Applied Academy

H-76 Sec 22

APPLICATION OF TRIGO, CIRCLE AND STATS

Class 10 - Mathematics

1. If the mean and the mode of a distribution are 17 and 20 respectively, then the median of the distribution, using empirical formula, is: **[1]**

   a) $\frac{31}{3}$ b) 17

   c) 20 d) 18

2. The algebraic sum of the deviations of a frequency distribution from its mean is: **[1]**

   a) 0 b) a non-zero number

   c) always positive d) always negative

3. If the mean of data is 27 and its median is 33 then the mode is **[1]**

   a) 43 b) 45

   c) 30 d) 47

4. Compute the mode for the following frequency distribution: **[1]**

Size of items (in cm)	0-4	4-8	8-12	12-16	16-20	20-24	24-28
Frequency	5	7	9	17	12	10	6

5. Find the mode of the following distribution: **[1]**

Classes:	10 - 15	15 - 20	20 - 25	25 - 30	30 - 35	35 - 40
Frequency:	45	30	75	20	35	15

6. While calculating the mean of a given data by the assumed-mean method, the following values were obtained: A = 25, $\sum f_i d_i = 110$, $\sum f_i = 50$. Find the mean. **[1]**

7. Find the mode of the following data: **[2]**

Class	50 - 60	60 - 70	70 - 80	80 - 90	90 - 100
Frequency	9	12	20	11	10

8. For the following data, find mode: **[2]**

Class	10 - 13	13 - 16	16 - 19	19 - 22	22 - 25
Frequency	4	8	9	11	7

9. Following table shows the weight of 12 students: **[2]**

Weight (in kgs):	67	70	72	73	75
Number of students:	4	3	2	2	1

Find the mean weight of the students.

10. Find the mean of the following distribution: **[2]**

Classes	0 - 15	15 - 30	30 - 45	45 - 60	60 - 75	75 - 90
Frequency	17	20	18	21	15	9

11. Given below is the frequency distribution of the heights of players in a school **[2]**

Height(in cm)	160 - 162	163 - 165	166 - 168	169 - 171	172 - 174
Number of students	15	118	142	127	18

Find the modal height and interpret it.

12. The arithmetic mean of the following frequency distribution is 25. **[3]**

Class	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50
Frequency	16	p	30	32	14

Find the value of p.

13. If the median of the following distribution is 58 and sum of all frequencies is 140. Find the values of x and y. **[3]**

Variable	**15-25**	**25-35**	**35-45**	**45-55**	**55-65**	**65-75**	**75-85**	**85-95**
Frequency	8	10	x	25	40	y	15	7

14. If the mean of the following frequency distribution is 24, find the value of p. **[3]**

Class	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50
Frequency	3	4	p	3	2

15. Find the mean of the following frequency distribution : **[3]**

Class :	0-6	6-12	12-18	18-24	24-30	30 –36	36 – 42
Frequency :	10	11	7	4	4	3	1

16. Find the mean of the following data and hence, find the mode , given that median of the data is 42.5. **[3]**

Class Interval	**10-20**	**20-30**	**30-40**	**40-50**	**50-60**	**60-70**	**70-80**
Frequency	4	8	10	12	10	4	2

17. Find the mean of the following frequency distribution, using the assumed-mean method: **[3]**

Class	100 - 120	120 -140	140 - 160	160 - 180	180 - 200
Frequency	10	20	30	15	5

18. The marks obtained out of 50, by 101 students in a Physics test are given in the frequency table below: **[3]**

Marks (x)	15	20	22	24	25	30	33	38	45
Frequency (f)	5	8	8	20	23	18	13	3	3

Find the average number of marks.

19. Calculate the median from the following distribution: **[3]**

Class	5-10	10-15	15-20	20-25	25-30	30-35	35-40	40-45
Frequency	5	6	15	10	5	4	2	2

20. Find the value of p, if the mean of the following distribution is 18. **[5]**

x	**f**

13	8
15	2
17	3
19	4
20 + p	5p
23	6

21. Calculate the median from the following frequency distribution: **[5]**

Class	5 - 10	10 - 15	15 - 20	20 - 25	25 - 30	30 - 35	35 - 40	40 - 45
Frequency	5	6	15	10	5	4	2	2

22. The monthly income of 100 families are given as below: **[5]**

Income in (in ₹.)	**Number of families**
0-5000	8
5000-10000	26
10000-15000	41
15000-20000	16
20000-25000	3
25000-30000	3
30000-35000	2
35000-40000	1

Calculate the modal income.

23. Find the mean of the following frequency distribution: **[5]**

Class	5 - 15	15 - 25	25 - 35	35 - 45	45 - 55	55 - 65
Frequency	6	11	21	23	14	5

24. The following table gives the marks obtained by 50 students in a class test: **[5]**

Marks	11 - 15	16 - 20	21 - 25	26 - 30	31 - 35	36 - 40	41 - 45	46 - 50
Number of students	2	3	6	7	14	12	4	2

Calculate the mean and median for the above data.

25. The following table shows the ages of the patients admitted in a hospital during a year: **[5]**

Age (in years)	5 - 15	15 - 25	25 - 35	35 - 45	45 - 55	55 - 65
Number of patients	6	11	21	23	14	5

Find the mode and mean of the data given above.

26. From an external point Q, the length of tangent to a circle is 12 cm and the distance of Q from the centre of circle is 13 cm. The radius of circle (in cm) is **[1]**

a) 10 b) 5

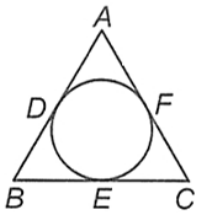
c) 7 d) 12

27. Maximum number of common tangents that can be drawn to two circles intersecting at two distinct points is: **[1]**

a) 1 b) 4

c) 3 d) 2

28. A circle inscribed in △ABC having AB = 10 cm, BC = 12 cm, CA = 28 cm touching sides at D, E, F (respectively). Then AD + BE + CF = _____. **[1]**



a) 22 cm b) 25 cm

c) 18 cm d) 20 cm

29. An isosceles triangle ABC, with AB = AC, circumscribes a circle, touching BC at P, AC at Q and AB at R. Prove that the contact point P bisects BC. **[1]**

30. From an external point C, k tangents can be drawn to the circle. Find the value of k. **[1]**

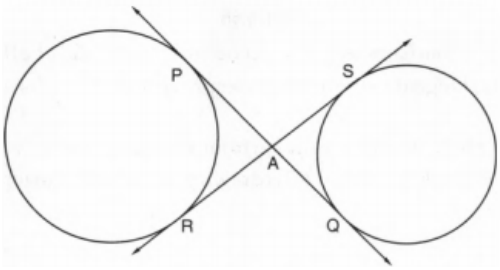
31. If tangents PA and PB from an external point P to a circle with centre O are inclined to each other at an angle of 70^o, then find ∠POA. **[1]**

32. Two concentric circles are of radii 6.5 cm and 2.5 cm. Find the length of the chord of the larger circle which touches the smaller circle. **[2]**

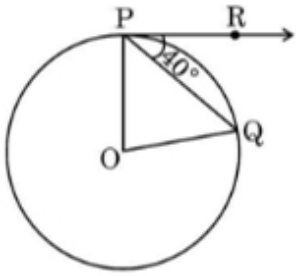
33. If the angle between two tangents drawn from an external point P to a circle of radius a and centre O, is 60° then find the length of OP. **[2]**

34. Let s denote the semi perimeter of a triangle ABC in which BC = a, CA = b and AB = c. If a circle touches the sides BC, CA, AB at D, E, F respectively, prove that **[2]**
AF = AE = s - a, BD = BF = s - b and CD = CE = s - c.

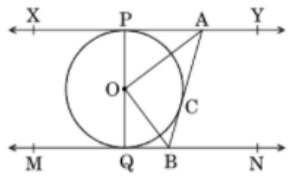
35. In fig common tangents PQ and RS to two circles intersect at A. Prove that PQ = RS. **[2]**



36. If O is the centre of a circle, PQ is a chord and the tangent PR at P makes an angle of 40^o with PQ, then find the measure of ∠POQ. **[2]**

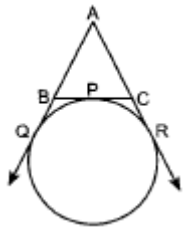


37. In the figure, XY and MN are two parallel tangents to a circle with centre O and another tangent AB with point of contact C intersecting XY at A and MN at B. Prove that ∠AOB = 90^o. **[3]**



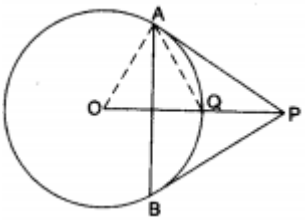
38. If the sides of a quadrilateral touch a circle, prove that the sum of a pair of opposite sides is equal to the sum of the other pair. **[3]**

39. In figure, a circle touches the side BC of △ABC at P and touches AB and AC produced at Q and R respectively. If AQ = 5 cm, find the perimeter of △ABC. **[3]**

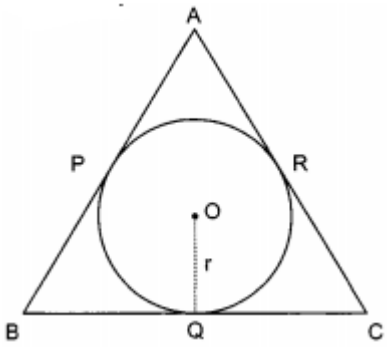


40. If radii of the two circles are equal, prove that AB = CD where AB and CD are common tangents. **[3]**

41. From a point P, two tangents PA and PB are drawn to a circle C(O r). If OP = 2r, show that $\triangle APB$ is equilateral. **[3]**



42. In figure the sides AB, BC and CA of triangle ABC touch a circle with centre O and radius r at P,Q and R respectively. **[5]**

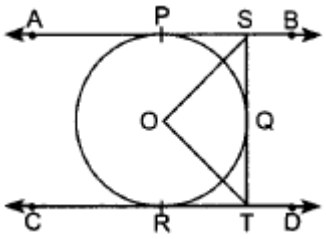


Prove that:

i. AB + CQ = AC + BQ

ii. $Area(\Delta ABC) = \frac{1}{2}(\text{Perimeter of } \Delta ABC) \times r$

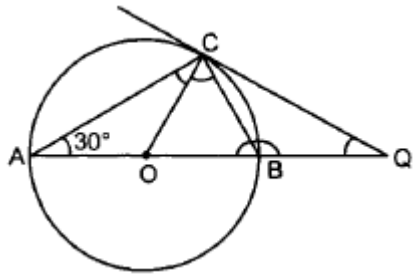
43. In figure AB and CD are two parallel tangents to a circle with centre O. ST is tangent segment between the two parallel tangents touching the circle at Q. Show that ∠SOT = 90° **[5]**



44. ABCD is a cyclic trapezium with AD || BC. If $\angle B = 70^\circ$, determine other three angles of the trapezium. **[5]**

45. Prove that the centre of a circle touching two intersecting lines lies on the angle bisector of the lines. **[5]**

46. In the figure, AB is diameter of a circle with centre O and QC is a tangent to the circle at C. If ∠CAB = 30°, find ∠CQA and ∠CBA. **[5]**



47. **Assertion (A):** If in a circle, the radius of the circle is 3 cm and the distance of a point from the centre of a circle is 5 cm, then length of the tangent will be 4 cm. **[1]**

Reason (B): $(\text{hypotenuse})^2 = (\text{base})^2 + (\text{height})^2$

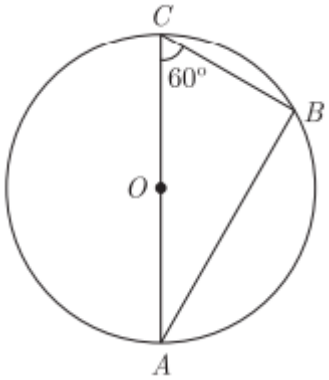
a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

48. **Assertion (A):** In the given figure, O is the centre of a circle and AT is a tangent at point A, then ∠BAT = 60° **[1]**



Reason (R): A straight line can meet a circle at one point only.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

49. A tree casts a shadow 7 m long on the ground, when the angle of elevation of the Sun is 45°. The height of the tree is: **[1]**

a) 3.5 m

b) $7\sqrt{3}$ m

c) 7 m

d) $\frac{7}{3}\sqrt{3}$ m

50. If the height of a tower is half the height of the flagstaff on it and the angle of elevation of the top of the tower as seen from a point on the ground is 30°, then the angle of elevation of the top of the flagstaff as seen from the same point is **[1]**

a) 30°

b) 60°

c) 45°

d) 15^o

51. The angle of elevation of the top of a tower at a point on the ground 50 m away from the foot of the tower is 45°. Then the height of the tower (in metres) is **[1]**

a) $\frac{50}{\sqrt{2}}$

b) $\frac{50}{\sqrt{3}}$

c) $50\sqrt{3}$ d) 50

52. At some time of the day the length of the shadow of a tower is equal to its height. Find the sun's altitude at that time. **[1]**

53. An observer 1.5 m tall is 28.5 m away from a tower. The angle of elevation of the top of the tower from her eyes is 45°. What is the height of the tower? **[1]**

54. Form the top of a tower 50 m high the angles of depression of the top and bottom of a pole are observed to be 45^o and 60^o respectively. Find the height of the pole. **[1]**

55. The angle of depression of a car, standing on the ground, from the top of a 75 m high tower is 30°. What is the distance of the car from the base of the tower? **[2]**

56. A ladder is placed along a wall of a house such that its upper end is touching the top of the wall. The foot of the ladder is 2 m away from the wall and the ladder is making an angle of 60° with the level of the ground. Determine the height of the wall. **[2]**

57. From a point on a bridge across a river the angles of depression of the banks on opposite side of the river are 30° and 45° respectively. If bridge is at the height of 30 m from the banks, find the width of the river. **[2]**

58. From the top of light house, 40 m above the water, the angle of depression of a small boat is 60^o Find the distance of boat from foot of light house. **[2]**

59. The shadow of a tower standing on a plane level is found to be 50 m longer when Sun's elevation is 30°, when it is 60°, find the height of the tower. **[2]**

60. The angle of elevation of a jet plane from a point A on the ground is 60°. After a flight of 30 seconds, the angle of elevation changes to 30°. If the jet plane is flying at a constant height of $3600\sqrt{3}$ m, find the speed of the jet plane. **[3]**

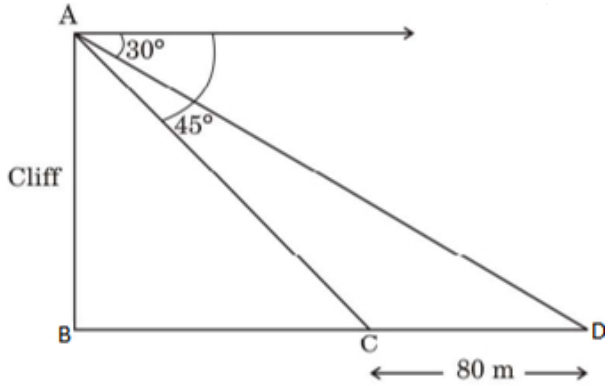
61. An observer 1.5m tall is 30m away from a chimney. The angle of elevation of the top of the chimney from his eye is 60^o. Find the height of the chimney. **[3]**

62. A tower subtends an angle α at a point A in the plane of its base and the angle of depression of the foot of the tower at a point B which is at 'b' meters above A is β.
Prove that the height of the tower is b tan α cot β. **[3]**

63. From the top of a building AB, 60m high, the angles of depression of the top and bottom of a vertical lamp-post CD are observed to be 30° and 60° respectively. Find the difference between the heights of the building and the lamp-post. **[3]**

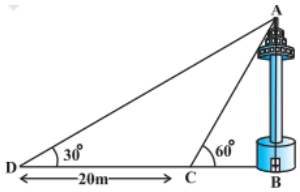
64. The angle of elevation of a cloud from a point 200 m above the lake is 30^o and the angle of depression of its reflection in the lake is 60^o, find the height of the cloud above the lake. **[3]**

65. Two boats are sailing in the sea 80 m apart from each other towards a cliff AB. The angles of depression of the boats from the top of the cliff are 30^o and 45^o respectively, as shown in Figure. Find the height of the cliff. **[3]**



66. From the top of a tower h metre high, the angles of depression of two objects, which are in the line with the foot of the tower are α andand $\beta(\beta > \alpha)$. Find the distance between the two objects. **[5]**

67. A TV tower stands vertically on a bank of a canal. From a point on the other bank directly opposite the tower, the angle of elevation of the top of the tower is 60°. From another point 20 m away from this point on the line joing this point to the foot of the tower, the angle of elevation of the top of the tower is 30°. Find the height of the tower and the width of the canal. **[5]**



68. A ladder rests against a vertical wall at an inclination α to the horizontal. Its foot is pulled away from the wall through a distance p so that its upper end slides a distance q down the wall and then the ladder makes an angle β to the horizontal. Show that $\frac{p}{q} = \frac{\cos\beta - \cos\alpha}{\sin\alpha - \sin\beta}$. **[5]**

69. From a point on the ground, the angle of elevation of the bottom and top of a transmission tower fixed at the top of a 20 m high building are 45^o and 60^o respectively. Find the height of the tower. (Use $\sqrt{3}$ = 1.73) **[5]**

70. A vertical tower stands on a horizontal plane and is surmounted by a flag-staff of height 7 m. From a point on the plane, the angle of elevation of the bottom of the flagstaff is 30° and that of the top of the flag-staff is 45°. Find the height of the tower. **[5]**

71. The angles of elevation and depression of the top and bottom of a light-house from the top of a 60 m high building are 30^o and 60^o respectively. Find **[5]**

    i. the difference between the heights of the light-house and the building.

    ii. the distance between the light-house and the building.

72. The angle of elevation of a stationery cloud from a point 2500 m above a lake is 15° and the angle of depression of its reflection in the lake is 45°. What is the height of the cloud above the lake level? **[5]**

73. If the angle of elevation of a cloud from a point h metres above a lake is a and the angle of depression of its reflection in the lake is β, prove that the height of the cloud is $\frac{h(\tan\beta + \tan\alpha)}{\tan\beta - \tan\alpha}$ **[5]**

74. Two poles of equal heights are standing opposite to each other on either side of the road which is 80 m wide. From a point P between them on the road, the angle of elevation of the top of a pole is 60^o and the angle of depression from the top of the other pole of point P is 30^o. Find the heights of the poles and the distance of the point P from the poles. **[5]**

75. From a point P on the ground, the angle of elevation of the top of a 15 m tall building is 30^o. A flag is hoisted at the top of the building and the angle of elevation of the top of the flagstaff from P is 45^o. Find the length of the flagstaff and the distance of the building from the point P. **[5]**

    (Use $\sqrt{3}$ = 1.732)