

**CLASS X (2020-21)**  
**MATHEMATICS STANDARD (041)**  
**SAMPLE PAPER-09**

**Time : 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 :**

1. It consists of two sections- I and II.
2. Section I has 16 questions. Internal choice is provided in 5 questions.
3. Section II has four case study-based questions. Each case study has 5 case-based sub-parts. An examinee is to attempt any 4 out of 5 sub-parts.

**Part–B :**

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.
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**PART - A**

**SECTION - I**

**Section I has 16 questions of 1 mark each. Internal choice is provided in 5 questions.**

- Q1. Write whether rational number  $\frac{7}{75}$  will have terminating decimal expansion or a non-terminating decimal.

**OR**

Find HCF of the numbers given below:

$k, 2k, 3k, 4k$  and  $5k$ , where  $k$  is a positive integer.

- Q2. A fraction becomes 4 when 1 is added to both the numerator and denominator and it becomes 7 when 1 is subtracted from both the numerator and denominator. What is the numerator of the given fraction ?
- Q3.  $\Delta ABC$  is an equilateral triangle with each side of length  $2p$ . If  $AD \perp BC$  then what is the value of  $AD$  ?
- Q4. If the point  $P(k, 0)$  divides the line segment joining the points  $A(2, -2)$  and  $B(-7, 4)$  in the ratio  $1 : 2$ , then what is the value of  $k$ ?

**OR**

Find the coordinates of a point  $A$  on  $y$ -axis, at a distance of 4 units from  $x$ -axis and below it.

- Q5. If  $\sin \theta + \cos \theta = \sqrt{2} \cos \theta$ , ( $\theta \neq 90^\circ$ ) then what is the value of  $\tan \theta$  ?
- Q6. If  $4 \tan \theta = 3$ , then find  $\left( \frac{4 \sin \theta - \cos \theta}{4 \sin \theta + \cos \theta} \right)$ .

Q7. An observer, 1.5 m tall is 20.5 away from a tower 22 m high, then what is the angle of elevation of the top of the tower from the eye of observer?

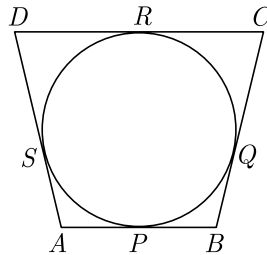
**OR**

A 6 m high tree cast a 4 m long shadow. At the same time, a flag pole cast a shadow 50 m long. How long is the flag pole?

Q8. Two concentric circles of radii  $a$  and  $b$  where  $a > b$ , Find the length of a chord of the larger circle which touches the other circle.

**OR**

In the given figure, a circle touches all the four sides of quadrilateral  $ABCD$  with  $AB = 6$  cm,  $BC = 7$  cm and  $CD = 4$  cm, then what is the length of  $AD$  ?

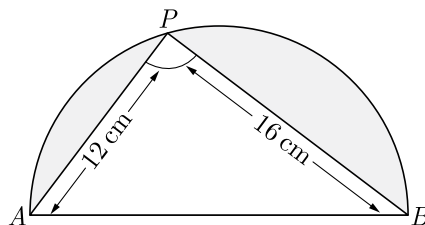


Q9. To divide a line segment  $AB$  in the ratio 2:5, a ray  $AX$  is drawn such that  $\angle BAX$  is acute. Then points are marked at equal intervals on  $AX$ . What is the minimum number of these points ?

**OR**

To divide the line segment  $AB$  in the ratio 2 : 3, a ray  $AX$  is drawn such that  $\angle BAX$  is acute,  $AX$  is then marked at equal intervals. Find minimum number of these marks.

Q10. In the given figure,  $AB$  is the diameter where  $AP = 12$  cm and  $PB = 16$  cm. Taking the value of  $\pi$  as 3, find the perimeter of the shaded region.



Q11. Find the area (in  $\text{cm}^2$ ) of the circle that can be inscribed in a square of side 8 cm.

Q12. Consider the following frequency distribution of the heights of 60 students of a class

Height (in cm)	150-155	155-160	160-165	165-170	170-175	175-180
Number of students	15	13	10	8	9	5

What is the upper limit of the median class in the given data?

Q13. If  $x_i$ 's are the mid-points of the class intervals of grouped data,  $f_i$ 's are the corresponding frequencies and  $\bar{x}$  is the mean, then find  $\sum (f_i x_i - \bar{x})$ .

Q14. Out of one digit prime numbers, one number is selected at random. What is the probability of selecting an even number?

- Q15. Find the probability of an impossible event.
- Q16. A number is selected at random from 1 to 30. Find the probability that it is a prime number.

## SECTION II

**Case study-based questions are compulsory. Attempt any 4 sub parts from each question. Each question carries 1 mark.**

- Q17. For a jewellery metal box to satisfy certain requirements, its length must be three meter greater than the width, and its height must be two meter less than the width.



- (i) If width is taken as  $x$ , which of the following polynomial represent volume of box ?
- (a)  $x^2 - 5x - 6$  (b)  $x^3 + x^2 - 6x$   
 (c)  $x^3 - 6x^2 - 6x$  (d)  $x^2 + x - 6$
- (ii) Which of the following polynomial represent the area of metal sheet used to make box ?
- (a)  $x^2 - 5x - 6$  (b)  $6x^2 + 4x - 12$   
 (c)  $x^3 - 6x^2 - 6x$  (d)  $6x^2 + 3x - 4$
- (iii) If it must have a volume of  $18 \text{ in}^3$ , what must be its length ?
- (a) 6 in (b) 3 in  
 (c) 4 in (d) 2 in
- (iv) At a volume of  $18 \text{ in}^3$ , what must be its height ?
- (a) 1 in (b) 3 in  
 (c) 2 in (d) 4 in
- (v) If box is made of a metal sheet which cost is 10 rs per  $\text{in}^2$ , what is the cost of metal ?
- (a) Rs 540 (b) Rs 1080  
 (c) Rs 270 (d) Rs 340
- Q18. Raju and his classmates planned a picnic in zoo. The total budget for picnic was Rs 2000 but 5 students failed to attend the picnic and thus the contribution for each student was increased by Rs 20.



The expense of different item was as follows.

S. No.	Article	Cost per student
1	Entry ticket	Rs 5
2	Coffee	Rs 10
3	Food	Rs 25
4	Travelling cost	Rs 50
5	Ice-cream	Rs 15

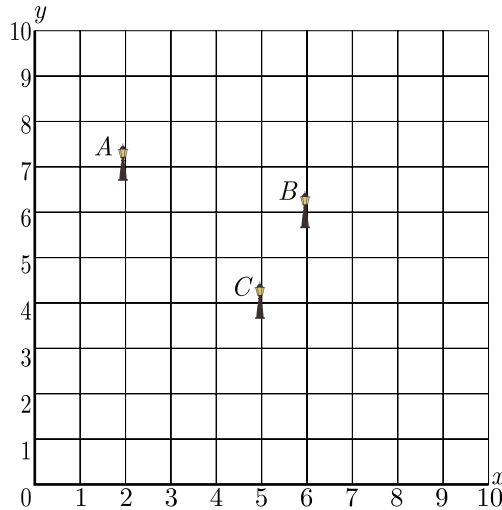
- (i) If  $x$  is the number of students planned for picnic, which is the correct quadratic equation that describe the situation.
- (a)  $x^2 - 5x - 500 = 0$  (b)  $x^2 + 4x - 400 = 0$   
 (c)  $x^2 + 5x - 500 = 0$  (d)  $x^2 - 4x + 400 = 0$
- (ii) What is the number of students planned for picnic ?
- (a) 30 (b) 40  
 (c) 25 (d) 20
- (iii) What is the number of students who attended the picnic?
- (a) 20 (b) 40  
 (c) 15 (d) 25
- (iv) What is the total expense for this picnic ?
- (a) Rs 1500 (b) Rs 2000  
 (c) Rs 1000 (d) Rs 2100
- (v) How much money they spent for travelling ?
- (a) Rs 500 (b) Rs 1000  
 (c) Rs 800 (d) Rs 3750

Q19. Resident Welfare Association (RWA) of a Gulmohar Society in Delhi have installed three electric poles  $A$ ,  $B$  and  $C$  in a society's common park. Despite these three poles, some parts of the park are still in dark.

So, RWA decides to have one more electric pole  $D$  in the park.



The park can be modelled as a coordinate systems given below.



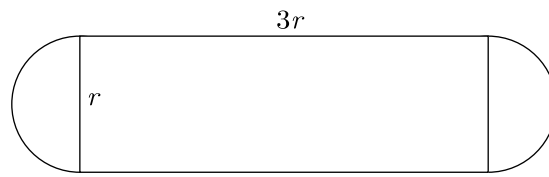
On the basis of the above information, answer any four of the following questions:

- (i) What is the position of the pole  $C$ ?
  - (a)  $(4, 5)$
  - (b)  $(5, 4)$
  - (c)  $(6, 5)$
  - (d)  $(5, 6)$
- (ii) What is the distance of the pole  $B$  from the corner  $O$  of the park ?
  - (a)  $6\sqrt{2}$  units
  - (b)  $3\sqrt{2}$  units
  - (c)  $6\sqrt{3}$  units
  - (d)  $3\sqrt{3}$  units
- (iii) Find the position of the fourth pole  $D$  so that four points  $A, B, C$  and  $D$  form a parallelogram.
  - (a)  $(5, 2)$
  - (b)  $(1, 5)$
  - (c)  $(1, 4)$
  - (d)  $(2, 5)$
- (iv) What is the distance between poles  $A$  and  $C$  ?
  - (a)  $6\sqrt{2}$  units
  - (b)  $3\sqrt{2}$  units
  - (c)  $6\sqrt{3}$  units
  - (d)  $3\sqrt{3}$  units
- (v) What is the distance between poles  $B$  and  $D$ ?
  - (a)  $2\sqrt{3}$  units
  - (b)  $\sqrt{28}$  units
  - (c)  $6\sqrt{3}$  units
  - (d)  $\sqrt{26}$  units

Q20. The boiler is essentially a closed vessel inside which water is stored. Fuel is burnt in a furnace and hot gasses are produced. These hot gasses come in contact with water vessel where the heat of these hot gasses transfer to the water and consequently steam is produced in the boiler. Then this steam is piped to the turbine of thermal power plant. There are many different types of boiler utilized for different purposes like running a production unit, sanitizing some area, sterilizing equipment, to warm up the surroundings etc.



Rajesh has been given the task of designing a boiler for NTPC. Boiler consist of a cylindrical part in middle and two hemispherical part at its both end. The cross section of boiler is given below. Length of cylindrical part is the 3 times of radius of hemispherical part.



- (i) Which of the following is correct expression for the surface area of cylindrical part of boiler?
  - (a)  $2\pi r^2$
  - (b)  $6\pi r^2$
  - (c)  $4\pi r^2$
  - (d)  $8\pi r^2$
- (ii) Which of the following is correct expression for the total surface area of boiler?
  - (a)  $\frac{22}{3}\pi r^2$
  - (b)  $\frac{11}{3}\pi r^2$
  - (c)  $6\pi r^2$
  - (d)  $10\pi r^2$
- (iii) Which of the following is correct expression for the volume of boiler?
  - (a)  $\frac{15}{4}\pi r^3$
  - (b)  $\frac{19}{3}\pi r^3$
  - (c)  $\frac{13}{3}\pi r^3$
  - (d)  $\frac{17}{4}\pi r^3$
- (iv) What is the ratio of volume to the surface area?
  - (a)  $\frac{13}{30}r$
  - (b)  $\frac{3}{10}r$
  - (c)  $\frac{10}{3}r$
  - (d)  $\frac{3}{10}r$
- (v) If  $r = 3$  m, what is the volume of boiler?
  - (a)  $117\pi \text{ m}^3$
  - (b)  $125\pi \text{ m}^3$
  - (c)  $231\pi \text{ m}^3$
  - (d)  $238\pi \text{ m}^3$

### PART - B

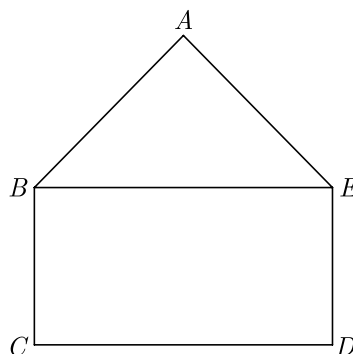
All questions are compulsory. In case of internal choices, attempt anyone.

Q21. Show that  $5\sqrt{6}$  is an irrational number.

OR

Write the denominator of the rational number  $\frac{257}{500}$  in the form  $2^m \times 5^n$ , where  $m$  and  $n$  are non-negative integers. Hence write its decimal expansion without actual division.

Q22. In the figure,  $ABCDE$  is a pentagon with  $BE \parallel CD$  and  $BC \parallel DE$ .  $BC$  is perpendicular to  $CD$ .  $AB = 5$  cm,  $AE = 5$  cm,  $BE = 7$  cm,  $BC = x - y$  and  $CD = x + y$ . If the perimeter of  $ABCDE$  is 27 cm. Find the value of  $x$  and  $y$ , given  $x, y \neq 0$ .



**OR**

Find the values of  $\alpha$  and  $\beta$  for which the following pair of linear equations has infinite number of solutions :  $2x + 3y = 7$ ;  $2\alpha x + (\alpha + \beta)y = 28$ .

Q23. Find the roots of the quadratic equation  $4x^2 - 4px + (p^2 - q^2) = 0$

Q24. In an equilateral triangle  $ABC$ ,  $AD$  is drawn perpendicular to  $BC$  meeting  $BC$  in  $D$ . Prove that  $AD^2 = 3BD^2$ .

Q25. Prove that :  $\frac{\cos A}{1 + \tan A} - \frac{\sin A}{1 + \cot A} = \cos A - \sin A$

Q26. Find the mode of the following distribution :

Classes	25-30	30-35	35-40	40-45	45-50	50-55
Frequency	25	34	50	42	38	14

Q27. Prove that  $\sqrt{3}$  is an irrational number.

Q28. Solve the following pair of equations for  $x$  and  $y$  :

$$\frac{a^2}{x} - \frac{b^2}{y} = 0, \frac{a^2 b}{x} + \frac{b^2 a}{y} = a + b, x \neq 0; y \neq 0.$$

**OR**

Solve for  $x$  and  $y$  :

$$ax + by = \frac{a + b}{2}$$

$$3x + 5y = 4$$

Q29.  $\triangle ABC$  is right angled at  $C$ . If  $p$  is the length of the perpendicular from  $C$  to  $AB$  and  $a, b, c$  are the lengths of the sides opposite  $\angle A, \angle B$  and  $\angle C$  respectively, then prove that  $\frac{1}{p^2} = \frac{1}{a^2} + \frac{1}{b^2}$ .

**OR**

In  $\triangle ABC$ ,  $DE \parallel BC$ . If  $AD = x + 2$ ,  $DB = 3x + 16$ ,  $AE = x$  and  $EC = 3x + 5$ , then find  $x$ .

Q30. Prove that :  $2(\sin^6\theta + \cos^6\theta) - 3(\sin^4\theta + \cos^4\theta) + 1 = 0$

Q31. Draw a circle of radius 3 cm. From a point  $P$ , 7 cm away from centre draw two tangents to the circle. Measure the length of each tangent.

Q32. A wire when bent in the form of an equilateral triangle encloses an area of  $121\sqrt{3}$  cm<sup>2</sup>. If the wire is bent in the form of a circle, find the area enclosed by the circle. Use  $\pi = \frac{22}{7}$ .

Q33. Compute the median from the following data :

Mid-values	115	125	135	145	155	165	175	185	195
Frequency	6	25	48	72	116	60	38	22	3

Q34. If the sum of first  $n$  term of an AP is given by  $S_n = 3n^2 + 4n$ . Determine the AP and the  $n^{\text{th}}$  term.

**OR**

The sum of the 3<sup>rd</sup> and 7<sup>th</sup> terms of an AP is 6 and their product is 8. Find the sum of first 20 terms of the AP.

- Q35. If  $A(-2,1)$ ,  $B(a,0)$ ,  $C(4,b)$  and  $D(1,2)$  are the vertices of a parallelogram  $ABCD$ , find the values of  $a$  and  $b$ . Hence find the lengths of its sides.
- Q36. Distance between two ships is 73.2 m. From the top of tower, 100 m high, a man observes two cars on the opposite sides of the tower with the angles of depression  $30^\circ$  and  $45^\circ$  respectively. Find the distance between the cars. (Use  $\sqrt{3} = 1.73$ )

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