29. if \( a + ib = 0 \) where \( i = \sqrt{-1} \), then \( a = b = 0 \)

30. if \( a + ib = x + iy \), where \( i = \sqrt{-1} \), then \( a = x \) and \( b = y \)

31. The roots of the quadratic equation \( ax^2 + bx + c = 0; a \neq 0 \) are

\[
\frac{-b \pm \sqrt{\Delta}}{2a}
\]

where \( \Delta = \text{discriminant} = b^2 - 4ac \)

32. The roots are real and distinct if \( \Delta > 0 \).

33. The roots are real and coincident if \( \Delta = 0 \).

34. The roots are non-real if \( \Delta < 0 \).

35. If \( \alpha \) and \( \beta \) are the roots of the equation \( ax^2 + bx + c = 0, a \neq 0 \) then

i) \( \alpha + \beta = \frac{-b}{a} = -\text{coeff. of } x \)

ii) \( \alpha \cdot \beta = \frac{c}{a} = \text{constant term} \)

36. The quadratic equation whose roots are \( \alpha \) and \( \beta \) is \( (x - \alpha)(x - \beta) = 0 \)

i.e. \( x^2 - (\alpha + \beta)x + \alpha \beta = 0 \)

i.e. \( x^2 - Sx + P = 0 \) where \( S = \text{Sum of the roots} \) and \( P = \text{Product of the roots} \).

37. For an arithmetic progression (A.P.) whose first term is \( (a) \) and the common difference \( (d) \).

i) \( n^{th} \) term = \( t_n = a + (n - 1)d \)

ii) The sum of the first \( (n) \) terms = \( S_n = \frac{n}{2}(a + l) = \frac{n}{2}(2a + (n - 1)d) \)

where \( l \) = last term = \( a + (n - 1)d \).

38. For a geometric progression (G.P.) whose first term is \( (a) \) and common ratio \( (\gamma) \),

i) \( n^{th} \) term = \( t_n = a\gamma^{n-1} \).

ii) The sum of the first \( (n) \) terms:

\[
S_n = \begin{cases} 
\frac{a(1 - \gamma^n)}{1 - \gamma} & \text{if } \gamma < 1 \\
\frac{a(\gamma^n - 1)}{\gamma - 1} & \text{if } \gamma > 1 \\
a \gamma - 1 & \text{if } \gamma = 1
\end{cases}
\]

39. For any sequence \( \{t_n\} \), \( S_n - S_{n-1} = t_n \) where \( S_n = \text{Sum of the first } (n) \) terms.

40. \( \sum_{\gamma=1}^{n} \gamma = 1 + 2 + 3 + \cdots + n = \frac{n}{2}(n + 1) \).

41. \( \sum_{\gamma=1}^{n} \gamma^2 = 1^2 + 2^2 + 3^2 + \cdots + n^2 = \frac{n}{6}(n + 1)(2n + 1) \).