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LEARNING MADE SIMPLE

CBSE
Laboratory Manual
MATHEMATICS
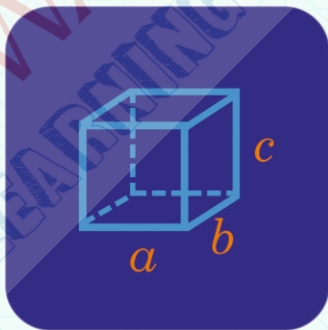
Class 10

Name ....

School ....

Class... Section ....

Roll No. ....

CONTENTS

Unit	Topic

...contd. contents

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ACTIVITY 1

EUCLID'S DIVISION LEMMA

VIVA VOCE

Q.1. Define a lemma.

Ans. A lemma is a proven statement used for proving another statement.

Q.2. State Euclid's Division Lemma.

Ans. For any two positive integers a and b, there exist unique whole numbers q and r such that $a = bq + r$, $0 \leq r < b$.

Q.3. State the Fundamental Theorem of Arithmetic.

Ans. Every composite number can be expressed (factorised) as the product of primes, and factorization is unique, apart from the order in which the prime factors occurs.

Q.4. Find The HCF Of 192 & 216 by using Euclid's Division Method.

Ans. On dividing 216 by 192 we get

1 as the quotient and 24 as the reminder

∴ $216 = 192 \times 1 + 24$

on dividing 192 by 24, we get

8 as the quotient and 0 as the reminder

∴ $192 = 24 \times 8 + 0$

HCF of 192 & 216 is 24

$$192 \overline{)216}(1$$
$$\underline{192}$$
$$24\overline{)192}(8$$
$$\underline{192}$$
$$\times$$

Q.5. What is the use of Euclid's Division Lemma ?

Ans. Euclid's Division Lemma is a technique used to compute the Highest Common Factor (HCF) of two given positive integers.

Q.6. What do you mean by Euclid's Division Lemma ?

Ans. Euclid's Division Lemma tells us about divisibility of integers for any positive integers a and b, there exits unique integers q and r(q ≠ r); $a = bq + r$, $0 \leq r < b$, Hence, it provides us a stepwise procedure to compute the HCF of two integers.

UNIT II   **Algebra**

ACTIVITY 2

QUADRATIC POLYNOMIAL

VIVA OCE

Q.1. What do you mean by quadratic polynomial ?

Ans. A polynomial of degree 2 is called a quadratic polynomial.

Q.2. Define zeros of a polynomial geometrically.

Ans. Geometrically the zeros of a polynomial f(x) are the x-co-ordinate of the points where the graph $y = f(x)$ intersects x-axis.

Q.3. The shape of curve for a quadratic polynomial graph is ....

Ans. Parabolic.

Q.4. How many zeros a polynomial can have ?

Ans. A polynomial f(x) of degree n can have almost n zeroes.

Q.5. What is the degree of a quadratic polynomial ?

Ans. Degree of a quadratic polynomial is 2.

Q.6. Does this graph represent quadratic polynomial ?
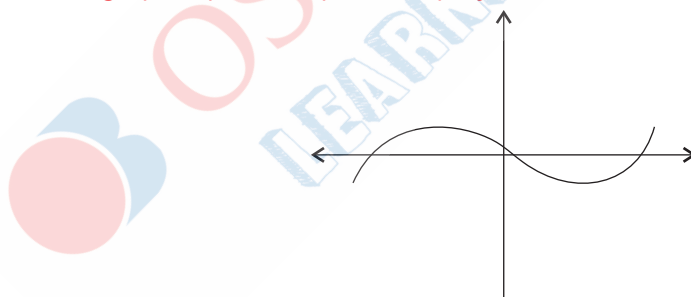
Ans. No.

Q.7. What is the relation between its zeroes and co-efficient for a given quadratic polynomial $ax^2 + bx + c$?

Ans. If α and β are the zeroes of a quadratic polynomial $ax^2 + bx + c$, then $\alpha + \beta = -\dfrac{b}{a}$, $\alpha\beta = \dfrac{c}{a}$.

ACTIVITY 3

LINEAR EQUATIONS IN TWO VARIABLES

VIVA VOCE

Q.1. Define a pair of linear equations in two variables.

Ans. Two linear equations in the same two variables are called a pair of linear equations in two variables.

Q.2. Name the various methods used to solve a pair of linear equations in two variables algebraically.

Ans. (i) Substitution method.

(ii) Elimination method.

(iii) Cross-multiplication method.

Q.3. What is the condition for a unique solution ?

Ans. $\dfrac{a_1}{a_2} \neq \dfrac{b_1}{b_2}$

Q.4. What is the shape of the curve in a graph of a pair of linear equations ?

Ans. Straight Lines.

Q.5. For $ax + by + c = 0$; write y in terms of x.

Ans. $ax + by + c = 0$

$$by = -ax - c$$

$$y = \frac{-ax - c}{b}$$

Q.6. What is the equation of a line parallel to x–axis ?

Ans. $y = a$ (where a is any constant)

ACTIVITY 4

ARITHMETIC PROGRESSION

VIVA VOCE

Q.1. When the set of numbers said to be in *A.P* ?

Ans. If the difference between any two consecutive terms is same.

Q.2. The set of whole numbers is an *A.P.* or not ?

Ans. Yes, set of whole numbers is an A.P.

Q.3. Define common difference of an *A.P.*

Ans. The difference between any two consecutive terms of an *A.P. i.e.,*

$d = t_2 - t_1 = t_3 - t_2 = $ _____ $= t_n - t_{n-1}$

Q.4. What is the common difference of set of multiples of 7 ?

Ans. 7

Q.5. Are the numbers 10, 20, 30, ... in *A.P.* ?

Ans. *Yes.*

Q.6. Is it possible that the common difference of an A.P. be negative ?

Ans. *Yes.*

Q.7. Define a sequence.

Ans. *A sequence is an arrangement of numbers in a definite order according to some rule.*

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ACTIVITY 5

NATURAL NUMBERS

VIVA VOCE

Q.1. Find the sum of first 6 natural numbers ?

Ans. $S_n = n \dfrac{(n + 1)}{2}$

Here, $n = 6$

$S_n = 6 \dfrac{(6 + 1)}{2} = 21$

Q.2. Is zero a natural number ?

Ans. No.

Q.3. If a, b, c are in $A.P.$, then b is called the _____ of a and c.

Ans. Arithmetic Mean.

Q.4. Write down an A.P., sum of whose first 11 terms is zero.

Ans. The A.P. is –5, –4, –3, –2, –1, 0, 1, 2, 3, 4, 5.

Q.5. What is the formula for an in S_n. If S_n is the sum of first n terms of an A.P. ?

Ans. $an = S_n – S_{n-1}$.

ACTIVITY 6

ODD NATURAL NUMBERS

VIVA VOCE

Q.1. Write the formula for the sum of first n odd natural numbers ?

Ans. $S_n = n^2$

Q.2. The difference between two consecutive odd numbers is ?

Ans. 2.

Q.3. Write first ten odd natural numbers.

Ans. 1, 3, 5, 7, 9, 11, 13, 15, 17, 19

Q.4. Which is the first odd natural number ?

Ans. 1.

Q.5. What is the sum of first eight odd natural numbers.

Ans. 8^2 *or 64.*

Q.6. What is a general odd natural number which can generate odd natural numbers for different values of *n* ?

Ans. $2n - 1$.

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UNIT III | **Geometry**

ACTIVITY 7

SIMILAR TRIANGLES : BASIC PROPORTIONALITY THEOREM

VIVA VOCE

Q.1. What do you mean by similar figures ?

Ans. Geometric figures which have the same shape but not necessarily the same sizes are known as similar figures.

Q.2. When are two triangles called similar ?

Ans. Two triangles are called similar if :

(i) Their corresponding angles are equal, and

(ii) Their corresponding sides are proportional.

Q.3. All similar figures are congruent, true or false ?

Ans. False.

Q.4. State Basic Proportionality Theorem.

Ans. If a line drawn parallel to one side of a triangle intersecting the other two sides, then it divides the two sides in the same ratio.

Q.5. State whether the following pair of triangles is similar or not ?
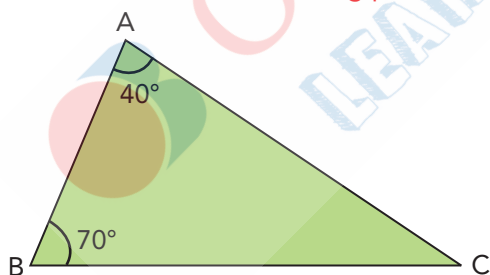
Fig. 4.11
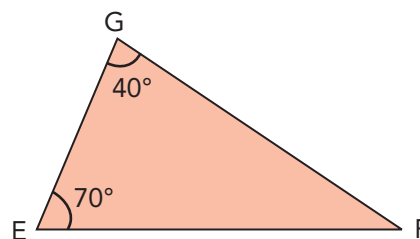
Fig. 4.12

Ans. Yes.

Q.6. What is the other name of B.P.T. ?

Ans. Thales Theorem.

ACTIVITY 8

SIMILAR TRIANGLES : MEASUREMENT OF DISTANCE

VIVA OCE

Q.1. Write the criteria for similarity of two triangles.

Ans. Two triangles are called similar if :
(i) their corresponding angles are equal, and
(ii) their corresponding sides are proportional.

Q.2. When are two triangles called equiangular ?

Ans. Two triangles are called equiangular, if their corresponding angles are equal.

Q.3. Give two examples of pair of similar figures.

Ans. (i) Any two equilateral triangles.

(ii) Any two regular hexagons.

ACTIVITY 9

SIMILAR SQUARES : MEASUREMENT OF DISTANCE

VIVA VOCE

Q.1. Are all congruent figures similar or not ?

Ans. Yes, all congruent figures are similar.

Q.2. State whether the following quadrilaterals are similar or not ?
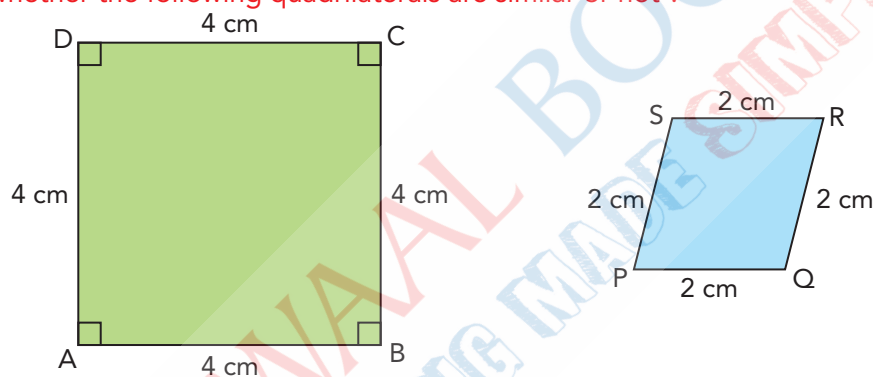
Ans. No.

Q.3. When can we obtain similar parallelograms/rectangles by adopting the same procedure ?

Ans. By taking the lengths of the two diagonals unequal and angle between the strips other than the right angle.

Q.4. State whether the following figures are similar or not ?
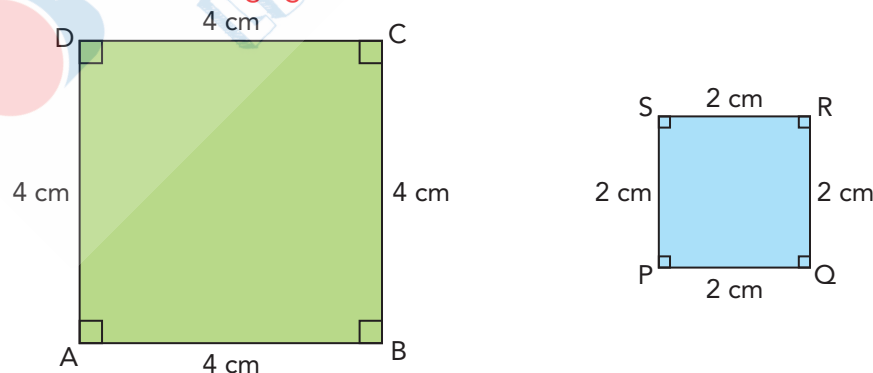
Ans. Yes.

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ACTIVITY 10

THALE'S THEOREM

● Application

The theorem can be used to establish various criteria of similarity of triangles. It can also be used for constructing a polygon similar to a given polygon with a given scale factor.

VIVA OCE

Q.1. Basic Proportionality Theorem is given by ....
Ans. Greek Mathematician Thales (600 B.C.).

Q.2. State Thales Theorem.
Ans. If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, the other two sides are divided in the same ratio.

Q.3. In the following figure, *DE || BC*. Find *x*.
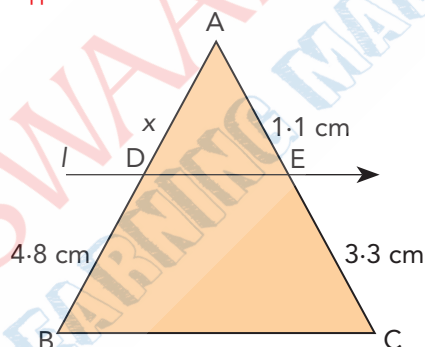
Ans. By Thales Theorem,

$$\frac{AD}{DB} = \frac{AE}{EC}$$

$$\frac{x}{4.8} = \frac{1 \cdot 1}{3 \cdot 2}$$

$$x = 1 \cdot 6 \, cm$$

Q.4. We can prove mid-point theorem using this activity ?
Ans. Yes.

Q.5. What is the another name of Thales Theorem ?
Ans. Basic proportionality theorem.

Q.6. What is the full form of B.P.T. ?
Ans. Basic Proportionality Theorem.

ACTIVITY 11

AREA OF SIMILAR TRIANGLES

VIVA VOCE

Q.1. Write the relationship between areas and sides of similar triangles.

Ans. Areas of similar triangles are proportional to the square of their corresponding sides.

Q.2. Is the theorem true for all pairs of triangles ?

Ans. No, only for similar triangles.

Q.3. Are two similar triangles congruent also ?

Ans. No.

Q.4. Are the areas of two congruent triangles equal ?

Ans. Yes.

ACTIVITY 12

PYTHAGORAS THEOREM : VERIFICATION USING AREA OF SQUARE

VIVA OCE

Q.1. Is the theorem true for all pairs of triangles ?

Ans. No, only for Right-angled triangles.

Q.2. State the Pythagoras Theorem.

Ans. In a right angled triangle, the square of the hypotenuse is equal to the sum of the squares of the other two sides.

Q.3. If c = 10 cm, a = 6 cm and b = 8 cm, then ∆ABC a right angled triangle ?

Ans. Yes, as $10^2 = 6^2 + 8^2$.

Q.4. Write the angles of a right angled isosceles triangle.

Ans. 90°, 45°, 45°.

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ACTIVITY 13

PYTHAGORAS THEOREM : VERIFICATION USING AREA OF TRIANGLE

VIVA VOCE

Q.1. What is the converse of Pythagoras Theorem ?

Ans. In a triangle, if the square of one side is equal to the sum of the squares of the other two sides, then the angle opposite to the first side is a right angle.

Q.2. The longest side of a right angled triangle is called ....

Ans. Hypotenuse.

Q.3. What is the name of triplet, by which right-angled triangle is formed ?

Ans. Pythagorean triplet.

ACTIVITY 14

TANGENT TO A CIRCLE-I

VIVA OCE

Q.1. Define tangent to circle.

Ans. A line that touches the circle at only one point is called tangent to circle.

Q.2. Give the relation between the lengths of tangents drawn from an external point to a circle.

Ans. The tangents are equal in length.

Q.3. In given fig., if PA = 7 cm, find PB.
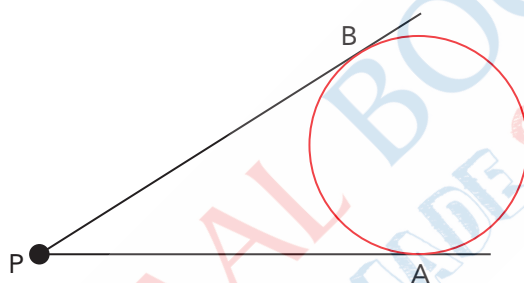
Ans. $PB = PA = 7$ cm

Q.4. The number of tangents drawn from a point P to a circle if P lies on the circle.

Ans. Number of tangent = 1

Q.5. Can you draw a tangent to a circle passing through a point lying inside the circle ?

Ans. No.

Q.6. Are the tangents drawn at the ends of a diameter of a circle are parallel ?

Ans. Yes.

ACTIVITY 15

TANGENT TO A CIRCLE-II

VIVA OCE

Q.1. Distance between centre and any point on the circumference of a circle is called ?

Ans. Radius.

Q.2. If the point P lies inside the circle, the number of tangents can be possible ?

Ans. If P lies inside the circle, then no tangent can be possible.

Q.3. Define point of contact ?

Ans. The common point of the tangent and circle is known as point of contact.

Q.4. Does a parallelogram drawn to circumscribe a circle is a rectangle ?

Ans. No, it will be a square.

ACTIVITY 16

AREA OF A CIRCLE

VIVA OCE

Q.1. What is area of semicircle of radius 'a' ?

Ans. Area of circle is πa^2

Area of semicircle = $\dfrac{\pi a^2}{2}$ sq. unit.

Q.2. What angle subtended by a semicircle at its centre ?

Ans. 180°.

Q.3. The sum of interior and exterior angles of a triangle is ?

Ans. 180° and 360°.

Q.4. If area of a semicircle is 154 cm^2, find its radius.

Ans. Here,

$\dfrac{\pi r^2}{2} = 154 \ \Rightarrow \ r^2 = \dfrac{154 \times 2}{\pi}$

$\Rightarrow r^2 = \dfrac{154 \times 2 \times 7}{22} = 98$

$\Rightarrow r = 7\sqrt{2}$ cm

●●

ACTIVITY 17

CIRCUMFERENCE OF A CIRCLE

VIVA OCE

Q.1. What is the formula for volume of cone ?

Ans. Volume of cone = $\frac{1}{3}\pi r^2 h$ cubic unit.

Q.2. What is the relation between slant height 'l' and height 'h' of a cone ?

Ans. $l = \sqrt{r^2 + h^2}$, where, r = radius of circular base of the cone.

Q.3. What is the area of the sector of a circle of radius r and central angle θ ?

Ans. Area, $A = \frac{\pi r^2 \theta}{360}$ sq. unit.

Q.4. If the radius of cone is 3 cm and height 7 cm. Find the volume of cone ?

Ans. Volume = $\frac{1}{3}\pi r^2 h$

$= \frac{1}{3} \times \frac{22}{7} \times 3 \times 3 \times 7$

$= 66$ cm^3

Q.5. Define cone ?

Ans. A right circular cone is a solid generated by revolving a line segment which pass through a fixed point and which makes a constant angle with a fixed line.

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ACTIVITY 18

MEDIANS OF A TRIANGLE

VIVA OCE

Q.1. What is circumcenter of a triangle ?

Ans. The point of intersection of the right bisectors of the sides of a triangle.

Q.2. Is the theorem true for all pairs of triangles ?

Ans. The point of intersection of the medians of the sides of a triangle.

Q.3. Tell the ratio in which centroid divides the medians from vertex to mid-point of opposite side ?

Ans. Centroid divide the each median in ratio 2:1.

Q.4. The centroid of triangle lies inside or outside of a triangle ?

Ans. Centroid lies inside the triangle.

ACTIVITY 19

AREA OF RIGHT CIRCULAR CYLINDER

VIVA OCE

Q.1. By using rectangular sheet, how many different dimension cylinders can be formed ?

Ans. 2.

Q.2. If a rectangle is fold along its breadth b units, then find the radius of cylinders obtained.

Ans. Circumference of base = Breadth of rectangle.

$2\pi r = b$

$r = \dfrac{b}{2\pi}$ units

Q.3. Tell the name of different types of surface areas a cylinder can have ?

Ans. (i) Lateral Surface Area

(ii) Total Surface Area

Q.4. What is the relation between Curved Surface Area and Total Surface Area of a cylinder ?

Ans. Total Surface Area = Curved Surface Area + $2\pi r^2$

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ACTIVITY 20

VOLUME OF RIGHT CIRCULAR CYLINDER-I

VIVA OCE

Q.1. By using rectangular sheet of same dimension, we make two different dimensions of cylinders, the volume of these two cylinder is equal or not ?

Ans. Volume is not equal.

Q.2. What will happen to volume of cylinder if its radius is doubled ?

Ans. V_1 = Volume of cylinder = $\pi r_2 h$

Now, if radius is doubled

then, V_2 = Volume of cylinder = $\pi(2r)^2 h = 4\pi r^2 h$

Therefore, volume of the cylinder will be four times of its former volume.

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ACTIVITY 21

VOLUME OF RIGHT CIRCULAR CYLINDER-II

VIVA VOCE

Q.1. *What is the relation between radius r and volume of right circular cylinder ?*

Ans. Volume = πh × (radius)^2

Q.2. *If the radius of base of a right circular cylinder is halved, how many times the height should become to keep the volume same ?*

Ans. 4 times of the original height.

$$\left[\pi \times \left(\frac{r}{2} \right)^2 (4h) \right] = \pi \frac{r^2}{h} \times 4h = \pi r^2 h$$

Q.3. *If the radius of cylinder is 7 cm and height is 1 cm. Find the volume ?*

Ans. Volume = $\pi r^2 h$

$$= \frac{22}{7} \times 7 \times 7 \times 1 = 154 \text{ cm}^3$$

Q.4. *What will happen to volume of cylinder if its radius is halved ?*

Ans. $V = \pi r^2 h$

if radius is halved then

$$V_1 = \pi \left(\frac{r}{2} \right)^2 h = \frac{1}{4} \pi r^2 h = \frac{1}{4} V$$

New volume will one-fourth of the initial volume.

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ACTIVITY 22

LATERAL SURFACE AREA OF A CONE

VIVA VOCE

Q.1. What is formula for lateral surface area of a cone ?

Ans. Lateral surface area of a cone = πrl sq unit.

where, r = radius of circular base of cone, l = Slant height of cone

Q.2. What is the formula for slant height of cone ?

Ans. $l = \sqrt{h^2 + r^2}$

where, r = radius of circular base of cone, h = height of cone

Q.3. A right circular cone has how many vertices ?

Ans. One.

Q.4. If curved surface area of a cone is 110 cm^2 and radius is 7 cm, find slant height of cone.

Ans. Curved surface area = πrl

$$110 = \frac{22}{7} \times 7 \times l$$

$$l = \frac{110}{22} = 5 \text{ cm}$$

Q.5. Find the volume of frustum of a cone ?

Ans. Volume of frustum of cone = $\frac{1}{3}\pi h [r_1^2 + r_2^2 + r_1 r_2]$ cubic unit.

where, r_1, r_2 are the radii of top and bottom of frustum.

ACTIVITY 23

CURVED SURFACE AREA & VOLUME OF A CONE

VIVA OCE

Q.1. What is a frustum of a right circular cone ?

Ans. Take a right circular cone, which is sliced through by a plane parallel to its base, when the smaller conical portion is removed, the resulting solid is called frustum of a right circular cone.

Q.2. Write the formula for the volume of the frustum of a cone ?

Ans. Volume = $\frac{1}{3}\pi r^2_1 h_1 - \frac{1}{3}\pi r^2_2 h_2$ cubic unit.

Q.3. What is the area for the curved surface area of the frustum of a cone ?

Ans. Curved Surface Area = $\pi r l_1 - \pi r l_2$ cubic unit.

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ACTIVITY 24

AREA OF A SPHERE

VIVA VOCE

Q.1. What is the formula for curved surface area of a hemisphere ?

Ans. Surface area of a hemisphere = $2\pi r^2$ sq. unit.

                (where r = radius)

Q.2. How many times the surface area of a sphere is increased if the radius of sphere is doubled ?

Ans. 4 times.

Q.3. What is surface area of a sphere of radius 7 cm.

Ans.

$$\text{Surface Area} = 4\pi r^2$$

$$= 4 \times \frac{22}{7} \times 7 \times 7$$

$$= 616 \text{ cm}^2$$

Q.4. What is the formula for total surface area of a hemisphere ?

Ans. Total surface area of a hemisphere = $3\pi r^2$. sq. unit.

                                                                ••

ACTIVITY 25

VOLUME OF A SPHERE

VIVA OCE

Q.1. Write the formula for the volume of sphere ?

Ans. Volume of sphere = $\frac{4}{3}\pi r^3$, (where r = radius) cubic unit.

Q.2. What is sphere ?

Ans. A sphere is a solid obtained on revolving a circle about any diameter of it.

Q.3. What is volume of sphere whose radius is 14 cm ?

Ans. Here $\qquad r = 14$ cm

$$\text{Volume of sphere} = \frac{4}{3}\pi r^3$$

$$= \frac{4}{3} \times \frac{22}{7} \times 14 \times 14 \times 14$$

$$= \frac{241472}{21}$$
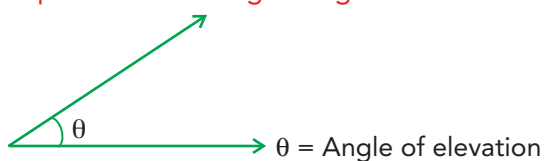
$$= 11{,}498.67 \text{ cm}^3$$

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UNIT V Trigonometry

ACTIVITY 26

TRIGONOMETRIC RATIOS

VIVA VOCE

Q.1. Explain the meaning of angles of elevation diagrammatically.

Ans.

θ = Angle of elevation

Q.2. What is the value of tan 45° + cot 45° ?

Ans. tan 45° + cot 45° = 1 + 1

                        = 2

Q.3. When we move closer to the object, the angle of elevation increases or decreases ?

Ans. Increases.

Q.4. Write the value of θ , when angle of elevation is equal to angle of depression ?

Ans. θ = 45 degrees.

Q.5. What happens about the length of the shadow of a tower, when the angle of elevation of sun above a tower increase ?

Ans. The length of shadow decrease.

Q.6. What is meant by clinometer ?

Ans. It is a geometrical instrument with a square plate moves 0° to 360°.

ACTIVITY 27

LESS THAN TYPE OGIVE

VIVA VOCE

Q.1. Write all measures of central tendency.

Ans. Measures of central tendency are :

(i) Mean   (ii) Median   (iii) Mode.

Q.2. Explain cumulative frequency.

Ans. The cumulative frequency of a class is the frequency obtained by adding the frequencies of all the classes preceding the given class.

Q.3. Write the use of ogive(s).

Ans. Ogive(s) can be used to find the median of a frequency distribution.

Q.4. Write the relation between Mean, Median and Mode.

Ans. Mode = 3 Median – 2 Mean.

ACTIVITY 28

MORE THAN TYPE OGIVE

VIVA VOCE

Q.1. Statistics deals with which type of data ?

Ans. Statistics deals with collection, presentation and analysis of numerical data.

Q.2. Write the formula used for calculating Mode.

Ans. Mode, $M_O = l + \left(\dfrac{f_1 - f_0}{2f_1 - f_0 - f_2} \times h \right)$

Q.3. If the series has two Modes, then it is known as ....

Ans. Bimodal.

Q.4. Mode is the value of the variable which has ....

Ans. Maximum frequency.

ACTIVITY 29

PROBABILITY

VIVA VOCE

Q.1. Define sample space ?

Ans. It is the set of all possible outcome of a random experiment.

Q.2. What is the probability of a sure event ?

Ans. Probability of a sure event = 1

Q.3. Write the interval in which probability of an event lies ?

Ans. Probability of an event lies between 0 and 1.

Q.4. Write the sum of all the probabilities of all the events.

Ans. Sum of probabilities of all the events is equal to 1.

Q.5. A dice is thrown once. The probability of getting a number 3 or 4 is ?

Ans. $\frac{1}{3}\left(\frac{2}{6}\right)$.

Q.6. Can probability be negative ?

Ans. No, probability can never be negative.

Q.7. What is the probability of getting more than 6 in a single throw of a dice ?

Ans. Zero.

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