1) If ${}^{8}p_{r} = 6720$, find $\underline{|r+1}$

2) Evaluate ${}^{n}p_{0} + {}^{n}p_{1} + {}^{n}p_{2}$ given that $\underline{|n+1} \div \underline{|n-1} = 72$

3) Prove that ${}^{n}p_{r} = {}^{n-1}p_{r} + r\,{}^{n-1}p_{r-1}$

4) P. that ${}^{n}C_{r} : {}^{n-1}C_{r-1} = \frac{n}{r}$ then evaluate $\frac{{}^{25}C_{4} + {}^{24}C_{3}}{{}^{24}C_{3} + {}^{23}C_{2}}$

5) Find ${}^{n}C_{7r+3}$ where ${}^{n}C_{3} = 120$, ${}^{n}C_{r^2+2r} = {}^{n}C_{2r+5}$

6) Find $(x+2)^5 - (x-2)^5$

7) If the value of the middle term in the expansion of $(x^2 + \frac{1}{2x})^{10}$ equals $\frac{28}{27}$, evaluate x.

8) Calculate the coefficient of x^5 in the expansion of $(\frac{x^2}{2} - \frac{3}{x})^{10}$

9) Find with respect to the expansion $(x + \frac{3}{2x^2})^{12}$

a) the coefficient of x^6

b) the order of the term free of x

10) Let a , b be the two middle terms in the expansion of $(x-\frac{1}{x})^{15}$ according to the descending order of the power of x , prove that $a + b x^2 = 0$

11) prove that the expansion of $(x^2 + \frac{1}{x})^n$ includes a term free of x if n is multiple of 3 , then find the term free of x when n = 12.

12) The ratio between the 5^{th} , 6^{th} terms in the expansion of $(x^2 + \frac{2}{x})^8$ equals 25 : 8 evaluate x .

13) In the expansion $(3 + x)^n$ according to the descending order of the power of x , if $T_{10} = \frac{2}{3} T_9$, $T_{14} = 4 T_{15}$ evaluate n , x

14) T_3 , T_4 , T_5 in expansion $(x + y)^n$ are 112 , 448 , 1120 respectively , evaluate x , y , n.

15) The ratio between T_2 , T_3 in $(A + B)^n$ equals the ratio between T_3 , T_4 In $(A + B)^{n+3}$, find n

16) The ratio among the three coefficient of three consecutive terms in the expansion of $(1 + x)^n$ are 15 : 24 : 28 , evaluate n , and find the order of these terms.

17) Consider the expansion $(2x + \frac{3}{x^2})^n$. $T_9 = T_{10}$, the ratio of T_6 , T_7 equals 8 : 15 , find n , then prove that there exists no term free of x in this expansion.

18) find each of the middle term and the term includes x^{-3} in the expansion $\left(\frac{2x}{3}+\frac{3}{2x^2}\right)^{12}$, if the ratio between these two terms is 7 : 9 find x

19) Find with respect to the expansion of $\left(4x^2+\frac{1}{2x}\right)^{15}$

a) The coefficient of x^4
b) The value of the term free of x
c) The value of x which makes the two middle terms equal.

20) If (2 – i) is one of the two roots of the equation $x^2 + bx + 1 = 0$ then find b .

21) If (-3) is a root of the equation $x^3 + x^2 – x + 15 = 0$, find the other two roots.

22) Solve the equation $2z + 3\bar{z} = 5$

23) If (- 1) is a root of the equation $x^3 - x^2 + 2 = 0$ show that the other two roots are conjugate to each other.

24) Let $z_1 = 10 (\cos \theta + i \sin \theta)$,

$z_2 = \frac{1}{2} (\sin 2\theta + i \cos 2\theta)$, $\tan \theta = \frac{3}{4}$, $0 < \theta < 90$,

find the trigonometric and the algebraic form of the product $z_1 z_2$.

25) Find $\left(\frac{1-i}{1+i}\right)^4$

26) Put each of the numbers $\sqrt{2}$ i , 1 + i in the trigonometric form and use it to find $\left(\frac{\sqrt{2}i}{1+i}\right)^6$

27) Find the square roots of the complex number

$z = 2 + 2\sqrt{3}\,i$

28) Find the real values of x , y which satisfy the equation

$(x + iy)^2 (1 + i) + 7 - i = 0$

29) If $(x + i y)^2 = \frac{11+i}{1+2i}$, find the real values of x , y.

30) If $x = \frac{1+i}{1-i}$, $y = \frac{1-i}{1+i}$, then find $\left(3x^{12} + 4y^{15}\right)^{\frac{1}{2}}$

31) Solve the equation $x^2 - 2x + 4 = 0$

32) Prove that $(1 + w + 5w^2)(1 - 2w - w^2) = 18$

33) Prove that $\frac{3}{2}i$ is one of the square roots of the equation

$$\left(\frac{1+10w+10w^2}{1-3w-3w^2}\right)$$

34) Prove that $w^2 - w = \pm i\sqrt{3}$ hence evaluate:

$$\left[\frac{5-3w^2}{5w-3} - \frac{2-7w}{2w^2-7}\right]^4$$

35) Prove that $(2 + 5w + 2w^2)^6 (2 + 2w + 5w^2)^6 = 729$

36) If $x = a + b$, $y = aw + b w^2$, $z = aw^2 – bw$ then prove that a) $xyz = a^3 + b^3$

b) $x^2 + y^2 + z^2 = 6 a b$

37) Form the quadratic equation whose roots are $(1 + w - w^2)^3$, $(1 – w + w^2)^3$

38) Show that:

$$\begin{vmatrix} x & a & a \\ a & x & a \\ a & a & x \end{vmatrix} = (x + 2 a) (x - a)^2$$

39) Find k that makes x is a factor of $\begin{vmatrix} x & 1 & 0 \\ -3 & 2 & 3 \\ -x+k & 5 & x-k \end{vmatrix}$

40) Evaluate

$$\begin{vmatrix} a^2+1 & ab & ac \\ ab & b^2+1 & bc \\ ac & bc & c^2+1 \end{vmatrix}$$

41) Evaluate

$$\begin{vmatrix} a_1+ib_1 & a_1 i+b_1 & c_1 \\ a_2+ib_2 & a_2 i+b_2 & c_2 \\ a_3+ib_3 & a_3 i+b_3 & c_3 \end{vmatrix}$$