**THIRD TERM E-LEARNING NOTE**

**SUBJECT: MATHEMATICS CLASS: SSS 1**

**SCHEME OF WORK**

**WEEK TOPIC**

1. Mensuration: The Concept of B – D a Shape Cube, Cuboids, Cylinder, Triangular Prism, Cone, Rectangular Based Pyramid, Total Surface Area of Cone, Cylinder and their Volumes.
2. (a) Volumes of Frustums of Cone, Rectangular Based Pyramid and other Pyramids

(b) Proofs of Angles Sum of a Triangle = 180o

(c) The Exterior Angle

1. Geometrical Construction
2. Revision of Construction of Triangle
3. Drawing and Bisection of Line Segment
4. Construction and Bisection of Angles 90o, 45o, 135o, 221/2o, 571/2o
5. Construction and Bisection of Angles: 30o, 60o, 90o, 120o, 150o, etc.
6. Construction:
7. Construction of Quadrilateral Polygon i.e. four sided figure with given certain conditions parallelogram
8. Construction of Equilateral Triangle
9. Locus of Moving Points Including Equidistance from Two Lines of Two Points and Constant Distance from the Point.
10. Deductive Proof:
11. Sum of Angles of a Triangle.
12. Relationship of Triangles on a Straight Line.
13. Revision of Angles on Parallel Line Cuts by a Transversal Line.
14. Congruent Triangles.
15. Properties of Parallelogram and Intercept Theorem.
16. Statistics
17. Collection and Tabulation and Presentation of data e.g. data from height, ages, weight, test and examination scores of students, population of students from different schools, classes etc.
18. Different Species of Animals and Types of Vehicles etc.

Calculation of Range, median and mode of ungrouped data

1. Data Already Collected by the Students
2. Data Collected from Other Statistical Records
3. Revision
4. Collection, Tabulation and Presentation of Grouped Data
5. Data from height, ages, weights, test and examination scores of students
6. Population of students from different classes.
7. Calculation of Range, Median and Mode of Grouped Data
8. Data already collected by the students
9. Other statistical records
10. Statistical Graphs:
11. Drawing of bar chart, pie-chart and histogram
12. Cumulative frequency curve
13. Reading and drawing inferences from the graph
14. (a) Mean deviation, Variance and standard deviation of grouped data use in solving practical problems related to real life situations
15. Revision/Examination

**REFERENCE BOOKS**

* New General Mathematics SSS 1 by M.F. Macrae et al
* Essential Mathematics SS 1

**WEEK ONE**

**TOPIC:**

**Mensuration: The concept of B – D a shape cube, cuboids, cylinder, triangular prism, cone, rectangular based pyramid, total surface area of cone, cylinder and their volumes.**

**MENSURATION OF SOLID SHAPES**

**Properties of solid shapes**

**a) A Cube**

L

L

L

A cube has the following properties.

1. It has 12 straight edges
2. It has 8 vertices
3. It also has 6 square faces
4. Its net consists of 6 square faces joined together

**b) A Cuboid**

Length

Height

Breadth

**A cuboid has the following properties.**

1. It has 12 straight edges
2. It has 8 vertices
3. It also has 6 rectangular faces
4. Its net consist of 6 rectangular faces

**c) A Triangular Prism**

A triangular prism has the following properties:

1. It has 6 vertices
2. It has 9 straight edges
3. It also has 3 rectangular faces and two triangular faces which are the end faces
4. Its net consist of 3 rectangles and 2 triangles joined together

d) **A Cylinder**

radius

Height

**Properties:**

1. A cylinder has 2 circular faces
2. It has 1 curved surface
3. It has 2 curved edges
4. Its net consist of two circular faces and 1 rectangular face i.e its net consist of 2 circles and 1 rectangle.

**e) A Cone**

Vertex

L

h

r

A cone has the following properties:

1. It has one vertex
2. It has 2 curved edges
3. It has 1 curved surface
4. It also has 1 circular face
5. Its net consist of a sector of a circle and a circle

f) **Rectangular based pyramids**

H

B

L

A rectangular based pyramid has the following properties:

1. It has 8 straight edges
2. It has 5 vertices
3. It has 4 triangular faces
4. It has 1 rectangular face
5. Its net consists of 4 triangles and 1 rectangle

**EVALUATION**

1. (a) Mention and draw 3 solid shapes that you know

(b) Write down the properties of each of the solid shapes you mentioned in 1a above

(c) List one real object for each of the solid shape mentioned in (1a) above

**Surface Area and Volume of Common Solid shapes**

A prism is a solid which has uniform cross section. Cubes, cuboids, and cylinders are examples of prisms. In general,

Volume of prism = area of uniform cross section X perpendicular height

=area of base x height

L

L

L

Cube Cuboids

Cylinder

Triangular prism

**Cube**

Volume = l3

Surface area = 6l2

**Cuboid**

Volume =lbh

Surface area = 2 (lb + lh + bh)

**Cylinder**

Volume = πr2 h

Curved surface area = 2πrh

Total surface area = 2πrh + 2π r2

= 2πr ( h + r)

Examples

1. Calculate the volumes of the following solids. All lengths are in cm.

a)

4cm

12cm

R

P

Q

5cm

7cm

s

In the figure above, PQRS is a trapezium

b)

4cm

14cm

2. Calculate the total surface area of the solids in 1 (b) above

Solutions

1a.) Volume of prisms = area of uniform cross section X perpendicular height

= area of base X length of the prism

Area of PQRS = ½ ( 7 + 4) X /QR/ cm2

4cm

3cm

x

P

R

5cm

Q

S

4cm

Since /QR/ = / X S/

Consider triangle P X S

/ PX /2 + /XS/2= 52

3 2+ /XS/2 = 25

9 + / XS/2 = 25

/XS/2 = 25 – 9

/XS/2 = 16

/XS/ = √16cm = 4cm

Thus /XS/ = /QR/ = 4cm

Area of PQRS = ½ x ( 7 + 4) x /QR/ cm2

= ½ x 11 x 4 cm2

= 22cm2

Hence,

Volume of Prism = area of uniform cross section X length of prism

= 22cm2 x 12cm

= 264cm3

(b) volume of given cylinder = πr2h

from the given cylinder,

r = d/2 = 14/2 cm = 7cm

h = 4cm

volume of given cylinder = π x (7) 2 x 4cm3

22/7 x 49 x 4cm

= 22 x 28cm3

= 616cm3

2a) To calculate the total surface area of the solid shapes in 1a and b above.

2b) Total surface area of the given cylinder = 2πrh + 2πr2

= 2πr ( h + r)

= 2 x 22/7 x 7 ( 4+ 7 ) cm2

= 44 x 11cm2

= 484 cm2

**EVALUATION**

1a. A rectangular tank is 76cm long, 50cm wide and 40 cm high. How many litres of water can it hold?

b. Calculate the total surface area of the rectangular tank in question 1a above

**Surface area of a Cone**

A sector of a circle can be bent to form the curved surface of an open cone. In the figure below, the sector OA x B is of radius l and arc A X B subtends angle θ at O. This sector is bent to form a cone of base radius r and slant height

X

D

L

B

r

B

X

A

o

The following points should be noted

1. The area of the sector is equal to the area of the curved surface of the cone .
2. The length of arc A x B in the 1st part of the figure above is the same as the circumference of the circular base of the cone in the 2nd part of the figure above

Curved surface area of cone =θ x πl2 …………..0

360

Also,

θ x 2πl = 2 πr

360

Divide both sides by 2π

θ x 2πl = 2 πr

360 2π 2π

θ x l =r

360

divide both sides by l

θ = r

360 l

substitute r/l for *θ* in equation i) above:

*360*

Curve surface area of cone =r x πl2

l

= Πrl

Hence,

Total surface area = curved surface area of a cone + area of circular base

= πr l +π r2

= πr ( l + r)

**Examples**

A paper cone has a diameter of 8cm and a height of 3cm

a). Make a sketch of the cone and hence use Pythagoras theorem to calculate its slant height.

b). Calculate the curved surface area of the cone in terms of π

c ) If the cone is cut and opened out into the sector of a circle. What is the angle of

the sector?

d) Assuming that the paper cone is closed at its base, what will be the total surface area of the closed paper cone?

8cm

4cm

L =?

3cm

4cm

Solutions.

From the given information about the paper cone,

Diameter = 8cm

:. Radius = diameter

2

= 8cm = 4cm

2

using Pythagoras theorem in the right angled triangle OBC

l2 = /OB/2 + /BC/ 2

l2  = 32 + 42

l2 = 9 + 16

l2 = 25

Take square root of both sides

√ l2  =√ 25

l = 5cm

:.the slant height of the paper cone is 5cm

b) Curve surface area of the cone = πrl

L = r = 5cm

= π x 4 x 5 cm

= 20 πcm2

c)

If the paper cone is cut and opened out into the sector of a circle as shown in the figure above, then

area of sector of circle = curved surface area of the cone

i.eθx π x (5) 2 = 20 x π

360

5

θx π x 25 = 20 x π

360

12

5 θ = 72 x 20

Divide both sides by 5

5 θ =72 x 20

5

5 θ = 72 x 4

θ = 288o

**EVALUATION**

1. A 216 sector of a circle of radius 5cm is bent to form a cone. Find the radius of the base of the cone and its vertical angle
2. Calculate (a) the curved surface area (b) the total surface area of the cone formed in question (1) above. Leave your anser in terms of П

**Volume of Pyramids and Volume of cone**

In general,

Volume = 1/3 x base area x height

L

h

L

**Square based pyramid rectangular based pyramid Cone**

:. Volume of square based pyramid = 1/3 x b2 x h

volume of rectangular based pyramid = 1/3 x l x b x h

volume of cone = 1/3 x Πr2 x h

**Examples**

1.A pyramid 8cm high stands on a rectangular base 6cm by 4cm.Calculate the volume of the pyramid.

2. A right pyramid on a base 4cm square has a slant edge of 6cm.Calculate the volume of the pyramid.

3. Calculate the volume of a cone 14cm in base diameter and 24cm high.

**Solutions**

1) Volume of a rectangular based pyramid = 1/3 x l x b x h

= 1/3 x 6 x 4 x 8 cm3

= 8 x8 cm3

= 64cm3

2) Considering the square base ABCD

B

6cm

4cm

O

4cm

E

C

D

A

/DB/ 2= /DC/ 2 + /CB/2

Pythagoras rule:

/DB/2 = 42 + 42

/B/2 = 16 + 16.

:. √/DB/ = √ 32

/DB/ = 4 √2 cm

but

/ EB/ = ½ /DB/

Since t is the midpoint of / DB/

Then /EB/ = ½ X 4 X √ 2

= 2 √2 cm.

Now

Consider right angle OEB

OE 2 + EB 2 = ( OB)2

OE 2+ ( 2√2) 2 = ( 6) 2

OE 2 + 4 x 2 = 36

OE 2 + 8 = 36

OE 2 = 36 – 8

OE2 = 28

OE = √28

OE = √4 x 7

OE = 2 x √ 7 cm

OE = 2 √7cm

But OE =height of the pyramid = 2√7

:.volume of square of based pyramid = 1/3 x b2 x h

1/3 x 42 x 2 x √7 cm3

1/3 x 16 x 2 x √7 cm3

= 32 x √7 cm3

3

32 x 2.646cmm3

3

= 32 x.0.882cm3

14cm

24cm

= 28. 224cm3

= 28.2cm3 to 1 d.p.

3)

Since

Diameter = 14cm

Radius = diameter

2

= 14 cm.=7cm

2

:. Volume of cone = 1/3 πr2 h

= 1/3 x 22/7 x ( 7 ) 2 x 24

= 1/3 x 22/7 x 49 x 24 cm3

= 22 x 56cm3

= 1232 cm3

**EVALUATION**

1. A cone of height 9cm has a volume of n cm3 and a curved surface area of n cm3. Find the vertical angle of the cone

2. A right pyramid on a base 8cm square has a slant edge of 6cm. Calculate the volume of the pyramid

**GENERAL EVALUATION**

1. A solid cone has a circular base of radius 7cm. the vertical height of the cone is 15cm. the cone is melted and recast into a metal cube of side xcm. Calculate correct to 3.s.f. the value of x.
2. A cylindrical container with a diameter 80cm and height 50cm is full of liquid. The liquid is then poured into another cylinder with a diameter 90cm. calculate the depth of the water.

**READING ASSIGNMENT**

NGM SS Bk 1 pg 166- 170 Ex 15a Nos 1 (d), 1(f), 2(b) and 29c) pages 168 -169.

**WEEKEND ASSIGNMENT**

1. Calculate the volume of a cylinder which has a radius of 21cm and height 6cm. A. 8500cm3 B. 8316cm3 C. 7632cm3 D 7500cm3 E. 8000cm3
2. Calculate the total surface of the cylinder in question 1. A, 5346cm2 B, 4653cm3 C. 3000cm2 D. 3564 cm2 E 3800cm2
3. Calculate the volume of a cone which has a base diameter of 7cm and a height of 6cm A. 77cm3 B. 70cm3 C. 88cm3 D. 90cm3 E. 65cm3
4. Calculate the curved surface area of the cone in question 3 above. A, 152cm2 B. 150cm2 C. 132cm2 D 142cm2 E. 160cm2
5. Calculate the total surface area of a cuboids which is 8cm by 5cm by 3cm. A.198cm2 B. 178cm2 C 188cm2  D 168cm2 E. 158cm2.

**THEORY**

1. A water tank is 1.2m square and 1.35m deep. It is half full of water . How many times can a 9 litre bucket be filled from the tank?
2. A measuring cylinder of radius 3cm contains water to a height of 49cm. If this water is poured into a similar cylinder of radius 7cm, what will be the height of the water column?.

**WEEK TWO Date……………………**

**TOPIC:**

**(a) Volumes of frustums of cone, rectangular based pyramid and other pyramids**

**(b) Proofs of angles sum of a triangle = 180o**

**(c) The exterior angle**

**(a) Volumes of frustums of cone, rectangular based pyramid and other pyramids**

Many composite solids can be made by joining basic solids together. In the figure below, the composite solids are made as follows:

(a) a cube and a square based pyramid.

(b) A cylinder and cone

**Examples:**

1. The figure below shows a composite solid consisting of a cube of edge 28cm and a square-based pyramid of height 16cm. Calculate the volume of the solid

16cm

2.8cm

2. The outer radius of a cylindrical metal tube is R and t is the thickness of the metal.

(a) Show that the volume V, of metal in a length, I units, of the tube is given by

V = П lt (2R – t)

(b) Hence calculate V when R = 7.5, t = 1 and 1 = 20

Solutions

1. From the diagram of the composite solid given in Question(1)

Volume of = Vol. of + Vol.

Composite solid square-based of

Pyramid cube

= 1/3 b2h + l3

= 1/3 x 28 x 28 x 16 + 283 cm3

= 784 x 16 + 28 x 28 x 28 cm3

= 12544 + 784 x 28 cm3

3

= 12544 + 21952 cm3

3

= 12544 + 65856 cm3

3

= 26133 1/3 cm3

= 26133cm3

Vol. of the Vol. of Vol. of

Cylindrical metal = outside - inside

Tube cylinder cylinder

= П R2l - П r2l ..................1

But

R = t + r ...................2

Where

R = radius of outside cylinder

t = thickness of the cylindrical metal tube

r = radius of inside cylinder

**From equation (2)**

r = R - t

And substituting П R – t for r in equ (1):

Vol of the cylindrical = ПR2*l* - Пr2*l*

Meta.tube = ПR2*l –П (R – t)*2*l*

= ПR2l – П(R2 – 2Rt + t2) *l*

= ПR2l– ПR2l + 2ПRtl - Пt2*l*

= 2 П Rtl – Пt2l

= Пlt (2R – t)

(b) When R = 7.5, t = 1 and *l =* 20, then

Vol. of the cylindrical

Metal tube = П *l* t (2R – t)

= 22/7 x 20 x 1 (2 x 7.5 - 1)

= 22/7 x 20 x (15 – 1)

= 22/7 x 20 x 14

= 44 x 20

= 880

If a cone or pyramid standing on a horizontal table is cut through parallel to

the table, the top part is smaller cone or pyramid. The other part is called a frustum.

To find the volume or surface area of a frustum, it is necessary to consider the frustum, as a

complete cone (or pyramid) with the smaller cone (or pyramid) removed.

**Examples:**

1. Volume of a right circular cone is 5 litres. Calculate the volumes of the two parts into which the cone is divided by a plane parallel to the base, one-third of the way down from the vertex to the base. Give your answers to the nearest ml.

**Solutions:**

L

H

B

L

From the question,

h = 1

H 3

H = 3h

Also using similar triangles:

r = h = 1

R H 3

Thus:

R = 3r

Vol. of frustum Vol. of - Vol. of

Of cone = big cone small cone

= 1 П R2 l t - 1 П r2 h

1. 3

But vol. of big cone = 5 litres

= 5 x 1000 ml

Since 1 litre = 1000 ml

i.e.

Volume of = 5000 ml

Big cone

1/3 П R2H = 5000 ml

П R2H = 3 x 5000 ml

П R2H = 15000 ml ………. (1)

Also,

From 3h = H

h = H/3

and 3r = R

r = R/3

Thus, vol. of small = 1/3 Пr2h

Cone

= x π x x

= 

= 

Since from equation (1) above ПR2H = 15000

Then

Vol. of small =  = 

Thus:

Vol. of frustum of cone = Vol. of big cone - Vol. of small cone

= 

= 

= 

= 4814.8*m*

4815*ml*

**(b) Proofs of angles sum of a triangle = 180o**

The sum of angles on a straight line is 180o. in the diagram below, x and y are adjacent angles on a straight line.

C

x

y

B

A

When two or more angles add up to 180o they are called supplementary angles so x + y = 180o (supplementary angles)

**Examples**

Find the unknown angles in the following diagrams:

70o

50o

a

2a

50o + 70o + a + 2a = 180o (sum of angles on a straight line)

120o + 3a = 180o3a = 180o – 120o = 60o

a = = 20o

2a = 2 x 20o = 40o

**EVALUATION**

Essential Mathematics for Senior Secondary School 1 Exercise 15.1 No. 1

**(c) The exterior angle**

The exterior angle of a triangle is equal to the sum of the two opposite interior angles.

A

E

x1

x

y1

z

y

B

C

D

Given: Any triangle ABC

To prove: ACD = x1 + y1

Construction: Draw CE parallel to BA.

Proof: Let ACE = x and ECD = y

x1 = x (alternate angles, BA//CE)

y1 = y (corresponding angles, BA//CE)

butACD = x + y

AACD = x1 + y1

**Example**

1. In the diagram below, APR is a straight line. Work out the value of x and hence find QPR.

A

P

(200 – 4x)o

3x

(2x – 20)o

Q

R

**Solution**

3x + 2x + 20 = 200 – 4x (Ext. theorem)

5x + 4x = 200 – 20

9x = 180

X = 20o

200o – 4x = 200o – 4 x 20o

= 200o – 80o = 120o

QPR = 180o – 120o (sum of angles on a straight line)

1. The ratio of the angles of a triangle is 3:4:5. Find the smallest and the largest angles.

**Solution**

The angles are in the ratio 3:4:5,

i.e. 3 + 4 + 5 = 12 parts

but the sum of angles of a triangle is 180o.

1st angle = = 45o

2nd angle = = 60o

3rd angle = = 75o

The smallest angle = 45o and the largest angle is 75o

Check: 45o + 60o + 75o = 180o

**EVALUATION**

1. Three angles of a triangle x, 2x and 3x. find the value of x and hence find the angles.
2. The ratio of the angles of a triangle is 2, 3 and 4. Find the angles.

**GENERAL EVALUATION**

1. A lampshade in the form of a frustum of a cone has a height of 12cm and an upper and lower diameters of 10cm and 20cm.

a. what is the curved surface area of the frustum?

b. What is the volume of the frustum?

c. Give both answers in terms of π

2.Afrustum of a pyramid is 16cm square at the bottom, 6cm square at the top and 12 cm high. Find the volume of the frustum.

**READING ASSIGNMENT**

NGM SS Bk 1 pages 173-175 Ex 15c Nos 6 and 9 pg 175.

**WEEKEND ASSIGNMENT**

1. Calculate the volume in cm3 of the material in a cylindrical pipe 1.8m long, the internal and external diameters being 16cm and 18 respectively.
2. A composite solid consisting of a cone on top of a cylinder. The height of the cone is 25cm. The height and base diameter of the cylinder are 40cm and 30 respectively. Calculate to 3.s.f. the volume of the solid, taking π to be 3.14 (see the figure below).

25cm

40cm

1. A storage container is in the form of a frustum of a right pyramid 4m square at the top and 2.5m square at the bottom. If the container is 3m deep. What is its capacity in m3?
2. Three angles of a triangle are (5x – 7)o, (2x + 15)o and (2x + 1)o. find the value of x and hence find the largest and the smallest angles.
3. The sides PQ and PR of PQR are produced to T and S respectively, such that TQR = 131o and QRS = 98o. findQPR.

**THEORY**

1. A right pyramid on a base 10m square is 15m high.

(a) Find the volume of the pyramid.

(b) If the top 6m of the pyramid are removed, what is the volume of the remaining frustum?

2. The cone in the figure below is exactly half full of water by volume. How deep is the water in the cone?

12cm

34cm

**WEEK THREE Date………………….**  
**TOPIC: GEOMETRICAL CONSTRUCTION**

1. **Revision of Construction of Triangle**
2. **Drawing and bisection of Line Segment**
3. **Construction and Bisection of Angles 90o, 45o, 135o, 221/2o, 571/2o**
4. **Construction and Bisection of Angles: 30o, 60o, 90o, 120o, 150o**
5. **Revision of Construction of Triangles**

**Example**

1. Construct ABC in which !AB ! = 7cm, !AC! = 9.5cm and ABC = 120o.Measure !BC!
2. Construct PQR in which !PQ != 5.5cm !QR! = 8..5cm and PQR = 75o . Construct M the midpoint of PR Measure /QM/

**Solutions**

1. First make a sketch of the triangle to be constructed .

7cm

B

120o

A

9.5cm

9.5cm

120o

7cm

Draw a line AB = 7cm

Then construct angle 120o at B with radius 9.5cm and centre A, draw an arc to cut the 120 o at

C. Draw line AC

From the diagram /BC/ = 3.6cm

2) First make a sketch of the triangle to be constructed.

a. Draw line PQ = 5.5cm

b. Construct angle 75o at Q

c. With centre Q and radius 8.5cm , draw an arc to cut the angle 75o at R.

d. Draw line QR.

e. Bisect line PR

75o

8.5cm

R

P

From the diagram, /QM/ = 5.5cm

EVALUATION

a. Construct XYX in which /YZ/ = 7.5cm XYZ = 60o and XZY = 45o

b measure !XY !and !XZ!

1. **Drawing and Bisection of Line Segments**

To bisect a given line segment means to divide the given line segment into two parts of equal length. The steps to take to bisect a given line segment are as follows:

1. Draw the given line segment AB ( let AB = 8.6cm)
2. With centre A and radius of about ¾ of length of AB, draw an arc above and below the line AB
3. With centre B and the same radius used in step 2 above, draw arcs to cut the previous arcs in step 2.
4. Draw a line through the 2 points of inter- section of the pair or arcs obtained from steps 2 and 3 . The line drawn is the perpendicular bisector of line AB.

E

B

A

8.6cm

C

D

10.6cm

Thus AE = EB = 4.3cm

**EVALUATION**

1. Draw a line CD = 11cm

Bisect the line CD

2. Construct the mid point M of the line drawn below

Where length CD = 10.6cm

1. **Construction and Bisection of angles : 90o, 45o, 135o, 22 ½ , 67 ½ o.**

**To construct angle 90o, take the following steps:**

1. Draw a line BC and mark a point A at which the angle 90o is to be constructed .
2. With centre B and any suitable radius draw an arc above line BC.
3. With centre C and the same radius used in step 2, draw an arc to cut the previous Arc at D.
4. Draw a line through points A and D. thus < DAB = <DAC = 90o

D

B

A

Since 45o = ½ of 90o, angle 90o is bisected to obtain angle 45o. This is shown in the figure below:

D

E

B

C

45o

A

Thus < IGF = 45o

Also < HGI = 45o

Similarly 22 ½ o = ½ of 45o, By bisecting angle 45o, we can obtain angle 22 ½ o as shown in the figure below:

B

C

E

D

F

221/2

A

Thus <EDB = 22 ½ o. Also <EDB = 22 ½ o

Also 135o = 90o + 45o. Thus by constructing angle 90o at a point on a line and bisecting the 90o on the other side, we can obtain angle 135o. This is shown in the figure below:

135o

B

C

Thus <FDE = 135o.

As explained above bisection of angle 135o will give angle 67 ½ o

**Bisection of a given Angle.**

The step to take for bisecting a given angle are as follows.

1. Draw the given angle ABC i.e<ABC

2. With centre B and any suitable radius, draw an arc to cut AB at D and BC at E.

3. With centre D and any suitable radius, draw an arc

4. With centre E and the same radius as the one used in step (3) above, draw another arc to cut the previous arc at F.

5. Draw the line BF. Line BF is the bisector of ABC. This is shown in the figure below

B

F

A

C

Thus < FBC = , ABF = ½ <ABC.

**EVALUATION**

1. Construct angle 135o

2a. Construct angles 22 ½ o

b. Construct angle 67 ½

1. **Construction and bisection of angle: 60o, 30o, 75o, 105o, 120, 150o.**

**To construct angle 60o, the following steps must be taken:**

1. Draw a line AB and mark the point A at which the angle 60o is to be constructed
2. With centre A and any convenient radius, draw an arc to cut line AB at C.
3. With centre C and the same radius used to draw the arc in step 2 above, draw another arc to cut the previous arc at D.
4. Draw line AD and extend it to E
5. Then ,EAB = 60o.

B

D

A

C

E

**To construct angle 30obisect angle 60o to give angle 30o, this is shown in the figure below:**

30o

A

B

Thus, <ABC = 30o

To construct angle 75o . Since 75o = 60 + ½ of 30o, then first construct angle 90o at a point on a straight line. Next construct angle 60o at the same point where angle 90o has been constructed. Then the angle 30o difference between the angle 90o and 60o is bisected to give 15o on either side .thus 60 o + 15 = 75. This is shown in the figure below:

D

F

75o

A

B

E

C

Thus, <ABC = 75.

105o

E

D

**Construction of angle 105o .**

E

Angle 105o can be constructed by constructing 60o in the adjacent right angle at E and bisecting the remaining 30o. Thus 105 = 90 + ½ x 30.this is shown in the figure below:

F

A

F

120o

C

B

Thus <FED = 105.

**To construct angle 120o**

the following steps must betaken :

1. Draw a straight line AB and mark a point C on the line where the angle 120o is to be constructed.

2. With centre C and a suitable radius, draw a well extended arc to cut line CB at point D.

3. With centre D and the same radius used in step 2 above draw an arc to cut the extended arc in step 2

at point E.

4. With E as centre and the same radius, draw an arc to cut the extended arc at point F.

5. Draw line CF. Thus <FCB = 120. This is shown in the figure below:

A

150o

C

B

**Construction of angle 150 o.**

Since 150 = 120o + ½ of 60o, first construct angle 120o on a straight line angle. Then bisect the adjacent 60o angle to get 30o. Thus 30o + 120o on the right hand side gives the required angle 150o. This is shown in the figure below:

<DCB = 150o

**EVALUATION**

1. Construct angle 70o
2. (a) Construct angle 105o

(b) Construct angle 150o.

**GENERAL EVALUATION**

Construct the following angles using compasses only.

1. 60o
2. 45o
3. 135o
4. 37.5o

**READING ASSIGNMENT**

NGM SS Bk I pg 176-178;Ex.16a. No 1 pg 177

**WEEKEND ASSIGNMENT**

Construct XYZ such that XY = 5cm, XZ = 120o and YZ = 7cm. measure the following

1. XZ A. 10.4cm B. 13cm C. 8cm D. 4cm
2. YZ A. 25o  B. 30o C. 35o  D. 40o
3. XY A. 30o B. 250  C. 50o D. 60o

Construct ABC such that AB = 6cm, BC = 7.5cm and ABC = 75o. bisect AB at P and AC at Q. Measure

1. PQ A. 3.8cm B. 10cm C. 2cm D. 8cm
2. QC A. 5.1cm B. 6.8cm C. 4.1cm D. 8.2cm

**THEORY**

1. (a)Use ruler and compasses to construct PQR in which Q = 90o, /QR/ = 5cm and /PR/ = 10CM

(b) Measure /PQ/

(c) Use pytahgoras theorem to check the result.

1. (a) Construct ABC such that /AB/ = 7cm, /BC/ = 6cm and ABC = 60o

(b) The bisector of C meets the perpendicular bisector of AC at X. Find the point X by construction

(c) Measure !BX

**WEEK FOUR Date……………..**

**TOPIC: CONSTRUCTIONS**

1. **Construction of quadrilateral polygon i.e. four sided figure with given certain conditions parallelogram**
2. **Construction of equilateral triangle**
3. **Locus of moving points including equidistance from two lines of two points and constant distance from the point.**
4. **Construction of Quadrilaterals**

**Examples**

1. Construct a quadrilateral ABCD in which AB is parallel to DC /AB/= 4cm, /BC /= 5cm and /DC/= 7cm and <ADC = 105o..Measure the diagonal BD.

2. Use your ruler and compasses to construct the parallelogram PQRS in which /QR/ = 5cm, /RS /=11cm and < QRS = 135o.

b. Measure the length of the shorter diagonal of PQRS.

**Solutions**

First make a sketch of the quadrilateral to be constructed as shown in the figure below:

B

4cm

A

5cm

105o

C

D

7cm

Steps of the required construction are stated as follows:

i. Draw DNC = 7cm with DN = 3cm and NC = 4cm

ii. Construct CDM = 105o

iii. With N as centre, radius 5cm draw an arc to cut DM at A

iv. With A as centre and radius of 4cm draw an arc.

With C as centre and a radius of 5cm draw a second arc to cut the first arc at B

v. Join A to B and C to B to complete the quadrilateral ABCD.

By measurement , /BD/= 4.5cm

M

4cm

B

A

5cm

4cm

3cm

D

C

2)First make a sketch of the parallelogram PQRS

11cm

Q

P

R

5cm

135o

**The step of the construction are stated as follows:**

1. Draw line QR = 5cm
2. Construct R = 135o
3. With R as centre and radius 11 cm draw an arc to cut the angle 135o line at S.
4. With S as centre and radius 5cm, draw an arc
5. With Q as centre and radius 11cm, draw a second arc to cut the arc of step iv. This is point P
6. Draw lines to join S to P and P to Q
7. Draw dotted line through diagonal RP and measure it.

P

S

11cm

135o

5cm

Q

By measurement the length of the shorter diagonal PR is 8.7cm

**EVALUATION**

1. Construct quadrilateral ABCD such that /AB/ = 5cm, /BD/= /DC/ =8cm,<ABD =30o and <BCD = 45o.
2. Measure the diagonal /AC/.
3. **Construction of Equilateral Triangle**

An equilateral triangle is a triangle in which all the sides are of equal length and each of its angle is 60o.

**Examples**

1. Construct an equilateral triangle XYZ such that /XY/= 5CM
2. (a) Construct an equilateral triangle ABC such that /AB/= 7cm

(b) Construct the bisectors of A, B and C

(c) What do you observe?

Z

**Solutions**

Sketch:

Z

5cm

5cm

Y

X

Y

X

2) Sketch: The required construction is

7cm

7cm

7cm

C. The bisectors of each angle meet each other at a point inside the equilateral triangle.

1. **Construction of Loci of Moving Points**

1. Locus of points at a given distance from a fixed point.

In the figure below, O is a fixed point, Pi, P2 are at a constant distance x cm from O . The locus of the points is a circle of radius x cm.(see the figure below).

P1

P2

xcm

O

ii**). Locus of point at a given distance from a straight line**

P1

P2`

P3

P4

Locus

x

x

In the figure above AB is a straight line which continues indefinitely in both directions. Points Pi, P2, P3, P4 are each a distance x cm from AB. In two dimensions, the locus of the points consist of two straight lines parallel to AB, each at a distance x cm from AB.

Note that this locus consist of two separate lines.

iii.) **Locus of points equidistant from two given points.**

P1

X

P3

Y

P2

In the figure above, x and y are two fixed points . Points Pi, P2, P3 are such that /PiX/ = /PiY/, /P2X/= /P2Y/and /P3Y. /. P1, P2, P3, lie on the perpendicular bisector of XY. The locus of the points is the perpendicular bisector of XY (shown in the figure above).

iv**) Locus of Points Equidistant from two straight lines.**

A

D

B

C

In the figure above, AB and CD are straight lines which intersect at O. P1 is equidistant from AB and CD . Similarly, P2 is equidistant from the two lines. P1 and P2 lie on the bisector of the acute angle between the two lines.

P3

D

A

B

C

In the figure above, P3 is equidistant from AB and CD.P3 lies on the bisector of the obtuse angle between the two lines.

Thus, the complete locus of points which are equidistant from two straight liens is the pair of bisectors of the angles between the lines.( see the figure below).

Note that the two parts of the locus intersect at right angles.

A

D

B

C

**Example**

**Using ruler and compasses only**

a, Construct ABC such that /AB/ = 6cm, /AC/ = 8.5cm and BAC = 120o

b. Construct the locus l1 of points equidistant from A and B,

c. Construct the locus l2 of points equidistant from AB and AC.

d.Find the points of intersection P1 and P2, of l1 and l2 and measure /P1 P2/

Solution

B

6cm

120o

C

8.5cm

A

P1

B

6cm

P2

120o

C

A

8.5cm

a. Note the construction of BAC = 120o.

b. l1 is the perpendicular bisector of AB

1. l2 is in two parts. AP1 is the bisector of BAC. AP2 is perpendicular to AP1, Note that points on AP2 are equidistant from AB and CA produced.
2. By measurement /P1P2/ = 6.8cm

**EVALUATION**

a. Construct an equilateral triangle ABC such that /AB/= 8cm

b. Construct the midpoints of AB, BC, and CA

c. What do you observe?

**READING ASSIGNMENT**

NGM SS BK 1 pages 176-186 Ex 16e No.6 page 186.

**GENERAL EVALUATION**

a. Construct a XYZ in which /YZ/ = 8.2cm, XYZ = 45o and XZY = 75o.

measure !XY!.

b. Using ruler and compasses only, construct:

* 1. The locus of a point equidistant from Y and Z.
  2. A point Q on this locus, equidistant from YX and YZ.

**WEEKEND ASSIGNMENT**

1. A circle centre O, radius 5cm is drawn on a sheet of paper. A point P moves on the paper so that it is always 2cm from the circle . The locus of O A. a circle, centre O, radius 3cm B. two circles,centre O radii 3cm and 7cm C. a circle, centre O, radius 6cm D. two circles,centreO,radii 4cm and 6cm E. a circle, centre O, radius 3.5cm.
2. XYZ is a straight line such that /XY/ =/YZ/= 3cm .A point P moves in the plane of XYZ so that /PY/ < /XY/, which of the following describes the locus of P? A. line through X perpendicular to XZ B. line through Y perpendicular to XZ C. line through Z perpendicular to XZ D. circular disc, centre X,radius 3cm E. circular disc, centre 4, radius 3cm.
3. Describe the locus of a point which moves so that it is always 5cm from a fixed point O in a plane. A. rectangle which measures 10cm by 5cm B. square of side length 5cm C. a parallelogram whose diagonals are 10cm and 5cm C. a circle of radius 5cm, centre O E. a circle of radius 10cm, centre O.
4. Describe the locus of a point which moves along a level floor so that it is 2m from a wall of a room.A. One line, parallel to and 2m from the wall. B. Two lines, one each side of, parallel to and 2m from the wall C. A circle of radius 2m D. A semi-circle of radius ½ m E. Two perpendicular lines, each of length 2m
5. Describe the locus of a point which moves so that it is 3cm from a fixed line AB in a plane. A. 2 lines parallel to AB and 6cm apart, joined by semi-circular ends. B. 2 lines parallel to AB and 8cm apart; joined by semi-circular ends C. 2 lines perpendicular to AB D. A circle of radius 6cm E. circle of radius 3cm.

**THEORY**

1. construct a trapezium ABCD in which AB is parallel to DC, AB =4cm BC = 8cm, CD = 11cm, DA = 6cm. (hint: in a rough figure, divide the trapezium into parallelogram AB X D and triangle BCX. (First construct triangle BCX )
2. Using ruler and compasses only, construct
3. ABC such that /AC/ = 8.5cm and ACB = 135o.
4. Using any geometrical instruments, find a point P within ABC which is at a distance 2.8cm from AC and 6cm from B. Measure the length of AP.

**WEEK 5 DATE................................................**

**TOPIC: Deductive proof**

**Sum of angles in a triangle**

The sum of the angles of a triangle is 180.

The sum of the angles of a triangle is 180.

b2

c2

A

a1

a2

B

C

b1

X

Given any triangle ABC

To prove: A+B+C=180

Construction:Produce BC to a point X.Draw CP parallel to BA.

Proof:With the lettering of the figure above

a1=a2 (alternate angles)

**b1**=b2 (corresponding angles)

c+a1+b1 = 180

C+a2+b2 = 180

ABC + A + B = 180

A + B + C = 180

**Relationship to angles on a straight line**

The sum of angles on a straight line is 180o.

The sum of angles on a straight line is 180o.

E

D

A

p

q

r

C

P + q + r = 180o

B

**Angles on a parallel line cut by a transversal line**

The figure below is parallel lines cut by a transversal line indicating angles a – h

**Corresponding Angles**

e

f

g

a

d

b

h

c

From the figure above, the following angles are corresponding:

a = g ; b = h ; c = e ; d = f

**Alternate Angles**

From the figure above, the following angles are alternate

h

a

d

c

g

b

a = d ; b = c

**Vertically Opposite Angles**

From the figure above, the following angles are vertically opposite

a = f ; b = e ; c = h ; d = g

b

a

e

f

**Example**

Isosceles triangles ABC and ABD are drawn on opposite sides of a common base AB. If ABC= 70 and ADB = 118, calculate ACB and CBD.

**Solution**

70o

A

118o

B

C

In triangle ABC,

ABC = 70 (given)

BAC = 70 (base angles of isos. Triangle)

Therefore, ACB = 180 – 70 – 70 (angle sum of triangle)

= 40

In triangle ABD,

ADB = 118 (given)

Therefore, ABD + BAD = 180 – 118 (angle sum of triangle)

= 62

Therefore, 2 X ABD = 62 (base angles of isos. Triangle)

ABD = 31

CBD = CBA + ABD = 70 + 31 = 101

ACB = 40 and CBD = 101

**Parallelogram**

A parallelogram is a quadrilateral which has both pairs of opposite sides parallel.

1. b)

Rhombus, rectangle and square are special examples of parallelogram. A rhombus is a parallelogram with sides of equal length.

**Properties of Parallelogram**

i) The opposite sides are parallel.

ii) The opposite sides are equal.

iii) The opposite angles are equal.

iv) The diagonals bisect one another.

**Properties Of Rhombus**

**i)** All four sides are equal.

ii) The opposite sides are parallel.

iii) The opposite angles are equal.

iv) The diagonals bisect one another at right angles.

v) The diagonals bisect the angles.

NB: In a rectangle, all of the properties of a parallelogram are found and all four angles are right angles. In a square, all of the properties of a rhombus are found and all four angles are right angles.

**Intercept**

In the figure above, the lines AB and CD cut the transversal PQ into three parts. The part of the transversal cut off between the lines is called an intercept. In the figure above, the line segment XY is the intercept

**Intercept Theorem**

If three or more parallel lines cut off equal intercepts on a transversal, then they cut off equal intercepts on any other transversal.

Given: Three parallel lines cutting a fourth line at A, B, C so that /AB/=/BC/ and cutting another line at X, Y, Z respectively.

To prove:/XY/ = /YZ/.

Construction: Draw XP and YQ parallel to ABC to cut BY and CZ at P and Q respectively.

Proof:

AXPB is a parallelogram (opp. Sides //)

XP = AB (opp side equal)

Similarly /YQ/ = /BC/ (in //gm YQCB)

/XP/ = /YQ/ (given AB = BC )

In triangles XPY, YQZ

/XP/ =/YQ/ (Proved)

X1 = x2 (corr. angles)

Y1 = y2 (corr. angles)

Therefore, triangle XPY = triangle YQZ (AAS)

/XY/ = /YZ/

**EVALUATION**

Find the length k, m, n in the figures below

3

3

3.1

n

k

m

2.5

2.5

**Congruent Triangles**

Two figures or triangles are congruent if they have exactly the same shape and size.The following are conditions for congruency:

i)Two sides and the included angle of one are respectively equal to two sides and the included angle of the other.(SAS) e.g in the figures below, triangle ABC is congruent to PQR

A

B

C

P

Q

R

ii)Two angles and a side of one are respectively equal to two angles and the corresponding side of the other.(ASA or AAS) e.g. the figures below are congruent

K

E

D

H

K

J

iii)The three sides of one are respectively equal to the three sides of the other.(SSS)

F

S

R

W

V

U

iv)They are right-angled, and have hypotenuse and another side of one respectively equal to the hypotenuse and another side of the other.(RHS)

M

L

K

F

S

R

**EVALUATION**

State whether the triangles are congruent, not congruent or not necessarily congruent. If congruent state condition of congruency

**READING ASSIGNMENT**

Essential Mathematics for Senior Secondary Schools 1 page 323

**GENERAL EVALUATION**

1. In the figure below, ABP = <110o and <DCP = 163o. Calculate BPC

P

110o

163o

D

C

A

B

1. In triangle ABC, <BAC= 68o and <ABC = 30o. BC is produced to X. the bisectors of <ABC and <ACX meet at P. calculate <BCP and <BPC.
2. Find the lettered lengths in cm.

z

y

z

5

8

w

6

6

**WEEKEND ASSIGNMENT**

**In each pairs of triangles a), b), c), state the condition of congruency**

(c)

(b)

(a)

1. State the condition of congruency for the pairs of triangle in a)ASA b)SAS c)SSS d)not congruent
2. State the condition of congruency for the pairs in b)a)SSS b)SAS c)AAS d)not congruent
3. State the condition of congruency for the pairs in c)a)SSS b)SAS c)RHS d)not congruent

**Use this figure to answer questions 4 and 5**

56o

u

v

1. Calculate the angle marked ua)28 b)38 c)48 d)56
2. Calculate the angle marked va)28 b)56 c)152 d)162

**THEORY**

1. Given the data of figure below, prove that triangle PQR is isosceles.

P

98o

R

Q

131o

1. (a) In figure below, a) what is the ratio /AD/ ÷ /DB/ ?

(b) If /DB/ = 5cm, what is /AB/?

Q

A

B

D

**WEEK 6 DATE...............................................**

**TOPIC: STATISTICS**

**CONTENT: COLLECTION, TABULATION AND PRESENTATION OF DATA**

**What is statistics?** This is defined as the collection of data and the presentation of the collected data in a clearer form, for better interpretation. There are two possible ways of presenting the collected data, for better interpretation and these are:

1. Tabular Presentation (Tables)
2. Graphical Presentation (Graphs)

Data:There are two possible ways in which data can be classify and these are Grouped and Ungrouped data.Data is/are sometimes referred to as information. Althoughthey differs in so many ways,i.e,information is wider than data,hence data is found under the information of a certain event.Example,I can gather the information of a class,such as SSS 1,each student in such class has their individual particular,these particulars of each of the student is then known as DATA. Simply put INFORMATION is the collection of data.

When data are collected at first,they are said to be RAW,because they are yet to be arranged in an order of magnitude.Therefore,it is important tore-arrange such data in an order of magnitude,(ascending or Descending, Order)

**TYPES OF DATA**

1. **Quantitative Data**:Since,the word quantitative, refers to as quantity,therefore,quantitative data, takes numeric values(Numbers).Quantitative data is sub-divided into two and these are:
2. **Discrete Data**: This data can simply be obtain by mere counting. Such as the number of student in a class, population of a country, number of cars in a garage, number of houses on a street etc.It must be noted that, Discrete data, always take a whole number value, as no counting can be in decimal.eg,43 students and not 42.5 students.
3. **Continuous Data**: These data are obtain by measurement, eg, weight, height,age,sizes,scores/marks etc,they can take whole number and decimal.
4. **Qualitative Data:** This type of data is concern about the quality of a data. it can be describe in word,eg,taste,colour,make of shoes etc.

It is a common practice to present data in **frequency tables**. Frequency tables are used for summarising data before analysis.

Example

1)A teacher gives a spelling test to 40 students. The number of errors made by the students is shown in table below. Represent the data in a frequency table.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 2 | 3 | 0 | 4 | 5 | 3 | 5 | 3 | 0 |
| 0 | 1 | 2 | 3 | 4 | 2 | 2 | 1 | 0 | 4 |
| 0 | 2 | 1 | 0 | 2 | 3 | 2 | 2 | 1 | 0 |
| 0 | 2 | 1 | 0 | 2 | 3 | 2 | 2 | 1 | 0 |
| 4 | 5 | 3 | 1 | 2 | 0 | 1 | 2 | 3 | 4 |

**The data first summarised by first using tally marks as shown below**

|  |  |  |
| --- | --- | --- |
| Number of errors | Tally | Frequency |
| 0  1  2  3  4  5 | ~~IIII~~ III  ~~IIII~~ II  ~~IIIIIIII~~  ~~IIII~~ II  ~~IIII~~  III | 8  7  10  7  5  3 |

**The data are then presented in a frequency table**

|  |  |
| --- | --- |
| Number of errors | 0 1 2 3 4 5 |
| Frequency | 8 7 10 7 5 3 |

**Evaluation**

Prepare a frequency table for the data below:

The number of beans in a sample of 30 cocoa pods are as follows

26 32 25 29 30 30

29 28 30 30 26 28

28 27 29 32 25 26

25 26 27 28 32 31

30 31 29 28 28 27

**UNGROUPED DATA**

Data are said to be ungroup if and only, each of the quantity/variable. Can stand as a unit without any combination.The variables are not large,therefore,to prepare the frequency table will be very easy.

Tabular Presentation of ungrouped data:

The table used in the presentation of statistical data is known as Frequency distribution table and consist of atleast three Column and in some cases, extra column may be required. The basic column required are listed and defined bellow:

* Variable Column (First column):It is mostly denoted with x.This column contains the item collected or required.such as Height,Ages,Weights,Test and Examination Scores of students. The variable column can also contain the population of a country.
* Tally Column(Second Column) : The tally is the use of strokes to represent an item collected,it makes the counting and the recording of the Frequency very easy.Tally is always in a bundle of five strokes.
* Frequency Column (Third Column):This is denoted with f,It is defined as the number of times an item occur.The use of tally can facilitate the accurate record of the frequency.

Example 1: The weight of some students in SSS1 class in Good Shepherd Schools are as listed below: 55,57,57,59,50,55,61,61,55,57, 57,57,59,55,55,50,55,55,50,57

57,57,59,50,50,55,57,57,55,5050,50,55,57,61,57,59,61,59,55

, 61,55,57,55,50,61,59,55,57,61

Prepare the frequency distribution table for the information.

Solution:

|  |  |  |
| --- | --- | --- |
| Weight (x) | **Tally** | **Frequency(f)** |
| 50 | **~~I III~~III** | **8** |
| 55 | **~~I II II I II~~I** | **11** |
| 57 | **~~I II II I II~~I** | **11** |
| 59 | **~~I III~~II** | **7** |
| 61 | **~~I III~~** | **5** |

The above frequency table is prepared for the ungrouped data,as each weight recorded stands as a unit.

Example 2:Prepare a frequency table,showing the percentage scrores of each of the scores obtained in a mathematics test of students in SSS 1 Shephered.The scores are:

**9, 7 ,8, 5, 4, 6, 5, 8, 6, 6, 10, 5, 6, 7, 6, 6, 5, 5, 7, 8, 10, 2, 8, 6, 6**

**2, 6, 4, 5, 5, 8, 8, 6, 6, 5, 9, 9, 2, 7, 4, 6, 3, 5, 6, 2, 7, 2, 9, 8, 10**

**Solution:**

|  |  |  |  |
| --- | --- | --- | --- |
| **MARKS** | **TALLY** | **FREQUENCY** | **PERCENTAGE%** |
| **2** | **~~I III~~** | **5** | **10** |
| **3** | **I** | **1** | **02** |
| **4** | **I II** | **3** | **06** |
| **5** | **~~I III~~IIII** | **9** | **18** |
| **6** | **~~I II II I II~~III** | **13** | **26** |
| **7** | **~~I III~~** | **5** | **10** |
| **8** | **~~I III~~II** | **7** | **14** |
| **9** | **I III** | **4** | **08** |
| **10** | **I II** | **3** | **06** |

**Calculation of Range, Median and Mode of Ungrouped Data**

**RANGE**

The range of a set of numbers is the difference between the largest and the smallest numbers.

Example: Find the range of the following set of scores: 79, 60, 52, 34, 58, 60.

**Solution**

Arrange the set in rank order: 79, 60, 60, 58, 52, 34

The range is 79 – 34 = 45

**THE MEAN**

There are many kinds of average. T hemean or arithmetic mean, is the most common kind. If there are n numbers in a set, then

Mean = sum of the numbers in the set/ n

**Examples**

1)Calculate the mean of the following set of numbers.

176 174 178 181 174

175 179 180 177 182

**Solution**

Mean = 176 + 174 + 178 + .... + 182/10

= 1776/10

= 177.6

2)Five children have an average age of 7 years 11 months . If the youngest child is not included, the average increares to 8 years 4 months. Find the age of the youngest child.

Solution

Total age of all five children

= 5 x 7 yr 11 mo

= 35 yr 55 mo

= 35 yr + 4 yr 7 mo

= 39 yr 7 mo

Total age of the four older children

= 4 x 8 yr 4 mo

= 32 yr 16 mo

= 32yr + 1 yr 4 mo

= 33 yr 4 mo

Age of youngest child

= 39yr 7 mo – 33 yr 4 mo

= 6 yr 3 mo

**Evaluation**

1. Find x if the mean of the numbers 13, 2x, 0, 5x and 11 is 9. Also find the range of the set of numbers.
2. A mother has seven children. The mean age of the children is 13 years 2 months. If the mother’s age is included, the mean age rises to 17 years 7 months. Calculate the age of mother.

**MEDIAN AND MODE**

**MEDIAN**: If a set of numbers is arranged in order of size, the middle term is called the median. If there is an even number of terms, the median is the arithmetic mean of the two middle terms.

**Examples**

Find the median of a) 15, 11, 8, 21, 17, 3, 8 b) 3.8, 2.1, 4.4, 8.3, 9.2, 5.0.

**Solution**

a)Arrange the numbers in rank order (i.e from highest to lowest).

21, 17, 15, 11, 8, 8, 3

There are seven numbers. The median is the 4th number, 11 .

b)Arrange the numbers from the lowest to highest.

2.1, 3.8, 4.4, 5.0, 8.3, 9.2

There are six numbers. The median is the mean of the 3rd and 4th terms.

Median = (4.4 + 5.0) /2

= 4.7

**MODE:** The mode of a set of numbers is the number which appears most often, i.e. the number with the greatest frequency.

**Example:** Twenty-one students did an experiment to find the melting point of naphthalene. The table below shows their results. What was a) the modal temperature b) the median temperature?

temperature (oC) 78 79 80 81 82 83 90

frequency 1 2 7 5 3 2 1

a)Seven students recorded a temperature of 80oC. This was the most frequent result.

Mode = 80oC

b)There were 21 students. The median is the 11th temperature. If the temperatures were written down in order, there would be one of 78oC, two of 79oC, seven of 80oC, and so on. Since 1 +2 + 7 = 10, the 11th temperature is one of the five 81oCs.

Median = 81o C.

**EVALUATION**

1. For the following set of numbers:

13, 14, 14, 15, 18, 18, 19, 19, 19, 21

a)state the median, b) state the mode, c) calcilate the mean.

**READING ASSIGNMENT**

NGM BK 1 PG 196 – 203 Ex 18d nos 17 - 20

**GENERAL EVALUATION**

**Prepare a frequency table for the following sets of data.**

1)The shoe sizes of a group of 24 children are

8 6 7 5 4 6 5 7

6 5 7 6 8 5 4 6

5 5 6 7 8 8 6 7

2)The ages of 32 students in Class 2 of a Junior Secondary School are

11 12 11 12 12 14 14 13

15 13 12 13 13 13 13 12

14 14 13 15 14 11 12 14

12 15 14 16 14 14 14 15

**WEEKEND ASSIGNMENT**

1. The number of goals scored by a team in nine handball matches are as follows: 3, 5, 7, 7, 8, 8, 8, 11, 15Which of the following statements are true of these scores?a)The mean is greater than the mode.b)The mode and the median are equal.c)The mean, median, and mode are all equal.

**Use the table below to question 2-5**

The table below shows the number of pupils (f) scoring a given mark (x) in attest.

X 2 3 4 5 6 7 8 9 10 11 12

f 3 8 7 10 13 16 15 15 6 2 5

1. Find the mode.a)7 b) 8 c) 9 d) 10
2. Find the median.a) 6 b) 7 c) 8 d) 9
3. Calculate the mean.a) 6.7 b) 6.8 c) 6.9 d) 6.95
4. Find the range.a)10 b) 11 c) 9 d) 12

**THEORY**

1. x, x, x, y represent four numbers. The mean of the numbers is 9,their median is 11. Find y
2. Students at a teacher training college are grouped by age as given in table below.

Age (years) 20 21 22 23 24 25

Frequency 4 5 10 16 12 3

1. Find the modal age.
2. Find the median age.
3. Calculate the mean age of the students.

**WEEK 7**

**REVISION**

**WEEK 8 DATE..................................................**

**TOPIC:Collection, Tabulation and Presentation of Grouped Data**

**GROUPED DATA:**Data are said to grouped,if two or more values are put together as one under one cell.In this case the variable column(first column) is known as Class interval,there are other parameters associated with grouped data and they are as listed below

**Class Interval**: 1-10, 11-20, 21-30………..

**Class Boundaries**:It is the possible extra length,created for the class interval:

0.5-10.5, 10.5-20.5, 20.5-30.5………

**Class mark/Mid mark(x)**:1+10,11+20,21+30…………

2 2 2

Therefore,class marks are:5.5, 15.5, 25.5………

This is also known as class size,It is the difference between the UPPER class interval and the LOWER class interval.

When a given data has a large number of values, it is cumbersome to prepare its frequency table. For example, the table below show scores out of 60 obtained by SS 3 students in a test:

30 12 58 23 25 14 8 20 5 35

27 38 53 32 36 15 14 37 13 50

31 19 34 51 25 30 39 10 42 33

55 16 45 18 56

If the above data is organised in a frequency table as in example 22.1, the table will show 35 differentsocres, each of them occurring 1 time except 25 and 14 which occur 2 times. So the frequency table and the bar chart of this data would not be very useful because the result would show no pattern. To overcome this problem, we can organise the data into **groups or classes**. Before we group the data, we consider the range first which is 5 – 58. With this range the data can be grouped into class intervals such as: 1 – 10, 11 – 20, 21 – 30, 31 – 40, 41 – 50, 51 – 60.

When a data is divided into groups it is called a **grouped frequency distribution**. The groups or classes into which the data are arranged are called **class intervals**. The first class interval is 1 – 10, the second class interval is 11 – 20, etc. since each class interval covers 10 possible marks, we say that the class width is 10 marks. The frequency distribution table for this data is shown in table (a) below:

**Table (a)**

|  |  |  |
| --- | --- | --- |
| **Scores (Class interval)** | **Tally** | **No of students (Frequency)** |
| 1 – 10 | III | 3 |
| 11 – 20 | ~~IIII~~IIII | 9 |
| 21 – 30 | ~~IIII~~ I | 6 |
| 31 – 40 | ~~IIII~~IIII | 9 |
| 41 – 50 | III | 3 |
| 51 – 60 | IIII | 5 |
|  | **Total** | **35** |

Note that in a grouped discrete data, the data are usually whole numbers. For this reason, the class intervals do not overlap because each mark can only appear in each interval. So it is wrong to use intervals such as 1 – 10, 10 – 20, 20 – 30 because 10 appears in both the 1st and the 2nd class intervals and 20 in the 2nd and 3rd class intervals. However, when we group discrete data, we are actually treating it as though it was continuous.

**Grouped Continuous data**

When dealing with continuous data, the variable is measured on a continuous scale. It is important to know where to place values that appear to be between groups or classes. For example, the frequency distribution in table (b) below shows the weight of 50 students to the nearest kg.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Weight** | 40 – 44 | 45 – 49 | 50 – 54 | 55 – 59 | 60 – 64 |
| **Frequency** | 5 | 8 | 15 | 12 | 10 |

This data is continuous, so we need to find the class boundaries (or the class mid value) and the width of class intervals.

**Class limits**

The end numbers of each class interval are known as the class limits of that interval. In the table above the 1stclass is 40 – 44. These figures give the class interval.The end numbers 40 and 44 are called the class limits. 40 is the lower class limit and 44 is the upper class limit.

Similarly, for the 2nd class the class interval is 45 – 49. 45 is the lower class limit and 49 is the upper class limit.

**Class boundaries**

When a data is given to the nearest unit, the class interval 40 – 44 theoretically includes all weights from 39.5kg to 44.5kg. we say that the 1st class interval has class boundaries of 39.5kg and 44.5kg.

39.5kg is the lower class boundary and 44.5kg is the upper class boundary.

Each class boundary can be found by adding the upper limit of one class to the lower limit of the next class and dividing the result by 2.

**For the 2nd class**

Lower class boundary =

Upper class boundary

**For the 3rd class**

Lowe class boundary = 49.5kg

Upper class boundary =

and so on.

**Notice**that in this case for each class interval:

* + 1. To obtain the lower class boundary, subtract 0.5 from the lower class limit.
    2. To obtain the upper class boundary add 0.5 to the upper class limit.

**Class width of a class interval**

Theclass width is also called the class size.

Class width = upper class boundary – lower class boundary

For example, for 1st interval,

Class width = 44.5 – 39.3 = 5

For 2nd interval,

Class width = 49.5 – 44.5 = 5

**Class mid-value (class mark)**

The mid-value of a class is known as the class mark. For a given class interval, the class mid-value is exactly half way between the lower limit and the upper limit.

Or class mid-value

=

Forexample, the class mid-value of the 1st interval =

2ndinterval =, etc.

**EVALUATION**

The weights of some students in a class of group of students to the nearest kg are given below:

65, 70, 60, 46, 51, 55, 59, 63, 68, 53, 47, 53, 72, 53, 67, 62, 64, 70, 57, 56

73, 56, 48, 51, 58, 63, 65, 62, 49, 64, 53, 59, 63, 50, 48, 72, 67, 56, 61, 64

With the class intervals 45-49,50-54,55-59 etc,Showing the class boundaries, class marks, tally and the frequencies, in that order.

**GENERAL EVALUATION**

1. In a particular company, the amount of money to the nearest naira spent by workers on transportation to work daily were recorded as follows:

30 60 120 200 80 90 74 240 236 125 40 75 110 120

220 130 180 60 90 112 150 210 245 135 140 80 100 125

215 240 50 60 180 190 180 148 120 88 138 195 248 130

140 150 154 208 225 65 145

1. Construct a grouped frequency distribution of this data taking equal intervals 0 – 49, 50 – 99, …
2. Find the class boundaries and the class marks of each class interval
3. Use the frequency distribution to find the class interval with the highest frequency
4. State the width of each class interval

**READING ASSIGNMENT**

Essential Mathematics for Senior Secondary Schools 1 page 348 - 350

**WEEKEND ASSIGNMENT**

The weights to the nearestkg of a group of people are shown in the table below.

|  |  |  |  |
| --- | --- | --- | --- |
| **Weight (kg)** | **Frequency** | **Class boundaries** | **Class marks** |
| 31 – 40 | 5 | 30.5 – 40.5 | 35.5 |
| 41 – 50 | 10 | 40.5 – 50.5 | 45.5 |
| 51 – 60 | 20 |  |  |
| 61 – 70 | 25 |  |  |
| 71 – 80 | 12 |  |  |
| 81 – 90 | 15 |  |  |
| 91 – 100 | 4 |  |  |

Use the table to answer question 1 –5

1. Copy and complete the table.
2. What is the modal class? A. 51 – 60 B. 61 – 70 C. 71 – 80 D. 31 – 40

**Find the class widths of the last two class intervals**

1. A. 90.5 – 80.5 = 10 B. 50.5 – 40.5 = 10 C. 41 – 40 = 1 D. 70 – 51 = 19
2. A. 90.5 – 70.5 = 20 B. 80.5 – 70.5 – 10 C. 100.5 – 90.5 = 10 D. 50.5 – 20.5 = 30
3. Estimate the mode of the frequency distribution

**THEORY**

1. (a) Copy and complete the table below for the length of leaves given to the nearest cm.

|  |  |  |  |
| --- | --- | --- | --- |
| **Length (cm)** | **Frequency** | **Class boundaries** | **Class marks** |
| 5.0 – 5.4 | 3 | 4.95 – 5.45 | 5.2 |
| 5.5 – 5.9 | 8 | 5.45 – 5.95 | 5.7 |
| 6.0 – 6.4 | 15 |  |  |
| 6.5 – 6.9 | 20 |  |  |
| 7.0 – 7.4 | 12 |  |  |
| 7.5 – 7.9 | 10 |  |  |
| 8.0 –8.4 | 2 |  |  |

* + 1. Find the class widths of the 1st and 2nd classes.
    2. Estimate the mode of the frequency distribution
    3. Find the median class.

1. The distribution below shows the number of workers in a farm with their daily earnings:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Daily** | 20 | 30 | 40 | 50 | 60 | 70 |
| **Numbers of workers** | 5 | 10 | 20 | 25 | 8 | 2 |

1. How many workers are there in the farm?
2. What is the mode?

**WEEK NINE Date……………………….**

**TOPIC: Calculation of Range, Median and Mode of Grouped data**

**RANGE:** This is defined as the difference between the HIGHEST variable and the LEAST variable.

**Example:** Find the range of the following distribution: 2.2, 2.5, 2.2, 1.6, 1.8, 2.7,and 1.4

**Solution:** Range= Highest score – Lowest score

Highest score = 2.8

Least score = 1.4

Range = 2.8 – 1.4 = 1.4

The above example is ungrouped data; therefore, the range is as simple as that.

To find the range from Grouped, just identify the highest (Upper) class interval and the Least (Lower) Class interval and find the difference.

**Example 1**: find the range of the distribution:

1-10 11-20 21-30 31- 40 and 41- 50

Highest = 50

Least = 1

Range = 50 – 1 = 49

**THE MEAN:** This is also known as Arithmetic mean, it is denoted with the symbol X.Simply put, arithmetic mean is also known as average.

For simple data, Such as: EXAMPLE (1) 2.2, 2.5, 2.2, 1.6, 1.8, 2.7, and 1.4, to calculate the arithmetic mean,the required formula is the same as that of the average: e g

MEAN = SUM OF THE ALL VARIABLES/SCORES

NUMBER VARIABLES/SCORES

2.2 + 2.5 + 2.2 + 1.6 + 1.8 + 2.7 + 1.4 = 14.4 = 2.06

7 7

The basic formular for the calculation of the arithmetic mean is given below:

X = ∑Fx where,∑ (Sigma) means summation.

∑F

Hence,Mean (X) = Sum of the product of the frequency and scores

Sum of the frequencies

**EXAMPLE 2:** The table below gives the scores of a group of students in a mathematics test

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **SCORES** | 2 | 3 | 4 | 5 | 6 | 7 |
| **Number of Students** | 2 | 4 | 7 | 2 | 3 | 2 |

Calculate the mean mark of the distribution:

Solution (Method,1)

Mean = ∑Fx= ( 2X 2) + (3 X 4) + (4 X 7) + ( 6X 3) + ( 7X2)

∑F 2 + 4 + 7 + 2 + 3 + 2

= 4 + 12 + 28 + 18 + 14

20

= 86 = 4.3

20

(Method 2): A simple frequency distribution may be constructed

|  |  |  |
| --- | --- | --- |
| **SCORES** | **FREQUENCY(f)** | **Fx** |
| 2 | 2 | 4 |
| 3 | 4 | 12 |
| 4 | 7 | 28 |
| 5 | 2 | 10 |
| 6 | 3 | 18 |
| 7 | 2 | 14 |
|  | ∑f = 20 | ∑fx= 86 | |

∑fx= 86 and ∑ = 20

therefore,Mean = 86 = 4.3

20

**ARITHMETIC MEAN FROM GROUPED DATA:**

To calculate the arithmetic mean from grouped data, a frequency table is necessary, only the Class intervals, frequencies, class marks(Mid Mark) and fx column is required.

**EXAMPLE 3**:The distributions of the waiting time for some students in a school is given as follows:

**Waiting Time (minuetes) Number of customers**

**1.5 – 1.9 3**

**2.0 – 2.4 10**

**2.5 – 2.9 18**

**3.0 – 3.4 10**

**3.5 – 3.9 7**

**4.0 – 4.4 2**

Calculate the mean time of the distribution:

Solution: Prepare a simple frequency distribution table for a grouped data:

|  |  |  |  |
| --- | --- | --- | --- |
| Time intervals  (Minuetes) | Mid Time (x) | No of Students  Frequencies | Fx |
| 1.5 – 1.9 | 1.7 | 3 | 5.1 |
| 2.0 – 2.4 | 2.2 | 10 | 22.0 |
| 2.5 – 2.9 | 2.7 | 18 | 48.6 |
| 3.0 – 3.4 | 3.2 | 10 | 32.0 |
| 3.5 – 3.9 | 3.7 | 7 | 25.9 |
| 4.0 – 4.4 | 4.2 | 2 | 8.4 |
|  |  | **∑ f = 50** | **∑fx=142.0** |

Mean Time (Average Time) = ∑fx= 142.0 = 2.8 minutes

∑f 50

**THE MODE**

The mode is the variable or score with the highest frequency. The variable with the highest occurrence or which appears most in an event is known as the MODE.

**EXAMPLE:** Determine the modal mark in the distribution table:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Marks | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Frequency | 5 | 3 | 2 | 6 | 5 | 1 | 3 |

**Solution**: Modal mark = 7 with the frequency of 6.

It is possible to record more than one variable as the modal mark.When only one number appears most (as mode) it is said UNIMODAL.When two numbers appears as the mode it is said to be BIMODAL and when more than two numbers appear as mode it is said to be MULTIMODAL.

**THE MEDIAN**

Median is the number(s) which appears at the middle.It is possible for two numbers to appear at the middle,especially when the total variable is even number,in such a case,the average of the two mid numbers,is calculated as the **MEDIAN**.it must be noted that before the median is picked or calculated,the variables or scores must be arranged in an order of magnitude.i.e,ascending or Descending Order of Magnitude.

**EXAMPLE:** Calculate the median of the distribution:

**2, 6, 4, 5, 5, 8, 8, 6, 6, 5, 9, 9, 2, 7, 4, 6, 3, 5, 6, 2, 7, 2, 9, 8, 10,6**

**Steps in** the variables in an order of magnitude

:2,2,2,2,3,4,4,5,5,5,5,6,6,6,6,6,6,7,7,8,8,8,9,9,9,10 **calculating MEDIAN from ungrouped (even) variables**

STEP (i) Rearrange

STEP(ii),Divide total number by 2. i.e,26/2=13.

STEP (iii) Count 13 numbers from both left and right

STEP (iv) subtract one from each, result is 12.Hence 12 numbers are then counted from both left and right as shown below: **2,2,2,2,3,4,4,5,5,5,5,6**, 6,6 ,**6,6,6,7,7,8,8,8,9,9,9,10**

From the above, two numbers are at the centre (6, 6) therefore the average of these numbers is the

median= 6 + 6 = 12 = 6. Therefore,median = 6

2 2

**EXAMPLE: 2**

Find the median of the scores below:

2.0, 1.8, 3.9, 4.5, 2.6, 3.7, 5.0, 2.1 and 3.3

**Solution:**

Rearranging the scores: 1.8, 2.0 ,2.1, 2.6, 3.3, 3.7, 3.9, 4.5, 5.0

There are nine scores in all; 9/2= 4.5

Counting four numbers from both left and right **1.8, 2.0 ,2.1, 2.6,** 3.3, **3.7, 3.9, 4.5, 5.0**

MEDIAN = 3.3

**MEDIAN FROM TABLES:**

EXAMPLE 3: The table shows the marks scored by SSS 1 students in a mathematics test

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| MARK | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| FREQUENCY | 5 | 3 | 2 | 6 | 5 | 1 | 3 |

Find the median

**Make a table as follows:**

**Marks ( x ) Frequency (f)**

4 5

5 3

6 2

7 6

8 5

9 1

10 3

Position of Median = ∑f + 1 = 25 + 1 = 26 = 13

2 2 2

Counting down the frequency column as shown on the above table,the position of the median (i.e,13th position) occurs opposite 7.

Thus the median mark = 7

**EVALUATION:**

The table gives the frequency distribution of marks obtained by a group of students in a test

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Marks | 3 | 4 | 5 | 6 | 7 | 8 |
| Frequency | 5 | X – 1 | x | 9 | 4 | 1 |

If the mean mark is 5 (a) Calculate the value of x

(b)Find the (i) mode (ii) Median (iii) Range of the distribution

**READING ASSIGNMENT**

Essential Mathematics for Senior Secondary Schools 1 pg 336 – 351

**WEEKEND ASSIGNMENTS**

**OBJECTIVES**

* 1. Which of the following is the same as the arithmetic mean of a distribution?A.Mean deviation B. average C. Ordinary mean D. Percentage
  2. A bundle of tally consists of \_\_\_\_\_\_\_\_\_\_\_\_ strokes?A.12 B. 10 C. 5 D. 4
  3. Frequency is defined as the…………………………..A.The number of times a variable occur in a distribution B. The number of bundles in a cell of tallies C. The highest occurrence scores D. The average score
  4. The range of the distribution: -2,3,3,1,1.7,2.4 and 2.6 is \_\_\_\_\_ ? A. 4 B. 0.6 C. 4.6 D. 3.5
  5. `Find the average age of the following distribution:1.23,2.32,1.17,2,3.11,2.11and2.12

**THEORY**

1. A group of students were asked to state their year of birth,the results are as follows

**1990 1992 1990 1989 1991 1990**

**1990 1988 1990 1989 1989 1991**

**1992 1992 1990 1989 1988 1990**

**1991 1991 1990 1988 1992 1991**

**1990 1990 1992 1991**

1. prepare a frequency table for this data
2. which year of birth has this highest frequency
3. what fraction and percentage of the student were born in 1990 and above
4. The height in meters of student in sss1 class in a certain secondary school were given as follows

**1.3 1.3 1.2 1.4 1.2 1.5 1.5 1.4 1.3 1.6**

**1.6 1.5 1.3 1.6 1.3 1.4 1.5 1.3 1.2 1.1**

**1.3 1.2 1.5 1.5 1.4 1.3 1.2 1.4 1.6 1.5**

**1.4 1.5 1.2 1.1 1.6 1.5 1.5 1.5 1.5 1.4**

**1.2 1.3 1.4 1.5 1.4 1.5 1.5 1.4 1.3 1.2**

**1.5 1.5**

1. Prepare a frequency distribution table for this data
2. How many student are in sss1?
3. What is the different between the highest and lowest height in cm?
4. How many student are more than 1.3 m tall?
5. What percentage of the student are 1.3 m tall and less?
6. State whether the data is discrete or continuons

**WEEK TEN Date…………………..**

**TOPIC: Statistical Graphs**

**CONTENTS:**

**Drawing of bar chart, pie-chart and histogram**

**Cumulative frequency curve**

**Reading and drawing inferences from the graph**

Graphical Presentation of data; the diagrammatic representation of collected data is known as the graphical presentation. Statistical data is interpret from graphs, than the use of frequency distribution table, as the graphs give a very clear pictures of data. There are various diagrams or graphs associated with statistics some of these are; BAR CHAT,PIE CHART,HISTOGRAM,CUMMULATVE CURVE(OGIVE),FREQUENCY POLYGON and FREQUENCY CURVE.

**THE BAR CHART**

This is the using of rectangular bars in representing collected data. Each of the bars in the bar chart are of the same width but different heights, the height of which is proportional to the frequency of the distribution. i.e. the higher the frequency, the taller the bars and the lower the frequency the shorter the bar.In between each of the bars are gaps which are also equal in width. It is not necessary for the spaces and the width of each bars to be the same.Bar chart is used to display qualitative and discrete data.The frequencies are recorded along the vertical axis while the variables are recorded along the horizontal axis.

**EXAMPLE:**

The table below shows the number of bottles of soft drinks sold in GODSHEPHRD restaurant on a Thursday. Draw a bar chart to display the information and the modal drink.

|  |  |  |
| --- | --- | --- |
| Type of Soft drink | | No of bottles |
| Coke | | 12 |
| Fanta | | 10 |
| Sprite | | 6 |
| Lemon | | 2 |
| Pepsi | | 8 |
| b Viju milk | 8 | |
| Caprisome | 4 | |

**The bar chart of the number of drinks sold in GOODSHEPHERD restaurant**

14

12

10

8

6

4

2

0

**Coke Fanta Sprite Lemon Pepsi vijuCaprisome**

From the above bar chart, the tallest bar s that of the coke, with frequency of 12.Hence the modal drink is Coke

There are other form of BAR CHART, and these are **compound bar chart** and **Composite bar chart.**

**Compound Bar Chart:** It is used to compare two or more set of information.

**Example 2:** The table below shows how some students are distributed into various campuses in GoodShepherdschool.

Prepare (a) Compound Bar chart and

(b) Composite Bar chart

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CAMPUSES** | **PEACE** | **DELIGENCE** | **SHEPHERD** | **WISDOM** |
| No Of Boys | 20 | 25 | 20 | 20 |
| No of Girls | 15 | 15 | 20 | 25 |

**COMPOUND BAR CHART**

**Girls**

**Boys**

25

20

15

10

5

0

**Peace Deligence Shepherd Wisdom**

**COMPOSITE BAR CHART**  **Boys**

50  **Girls**

45

40

35

30

25

20

15

10

5

0

Peace Diligence Shepherd Wisdom

**PIE CHART**

This is also known as divided Circles. A pie chart is a circle divided into sectors. Each angles in the sector is proportional to the frequencies. The higher the frequency the higher the Sectoral angles and the larger the sector. To prepare a pie chart,a frequency table is necessary, to display the Variables,Frequecies and the Sectoral angles.

Sectoral angles is given by the formula, FREQUECY X 360

SUM OF FREQUECIES

Students must use a pair of compasses and a protractor in constructing a pie chart, free hand sketch must not be used at all, as each Sectoral angles represent a certain angle, therefore,the angle must be measured accurately with a protractor.

**Example 3**In a certain school,the lesson periods for each week are as itemised below:

ENGLISH 10; MATHEMATICS 7; BIOLOGY 3; STATISTICS 4; IGBO 3; OTHERS 9.Draw a pie chart to **illustrate the information.**

**Solution**:

Step 1: Construct a simple frequency table as shown below;

**SUBJECTS NO OF PERIODS (f) SECTORAL ANGLES (Degrees)**

ENGLISH 10 10/36 X 360 = 100

MATHEMATICS 7 7/36 X 360 = 70

BIOLOGY 3 3/36 X 360 = 30

STATISTICS 4 4/ 36 X 360 = 40

IGBO 3 3/ 36 X 360 = 30

OTHERS 4 4/ 36 X 360 = 40

SUM OF (F) = 36

**Step 2**; construct a pie chart using the Sectoral angles above, with protractor

**THE HSTOGRAM**

: Histogram is a statistical diagram, which involves the use of rectangular bars in representing collected data. The bars in Histogram are also of the same width, while the height of each bar is proportional to the frequency. The bars in histogram are not to be spaced at all, like those of bar chart, as mentioned above. Histogram is very similar to bar chart. The Histogram is mostly used for grouped data.

**Example:**

Construct a Histogram for the distribution below:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Class interval** | 1 – 10 | 11 – 20 | 21 – 30 | 31 – 40 | 41 – 50 | 51 – 60 |
| **frequency** | 3 | 9 | 6 | 9 | 3 | 5 |

10

8

6

4

2

0

0.5 10.5 20.5 30.5 40.5 50.5 60.5

**EVALUATION:**

The Table gives the numbers of hours per week allotted to each subject taught at a technical school.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Subject** | Maths | Tech. drawing | Wood-work | Mechanics | Science | Metal-work |
| **Hours/wk** | 5 | 4 | 2 | 3 | 4 | 3 |

1. Represent the information on a pie chart.
2. Draw a bar chart to show the information

**READING ASSIGNMENT**:

From your text book,prepare (i) A composite bar chart

(ii) A compound bar chart.Using any suitable question

**GENERAL EVALUATION**

* + 1. The pie chart represents 24hours in the life of a student

1. What fraction of the time is spend sleeping?
2. What percentage of the time is spend studying
3. If 1hr 20 mins is spent travelling, calculate the value of x.

**WEEKEND ASSIGNMENT**

1. Which of the following is a characteristic of bar chart?(A) The height of each bar is corresponding to the frequency (B) The Variables are respectively proportional to the width of each bar (C) The height depends on the frequency (d) None of the above
2. Calculate the Sectoral angle in a pie chart, with the frequency of 10 and Sum of frequency 36 (A) 100**0** (B) 36**0** (C) 360**0** (D) 72**0**
3. A pie chart is also known as \_\_\_\_\_\_\_\_\_\_\_\_\_ (A) semi circles (B) Divided Circles (C) Circular graph (D) Angle chart
4. Which of the following is not an example of statistical graph? (A) Frequency polygon (B) Frequency curve (C) Ogive (D) Quadratic graph
5. A bundle of tally consists \_\_\_\_\_\_\_\_\_\_\_\_ strokes (A) 4 (B) 5 (c) 6 (D) 12

**THEORY**

1. The number of items produced by a company over a five year period is given below:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **YEAR** | 1978 | 1979 | 1980 | 1981 | 1982 |
| **NUMBER PRODUCED** | 4100 | 2500 | 1500 | 1800 | 9200 |

1. Plot a bar chart for this information
2. What is the average production for the five year period

2. The table below shows how a company’s sales manager spent his annual salary.

FOOD 30%

RENT 18%

CAR MAINTENANCE 25%

SAVINGS 12%

TAXES 5%

OTHERS 10%

1. Represent these information on a pie chart
2. Find his savings at the end of the year, if his annual salary was N60, 000. 00

**WEEK ELEVEN Date……………………..**

**TOPIC: Mean Deviation, Variance and standard Deviation of Grouped Data use in solving practical problems related to real life situations**

**Mean Deviation of Grouped Data**

Example 1

The speeds of 40 cars in a certain road are tabulated as follows:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Speed (km/h) | 50 – 54 | 55 – 59 | 60 – 64 | 65 – 69 | 60 – 74 | 75 – 80 | 80 - 84 |
| Frequency | 5 | 10 | 15 | 12 | 10 | 6 | 2 |

For this distribution, calculate

1. The mean
2. The mean deviation

**Solution**

The complete table of the distribution is shown below.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Class interval** | **Mid – value (xm)** |  |  |  |  |
| 50 – 54 | 52 | 5 | 260 | 13.17 | 65.85 |
| 55 – 59 | 57 | 10 | 570 | 8.17 | 81.5 |
| 60 – 64 | 62 | 15 | 930 | 3.17 | 47.55 |
| 65 – 69 | 67 | 12 | 804 | 1.83 | 21.96 |
| 60 – 74 | 72 | 10 | 720 | 6.83 | 68.3 |
| 75 – 80 | 77 | 6 | 462 | 11.83 | 70.98 |
| 80 – 84 | 82 | 2 | 164 | 16.83 | 33.66 |
| **Total** |  |  |  |  |  |

1. Mean, =

The mean is 65.2km/h to 1 d.p.

1. Mean deviation =

The mean deviation is 6.5km/h

**EVALUATION**

1. Calculate the mean and the mean deviation of the following:
   * + 1. 8, 5, 12, 8, 13, 4, 9, 5, 4, 7
       2. 9.25, 8.04, 12.08, 9.82, 10.05, 2.05, 8.25, 7.64, 7.02, 8.02

**Variance and Standard Deviation of a Grouped Data**

Example 1

The table shows the time to the nearest hours of television watched by a group of students in a week.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Time** | 1 – 5 | 6 – 10 | 11 – 15 | 16 – 20 | 21 – 25 | 26 – 30 | 31 – 35 | 36 – 40 |
| **Frequency** | 2 | 5 | 8 | 10 | 14 | 6 | 4 | 1 |

Calculate

1. The mean
2. The variance
3. The standard deviation

**Solution**

Let xm represents the mid-value (or class mark) of the interval.

1. =

Now subtract 19.8 from each value in the 2nd column to obtain the results in the 5th column. Then complete the other two columns as shown in the table.

1. S2 =

Variance = 64.8h to 3 s.f.

1. S = = 8.047h

Standard deviation is 8.05h to 3 s.f.

**Alternative method**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Interval** |  |  |  |  |  |
| 1 – 5 | 3 | 2 | 6 | 9 | 18 |
| 6 – 10 | 8 | 5 | 40 | 64 | 320 |
| 11 – 15 | 13 | 8 | 104 | 169 | 1352 |
| 16 – 20 | 18 | 10 | 180 | 324 | 3240 |
| 21 – 25 | 23 | 14 | 322 | 529 | 7406 |
| 26 – 30 | 28 | 6 | 168 | 784 | 4704 |
| 31 – 35 | 33 | 4 | 132 | 1089 | 4356 |
| 36 – 40 | 38 | 1 | 38 | 1444 | 1444 |
| **Total** |  |  |  |  |  |

**EVALUATION**

1. Calculate to 1 d.p the mean and standard deviation of the following numbers:
   * 1. 5, 7, 12, 10, 5, 15, 14, 9, 7, 8
     2. 6.5, 8.5, 6.5, 8.4, 6.9, 2.5, 6.2, 5.5

**GENERAL EVALUATION**

1. The table bellows shows the age distributions of a group of people.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Age (yrs)** | 20 – 29 | 30 – 39 | 40 – 49 | 50 – 59 | 60 – 69 | 70 – 79 |
| **Frequency** | 3 | 5 | 10 | 13 | 7 | 2 |

Calculate:

* + 1. The mean age
    2. The variance
    3. The standard deviation

**READING ASSIGNMENT**

Essential Mathematics for Senior Secondary 1 pgs 237 - 248

**WEEKEND ASSIGNMENT**

1. The lowest temperatures of a city in Asia for 10 consecutive days are recorded as: - 5oC, - 6oC, -5oC, 4oC, 0oC, 1oC, 2oC, 3oC, 4oC, 7oC. Find the mean deviation. A. 3.9 B. 4.0 C. 3.6 D. 6.4

Use the table below to answer question 2 to 4

A dice is thrown 100 times. The results are recorded as shown in the following table

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Score** | 1 | 2 | 3 | 4 | 5 | 6 |
| **Frequency** | 15 | 18 | 17 | 21 | 14 | 15 |

Calculate:

1. The mean score A. 4.0 B. 3.5 C. 1.0 D. 5.6
2. The variance A. 2.7 B. 3.7 C. 2.1 D. 1
3. The standard deviation A. 4 B. 5.1 C. 1.6 D. 7
4. Find the variance of x, 2x, 3x, 4x, 5x, 6x, 7x, 8x, 9x and 10x. A. 8.25x29x2 B. 10x2 7.25x2

**THEORY**

1. The shoe sizes of a group of people are as follows:

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Shoe size** | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| **Frequency** | 3 | 8 | 14 | 16 | 20 | 10 | 5 | 3 | 1 |

For this distribution, calculate the mean deviation

1. The table below show the age distributions of a group of people.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Age (yrs)** | 20 – 29 | 30 – 39 | 40 – 49 | 50 – 59 | 60 -69 | 70 – 79 |
| **Frequency** | 3 | 5 | 10 | 13 | 7 | 2 |

Calculate (a) the mean age (b) the variance (c) the standard deviation