

# SPECTRA PRE-BOARD EXAMINATION

## SPECTRA CLASSES

### CLASS 10<sup>TH</sup>

### SUBJECT-MATHEMATICS

TIME-3HR.

MM:80

General Instruction:

1. This Question paper contains - five sections A, B, C, D and E.
2. Section A has 20 MCQs and 02 Assertion-Reason based questions of 1 mark each.
3. Section B has 5 Very Short Answer (VSA)-type questions of 2 marks each.
4. Section C has 6 Short Answer (SA)-type questions of 3 marks each.
5. Section D has 4 Long Answer (LA)-type questions of 5 marks each.
6. Section E has 3 case based integrated units of assessment (4 marks each) with sub parts of the values of equal marks.
7. All questions are compulsory. However, an internal choice in 2 questions of 5 marks, 2 Qs of 3 marks and 2 questions of 2 marks has been provided.
8. Draw neat figures wherever required.

#### SECTION-A

1. Which of the following is not irrational?  
(a)  $(3 + \sqrt{7})$                       (b)  $(3 - \sqrt{7})$                       (c)  $(3 + \sqrt{7})(3 - \sqrt{7})$                       (d)  $3\sqrt{7}$
2. If the HCF of 65 and 117 is expressible in the form  $65m - 117$ , then the value of m is  
(a) 4                      (b) 2                      (c) 1                      (d) 3
3. Zeroes of a polynomial can be expressed graphically. Number of zeroes of polynomial is equal to number of points where the graph of polynomial is:  
(a) Intersects x-axis                      (b) Intersects y-axis  
(c) Intersects y-axis or x-axis                      (d) None of the above
4. 3. The pairs of equations  $9x + 3y + 12 = 0$  and  $18x + 6y + 26 = 0$  have  
(a) Unique solution                      (b) Exactly two solutions  
(c) Infinitely many solutions                      (d) No solution
5. The roots of quadratic equation  $2x^2 + x + 4 = 0$  are:  
(a) Positive and negative                      (b) Both Positive  
(c) Both Negative                      (d) No real roots
6. If a = 10 and d = 10, then first four terms will be:  
(a) 10, 30, 50, 60                      (b) 10, 20, 30, 40  
(c) 10, 15, 20, 25                      (d) 10, 18, 20, 30
7. D and E are the midpoints of side AB and AC of a triangle ABC, respectively and BC = 6 cm. If  $DE \parallel BC$ , then the length (in cm) of DE is:  
(a) 2.5                      (b) 3                      (c) 5                      (d) 6
8. If the distance between the points A(2, -2) and B(-1, x) is equal to 5, then the value of x is:  
(a) 2                      (b) -2                      (c) 1                      (d) -1

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9. If  $\cos X = \frac{2}{3}$  then  $\tan X$  is equal to:  
(a)  $\frac{5}{2}$  (b)  $\sqrt{\frac{5}{3}}$  (c)  $\frac{\sqrt{5}}{2}$  (d)  $\frac{2}{\sqrt{5}}$
10. If a tower 6m high casts a shadow of  $2\sqrt{3}$  m long on the ground, then the sun's elevation is:  
(a)  $60^\circ$  (b)  $45^\circ$  (c)  $30^\circ$  (d)  $90^\circ$
11. If TP and TQ are the two tangents to a circle with centre O so that  $\angle POQ = 110^\circ$ , then  $\angle PTQ$  is equal to  
(a)  $60^\circ$  (b)  $70^\circ$  (c)  $80^\circ$  (d)  $90^\circ$
12. Two concentric circles are of radii 5 cm and 3 cm. The length of the chord of the larger circle which touches the smaller circle is:  
(a) 8 cm (b) 10 cm (c) 12 cm (d) 18 cm
13. Area of a sector of angle p (in degrees) of a circle with radius R is  
(a)  $\frac{P}{180} \times 2\pi R$  (b)  $\frac{P}{180} \times 2\pi R^2$  (c)  $\frac{P}{720} \times 2\pi R^2$  (d)  $\frac{P}{360} \times 2\pi R$
14. If  $\theta$  is the angle (in degrees) of a sector of a circle of radius r, then the length of arc is  
(a)  $(\pi r^2\theta)/360$  (b)  $(\pi r^2\theta)/180$  (c)  $(2\pi r\theta)/360$  (d)  $(2\pi r\theta)/180$
15. If we change the shape of an object from a sphere to a cylinder, then the volume of cylinder will:  
(a) Increase (b) Decrease (c) Remains unchanged (d) Doubles
16. A right circular cylinder of radius r cm and height h cm ( $h > 2r$ ) just encloses a sphere of diameter  
(a) r cm (b) 2r cm (c) h cm (d) 2h cm
17. The mode and mean is given by 7 and 8, respectively. Then the median is:  
(a)  $\frac{1}{13}$  (b)  $\frac{13}{3}$  (c)  $\frac{23}{3}$  (d) 33
18. The class interval of a given observation is 10 to 15, then the class mark for this interval will be:  
(a) 11.5 (b) 12.5 (c) 12 (d) 14
19. If two dice are thrown in the air, the probability of getting sum as 3 will be  
(a)  $\frac{2}{18}$  (b)  $\frac{3}{18}$  (c)  $\frac{1}{18}$  (d)  $\frac{1}{36}$

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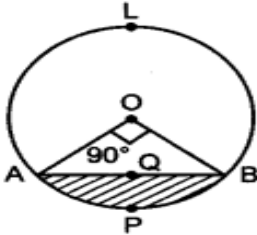
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20. If the pair of linear equations has a unique solution, then the lines representing these equations will
- (a) coincide (b) intersect at one point  
(c) parallel to each other (d) parallel to x-axis

### SECTION-B

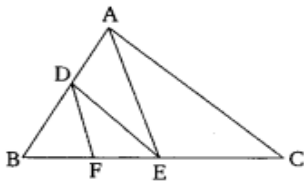
21. In figure, is a chord AB of a circle, with centre O and radius 10 cm, that subtends a right angle at the centre of the circle. Find the area of the minor segment AQB.



OR

Find c if the system of equations  $cx + 3y + (3 - c) = 0$ ;  $12x + cy - c = 0$  has infinitely many solutions?

22. In the given figure,  $DE \parallel AC$  and  $DF \parallel AE$ .  
Prove that  $\frac{BF}{FE} = \frac{BE}{EC}$



23. If  $\tan(A + B) = \sqrt{3}$  and  $\tan(A - B) = \frac{1}{\sqrt{3}}$ ;  $0^\circ < A + B \leq 90^\circ$ ;  $A > B$ , find A and B.
24. The length of a tangent from a point A at distance 5 cm from the centre of the circle is 4 cm. Find the radius of the circle.
25. Find the diameter of a circle whose area is equal to the sum of the areas of two circles of radii 40cm and 9cm.

OR

A chord of a circle of radius 10 cm subtends a right angle at the centre. Find the area of major segment. (use  $\pi=3.14$ )

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**SECTION-C**

26. On a morning walk three persons step off together and their steps measure 40 cm, 42 cm, 45 cm, what is the minimum distance each should walk so that each can cover the same distance in complete steps?

**OR**

$$\frac{\cos A - \sin A + 1}{\cos A + \sin A - 1} = \operatorname{cosec} A + \cot A, \text{ using the identity } \operatorname{cosec}^2 A = 1 + \cot^2 A$$

27. Find the roots of the following equation:

$$\frac{1}{x+4} - \frac{1}{x-7} = \frac{11}{30}, x \neq -4, 7$$

28. A tent of height 77 dm is in the form of a right circular cylinder of diameter 36 m and height 44 dm surmounted by a right circular cone. Find the cost of the canvas at Rs. 3.50 per m<sup>2</sup>

**OR**

A lending library has a fixed charge for the first three days and an additional charge for each day thereafter. Saritha paid Rs. 27 for a book kept for seven days, while Susy paid Rs. 21 for the book she kept for five days. Find the fixed charge and the charge for each extra day.

29. show that the points A (1,0), B (5,3), C (2, 7) and D (-2, 4) are the vertices of a parallelogram.
30. Two different dice are thrown together. Find the probability of:  
(i) getting a number greater than 3 on each die  
(ii) getting a total of 6 or 7 of the numbers on two dice
31. Prove that  $15 + 17\sqrt{3}$  be an irrational number.

**SECTION-D**

32. Find the mean, mode and median of the following frequency distribution:

CLASS	FREQUENCY
0-10	4
10-20	4
20-30	7
30-40	10
40-50	12
50-60	8
60-70	5

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**OR**

If the mean of the following frequency distribution is 145, find the missing frequencies ( $f_1, f_2$ ):

CLASS	FREQUENCY
0-50	8
50-100	12
100-150	$f_1$
150-200	25
200-250	$f_2$
250-300	5

33. A vessel is in the form of an inverted cone. Its height is 8 cm and the radius of its top, which is open, is 5 cm. It is filled with water up to the brim. When lead shots, each of which is a sphere of radius 0.5 cm are dropped into the vessel, one-fourth of the water flows out. Find the number of lead short dropped in the vessel.
34. Sides AB and AC and median AD of a  $\Delta ABC$  are respectively proportional to sides PQ and PR and median PM of another  $\Delta PQR$ . Show that  $\Delta ABC \sim \Delta PQR$ .
35. Two train each 80 m long passes each other on parallel lines. If they are going in same direction, the faster train takes one minute to pass the other completely. If they are going in opposite directions, they over take each other in three seconds. Find the speed of each train in Km/hr.

**OR**

A manufacturer of laptop produced 6000 units in 3<sup>rd</sup> year and 7000 units in the 7<sup>th</sup> year. Assuming that production increases uniformly by a fixed number every year, find

- (i) The production in the 1<sup>st</sup> year  
(ii) The production in the 5<sup>th</sup> year  
(iii) The total production in 7years.

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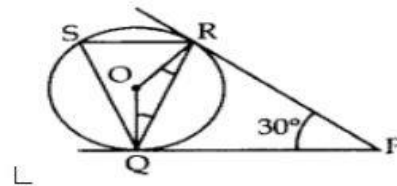
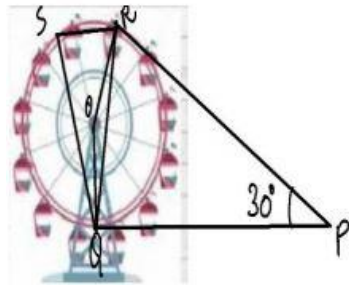
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#### SECTION-E

#### 36. Case Study-1

A Ferris wheel (or a big wheel in the United Kingdom) is an amusement ride consisting of a rotating upright wheel with multiple passenger-carrying components (commonly referred to as passenger cars, cabins, tubs, capsules, gondolas, or pods) attached to the rim in such a way that as the wheel turns, they are kept upright, usually by gravity.

After taking a ride in Ferris wheel, Aarti came out from the crowd and was observing her friends who were enjoying the ride. She was curious about the different angles and measures that the wheel will form. She forms the figure as given below.



1. In the given figure find  $\angle ROQ$ .

- a) 60                      b) 100                      c) 150                      d) 90

2. Find  $\angle RQP$

- a) 75                      b) 60                      c) 30                      d) 90

3. Find  $\angle RSQ$

- a) 60                      b) 75                      c) 100                      d) 30

4. Find  $\angle ORP$

- a) 90                      b) 70                      c) 100                      d) 60

37. **CASE STUDY 2:** Your friend Veer wants to participate in a 200m race. He can currently run that distance in 51 seconds and with each day of practice it takes him 2 seconds less. He wants to do in 31 seconds.



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**1. Which of the following terms are in AP for the given situation**

- a) 51,53,55....                      b) 51, 49, 47....  
c) -51, -53, -55....                d) 51, 55, 59...

**2. What is the minimum number of days he needs to practice till his goal is achieved**

- a) 10            b) 12            c) 11            d) 9

**3. Which of the following term is not in the AP of the above given situation**

- a) 41            b) 30            c) 37            d) 39

**4. If  $n$ th term of an AP is given by  $a_n = 2n + 3$  then common difference of an AP is**

- a) 2            b) 3            c) 5            d) 1

- 38. CASE STUDY 3:** A group of students of class X visited India Gate on an education trip. The teacher and students had interest in history as well. The teacher narrated that India Gate, official name Delhi Memorial, originally called All-India War Memorial, monumental sandstone arch in New Delhi, dedicated to the troops of British India who died in wars fought between 1914 and 1919. The teacher also said that India Gate, which is located at the eastern end of the Rajpath (formerly called the Kingsway), is about 138 feet (42 metres) in height.



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**1. What is the angle of elevation if they are standing at a distance of 42m away from the monument?**

- a)  $30^\circ$       b)  $45^\circ$       c)  $60^\circ$       d)  $0^\circ$

**2. They want to see the tower at an angle of  $60^\circ$ . So, they want to know the distance where they should stand and hence find the distance.**

- a) 25.24 m      b) 20.12 m      c) 42 m      d) 24.64 m

**3. If the altitude of the Sun is at  $60^\circ$ , then the height of the vertical tower that will cast a shadow of length 20 m is**

- a)  $20\sqrt{3}$  m      b)  $20/\sqrt{3}$  m      c)  $15/\sqrt{3}$  m      d)  $15\sqrt{3}$  m

**4. The ratio of the length of a rod and its shadow is 1:1. The angle of elevation of the Sun is**

- a)  $30^\circ$       b)  $45^\circ$       c)  $60^\circ$       d)  $90^\circ$