

THE INDIAN PUBLIC SCHOOL, DEHRADUN
PREBOARD II - 2021
MATHEMATICS
CLASS X

TIME: 3 hr 15 Mins

MM: 80

RST: 40

GENERAL INSTRUCTIONS

- (i) This question paper contains of two parts A and B*
- (ii) Both parts A and B have internal choice.*

Part - A consists of 20 questions.

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

Part - A consists of 16 questions.

- (i) Questions 21 to 26 very short answer type questions of 2 marks.*
- (ii) Questions 27 to 33 short answer type questions of 3 marks.*
- (iii) Questions 34 to 36 long answer type question of 5 marks each.*

Part A

1. Has the rational number $\frac{441}{2^2 \times 5 \times 7^2}$ a terminating or a non-terminating decimal representation?

OR

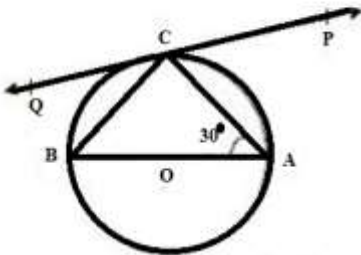
Show that 12^n cannot end with digit 0 or 5 for any natural number n.

2. Determine the value of k for which the given value is a solution of the equation $2x^2 + kx + 6 = 0$, $x = -2$
3. For what value of a the following pair of linear equation has infinitely many solution?

$$ax - 3y = 1$$

$$-12x + ay = 2$$

4. In the following figure, PQ is a tangent at a point C to circle with centre O. If AB is a diameter and $\angle CAB = 30^\circ$, then find $\angle PCA$.



5. For the A.P $\frac{1}{5}, \frac{3}{5}, \frac{5}{5}, \frac{7}{5}, \dots$ write the first term and the common difference.

OR

Find the next term in AP: 3, 1, -1, -3.

6. Find the sum of first forty positive integers divisible by 6.

7. Solve: $4x^2 - 2(a^2 + b^2)x + a^2b^2 = 0$.

OR

State whether the quadratic equation $x(1 - x) - 2 = 0$ has two distinct real roots. Justify your answer.

8. Distance between two parallel lines is 14 cm. Find the radius of the circle which will touch both the lines.

9. From an external point P, tangents PA = PB are drawn to a circle with centre O. If $\angle PAB = 50^\circ$, then find $\angle AOB$.

OR

A quadrilateral ABCD is drawn to circumscribe a circle. If AB = 12 cm, BC = 15 cm and CD = 14 cm, find AD.

10. In the given figure, $OA \times OB = OC \times OD$ or $\frac{OA}{OC} = \frac{OD}{OB}$ prove that $\angle A = \angle C$ and $\angle B = \angle D$



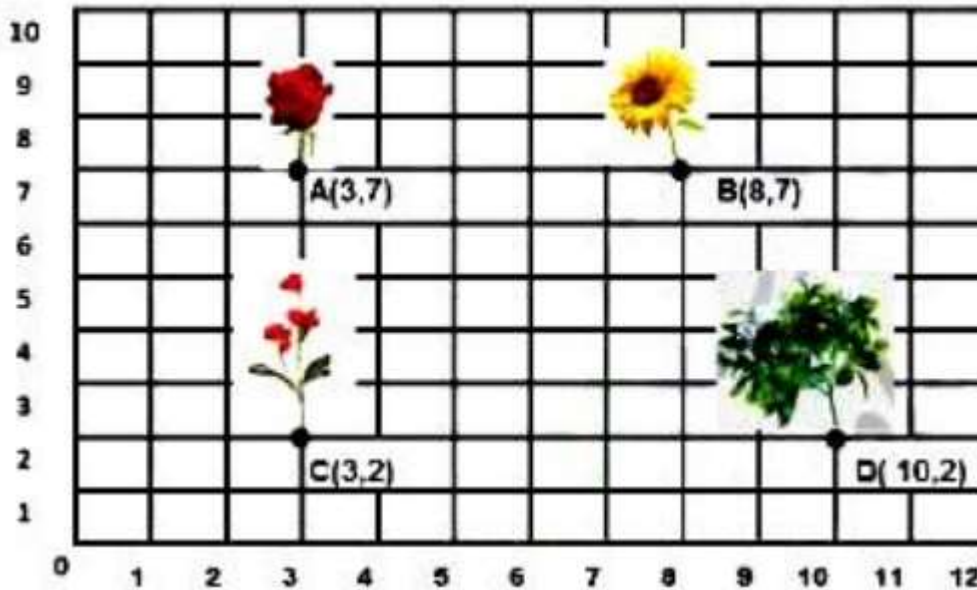
11. Write an A.P. whose first term is 10 and common difference is 3.
12. Prove the trigonometric identity: $\sin^4 A + \cos^4 A = 1 - 2\sin^2 A \cos^2 A$
13. If $\cos \theta = \frac{2}{3}$, then find the value of $(4 + 4 \tan^2 \theta)$.
14. The volume of a right circular cylinder with its height equal to the radius is $25\frac{1}{7} \text{ cm}^3$. Find the height of the cylinder.
15. Write the value of $a_{30} - a_{10}$ for the A.P. 4, 9, 14, 19,

OR

Find 7th term from the end of the AP : 7, 10, 13,, 184.

16. 17 cards numbered 1, 2, 3, ..., 17 are put in a box and mixed thoroughly. One person draws a card from the box. Find the probability that the number on the card is odd.

17. In the school garden Ajay(A), Brijesh(B), Chinki(C) and Deepak(D) planted their flower plants of Rose, Sunflower, Champa and Jasmine respectively as shown in the following figure. A fifth student Eshan wanted to plant her flower in this area. The teacher instructed Eshan to plant his flower plant at a point E such that $CE: EB = 3 : 2$.



Answer the following questions:

- i. Find the coordinates of point E where Eshan has to plant his flower plant.
 - a. (5, 6)
 - b. (6, 5)
 - c. (5, 5)
 - d. (6, 7)

- ii. Find the area of $\triangle ECD$.
- a. 9.5 square unit
 - b. 11.5 square unit
 - c. 10.5 square unit
 - d. 12.5 square unit
- iii. Find the distance between the plants of Ajay and Deepak.
- a. 8.60 unit
 - b. 6.60 unit
 - c. 5.60 unit
 - d. 7.60 unit

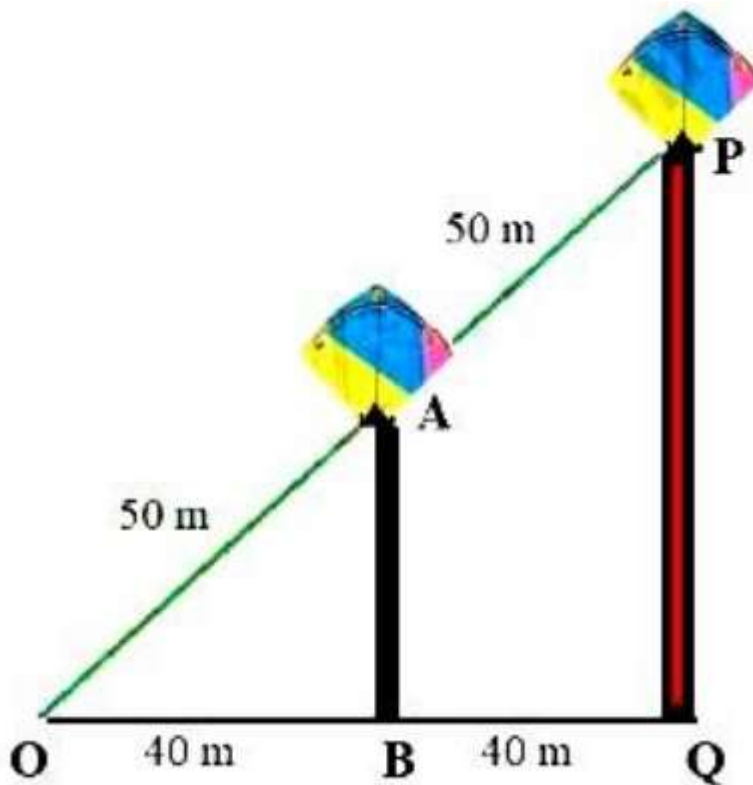
iv. The distance between A and B is:

- a. 5.5 units
- b. 7 units
- c. 6 units
- d. 5 units

v. The distance between C and D is:

- a. 5.5 units
- b. 7 units
- c. 6 units
- d. 5 units

18.



As shown in the figure Harish is trying to measure the height of two towers AB and PQ. He is flying a kite He is having 100m thread with him, Harish found that when his half thread is open That time kite is just above the tower AB. Harish continues flying the kites,

When his full thread is open that time kite reaches just above the tower PQ. Now answer the following questions:

- i. What is the height of the tower AB?
 - a. 40m
 - b. 30 m
 - c. 50 m
 - d. 100m
- ii. What is the height of the tower PQ?
 - a. 40 m
 - b. 30 m
 - c. 60 m
 - d. 100m
- iii. What is the length of the hypotenuse in the triangle OAB?
 - a. 40 m
 - b. 50 m
 - c. 100 m
 - d. 80 m
- iv. What is the length of the hypotenuse in the triangle OPQ?
 - a. 40 m
 - b. 50 m
 - c. 100 m
 - d. 80 m

v. What is the length of the Base in the triangle OPQ?

- a. 40 m
- b. 50 m
- c. 100 m
- d. 80 m

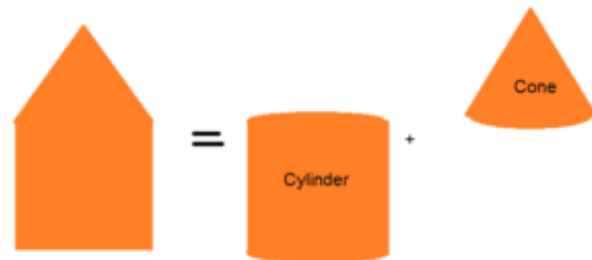
19. A survey was conducted by the Education Ministry of India. The following distribution gives the state-wise teachers-students ratio in higher secondary schools of India.



Number of students per teacher	Number of states/U.T	Number of students per teacher	Number of states/U.T
15 - 20	3	35 - 40	3
20 - 25	8	40 - 45	0
25 - 30	9	45 - 50	0
30 - 35	10	50 - 55	2

- i. The modal class is
- a. 40 - 45
 - b. 30 - 35
 - c. 50 - 55
 - d. 25 - 30
- ii. The mean of this data is
- a. 19.2.
 - b. 22.9
 - c. 39.2
 - d. 29.2
- iii. The mode of the data is
- a. 36.625
 - b. 30.625
 - c. 32.625
 - d. 31.625

- iv. Half of (upper-class limit + lower class limit) is
- Class interval
 - Classmark
 - Class value
 - Class size
- v. The construction of the cumulative frequency table is useful in determining the
- Mean
 - Mode
 - Median
 - All of the above
20. Due to heavy floods in a state, thousands of people were homeless. 50 schools collectively offered to the state government to provide the place and the canvas for 1500 tent to be fixed by the government and decided to share the whole expenditure equally. The lower part of each tent is cylindrical of base radius 2.8 m and height 3.5 m, with the conical upper part of the same base radius but of height 2.1 m. [use $\pi = \frac{22}{7}$]



- i. Area of canvas used to make the tent is
- TSA of cylindrical portion + CSA of the conical portion
 - CSA of cylindrical portion + CSA of the conical portion
 - CSA of cylindrical portion + TSA of the conical portion

- d. TSA of cylindrical portion + TSA of the conical portion
- ii. The volume of the tent is
- $\pi r^2\left(\frac{1}{3}r + h\right)$ cubic units
 - $\frac{1}{3}\pi r^2(r + h)$ cubic units
 - $\frac{4}{3}\pi r^2h$ cubic units
 - none of these
- iii. If the canvas used to make the tent cost ₹120 per sq.m, find the amount to be paid by the schools for making the tents.
- ₹ 11098
 - ₹ 88889
 - ₹ 11088
 - ₹ 99998
- iv. Amount shared by each school to set-up the tents.
- ₹ 442640
 - ₹ 222640
 - ₹ 332640
 - ₹ 552640

Part-B

21. Show that $5 - 2\sqrt{3}$ is an irrational number.
22. Find the coordinates of the point which divides the line segment joining (-1, 3) and (4, -7) internally in the ratio 3 : 4.

OR

Points P, Q, R and S divide the line segment joining the points A (1,2) and B (6, 7) in 5 equal parts. Find the coordinates of the points P, Q and R.

23. If α, β are zeroes of polynomial $p(x) = 5x^2 + 5x + 1$ then find the value of $\alpha^2 + \beta^2$.
24. Draw two concentric circles of radii 3 cm and 5 cm. Taking a point on outer circle construct the pair of tangents to the other. Measure the length of a tangent and verify it by actual calculation.
25. If $3 \cot A = 4$, find the value of $\frac{\operatorname{cosec}^2 A + 1}{\operatorname{cosec}^2 A - 1}$.

OR

Verify that, $4(\sin^4 30^\circ + \cos^4 60^\circ) - 3(\cos^2 45^\circ - \sin^2 90^\circ) = 2$.

26. Two tangents PA and PB are drawn from an external point P to a circle inclined to each other at an angle of 70° , then what is the value of $\angle PAB$?
27. Prove that $\sqrt{5} + \sqrt{3}$ is irrational.
28. Solve: $\frac{16}{x} - 1 = \frac{15}{x+1}; x \neq 0, -1$

OR

Solve the following quadratic equation by factorisation method .

i. $x^2 - 14x + 24 = 0$

ii. $4\sqrt{3}x^2 + 5x - 2\sqrt{3} = 0$

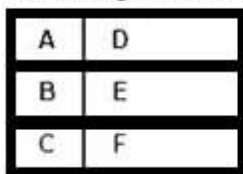
29. Verify whether 2, 3 and $\frac{1}{2}$ are the zeroes of the polynomial $p(x) = 2x^3 - 11x^2 + 17x - 6$.

30. The diagonal BD of a parallelogram ABCD intersects the line-segment AE at the point F, where E is any point on the side BC. Prove that $DF \times EF = FB \times FA$

OR

A ladder is placed in such a way that its foot is at a distance of 15 m from a wall and its top reaches a window 20 m above the ground. Find the length of the ladder.

31. Figure show the top view of an open square box that is divided into 6 compartments with walls of equal height. Each of the rectangles D, E, F has twice the area of each of the squares A, B and C. When a marble is dropped into the box at random, it falls into one of the compartments. What is the probability that it will fall into compartment F?



32. Two poles of equal heights are standing opposite to each other on either side of a road, which is 80 m wide. From a point between them on the road, angles of elevation of their top are 30° and 60° . Find the height of the poles and distance of point from poles.
33. If the median of the distribution given below is 28.5, find the value of x and y.

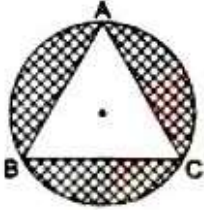
Class interval	0-10	10-20	20-30	30-40	40-50	50-60
No. of students:	5	x	20	15	y	5

OR

Find the mean of the following frequency distribution :

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

34. On a circular table cover, of radius 42 cm, a design is formed by a girl leaving an equilateral triangle ABC in the middle, as shown in the figure. Find the covered area of the design. [Use $\sqrt{3} = 1.73$ and $\pi = \frac{22}{7}$].



35. Show graphically that the system of equations
 $2x + 4y = 10$
 $3x + 6y = 12$
 has no solution.
36. A vertical pedestal stands on the ground and is surmounted by a vertical flagstaff of height 5 m. At a point on the ground the angles of elevation of the bottom and the top of the flagstaff are 30° and 60° respectively. Find the height of the pedestal.