iOTA Classes

FORMULA SHEET

CLASS 10TH MATH

Full chapter Video on YouTube
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Hand
Written
Notes

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Formula Sheet For Class 10th

Some Important Formula

01.	$(a+b)^2 = a^2 + b^2 + 2ab$
02.	$(a-b)^2 = a^2 + b^2 - 2ab$
03.	$a^2 - b^2 = (a+b)(a-b)$
04.	$a^2 + b^2 = (a+b)^2 - 2ab$
05.	$a^2 + b^2 = (a-b)^2 + 2ab$
06.	$(a+b)^2 - (a-b)^2 = 4ab$
07.	$(a+b+c)^2 = a^2 + b^2 + c^2 + 2(ab + bc + ac)$
08.	$(a+b)^3 = a^3 + b^3 + 3ab(a+b)$
09.	$(a-b)^3 = a^3 - b^3 - 3ab(a-b)$
10.	$a^3 - b^3 = (a-b)(a^2 + b^2 + ab)$
11.	$a^3 + b^3 = (a+b)(a^2 + b^2 - ab)$

Chapter 1 :- Real Numbers

Fundamental Theorem of Arithmetic :- Every composite number can be expressed (factorised) as a product of primes, and this factorisation is unique, apart from the order in which the prime factors occur.

$$\text{HCF} \times \text{LCM} = \text{Product of two numbers}$$

$$\text{HCF}(a,b) \times \text{LCM}(a,b) = a \times b$$

$$\text{HCF} = \frac{\text{Product of two numbers } (a \times b)}{\text{LCM}} \qquad \text{LCM} = \frac{\text{Product of two numbers } (a \times b)}{\text{HCF}}$$

$$\text{First number } (a) = \frac{\text{HCF} \times \text{LCM}}{\text{Second number } (b)} \qquad \text{Second number } (b) = \frac{\text{HCF} \times \text{LCM}}{\text{First number } (a)}$$

Chapter 2 :- Polynomials

Quadratic Polynomial Form :- $ax^2 + bx + c$ (Degree 2)

Relationships Between Zeroes and Coefficients for Quadratic Polynomial :-

If α and β are the zeroes of the Quadratic Polynomial then,

i) Sum of Zeroes = $\frac{-\text{Coefficient of } x}{\text{Coefficient of } x^2}$ Or, $\alpha + \beta = \frac{-b}{a}$

ii) Product of the Zeroes = $\frac{\text{Constant Term}}{\text{Coefficient of } x^2}$ Or, $\alpha \times \beta = \frac{c}{a}$

iii) To find the Quadratic Polynomial = $x^2 - (\alpha + \beta)x + (\alpha \times \beta)$

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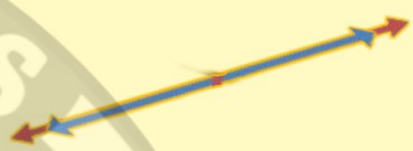
Chapter 3 :- Linear Equation in Two Variables

Standard Form:- $ax + by + c = 0$

Condition	Number Of Solutions	Graphical Representations	Graph
$\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$	Unique Solution or One Solution	Intersecting Lines	
$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$	Many Solutions or Infinite Solutions	Coincident Lines	
$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$	No Solution or Zero Solution	Parallel Lines	

Chapter 4 :- Quadratic Equation

Standard Form:- $ax^2 + bx + c = 0$

Discriminant (D) = $b^2 - 4ac$

Quadratic Formula

$$x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$$

Discriminant (D)	Nature Of Roots	Formula
i) if, $D > 0$	Real & Unequal Roots	$\frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$
ii) if, $D = 0$	Real & Equal Roots	$\frac{-b}{2a}$
iii) if, $D < 0$	No Real Roots	

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Chapter 5 :- Arithmetic Progression

An arithmetic progression is a sequence where the differences between every two consecutive terms are the same.

In an AP let a be the first term and d be the common difference, then

i) n^{th} term $T_n = a_n = a + (n-1)\,d$

ii) n^{th} term from the end of AP = $l - (n-1)\,d$

iii) Arithmetic Mean = $\frac{1}{2}(a + b)$

If some numbers are in AP, then

i) 3 numbers in AP as (a - d), (a), (a + d)

ii) 4 numbers in AP as (a - 3d), (a - d), (a + d), (a + 3d)

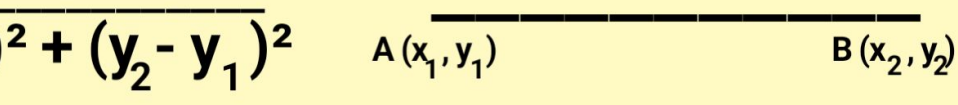
iii) 5 numbers in AP as (a - 2d), (a - d),(a), (a + d), (a + 2d)

👉 Sum of n^{th} term of an AP :- $S_n = \frac{n}{2}[2a + (n-1)\,d]$

👉 If last term of an AP is given then :- $S_n = \frac{n}{2}(a + l)$

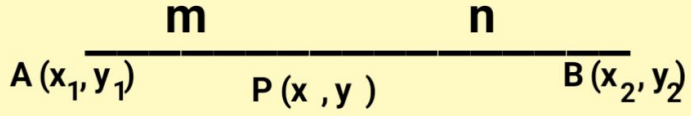
Chapter 6 :- Coordinate Geometry

👉 Distance Formula = $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$



👉 Section Formula (x) = $\frac{m x_2 + n x_1}{m + n}$

(y) = $\frac{m y_2 + n y_1}{m + n}$



👉 Mid Point Formula (x) = $\frac{x_1 + x_2}{2}$, (y) = $\frac{(y_1 + y_2)}{2}$

👉 Centroid of Teingle (x) = $\frac{x_1 + x_2 + x_3}{3}$, (y) = $\frac{y_1 + y_2 + y_3}{3}$

Chapter 7 :- Triangles

1. Basic Proportionality Theorem (Thales Theorem)
If a line is drawn parallel to one side of a triangle to intersect the other two sides, then it divides those sides in the same ratio.

2. Converse of Basic Proportionality Theorem
If a line divides any two sides of a triangle in the same ratio, then the line is parallel to the third side.

3. Theorem on Similar Triangles (AAA Similarity Criterion)
If in two triangles, their corresponding angles are equal, then their corresponding sides are proportional and the triangles are similar.

4. SSS Similarity Theorem
If in two triangles, the corresponding sides are proportional, then the triangles are similar.

5. SAS Similarity Theorem
If in two triangles, one angle is equal and the sides including that angle are proportional, then the triangles are similar.

6. AA Similarity Theorem
If two angles of one triangle are respectively equal to two angles of another triangle, then the triangles are similar.

7. Theorem on Corresponding Medians of Similar Triangles
The ratio of the corresponding medians of two similar triangles is equal to the ratio of their corresponding sides.

8. Theorem on Corresponding Altitudes of Similar Triangles
The ratio of the corresponding altitudes of two similar triangles is equal to the ratio of their corresponding sides.

09. Theorem on Corresponding Angle Bisectors of Similar Triangles
The ratio of the corresponding angle bisectors of two similar triangles is equal to the ratio of their corresponding sides.

Chapter 8 :- Circles

Theorem 01
Tangent at any point of a circle is perpendicular to the radius through the point of contact.

Theorem 02
The lengths of tangents drawn from an external point to a circle are equal.

- Important Results / Corollaries (used in proofs)

1. Only one tangent can be drawn at a point on the circle.

2. There are exactly two tangents from an external point to a circle.

3. A line perpendicular to the radius at its endpoint on the circle is a tangent.

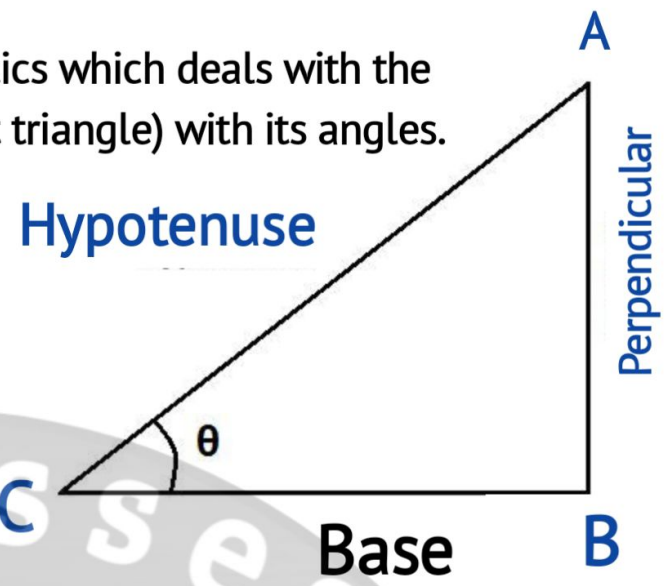
4. The angle between the radius and the tangent at the point of contact is 90°.

Trigonometry

Chapter 10, 11, 12 13 & 14

Trigonometry is one of the branches of mathematics which deals with the relationship between the sides of a triangle (right triangle) with its angles.

Tri = Three
Gone = Angles
Metry = Measurement



1. sine θ = sin θ = $\frac{\text{Perpendicular (P)}}{\text{Hypotenuse (H)}} = \frac{AB}{AC} = \frac{1}{\text{cosec } \theta}$

2. cosine θ = cos θ = $\frac{\text{Base (B)}}{\text{Hypotenuse (H)}} = \frac{BC}{AC} = \frac{1}{\sec \theta}$

3. tangent θ = tan θ = $\frac{\text{Base (B)}}{\text{Perpendicular (P)}} = \frac{AB}{BC} = \frac{1}{\text{Cot } \theta}$

4. cotangent θ = cot θ = $\frac{\text{Perpendicular (P)}}{\text{Base (B)}} = \frac{BC}{AB} = \frac{1}{\tan \theta}$

5. secant θ = sec θ = $\frac{\text{Hypotenuse (H)}}{\text{Base (B)}} = \frac{AC}{BC} = \frac{1}{\cos \theta}$

6. cosecant θ = cosec θ = $\frac{\text{Hypotenuse (H)}}{\text{Perpendicular (P)}} = \frac{AC}{AB} = \frac{1}{\sin \theta}$

1. $\sin \theta \times \text{cosec } \theta = 1$ 2. $\cos \theta \times \sec \theta = 1$ 3. $\tan \theta \times \cot \theta = 1$

Note :-

$(\sin\theta)^2 = \sin\theta^2$ (wrong)

$= \sin^2\theta^2$ (wrong)

$= \sin^2\theta$ (Right 👍)

Complementary Angles

1. $\sin(90 - \theta) = \cos\theta$
2. $\cos(90 - \theta) = \sin\theta$
3. $\tan(90 - \theta) = \cot\theta$
4. $\cot(90 - \theta) = \tan\theta$
5. $\sec(90 - \theta) = \text{cosec}\,\theta$
6. $\text{cosec}(90 - \theta) = \sec\theta$

1. $\sin^2\theta + \cos^2\theta = 1$
   a. $\sin^2\theta = 1 - \cos^2\theta$
   b. $\cos^2\theta = 1 - \sin^2\theta$

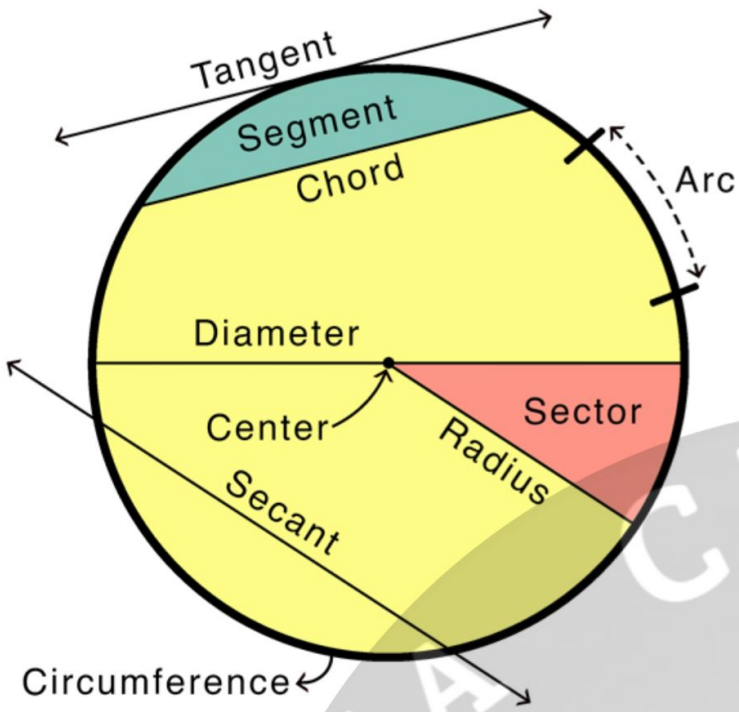
2. $\sec^2\theta - \tan^2\theta = 1$
   a. $\sec^2\theta = 1 + \tan^2\theta$
   b. $\tan^2\theta = \sec^2\theta - 1$

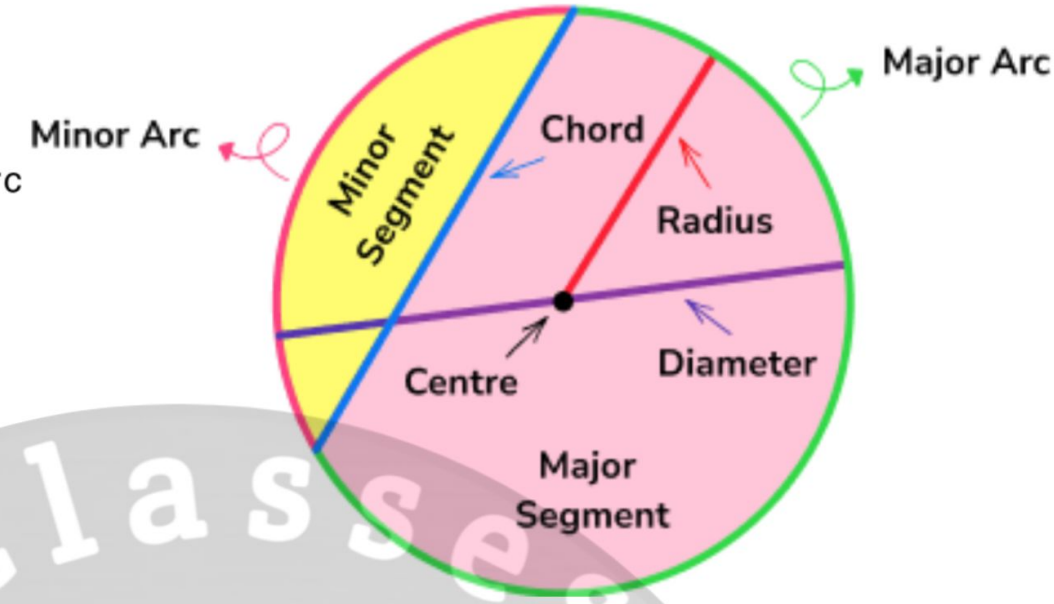
3. $\text{cosec}^2\theta - \cot^2\theta = 1$
   a. $\text{cosec}^2\theta = 1 + \cot^2\theta$
   b. $\cot^2\theta = \text{cosec}^2\theta - 1$

Trigonometry Table

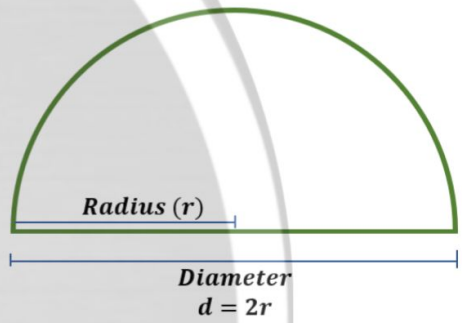
$\angle A$	0°	30°	45°	60°	90°
sin *A*	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1
cos *A*	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0
tan *A*	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	undefined
cosec *A*	undefined	2	$\sqrt{2}$	$\frac{2}{\sqrt{3}}$	1
sec *A*	1	$\frac{2}{\sqrt{3}}$	$\sqrt{2}$	2	undefined
cot *A*	undefined	$\sqrt{3}$	1	$\frac{1}{\sqrt{3}}$	0

Chapter 16 :- Area of Circle, Sector and Segment

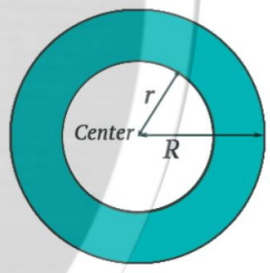




1. Area of Circle = πr^2
2. perimeter or Circumference of Circle = $2\pi r$



3. Area of Semicircle = $\frac{\pi r^2}{2}$
4. Perimeter of Semicircle = $\pi r + 2r$



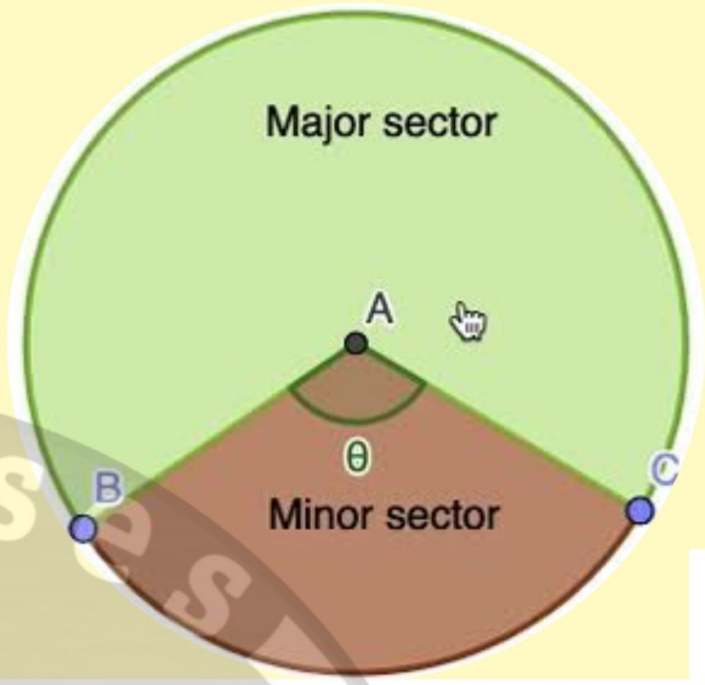
5. Area of Ring of a Circle $= \pi R^2 - \pi r^2$
$= \pi(R^2 - r^2)$
$= \pi(R + r)(R - r)$

6. Length of Minor Arc = $\frac{2\pi r\theta}{360°}$

7. Length of Major Arc = (Circumference of circle - Length of Minor Arc)

Length of Major Arc = $2\pi r - \frac{2\pi r\theta}{360°}$

Area of Sector



8. Area of Minor Sector = $\frac{\pi r^2\theta}{360°}$

9. Area of Major Sector = (Area of Circle - Area of Minor Sector)

Area of Major Sector = $\pi^2 r - \frac{\pi r^2\theta}{360°}$

10. Perimeter of Sector = $\frac{2\pi r\theta}{360} + 2r$

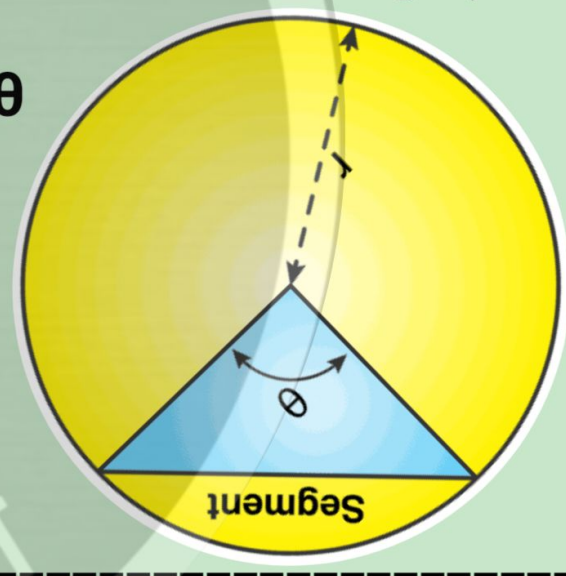
Area of Segment

11. Area of Minor Segment = (Area of Sector - Area of Triangle)

$= \frac{\pi r^2\theta}{360°} - \frac{1}{2} r^2 \sin\theta$

12. Area of Major Segment = (Area of Circle - Area of Minor Segment)

$= \pi r^2 - \left(\frac{\pi r^2\theta}{360°} - \frac{1}{2} r^2 \sin\theta\right)$



Some Important Results :-

1 minute = 6°
60 minutes = 360°
1 hour = 30°
12 hours = 360°

For rotating wheels :-

Distance cover by wheel in 1 rotation = Circumference of wheel ($2\pi r$)

No. of rotation of wheel in 1 minute = $\frac{\text{Distance Cover by wheel in 1 minute}}{\text{Circumference of wheel}}$

Chapter 17 :- Volume and Surface Area

Cube

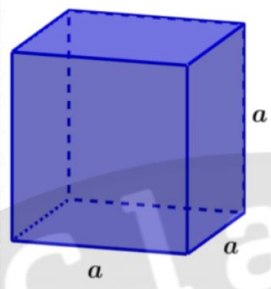
Volume = a^3

Lateral Surface Area = $4a^2$

Area of 4 walls = $4a^2$

Total Surface Area = $6a^2$

Diagonal of Room = $\sqrt{3}\,a$



Cuboid

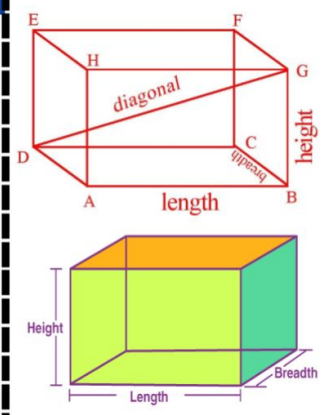
Volume = l × b × h

Lateral Surface Area = 2 (l + b) h

Area of 4 walls = 2 (l + b) h

Total Surface Area = 2 (lb + bh + lh)

Diagonal of Room = $\sqrt{(l^2 + b^2 + h^2)}$



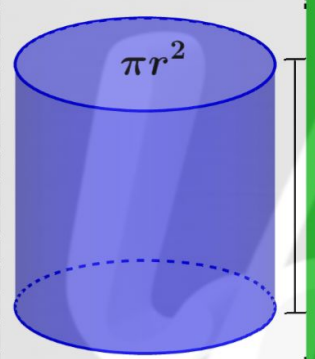
Cylinder

Volume = $\pi r^2 h$

Curved Surface Area = $2\pi rh$

Total Surface Area = $2\pi rh + 2\pi r^2$

$= 2\pi r\,(h + r)$



Hollow Cylinder

Volume of Material = $\pi R^2 h - \pi r^2 h$

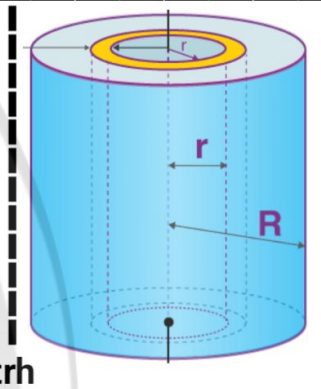
$= \pi\,(R^2 - r^2)\,h$

Curved Surface Area = $2\pi Rh + 2\pi rh$

$= 2\pi(R + r)\,h$

Total Surface Area = $2\pi Rh + 2\pi rh + 2\pi R^2 - 2\pi r^2$

$= 2\pi(R + r)\,h + 2\pi(R^2 - r^2)$



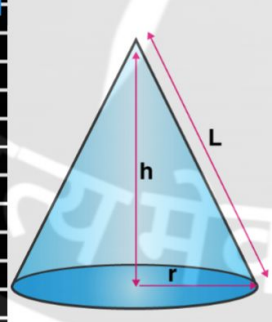
Cone

Volume = $1/3(\pi r^2 h)$

Curved Surface Area = πrl

Slant height (l) = $\sqrt{(r^2 + h^2)}$

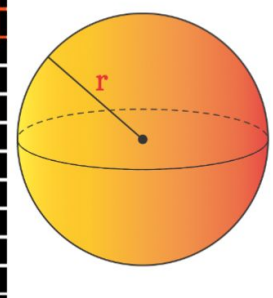
Total Surface Area = $\pi rl + \pi r^2$



Sphere

Volume = $4/3(\pi r^3)$

Surface Area = $4\pi r^2$

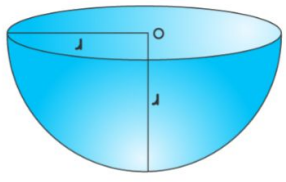


Hemisphere

Volume = $2/3(\pi r^3)$

Curved Surface Area = $2\pi r^2$

Total Surface Area = $3\pi r^2$

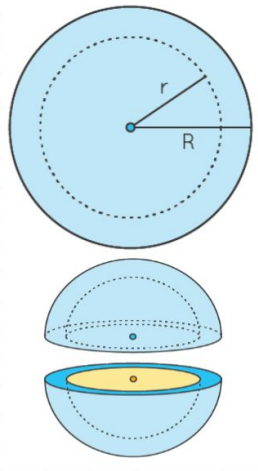


Spherical Shell

Volume of Material

$= 4/3(\pi R^3) - 4/3(\pi r^3)$

$= 4/3\,\pi(R^3 - r^3)$



Chapter 18 :- Mean, Median, Mode of Grouped Data

Mean

Mean of Raw Data

$$\overline{X} = \frac{\text{Sum of observation}}{\text{Number of observation}}$$

Mean of Grouped Data

i) Direct Method

$$\bar{x} = \frac{\sum f_i x_i}{\sum f_i}$$

$$\overline{X}_i = \frac{\text{Upper Class limit + lower limit}}{2}$$

ii) Assumed Mean Method

$$\text{Mean} = \bar{x} = A + \frac{\sum f_i d_i}{\sum f_i}$$

A = Middle Value of X_i Column

$d_i = X_i - A$

iii) Step Deviation Method

$$\text{Mean} = \bar{x} = A + \frac{\sum f_i u_i}{\sum f_i} \times h$$

$$u_i = \frac{x_i - A}{h}$$

h = Class Size

3 Median - 2 Mean = Mode

Median of Grouped Data

$$\text{Median} = l + \left[\frac{\frac{N}{2} - cf}{f}\right] \times h$$

Median Class = Class with cumulative frequency greater than N/2

l = lower limit of the median class
h = Class size
f = frequency of median class
cf = cumulative frequency of class preceding median class

Mode of Grouped Data

$$\text{Mode} = \ell + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times h$$

Modal Class = Class with highest frequency
l = lower limit of the modal class
h = Class size
f1 = frequency of modal class
f0 = frequency of class preceding modal class
f2 = frequency of class succeeding modal class

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Chapter 19 :- Probability

$$P(E) = \frac{\text{Numbers outcomes Favorable to E}}{\text{Total Number of possible outcomes}}$$

i) Probability Range :- $0 \le P(E) \le 1$
ii) $P(\text{not E}) + P(E) = 1$ or $P(\text{not E}) = 1 - P(E)$
iii) $P(E) = 0$ when It signifies an impossible event
iv) $P(E) =$ when you are 100 % assure

Coins

i) When a coin is thrown once
Total number of outcomes = 2 (H, T)
ii) When a coin is thrown twice
Total number of outcomes = 4
(HH, HT, TT and TH)
iii) When a coin is thrown thrice
Total number of outcomes = 8 (HHH, HHT, HTH, HTT, TTT, TTH, THT and THH)

Dies

i) When a die is thrown once
Total number of outcomes = 6
(1, 2, 3, 4, 5 and 6)
ii) When a die is thrown twice
Total number of outcomes = 36

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

Playing Cards

A = Ace
J = Jack (Face Card)
Q = Queen (Face Card)
K = King (Face Card)

Total Number of outcomes = 52
Total Number of Black Cards = 26
Total Number of Red Cards = 26

Spades	Clubs	Hearts	Diamond
A	A	A	A
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9
10	10	10	10
J	J	J	J
Q	Q	Q	Q
K	K	K	K
13	13	13	13 = 52

Total no. Face Card = 12
Total Red Face Card = 6
Total Black Face Card = 6