ANNUAL EXAMINATION

Question Paper 2024

NCERT BASED SYLLABUS

FOR CBSE AND STATE BOARD
FOLLOWING NCERT

SESSION ENDING EXAMINATION 2023-24

Class – IX **Subject – Mathematics**

Time: 3 Hours **Max. Marks: 80**

General Instructions:

1. This Question Paper has 5 Sections A, B, C, D, and E.
2. Section A has 20 Multiple Choice Questions (MCQs) carrying 1 mark each.
3. Section B has 5 Short Answer-I (SA-I) type questions carrying 2 marks each.
4. Section C has 6 Short Answer-II (SA-II) type questions carrying 3 marks each.
5. Section D has 4 Long Answer (LA) type questions carrying 5 marks each.
6. Section E has 3 Case Based integrated units of assessment (4 marks each) with sub-parts of the values of 1, 1 and 2 marks each respectively.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided. An internal cho ice has been provided in the 2marks questions of Section E
8. Draw neat figures wherever required. Take π =22/7 wherever required if not stated.

Section A

1 Factors of $6x^2 + 5x - 6$ are 1

a. (x – 6) (x+5) b. (2x – 2) (x – 3) c. (2x -3) (3x +2) d. (2x +3) (3x – 2)

2 The bisectors of any two adjacent angles of a parallelogram intersect at: 1

(a) 30 degree (b) 45 degree (c) 60 degree (d) 90 degree

3 Which is not the criteria of congruency?

(a) SSS (b) AAS (C) AAA (d) SAS

4 The linear equation x + 0y + 9 = 0 in two variables is 1

a) parallel to x axis b) parallel to y axis c) passing through origin d) none of these

5 Which of the following is not a solution of linear equation 2x – 3y = 12 1

(a) (0,-4) (b) (2, 3) (c) (6, 0) (d) (3, -2)

6 An angle is 18 degree less than its complementary angle. The measure of this angle is 1

(a) 36 degree (b) 48 degree (c) 83 degree (d) 81 degree

7 For drawing a frequency polygon of a continuous frequency distribution, we plot the points whose ordinates are the frequencies of the respective classes and abscissa are respectively: 1

(a) upper limits of the classes (b) lower limits of the classes
(c) class marks of the classes (d) upper limits of preceding classes

8 The value of semi-perimeter of an equilateral triangle having area $4\sqrt{3}$ sq cm is 1

(a) 8 cm (b) 36 cm (c) 16 cm (d) 6 cm

9 Euclid stated that all right angles are equal to each other in the form of 1

(a) A Postulate (b) A Proof (c)An Axiom (d)A Definition

10 0.01233333….. can be expressed in rational form as 1

(a)900/111 (b) 111/9000 (c)123/100 (d)111/900

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11 The expanded form of $(3x - 5)^3$ is: 1

(a) $27x^3 + 135x^2 + 225x - 125$
(b) $27x^3 + 135x^2 - 225x + 125$
(c) $27x^3 - 135x^2 + 225x - 125$
(d)None of the above

12 How many linear equations can be satisfied by x = 2 and y = 3? 1

(a) Only one (b) many (c) two (d) none of these

13 Abscissa of a point is negative in a
(a)Quadrant IV only (b) Quadrant II and III(c)Quadrant I and IV (d) Quadrant I only

14 The ordinate of any point on x – axis 1

(a) 0 (b) -1 (c) 1 (d) any

15 If $\sqrt{5} = 2.236$, then $1/\sqrt{5}$= ? 1

(a) 44.72 (b) 0.4472 (c) 0.04472 (d) 4.472

16 D and E are the mid points of sides AB and AC of a Δ ABC. If BC = 5.6 cm, find DE. 1

(a) 2.8 cm (b) 3 cm (c) 2.9 cm (d) 2.5 cm

17 A polynomial of two terms is called 1

(a) quadratic (b) binomial (c) monomial (d) cubic

18 Find the value of k , if x=1 , y= -3 is a solution of equation 2x – 3y=k 1

(a) 32 (b) 10 (c) 11 (d) 22

19 **Assertion (A):** If (x – 1) is a factor of $4x^3 + 3x^2 - 4x + k$, then k = -3 1

Reason (R): (x – a) is a factor of the polynomial p(x) if p(a)=0.

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of 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): 2 + √6 is an irrational number.** 1

Reason (R): Sum of a rational number and an irrational number is always an irrational number.

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).
(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

Section B

21 A shot-putt is a metallic sphere of radius 4.9 cm. if the density of the metal is 7.8g per cm cube , find the mass of the shot-putt. 2

22 Factorise $8x^3 - (2x - y)^3$ 2

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23 Write the coordinates of the point: 2

i) Which lie on x and y axes both.

ii) Whose ordinate is -4 and which lies on y axis.

24 If point C lies between two points A and B such that AC = BC, then prove that AC = $1/2AB$. 2

Explain by drawing the figure.

OR

Why is Axiom 5, The whole is greater than a part, considered a "universal truth

25 The surface areas of two spheres are in the ratio 1:4, find the ratio of their volumes. 2

OR

Find the capacity of a conical vessel in litres with height 12 cm and slant height 13 cm

Section C

26 If $x - \frac{1}{x} = 5$, find the value of 3

$x^3 - \frac{1}{x^3}$

OR

Factorise: $x^3 - 23x^2 + 142x - 120$

27 Represent √9.3 on number line. 3

28 Prove that the angle subtended by an arc at the centre is double the angle subtended by any point on the remaining part of the circle. 3

29 Triangle ABC is an isosceles triangle in which AB = AC. Side BA is produced to D such that AD=AB . So that angle BCD is a Right angle. 3

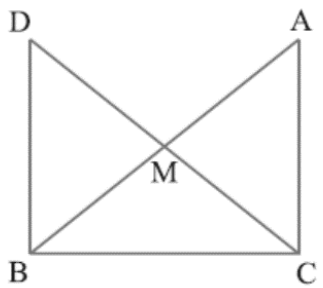
OR

In right triangle ABC, right angled at C, M is the mid-point of hypotenuse AB. C is joined to M and produced to a point D such that DM = CM. Point D is joined to point B (see Figure). Show that:

(i) Δ AMC ≅ Δ BMD

(ii) ∠ DBC is a right angle.

(iii) Δ DBC ≅ Δ ACB



30 A triangular park ABC is inside the campus of green valley apartments. All age group peoples used to visit the park. This park has sides 120m, 80m and 50m. A gardener dhania has to put a fence all around it and also plant grass inside. Based on the above information answer the following questions. 3

i) How much area does he need to plant grass?

ii) If the shape of the park is similar to equilateral triangle of perimeter 180 m, then what will be the area of the park?

31 Find three different solutions of the equation 2x + y = 6. 3

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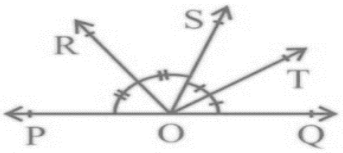
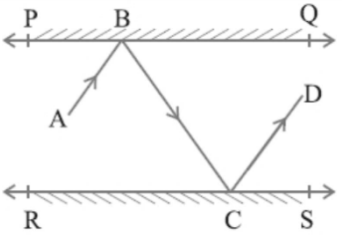
Section D

32 i) In the figure, ray OS stands on a line POQ. Ray OR and OT are angle bisectors of $\angle POS$ and $\angle SOQ$, respectively. If $\angle POS = 2a$, find $\angle ROT$ 2



ii) In given figure, PQ and RS are two mirrors placed parallel to each other. An incident ray AB strikes the mirror PQ at B, the reflected ray moves along the path BC and strikes the mirror RS at C and again reflects back along CD. Prove that AB || CD. 3



33 Monica has a piece of canvas whose area is 551 m^2 . She uses it to have a conical tent made, with a base radius of 7 m. assuming that all the stitching margins and the wastage incurred while cutting, amounts to approximately 1 m^2, Find the volume of the tent that can be made with it. 5

OR

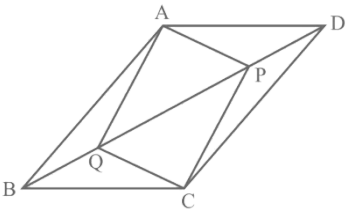
A right triangle ABC with sides 5 cm, 12 cm and 13 cm.

(a) If the triangle ABC is revolved about the side 12 cm, then find the volume of the solid so obtained.

(b) If the triangle ABC is revolved about the side 5 cm, then find the volume of the solid so obtained.

(c) Find the ratio of the volumes of the two solids obtained

34 In parallelogram ABCD, two points P and Q are taken on diagonal BD such that DP = BQ (see Fig.). Show that: 5



(i) Δ APD $\cong$ Δ CQB
(ii) AP = CQ
(iii) Δ AQB $\cong$ Δ CPD
(iv) AQ = CP
(v) APCQ is a parallelogram

OR

ABC is a triangle right angled at C. A line through the mid-point M of hypotenuse AB and parallel to BC intersects AC at D. Show that:

(i) D is the mid-point of AC

(ii) MD $\perp$AC

(iii) CM = MA = 1/ 2 AB

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35 .Draw a Frequency Polygon to represent the following grouped frequency distribution : 5

Age in years	20-24	25-29	30-34	35-39	40-44	45-49	50-54
No.of teachers	10	28	32	48	50	35	12

Section E

36 Two partners start a business together. They decided to share their capitals depending upon the variable expenditure. The capital of two partners together is given $4x^2 - 8x - 5$ which is the product of their individual share factors.

a. Write the degree of given polynomial and also write the name of polynomial on the basis of degree. 1

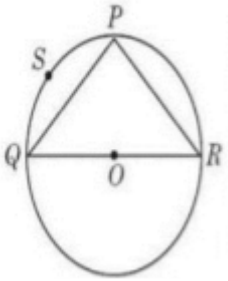
b. Name of the polynomial of amount invested by each partner. 1

c. What are the shares of two partners invested individually? 2

OR

What is the total amount invested by both, if x = 100.

37 Sanjay and his mother visited in a mall. He observes that three shops are situated at P, Q and R as shown in the figure from where they have to purchase things according to their need. Distance between shop P and Q is 8m and distance between shop P and R is 6m. Considering O as centre of the circle.



Answer the following questions

(a) Find the measure of ∠ QPR 1

(b) Find the radius of the circle. 2

OR

Find the perimeter of the circle. 1

(c) Find the measure of ∠ QSR

38 To judge the preparation of students of class 9th on the topic rationalisation of irrational numbers, Mathematics teacher defined rationalisation saying that when the denominator of an expression contains the term with the square root, the procedure of converting it to an equivalent expression whose denominator is rational number is called rationalising that denominator

Based on the above information answer the following questions

a) Rationalize $\frac{1}{\sqrt{3}+\sqrt{2}}$ 1

b) Classify the following as Rational or irrational number $(6 - \sqrt{27}) - (-\sqrt{27} - 8)$ 1

c) Simplify $(\sqrt{14} - 2\sqrt{2})^2$ 2

OR

Rationalize the denominators of $\frac{\sqrt{7}}{\sqrt{11} - \sqrt{5}}$ 4

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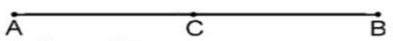
SESSION ENDING EXAMINATION 2023-24

Class – IX **Marking Scheme** **Subject - Mathematics**

S. No.	**Section A** **Section A consists of 20 questions of 1 mark each**	Marks
1	D	1
2	D	1
3	C	1
4	B	1
5	B	1
6	A	1
7	C	1
8	D	1
9	A	1
10	B	1
11	C	1
12	B	1
13	B	1
14	A	1
15	B	1
16	A	1
17	B	1
18	C	1
19	A	1
20	A	1
	Section B consists of 5 questions of 2 marks each	
21	493 cm cube (nearly) (correct formula, correct calculation, correct answer) 3845.44 g(nearly)	1+1
22	$\lfloor(2x-(2x-y)\rfloor\{(2x)^2+2x(2x-y)+(2x-y)^2\}$ $y(12x^2-6xy+y^2)$	1+1
23	(0,0) (0,-4)	1 + 1
24	 AC = CB Also AC + AC = BC + AC. (Equals are added to equals) BC + AC coincides with AB $\Rightarrow$ 2AC = AB $\Rightarrow$ AC = $\frac{1}{2}$ AB. Or Correct explanation	1 1 2
25	$\frac{S_1}{S_2}=\frac{4\pi r_1^2}{4\pi r_2^2}$ ½ $\frac{1}{4}=\frac{r_1^2}{r_2^2}$ $\frac{r_1}{r_2}=\frac{1}{2}$ ½ $\frac{V_1}{V_2}=\frac{4/3\pi r_1^3}{4/3\pi r_2^3}=\frac{r_1^3}{r_2^3}=$ ½ $(\frac{1}{2})^3\frac{V_1}{V_2}=\frac{1}{8}$ ½ OR $r=\sqrt{l^2-h^2}$ $r=\sqrt{169-144}=\sqrt{25}$ r = 5 cm ½ $V=\frac{1}{3}\pi r^2h$ ½ $V=\frac{1}{3}\times\frac{22}{7}\times 5\times 5\times 12$ ½ $V=314.28\ cm^3$ V = 0.31428 litres ½	1+1
	Section C consists of 6 questions of 3 marks each	

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26	**Solution** (Verified by Toppr) Given, $x - \frac{1}{x} = 5$ Squaring both the sides, $\Rightarrow (x - \frac{1}{x})^2 = 5^2$ $\Rightarrow x^2 + \frac{1}{x^2} - 2(x)(\frac{1}{x}) = 25$ $\Rightarrow x^2 + \frac{1}{x^2} = 25 + 2$ $\Rightarrow x^2 + \frac{1}{x^2} = 27$ Now, $x^3 - \frac{1}{x^3}$ $= (x - \frac{1}{x}) \left[(x)^2 + (\frac{1}{x})^2 + (x)(\frac{1}{x})\right]$ $= 5(27 + 1)$ $= 140$ or $P(x) = x^3 - 23x^2 + 142x - 120$ $P(1) = 0$, (x-1) is factor of p(x) $P(x) = x^2(x-1) - 22x(x-1) + 120(x-1)$ $= (x-1)(x^2 - 22x + 120)$ $=(x-1)(x-10)(x-12)$	1 1 1 1 1 1
27	For correct representation + construction	1+2
28	For correct diagram For correct proof	1 2
29	For correct figure For correct proof OR In ΔAMC and ΔBMD AM=BM (M is midpoint of AB) ∠AMC=∠BMD(vertically opposite angles)CM=DM (given) ∴ΔAMC≅ΔBMD (by SAS congruence rule) ∴ AC=BD (by CPCT) ⇒∠DBC+∠ACB=180∘(co−interior angles) ⇒ ∠DBC+90∘=180∘(∠ACB=90∘)⇒∠DBC=180∘−90∘⇒∠DBC=90∘ ⇒DB=AC (By CPCT)…(i) In ΔDBC and ΔACB DB=AC (From (i))BC=BC(Common)∠DBC=∠ACB=90∘ ∴ΔDBC≅ΔACB by SAS congruence	1 2 1+1+1
30	i) 375√15m² (Using correct formula + correct calculation + correct answer) ii) 900√3m² (Using correct formula + correct calculation + correct answer)	½ +1/2+1/2 ½+1/2+ 1/2
31	For 3 correct solutions	1+1+1
	Section D	
	Section D consists of 4 questions of 5 marks each	
32	i) $\angle POS + \angle SOQ = 180^0$ $\angle ROT = 90^0$ ii) Since BE and FC are normal to PQ and RS respectively, therefore, BE||FC Let, ∠ABE=∠EBC=x[PQ is a mirror, so angle of incidence is equal to angle of reflection] ∠FCD=∠BCF=y[RS is a mirror, so angle of incidence is equal to angle of reflection] Now considering BE and FC, taking BC as transversal,	1 1 .5 .5

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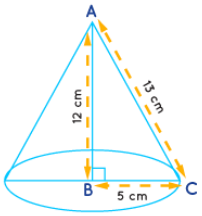
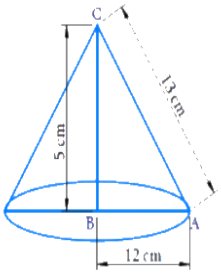
	∠EBC=∠BCF.....(i) [alternate interior angle] i.e. x=y i.e. ∠ABE=∠FCD.....(ii) Adding equation (i) and (ii) ∠EBC+∠ABE=∠BCF+∠FCD ∠ABC=∠BCD Now if we take line AB and CD in consideration, alternate interior angles that are ∠ABC and ∠BCD are equal. Therefore, AB‖CD	.5 .5 .5 .5
33	find Slant height = 25 m (Using correct formula + correct calculation + correct answer) find height = 24 m (Using correct formula + correct calculation + correct answer) volume of the tent 1232m^3 (Using correct formula + correct calculation + correct answer) or (a) Since the triangle is revolved about the side 12 cm, a solid cone is formed with a height of 12 cm and radius of the base of 5 cm as shown below.  Volume of a cone having radius 'r', and height 'h', = 1/3πr²h Radius of the cone, 'r' = 5 cm Height of the cone, 'h' = 12 cm Volume of the cone = 1/3πr²h = 1/3 × π × 5 cm × 5 cm × 12 cm = 100π cm³ Volume of the cone is 100π cm³. (b) Since the triangle is revolved about the side 5 cm, a solid cone if formed with a height of 5 cm and radius of the base of 12 cm.  Volume of a cone having radius 'r' and height 'h' = 1/3πr²h Radius of the cone, r =12cm Height of the cone, h = 5cm Volume of the cone = 1/3πr²h = (1/3) × π × 12cm × 12cm × 5cm = 240π cm³ (c) Ratio = Volume of the cone in (a)/ Volume of the cone in (b) = 100π : 240π = 5 :12 The volume of the cone is 240π cm³ and the required ratio is 5 :12	1+1 1 2 2 2 1
34	1 mark for each part Or For correct figure (i) In ΔACB, M is the midpoint of AB and MD ‖ BC	1

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	D is the midpoint of AC (Converse of mid point theorem) (ii) ∠ACB = ∠ADM (Corresponding angles) also, ∠ACB = 90° ∠ADM = 90° and MD ⊥ AC (iii) In ΔAMD and ΔCMD, AD = CD (D is the midpoint of side AC) ∠ADM = ∠CDM (Each 90°) DM = DM (common) ΔAMD ≅ ΔCMD [SAS congruency] AM = CM [CPCT] also, AM = ½ AB (M is midpoint of AB) Hence, CM = MA = ½ AB	1 1 1 1
35	For making class interval continuous For class mark+ proper scaling frequency polygon	1 1+1/2 2 1/2
	Section E	
	Section E consists of 3 questions of 4 marks each	
36	a) degree is 2 , Quadratic polynomial b) Linear c) (2x+1), (2x-5) or 39195	½ +1/2 **1** 2
37	(a) Angle QPR = 90 degree (b) Triangle QPR is a right angled triangle $4r^2$ = 64 +36 r = 5 cm OR Perimeter of circle = $2\pi r$ = 2 ×22/7 ×5 = 31.4 cm (c) Angle QSR = Angle QPR = 90 degree (Angle in the same segment)	1 2 1
38	i) $\sqrt{3} - \sqrt{2}$ ii) Rational iii) 22- 4√28 Or $\frac{\sqrt{77} - \sqrt{35}}{6}$	**1** **1** 2

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