PODAR INTERNATIONAL SCHOOL, POWAI
POWAI (CBSE)

SESSION 2020-2021

PREBOARD EXAM-I

MATHEMATICS STANDARD PAPER - 1 (041)

MARKS : 60 **DATE : 07/11/2020**

ROLL NUMBER : PISPB | | | | | | | | | **NO.OF PAGES : 08**

General Instructions **:**

1. This question paper contains two parts A and B.
2. Both Part A and Part B have internal choices.

PART - A :

I. It consists two sections - I and II
II. Section I has 12 questions of 1 mark each.
III. Section II has 3 questions on case study. Each case study has 5 case based sub-parts. An examinee is to attempt any 4 out of 5 sub-parts.

PART - B :

I. Question No 16 to 19 are Very Short Answer Type questions of 2 marks each.
II. Question No 20 to 25 are Short Answer Type questions of 3 marks each.
III. Question No 26 to 27 are Long Answer Type questions of 5 marks each.
4. Internal choice is provided in 2 questions of 2 marks, 2 questions of 3 marks and 1 question of 5 marks.
5. In addition to this, separate instructions are given with each section and question, wherever necessary.
6. Use of calculators is not permitted.

PART - A

SECTION – I

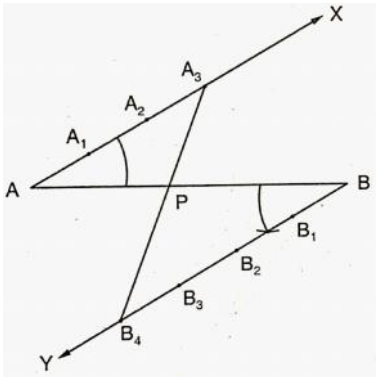
Section I has 12 questions of 1 mark each.

1. If the product of two numbers is 1080 and their HCF is 30, find their LCM.

2. If α, β are the zeroes of the polynomial $2y^2 + 7y + 5$, write the value of $\alpha + \beta + \alpha\beta$.

3. Find the value of $2\cos^2 60° + 3\sin^2 45° - 3\sin^2 30° + 2\cos^2 90°$

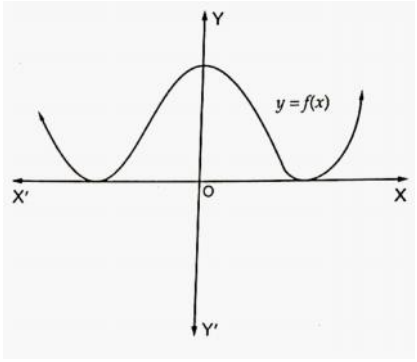
4. Find the discriminant of the quadratic equation $3\sqrt{3}x^2 + 10x + \sqrt{3} = 0$

5. 

Determine the ratio in which P divides seg AB.

6. The string of a kite is 100 metres long and it makes an angle of 60° with the horizontal. Find the height of the kite, assuming that there is no slack in the string.

7. The graph of a polynomial $f(x)$ is as shown in fig. below. Write the number of real zeros of $f(x)$.



8. If $\sec^2\theta\ (1 + \sin\theta)\ (1 - \sin\theta) = k$, find the value of k.

9. A cylinder and a cone are of the same base radius and same height. Find the ratio of the volume of the cylinder to that of the cone.

10. If $x = \frac{-1}{2}$, is a solution of the quadratic equation $3x^2 + 2kx - 3 = 0$, find the value of k.

11. The surface area of a sphere is 616 cm^2. Find its radius,

12. Without actually performing the long division, state whether the given rational number will have terminating decimal expansion or a non-terminating repeating decimal expansion. Also, find the number of places of decimals after which the decimal expansion terminates.

$\frac{23}{2^3 5^2}$

SECTION – II

Case study based questions are compulsory. Attempt any four sub parts of each question. Each subpart carries 1 mark

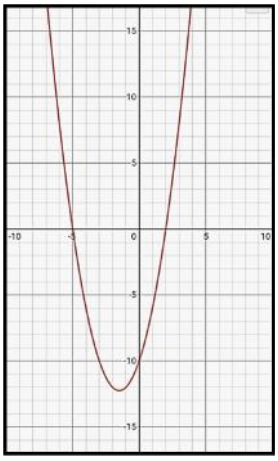
13. **Case Study based - 1**

A parabolic dish (or parabolic reflector) is a curved surface with a cross-sectional shape of a parabola used to direct light or sound waves. (The 3-D shape is called a paraboloid.)

Any sound waves entering a parabolic dish parallel to the axis of symmetry and hitting the inner surface of the dish are reflected back to the focus.

Radio telescope antennas and satellite dishes use this concept by placing a receiver at the focal point to obtain a concentrated signal.

In a similar manner, the parabolic reflector in a flashlight concentrates the light emitted by the bulb, located at the focal point, into a directed beam of light.



(i) If one zero of the quadratic polynomial $x^2 + 3x + k$ (representing the parabolic dish) is 2 then the value of k is

(a) 10 (b) –10 (c) 5 (d) –5

(ii) The zeroes of the quadratic polynomial representing parabolic dish are

(a) both positive (b) both negative

(c) both equal (d) one positive and one negative

(iii) If α and β are the zeroes of the polynomial representing parabolic dish, then which of the following will represent the quadratic polynomial whose zeroes are $\frac{2\alpha}{\beta}$ and $\frac{2\beta}{\alpha}$

(a) $k\left[x^2 - \frac{29}{5}x - 4\right]$ (b) $k\left[x^2 + \frac{29}{5}x + 4\right]$

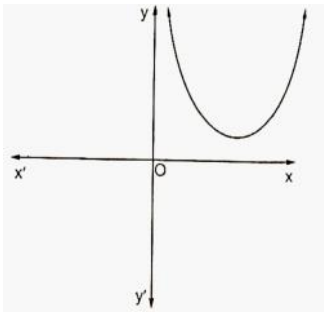
(c) $k\left[x^2 - \frac{29}{5}x + 4\right]$ (d) $k\left[x^2 + \frac{29}{5}x - 4\right]$

(iv) The no of polynomials having zeros 2 and – 5 are

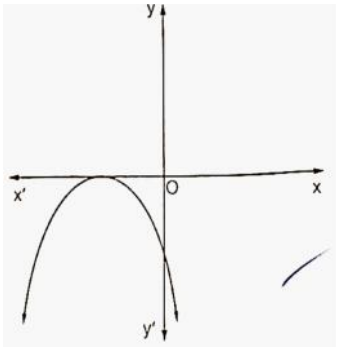
(a) 1 (b) 2 (c) 3 (d) more than 3

(v) Which of the following is the graph of a quadratic polynomial $ax^2 + bx + c$, $a > 0$, with two real zeroes?

(a)



(b)



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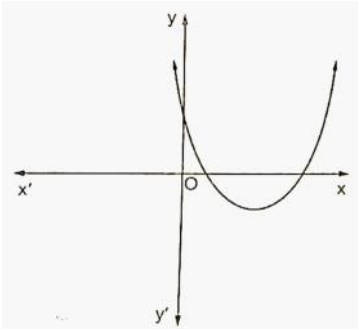
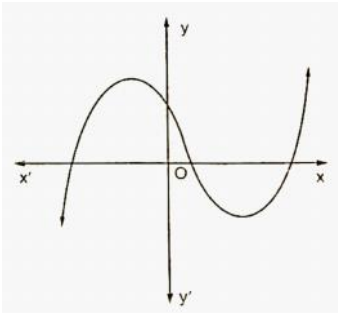
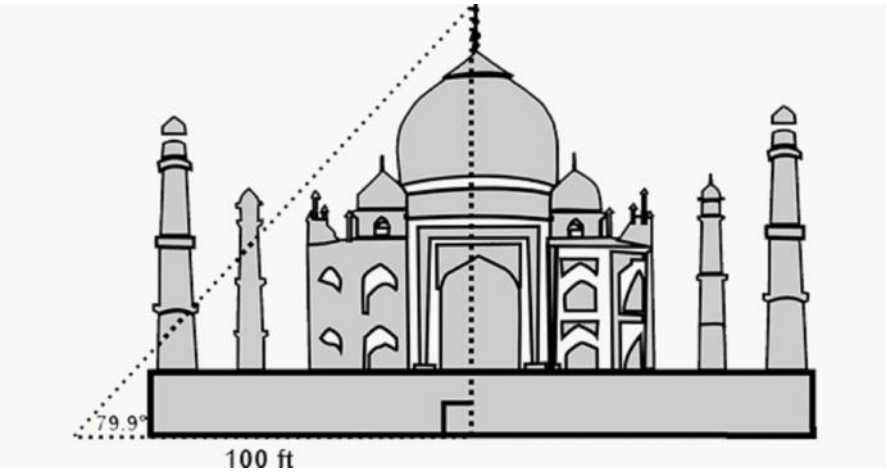


(d)

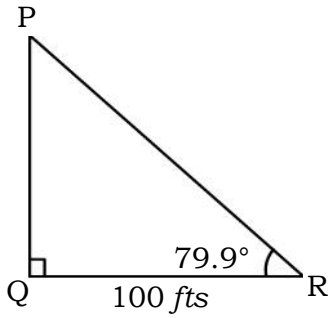


14. **Case Study based - 2**

Trigonometry can be used to measure the height of a building or mountains: if you know the distance from where you observe the building and the angle of elevation you can easily find the height of the building. Similarly, if you have the value of one side and the angle of depression from the top of the building you can find another side in the triangle, all you need to know is one side and angle of the triangle.

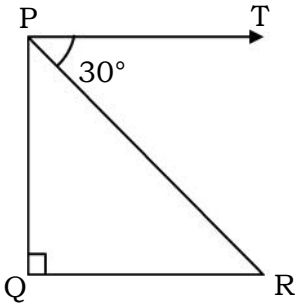


(i) In the adjoinig figure, find PQ
[tan 79.9° = 5.61]
(a) 561 fts
(b) 56.1 fts
(c) 5.61 fts
(d) 0.561 fts

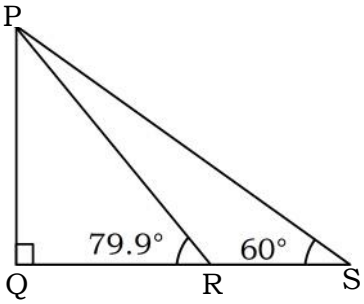


(ii) The length of the shadow of the TAJ on the plane ground is $\sqrt{3}$ times the height of it. The angle of elevation of sun is
(a) 45° (b) 30° (c) 60° (d) 90°

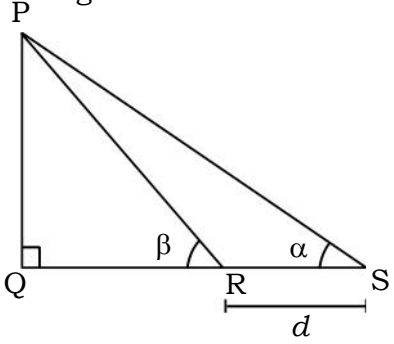
(iii) The angle of depression of a car, standing on the ground, from the top of the TAJ, is 30°. The distance of the car from the base of the TAJ (in feets) is
(a) $561\sqrt{3}\,m$
(b) $56.1\sqrt{3}\,m$
(c) $5.61\sqrt{3}\,m$
(d) $0.561\sqrt{3}\,m$



(iv) On moving some distance away from the TAJ, the observer founds the angle of elevation to be 60°. What is that distance he has moved away from the TAJ ?
(a) $(187\sqrt{3} - 100)$ fts
(b) $(561\sqrt{3} - 100)$ fts
(c) $(5.61\sqrt{3} - 100)$ fts
(d) $(1.87\sqrt{3} - 100)$ fts



(v) The angle of elevation of the top of tower standing on a horizontal plane form a point A is α. After walking a distance d towards the foot of the tower . . . . . β. The heigth of the tower is
(a) $\dfrac{d}{\cot\alpha + \cot\beta}$ (b) $\dfrac{d}{\cot\alpha - \cot\beta}$
(c) $\dfrac{d}{\tan\beta - \tan\alpha}$ (d) $\dfrac{d}{\tan\beta + \tan\alpha}$

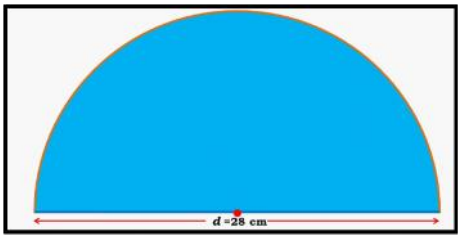


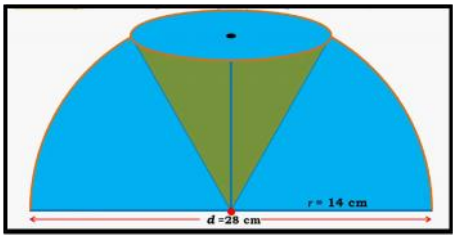
15. **Case Study based - 3**

Knowing about volume and surface area can be very useful in your daily life!

Say, for example, you wanted to know how much a precious mineral was worth. Part of that would require knowing the volume! Or, if you wanted to know how many calories were in a pie, that would also include knowing the volume! Same with surface area! You could use surface area to find out how much cardboard was used to make a box, or how much fabric was used to make a pillow! See, there are many applications of surface area and volume!

And not just in daily life, but in subfields of Science, such as engineering and physics!





ACTIVITY: Semi circular sheet is bend to form a conical cup

(i) What is the slant height of the conical cup ?

(a) 28 *cm* (b) $28\sqrt{3}$ *cm*

(c) 14 *cm* (d) $14\sqrt{3}$ *cm*

(ii) What is the radius of the conical cup ?

(a) 14 *cm* (b) $7\sqrt{3}$ *cm*

(c) $14\sqrt{3}$ *cm* (d) 7 *cm*

(iii) What is the height of the conical cup ? ($\sqrt{3}$ = 1.73)

(a) 12.11 *cm* (b) 1.211 *cm*

(c) 0.1211 *cm* (d) 121.1 *cm*

(iv) Which relation holds true for the above activity r_1, h_1 and l_1, being the radius, height and slant height respectively of the conical cup ?

(a) $r_1\ l_1 = \frac{1}{2}r^2$ (b) $r_1\ h,\ l_1 = \frac{1}{2}r^2$

(c) $\sqrt{r_1\ h_1\ l_1} = \frac{1}{2}r^2$ (d) $\sqrt{h_1 + r_1^2} \times l = \frac{1}{2}r^2$

(v) What is the volume of the conical cup ?

(a) 621.65 cm^3 (b) 6216.5 cm^3

(c) 6.2165 cm^3 (d) 62165 cm^3

PART - B

SECTION - III

Section III has 4 questions of 2 marks each. Internal choice is provided in 2 questions.

16. In a seminar, the number of participants in Hindi, English and Mathematics are 60, 48 and 108, respectively. Find the minimum number of rooms required if in each room the same number of participants are to be seated and all of them being in the same subject.

17. If two zeros of the polynomial $f(x) = x^3 - 4x^2 - 3x + 12$ are $\sqrt{3}$ and $-\sqrt{3}$ then, find its third zero.

OR

Find a cubic polynomial with the sum, sum of the products of its zeros taken two at a time, and product of its zeros as 3, –1 and –3 respectively.

18. If $\tan(A - B) = \frac{1}{\sqrt{3}}$ and $\tan(A + B) = \sqrt{3}$, $0° < A + B \leq 90°$, $A > B$.
Find A and B.

OR

If $\sin\theta = \frac{1}{3}$, then find the value of $(2\cot^2\theta + 2)$.

19. A metallic sphere of radus 4.2 *cm* is melted and recast into the shape of a cylinder of radus 6 *cm*. Find the height of the resulting cylinder.

SECTION - IV

Section IV has 6 questions of 3 marks each. Internal choice is provided in 2 questions.

20. Prove that $3 + 2\sqrt{3}$ is irrational, given that $\sqrt{3}$ is irrational.

21. If –5 is a root of the quadratic equation $2x^2 + px - 15 = 0$ and the quadratic equation $p(x^2 + x) + k = 0$ has equal roots, find the value of k.

OR

Find the values of p for which the quadratic equation
$(2p + 1)\,x^2 - (7p + 2)x + (7p - 3) = 0$ has equal roots. Also find theie roots.

22. A statue 1.6 *m* tall stands on the top of pedestal. From a point on the ground, the angle of elevation of the top of the statue is 60° and from the same point the angle of elevation of the top of the pedestal is 45°. Find the height of the pedestal.

23. Draw a pair of tangents to a circle of radius 4.5 *cm*, which are inclined to each other at an angle of 45°

24. Prove that : $(\sin\theta + \text{cosec}\,\theta)^2 + (\cos\theta + \sec\theta)^2 = 7 + \tan^2\theta + \cot^2\theta$

OR

Prove that : $\frac{1}{\sec A + \tan A} - \frac{1}{\cos A} = \frac{1}{\cos A} - \frac{1}{\sec A - \tan A}$

25. A tent is in the shape of a cylinder surmounted by a conical top. If the height and diameter of the cylindrical part are 2.1 *m* and 4 *m* respectively, and the slant height of the top is 2.8 *m*. Find the cost of the canvas of the tent at the rate of ₹ 500 per m^2. Consider that the base of the tent will not be covered with canvas.

SECTION - V

Section V has 2 questions of 5 marks each. Internal choice is provided in 1 question.

26. A Bird is sitting on the top of a 80 *m* high tree. From a point on the ground, the angle of elevation of the bird is 45°. The bird flies away horizontally in such a way that is remained at a constant height from the ground. After 2 seconds, the angle of elevation of the bird from the same point is 30°. Find the speed of flying of the bird. (Take $\sqrt{3} = 1.732$).

OR

A straight highway leads to the foot of tower. A man standing at the top of tower observes a car at an angle of depression of 30°, which is approaching the foot of the tower with uniform speed. Six seconds later, the angle of depression of the car is found to be 60°. Find the time taken by the car to reach the foot of the tower from this point.

27. Water is flowing at the rate of 5 *km* per hour through a pipe of diameter 14 *cm* into a rectangular tank which is 25 *m* long and 22 *m* wide. Determine the time in which the level of water in the tank will rise by 21 *cm*.
(Take $\pi = 22/7$)

All the Best 👍