

**SS1 Mathematics Lesson Note (Third Term) [year]**

**SCHEME OF WORK FOR SIGMA (THIRD) TERM SS1**

**GENERAL MATHEMATICS**

**WEEK(S) TOPICS**

**1 MENSURATION:** Concept of 3rd shapes cube, cuboids, cylinder, triangular prism, cone, rectangular based pyramid, and total surface area of cone, cylinder and their volumes.

**2 (a) Volumes of frustums of cone, rectangular based pyramids (b) Proofs of angles sum of a triangle (c) the exterior angle.**

**3 Geometrical Construction:** (a) revision of construction of triangle. (b) Drawing and bisecting of line segment. (c) Construction and bisection of  $\angle$ . (d) Construction and bisection of  $\angle$ , etc.

**4 CONSTRUCTION:** (a) construction of quadrilateral polygon (b) construction of equilateral triangle. (c) Locus of moving points including equidistance from two lines, of two points and constant distance from the point.

**5 DEDUCTIVE PROOF:** (a) sum of angles of a triangle (b) Relationship of triangles on a straight line. (c) Revision of angles on parallel line cut by a transversal line. (d) Congruent triangles. (e) Properties of parallelogram and intercept theorem.

**6 STATISTICS:** (a) 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. (b) Different species of animals and types of vehicles etc.

**7 Calculation of Range, median and mode of ungrouped data. (a) Data already collected by the students. (b) Data collected from other statistical records.**

**8 Collection, tabulation and presentation of grouped data (a) Data from height, ages, weights, test and examination scores of students. (b) Population of students from different classes.**

**9 Calculation of range, media and mode of grouped data. (a) Data already collected by students. (b) Other statistical records.**

**10 STATISTICAL GRAPHS:** (a) Drawing of bar chart, pie-chart and histogram. (b) Cumulative frequency curve. (c) Reading and drawing inferences from the graph.

**11 (a) Mean deviation, variance and standard deviation of grouped data. Use in solving practical problems related to real life situations.**

**12&13 Revision/promotion examination.**

## **WEEK 1**

### **MENSURATION**

Mensuration is defined as a branch of Mathematics that deals with measurement, especially the derivation and use of algebraic formulae to measure the areas, volumes and different parameters of geometric. Examples are cylinder, cone, cuboid, rectangular prism, rectangular based pyramid, total surface area of cylinder, cone and their volume.

### **FORMULAE**

**SHAPES AREA SURFACE AREA (C.S.A) TOTAL SURFACE AREA (T.S.A) VOLUME**

**CONE**  $\pi r l + \pi r^2$

**CYLINDER**  $2\pi r h + 2\pi r^2$

**CUBOID**  $2(lw+lh+wh)$   $l.w.h$

**TRIANGULAR PRISM** Sum of areas of all surfaces Area of cross section x height

**RECTANGULAR PYRAMID** Sum of all four triangular faces + base area  $\times$  base area  $\times$  height

**CUBE**  $6$

### **IDENTIFICATION OF SHAPES**

### **SURFACE AREA AND VOLUME OF SOLID SHAPE**

### **EXAMPLE**

The base radius and height of a right circular cone is 7 cm and 24 cm. Find its curved surface area, total surface area and volume.

**SOLUTION:**

$r = 7$  cm and  $h = 24$  cm. So, slant height  $l = 25$

Curved surface area =  $\pi r l = \frac{22}{7} \times 7 \times 24$  cm<sup>2</sup> = 550 cm<sup>2</sup>

Total surface area =  $\pi r l + \pi r^2 = (550 + \frac{22}{7} \times 49)$  cm<sup>2</sup> = (550 + 154) cm<sup>2</sup> = 704 cm<sup>2</sup>

Volume =  $\frac{1}{3} \pi r^2 h = \frac{1}{3} \times \frac{22}{7} \times 49 \times 24$  cm<sup>3</sup> = 1232 cm<sup>3</sup>

**EXAMPLE**

A conical tent is 6 m high and its base radius is 8 m. Find the cost of the canvas required to make the tent at the rate of ₹ 120 per m<sup>2</sup> (Use  $\pi = 3.14$ )

**Solution:**

Let the slant height of the tent be  $x$  metres.

By Pythagoras theorem,

=

$x^2 = 6^2 + 8^2$

$x = 10$  m.

Thus, slant height of the tent is 10 m.

Curved surface area =  $\pi r l = 3.14 \times 8 \times 10$  cm<sup>2</sup> = 251.2 m<sup>2</sup>

The material required =  $251.2 \times 120 = 30144$

The measure of the space region enclosed by a solid figure is called its volume. •

## MENSURATION SURFACE AREAS AND VOLUMES OF SOLID FIGURES

**Practice questions**

(i) Surface area of cylinder open at one end = \_\_\_\_\_, where  $r$  and  $h$  are the radius and height of the cylinder.

(ii) Volume of the cylinder of radius  $r$  and height  $h$  = \_\_\_\_\_

(iii) Curved surface area of cone = \_\_\_\_\_, where  $r$  and  $l$  are respectively the \_\_\_\_\_ and \_\_\_\_\_ of the cone.

(iv) Surface area of a sphere of radius  $r$  = \_\_\_\_\_

(v) Volume of a hemisphere of radius  $r$  = \_\_\_\_\_ 2. Choose the correct answer from the given four options:

(vi) The edge of a cube whose volume is equal to the volume of a cuboid of dimensions  $63\text{ cm} \times 56\text{ cm} \times 21\text{ cm}$  is

(A) 21 cm (B) 28 cm (C) 36 cm (D) 42 cm

(vii) If radius of a sphere is doubled, then its volume will become how many times of the original volume? (A) 2 times (B) 3 times (C) 4 times (D) 8 times

(viii) Volume of a cylinder of the same base radius and the same height as that of a cone is

(A) the same as that of the cone (B) 2 times the volume of the cone (C) 3 times the volume of the cone (D) 3 times the volume of the cone.

(ix) If the surface area of a cube is  $96\text{ cm}^2$ , then find its volume

(x) Find the surface area and volume of a cuboid of length 3m, breadth 2.5m and height 1.5 m.

(xi) Find the surface area and volume of a cube of edge 1.6 cm.

(xii) Find the length of the diagonal of a cuboid of dimensions  $6\text{ cm} \times 8\text{ cm} \times 10\text{ cm}$ .

(xiii) Find the length of the diagonal of a cube of edge 8 cm.

(xiv) Find the total surface area of a hollow cylindrical pipe open at the ends if its height is 10 cm, external diameter 10 cm and thickness 12 cm (use  $\pi = 3.14$ ).

(xv) (i) Find the slant height of a cone whose volume is  $12936\text{ cm}^3$  and radius of the base is 21 cm. (ii) find its total surface area.

(xvi) A well of radius 5.6 m and depth 20 m is dug in a rectangular field of dimensions  $150\text{ m} \times 70\text{ m}$  and the earth dug out from it is evenly spread on the remaining part of the field. Find the height by which the field is raised.

(xvii) Find the radius and surface area of a sphere whose volume is  $606.375\text{ m}^3$

## WEEK 2

### MENSURATION: VOLUMES OF CONES AND PYRAMIDS

#### FRUSTUM

A conical frustum is a truncated cone. This solid geometrical shape is obtained by slicing the top off of a cone leaving a circular top. The resulting shape resembles a cylinder, except the bottom is wider than the top.

You can compute the volume and surface area of a conical frustum from its height, bottom radius, and top radius. The calculator below will compute the surface area and volume if you input values for the height and radii. You can also apply the formulas described below.

#### VOLUME OF A CONICAL FRUSTUM

Call the height of the frustum  $H$ , the top radius  $A$ , and the bottom radius  $B$ . The volume of the solid is given by the equation

$$\text{Volume} = \left(\frac{\pi}{3}\right)H(A^2 + AB + B^2).$$

Note:  $\pi$  is the mathematical constant 3.14159265358...

#### SURFACE AREA OF A CONICAL FRUSTUM

The surface area formula excluding both bases is

$$\text{Surface Area} = \pi(A + B)\sqrt{(B - A)^2 + H^2}.$$

The formula for its total surface area (including the bases) is

$$\text{Surface Area} = (A + B)\sqrt{(B-A)^2 + H^2} + \pi A + \pi B$$

**Example**

Suppose a conical frustum is 20 cm tall with a top radius of 5 cm and a bottom radius of 10 cm. So we have  $H = 20$ ,  $A = 5$ , and  $B = 10$ . Find the volume?

$$\text{Volume} = \frac{\pi}{3}(20)(5^2 + (5)(10) + 10^2) = 3,665$$

The surface area (excluding the bases) is

$$= (5+10)\sqrt{(10-5)^2 + 20^2} = 971 \text{ cm}^2$$

## PYRAMIDS

When we think of pyramids we think of the Great Pyramids of Egypt.

They are actually Square Pyramids, because their base is a Square.

Parts of a Pyramid

A pyramid is made by connecting a base to an apex

Types of Pyramids

There are many types of Pyramids, and they are named after the shape of their base.

Pyramid Base

Triangular

Pyramid: Details >>

Square

Pyramid: Details >>

Pentagonal

Pyramid:

Details >>

Volume Of A Pyramid

### The Volume of a Pyramid

- $\frac{1}{3} \times [\text{Base Area}] \times \text{Height}$

### The Surface Area of a Pyramid

When all side faces are the same:

- $[\text{Base Area}] + \frac{1}{2} \times \text{Perimeter} \times [\text{Slant Length}]$

When side faces are different:

- $[\text{Base Area}] + [\text{Lateral Area}]$

Notes: The Surface Area has two parts: the area of the base (the Base Area), and the area of the side faces (the Lateral Area).

For Base Area :

It depends on the shape, there are different formulas for triangle, square, etc.

For Lateral Area :

When all the side faces are the same:

- Multiply the perimeter by the "slant length" and divide by 2. This is because the side faces are always triangles and the triangle formula is "base times height divided by 2"

But when the side faces are different (such as an "irregular" pyramid) we must add up the area of each triangle to find the total lateral area.

### EXAMPLE

The diagram below shows a pyramid whose base is a regular pentagon of area 42 cm<sup>2</sup> and whose height is 7 cm

What is the volume of the pyramid?

### SOLUTION

Volume =  $\frac{1}{3} \times \text{base area} \times \text{height} = \frac{1}{3} \times 42 \times 7 = 98$ .

### EXAMPLE

The diagram shows a square-based pyramid with base lengths 6 in and height 8 in

What is the volume of the pyramid?

**SOLUTION**

Volume =  $\frac{1}{3}$  x square base area x height.

$$= \frac{1}{3} \times 6 \times 6 \times 8$$

$$= 12 \times 8 = 96.$$

The diagram shows a rectangular-based pyramid with base length 15 cm and width 8cm. The height of the pyramid is 20 cm

What is the volume of the pyramid?

**SOLUTION**

$$\text{VOLUME} = \frac{1}{3} \times \text{area of rectangle} \times \text{height} = \frac{1}{3} \times 15\text{cm} \times 8\text{cm} \times 20\text{cm} = 5\text{cm} \times 8\text{cm} \times 20\text{cm} = 800\text{c.}$$

**SURFACE AREA OF A PYRAMID**

**EXAMPLE**

The diagram shows a rectangular-based pyramid with base length 15 cm and width 8cm. The height of the pyramid is 20 cm

What is the volume of the pyramid?

**SOLUTION**

We will use the formula

$$\text{Surface Area of a Pyramid} = \frac{1}{2} \times \text{Perimeter} \times [\text{Side Length}] + [\text{Base Area}]$$

First find the Perimeter:

$$\text{Perimeter} = 4 \times 10 \text{ in} = 40 \text{ in}$$

Now find the Base Area:

$$\text{Base Area} = 10 \text{ in} \times 10 \text{ in} = 100 \text{ in}^2$$

Next find the side length:

If V is the vertex of the pyramid, O is the center point of the base ABCD and M is the midpoint of AB, then triangle VOM is a right triangle with base 5 in and height 12 in

Therefore we can use Pythagoras' Theorem in triangle VOM:

$$l^2 = 5^2 + 12^2 = 25 + 144 = 169$$

$$\Rightarrow l = \sqrt{169} = 13$$

Now substitute into the formula

Surface Area of a Pyramid =  $\frac{1}{2} \times \text{Perimeter} \times [\text{Side Length}] + [\text{Base Area}]$

$$= \frac{1}{2} \times 40 \text{ in} \times [13 \text{ in}] + [100 \text{ in}^2]$$

$$= 260 \text{ in}^2 + 100 \text{ in}^2 = 360.$$

#### EXAMPLE

The diagram shows a pyramid with vertex V and a rectangular base ABCD. M is the midpoint of AB, N is the midpoint of BC and O is the point at the center of the base.

$$AB = 10 \text{ ft}$$

$$BC = 18 \text{ ft}$$

$$VO = 12 \text{ ft}$$

$$VM = 15 \text{ ft}$$

$$VN = 13 \text{ ft}$$

What is the total surface area of the pyramid?

Solution

The surface area consists of one rectangle (ABCD) and four triangles (VAB, VBC, VCD and VDA)

**Area of the base ABCD =  $18 \text{ ft} \times 10 \text{ ft} = 180 \text{ ft}^2$**

**Area of triangle VAB =  $\frac{1}{2} \times 10 \text{ ft} \times 15 \text{ ft} = 75 \text{ ft}^2$**

**Area of triangle VBC =  $\frac{1}{2} \times 18 \text{ ft} \times 13 \text{ ft} = 117 \text{ ft}^2$**

**Area of triangle VCD =  $\frac{1}{2} \times 10 \text{ ft} \times 15 \text{ ft} = 75 \text{ ft}^2$**

**Area of triangle VDA =  $\frac{1}{2} \times 18 \text{ ft} \times 13 \text{ ft} = 117 \text{ ft}^2$**

**Therefore total surface area**

**=  $180 \text{ ft}^2 + 75 \text{ ft}^2 + 117 \text{ ft}^2 + 75 \text{ ft}^2 + 117 \text{ ft}^2$**

**=  $564 \text{ ft}^2$**

**ASSESSMENT: Solve the following questions given below from New Concept Mathematics for Senior Secondary School, SS1, Chapter 18:**

**Exercise 18.1, pages 246-247, questions 1 -10,**

**Exercise 18.2, page 250, questions 1 -10,**

**Exercise 18.3, pages 252-253, questions 1 -10,**

**Exercise 18.4, pages 255-256, questions 1 -10,**

**WEEK 3**

**CONSTRUCTION**

**The above diagram is the construction of angle**

**BISECTING A LINE INTO TWO.**

**PROTRACTOR (MEASURING INSTRUMENT).**

**CONSTRUCTION INSTRUMENT**

**CONSTRUCTION OF ANGLE**

**BISECTION OF LINE SEGMENT AND ANGLES**

**CONSTRUCTION OF AND .**

**ASSESSMENT:** Using a ruler and a pair of compasses only , construct the following angle

, , , , , and .

**ASSESSMENT:** Solve the following questions given below from New Concept Mathematics for Senior Secondary School, SS1, Chapter 1:

Exercise 11.1, page 145, questions 1-8,

#### **WEEK 4**

#### **CONSTRUCTION (BISECTION, QUADRILATERAL AND LOCUS OF POINTS)**

#### **BISECTION OF ANGLES ( INSCRIBE )**

Is the process of dividing the angle into two equal parts .

#### **EXAMPLE**

Using a ruler and a pair of compass only , construct triangle DEF, with  $DFE = 60^\circ$ ,  $DF = 6\text{cm}$  and  $DE = 8.2\text{cm}$  . (a) Measure  $\angle D$  (b) bisect  $\angle D$ ,  $\angle F$  and  $\angle E$  to meet at point P as Centre . (c) Inscribe a circle touching the three edges of the triangle.

#### **SOLUTION**

**ASSESSMENT:** Using a ruler and a pair of compasses only , construct the following :

Exercise 11.2, pages 146-147, questions 1-10,

Exercise 11.3, pages 146-147, questions 1 -10,

Exercise 12.1, pages 153-155, questions 1-9,

Exercise 12.2, pages 153-155, questions 1 -10.

**WEEK 5**

**DEDUCTIVE PROOF (SUM OF ANGLE) AND PROPERTIES OF PARALLELOGRAM**

**SUM OF THE INTERIOR ANGLE OF A TRIANGLE ( )**

335x237 images.tutorvista.com

237x99 www.mathsisfun.com

183x99 www.sailingissues.com

162x117 demonstrations.wolfram.com

631x859 www.cs.bham.ac.uk

369x257 www.mathopenref.com

284x245 images.tutorvista.com ALITER

**GIVEN:** any triangle ABC

**PROVE:** = (2 RIGHT ANGLE) .

**CONSTRUCTION:** produce to meet point x and draw parralel to .

**POOF:**

(Alternate angles)

(Corresponding angles)

C + , BX is a straight line angle

C + (sum of interior angles)

AB +

**SOLUTION**

$(2x + 1 + (5x + 7) + (2x + 15) = 180$  (sum of interior angles)

$2x + 5x + 2x + 1 + 7 + 15 =$

$9x + 9 =$

$9x = 180 - 9 \quad x =$

**Then:**

$$(2x + 1 = 2(1) + 1 =$$

$$(2x + 15 = [2 (19) + 15 =$$

## PARALLELOGRAM

### Properties of Parallelograms: Sides and Angles

A parallelogram is a type of quadrilateral whose pairs of opposite sides are parallel.

Quadrilateral ABCD is a parallelogram because  $AB \parallel DC$  and  $AD \parallel BC$ .

Although the defining characteristics of parallelograms are their pairs of parallel opposite sides, there are other ways we can determine whether a quadrilateral is a parallelogram. We will use these properties in our two-column geometric proofs to help us deduce helpful information.

If a quadrilateral is a parallelogram, then.

- (1) its opposite sides are congruent,
- (2) its opposite angles are congruent, and
- (2) its consecutive angles are supplementary.

Another important property worth noticing about parallelograms is that if one angle of the parallelogram is a right angle, then they all are right angles. Why is this property true? Let's examine this situation closely. Consider the figure below.

Given that  $\angle J$  is a right angle, we can also determine that  $\angle L$  is a right angle since the opposite sides of parallelograms are congruent. Together, the sum of the measure of those angles is 180 because

We also know that the remaining angles must be congruent because they are also opposite angles. By the Polygon Interior Angles Sum Theorem, we know that all quadrilaterals have angle measures that add up to 360. Since  $\angle J$  and  $\angle L$  sum up to 180, we know that the sum of  $\angle K$  and  $\angle M$  will also be 180: Since  $\angle K$  and  $\angle M$  are congruent, we can define their measures with the same variable,  $x$ . So we have

Therefore, we know that  $\angle K$  and  $\angle M$  are both right angles. Our final illustration is shown below.

**ASSESSMENT:** Solve the following questions given below from New Concept Mathematics for Senior Secondary School, SS1, Chapter 18:

Exercise 13.1, pages 159-160, questions 1-10,

Exercise 13.2, page 161-162, questions 1-7,

Exercise 13.3, pages 163-164, questions 1-9,

Exercise 13.4, pages 167-168, questions 1 -10,

Exercise 13.5, pages 169-170, questions 1-10,

## WEEK 6

### STATISTICS (COLLECTION, TABULATION AND PRESENTATION OF DATA)

**STATISTICS:** is the gathering, collection, organizing, analyzing and interpretation of numerical data or information.

**DISCRETE DATA:** these are data that can be obtained by counting. i.e. cars , houses , books , tables etc.

**CONTINUOUS DATA:** These are data that can be measured. i.e. length , height , volume etc.

**GRAPHICAL:** These are data that are collected and represented in pictorial, chart or diagrammatical form. i.e. pie chart , bar chart , histogram , pictogram etc.

**CHART:** A chart is a graphical representation of data in symbolic form. i.e. bar chart line chart , pie chart etc.

**FREQUENCY POLYGON:** A frequency polygon is used to display information or data in place of histogram or as a alternative diagram to histogram.

### COLLECTION AND PRESENTATION OF DATA

#### EXAMPLE

In a game of dice, a die was thrown several times; the result of the outcome is shown below :

2, 3, 4, 4, 2, 1, 3, 2, 6, 5, 3, 2, 1, 1,

2, 5, 2, 1, 4, 4, 6, 5, 6, 1, 6, 5, 4, 5,

4, 3, 6, 5, 5, 3, 5, 2, 1, 4, 5, 2, 4, 5,

4, 6, 3, 1, 5, 6, 6, 5.

(a) Prepare a frequency table for the distribution.

(b) How many throws were made altogether during the game.

(c) Which throw has the highest number of throws?

(d) State whether the data is discrete or continuous.

**SOLUTION**

(a) FREQUENCY TABLE

SCORES TALLY MARKS NO. OF OUTCOME

1 1111 11 7

2 1111 111 8

3 1111 1 6

4 1111 1111 9

5 1111 1111 11 12

6 1111 111 8

(b) The number of throws that were made is 50 throws.

(c) The throw with the highest number of throws is 5

(d) The data is discrete.

**REPRESENTATION OF DATA/INFORMATION**

**BAR CHART:** Is a rectangular bars of the same width with a corresponding frequency.

**EXAMPLE**

The holiday destinations of 100 candidates were as follows:

**DESTINATION UK KENYA USA FRANCE THAILAND**

**1. OF CAND. 30 15 25 20 10**

**Represent the information above by means of : (a) bar chart (b) histogram (c) pie chart**

**SOLUTION**

**A BAR CHART SHOWING THE DESTINATION OF CANDIDATES**

**A PIE CHART SHOWING THE % OF DESTINATIONS OF CANDIDATES**

**NOTE: Before drawing the pie chart the following table process must be observed.**

**DESTINATION NO. OF CANDIDATES SECTORIAL ANGLES**

**UK 30 =**

**KENYA 15**

**USA 25**

**FRANCE 20**

**THAILAND 10**

**HISTOGRAM OF DESTINATIONS OF CANDIDATES**

**ASSESSMENT: The following table shows the frequency distribution for the height of 60 people to the nearest cm.**

**HEIGHT(CM) 120 – 129 130 – 139 140 – 149 150 – 159 160 – 169 170 – 179**

**FREQUENCY 5 8 6 11 20 10**

**Illustrate the information in the following:**

**i.(a) Bar chart (b) pie chart (c) histogram**

**ii.Determine the modal height from your histogram.**

**BAR CHART:** Is a rectangular bars of the same width with a corresponding frequency.

**EXAMPLE**

The holiday destinations of 100 candidates were as follows:

**DESTINATION UK KENYA USA FRANCE THAILAND**

**1. OF CAND. 30 15 25 20 10**

Represent the information above by means of : (a) bar chart (b) histogram (c) pie chart

**SOLUTION**

**A BAR CHART SHOWING THE DESTINATION OF CANDIDATES**

**A PIE CHART SHOWING THE % OF DESTINATIONS OF CANDIDATES**

**NOTE:** Before drawing the pie chart the following table process must be observed.

**DESTINATION NO. OF CANDIDATES SECTORIAL ANGLES**

**UK 30 =**

**KENYA 15**

**USA 25**

**FRANCE 20**

**THAILAND 10**

**HISTOGRAM OF DESTINATIONS OF CANDIDATES**

**ASSESSMENT:** The following table shows the frequency distribution for the height of 60 people to the nearest cm.

**HEIGHT(CM) 120 – 129 130 – 139 140 – 149 150 – 159 160 – 169 170 – 179**

**FREQUENCY 5 8 6 11 20 10**

Illustrate the information in the following:

Pie chart , bar chart , histogram and frequency polygon.

**WEEK 7**

## **CALCULATION OF RANGE, MEDIAN, AND MODE OF UNGROUPED DATA**

**RANGE:** is the highest value minus lowest value. i.e.  $H - L$

**MEDIAN:** this is the middle number of a given distribution when arranged in order.

**MODE:** this is the number that occurred most frequent in a given distribution.

**UNGROUPED DATA:** These are data that are collected raw and treated as individual entity.

### **EXAMPLE**

A dice is thrown 14 times and the scores were:

1, 6, 6, 4, 3, 5, , 5, 2, 4, 6, 3, 2, 1, 4.

Find the: (a) range (b) median score (c) mode score.

### **SOLUTION**

Range = Highest score – Lowest score

$$= 6 - 1 = 5$$

Median score = 1, 1, 2, 2, 3, 3, | 4, 4, | 4, 5, 5, 6, 6, 6 (arrange in order)

$$= =$$

Median = 4

Mode = 4 and 6 ( bi – modal )

### **EXAMPLE**

The table below shows the shoe size of a group of boys in ss1 Elias International School.

SHOE SIZE 9 10 11 12

FREQUENCY 4 5 7 2

Find the: (a) mode (b) median (c) range

### **SOLUTION**

Mode is 11 because it appears 7 times.

Median =

$$+ 1 = 4 + 5 + 7 + 2 + 1 = 19$$

$$19 \div 2 = 9.5\text{th term}$$

Median = =

Median = 10.5

Range =  $12 - 9 = 3$

**EXAMPLE**

Find the mode, median, and range of 50%, 55%, 60%, 70%, 65%.

**SOLUTION**

Mode = no mode

Median = 50%, 55%, | 60%, | 65%, 70% = 60%

Range =  $70\% - 50\% = 20\%$

**ASSESSMENT:** find the mode, median and range of the following:

1. , , , , , , , .

2. Dice was thrown many times. The table is given below showing the number of the dice that appear.

Nos. on the dice 1 2 3. 4. 5. 6.

Frequency 4 6 8 7. 3 2

Find the (a) mode (b) median (c) range.

3. The table below shows the marks obtained in a Mathematics test by sss1 students.

MARKS 5 6 7 8 9 10

FREQUENCY 2 3 5 7 4 2

Find the : (a) Modal mark (b) range (c) median mark.

4. OLUCHI did 10 tests in English dictation and her marks were as follows:

70, 50, 60, 75, 30, 65, 60, 40, 78, 80 .

(a) Find her range.

(b) Find her median mark.

(c) Find her modal mark

## WEEK 8

### STATISTICS (COLLECTION, TABULATION AND PRESENTATION OF GROUPED DATA)

**GROUPED DATA:** Grouped data are number of items ,things placed together to form an entity.

#### EXAMPLE

The following data gives the lengths , in cm of 30 pieces of iron rods:

45, 55, 65, 60, 61, 68, 59, 54, 64, 76, 50, 68, 72, 68, 80, 67, 70, 62, 79, 67, 64, 63, 71, 59, 64, 53, 57, 74, 55, 57 .

(a)Using a class interval of 45 – 49 , 50 – 54 , 55 – 59,...., construct a frequency table of the distribution .

(b)Draw a histogram for the distribution .

(c)Find the modal class .

(d)Construct a frequency polygon

#### SOLUTION

(a)FREQUENCY TABLE

CLASS INTERVALS FREQUENCY TALLY CLASS BOUNDARY

45 – 49 1 1 44.5 – 49.5

50 – 54 3 III 49.5 – 54.5

55 – 59 6 IIII I 54.5 – 59.5

60 – 64 7 IIII II 59.5 – 64.5

65 – 69 6 IIII I 64.5 – 69.5

70 – 74 4 IIII 69.5 – 74.5

75 – 79 2 II 74.5 - 79.5

80 – 84 1 I 79.5 -84.5

(b)HISTOGRAM

( c ) Modal class in the iron rod = 62 i.e. 59.5 – 64.5

(c)FREQUENCY POLYGON

**ASSESSMENT:** The marks scored by 50 students in a geography examination are as follows::

60, 54, 40, 67, 53, 73, 37, 55, 62, 43, 44, 69, 39,  
32, 45, 58, 48, 67, 39, 51, 46, 59, 40, 52, 61, 48,  
23, 60, 59, 47, 65, 58, 74, 47, 40, 59, 68, 51, 50,  
50, 71, 51, 26, 36, 38, 70, 46, 40, 51, 42 .

(a)Using class interval 21 – 30 , 31 – 40 , ... , prepare a frequency distribution table .

(b)Construct a histogram for the distribution

(c)Construct a frequency polygon.

(d)Estimate the mode from your graph.

**ASSESSMENT:** Solve the following questions given below from New Concept Mathematics for Senior Secondary School, SS1, Chapter 19:

Exercise 19.1, pages 246-247, questions 1 -10,

Exercise 19.2, page 250, questions 1 -10,

Exercise 19.3, pages 252-253, questions 1 -5,

**WEEK 9**

**STATISTICS (CALCULATION OF RANGE, MEDIAN, AND MODE OF GROUPED DATA) .**

**EXAMPLE**

The table below shows the marks obtained by 40 students in a Mathematics test.

**MARKS** 0 – 9   10 – 19   20 – 29   30 – 39   40 – 49   50 – 59

**1. OF STUDENTS** 4   5   6   12   8   5

(a)Calculate the median of the distribution

(b)Calculate the mode of the distribution

(c)Find the range of the distribution.

**SOLUTION**

**MEDIAN = + x c**

$l = 20$ ,  $C =$  CLASS WIDTH,  $l =$  LOWER CLASS BOUNDARY OF THE MEDIAN CLASS

MARKS FREQUENCY CUMULATIVE FREQUENCY CLASS BOUNDARY

0 – 9 4 4 -0.5 – 9.5

10 – 19 5 4+5 = 9 9.5 – 19.5

20 – 29 6 9+6 = 15 19.5 – 29.5

30 – 39 12 15+12 = 27 29.5 – 39.5

40 – 49 8 39.5 – 49.5

50 – 59 5 49.5 – 59.5

MEDIAN =  $29.5 + \frac{X}{10} \times 10 = 29.5 + \frac{X}{10} \times 10 = 29.5 + 4.17$

MEDIAN = 33.67

MODE =  $l + \frac{f}{F} \times c$

$F$  = modal class,  $f$  = frequency before the modal class,  $F$  = frequency after the modal class and  $c$  = class width.

MODE =  $29.5 + \frac{f}{F} \times 10 = 29.5 + \frac{8}{12} \times 10 = 29.5 + 6.67$

Mode =  $29.5 + 4 = 33.5$

RANGE

Range = highest value – lowest value.

Range =  $59 - 0 = 59$ .

WEEK 10

CUMMULATIVE FREQUENCY CURVE (OGIVE)

From the diagram above, find the following:

(a) Number of children who celebrated their birth day.

(b) The probability of children of 30 people

(c) The number of people with probability 0.2

(d)The number of people with probability of either 0.1 or 0.9.

**SOLUTION**

(a)From the graph above, the number of children that celebrated birth day party is  $10 + 20 + 30 + 40 + 50 + 60 = 210$  children.

(b) The probability of children of 30 people = 0.7

(c)The number of people with probability of 0.2 = 15 people

(d)The number of people with probability of either 0.1 or 0.9 =  $10 + 40 = 50$  people.

**ASSESSMENT:** The table below shows the different shoe sizes:

**Shoe Sizes Number of boys**

8 3

9 7

10 8

11 4

12 2

(a)How many boys are involved

(b)Which shoe sizes is the most common

(c)Which shoe size is the least among them

**WEEK 11**

**MEAN DEVIATION, VARIANCE, AND STANDARD DEVIATION OF GROUPED DATA .**

**THE MEAN ABSOLUTE DEVIATION:** is the average distance between each data value and the mean or the average of absolute differences expressed without plus or minus sign between each value in a set of given values and the average of all values of that set.

**VARIANCE:** is defined as the arithmetic mean of the square of the deviation from the mean or is the mean squared deviation

**STANDARD DEVIATION:** Is the measure of how far typical values tend to be from the mean or is the square root of variance

**GROUPED DATA:** is a statistical term used in data analysis. A raw dataset can be organized by constructing a table showing the frequency distribution of the variables whose values are given in the raw dataset. Such a frequency table is often referred to as grouped data.

**MEAN DEVIATION (M.D)**

M.D. =

**EXAMPLE**

Calculate the mean deviation of the numbers 5, 8, 7, 10, 9, 5, and 12 .

**SOLUTION**

MEAN =  $\frac{56}{7} = 8$

Numbers (X) Deviation from mean X - Absolute values

5 5 - 8 = - 3 3

8 8 - 8 = 0 0

7 7 - 8 = -1 1

10 10 - 8 = 2 2

9 9 - 8 = 1 1

5 5 - 8 = - 3 3

12 12 - 8 = 4 4

Total 0 14

M.D =  $\frac{14}{7} = 2$

**EXAMPLE**

Calculate the variance and standard deviation of the following set of numbers:

4, 8, 12,16, 20, 24, 28, 32.

**SOLUTION**

VARIANCE ( =

= = = 18

X X - (x -

4 4 - 18 = -14 196

$$8 \ 8 - 18 = -10 \ 100$$

$$12 \ 12 - 18 = -6 \ 36$$

$$16 \ 16 - 18 = -2 \ 4$$

$$20 \ 20 - 18 = 2 \ 4$$

$$24 \ 24 - 18 = 6 \ 36$$

$$28 \ 28 - 18 = 10 \ 100$$

$$32 \ 32 - 18 = 14 \ 196$$

Total 0 672

$$\text{Variance } ( ) = = 84$$

**STANDARD DEVIATION**

Standard Deviation (s) = or

$$= = 9.165.$$

**GROUPED DATA**

The masses of a group of fish were recorded as follows:

**MASS (g) NO. OF FISH**

200 – 299 3

300 – 399 25

400 – 499 15

500 – 599 10

600 – 699 5

700 – 799 2

Calculate the: (a) range (b) mean (c) mean deviation (d) standard Deviation

**SOLUTION**

$$\text{(a) RANGE} = \text{Highest} - \text{Lowest} = 799\text{g} - 200\text{g} = 599\text{g}$$

**Class interval Frequency Mid – value F x X f**

200 -299 3 249.5 748.5 191.7 575.1

300 – 399 25 349.5 8737.5 91.7 2292.5

400 – 499 15 449.5 6742.5 8.3 124.5

500 – 599 10 549.5 5495.0 108.3 1083.0

600 – 699 5 649.5 3247.5 208.3 1041.0

700 – 799 2 749.5 1499.0 308.3 616.6

Total 60 26470.0 5733.2

(b) MEAN ( ) = = = 441.2g

(c) MEAN DEVIATION (M.D.) = = = 95.55g

(c) STANDARD DEVIATION (s) =

FREQUENCY MID-VALUE (X) d = X- F x d F

3 249.5 -191.7 36748.89 -575.1 110246.67

25 349.5 - 91.7 8408.89 -2292.5 210222.25

15 449.5 8.3 68.89 124.5 1033.35

10 549.5 108.3 11728.89 1083 117288.9

5 649.5 208.3 43388.89 1041.5 216944.45

2 749.5 308.3 95048.89 616.6 190097.78

60 -2 845833.4

Standard Deviation (s) = = = = 118.7317 119g

ASSIGNMENT: The table below shows the heights to the nearest cm of a group of people.

HEIGHT (cm) 120 – 129 130 – 139 140 – 149 150 – 159 160 – 169 170 – 179

FREQUENCY 3 5 12 25 10 2

(a) Calculate the range of the distribution ,

(b) Calculate an estimate of the mean and mean deviation

(c) Calculate the standard deviation of the distribution.