1. Express each of the following decimals in the form p/q
   (i) 0.123  (ii) 15.712
2. If x = 3 + 2√2, find out whether x 1/2 is rational or irrational.
3. Prove that: \( \frac{1}{\sqrt{2} - \sqrt{3}} + \frac{1}{\sqrt{3} - \sqrt{4}} + \frac{1}{\sqrt{4} - \sqrt{5}} + \frac{1}{\sqrt{5} - \sqrt{6}} = 5 \).
4. Find the value of \( \frac{4}{(216)^{2/3}} + \frac{1}{(256)^{3/4}} + 2/(243)^{1/5} \).
5. Factorize (a) \( 4y^2 - 4y + 1 \) (b) \( x^4 - y^4 \).
6. The polynomial \( P(x) = kx^3 + 9x^2 + 4x - 8 \) when divided by \( x + 3 \) leaves a remainder 10 \( (1 - k) \). Find the value of k.
7. If \( x^2 + px + q = (x + a)(x + b) \), then factorize: \( x^2 + px + qy^2 \).
8. Verify that: \( (a) x^3 + y^3 + z^3 - 3xyz = \frac{1}{2}[(x + y + z)[(x - y)^2 + (y - z)^2 + (z - x)^2]] \)
9. Plot the points A(1,4), B(-2,1) and C(4,1). Name the figure so obtained on joining them in order and also find its area.
10. Write the value of abscissa of all the points lie on y-axis.
11. Find the distance of the point (0,-5) from the origin.
12. a) Plot the points M(4,3), N(4,0), Q(0,0), P(0,3).
    b) Name the figure obtained by joining MNOP.
    c) Find the perimeter of the figure.
13. Sketch the graph of the equation \( 3x + 5y = 15 \). Find the area of the figure formed by this line and the two axes.
14. Express \( y \) in terms of \( x \) in the equation \( 2x - 3y = 12 \). Find the points where the line represented by the \( 2x - 3y = 12 \) cuts the x-axis and y-axis.
15. Write the equation \( 2y - 3 = \sqrt{2}x \) in the form of \( ax + by + c = 0 \) and indicate the values of \( a, b \) and \( c \).
16. Write three different solutions for \( 3x - 8y = 27 \).
17. Prove that two distinct lines cannot have more than one point in common.
18. A.B.C & D are collinear points such that \( AB = CD \), then prove that \( AC = BD \).
19. Two lines which are both parallel to the given line, are parallel to each other. Prove the theorem.
20. Solve the equation \( a - 20 = 15 \) by using Euclid’s axiom and write the axiom used in this equation.
21. If two parallel lines are intersected by a transversal, prove that bisector of two pairs of interior angles form a rectangle.
22. Can a triangle have all angles less than 60°? Give reasons.
23. In the figure, PQR is an isosceles triangle in which PQ = PR and LM is parallel to QR. If \( \angle P = 50^\circ \), find \( \angle LMR \).
24. In the figure, \( \angle ACB = \angle BDA \) and \( \angle DCB = \angle CDA \). Prove that (i) \( AD = BC \) and (ii) \( \angle A = \angle B \).

25. In the figure, \( ABCD \) is a square and \( \Delta DCE \) is an equilateral triangle. Prove that (i) \( \Delta ADE = \Delta BCE \) (ii) \( AE = BE \) (iii) \( \angle DAE = 15^\circ \).

26. In the figure, \( ABCD \) is a square and \( P \) is the mid-point of \( AD \). \( BP \) and \( CP \) are joined

Prove that \( \angle PCB = \angle PBC \).

27. \( E \) and \( F \) are respectively the mid-points of the non-parallel sides \( AD \) and \( BC \) of a trapezium \( ABCD \). Prove that \( EF \parallel AB \) and \( EF = \frac{1}{2}(AB + CD) \).

28. The angle between two altitudes of a parallelogram through the vertex of an obtuse angle of the parallelogram is \( 60^\circ \). Find the angles of the parallelogram.

29. \( ABCD \) is a quadrilateral in which \( AB \parallel CD \) and \( AD = BC \) to. Prove \( \angle A = \angle B \) and \( \angle C = \angle D \).

30. Prove that the line joining the mid-points of the diagonals of a trapezium is parallel to the parallel sides of the trapezium.

31. A rectangle and a parallelogram are on the same base and between the same parallels. If the height of the parallelogram is 4 cm and the length of the base of rectangle is 8 cm, find the area of parallelogram.

32. \( ABCD \) is a parallelogram whose diagonals \( AC \) and \( BD \) intersect at \( O \). A line through \( O \) intersects \( AB \) at \( P \) and \( DC \) at \( Q \). Prove that \( \text{ar}(\Delta POA) = \text{ar}(\Delta QOC) \).

33. In a parallelogram \( ABCD \), \( E \), \( F \) are any two points on the side \( AB \) and \( BC \) respectively. Show that \( \text{ar}(\Delta ADF) = \text{ar}(\Delta DCE) \).

34. Show that the diagonals of a parallelogram divide it into four triangles of equal area.

35. In the given figure \( BD = DC \) and \( \angle DBC = 15^\circ \). Find \( \angle A \). (fig-a)

(fig-a) (fig-b)
36. In the given figure, O is the centre of the circle. Find \( \angle BDO \). (fig-b)
37. OD is the perpendicular to chord AB of a circle whose centre is O. If BC is the diameter, prove that CA=2OD.
38. Prove that the right bisector of a chord of a circle, bisects the corresponding arc of the circle.
39. Construct a \( \triangle PQR \) in which \( PQ=6 \text{ cm}, QR=6 \text{ cm} \) and median \( PM=4 \text{ cm} \).
40. Construct a \( \triangle XYZ \) in which \( XY=6 \text{ cm}, \angle X=60^\circ \) and \( YZ=XZ=4 \text{ cm} \).
41. Draw a \( \triangle ABC \) with base BC=7 cm and angles in the ratio 3:4:5. Draw the bisectors of its angles.
42. Prove that an isosceles trapezium is always cyclic.
43. A field in the form of a parallelogram having sides 60 m and 40 m and one of the diagonal is 80 m long. Find the area of the parallelogram.
44. The perimeter of a rhombus is 20 cm. One of its diagonal is 8 cm. Find the area of the rhombus and the length of the other diagonal.
45. The length of two adjacent sides of a parallelogram is 17 cm and 12 cm. One of its diagonal is 25 cm long. Find the area of the parallelogram. Also find the length of altitude from vertex to the side of length 12 cm.
46. Find the area of an isosceles triangle whose one side is 10 cm longer than each of its equal sides and its perimeter is 100 cm.
47. The total surface area of a cylinder is 462 \text{ cm}^2. Its curved surface area is one-third of its total surface area. Find the volume of the cylinder.
48. If \( h, c \) and \( V \) are height, curved surface area and volume of a cone respectively, prove that \( 3\pi V h^3 + c^2 h^2 + 9V^2 = 0 \).
49. A hemispherical bowl of internal diameter 36 cm contains a liquid. This liquid is to be filled in cylindrical bottles of radius 3 cm and height 6 cm. How many bottles are required to empty the bowl?
50. Three cubes of metal whose edges are in the ratio 3:4:5 are melted down into a single cube whose diagonal is 12\sqrt{3} \text{ cm}. Find the edges of the three cubes.
51. If the mean of the following distribution is 6, find the value of \( P \).

<table>
<thead>
<tr>
<th>X</th>
<th>2</th>
<th>4</th>
<th>6</th>
<th>8</th>
<th>( P+5 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

52. The median of the following observations arranged in ascending order is 25. Find \( x \). 11, 13, 15, 19, \( x + 2 \), \( x + 4 \), 30, 35, 39, 46, 12.
53. The mean of 1, 7, 5, 3 and 4 is \( m \). The numbers 3, 2, 4, 2, 3, 3, and \( p \) have mean \( m - 1 \) and median \( q \). Find \( p \) and \( q \).
54. Find the median of the first 10 natural numbers. Is it equal to their mean?
55. Three coins are tossed simultaneously 200 times with the following frequencies of different outcomes:

<table>
<thead>
<tr>
<th>Number of Tails</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>35</td>
<td>45</td>
<td>42</td>
<td>78</td>
</tr>
</tbody>
</table>

Compute the probability of getting
(i) At least 2 heads
(ii) All heads
56. Following table shows the marks obtained by 30 students in a class test:

<table>
<thead>
<tr>
<th>Marks obtained</th>
<th>70</th>
<th>58</th>
<th>60</th>
<th>52</th>
<th>65</th>
<th>75</th>
<th>68</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of students</td>
<td>3</td>
<td>5</td>
<td>4</td>
<td>7</td>
<td>6</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

Find the probability that a student secures
(i) 60 marks
(ii) less than 60 marks
57. A bag contains tickets which are numbered from 1 to 100. Find the probability that a ticket number picked up at random
(i) is a multiple of 7    (ii) is not a multiple of 7
58. In an experiment, a coin is tossed 500 times. If head turns up 280 times, then find the probability of getting a tail.

Q1. Which of the following is irrational?
(a) \(\sqrt{2}\)  (b) \(\sqrt{3}\)  (c) \(\sqrt{5}\)  (d) \(\sqrt{81}\)

Q2. If \(x-2\) is a factor of \(x^2 + 3ax -2a\), then \(a =\)
(a ) 2    (b) -2    (c ) 1    (d)-1

Q3. If \((4,1,9)\) is a solution of the equation \(y = ax + 3\), then \(a =\)
(a) 3    (b) 4    (c) 5    (d) 6

Q4. The perpendicular distance of the point \(P(4, 3)\) from \(y\)-axis is
(a) 4    (b) 3    (c) 5    (d) none of these

Q5. Two straight lines \(AB\) and \(CD\) cut each other at \(O\). If \(\angle BOD = 63^0\), then \(\angle BOC =\)
(a) \(63^0\)    (b) \(117^0\)    (c) \(170^0\)    (d) \(153^0\)

Q6. In a \(\triangle ABC\), if \(AB = AC\) and \(BC\) is produced to \(D\) such that \(\angle ACD = 100^0\) then \(\angle A =\)
(a ) \(20^0\)    (b) \(40^0\)    (c) \(60^0\)    (d) \(80^0\)

Q7. The two diagonal are equal in a
(a) Parallelogram    (b) rhombus    (c) rectangle    (d) kite

Q8. Two parallelograms are on the same base and between the same parallels. The ratio of their areas is
(a) 1:2    (b) 2:1    (c) 1:1    (d) 3:1

Q9. If the length of a chord of a circle is 16 cm and is at a distance of 15 cm from the centre of the circle, then the radius of the circle is
(a) 15 cm    (b) 16 cm    (c) 17 cm    (d) 34 cm

Q10. The sides of a triangle are 16 cm, 30 cm, 34 cm. Its area is
(a) 225 cm\(^2\)    (b) 240 cm\(^2\)    (c) 225 \(\sqrt{2}\) cm\(^2\)    (d) 450 cm\(^2\)

Q11. If the volumes of two cubes are in the ratio 8:1, then the ratio of their edges is
(a) 8:1    (b) \(2\sqrt{2}:1\)    (c) 2:1    (d) none of these

Q12. The difference between the upper and the lower class limits is called
(a) Mid – points    (b) class size    (c) frequency    (d) mean

Q13. A solid cylinder is melted and cast into a cone of same radius. The height of the cone and cylinder are in the ratio
(a) 9:1    (b) 1:9    (c) 3:1    (d) 1:3

Q14. The probability an event of a trial is
(a) 1    (b) 0    (c) less than 1    (d) more than 1

Q 15. If the arithmetic mean of 7, 5, 13, \(x\) and 9 is 10, then the value of \(x\) is
(a) 10    (b) 12    (c) 14    (d) 16

**ANSWER KEY for MCQ**
1. (c) \(\sqrt{7}\)  2. (d)-1  3. (b) 4  4. (a) 4  5. (b) 117\(^0\)  6. (a) 20\(^0\)  7. (c) rectangle  8. (c) 1:1  9. (c) 17 cm  10. (b) 240 cm\(^2\)  11. (c) 2:1  12. (b) class size  13. (c) 3:1  14. (c) less than 1  15. (d) 16