CHENNAI SAHODAYA SCHOOL COMPLEX

COMMON EXAMINATION

Class-10

MATHEMATICS -041

Time Allowed: 3 Hours **Maximum MARKS :80**

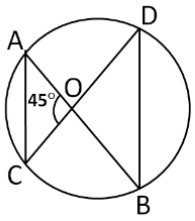
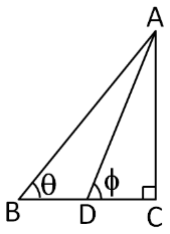
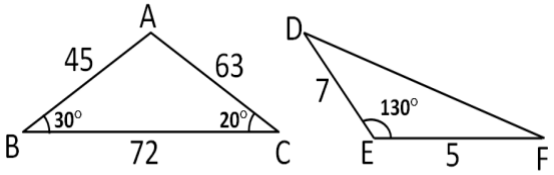
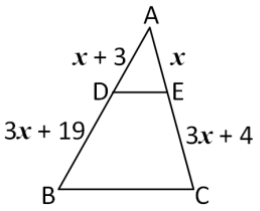
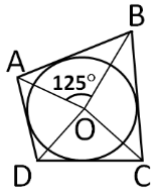
Roll No.: **CODE - II** **Date: 27/01/2023**

General Instructions:

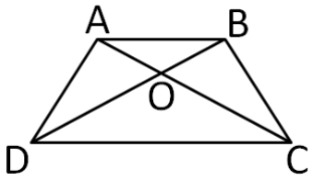
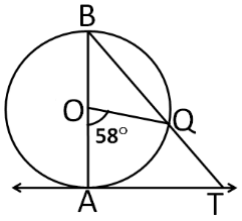
1. This Question Paper has 5 Sections A, B, C, D, and E.
2. Section A has 20 Multiple Choice Questions (MCQs) carrying 1 mark each.
3. Section B has 5 Short Answer-I (SA-I) type questions carrying 2 marks each.
4. Section C has 6 Short Answer-II (SA-II) type questions carrying 3 marks each.
5. Section 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 2 marks, 2 Qs of 3 marks and 2 Questions of 5 marks has been provided. An internal choice has been provided in the 2 marks questions of Section E.
8. Draw neat figures wherever required. Take π =22/7 wherever required if not stated.

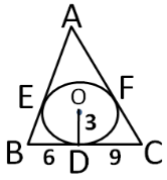
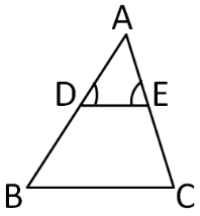
SECTION - A

	Section A consists of 20 questions of 1 mark each.	
SN		**Marks**
1.	If the HCF of 85 and 153 is expressible in the form 85n – 153 , then the value of n is (a) 3 (b) 2 (c) 4 (d) 1	1
2.	Which of the following quadratic equations has its roots as $2+\sqrt{3}$ and $2-\sqrt{3}$? (a) $2x^2-4x+1=0$ (b) $x^2-4x+1=0$ (c) $x^2-6x+4=0$ (d) None of these	1
3.	If the sum of the squares of zeroes of a quadratic polynomial $f(x)=x^2-8x+k$ is 40, then the value of 'k' is (a) 24 (b) 12 (c) 6 (d) 22	1
4.	If $2^{x-y}=8$ and $2^{x+y}=64$, then the value of x and y are (a) $\frac{9}{2}$, $\frac{3}{2}$ (b) $\frac{-9}{2}$, $\frac{3}{2}$ (c) $\frac{9}{2}$, $\frac{-3}{2}$ (d) 3 , 2	1
5.	If P(1,2) , Q(4,6) , R(5,7) and S(m,n) are the vertices of a parallelogram PQRS taken in order, then (a) m = 2 , n = 4 (b) m = 3 , n = 4 (c) m = 2 , n = 3 (d) m = 3 , n = 5	1

6.	O is the point of intersection of two chords AB and CD, such that OB = OD and ∠AOC = 45°, then the triangles OAC and ODB are (a) equilateral but not similar (b) isosceles but not similar (c) equilateral and similar (d) isosceles and similar 	1
7.	In the figure, △ABC is right angled at C. D is the midpoint of BC. Then $\frac{\tan\theta}{\tan\phi}$ = (a) $\frac{1}{2}$ (b) 2 (c) $\sqrt{3}$ (d) $\frac{1}{\sqrt{3}}$ 	1
8.	If $\sin x + \text{cosec}\ x = 2$, then $sin^{19}\ x\ + cosec^{20}x$ is (a) 2^{19} (b) 2^{20} (c) 2 (d) 2^{39}	1
9.	In the figure, the measures of ∠D and ∠F respectively are (a) 50° , 40° (b) 20° , 30° (c) 40° , 50° (d) 30° , 20° 	1
10.	The value of x for which DE ∥ BC in the given figure is (a) 4 (b) 1 (c) 3 (d) 2 	1
11.	If the perimeter of a square is equal to the perimeter of a circle, then the ratio of their areas is (a) 22 : 13 (b) 11 : 14 (c) 14 : 11 (d) 13 : 22	1
12.	In the figure, if ∠AOB = 125° , then ∠COD = (a) 62.5° (b) 45° (c) 35° (d) 55° 	1
13.	A sphere of diameter 18 cm is dropped into a cylindrical vessel of diameter 36 cm partly filled with water. If the sphere is completely submerged, then the water level rises by _____ cm. (a) 3 (b) 4 (c) 5 (d) 6	1

14.	If for a data mean : median = 9 : 8 , then median : mode is (a) 8 : 9 (b) 4 : 3 (c) 7 : 6 (d) 5 : 4	1
15.	A chord of a circle of radius 14cm subtends a right angle at the centre. Then the area of the minor sector is (a) $154\ cm^2$ (b)) $156\ cm^2$ (c) $158\ cm^2$ (d) $60\ cm^2$	1
16.	For the following distribution Class | 0 – 5 | 5 – 10 | 10 – 15 | 15 – 20 | 20 – 25 Frequency | 10 | 15 | 12 | 20 | 9 the difference between the upper limit of the modal class and the lower limit of the median class is (a) 5 (b) 10 (c) 15 (d) 20	1
17.	A game consists of tossing a coin 3 times and noting the outcome each time. If getting the same result in all the tosses is a success, then the probability of losing the game is (a) $\frac{1}{4}$ (b) $\frac{3}{4}$ (c) $\frac{1}{8}$ (d) $\frac{5}{8}$	1
18.	If $\frac{sin^2\theta}{7} + \frac{cos^2\theta}{7} = \frac{x}{21}$, then x is (a) 1 (b) 2 (c) 3 (d) 4	1
	Direction for questions 19 & 20: In question numbers 19 and 20, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct option.	
19.	**Assertion** : $\sqrt{p}$ is an irrational number where p is a prime number. **Reason** : Square root of any prime number is 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.	1
20.	**Assertion** : : If A and B are the points (–3 , 4) and (2 , 1) respectively, then the coordinates of the point C on AB produced such that AC = 2BC are (7, –2) **Reason** : The midpoint of the line joining (x_1 , y_1) and (x_2, y_2) is $(\frac{x_1+x_2}{3}, \frac{y_1+y_2}{3})$ (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.	1

	SECTION - B	
	Section B consists of 5 questions of 2 marks each.	
21.	Solve the following pair of linear equations : $152x - 378y = -74$ $-378x + 152y = -604$	2
22.	In the figure, $\frac{AO}{CO} = \frac{BO}{DO} = \frac{2}{3}$ and AB = 4cm. Find DC. 	2
23.	In the figure, AB is a diameter of a circle with centre O and AT is a tangent. If ∠AOQ = 58° , find ∠ATQ. 	2
24.	A bicycle wheel makes 5000 revolutions in moving 11km. Find the diameter of the wheel. **[OR]** An arc of a circle is of length 5π cm and the sector it bounds has an area of 20π cm^2. Find the radius of the circle.	2
25.	Evaluate $\frac{3\sin 3A + 2\cos(5A+10)^0}{\sqrt{3}\tan 3A - cosec\,(5A-20)^0}$ when A = 10° **[OR]** If $2\sin 3x = \sqrt{3}$, find the value of $\tan(x+25)^0$	2
	Section C	
	Section C consists of 6 questions of 3 marks each.	
26.	Prove that $6 + \sqrt{2}$ is irrational.	3
27.	Find the zeroes of the polynomial $4\sqrt{3}x^2 + 5x - 2\sqrt{3}$ and verify the relationship between the zeroes and the coefficients.	3
28.	A and B each has a certain number of mangoes. A says to B "If you give 30 of your mangoes, I will have twice as many as left with you". B replies "If you give me 10, I will have thrice as many as left with you." How many mangoes does each have? **[OR]** In $\triangle ABC$, $\angle A = x°$, $\angle B = (3x)°$ and $\angle C = y°$. If $3y - 5x = 30°$, show that the triangle is a right angled triangle.	3
29.	Prove that $\frac{1}{cosec\theta - cot\theta} - \frac{1}{\sin\theta} = \frac{1}{\sin\theta} - \frac{1}{cosec\theta + cot\theta}$	3

30.	Prove that a parallelogram circumscribing a circle is a rhombus. **[OR]** A $\triangle ABC$ is drawn to circumscribe a circle of radius 3cm such that the segments BD and DC are respectively of lengths 6cm and 9cm. If the area of $\triangle ABC$ is $54cm^2$, find AB and AC. 	3
31.	The king, queen and jack of clubs are removed from a pack of cards and one card is chosen at random from the remaining cards. Find the probability of getting a) a black king b) a jack c) a red queen	3
	Section D	
	Section D consists of 4 questions of 5 marks each.	
32.	In a flight of 2800km, an aircraft was slowed down due to bad weather. Its average speed is reduced by 100km/hr and time increased by 30 minutes. Find the original duration of the flight. **[OR]** A pole has to be erected at a point on the boundary of a circular park of diameter 13m in such a way that the difference of its distances from two diametrically opposite fixed gates A and B on the boundary is 7m. Is it possible to do so? If yes at what distances from the two gates should the pole be erected?	5
33.	Prove that if a line is drawn parallel to one side of a triangle to intersect the other two sides at distinct points, then the other two sides are divided in the same ratio. In the figure, $\angle D = \angle E$ and $\frac{AD}{DB} = \frac{AE}{EC}$. Using the above theorem, prove that ΔBAC is an isosceles triangle. 	5
34.	A toy rocket is in the form of a right circular cylinder closed at the lower end and surmounted by a cone with the same radius as that of the cylinder. The diameter and height of the cylinder are 6cm and 12cm respectively. If the slant height of the conical portion is 5cm, find the surface area and volume of the rocket [Use $\pi = 3.14$]	5
35.	A survey regarding the heights (in cm) of 50 girls of class X of a school was conducted and the following data was obtained.	5

Height (in cm)	120 – 130	130 – 140	140 – 150	150 – 160	160 – 170
No. of girls	2	8	12	20	8

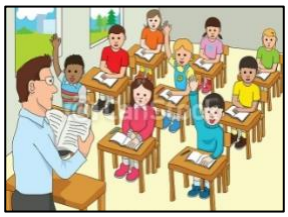
Find the mean and mode of the above data.

SECTION - E

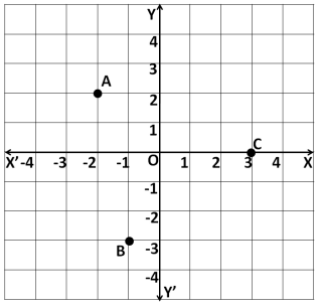
Case study based questions are compulsory.

36. **Case Study – 1**

Ajay , Biju and Collin are childhood friends. They always want to sit in a row in the classroom. But the class teacher changes the seating arrangement everyday. Biju is very good in maths. He considers the centre of the class as origin and marks their positions on a paper in a coordinate system.



One day Biju made the following diagram of their seating position.



(i) Find the ratio in which AB is divided by the x-axis. 1

(ii) What is the position of David, if he is sitting at the midpoint of AC. 1

(iii) Collin wants to sit at the position (x , y) such that he is equidistant from Ajay and Biju. Find the relation between x and y. 2

(OR)

If Eira is seated at $\left(\frac{-3}{2}, \frac{-1}{2}\right)$, show that the positions of Ajay, Biju and Eira are collinear.

37. **Case Study – 2**

Rishi wants to buy a car and plans to take loan from a bank. He pays his total loan amount of Rs.11,80,000 by paying every month starting with the first instalment of Rs.10,000. If he increases the instalment by Rs.1000, every month, answer the following questions.

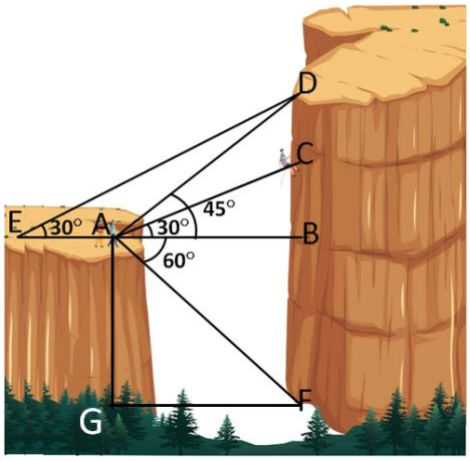
(i) What is the amount paid by Rishi in 30th instalment? 1

(ii) Determine the amount paid by Rishi in 30 instalments. 2

[OR]

Find the difference between the amount paid in the 25th instalment and 15th instalments.

(iii) What is the ratio of the 1st instalment to the 40th instalment? 1

38.	**Case Study – 3** Trekking : Himalyas trekking club has just hiked to the point A on the south rim of a large canyon, when they spot a climber at point C, trying to reach the point D at the top of the northern rim. The distance AB between the northern and southern walls of the canyon is 150m. The hikers observe an angle of depression of 60° to the bottom F of the north face. The angle of elevation of the climber and the top of the northern rim were found to be 30° and 45°. (Use $\sqrt{3}$= 1.7) (i) How high is the southern rim AG of the canyon? 1 (ii) Hoe high is the northern rim FD? 1 (iii) How much more should the climber climb to reache the top? 2 **[OR]** The hikers move to the point E on the southern face such that E, A and B are on a straight line. Now they observe the angle of elevation of the point D to be 30°. Find the distance AE. 

End of Paper