1) Prove that if x & y are odd positive integers, then prove that $x^2 + y^2$ is even & not divisible by 4.
2) Prove that one and only one out of n, n + 2 and n + 4 is divisible by 3, where n is any positive integer.
3) Show that cube of any positive integer is of the form 9m, 9m + 1 or 9m + 8, for some integer m.
4) After how many decimal places the decimal expansion of the rational number $\frac{441}{2^2 \times 5^7 \times 7}$ will terminate.
5) What can you say about the product and difference of two different irrational numbers, justify with examples.
6) If 'd' is the H.C.F of 963 & 657, Find the value of x & y satisfying d = 963x + 657y.
7) Prove that $2 - 5\sqrt{3}$ is an irrational number.
8) Prove that product of three consecutive integers is divisible by 6.
9) Using Euclid's division algorithm, find the largest number that divides 398,436,542 leaving remainders 7,11 & 15 respectively.
10) Find the greatest number of 6 digits exactly divisible by 24, 15, 36.
11) Verify by using Euclid's division algorithm that the numbers 350 & 849 are co –primes.
12) Find all the zeroes of $2x^4 - 3x^3 - 3x^2 + 6x - 2$, if you know that two of its zeroes are $-\sqrt{2}$ and $\sqrt{2}$.
13) If two zeroes of the polynomial $x^4 - 6x^3 - 26x^2 + 138x - 35$ are $2 \pm \sqrt{3}$, find other zeroes.
      Find the zeroes of a cubic polynomial $p(x) = x^3 - 5x^2 - 2x + 24$, when it is given that product of its two zeroes is 12.
14) The zeroes of the polynomial $q(x) = px^2 - 2(p + 2)x + 3p$ are α & β. If $\alpha - \beta = 2$. Find α, β & p .
15) If the polynomial $x^4 - 6x^3 + 16x^2 - 25x + 10$ is divided by another polynomial $x^2 - 2x + k$, the remainder comes out to be x + a, find k and a.
16) Given that the zeroes of the cubic polynomial $x^3 - 6x^2 + 3x + 10$ are of the form a, a + b, a + 2b for some real numbers 'a' and 'b', find the values of a and b as well as the zeroes of the given polynomial.
17) Give examples of polynomials p(x), g(x), q(x) and r(x), which satisfy the division algorithm and
      (i) deg p(x) = deg q(x)   (ii) deg q(x) = deg r(x)   (iii) deg r(x) = 0
18) If α & β are zeroes of the polynomial $p(x) = x^2 - 4x + 2$, then find the value of $(\alpha + 1)^{-2} + (\beta + 1)^{-2}$.
19) Find the zeroes of the following quadratic polynomials and verify the relationship between the zeroes and the coefficients:
$$\text{a) } 3x^2 - 1 \qquad \text{b) } 4x^2 + 5\sqrt{2}x - 3$$
20) α, β, γ are zeroes of polynomial $x^3 + px^2 + qx + 2$ such that $\alpha.\beta + 1 = 0$. Find the value of 2p + q + 5 .
21) Find the condition that the zeroes of the polynomial $f(x) = x^3 - px^2 + qx - r$, may be in Arithmetic progression.
22) If α & β are the zeroes of the quadratic polynomial $f(x) = 2x^2 - 5x + 7$, find a quadratic polynomial whose zeroes are $(2\alpha + 3\beta)$ & $(2\beta + 3\alpha)$.
23) If squared difference of the zeroes of the polynomial $x^2 + ax + 45$ is equal to 144, find the value of a .
24) If α & β are the zeroes of the polynomial $3x^2 + kx + 3$ & $\alpha^2 + \beta^2 + \alpha\beta = \frac{21}{4}$, then find the value of k .
25) α, β, γ are zeroes of cubic polynomial $x^3 - 12x^2 + 44x + c$. If α, β, γ are in AP, find the value of c.
26) If the zeroes of the polynomial $x^3 - 12x^2 + 39x - 28$ are in A.P , find them .
27) p & q are the zeroes of the $2x^2 - 6x + 3$, Find the value of $(p^3 + q^3) - 3pq(p^2 + q^2) - 3pq(p+q)$.
28) If α and β are zeroes of the quadratic polynomial $kx^2 + 4x + 4$ such that $\alpha^2 + \beta^2 = 24$, find the value of k .
29) If α & β are the zeroes of the quadratic polynomial $f(x) = 3x^2 - 4x + 1$, find a quadratic polynomial whose zeroes are i) $\frac{\alpha^2}{\beta}$ & $\frac{\beta^2}{\alpha}$

      ii) $\frac{\alpha}{\beta}$ & $\frac{\beta}{\alpha}$

30) If the zeroes of $g(x) = lx^2 + nx + n$ are in the ratio p : q , then prove that : $\frac{\sqrt{p}}{\sqrt{q}} + \frac{\sqrt{q}}{\sqrt{p}} + \frac{\sqrt{n}}{\sqrt{l}} = 0$.

31) The traffic lights at three different road crossings change after every 48 seconds , 72 seconds and 108 seconds respectively. If they all change simultaneously at 8 a.m, then at what time will they again change simultaneously ?
32) A mason has to fit a bathroom with square marble type of largest possible size. The size of bathroom is 10 fit by 8 fit. what would be the size in inches of tile and required that has to be cut and how many such tiles are required.
33) Find the least no. that is divisible by all integers from 1 to 10.
34) Can two numbers have 28 as their HCF and 812 as their LCM? Give reasons.
35) If prime factorisation of a natural number N is $2^4 \times 3^4 \times 5^3 \times 7$, Write the number of consecutive zeroes in N.
36) For what value of n , $n^2 - 1$ is divisible by 8 .
37) If A = 2n + 13 & B = n + 7, where n is a natural number Find the HCF of A & B
38) How many polynomials having zeroes as 3 & -5 , write any two polynomials.
39) What can you say about zeroes of quadratic polynomial $x^2 - 99x + 127$.
40) Find the HCF of smallest prime & smallest 2 digit composite no.
41) Solve for x : i) $x^2 + 5x - (a^2 + a - 6) = 0$ ii) $\frac{1}{2a+b+2x} = \frac{1}{2a} + \frac{1}{b} + \frac{1}{2x}$ iii) Solve : $\frac{2x}{x-3} + \frac{1}{2x+3} + \frac{3x+9}{(x-3)(2x+3)} = 0$

42) Solve i) $2\left(\frac{x+2}{2x-3}\right) - 9\left(\frac{2x-3}{x+2}\right) = 3$ ii) $x^2 - 4ax - b^2 + 4a^2 = 0$ iii) $\frac{p}{(x-q)} + \frac{q}{(x-p)} = 2$ iv) $\frac{x-4}{x-5} + \frac{x-6}{x-7} = \frac{10}{3}$

43) The total cost of a certain length of a piece of cloth is Rs 200. If the piece was 5 m longer and each metre of cloth costs 2 less, the cost of the piece would have remained unchanged. How long is the piece and what is its original rate per metre ?

44) Swati can row her boat at speed of 5km /h in still water . If it takes her 1 hour more to row the boat 5.25 km upstream than to downstream , find the speed of the stream.

45) A peacock is sitting on the top of a pillar which is 9m high . From a point 27 m away from the bottom of the pillar , a sanke is coming to its hole at thee base of the pillar . Seeing the snake the peacock pounces on it. If their speeds are equal at what distance from the hole is the snake caught.

46) A train travels at a certain average speed for a distance of 63 km and then travels a distance of 72 km at an average speed of 6 km/h more than its original speed. If it takes 3 hours to complete the total journey, what is its original average speed?

47) Two water taps together can fill a tank in 75/8 hours. The tap of larger diameter takes 10 hours less than the smaller one to fill the tank separately. Find the time in which each tap can separately fill the tank.

48) An aeroplane 30 minutes later than its scheduled time , & in order to reach its destination 1500 km away in time , it has to increase its speed by 250 km/h from its usual speed , determine its usual speed.

49) If roots of equation are equal (b-c) x^2 + (c-a)x + (a-b) = 0 are equal , then prove that : 2b = a + c

50) A pole has to be erected at a point on the boundary of a circular park of diameter 17 m in such a way that the differences of its distances from two diametrically opposite fixed gates A and B on the boundary is 7 metres. Find the distances from the two gates where the pole is to be erected.

51) Solve the equation − 4 + (−1) + 2 +...+ x = 437.

52) Determine the 10th term from the end of the A.P. 4, 9, 14, ..., 254.

53) How many terms of the series 54, 51, 48, ... be taken so that their sum is 513 ? Explain the double answer.

54) The ratio of the sum use of n terms of two A.P.'s is (5n + 4) : (9n + 6). Find the ratio of their 25th terms.

55) The ratio of the sums of m and n terms of an A.P. is m^2 : n^2. Show that the ratio of the mth and nth terms is (2m − 1) : (2n − 1).

56) If the term of m terms of an A.P. is the same as the sum of its n terms, show that the sum of its (m + n) terms is zero.

58) 150 workers were engaged to finish a job in a certain number of days. 4 workers dropped out on second day, 4 more workers dropped out on third day and so on. It took 8 more days to finish the work. Find the number of days in which the work was completed.

57) The sum of n terms of an A.P. is $3n^2$ + 4 n. Find its nth term & the series .

58) Divide 56 in four parts in A.P. such that the ratio of the product of their extremes (1st and 4th) to the product of means (2nd and 3rd) is 5 : 6.

59) Find the common difference of an A.P. whose first term is 5 & the sum of its first four terms is half the sum of the next four terms .

60) If the sum of first 7 terms of an A.P. is 49 and that of its first 17 terms is 289,   find the sum of first n terms of the A.P.

61) If the pth, q^{th} & r^{th} term of an AP is x, y and z respectively, show that x(q-r) + y(r-p) + z(p-q) = 0

62) For which values of a and b does the following pair of linear equations have an infinite number of solutions?
    2x + 3y = 7   &   (a − b) x + (a + b) y = 3a + b − 2.

63) Solve the equations : $\frac{5}{x-1} + \frac{1}{y-2}$ =2 , $\frac{6}{x-1} - \frac{3}{y-2}$ = 1, Hence find value of m for which y = mx + 3 .

64) A shopkeeper sells a saree at 8% profit and a sweater at 10% discount, thereby, getting a sum Rs 1008. If she had sold the saree at 10% profit and the sweater at 8% discount, she would have got Rs 1028. Write equations .

65) A person, rowing at the rate of 5 km/h in still water, takes thrice as much time in going 40 km upstream as in going 40 km downstream. Find the speed of the stream.

66) A motor boat can travel 30 km upstream and 28 km downstream in 7 hours. It can travel 21 km upstream and return in 5 hours. Find the speed of the boat in still water and the speed of the stream.

67) It can take 12 hours to fill a swimming pool using two pipes. If the pipe of larger diameter is used for 4 hours and the pipe of smaller diameter for 9 hours, only half the pool can be filled.How long would it take for each pipe to fill the pool separately?

68) If difference of two numbers is 3 & difference of their reciprocals is 3/28 . Find the numbers.

69) At present Asha's age (in years) is 2 more than the square of her daughter Nisha's age. When Nisha grows to her mother's present age, Asha's age would be one year less than 10 times the present age of Nisha. Find the present ages of both Asha and Nisha.

70) For what value of k , the expression (4- k) x^2 + (2k +4)x +(8k +1) is a perfect square. Hence , Write the expression .

71) A man bought a certain number of toys for Rs 180 , he kept one one for his own use & sold the rest for one rupee each more than he gave for them , besides getting his own toy for nothing he made a profit of Rs 10. Find the number of toys .

72) At t minutes past 2 pm, the time needed by the minutes hand of a clock to show 3 pm was found to be 3 minutes less than $t^2/4$ minutes. Find t.

73) 90% & 97 % pure acid solutions are mixed to obtain 21 litres of 95 % pure acid solutions .Find the amount of each type of acid to be mixed to form the mixture .

74) Jamila sold a table and a chair for Rs 1050, thereby making a profit of 10% on the table and 25% on the chair. If she had taken a profit of 25% on the table and 10% on the chair she would have got Rs 1065. Find the cost price of each.

75) For which values of p and q, will the following pair of linear equations have infinitely many solutions?   4x + 5y = 2 & (2p + 7q) x + (p + 8q) y = 2q − p + 1.

76) Solve the system of equations : a) $a^2/x - b^2/y = 0$ & $a^2b/x + b^2a/y = a + b$ b) $mx - ny = m^2 + n^2$, x + y = 2m   c) 21x + 47y = 110, 47x + 21y = 162

77) In an AP of 50 terms, the sum of first 10 terms is 210 and the sum of its last 15 terms is 2565. Find the AP.

78) A bucket is in the form of a frustum of a cone and it can hold 28.49 litres of water. If the radii of its circular ends are 28 cm and 21 cm, find the height of the bucket.

79) Water is flowing at the rate of 15 km/hour through a pipe of diameter 14 cm into a cuboidal pond which is 50 m long and 44 m wide. In what time will the level of water in the pond rise by 21 cm?

80) A solid metallic right circular cone 20 cm high and whose vertical angle is 60°, is cut into two parts at the middle of its height by a plane parallel to its base. If the frustum so obtained be drawn into a wire of diameter $\frac{1}{12}$cm, find the length of the wire.

81) In a flight of 2800 km, an aircraft was slowed down due to bad weather. Its average speed is reduced by 100 kmph and time is increased by 30 minutes. Find the original duration of the flight.

82) When the son will be as old as his father today the sum of their ages will be 126 when the father was as old as his son today sum of their ages was 38 find their present age.

83) If $ad \neq bc$, then Prove that $x^2(a^2 + b^2)+ 2x(ac + bd) + (c^2 + d^2) = 0$ has no roots

84) 2 women and 5 men can together finish an embroidery work in 4 days, while 3 women and 6 men can finish it in 3 days. Find the time taken by 1 woman alone to finish the work, and also that taken by 1 man alone.

85) A milk container is made of metal sheet in the shape of frustum of a cone whose volume is $10459\frac{3}{7}$ cm^3. The radii of its lower and upper circular ends are 8 cm and 20 cm respectively. Find the cost of metal sheet used in making the container at the rate of Rs 1.40 per square centimeter.

86) A petrol tank is in the form of a frustum of a cone of height 20 m with diameters of its lower and upper ends as 20 m and 50 m respectively. Find the cost of petrol which can fill the tank completely at the rate of Rs. 70 per litre. Also find the surface area of the tank.

87) Water is flowing through a cylindrical pipe, of internal diameter 2 cm, into a cylindrical tank of base radius 40 cm, at the rate of 0.4 m/s. Determine the rise in level of water in the tank in half an hour.

88) The interior of a building is in the form of cylinder of a diameter 4.3m and 3.8m high surmounted by cone having same base whose Vertical angle is right angle find the area of surface and volume of the building.

89) A well of diameter 4 m is dug 21 m deep. The earth taken out of it has been spread evenly all around it in the shape of a circular ring of width 3 m to form an embankment. Find the height of the embankment.

90) In a canal, 5.4 m wide and 1.8 m deep, water is flowing with a speed of 25 km/hr. How much area can it irrigate in 40 minutes, if 10 cm of standing water is required for irrigation?

91) A container made up of a metal sheet is in the form of a frustum of a cone of height 12 cm with radii of its lower and upper ends as 3 cm and 12 cm respectively. Find the cost of metal sheet used, if it costs Rs. 4 per 100 cm^2. (Take $\pi = 22/7$)

92) The height of a cone is 30 cm. A frustum is cut off from this cone by a plane parallel to the base of the cone. If the volume of the frustum is $\frac{19}{27}$ of the volume of the cone, find the height of the frustum.

93) The height of a cone is 10 cm. The cone is divided into two parts by drawing a plane through the midpoint of the axis of the cone, parallel to the base. Compare the volume of the two parts.

94)   A hollow cone is cut by a plane parallel to the base and upper part is removed. If the curved surface of the remainder is $\frac{15}{16}$ of the curved surface of the whole cone, find the ratio of the line-segments into which the cone's altitude is divided by the plane.

95) Water flows through a cylindrical pipe, whose inner radius is 1 cm, at the rate of 80 cm/sec in an empty cylindrical tank, the radius of whose base is 40 cm. What is the rise of water level in tank in half an hour?

96) A hollow cone is cut by a plane parallel to the base & the upper portion is removed , If the curved surface of the remainder is 8/9 of the curved surface of the whole cone, Find the ratio of the line segment into which the cone 's altitude is divided by the plane .

97) A hemispherical tank full of water is emptied by a pipe at the rate of 3 litres per second. How much time will it take to half-empty the tank, if the tank is 3 metres in diameter? (Take $\pi = 22/7$)

98) A conical tank is full of water. Its base-radius is 1·75 m and height 2·25 m. It is connected with a pipe which empties it at the rate of 7 litres per second. How much time will it take to empty the tank completely? (Take $\pi = 22/7$)

99) Water in a canal 4 m wide and 1·5 m deep is flowing with velocity 12 km per hour. How much area will it irrigate in 30 minutes, if 9 cm of standing water is required for irrigation?

100)   Water flows at the rate of 15 m per minute through a cylindrical pipe having its diameter 1·2 cm. How much time will it take to fill a conical vessel whose diameter of base is 40 cm and depth 81 cm ?

101)   A conical vessel of radius 6 cm and height 8 cm is completely filled with water. A sphere is lowered into the water and its size is such that when it touches the sides, it is just immersed. What fraction of water overflows?

102)   From a solid cylinder of height 20 cm and diameter 12 cm, a conical cavity of height 8 cm and radius 6 cm is hollowed out. Find the total surface area of the remaining.

103)   150 spherical marbles, each of diameter 1.4 cm, are dropped in a cylindrical vessel of diameter 7 cm containing some water, which are completely immersed in water. Find the rise in the level of water in the vessel.

105) A right circular cone with sides 12 cm and 16 cm is revolved around its hypotenuse. Find the volume of the double cone so formed.

106)   A solid right circular cone of height 120 cm and radius 60 cm is placed in a right circular cylinder full of water of height 180 cm such that it touches the bottom. Find the volume of water left in the cylinder, if the radius of the cylinder is equal to the radius of the cone.

107)   A cubical block of side 7cm is surmounted by a hemisphere. what is the greatest diameter of the hemisphere can have? Find the total surface area of the solid.

108) Difference between the outer & inner C.S.A of hollow cylinder , 14 cm long is 88 cm^2. If the volume of metal used in making the cylinder is 176 cm^3, Find the outer & inner diameters of the cylinders.

109) Prove that the line segment joining the points of contact of two parallel tangents of a circle passes through its centre.

110) 110) A spiral is made up of successive semicircles, with centres alternately at A and B, starting with centre at A, of radii 0.5 cm, 1.0 cm, 1.5 cm, 2.0 cm, . . . What is the total length of such a spiral made up of thirteen consecutive semicircles?

111) From an external point P , two tangents PT & PS are drawn to a circle with centre O & Radius r. If OP = 2r, Show that ∟OTS = ∟OST = 30°.

112) O is the centre of a circle of radius 5 cm, T is a point such that OT = 13 cm and OT intersects the circle at E. If AB is the tangent to the circle at E, find the length of AB.

113) Prove that the perpendicular at the point of contact to the tangent to a circle passes through the centre.

114) Prove that the parallelogram circumscribing a circle is a rhombus.

115) Two tangents TP and TQ are drawn to a circle with centre O from an external point T. Prove that ∠PTQ = 2 ∠OPQ.

116) The common tangent, AB and CD to two circles with centres O and O' intersect at E. Prove that i) AB = CD ii) Points O_1, E, O_2 are collinear.

117) PQ is a chord of length 8 cm of a circle of radius 5 cm. The tangents at P and Q intersect at a point T .Find the length TP.

118) The annuals profits earned by 30 shops of a shopping complex in a locality give rise to following dist.

| Profit (lakhs)	More than or equal to 5	More than or equal to 10	More than or equal to 15	More than or equal to 20	More than or equal to 25	More than or equal to 30	More than or equal to 35
Shops	30	28	16	14	10	7	3

Draw Both Ogives , Hence Find median Profit.

119) Following table shows the ages of patients admitted in Hospital during a year :

Age(Years)	5-15	15-25	25-35	35-45	45-55	55-65
Patients	6	11	21	23	14	5

Find the Mode & Mean of data Given Above. Compare & Interpret two measures of central tendency .

120) Aditya decided to collect the Science marks of his class. The total number of students is 50. After collecting the data, he analyzed the data and prepared a report on the Science marks of his class. Using this report, he drew the following graph for a particular of Science marks of his class:
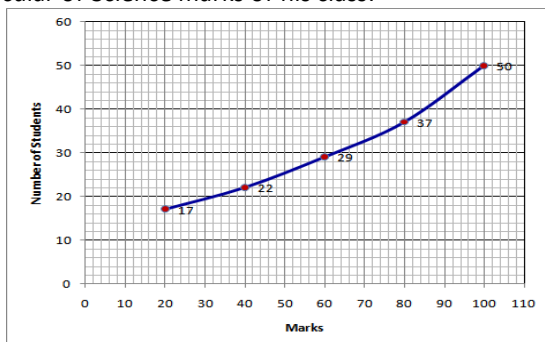
Based on the above graph, answer the following questions:
  (i) Form the frequency distribution table for the data.
  (ii) Find the median marks of his class from graph and verify the result by using formula.
  (iii) Obtain the Mode of the data if mean is 52   Ask queries : tarunacadamy@gmail.com