NATIONAL PUBLIC SCHOOL
INDIRANAGAR, BENGALURU
PREPARATORY EXAMINATION – 2019-20

Class: 10 **MATHEMATICS** **Max. Marks: 80**
No. of pages: 7 **Time: 3 hrs**

General Instructions:

- ***All Questions are compulsory***
- ***The question paper consists of 40 questions divided into 4 sections A,B,C and D***
- ***Section A comprises of 20 questions of 1 mark each. Section B comprises of 6 questions of 2 marks each. Section C comprises of 8 questions of 3 marks each. Section D comprises of 6 questions of 4 marks each***
- ***There is no overall choice. However, an internal choice has been provided in two questions of 1 mark each, two questions of 2 marks each, three questions of 3 marks each, and three questions of 4 marks each. You have to attempt only one of the alternatives in all such questions***
- ***Use of calculators is not permitted***

SECTION A

Q1- Q10 are multiple choice questions. Select the most appropriate answer from the given options

1. The decimal expansion of the rational number $\frac{33}{2^2.5}$ will terminate after
   a) One decimal place
   b) Two decimal place
   c) Three decimal place
   d) More than three decimal place

2. The time, in seconds taken by 150 athletes to run a 110m hurdle race are tabulated below

Time	13.8-14	14-14.2	14.2-14.4	14.4-14.6	14.6-14.8	14.8-15
Frequency	2	4	5	71	48	20

The number of athletes who completed the race in less than 14.6 seconds is
   a) 11
   b) 71
   c) 82
   d) 130

3. n^2-1 is divisible by 8 if n is
   a) An integer
   b) A natural number
   c) An odd integer
   d) An even integer

4. The pair of equations $x=a, y=b$ graphically represents lines which are
   a) Parallel
   b) Intersecting at (b,a)
   c) Coincident
   d) Intersecting at (a,b)

5. Given that $\sin\alpha = \frac{1}{2}$, $\cos\beta = \frac{1}{2}$, then the value of $\alpha+\beta$ is

a) $0°$
b) $30°$
c) $60°$
d) $90°$

6. If $\sin A + \sin^2 A = 1$, then the value of the expression $\cos^2 A + \cos^4 A$ is

a) 1
b) $\frac{1}{2}$
c) 2
d) 3

7. If $\cos 9\alpha = \sin\alpha$, and $9\alpha < 90°$, then the value of $\tan 5\alpha$ is

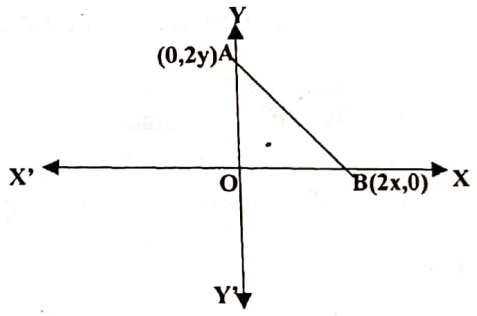
a) $\frac{1}{\sqrt{3}}$
b) $\sqrt{3}$
c) 1
d) 0

8. The points $A(9,0); B(9,6), C(-9,6) \& D(-9,0)$ are the vertices of a

a) Square
b) rectangle
c) rhombus
d) trapezium

9. The coordinates of the point which is equidistant from the three vertices of the triangle AOB as shown in the fig is

a) (x,y)
b) (y,x)
c) $\left(\frac{x}{2},\frac{y}{2}\right)$
d) $\left(\frac{y}{2},\frac{x}{2}\right)$



10. The fourth vertex D of a parallelogram ABCD whose three vertices are $A(-2,3), B(6,7), C(8,3)$ is

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

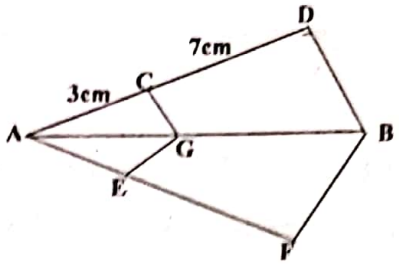
(Q11-Q15) Fill in the blanks

11. A cylindrical pencil sharpened at one edge is the combination of _____ and _____

12. Complete the sequence ---------,13,---------,3 to form an A.P

13. In the given fig $GC \parallel BD$ and $GE \parallel BF$.
if AC=3cm, CD=7cm, the ratio $\frac{AE}{AF}$ is

_____



14. Values of k for which the quadratic equation $2x^2 - kx + k = 0$ has equal roots is

_____

OR

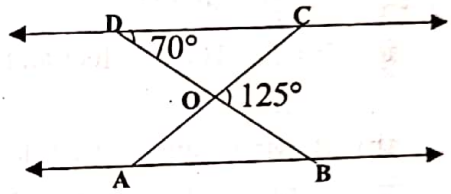
The smallest value of k for which the equation $x^2 + kx + 9 = 0$ has real root is

_____

15 A letter from English alphabets is chosen at random. The probability that it is a letter of the word MATHEMATICS is _____

(Q16- Q 20)Answer the following

16. If $HCF(336,54) = 6$, find LCM (336,54)
17. In the given fig, $\Delta ODC \sim \Delta OBA$,
$\angle BOC = 125°, \angle CDO = 70°$.
Find $\angle DCO, \angle OAB$



18 Out of the two concentric circles, the radius of the outer circle is 5cm and chord AC of length 8cm is a tangent to the inner circle. Find the radius of the inner circle.

OR

From a point P which is at a distance of 13cm from the centre O of a circle of radius 5cm, a pair of tangents PQ and PR are drawn to the circle . Find the area of the quadrilateral PQOR

19 Find the 11^{th} term from the last term of the AP 10,7,4,……,-62

20 Find the roots of the quadratic equation $3x^2 - 2\sqrt{6}x + 2 = 0$

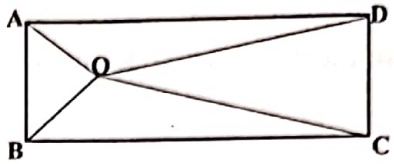
SECTION B

21. Jasleen saved ₹ 5 in the first week of the year and then increased her weekly savings by ₹1.75 each week. In which week will her weekly savings be ₹20.75

22 Prove that the angle between the two tangents drawn from an external point to a circle is supplementary to the angle subtended by the line segment joining the points of contact at the centre

23 O is any point inside a rectangle ABCD.

Prove that $OB^2 + OD^2 = OA^2 + OC^2$



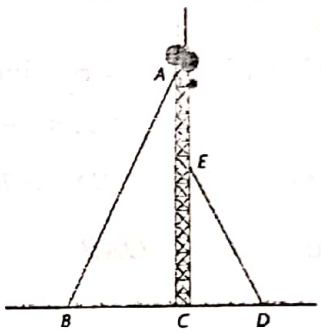
OR

Prove that the sum of the squares of the sides of a rhombus is equal to the sum of the square of its diagonals.

24 Study the diagram given of a radio transmitter tower with two support wires attached to it at A and E and to the ground at B and D

a) If CD= $100\sqrt{3}$ feet and CE = 100 feet, find the $\angle EDC$

b) If Mr Joseph were asked to attach a support wire, 125 feet long from point D to the tower maintaining the same angle at D, how far up the tower would Mr Joseph have to climb.



25. Suppose you roll a die and then roll it again. The die has the shape of a regular tetrahedron and the numbers 1,2,3, and 4 on it.

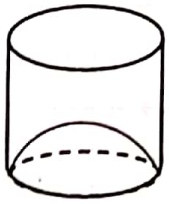
a) How many possible outcomes are there ?
b) Are they equally likely
c) What is the probability of getting a difference of 5
d) What is the probability of getting a difference of 2.

OR

A die has its six faces marked 0,1,1,1,6,6. Two such dice are thrown together and the total score is recorded.

a) How many different scores are possible?
b) What is the probability of getting a total of 7

26 A juice seller was serving his customers using glasses as shown in the fig. the inner diameter of the cylindrical glass was 5cm , but the bottom of the glass had a hemispherical raised portion which reduced the capacity of the glass. If the height of a glass was 10cm , find the apparent capacity of the glass and its actual capacity (use $\pi = 3.14$)



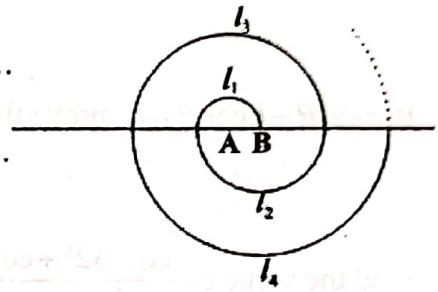
SECTION C

27. Show that $5-\sqrt{3}$ is irrational, given that $\sqrt{3}$ is irrational.

OR

Check whether 6^n can end with the digit 0 for any natural number

28 A spiral is made up of successive semicircles, with centres alternately at A and B starting with centre A of radii 0.5cm, 1.0cm, 1.5cm , 2.0 cm,..... as shown in the fig. What is the total length of such a spiral made up of thirteen consectuive semi circles . take ($\pi = \frac{22}{7}$)



29 Solve the following system of equations:

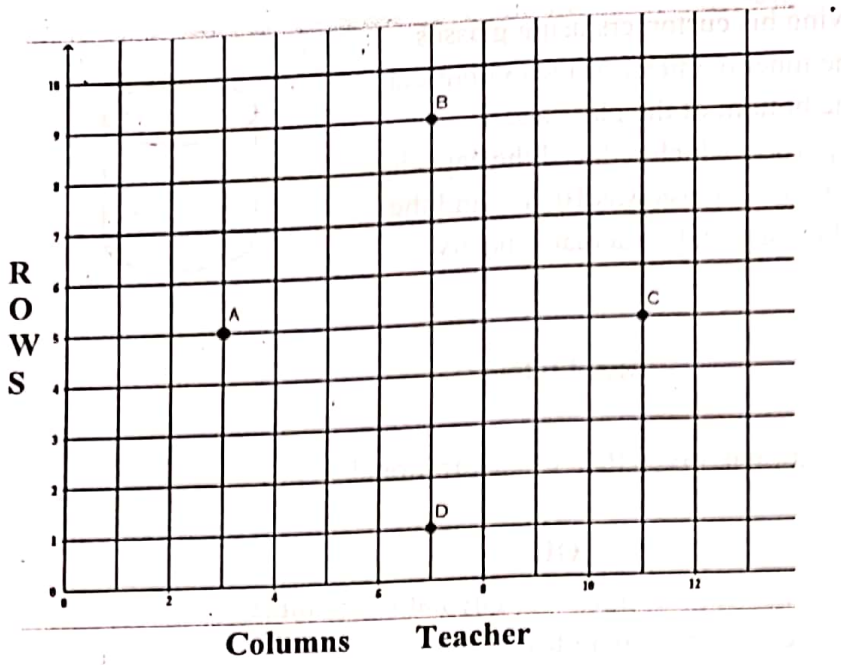
$$\frac{2}{\sqrt{x}}+\frac{3}{\sqrt{y}}=2 \quad \& \quad \frac{4}{\sqrt{x}}-\frac{9}{\sqrt{y}}=-1 \quad , \; x, y \neq 0$$

OR

A boat goes 30km upstream and 44km downstream in 10 hours. In 13 hours it can go 40km upstream and 55km downstream. Determine the speed of the stream and that of the boat in still water.

30 Verify 3, -1, -1/3 are the zeroes of the cubic polynomial $p(x) = 3x^3 - 5x^2 - 11x - 3$ and then verify the relationship between the zeroes and the coefficients

31 Students of a school are standing in rows and columns in their play ground for a drill practice. A,B,C,D are the position of four students as shown in the fig. is it possible to place Jaspal in the drill in such a way that he is equidistant from each of the four students A,B,C and D? If so what should be his position

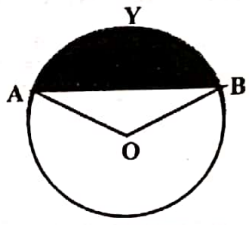


32 If $a\sin\theta + b\cos\theta = c$, prove that $a\cos\theta - b\sin\theta = \sqrt{a^2 + b^2 - c^2}$

OR

Find the value of $\dfrac{\cos^2 32° + \cos^2 58°}{\sec^2 50° - \cot^2 40°} - 4\tan 13°\tan 37°\tan 53°\tan 77°$

33 Find the area of the segment AYB shown in the fig, if radius of the circle is 21cm and $\angle AOB = 120°, \left(use\ \pi = \dfrac{22}{7}\right)$



34 The median of the distribution given below is 14.4. find the values of X and Y if the total frequency is 20

Class interval	0-6	6-12	12-18	18-24	24-30
Frequency	4	X	5	Y	1

SECTION D

35 Construct an isosceles triangle whose base is 8cm and altitude 4cm and then another triangle whose sides are $1\frac{1}{2}$ of the corresponding sides of the isosceles triangle

OR

Construct a pair of tangents to a circle of radius 5cm which are inclined to each other at an angle of 60°

36 Prove that the lengths of the tangents drawn from an external piont to a circle are equal. Using the above theorem, prove that
If quadrilateral ABCD is drawn circumscribing a circle then AB+CD=AD+BC

37. If the price of a book is reduced by ₹ 5 , a person can buy 5 more books for ₹ 300. Find the original list price of the book.

OR

The sum of the ages of two friends is 20 years. Four years ago, the product of their ages in years as 48. Is this situation possible? If so determine their present ages.

38 An open metal bucket is in the shape of a frustum of a cone, mounted on a hollow cylindrical base made of the same metallic sheet. The diameters of the two circular ends of the bucket are 45cm and 25 cm, the total vertical height of the bucket is 40cm and tht of the cylindrical base is 6cm. Find the area of the metallic sheet used to make the bucket, where we do not take into account handle of the bucket. (take $\pi = \frac{22}{7}$)

OR

A vessel is in the form of an open inverted cone. Its height is 8cm and radius of its top, which is open is 5cm. It is filed with water upto the brim. When lead shots, each is a sphere of radius 0.5cm are dropped into the vessel, one fourth of the water flows out. Find the number of lead shots dropped in the vessel.

39 A pole 5m high is fixed on the top of a tower. The angle of elevation of the top of the pole as observed from a point A on the ground is $60°$ and the angle of depression of a point A from the top of the tower is $45°$. Find the height of the tower. (take $\sqrt{3} = 1.73$)

40 The distribution below shows the number of wickets taken by bowlers in one day cricket matches. Find the mean number of wickets by choosing a suitable method. What does the mean signify?

No of wickets	20-60	60-100	100-150	150-250	250-350	350-450
No of bowlers	7	5	16	12	2	3

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