# ST. XAVIER'S SENIOR SECONDARY SCHOOL, DELHI - 110054 

Std. 9
28-2-2024
Final Examination in MATHEMATICS
Time : $\mathbf{3}$ hrs.
CS
Max. Marks: 80
General Instructions:
i) Section A consists of 20 questions; each carry one mark. All questions are compulsory.
ii) Section B consists of 5 question; each carry 2 marks. You have option in 2 question.
iii) Section $C$ consists of 6 questions; each carry 3 marks. You have option in 2 questions.
iv) Section D consists of 4 questions; each carry 5 marks. You have option in 2 questions.
v) Section E consists of 3 case study based questions; each carry 4 marks. You have option in the third part of each question.

## SECTION - A (1 x 20 = $\mathbf{2 0}$ marks)

1. Simplified form of $3^{\frac{2}{3}} \times 3^{\frac{1}{5}}$ is
a) $3^{\frac{2}{15}}$
b) $\quad 9^{\frac{2}{15}}$
c) $\quad 3^{\frac{2}{3}}$
d) $\quad 3^{\frac{13}{15}}$
2. If $p(x)=x+3$, then $p(x)+p(-x)$ is equal to
a) 3
b) $2 x$
c) 0
d) 6
3. The solution of the linear equation $y=24$ and $x=8$ is
a) $3 y=x$
b) $y=x$
c) $y=4 x$
d) $y=3 x$
4. If two complementary angles are in the ratio $13: 5$, then the angles are
a) $65^{0}, 25^{0}$
b) $130^{0}, 50^{0}$
c) $13 x^{0}, 5 x^{0}$
d) $60^{0}, 30^{0}$
5. In an isosceles triangle $\triangle A B C, A D$ is the median and $A B=A C$. If the value of $\angle A B D$ is $35^{\circ}$, then $\angle B A D$ is
a) $35^{\circ}$
b) $55^{\circ}$
c) $110^{\circ}$
d) $\quad 70^{\circ}$
6. A Quadrilateral whose diagonals bisect at right angles is called
a) A trapezium
b) A rectangle
c) A rhombus
d) none of these
7. In the given figure, value of ' $y$ ' is
a) $35^{\circ}$
b) $140^{\circ}$
c) $70^{\circ}+x$
d) $70^{\circ}$

8. Ramesh wants to form a triangle using three sticks of length $10 \mathrm{~cm}, 5 \mathrm{~cm}$ and 7 cm . Then the semi-perimeter of the triangle will be
a) 22 cm
b) 11 cm
c) 10 cm
d) none of the above
9. If the volume and the surface area of a sphere is equal, then it's radius will be
a) 2 units
b) 1 unit
c) 3 units
d) 5 units
10. The difference between the highest and the lowest value of the data is called
a) Class mark
b) Frequency polygon
c) Range
d) Class size
11. The class mark of an interval is 32 . If the lower limit is 20 , then the value of the upper limit will be
a) 44
b) 84
c) 30
d) 64
12. If polynomial $p(x)=3 x^{4}-4 x^{3}-3 x-1$ is divided by $(x-1)$, then remainder is
a) 3
b) -4
c) -1
d) $\quad p(1)$
13. The linear equation, $y=3 x+5$ has
a) A unique solution
b) only two solutions
c) infinitely many solutions
d) no solution
14. Three adjacent angles form a straight line. The value of the angles are $5 y^{\circ}, 3 y^{\circ}$ and $2 y^{\circ}$. Then the measure of the smallest angle will be
a) $20^{\circ}$
b) $36^{\circ}$
c) $18^{\circ}$
d) $40^{\circ}$
15. In triangles $A B C$ and $P Q R$, if $A B=A C, \angle C=\angle P$ and $\angle B=\angle Q$. Then, the two triangles are
a) Isosceles but not congruent
b) Isosceles and congruent
c) Congruent but not isosceles
d) neither congruent nor isosceles
16. The range of 10 observations is 15 and its highest score is 28 , then the least score of the data is
a) 2
b) 13
c) 16
d) 5
17. $A B C D$ is a rhombus such that $\angle B C D$ is $80^{\circ}$. Then $\angle A D B$ is equal to
a) $40^{\circ}$
b) $100^{\circ}$
c) $60^{\circ}$
d) $50^{\circ}$
18. The area of an equilateral triangle with side $6 \sqrt{3} m$ is
a) $27 \sqrt{3} m^{2}$
b) $27 m^{2}$
c) $18 \sqrt{3} m^{2}$
d) $\quad 54 \sqrt{3} m^{2}$
19. Assertion (A): If $A O B$ is a diameter of a circle and C is a point on the circle, then $A C^{2}+B C^{2}=A B^{2}$.

Reason (R): Angle in a semi-circle is always a right angle.
a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation for Assertion (A).
b) Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation for Assertion (A).
c) Assertion (A) is True but Reason (R) is False.
d) Assertion (A) is False but Reason (R) is True.
20. Assertion (A): If the radius of right circular cone is halved and height is doubled, the volume will be halved.
Reason (R): In a right circular cone, height, radius and slant height do not always form the sides of a right triangle.
a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation for Assertion (A).
b) Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation for Assertion (A).
c) Assertion (A) is True but Reason (R) is False.
d) Assertion (A) is False but Reason (R) is True.

## SECTION - B ( $\mathbf{2 \times 5} \mathbf{5} \mathbf{1 0}$ marks)

21. If $a=\sqrt{2}+1$, find the value of $\left(a-\frac{1}{a}\right)^{2}$.

Represent $\sqrt{4 \cdot 5}$ on the number line.
22. Simplify: $64^{\frac{-1}{3}} \times\left[64^{\frac{1}{3}}-64^{\frac{2}{3}}\right]$.
23. Find the value of ' $k$ ' for which the point (1, -2 ) lies on the graph of linear equation $x-2 y+k=0$. Find one more solution for the equation.
24. Determine the volume of a conical tin having radius of the base as 30 cm and its slant height as 50 cm . (Use $\pi=3.14$ )
(OR)
The slant height and the diameter of a conical tomb are 25 m and 14 m respectively. Find the cost of white-washing its curved surface at the rate of 210 Rs per $100 \mathrm{~m}^{2}$.
25. Find two irrational numbers between $-\frac{2}{3}$ and $\frac{3}{4}$.

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\text { SECTION - C (3 x } 6 \text { = } 18 \text { marks })
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26. Draw a frequency polygon for the following data:

| Cost of living index | Number of weeks |
| :---: | :---: |
| $120-130$ | 8 |
| $130-140$ | 12 |
| $140-150$ | 4 |
| $150-160$ | 16 |
| $160-170$ | 8 |

27. If $2 x+3 y=12$ and $x y=6$, find the value of $8 x^{3}+27 y^{3}$.
28. Find four solutions for the equation $4 x+3 y=24$. How many solutions of this equation are possible?
29. In the figure, if $A B$ and $C D$ are parallel, find the value of $x$.


If a transversal intersects two lines such that the bisectors of a pair of corresponding angles are parallel, then prove that the two lines are parallel.
30. $A B D F$ is a square and $B C=E F$ in the given figure.

Prove that
a) $\triangle \mathrm{ABC} \cong \triangle \mathrm{AFE}$
b) $\triangle \mathrm{ACG} \cong \triangle \mathrm{AEG}$

31. The sides of a triangular ground are $5 \mathrm{~m}, 7 \mathrm{~m}$ and 8 m . Find the cost of levelling the ground at the rate of 10 Rs per $m^{2}$. (Take $\sqrt{3}=1 \cdot 73$ )

Find the area of a triangle whose two sides are 18 cm and 10 cm and its perimeter is 42 cm .

## SECTION - D (5 x 4 = 20 marks)

32. Factorise the following:
a) $4 x^{2}+9 y^{2}+16 z^{2}+12 x y-24 y z-16 x z$
b) $x^{3}+3 x^{2} y+3 x y^{2}+y^{3}-125$
33. $A B C D$ is a rhombus and $P, Q, R$ and $S$ are the mid- points of the sides $A B, B C, C D$ and $D A$ respectively. Show that the quadrilateral $P Q R S$ is a rectangle.
(OR)
Prove the following:
I. The diagonal of a parallelogram divides it into two congruent triangles.
II. The bisectors of angles of a parallelogram form a rectangle.
34. Prove that:
a) Equal chords subtend equal angles at the centre.
b) If two equal chords of a circle intersect within the circle, prove that the line joining the point of intersection to the centre makes equal angles with the chords.
(OR)
Answer the following questions:
a) Prove that the angle subtended by an arc at the centre is double the angle subtended by it at any point on the remaining part of the circle.
b) In the given figure, $\angle \mathrm{PQR}=100^{\circ}$, where $\mathrm{P}, \mathrm{Q}$ and R are points on a circle with centre $O$. Find $\angle O P R$.

35. The following information shows the marks of the students of class IX. Draw a histogram for the following data:

| Marks | Number of Students |
| :---: | :---: |
| $10-15$ | 7 |
| $15-20$ | 9 |
| $20-25$ | 8 |
| $25-30$ | 5 |
| $30-40$ | 12 |
| $40-60$ | 12 |
| $60-80$ | 8 |

## SECTION - E (CASE STUDY BASED QUESTIONS) (4 x 3 = 12 marks)

36. CAMPUS

A university administrator tells a group of new students about the central campus building and facilities they provide to students. "Welcome everyone to the complex." Today I will explain you about some of the places of campus. You can assume it like a Cartesian plane on paper. If we start from the origin and move five steps towards left (west) and then 3 steps right, we reach the Library. Adjacent to Library, there is a photocopy shop. There is a Cafeteria, where students get an opportunity to relax and eat various cuisines. Parallel to Cafeteria there is a recreational room for students to play indoor games such as chess, carom etc. At point $E$ is a medical room.


Now answer the following questions:
a) What are the co-ordinates of the Library and the Medical Room?
b) What will be the sign of the coordinates of the cafeteria?
c) What is the sum of the ordinate of the Photocopy shop and the abscissa of the Recreational room?
(OR)
What are the quadrants of the Photocopy shop, Cafeteria, Medical Room and the Recreational room?
37. Wall Hanging

Roshni has made a wall hanging on cloth to decorate the living room of her house. The wall hanging was in a parallelogram shape. When she hanged it on wall using nail, point of one portion of the wall just came out. And it was not looking good. She became very upset. Her mother came and asked about the problem and came up with an idea. She told Roshni that she can add triangle shape different coloured cloth so that wall hanging can cover that spoiled part of the wall. Both decorated the wall hanging and got it framed. Now it was in a rectangular shape as shown in figure.

a) AP is equal to which side?
b) What is the measure of $\angle A D P$ ?
c) Prove $\triangle \mathrm{APD}$ and $\triangle \mathrm{CQB}$ are congruent?


Find the value of $\angle y$ ?

## 38. Clay modelling activity

Various studies have shown that clay modelling is a great activity which helps kids' development in many ways. Every child needs experience that matches his or her development level. Playing with clay involves both left and right brains. Left brain focuses on the discipline and right brain creates the imagination. It also helps to resolve stress and offers positive division. It promotes sensory development. In teaching Mathematics also, clay modelling is used in classrooms. Students of class IX have made some 3D shapes from clay modelling. Out of these two shapes, one is a hemispherical dome having circumference of base 132 cm and another is a sphere.


Fig. ( 1 )


Fig. (ii)
a) What will be the radius of the dome shaped portion in fig (i)?
b) Find the area of the dome to be painted from outside.
c) If the sphere in figure (ii) has diameter of 14 cm , then find its volume.
(OR)

Find the ratio of the surface areas when the radius of the sphere is doubled?

