

CLASS 10 - MATHEMATICS

Time Allowed: 3 hours

Maximum Marks: 80

General Instructions:

1. This question paper contains two parts A and B.
2. Both Part A and Part B have internal choices.

Part – A consists 20 questions

1. Questions 1-16 carry 1 mark each. Internal choice is provided in 5 questions.
2. Questions 17-20 are based on the case study. Each case study has 5 case-based sub-parts. An examinee is to attempt any 4 out of 5 sub-parts.

Part – B consists 16 questions

1. Question No 21 to 26 are Very short answer type questions of 2 mark each,
2. Question No 27 to 33 are Short Answer Type questions of 3 marks each
3. Question No 34 to 36 are Long Answer Type questions of 5 marks each.
4. Internal choice is provided in 2 questions of 2 marks, 2 questions of 3 marks and 1 question of 5 marks.

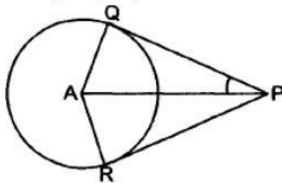
Part-A

1. Show that 12^n cannot end with digit 0 or 5 for any natural number n. [1]

OR

Without actually performing the long division, Check whether $\frac{64}{455}$ will have the terminating decimal expansion or non-terminating repeating decimal expansion.

2. Write the discriminant of the quadratic equation $x^2 + 4x + q = 0$ [1]
3. Does the pair of the linear equation have no solution? Justify your answer. [1]
 $3x + y - 3 = 0, 2x + \frac{2}{3}y = 2$
4. In figure, PQ and PR are tangents to circle with centre A. If $\angle QPA = 27^\circ$, then find $\angle QAR$. [1]



5. Find the Arithmetic Mean of $(a - b)$ and $(a + b)$. [1]

OR

Find the 10th term of AP: 10.0, 10.5, 11.0, 11.5,

6. Find the Arithmetic Mean of 13 and 19. [1]
7. If $(x^2 + y^2)(a^2 + b^2) = (ax + by)^2$. Prove that $\frac{x}{a} = \frac{y}{b}$ [1]

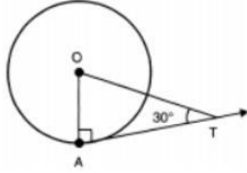
OR

State whether the following equation is quadratic equation in x?

$$2x^2 + \frac{5}{2}x - \sqrt{3} = 0$$

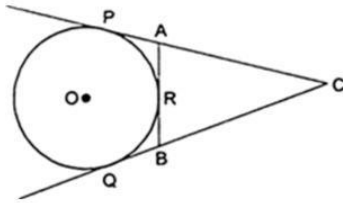
8. What is the distance between two parallel tangents of a circle of radius 4 cm? [1]

9. In given figure, if AT is a tangent to the circle with centre O, such that OT = 4 cm and $\angle OTA = 30^\circ$, then find the length of AT (in cm). [1]



OR

In figure, CP and CQ are tangents to a circle with centre O. ARB is another tangent touching the circle at R. If CP = 11 cm, and BC = 7 cm, then find the length of BR.



10. A ladder is placed in such a way that its foot is at a distance of 5 m from a wall and its tip reaches a window 12 m above the ground. Determine the length of the ladder. [1]

11. Find the 21st term of the A.P: $-4\frac{1}{2}, -3, -1\frac{1}{2}, \dots$ [1]

12. Evaluate: $\sin^2 30^\circ \cos^2 45^\circ + 4 \tan^2 30^\circ + \frac{1}{2} \sin^2 90^\circ - 2 \cos^2 90^\circ + \frac{1}{24} \cos^2 0^\circ$. [1]

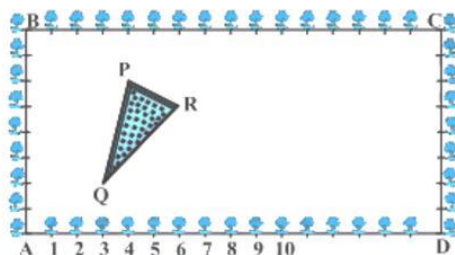
13. Prove that : $\cos^2 \theta (1 + \tan^2 \theta) = 1$ [1]

14. If the lateral surface area of a cylinder is 94.2 cm^2 and its height is 5 cm, then find radius of its base. [1]

15. For what value of k will $k+9, 2k-1,$ and $2k+7$ are consecutive terms of an AP. [1]

16. A number is chosen at random from the numbers - 3, - 2, - 1, 0, 1, 2, 3. What will be the probability that the square of this number is less than or equal to 1? [1]

17. The Class X students of a secondary school in Krishinagar have been allotted a rectangular plot of land for their gardening activity. Sapling of Gulmohar is planted on the boundary of the plot at a distance of 1m from each other. There is a triangular grassy lawn inside the plot as shown in Fig. The students have to sow seeds of flowering plants on the remaining area of the plot. [4]



i. Considering A as the origin, what are the coordinates of A?

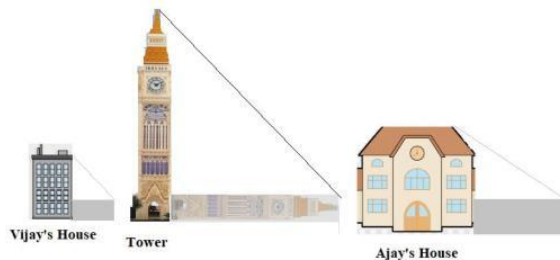
a. (0, 1)

b. (1, 0)

- c. (0, 0)
 - d. (-1, -1)
- ii. What are the coordinates of P?
- a. (4, 6)
 - b. (6, 4)
 - c. (4, 5)
 - d. (5, 4)
- iii. What are the coordinates of R?
- a. (6, 5)
 - b. (5, 6)
 - c. (6, 0)
 - d. (7, 4)
- iv. What are the coordinates of D?
- a. (16, 0)
 - b. (0, 0)
 - c. (0, 16)
 - d. (16, 1)
- v. What are the coordinates of P if D is taken as the origin?
- a. (12, 2)
 - b. (-12, 6)
 - c. (12, 3)
 - d. (6, 10)

[4]

18.

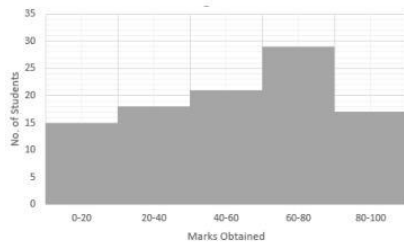


Vijay is trying to find the average height of a tower near his house. He is using the properties of similar triangles. The height of Vijay's house is 20 m when Vijay's house casts a shadow 10 m long on the ground. At the same time, the tower casts a shadow 50 m long on the ground. At the same time, the house of Ajay casts 20 m shadow on the ground.

- i. What is the height of the tower?
- a. 20 m
 - b. 50 m
 - c. 100 m
 - d. 200 m
- ii. What will be the length of the shadow of the tower when Vijay's house casts a shadow of 12 m?
- a. 75 m

- b. 50 m
 - c. 45 m
 - d. 60 m
- iii. What is the height of Ajay's house?
- a. 30 m
 - b. 40 m
 - c. 50 m
 - d. 20 m
- iv. When the tower cast shadow of 40 m, Same time what will be the length of the shadow of Ajay's house?
- a. 16 m
 - b. 32 m
 - c. 20 m
 - d. 8 m
- v. When the tower cast shadow of 40 m, Same time what will be the length of the shadow of Vijay's house?
- a. 15 m
 - b. 32 m
 - c. 16 m
 - d. 8 m

19. Recently the half-yearly examination was conducted in DAV public school. The mathematics teacher maintains a record of the marks of 100 students. On the basis of the recorded data of the marks obtained in Mathematics, the histogram is given below: [4]



On the basis of the above histogram, answer the following questions:

- i. Identify the modal class from the given graph.
 - a. 80 - 100
 - b. 20 - 40
 - c. 60 - 80
 - d. 40 - 60
- ii. Find the mode of the distribution of marks obtained by the students in an examination.
 - a. 78
 - b. 68
 - c. 48
 - d. 58

iii. Given the mean of the above distribution is 53, using empirical relationship estimate the value of its median.

- a. 78
- b. 68
- c. 48
- d. 58

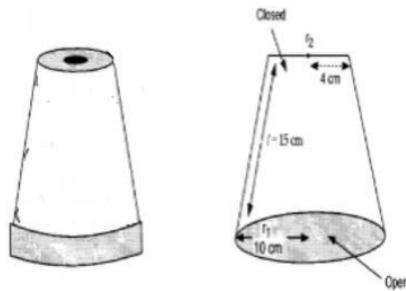
iv. The construction of the cumulative frequency table is useful in determining the

- a. Median
- b. Mean
- c. Mode
- d. All of the above

v. What will be the upper limit of the modal class?

- a. 100
- b. 80
- c. 40
- d. 60

20. During the battle of Turks against the Rajputs of India, the Turk soldiers wore a costume with a metallic shield-like knee pads, buckler (elbow shield) and cap to save themselves from injuries. The headgear cap (a fez) used by these soldiers is shaped like the frustum of a cone with its radius on the open side 10 cm, and radius at the upper base as 4 cm and its slant height as 15 cm. [4]



By using the above information, find the following:

i. The curved surface area of the cap is:

- a. 650 cm^2
- b. 660 cm^2
- c. 606 cm^2
- d. 666 cm^2

ii. Area of the closed base is:

- a. 55.285
- b. 50.285
- c. 52.285
- d. 56.285

iii. The area of the material used for making it.

- a. 701.28 cm^2
 b. 720.28 cm^2
 c. 710.28 cm^2
 d. 717.28 cm^2
- iv. During the conversion of a solid from one shape to another the volume of the new shape will:
- a. increase
 b. remain unaltered
 c. double
 d. decrease
- v. The formula to find the volume of the frustum of a cone is:
- a. $\frac{2}{3}\pi h(r_1^2 + r_2^2 + r_1 r_2)$
 b. $\frac{1}{3}\pi h(r_1^2 + r_2^2)$
 c. $\frac{1}{3}\pi h(r_1^3 + r_2^3 + r_1 r_2)$
 d. $\frac{1}{3}\pi h(r_1^2 + r_2^2 + r_1 r_2)$

Part-B

21. The decimal expansion of the rational number $\frac{79}{2^3 \times 5^4}$ will terminate after how many places of decimal? [2]
22. Find the third vertex of a triangle, if two of its vertices are at (-3, 1) and (0, -2) and the centroid is at the origin. [2]

OR

If P (2, 1), Q (4, 2), R(5, 4) and S(3, 3) are vertices of a quadrilateral, find the area of the quadrilateral PQRS.

23. Find the zeroes of the quadratic polynomial given as: $x^2 + 7x + 10$, and also verify the relationship between the zeroes and the coefficients. [2]
24. Draw a circle of radius 3 cm. Take a point P outside the circle at a distance of 5.8 cm from its centre. Draw tangents from P to the circle. [2]
25. If $\sin(A + B) = \sin A \cos B + \cos A \sin B$ and $\cos(A - B) = \cos A \cos B + \sin A \sin B$, find the values of [2]
- i. $\sin 75^\circ$
 ii. $\cos 15^\circ$

OR

Prove that: $(\sin^8 \theta - \cos^8 \theta) = (\sin^2 \theta - \cos^2 \theta) (1 - 2 \sin^2 \theta \cos^2 \theta)$

26. A point P is 25 cm away from the centre of a circle and the length of tangent drawn from P to the circle is 24 cm. Find the radius of the circle. [2]
27. Prove that $\sqrt{2}$ is an irrational number. [3]
28. Solve: $x^2 + 5x - (a^2 + a - 6) = 0$ [3]

OR

The numerator of a fraction is one less than its denominator. If three is added to each of the numerator and denominator, the fraction is increased by $\frac{3}{28}$. Find the fraction.

29. If α and β are the zeros of the quadratic polynomial $f(x) = kx^2 + 4x + 4$ such that $\alpha^2 + \beta^2 = 24$, [3]
find the values of k .
30. E is a point on side AD produced of a parallelogram ABCD and BE intersects CD at F. Prove that [3]
 $\triangle ABE \sim \triangle CFB$.

OR

ABCD is a trapezium in which **$AB \parallel DC$** . P and Q are points on sides AD and BC such that **$PQ \parallel AB$** . If PD = 18, BQ = 35 and QC = 15, find AD.

31. Two dice are thrown at the same time. Find the probability of getting: [3]
i. same number on both dice
ii. sum of two numbers appearing on both the dice is 8.
32. As observed from the top of a 150 m tall light house, the angles of depression of two ships [3]
approaching it are 30° and 45° . If one ship is directly behind the other, find the distance
between the two ships.
33. Find the mean of the following frequency distribution: [3]

Class interval	0-6	6-12	12-18	18-24	24-30
Frequency	6	8	10	9	7

34. Find the area of a rhombus each side of which measures 20 cm and one of whose diagonals is [5]
24 cm.
35. On selling a tea set at 5% loss and a lemon set at 15% gain, a crockery seller gains ₹ 7. If he [5]
sells the tea set at 5% gain and the lemon set at 10% gain, he gains ₹ 13. Find the actual price
of each of the tea set and the lemon set.
36. A vertical tower stands on a horizontal plane and is surmounted by a flag-staff of height 7 m. [5]
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.