 6

Period 3: Further Practice Questions

Evaluation:

Pg. 15. Ex. 1C, no. 8

Ticket Out:

Pg. 15. Ex. 1C, no. 15

Week: Three

Period: Three

Duration: 45 minutes per period

Subject: Further Mathematics

Class: SS1

Topic: Indices

Subtopic: Laws of Indices

Learning Objectives: At the end of the lesson, learners should be able to:

1. list the laws of indices

2. apply the laws to solving problems on indices

3. solve indicial equations

Reference Materials: New Further Mathematics Project, Book 1

Period 1

Definition: Index, the singular of indices, refers to the power to which a base is raised. The index is sometimes referred to as exponent or power.

Laws of Indices

Form Name

1. am × an = am+n Product law

2. am ÷ an = am-n Quotient law

3. a0 = 1 (00 ≠ 1) Zero index

4. (am)n = amn Power law

5. a-m = 1/am Negative index

6. C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps1.jpg = C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps2.jpg Fractional index

7. C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps3.jpg = C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps4.jpg Fractional index

8. (ab )m = ambm Distributive index

9.C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps5.jpg= C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps6.jpg Distributive index

Example 1

63 x 65 = 6(3+5)= 68

Example 2

55 ÷ 53 = 5(5-3) = 52

Example 3

(32)4 = 32×4 = 38

Example 4

2540 = 1

Example 5

6-3 = C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps7.jpg

Example 6

C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps8.jpg= 52 = 25

Example 7

Solve each of the following equations

(a) C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps9.jpg= 625

(b) C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps10.jpg.C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps11.jpg = 27

Solution

(a) C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps12.jpg= 625

C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps13.jpg= 54

-y = 4

y = -4

(b) 3.3a = 27

3(1+a) = 33

1+a = 3

a = 3-1

a = 2

Class Work: Pg. 35, Ex. 3A, no. 1 and 2, a and c.

Ticket Out: Pg. 35, Ex. 3A, no. 1 and 2, d and e.

Period 2:

Indicial Equations

Example 9

Solve the equation

52x- 26(5x) + 25 = 0

Solution

(a) 52x- 26(5x) + 25 = 0

(5x)2- 26(5x) + 25 = 0

Let 5x = m

m2 – 26m + 25 = 0

(m-25)(m-1) = 0

m = 25 or m = 1

put m as 5x

5x = 25 or 5x = 1

5x = 52 or 5x = 50

x=2 or x = 0

Example 10

Solve the equation



Let 









 has no solution.





Class Work: Pg. 35, Ex.3A, no. 3, a, b and c.

Ticket Out: Pg. 35, Ex.3A, no. 3, d and e.

Period 3:

Class Activities

Class Work: Pg. 35, Ex.3A, no.1 and 2, f.

Ticket Out: Pg. 35, Ex.3A, no. 3, f and g.

Date………………………..

Week: Four

Period: Three

Duration: 45 minutes per period

Subject: Further Mathematics

Class: SS1

Topic: Logarithms

Subtopic: Laws of logarithms and application

Learning Objectives: At the end of the lesson, learners should be able to:

1. List and apply the laws of logarithms

2. solve calculations using logarithms.

Reference Materials: New Further Mathematics Project, Book 1

Period 1

Definition: the Logarithm of a number (N) to a given base(x), is the power (y)to which the base must be raised to give the number(N).

Simply put:

C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps14.jpg= y therefore N = xy

C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps15.jpg = 3. This is because 103 = 1000

Logarithms is therefore the mirror image of an index

If m = bn then C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps16.jpg = n

Laws of Logarithm

|  |  |
| --- | --- |
| 1. C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps17.jpg = C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps18.jpg + C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps19.jpg | Product law |
| 2. C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps20.jpg = C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps21.jpg - C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps22.jpg | Quotient law |
| 3. C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps23.jpg = nC:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps24.jpg | Index law |
| 4. C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps25.jpg = 1 | Equal number and base |
| 5. C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps26.jpg = 0 | Logarithm of unity |
| 6. C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps27.jpg = C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps28.jpg | Change of base |
| 7. C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps29.jpg = C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps30.jpg | Reciprocal law |
| 8. C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps31.jpg = m | Logarithm at index |

Example 1

Simplify (i) C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps32.jpg (ii) C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps33.jpg (iii) C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps34.jpg

Solution

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Example 2

Given that C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps42.jpg= 0.3010, C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps43.jpg= 0.4771 and C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps44.jpg= 0.8451, evaluate (i) C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps45.jpg (ii) C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps46.jpg

Solution

(i) C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps47.jpg = C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps48.jpg = C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps49.jpg = C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps50.jpg + 2C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps51.jpg

= 0.3010 + 2(0.4771) = 0.3010 + 0.9542 = 1.2552

(ii) C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps52.jpg = C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps53.jpg = C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps54.jpg + C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps55.jpg + C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps56.jpg = C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps57.jpg + C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps58.jpg + C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps59.jpg

= 2 C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps60.jpg + C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps61.jpg + C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps62.jpg = 2(0.3010) + 0.4771 + 0.8451 = 1.9242

Example 3

If C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps63.jpg = x, express C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps64.jpg in terms of x

Solution

C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps65.jpg = C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps66.jpg = C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps67.jpg = C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps68.jpg = C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps69.jpg = 2C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps70.jpg- 3 C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps71.jpg

= 2(1) – 3(x) = 2 – 3x

Example 4

Simplify C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps72.jpg x C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps73.jpg

Solution

C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps74.jpg x C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps75.jpg= C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps76.jpg x C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps77.jpg

= C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps78.jpg x C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps79.jpg = 2 x 32 = 64

Example 5

Simplify C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps80.jpg - C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps81.jpg + C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps82.jpg

Solution

C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps83.jpg - C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps84.jpg + C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps85.jpg = C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps86.jpg - C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps87.jpg + C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps88.jpg = C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps89.jpg -C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps90.jpg + C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps91.jpg = C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps92.jpg

Class Work: Pg. 38, Ex.3B, no. 1, a to e.

Ticket Out: Pg. 38, Ex.3B, no. 1, f to h.

Period 2

Logarithmic Equations

These are algebraic equations that involve logarithms and can be solved using the combined laws of indices and logarithms.

Example 6

Solve for x, C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps93.jpg = x + 2

Solution

C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps94.jpg = x + 2

32 = C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps95.jpg

C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps96.jpg =C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps97.jpg

5 = 3x + 6

3x = 5 -6

x = C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps98.jpg

Example 7

Find x, if C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps99.jpg + C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps100.jpg - C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps101.jpg = 2

Solution

C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps102.jpg + C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps103.jpg - C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps104.jpg = 2

C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps105.jpg = C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps106.jpg

C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps107.jpg = 32

C:\Users\LAGOOZ~3\AppData\Local\Temp\ksohtml501868\wps108.jpg = 9

4x + 6 = 9x -9

9x -4x = 6 + 9

5x = 15

x = 3

Class Work: Pg. 38, Ex.3B, no. 2, a to e.

Ticket Out: Pg. 38, Ex.3B, no. 3, a to c.

Period Three

The use of logarithmic tables to calculate logarithms of numbers.

Guidelines on finding the logarithm of a number

1. Express the number in standard form
2. Determine the characteristics of the number
3. Find the mantissa using the logarithm table
4. Add the partial results in 2 and 3 above

No standard form characteristics (x) mantissa (y) logarithm (x+y)

1. 1.25 1.25 x 100 0 0.0969 0.0969
2. 438 4.38 x 102 2 0.6415 2.6415
3. 61500 6.15 x 1044 4 0.7889 4.7889
4. 0.0617 6.17 x 10-2  0.7903 
5. 0.000749 7.49 x 10-4  0.8745 

Example 1

Find the logarithm of 0.0000415.

Solution

0.0000415 = 4.15 x 10-5

Characteristics = 

Mantissa of 0.0000415 = 0.6180

Therefore the log of 0.0000415 = .

Antilog

Antilog is the reverse of logarithm.

Recall that log 0.0000415 =  is in base 10

Therefore, 0.0000415 = 10

But = -5 + 0.6180 = -4.3820

Thus, 10-4.3820= 0.0000415.

In general, if = y, then N = 10y read as the antilog of y.

Logarithms of numbers greater than 1

Example 2

Evaluate 

Solution

|  |  |
| --- | --- |
| Number | Logarithm |
|  | 0.6105 x 3 = 1.8315  3.8004 x  = -1.9002 |
| 8.537 x 10-1 (antilog of .9313 | .9313 |

Logarithms of numbers less than 1

Example 3

Evaluate 

Solution.

|  |  |
| --- | --- |
| Number | Logarithm |
| 5.049 | 0.7032 = 0.7032 |
| 0.1625  0.0572 | +  .9682 = -.9682 |
|  | 2.7350  ÷ 2 |
| 2.331 × 101(antilog of 1.3675) | 1.3675 |

Class Work

Pg. 46, Ex. 3C, no. 1, 2, and 3, g each.

Ticket Out

Pg. 46, Ex. 3C, no. 4, 5 and 6.

Date…………………..

Week: Five

Period: Three

Duration: 45 minutes per period

Subject: Further Mathematics

Class: SS1

Topic: Surds

Subtopic: Laws of Surds

Learning Objectives: At the end of the lesson, learners should be able to:

1. state the laws of surds

2. perform basic operations on surds and

3. rationalize surds.

Rules of Surds

Surds are irrational numbers. They are the root of rational numbers whose value cannot be expressed as exact fractions. Examples of surds are: √2, √7, √12, √18, etc.

1. √(a X b ) = √a X √ b
2. √(a / b ) = √a / √b
3. √(a + b ) ≠ √a + √b
4. √(a – b ) ≠ √a - √b

Basic Forms of Surds

√a is said to be in its basic form if A does not have a factor that is a perfect square. E.g. √6, √5, √3, √2 etc. √18 is not in its basic form because it can be broken into √ (9x2) = 3√2. Hence 3√2 is now in its basic form.

Similar Surds

Surds are similar if their irrational part contains the same numerals e.g.

1. 3√n and 5√n
2. 6√2 and 7√2

Conjugate Surds

Conjugate surds are two surds whose product result is a rational number.

(i)The conjugate of √3 - √5 is √3 + √5

The conjugate of -2√7 + √3 is 2√7 - √3

In general, the conjugate of √x + √y is √x - √y

The conjugate of √x - √y = √x + √y

Simplification of Surds

Surds can be simplified either in the basic form or as a single surd.

Examples

Simplify the following in its basic form (a) √45 (b) √98

Solution

(a) √45 = √ (9 x 5) = √9 x √5 = 3√5

(b) √98 = √ (49 x 2) = √49 x √2 = 7√2

Examples

Simplify the following as a single surd (a) 2√5 (b) 17√2

Solution

(a) 2√5 = √4 x √5 = √ (4 x 5) = √20

(b) 17√2 = √289 x √2 = √ (289 x 2) = √578

Addition and Subtraction of Surds

Surds in their basic forms which are similar can be added or subtracted.

Examples

Evaluate the following

(a)√32 + 3√8 (b) 7√3 - √75 (c) 3√48 - √75 + 2√12

Solution

1. (√32 + 3√8

= √ (16 x 2) + 3√ (4 x 2)

=4√2 + 6√2

= 10√2

(b) 7√3 - √75

= 7√3 - √ (25 x 3)

=7√3 – 5√3 =2√2

(c) 3√48 - √75 + 2√12

= 3√ (16 x 3) - √ (25 x 3) + 2√ (4 x 3)

= 12√3 - 5√3 + 4√3

= 11√3

Evaluation

1. Simplify the following (a) 5√ 12 - 3√ 18 + 4√72 + 2√75 (b) 3√2 - √32 + √50 + √98

2. Simplify the following as a single surd (i) 8√3 (ii) 13√2

Multiplication and Division of Surds

Example: Evaluate the following (a) √45 x √28 (b) √24 /√50

Solution

(a) √45 x √28

= √ (9 x 5) x √ (4 x 7)

= 3√5 x 2√7

= 3 x 2 x √ (5 x 7)

= 6√35

(b)√24 / √50

= √ (24 / 50)

= √ (12 / 25)

= √12 / √25

= √ (4 x 3) / 5

= 2√3 / 5

Evaluation:

Simplify 1. √6 x (3 - √5) 2. (2√3 - √7)(2√3 + √7)

2. Multiply the following by their conjugate (a) √3 - 2√5 (b) 3√2 + 2√3

Surds Rationalisation

Rationalisation of surds means multiplying the numerator and denominator by the denominator or by the conjugate of the denominator.

1. Example: Evaluate the following (a) 6/√3 (b) 3

√3 + √2

Solution

1. 6/√3 (b) 3

= 6 x √3 √3 + √2

√3 x √3 = 3 (√3 - √2)

= 6√3 (√3 + √2) (√3 - √2)

3 = 3√3 - 3√2

= 2√3 (√3)2 – (√2)2

= 3√3 - 3√2

3 - 1

= 3√3 - 3√2

1

= 3(√3 -√2)

Equality of Surds

Given two surds i.e P + √m and q + √n if P +√m = q + √n then

√P - q = √n - m the L.H.S

Of the equation is a rational number while the L.H.S and R.H.S can only be equal if they are both equal to zero (0)

P – q = 0

:. P = q and n - m = 0 i.e.

√n = √m

Examples:

Find the square root of the following?

a) 7 + 2√10 b) 14 - 4√6

Solution

(a) Let the square root of 7 + 2 √10 be √m + √n

(√m + √n)2 = 7 + 2√10

m +√2mn+ n = 7 + 2√10

m + n = 7 (1)

2√mn = 2√10

mn = 10

Squaring both surds we have

mn = 10 \_\_\_\_\_\_\_(ii)

m + n = 7 \_\_\_\_\_\_ (i)

m n = 10 \_\_\_\_\_\_\_ (ii)

From equation (1) m = 7 – n

Put m in (ii) we have

(7 – n) n = 10

7n – n2 = 10

In sum; n2 – 7n + 10 = 0

n2 – 2n – 5n + 10 =0

n (n – 2) – 5 (n – 2) = 0

(n -5) (n – 2) = 0

n = 5 or 2

m = 7 – 2, where n = 2

m = 5,

m = 7 – 5 , when n = 5

m = 2

m= 5 or 2

The square root of 7 + √10 are 5 & + 2.

(b) Let the square root of 14 – 4√6 be √P - √Q

The (√P - √Q) 2  =14 – 4√6

P - 2√PQ + Q = 14 – 4 √6

P + Q = 14 …………………… (1)

-2√PQ = - ~~4~~√6

-2 - 2

√PQ = 2√6 (squaring both sides)

PQ = (2√6)2

PQ = 4 x 6 ……………………………….. (11)

P + Q = 14 ………………………………… (1)

PQ = 24 ……………………………………… (11)

From equation……………… (1) P = 14 - Q

Sub for p in equation ………………… (11)

(14 – Q) Q = 24

14Q – Q2 = 24

In turn we have:

Q2 – 14Q + 24 = 0

Q2 – 12Q – 2Q + 24 = 0

Q (Q -12) – 2 (Q – 12) = 0

Q = 2 or 12

If P = 14 – Q ,when Q= 12

P = 14 – 12

P = 2

If P = 14 – Q when Q = 2

P = 14 - 2

= 12

(√12 – √2 ) = (2 √ 3 - √2) and

(√2 - √12) = (√2 - 2 √3)

Evaluation:

1. Express 3√2 - √3 in the form √m where m and n are whole number.

2√3 - √2 √n

2. Express 1 in the form p√5 + q√3, where p and q are rational numbers.

√5 +√3

General Evaluation

1. Simplify 3x2 x 4x3

6x7

2. Evaluate 23.97 x 0.7124

3.877 x 52.18

3. Solve 9(1 - x) = (1/27) x+1

4. Log8 (r2 – 8r + 18) = 1/3

5. Simplify: 2√12 + 3√48 + √75

Reading Assignment: Further Mathematics Project Book 1(New third edition).Chapter 3 pg.19-27

Weekend Assignment

1. Expand (3√2 - 1) (3√2 + 1) (a) 16 (b) 20 (c) 17 (d) 24

2. Simplify √200 in its basic form (a) 10√2 (b) 5√4 (c) 2√10 (d) 2√50

3. Simplify 9/√3 (a) 3√2 (b) 3√3 (c) 1/3 (d) 2√2

4. Express 3√5 as a single surd (a) √40 (b) √55 (c) √45 (d) √35implify

5. Simplify √`128 - 4√8 (a) 0 (b) 1 (c) 2 (d) 3

Theory

1.Express 3√2 - √3 in the form √m where m and n are whole number.

2√3 - √2 √n

2.Express 1 in the form *p√5 + q√3*, where p and q are rational numbers.

√5 +√3

Week: Six

Period: Three

Duration: 45 minutes per period

Subject: Further Mathematics

Class: SS1

Topic: Coordinate Geometry

Subtopic: Distance between two points

Learning Objectives: At the end of the lesson, learners should be able to:

1. find the distance between 2 points

2. find the mid-point of a line segment joining 2 points

3. find the gradient of a line segment joining 2 points

4. solve for the angle between 2 intersecting straight lines.

5. state conditions for parallelism and perpendicularity.

6. solve for the equation of a straight line given certain parameters.

Distance Between Two Points

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………… The distance between two points is given by:

𝐷𝑖𝑠𝑡𝑎𝑛𝑐𝑒 =

Example 1

Find the distance of the line segment joining the following pairs of points:

a. A(2,3) and B(-5,7)

b. C(-5,-3) and D(6,-8)

solution

a. 𝐷𝑖𝑠𝑡𝑎𝑛𝑐𝑒 =

=

=



b. 𝐷𝑖𝑠𝑡𝑎𝑛𝑐𝑒 =

=

=



Mid Point of a Line Segment

The coordinates of the midpoint (P) of line segment joining A(x1, y1) and B(x2, y2) is given by

MP(x,y)

Example 2: What is the midpoint of line segment PQ whose coordinates are P (-3, 3) and Q (1, 4), respectively.

Solution: Given,  P (-3, 3) and Q (1, 4) are the points of line segment PQ.

Using midpoint formula, we have;

MP(x,y)



GRADIENT OF A STRAIGHT LINE

The gradient of a straight line is the rate of change of y compared with x.

For example, if the gradient is 2, then for any increase in x, y increases two times as much.

Gradient of AB = Increase in y from A to B = MB

Increase in x from A to B AM

Example 3

Find the gradient of the line joining P(7, -2) and Q(-1, 2)

Gradient of PQ = increase in y = - AQ

Increase in x PA

 = 

Example 4

Find the gradient of the line 7x + 4y – 8 = 0

Re-arrange the equation: 4y = - 7x + 8

y =  + 2

Therefore, gradient (m) =  , y – intercept (c) = 2

SKETCHING GRAPHS OF STRAIGHT LINES

Given the equation

y = 3x – 2 , gradient = 3, y – intercept(c) = -2

2x + 3y = 6, gradient =  , y – intercept(c) = 2

Example 5

Sketch the graph of the line whose equation is 4x – 3y = 12

Solution

When x = 0 ,- 3y = 12

y = - 4

The line crosses the y – axis at (0, - 4).

When y = 0 , 4x = 12

x = 3

The line crosses the x – axis at (3, 0).

Gradient m = 

=  = 

y – intercept = - 4

Lines parallel to axes

Any line parallel to the x – axis has a gradient of zero. The equation of such lines is always in the form

*y = c*, where *c* may be any number.

The figure below shows the graph of y = 5 and y = - 3.

Notice that the equation of the x – axis is y = 0

------------------------------------

The gradient of a line that is parallel to the y – axis is undefined. The equations of such a lines are always in the form x = *a* , where *a* may be any number.

The figure below shows the graph of line x = 2 and x = - 4.

Notice that the equation of the y – axis is x = 0

ANGLE OF SLOPE

Example 6: Find the gradient of the line joining (3, 2) and (7, 10) and the angle of slope of the line.

Solution

Let m be the gradient of the line, then

m = 

Let  be the angle of slope of the line; then:





ANGLE BETWEEN TWO LINES

*Condition for Parallelism*

If two lines are parallel, the angle between them is zero, hence 

Example 7: Determine if AB is parallel to PQ in each of the following.

1. A(3, 1); B(4, 3) and P(4,6); Q(5, 8)
2. A(-1, -2); B(2, -3) and P(5, 4) ; Q(6, 7)

Solution

1. Let  be the gradient joining A and B and be the gradient joining P and Q.





Since ; AB||PQ

1. Let  be the gradient joining A and B and be the gradient joining P and Q.





Since ; AB is not parallel to PQ

CONDITION FOR PERPENDICULARITY

If the lines are perpendicular,  and ; therefore:

1 + 





Example 8: Determine if AB is parallel to PQ in each of the following.

1. A(5, -1); B(3, 2) and P(2, 4); Q(5, 6)
2. A(-1, -2); B(2, -3) and P(5, 4) ; Q(6, 7)

Solution

1. Let  be the gradient joining A and B and be the gradient joining P and Q.





Since ; AB is perpendicular to PQ

1. Let  be the gradient joining A and B and be the gradient joining P and Q.





Since ; AB is perpendicular to PQ

EQUATION OF A LINE

*The equation of a straight line is given by: y =mx + c*

Example 9: Find the gradient and intercept on the y-axis of the following lines:

1. y = 3x – 4
2. y = - ½x – 3

Solution:

1. Compare y = 3x – 4 with y = mx + c ; Hence the gradient is 3, intercept on y-axis is -4
2. Gradient is – ½ , intercept on y-axis

Example 10

Determine the equation of a straight line whose gradient is  and passes through the point (- 3, 2).

Solution

Using the formula y – y1 = m(x - x1)

Where (x1, y1) = (- 3, 2) and m = 

y – 2 =  (x + 3)

3y – 6 = - x – 3

x + 3y = 3

GRADIENT AND ONE POINT FORM

y - 

Example 11: Find the equation of a straight line of slope 2, if it passes through the point (3, -2)

m = 2; 

Hence the equation of the straight line is:

y – (-2) = 2(x – 3)

y + 2 = 2x – 6

y = 2x -6 -2 = 2x – 8

y = 2x – 8

Two Points Form

 = 

Example 12

Find the equation of the straight line passing through the points (1, 4) and (- 2, 6).

Using the formula  = 

Where = (x1, y1) = ( 1, 4) and (x2, y2) = (- 2, 6), the equation is

 = 

cross multiply

- 3y + 12 = 2x – 2

2x + 3y = 14

Practice Questions

1. Find the coordinate of the point which will divide the line joining the point (2,4) and (7,9) internally in the ratio 1:2?

A. (5/3 , 1/3)

B. (3/8 , 3/11)

C. (8/3 , 11/3)

D. (11/3 , 17/3)

2. Find the equation of the line whose slope is 3 and y intercept is – 4.

A. y = 2x – 3

B. Y=3x+4

C. Y=3x- 4

D. 4.y=√3x-2

3.  Find the equation of the line passing through (2, -1) and parallel to the line 2x – y = 4.

A. y = 2x – 5

B. Y=2x+6

C. Y=√2x +7

D. 4.y=2x+5

4. Find the equation of the line parallel to the line passing through (5,7) and (2,3) and having x intercept as -4.

A. 3y = 4x -16

B. 4y=3x-16

C. 3y = 4x +16

D. 4y=3x+16

5. Find the equation of the line passing through (2, -1) and perpendicular to the line 2x – y = 4.

A. x+2y=0

B. Y=5x-2

C. Y=2x-5

D. None of these

6. Find the coordinates of the point which will divide the line joining the points (3, 5) and (11, 8) externally in the ratio 5: 2.

A. (5/3 , 1/3)

B. (3/49 , 1/10)

C. (49/3 , 10)

D. None of these

Date………………….

Week: Seven

Period: Three

Duration: 45 minutes per period

Subject: Further Mathematics

Class: SS1

Topic: Coordinate Geometry 2

Subtopic: Area of Triangle and Quadrilateral

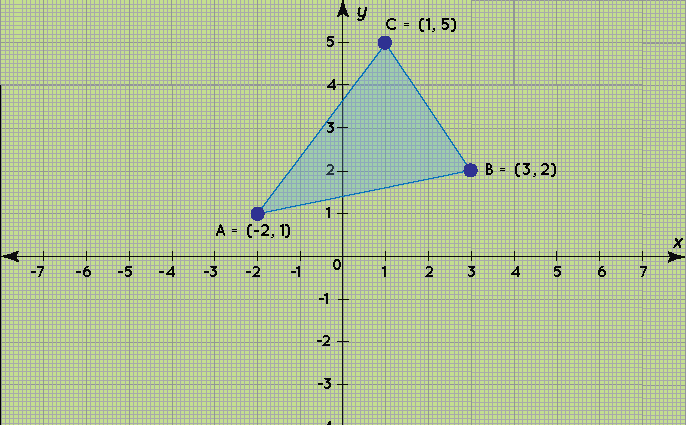
Learning Objectives: At the end of the lesson, learners should be able to:

1. solve for the area of a triangle given the coordinates of the vertices and

2. solve for the area of a quadrilateral given the coordinates of the vertices.

Content

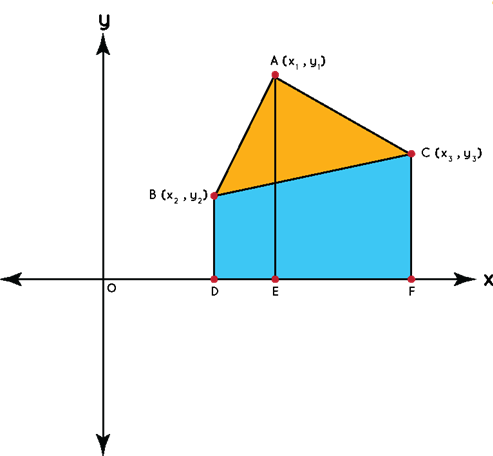
Consider these three points: A(−2,1), B(3,2), C(1,5). If you plot these three points in the plane, you will find that they are non-collinear, which means that they can be the vertices of a triangle, as shown below:



The area covered by the triangle ABC in the x-y plane is the region marked in blue. Now, with the help of coordinate geometry, we can find the area of this triangle. Let us learn more about it in the following section.

## How Do You Calculate the Area of A Triangle in Coordinate Geometry?

…………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………



We can express the area of a triangle in terms of the areas of these three trapeziums.

Area(ΔABC) = Area(Trap.BAED) + Area(Trap.ACFE) - Area(Trap.BCFD)

Now, the area of a trapezium in terms of the lengths of the parallel sides (the bases of the trapezium) and the distance between the parallel sides (the height of the trapezium):

Trapezium Area = (1/2) × Sum of bases × Height

Consider any one trapezium, say BAED. Its bases are BD and AE, and its height is DE. BD and AE can easily be seen to be the *y* coordinates of B and A, while DE is the difference between the *x* coordinates of A and B. Similarly, the bases and heights of the other two trapeziums can be easily calculated. Thus, we have:

Area(Trap.BAED) = (1/2) × (BD + AE) × DE

= (1/2) × (y22 + y11) × (x11 − x22)

Area(Trap.ACFE) = (1/2) × (AE + CF) × EF

= (1/2) × (y11 + y33) × (x33 − x11)

Area(Trap.BCFD) = (1/2) × (BD + CF) × DF

= (1/2) × (y22 + y33) × (x33 − x22)

The expression for the area of the triangle in terms of the coordinates of its vertices can thus be given as,

Area(ΔABC) = Area(Trap.BAED) + Area(Trap.ACFE) - Area(Trap.BCFD)

= (1/2) × [(y22 + y11) × (x11 − x22)] + (1/2) × [(y11 + y33) × (x33 − x11)] - (1/2) × [(y22 + y33) × (x33 − x22)]

However, we should try to simplify it so that it is easy to remember.

For that, we simplify the product of the two brackets in each terms:

= (1/2) (x11y22 − x22y22 + x11y11 − x22y11) + (1/2) (x33 y11 − x11y11 + x33y33 − x11y33) − (1/2)(x33y22 − x22y22 + x33y33 − x22y33)

Take the common term 1/2 outside the bracket.

=(1/2) (x11y22 − x22y22 + x11y11 − x22y11 − x33 y11 − x11y11 + x33y33 − x11y33 − x33y22 + x22y22 - x33y33 + x22y33)

Thus,

Area(ΔABC) = (1/2){x11(y22 − y33) + x22(y33 − y11) + x33(y11 − y22)}

As the area is always positive.

(ΔABC) = (1/2) |x11(y22 − y33) + x22(y33 − y11) + x33(y11 − y22)|

This is a symmetric expression, and there is an easy technique to remember it, which we will now discuss as Determinants Method.

* **Example 1:** Find the area of a triangle with the vertices: A(3,4), B(4,7), and C(6,−3).

**Solution:**

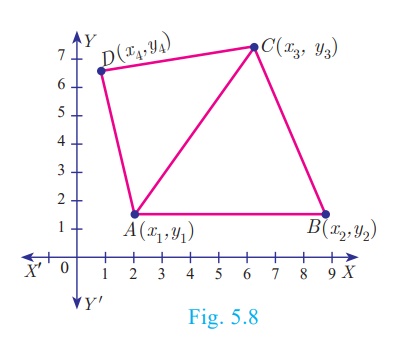
We have:

(ΔABC) = (1/2) |x11(y22 − y33) + x22(y33 − y11)+ x33(y11 − y22)|

(ΔABC) = (1/2) |3(7 − (−3)) + 4((−3) − (−4)) + 6(4 − (7))| = 12|30 + 4 − 18| = (1/2) × 16 = 8sq.units

Area of a Quadrilateral

If ABCD is a quadrilateral, then considering the diagonal AC, we can split the quadrilateral ABCD into two triangles ABC and ACD.



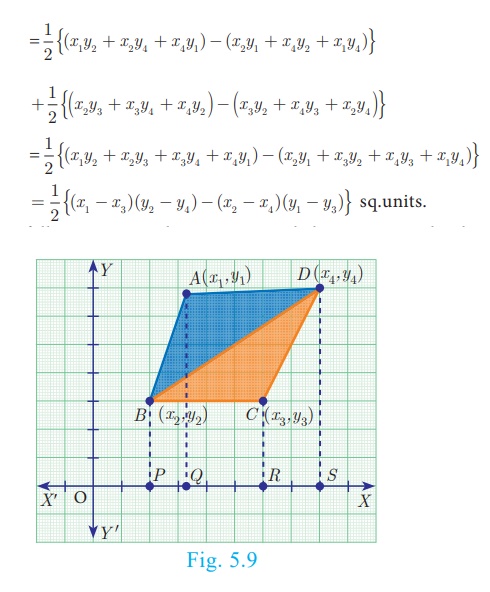
Using area of triangle formula given its vertices, we can calculate the areas of triangles ABC and ACD.

Now, Area of the quadrilateral ABCD = Area of triangle ABC + Area of triangle ACD

We use this information to find area of a quadrilateral when its vertices are given.

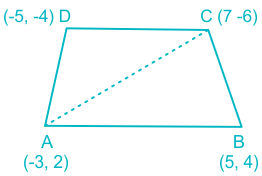
Let *A*(*x*1,*y*1), *B*(*x*2,*y*2), *C*(*x*3,*y*3) and *D*(*x*4,*y*4) be the vertices of a quadrilateral ABCD.

Now, Area of quadrilateral ABCD = Area of the ΔABD + Area of the ΔBCD (Fig5.9)



Example 2: Find the area of the quadrilateral whose coordinates are A(3,2), B(5,4), C(7,6), and D(5,4), in that sequence.

Solution: A quadrilateral's area is the sum of the areas of the two triangles that result from dividing it in half.

Step: 1 Area of the ABCD-shaped quadrilateral = Area of ABC + Area of ACD 

Step: 2 Areaof a, ABC = 1 R-3)(4 + 6) + 5( —6 — 2) + 7(2 — 4)] = 41-30 — 40 — 14] = 4[-84] 42 square unit Step: 3 now, find the area of LACD = 4[-3( —6 + 4) + 7( —4 — 2) + (-5)(2 + 6)] = 41+6 — 42 — 40] = 4[-76] 38 square unit Step: 4 Therefore, the ABCD quadrilateral's area is 42 + 38 = 80 square units.

**Ticket Out:** Find the area of the triangle in coordinate geometry, whose vertices are: A(1,−2), B(−3,4), C(2,3)

Date……………………….

Week: Eight

Period: Three

Duration: 45 minutes per period

Subject: Further Mathematics

Class: SS1

Topic: Logical Reasoning

Subtopic: The Truth Table

Learning Objectives: At the end of the lesson, learners should be able to:

1. define a logical statement

2. write the negation of a logical statement

3. prepare a truth table for compound statements

CONTENT

* Logical Statements
* Negations
* Conditional statements and bi-conditional statements.
* Identification of Antecedence & Consequence of Simple Statement

LOGICAL STATEMENTS

………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………

Questions, exclamations, commands and expression of feelings are not logical statements.

Example: Which of the following are logical statements?

i. Nigeria is an African country (Statement)

ii. Who is he? (Not statement)

iii. If I run I shall not be late (Statement)

iv. Japanese are hardworking people (Statement)

v. What a lovely man! (Not statement)

vi. The earth is conical in shape (Statement)

vii. If I think of my family (Not statement)

viii. Take the pencil away (Not statement)

Evaluation

State which of the statements is a logical statement

1. Caesar was great leader

2. Oh Mansa Musa, you are wonderful!

3. Is he a serious teacher at all?

4. If 6 is an odd number, then 3 + 5 = 10

5. Stop talking to the boy

6. The Broking House In Ibadan is a magnificent building

NEGATION

Given a statement p, the negation of p written ~p is the statement ‘it is false that p” or “not p”

If P is true (T), ~p is false (F) and if P is false(F) ~p is true(T) .

The relationship between P and ~p is shown in a table called a truth table

P ~p

T F

F T

Example I: Let P be the statement ‘Nigeria is a rich country’ then ~p is the statement ‘It is false that Nigeria is a rich country or ‘Nigeria is not a rich country’

Example II: Let r be the statement 3 + 4 = 8 then ~p is the statement 3 + 4 ≠ 8

Example III: Let q be the statement ‘isosceles triangle are equiangular’ then ~q is the statement ‘it is false that isosceles triangles are equiangular or ‘isosceles triangle are not equiangular’.

Evaluation

1. Write the negation each of the following statements.

1. It is very hot in the tropics.

2. He is a handsome man.

3. The football captain scored the first goal.

4. Short cuts are dangerous.

2. Write the negation of each of the following avoiding the word ‘not’ as much as possible.

1. He was present in school yesterday.

2. His friend is younger than my brother.

3. She is the shortest girl in the class.

4. He obtained the least mark in the examination.

Reading Assignment: Further Maths projects Ex. 9a Q 3 – 7.

CONDITIONAL STATEMENTS

Let q stand for the statement ‘Femi is a brilliant student’ and r stand for the statement ‘Femi passed the test’. One way of combing the two statement is ‘If Femi is a brilliant student then Femi passed the test’ or ‘If q then r’

The student ‘If q then r’ is a combination of two simple statements q and r. It is called a compound statement.

Symbolically, the compound statement can be written as follows: ‘If q then r’ as q ⇒ r

The statement q ⇒ r is real as

q implies r or if q then r or q if r

The symbol ⇒ is an operation. In the compound statement q ⇒ r, the statement q is called the

antecedent while the sub statement r is called the consequence of q ⇒ r.

The truth or falsity table for q ⇒ r is shown below.

q r q ⇒ r

T TT

T F F

F T T

F FT

Example: If q is the statement ‘I am a male’ and r is the statement ‘The sun will rise’

Consider the statements.

a. If I am a male then the sun will rise

b. If I am a male then the sun will not rise

c. If I am not a male then the sun will rise

d. If I am not a male then the sun will not rise

The statement (a), (c) and (d) are all true but b is not true b and c the antecedent is true and the consequent is false.

CONVERSE STATEMENT: The statement q ⇒ p is called the converse of the statement p ⇒p. e.g. Let p be the statement ‘a triangle is equiangular’ and q the statement ‘a triangle is equilateral’.

The State p ⇒p means if a triangle is equiangular then u is equilateral.

The statement q ⇒ p means if a triangle is equilateral then u is equiangular.

INVERSE STATEMENT: This statement ~p ⇒~ q is called the inverse of the statement p ⇒ q.

If p is the statement ‘a triangle is equiangular and q is the statement ‘a triangle is equilateral’

the statement ~p ⇒~ q is the statement ‘if a triangle is not equiangular then it is not equilateral’.

CONTRAPOSITIVE STATEMENTS: The statement ~q ⇒~ p is called the contrapositive statement of p ⇒ q.

If p is the statement ‘I can swim’ and q is the statement ‘I will win’ then the statement ~q ⇒~ p is the statement ‘If I cannot swim then I cannot win’.

Evaluation

If p is the statement ‘it rains sufficiently’ and q the statement ‘the harvest will be good’ write the symbol of these statements.

(i) If it rains sufficiently then the harvest will be good.

(ii) If it doesn’t rain sufficiently then it doesn’t

(iii) If the harvest is poor then it doesn’t rain sufficiently.

(iv) It doesn’t rain sufficiently.

(v) If it doesn’t rain sufficiently then the harvest will be good.

IDENTIFICATION OF ANTICEDENCE AND CONSEQUENCE OF SIMPLE STATEMENTS.

1. Bi-conditional statements

2. The Chain Rule

1. BICONDITIONAL STATEMENTS : If p and q are statements such that p ⇒ q and q ⇒ p are valid, then p and q

imply each other or p is equivalent to q and we write p ⇔ q. The statement p ⇔ q is called a biconditional

statement of p and q and the statement p and q are equivalent to each other.

p ⇔ q could be read as

q is equivalent to p or

q if and only if p or

p if and only if q or

if p then q and if q then p

The truth or falsity of p ⇔ q is shown below.

|  |  |  |
| --- | --- | --- |
| P | Q | P ⇔ q |
| T | T | T |
| T | F | F |
| F | T | F |
| F | F | T |

A bi-conditional statement is true when two sub-statements have the same truth value.

e.g. If p is the statement ‘the interior angle of a polygon are equal’ and q is the statement ‘a polygon is regular’.

p ⇒ q is the statement ‘if the interior angles of a polygon are equal then the polygon is regular’.

q ⇒ p is the statement ‘if a polygon is regular then the interior angles of the polygon are equal’.

p ⇒ q and q ⇒ p

p ⇔ q

p and q are equivalent to each other.

Examples: Let p be the statement ‘Mary is a model’

Let q be the statement ‘Mary is beautiful’

Consider these statements.

a. Mary is a model if and only if she is beautiful.

b. Mary is a model if and only if she is ugly.

c. Mary is not a model if and only if she is beautiful.

d. Mary is not a model if and only if she is ugly.

Statements a and d are true b and c the sub-statements have the same truth value. Statements b and c are false because the sub-statements have different truth values.

2. THE CHAIN RULE: If p, q and r, are three statements such that p ⇒ q and q ⇒ r.

Example I: Consider the arguments

Premise T1: If a student works very hard, he passes his examination

Premise T2: If a student passes his examination he is awarded a certificate.

Conclusion T3: If a student works very hard, he is awarded a certificate.

SOLUTION

Let p be the statement “a student works very hard”

Let q be the statement “a student passes his examination”

Let r be the statement “a student is awarded a certificate”

‘The argument has the following structural form.

p ⇒ q and q ⇒ r ∴ p ⇒ r

This argument follows the chain rule link hence u is said to be valid.

Example II: Consider the arguments

T1: Soldiers are disciplined

T2: Good leaders are disciplined men

T3: Soldiers are good leaders.

SOLUTION

Let p be the statement ‘X is a seller’

Let q be the statement ‘X is a disciplined man’

Let r be the statement ‘X is a good leader’

The argument has the following structural form.

T1 : p ⇒ q

T2 : r ⇒ q

T3 : p ⇒ r

The argument does not follow the format of the chain rule, hence it is not valid.

Evaluation I

Give an outline of the structural form of the following arguments and state whether or not it is valid.

T1 : It is necessary to stay healthy in order to live long.

T2 : It is necessary to eat balanced diet in order to stay healthy.

T3 : It is necessary to eat balanced diet in order to lives long.

Evaluation II

(1) Let P be the statement : “He is funny” and q be the statement : “He is serious”. Write each of the following in simple English (i) p v q (ii) p ˄ q (iii) p˄ ~q (iv) ~pv~q

(2) If p and q represent two statements “he is good in physics” and “he is good in mathematics” respectively. write the following in symbolic form; “he is good in physics if and only if he is good in mathematics”.

General Evaluation

(1) Find the truth value of these statements.

a. If 11 > 8 then -1< -8

b. If 3 + 4 ≠ 10 then 2 + 3 ≠ 5

(2) Find the values of x satisfying 23x + 1  - 3 (22x) + 2x + 1 = 2x

(3) Solve the equation 32x – 30 (3x) + 81 = 0

(4) Solve the simultaneous equations 2x + y = 3; 4x2 – y2 + 2x + 3y = 16.

Reading Assignment: F/Maths Project 1 pages 126 – 130 Exercise 9b Q 2, 3 and 4

WEEKEND ASSIGNMENT

P is the statement ‘Ayo has determination and q is the statement ‘Ayo will succeed’. Use this information to answer these questions. Which of these symbols represent these statements?

1. Ayo has no determination.

A. P ⇒ q B. ~ p ⇒ q C. ~ p

2. If Ayo has no determination then he won’t succeed.

A. ~p ⇒~ q B. p ⇒~ q C. p ⇒ q D. p ⇒~ q

3. If Ayo won’t succeed then he has no determination.

A. ~q ⇒ p B. ~q ⇒~q C. ~q ⇒ p D. q ⇒ p

4. If Ayo has determination then he will succeed.

A. ~p ⇒ q B. ~p ⇒~ q C. ~q ⇒~ p D. p ⇒ q

5. If Ayo has no determination then he will succeed.

A. ~p ⇒ q B. ~q ⇒~ p C. ~p D. ~p ⇒~ q

THEORY

1. Write down the inverse, converse and contrapositive of each of these statements.

(i) If the bank workers work hard they will be adequately compensated.

(ii) If he is humble and prayerful, he will meet with God’s favour.

(iii) If he sets a good example, he will get a good followership.

2. Consider the following statements P: Some dogs are tame Q: All tame animals are small.

Which of the following is a valid conclusion from the above statements?

(i) All dogs are tame. (ii) No dog is small. (iii) All small animals are tame. (iv) Some dogs are small.

(v) All tame animals are dogs.

* ; (Disjunction and conjunction)
* Tautology and contradiction

Disjunction: In disjunction two statement can be combined by the use of the connective to the truth table. The truth table technique is used to establish whether or not two logical statement are equivalent.

Let p = He is a pastor and q = He is a singer

The above statement can be written as either he is a pastor or he is a singer.

Hence, in logical symbols; the statement can be written as p or q, where or means v i.epvq.

NOTE: the statement Pvq is false when both p and q are the false otherwise pvq is true.

The truth table for the above statement is given or presented as:

|  |  |  |
| --- | --- | --- |
| p | Q | Pvq |
| T | T | T |
| T | F | T |
| F | T | T |
| F | F | F |

CONJUNCTION: When the connective and is used to combine two statement thus, we have conjunction.

Let p = Lagos is in Nigeria

Let q = 3 is an odd number

Thus, the above statement can be combined using the connective “and” as in : Lagos is in Nigeria and 3 is an odd number and it can be written as; p and q, where and is symbolically represented as  i.e  means “and”. Hence, p and q = pq.

The above statement can be illustrated using a truth table.

NOTE: the statement pq is true when the sub statement p and q are both true otherwise pq is False.

|  |  |  |
| --- | --- | --- |
| p | q | pq |
| T | T | T |
| T | F | F |
| F | T | F |
| F | F | F |

TAUTOLOGY: A compound statement which is always true irrespective of the truth values of the sub statement is called TUATOLOGY. It is represented as T.

Example: Use the truth table to show that the statement pvp is a tautology.

|  |  |  |
| --- | --- | --- |
| p | p | pvp |
| T | F | T |
| T | F | T |
| F | T | T |
| F | T | T |

From the above table it can be observed that the last column has the truth value T. Hence, the statement is TAUTOLGY.

CONTRADICTION: A compound statement which is always False irrespective of the truth value of the sub statement is called CONTRADICTION. It is usually denoted by F.

Example: Use the truth table to show that the statement pp is a tautology.

|  |  |  |
| --- | --- | --- |
| p | p | pp |
| T | F | F |
| T | F | F |
| F | T | F |
| F | T | F |

From the above table it can be observed that the last column has the truth value F. Hence, the statement is CONTRADICTION.

EVALUATION:

1.Copy and complete the truth table below:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| P | q | R | qvr | p(qvr) |
| T | T | T |  | T |
| T | T | F |  |  |
| T | F | T | T |  |
| T | F | F | F | F |
| F | T | T |  |  |
| F | T | F |  |  |
| F | F | T |  |  |
| F | F | F |  | F |

2. Use the truth table technique to establish the following results:

1. pq = qp

( ii.) pv(qr) = (pvq)vr

(iii) {ppvq)}Vq is a tautology

GENERAL EVALUATION:

1. Draw the truth table for  (pq)

Using the truth tables, prove that:

2. p{(pp)V(pq)} is a contradiction.

3. {(pvq)(pvq)}Vq is tautology.

Reading Assignment: F/Maths Project 2 pages 30 Exercise 3 Q 9 and 12

WEEKEND ASSIGNMENT

1. Let p = She is short and q = She is beautiful. Write each of the following in symbolic form using p and q.

(i) She is short and beautiful (ii) She is short and but not beautiful (iii) It is false that she is tall and beautiful (iv) She is neither short nor beautiful.

Use the truth table technique to show that

1. pq = (pq)(qp)
2. (pq)(pvq) is a contradiction.

(pvq)v (pvr)v(qvr) is a tautology.

Date……………………….

Week: Nine - Ten

Period: Six

Duration: 45 minutes per period

Subject: Further Mathematics

Class: SS1

Topic: Trigonometric Ratios of Special Angles and Trigonometric Functions

Subtopic: Basic Trigonometric Identity

Learning Objectives: At the end of the lesson, learners should be able to:

1. state the basic trigonometric ratios

BASIC TRIGONOMETRIC RATIO

The basic trigonometric ratios can be defined in terms of the sides of a right angled triangle.

Q

r

p

R q P

▲PQR in the figure above is a right angle triangle with QPR = Ө and PRQ = 90˚

We define the three basic ratios as follows:

Cosine of angle Ө = PR q

PQ = r

Sine of angle Ө =QR p

PQ = r

Tangent of angle Ө = QR p

PR = r

The cosine of angle Ө, sine of angle Ө and the tangent of angle Ө will be abbreviated as cosӨ, sinӨ and tanӨ respectively.

Thus:

cosӨ = q ,sinӨ = p ,tanӨ = p

r r q

Also,

sinӨ = p/r = p = tanӨ

cosӨ q/r q

tanӨ = sinӨ

cosӨ

Reciprocals of Basic Ratios

We define the reciprocals of the three basic ratios as:

Secant of angle Ө = PQ/PR = r/q = 1 / cosine of angle Ө.

Cosecant of angle Ө = PQ / QR = r / q = 1 / sine of angle Ө

Cotangent of angle Ө = PR / QR = q / p = 1 / tangent of angle Ө

The secant of angle Ө, the cosecant of angle Ө and the cotangent of angle Ө are abbreviated secӨ, cosecӨ and cotӨ respectively.

SecӨ = r / q = 1 / cosӨ

CosecӨ = r / p = 1 / sinӨ

CotӨ = q / p = 1 / tanӨ = cosӨ / sinӨ

Example 1

Given that sinӨ = 5 / 13 and Ө is acute, find:

* 1. cosӨ
  2. tanӨ
  3. secӨ
  4. cosecӨ
  5. cotӨ

Solution

Q

13

5

R 5 P

Use Pythagoras theorem to find PR

PQ2 = PR2 + QR2

132 =PR2 + 52

PR2 = 132 - 52

= 169 – 25

= 144

PR = 12

Thus, q = 12, r = 13, p = 5.

1. cosӨ = q / r = 12 /13
2. tanӨ = p / q = 5 / 12
3. secӨ = r / q = 13 / 12
4. cosecӨ = r / p = 13 / 5
5. cotӨ = q / p = 12 / 5

Ratios of General Angles

First Quadrant

sinӨ = y

cosӨ= x

tanӨ = y / x

Example: Use table to evaluate (a) sin37 (b) cos75 (c) tan62

Solution

1. sin37 = 0.6018
2. cos75 = 0.2588
3. tan62 = 1.881

Second Quadrant

Sin (180 - Ө) = sinӨ

Cos (180 - Ө) = -cosӨ

Tan (180 - Ө) = -tanӨ

Example: Use table to evaluate (a) sin143 (b) cos 115 (c) tan 125

Solution

1. sin143 = sin(180-143) = sin37 = 0.6018
2. cos115 = -cos(180-115) = -cos65 = -0.4226
3. tan125 = -tan(180-125) = -tan55 = -1.428

Third Quadrant

Sin (180 + Ө) = - sinӨ

Cos (180 + Ө) = - cosӨ

Tan (180 + Ө) = tanӨ

Example: Use table to evaluate (a) sin220 (b) cos236 (c) tan242

Solution

1. sin220 = sin (180 + 40) = - sin40 = - 0.6428
2. cos236 = cos (180 + 56) = - cos56 = - 0.5992
3. tan242 = tan (180 + 62) = tan 62 = 1.881

Fourth Quadrant

Sin (360 - Ө) = - sinӨ

Cos (360 - Ө) = cosӨ

Tan (360 - Ө) = - tanӨ

Example: Use table to evaluate (a) sin3100 (b) cos2850 (c) tan3340

Solution

……………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………………...

Note that:

1. In the first quadrant, all the ratios are positive.

2. In the second quadrant, only sine ratio is positive, while the rest are negative.

3. In the third quadrant, only tangent ratio is positive, while the rest are negative.

4. In the fourth quadrant, only cosine ratio is positive, while the rest are negative.

Evaluation

1. Use tables to evaluate the following (a) Sin 1620 (b) Cos 2830 (c) Tan 3250 (d) Cos( - 75)

(e)Tan (-100) (f) Sin ( -223)

2) Use tables to find the values ϕ between 00 and 3600 which satisfy each of the following.

(a) Sin ϕ = 0.4396 (b) Tan ϕ = - 2.4398 (c) Cos ϕ = 0.8427

TRIGONOMETRIC IDENTITY

Pythagoras theorem. Y

P

1

y

x

O x N

The figure above shows a unit circle. ▲OPN is a right angled with OP = 1, ON= x and PN = y,

PON = Ө. From the definition of trigonometric ratios.

x = cosӨ …. (1)

y = sinӨ …..(2)

From (1) x2 = cos2Ө …… (3)

From (2) y2 = sin2Ө …… (4)

Adding equations (3) and (4)

x2 + y2 = cos2Ө + sin2Ө …..(5)

Since ▲OPN is a right angled triangle

ON2 + NP2 = OP2

x2 + y2 = 1 …… (6)

Equating equations (5) and (6)

Cos2Ө + sin2Ө = 1 …… (7)

Dividing both sides of (7) by cos2Ө

Cos2Ө / cos2Ө + sin2Ө / cos2Ө = 1 / cos2Ө

1 + tan2Ө = sec2Ө …..(8)

Dividing (7) through by sin2Ө

Cot2Ө + 1 = cosec2

1 + cot2Ө = cosec2Ө …..(9)

Evaluation 1

1. Prove that (1 – Sinϕ)(1 + Sin ϕ) = Cot2ϕ

Sin2 ϕ

1. Show that (Sec ϕ - Tan ϕ)(Sec ϕ + Tan ϕ)= 1

Evaluation 2

Find the values of Ѳ lying between 0 and 360 for each of the following

1)cos Ѳ = 0.2874

2)sin Ѳ = 0.9361

3)cos Ѳ =-0.8271

4)tan Ѳ =-2.106

GRAPH OF SINE AND COSINE FOR ANGLES

In the figure below, a circle has been drawn on a Cartesian plane so that its radius, OP, is of length 1unit. Such a circle is called unit circle.

The angle Ѳ that OP makes with Ox changes according to the position of P on the circumference of the unit circle. Since P is the point (x,y) and /OP/ = 1 unit,

Sin Ѳ = y/1 = y

Cos Ѳ = x/1 = x

Hence the values of x and y give a measure of cos Ѳ and sin Ѳ respectively.

If the values of Ѳ are taken from the unit circle, they can used to draw the graph of sin Ѳ. This is done by plotting values of y against corresponding values of Ѳ as in figure below.

In the figure above, the vertical dotted lines gives the values of sin Ѳ corresponding to Ѳ = 30, 60,90,......., 360.

To draw the graph of cos Ѳ , use corresponding values of x and Ѳ. This gives another wave-shaped curve, the graph of cos Ѳ as in figure below.

As Ѳ increases beyond 360, both curves begin to repeat themselves as in figures below.

Notice the following:

1)All values of sin Ѳ and cos Ѳ lie between +1 and -1.

2)The sine and cosine curves have the same shapes but different starting points.

3)Each curve is symmetrical about its peak(high point) and trough(low point). This means that for any value of sin Ѳ there are usually two angles between 0 and 360; likewise cos Ѳ. The only exceptions to this are at the quarter turns, where sinѲ and cosѲ have the values given in table below;

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | 0 | 90 | 180 | 270 | 360 |
| SinѲ | 0 | 1 | 0 | -1 | 0 |
| CosѲ | 1 | 0 | -1 | 0 | 1 |

Examples

1) Reffering to graph on page 211 of NGM Book 1, (a)Find the value of sin 252, b)solve the equation 5 sin Ѳ = 4

Solution

a)On the Ѳ axis, each small square represents 6. From construction a) on the graph:

Sin 252 = -0.95

b) If 5 sin Ѳ = 4

then sin Ѳ = 4/5 = 0.8

From construction (b) on the gragh: when sin Ѳ = 0.8, Ѳ = 54 or 126

Graph of tan Ѳ

Values can be taken from a unit circle to draw a tangent curve. In the figure below, a tangent is drawn to the unit circle OX. A typical radius is drawn and extended to meet the tangent at T. the y – coordinates of T gives a measure of tan Ѳ, where Ѳ is the angle that the radius makes with OX.

Note that tan Ѳ is not defined when Ѳ =900 and 2700.

Ratio of special Angles (450, 300 and 600)

A. Tan, Sin and Cos of 450

Considering the diagram below;

ABC is right –angled triangle at B and /AB/ = /BC/ = 1 unit

/AC/2 = 12 + 12 = 2 (by Pythagoras’ theorem)

/AC/ =

Thus, tan450 = 1

Sin450 = 

Cos450 = 

B. Tan, Sin and Cos of 300 and 600

Considering the diagram below;

ABC is an equilateral triangle with sides of 2 units in length. Line AD is an altitude where /BD/ = /DC/ = 1 unit.

In ABD, /AB/2 = /AD/2 + /BD/2 (by Pythagoras’ theorem)

22 = /AD/2 + 12

/AD/2 = 3

/AD/ =  units

Since, <B = 600

Thus, Tan 600 = 

Sin 600 = 

Cos 600 = ½ = 0.50

Also, <BAD = 300

Tan 300 = 

Sin 300 = ½ = 0.50

Cos 300 =

Example: Write the value of each the following in surd form;

1. sin1350

2. tan3300

3. cos2400

Solution

1. sin1350 = sin(180 -135) = sin 45 =  = 

2. tan3300 = -tan(360-330) = tan30 = 

3. cos2400 = cos(240 -180) = cos60 = - 1/2

Evaluation:

1)Using the same graph used in the above example, find the values of the following

a)sin 24 b) sin 294

2)Use the same graph to find the angles whose sines are as follows:

a) 0.65 b)-0.15

GENERAL EVALUATION

1. Use tables to evaluate each of the following (i) sin310 (ii) tan242 (iii) cos(-243) (iv) sin(-260) (iv) tan(-255)

2. Use tables to find the values of Ѳ between 00 and 3600 which satisfy each of the following (i) cos Ѳ = -0.4540 (ii) tan

Ѳ= 1.176 (iii) sin Ѳ = -0.9336

3. Using the same axis, a scale of 1cm to represent 300 on the Ѳ-axis and 2cm to represent 1 unit on the y-axis, draw the graph of the following relations (i) y = sin Ѳ (ii) sin Ѳ/2

4. Simplify 3 + √2

3- √2

5. Express 5 - 2√10 in the form m + n√2, where ,m and n are rational numbers

3√5 + √2

READING ASSIGNMENT

NGM BK 1 PG 187 – 195; Ex 17c nos 3 and 6

WEEKEND ASSIGNMENT

Given that sin Ө = 4/5 and Ө is acute

1. find cos Ө (a) 5/3 (b) 3/5 (c) 4/3 (d) 4/5
2. find tan Ө (a) 4/5 (b) 3/5 (c) 5/4 (d) ¾
3. find cosec Ө (a) 4/5 (b) 3/5 (c) 5/4 (d) ¾
4. find sec Ө (a) 5/3 (b) 5/4 (c) ¾ (d) 5/2
5. find cot Ө (a) 3/5 (b) 4/5 (c) 5/4 (d) 5/3

THEORY

1a.) Prove that 1 + 1 = 2 cosec2 Ө

1 + cos Ө 1 – cos Ө

b.) Given that sin Ө = 5/ 13 and Ө is acute, find (i) cos Ө (ii) tan Ө (iii) sec Ө (iv) cosec Ө (v) cot Ө

2a) Copy and complete the table below, giving corresponding values of Ѳ from 0o to 360o

Ѳ 0 30 60 90 120 150 180 210 240 270 300 330 360

Cos Ѳ 1 0.87 0.5 0 - 0.5

b)Hence draw the graph of cos Ѳ, using 2cm to 0.5 on y-axis and 1cm to 30o x-axis

bi) Construct a table for y = cosx – 3sinx for values of x from 00 to 1800 at intervals of 200.

ii) Using a scale of 2cm to 200 on the x-axis and 2cm to 1 unit on the y-axis, draw the graph of y= cosx -3sinx.

iii) Use your grah to find the value(s) of x correct to the nearest degree for which (i) 3tanx = 1(ii) 2 + cosx = 3sinx.