

Vishwa Bharati Public School, Noida

I – Preboard Examination (2020-21)

X : Mathematics

Time: 3 hrs

Max. Marks : 80

General Instructions :

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

PART-A :

1. It consists two sections Section I and Section II.
2. Section I has 16 questions of 1 mark each.
3. Section II has 4 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

1. Question No. 21 to 26 are Very Short Answer Type questions of 2 marks each.
2. Question No. 27 to 33 are Short Answer Type questions of 3 marks each.
3. Question No. 34 to 36 are Long Answer Type questions of 5 marks each.

PART – A

Section – I

Section I has 16 questions of 1 mark each.

Q1. What is the H.C.F of two consecutive even numbers ?

OR

If ' a ' = $2^3 \times 3^4 \times 5^4 \times 7$, then find the number of consecutive zeroes in ' a ' , where ' a ' is a natural number.

Q2. If the sum of the zeroes of the polynomial $p(x) = kx^2 + 2x + 3k$ is equal to their product, Then find the value of ' k ' .

Q3. For what value of ' k ' , do the equations $3x - y + 8 = 0$ and $6x - ky = -16$ represent Co-incident lines.

Q4. Find the quadratic equation whose roots are twice the roots of $2x^2 - 5x + 2 = 0$.

Q5. Write the discriminant and discuss the nature of the roots of quadratic equation

$$(x + 5)^2 = 2(5x - 3).$$

Q6. Find the 6th term from the end of the A.P. 17,11,14..... -40.

Q7. Find the common difference of the A.P. $\frac{1}{p}, \frac{1-p}{p}, \frac{1-2p}{p}$

OR

If the numbers $x-2$, $4x-1$ and $5x+2$ are in A.P., then find the value of 'x'.

Q8. A cone, a hemisphere and a cylinder stand on equal bases and have the same height.

Find the ratio of their volumes.

Q9. In triangle ABC, $DE \parallel BC$ and $AD = (x+3)$, $DB = (3x+19)$, $AE = x$ and

$CE = (3x+4)$, then find x.

Q10. What is the distance between two parallel tangents of a circle of radius 5 cm?

Q11. AB and AC are two tangents to a circle having centre O. If $\angle BOC = (3x - 8)^\circ$ and

$\angle BAC = (2x + 3)^\circ$, find x.

Or

If two tangents inclined at an angle of 60° are drawn to a circle of radius 5cm, then

find the length of each tangent.

Q12. To divide a line segment in the ratio 2 : 3, find the minimum number of points marked on the ray making an acute angle with the given line segment.

Q13. Given that $\sin A = \frac{1}{2}$ and $\cos B = \frac{1}{2}$, then find the value of $(A + B)$.

Q14. If $\tan x = \sin 45^\circ \cos 45^\circ + \sin 30^\circ$, then find the value of x.

Q15. If the perimeter of a semi-circular protractor is 36 cm., then find its diameter.

Q16. Someone is asked to choose a number between 1 to 100. Find the probability that the Chosen number is prime.

OR

If three different coins are tossed together, then find the probability of getting two heads.

Section – II

Case study based questions are compulsory. Attempt any four sub – parts of each question.

Each sub-part carries 1 mark.

Q17. Case Study I

Parabolic Path

A car moves on a highway, the path trace by the car is shown below :



The pattern of the path traced in the shape of parabolic. A Parabola is the graph that forms by the quadratic expression $p(x) = ax^2 + bx + c$. Parabolas are symmetric about a vertical line known as the axis of symmetry.

a) What is the shape of the curve CDE?

- i) Parabolic ii) circle iii) straight line iv) ellipse

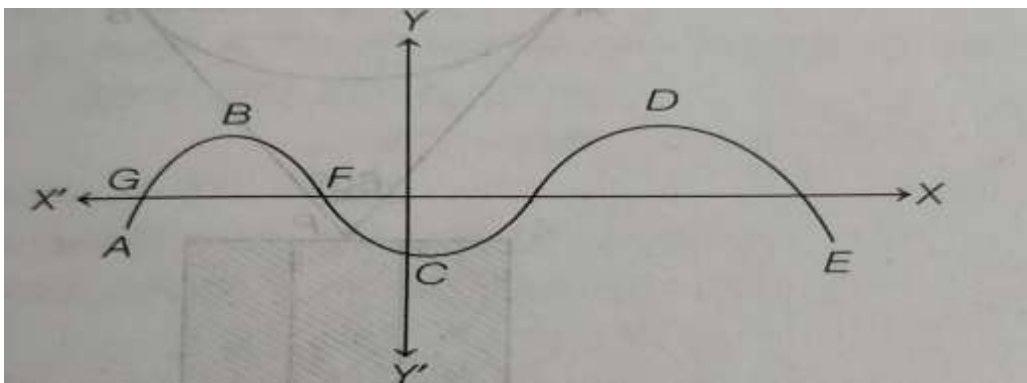
b) If the shape of the curve ABC is represented by $x^2 - 7x + 12$, then its zeroes are:

- i) 2, -3 ii) 3, 4 iii) 4, -5 iv) 3, -5

c) The path trace by the car, whose zeroes are 2 and -4, is:

- i) $x^2 - 4x - 8$ ii) $x^2 + 2x - 8$ iii) $x^2 + 2x + 8$ iv) $x^2 - 2x + 8$

d) The given path is shown on the coordinate axes:



find the number of zeroes of the given curve.

- ii) 3 ii) 2 iii) 4 iv) 1

e) If the path ABC traced by the car in the above question is represented by $x^2 + 8x + 15$, then find the distance between G and F?

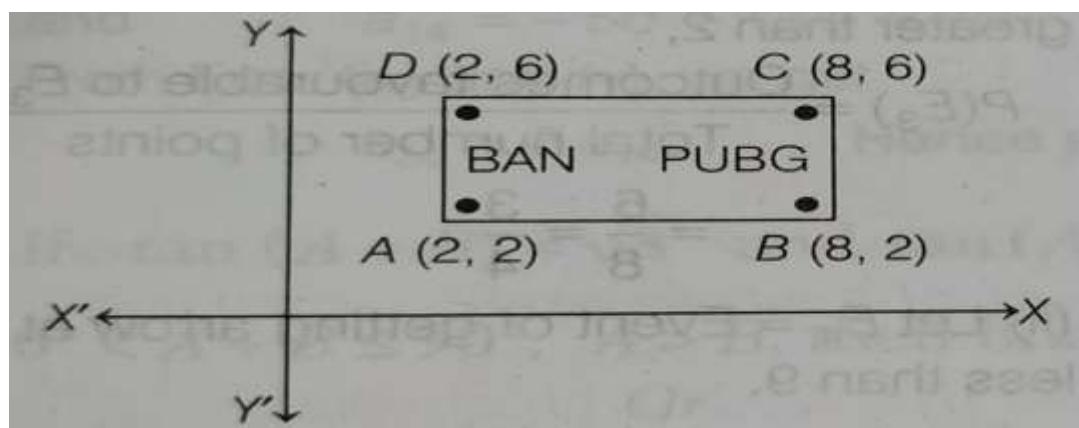
- i) 2 ii) 3 iii) 1 iv) can't be determined

Q18. Case Study II

Campaign Against PUBG Game

Using of mobile screen for long hours, it make lazy affect your eyesight and give you headaches. Those who are addicted to playing PUBG can get easily stressed out or face anxiety issues in public due to lack of social interaction.

To raise social awareness about ill effects of playing PUBG, a school decided to start "BAN PUBG" campaign, students are asked to prepare campaign board in the shape of rectangle (as shown in the figure



(a) Find the area of the board.

- i) 24 cm^2 (ii) 23 cm^2 (iii) 20 cm^2 (iv) 15 cm^2

(b) If cost of 1 cm^2 of board is Rs. 8, then find the cost of board.

- i) Rs. 192 (ii) Rs. 194 (iii) Rs. 190 (iv) Rs. 196

(c) Find the intersection point of the diagonals.

- (i) (5, 4) (ii) (4, 5) (iii) (3, 5) (iv) (6, 2)

(d) If we replace X-axis by Y-axis and Y-axis by X-axis, then find the coordinate of C.

- (i) (5, 4) (ii) (6, 8) (iii) (8, -6) (iv) (-6, - 8)

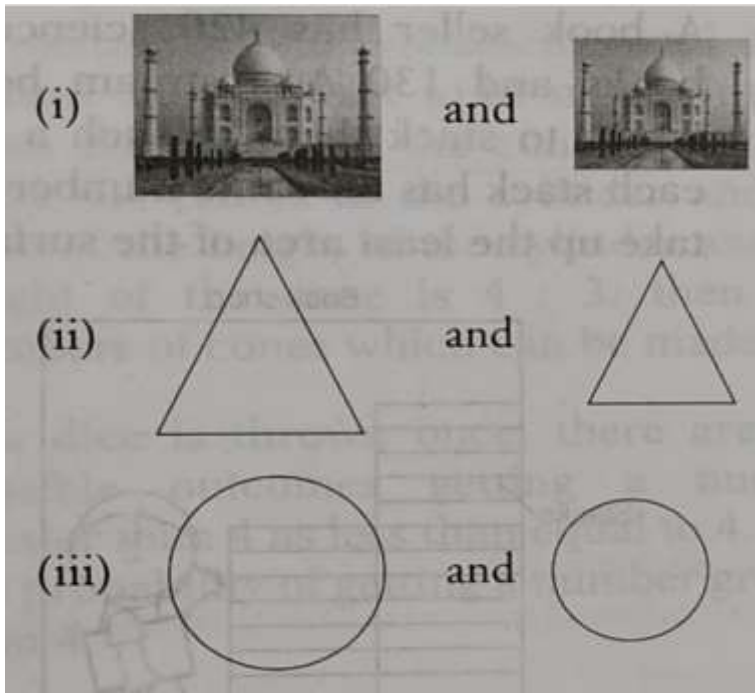
(e) Find the image of a point D about the X-axis.

- (i) (2, - 6) (ii) (- 2, 6) (iii) (6, 2) (iv) None of these

Q19. Case Study III

Similar Triangle

Two geometrical figures are said to be similar figures, if they have same shape but not necessarily the same size. Some examples of similar figures are given below:



Two triangles are said to be similar, if

- (i) their corresponding angles are equal.
- (ii) their corresponding sides are proportional (i.e. the ratios of the lengths of corresponding Sides are equal) .

Some of the criterion used for making similarity are AAA, SSS, SAS.

Through the mid-point M of the side CD of a parallelogram ABCD, the line BM is drawn intersecting AC in L and AD produced in E.

(a) The figure formed in the given statement, AE is equal to

- (i) AB
- (ii) 2BC
- (iii) 3BC
- (iv) 4BC

(b) Which similarity criterion is used for making similarity of triangles $\triangle AEL$ and $\triangle CBL$

- (i) AA
- (ii) SSS
- (iii) SAS
- (iv) None of these

(c) Suppose $\triangle AEL$ and $\triangle CBL$ is similar, then $\frac{ar(\triangle AEL)}{ar(\triangle CBL)}$ is

- (i) $\frac{AE}{CB}$
- (ii) $\left(\frac{AE}{CB}\right)^2$
- (iii) $\left(\frac{AE}{BL}\right)^2$
- (iv) None of these

(d) If area of two similar triangles are 25 cm^2 and 81 cm^2 , then find the ratio of their corresponding sides.

- i) $\frac{5}{9}$
- ii) $\frac{7}{9}$
- iii) $\frac{1}{9}$
- iv) $\frac{9}{5}$

(e) If one angle of a triangle is equal to the one angle of the other triangle and the sides including these angles are proportional, then the two triangles are similar. The criterion used to represent the above statement is

- (i) ASA (ii) SAS (iii) SSA (iv) None of these

Q20. Case Study IV

Students Studying in Class Room

In a mathematic class, a teacher explain the concept for determine the mean by defining

the formula, $\bar{x} = \frac{\sum fixi}{\sum fi}$



Further, a teacher give one example for explaining the above concepts.

The marks obtained by 30 students of class X of a certain school in a mathematics paper consisting of 100 marks are presented in table below :

Class Interval	10- 25	25-40	40 - 55	55-70	70 - 85	85-100
No. Of Students	2	3	7	6	6	6

(a) Find the number of students securing more than or equal to 40 marks.

- (i) 6 (ii) 12 (iii) 25 (iv) 18

(b) Find the cumulative frequency value in the interval (40-55).

- (i) 5 (ii) 12 (iii) 2 (iv) 18

(c) Through cumulative frequency table, which central measurement can be determined.

- (i) mean (ii) mode (iii) median (iv) None of these

(d) Find the lower limit of the median class.

- (i) 55 (ii) 40 (iii) 70 (iv) 25

(e) Find the upper limit of modal class.

- (i) 40 (ii) 55 (iii) 70 (iv) 25

PART B

All questions are compulsory. In case of internal choices, attempt any one.

Q 21 . Find the first negative term of the A.P 114, 106 , 98 , 92 , 84 (2)

Q22. If HCF (54 , 81) = 27 then, find LCM (54 , 81)? (2)

Q23 Prove that the lengths of the tangents drawn from an external point to a circle are Equal. (2)

Q24. Draw a circle of radius 3 cm. Take two points P and Q on one of its extended diameter each at a distance of 7 cm. from its centre. Draw tangents to the circle from these two points P and Q. (2)

Q25. If the centroid of the triangle formed by (9,a) (b, -4) and (7,8) is (6,8) then find the value of 'a' and 'b'. (2)

OR

Find the ratio in which the segment joining the points (1, -3) and (4,5) is divided by X – axis. (2)

Q26. If $\sin (A + 2B) = \frac{1}{2}$ and $\cos (A + 4B) = \frac{1}{\sqrt{2}}$, $A > B$ then find A and B. (2)

OR

If $x = a \sin \theta$ and $y = b \tan \theta$, then prove that $\frac{a^2}{x^2} - \frac{b^2}{y^2} = 1$ (2)

Q27. Show that $(\sqrt{3} + \sqrt{5})^2$ is an irrational number. (3)

Q28. Solve for x : $\frac{1}{a+b+x} = \frac{1}{a} + \frac{1}{b} + \frac{1}{x}$ (3)

OR

If the roots of the equation $(b - c) x^2 + (c - a) x + (a - b) = 0$ are equal , prove that $2b = a + c$. (3)

Q29. State and prove Basic Proportionality Theorem. (3)

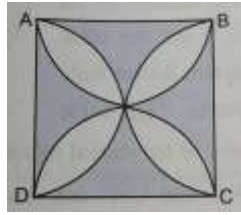
OR

In an equilateral triangle ABC , D is a point on side BC such that $BD = \frac{1}{3} BC$. Prove that

$9 AD^2 = 7 AB^2$. (3)

Q30. Prove the identity : $\frac{\cos A - \sin A + 1}{\cos A + \sin A - 1} = \operatorname{Cosec} A + \cot A$ (3)

- Q 31. In figure , ABCD is a square of side 14 cm. Semicircles are drawn with each side of Square as diameter. Find the area of the shaded region. (3)



- Q32. The mean of the following frequency table is 50 but the frequencies x and y in class Intervals 20 – 40 and 60 – 80 are missing. Find the missing frequencies. (3)

Class Interval	0 - 20	20-40	40 - 60	60 -80	80 - 100	Total
Frequency	17	x	32	y	19	120

- Q33. A card is drawn at random from a well shuffled pack of 52 cards . (3)

Find the probability that the drawn card is :

- i) a card of spade or an ace.
- ii) Neither a jack nor a king
- iii) Either a king or a queen.

- Q34. A boat goes 24 Km. upstream and 28 Km. downstream in 6 hours. It goes 30 Km.

Upstream and 21 Km. downstream in $6\frac{1}{2}$ hours. Find the speed of the boat in still

Water and also the speed of stream. (5)

- Q35. A metallic spherical shell of internal and external diameters 4 cm and 8 cm, respectively is melted and recast into the form of a cone of base diameter 8 cm. Find the height of cone formed. (5)

OR

The height of a cone is 30 cm. A small cone is cut off at the top by a plane parallel

to the base . If its volume be $\frac{1}{27}$ of the volume of the given cone , at what height

above the base is the section made ? (5)

- Q 36. The angle of elevation of an aeroplane from a point A on the ground is 60° . After a flight of 30 seconds , the angle of elevation changes to 30° . If the plane is flying at a constant height of $3600\sqrt{3}$ metres , find the speed of aeroplane in m/sec. (5)