1. Euclid's division lemma

$a = bq + r \quad 0 \le r < |b|$

2. Arithmetic Progression

i) AP is $a, a+d, a+2d, a+3d \ldots$ n^{th} term is given by $t_n = a + (n-1)d$

ii) Sum to first n terms of an A.P is

$$S_n = \frac{n}{2}[2a + (n-1)d]$$

iii) If the last term (n^{th} term) is given then

$$S_n = \frac{n}{2}(a + l)$$

3. Geometric Progression

i) Geometric progression is are $a, ar, ar^2, \ldots ar^{n-1}$. n^{th} term is given by

$$t_n = ar^{n-1}$$

ii) Sum to first n terms of an G.P

is $S_n = \frac{a(r^n - 1)}{r - 1}$ if $r \neq 1$

iii) Suppose $r = 1$ then $S_n = na$

iv) Sum to infinite terms of G.P $a + ar + ar^2 + \ldots + \ldots$ is $S_\infty = \frac{a}{1 - r}$ where $-1 < r < 1$

4. Special series

i) The sum of first n natural number

$$1 + 2 + 3 + \ldots + n = \frac{n(n+1)}{2}$$

ii) The sum of Square of first n natural numbers

$$1^2 + 2^2 + 3^2 + \ldots + n^2 = \frac{n(n+1)(2n+1)}{6}$$

iii) The sum of cubes of first n natural numbers

$$1^3 + 2^3 + 3^3 + \ldots + n^3 = n\left(\frac{n+1}{2}\right)^2$$

iv) The sum of first n odd natural number

$$1 + 3 + 5 + \ldots + (2n - 1) = n^2.$$

5. Quadratic equation $ax^2+bx+c=0$ $(a\neq 0)$ are given by $\frac{-b\pm\sqrt{b^2-4ac}}{2a}$

6. Sum of the roots $\alpha+\beta = -b/a$

7. Product of the roots $\alpha\beta = c/a$

8. Quadratic equation are α and β then the equation given by $x^2+(\alpha+\beta)x+\alpha\beta=0$

9. Nature of Roots $\Delta=b^2-4ac$

i) $\Delta>0$ Real and unequal

ii) $\Delta=0$ Real and equal

iii) $\Delta<0$ No Real Roots

10 BPT Theorem is $\frac{AD}{DB}=\frac{AE}{EC}$

11. ABT Theorem is $\frac{AB}{AC}=\frac{BD}{CD}$

12 Ceva's Theorem is $\frac{BD}{DC}\times\frac{CE}{EA}\times\frac{AF}{FB}=1$

13. Menelaus Theorem is $\frac{BP}{PC} \times \frac{CQ}{QA} \times \frac{AR}{RB} = -1$

14. Area of a triangle $= \frac{1}{2}\{(x_1y_2 + x_2y_3 + x_3y_1) - (x_2y_1 + x_3y_2 + x_1y_3)\}$ Sq. units

15 i) $\Delta ABC = 0$ or $x_1y_2 + x_2y_3 + x_3y_1 = x_2y_1 + x_3y_2 + x_1y_3$

ii) Slope of AB = Slope of BC or Slope of AC

16. Area of a Quadrilateral (x_1, y_1) (x_2, y_2) (x_3, y_3) (x_4, y_4) is

$\frac{1}{2}\{(x_1y_2 + x_2y_3 + x_3y_4 + x_4y_1) - (x_2y_1 + x_3y_2 + x_4y_3 + x_1y_4)\}$ Sq. units

17 Slope of AB is $\frac{y_2 - y_1}{x_2 - x_1}$

18 Slope of line $ax + by + c = 0$ is $m = -a/b$

19 General form $= ax + by + c = 0$

20 Point - Slope form $= y - y_1 = m(x - x_1)$

21 Slope - intercept $= y = mx + c$

22. Two point form $= \frac{y-y_1}{y_2-y_1} = \frac{x-x_1}{x_2-x_1}$

23 Intercept form $= \frac{x}{a} + \frac{y}{b} = 1$

24. Parallel to y axis $= x = c$

25. Parallel to x axis $= y = b$

26 Parallel is $m_1 = m_2$

27 Prependicular is $m_1 \times m_2 = -1$

28 $\sin^2\theta + \cos^2\theta = 1$

29 $\sec^2\theta - \tan^2\theta = 1$

30 $\operatorname{cosec}^2\theta - \cot^2\theta = 1$

31 $\sin\theta = \frac{\text{Opposite side}}{\text{Hypotenuse}}$

32 $\cos\theta = \frac{\text{Adjacent side}}{\text{Hypotenuse}}$

33. $\tan\theta = \frac{\text{Opposite side}}{\text{Adjacent side}}$

34 Cuboid ⇒ C.S.A $= 2h(l+b)$

T.S.A $= 2(lb+bh+lb)$

Volume $= l \times b \times h$

35 Cube ⇒ C.S.A $= 4a^2$

T.S.A $= 6a^2$

Volume $= a^3$

36 Cylinder ⇒ C.S.A $= 2\pi rh$

T.S.A $= 2\pi r(h+r)$

Volume $= \pi r^2 h$

37 Cone ⇒ C.S.A $= \pi rl$ $l = \sqrt{r^2+h^2}$

T.S.A $= \pi rl + \pi r^2 = \pi r(l+r)$

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

38 Sphere $\Rightarrow$ C.S.A $= 4\pi r^2$

T.S.A $= 4\pi r^2$

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

39 Hemisphere $\Rightarrow$ C.S.A $= 2\pi r^2$

T.S.A $= 3\pi r^2$

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

40 Hollow cylinder $\Rightarrow$ C.S.A $= 2\pi(R+r)h$

T.S.A $= 2\pi(R+r)(R-r+h)$

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

41 Hollow Sphere $\Rightarrow$ C.S.A $= 4\pi R^2$

T.S.A $= 4\pi(R^2+r^2)$

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

41 Hollow cylinder $\Rightarrow$ C.S.A $= 2\pi(R^2+r^2)$

T.S.A $= \pi(3R^2+r^2)$

Volume $= \frac{2}{3}\pi(R^3-r^3)$

42. Frustum $\Rightarrow$ C.S.A $= \pi(R+r)l$

$l = \sqrt{h^2+(R-r)^2}$

T.S.A $= \pi(R+r)l + \pi R^2 + \pi r^2$

Volume $= \frac{1}{3}\pi h(R^2+r^2+Rr)$.

43 Range $\Rightarrow R = L-S$

44 Coefficient of Range $R = \frac{L-S}{L+S}$

45 Standard deviation $\sigma = \sqrt{\frac{\Sigma x}{n} - \left(\frac{\Sigma x}{n}\right)^2}$

46 Variance $\sigma^2 = \sqrt{\frac{\Sigma x}{n} - \left(\frac{\Sigma x}{n}\right)^2}$

47 Mean Method $\sigma = \sqrt{\frac{\Sigma d^2}{n}}$

9) Direct method $\sigma = \sqrt{\frac{\Sigma x^2}{n} - \left(\frac{\Sigma x}{n}\right)^2}$

ii) Assumed mean method $\sigma = \sqrt{\frac{\Sigma d^2}{n} - \left(\frac{\Sigma d}{n}\right)^2}$

iii) Step deviation $\sigma = c \times \sqrt{\frac{\Sigma d^2}{n} - \left(\frac{\Sigma d}{n}\right)^2}$

48. First "n" natural numbers $\sigma = \sqrt{\frac{n^2 - 1}{12}}$

49 Coefficient of Variation $C.V = \frac{\sigma}{\bar{x}} \times 100\%$.

50 Sure event is 1 = $P(S) = \frac{n(S)}{n(S)} = 1$

Possible event

51 $P(\phi) = \frac{n(\phi)}{n(S)} = 0$

impossible event

52 $P(A) + P(\bar{A}) = 1$

53. Addition Theorem of Probability

i) $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

ii) $P(A \cup B \cup C) = P(A) + P(B) + P(C) - P(A \cap B) - P(B \cap C) - P(C \cap A) + P(A \cap B \cap C)$.

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