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MATHEMATICS

CLASS X SESSION 2020-2021

PRE BOARD-I

Time Allowed: 3 Hours **Maximum 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 three sections- I and II.
2. Section I has 16 questions of 1 mark each. Internal choice is provided in 5 questions.
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 mark 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.
4. Internal choice is provided in 2 questions of 2 marks, 2 questions of 3 marks and 1 question of 5 marks.

Part-A

Section-I

Section I has 16 questions of 1 mark each. Internal choice is provided in 5 questions.

Q1. If HCF of 65 and 117 are expressible in the form 65m-117, then find the value of m.

Or

Find the sum of exponents of the prime factors in the prime factorization of 196. [1]

Q2. If one of the zeroes of the quadratic polynomial $4x^2-8kx-9$ is equal in magnitude but opposite in sign to the other, find the value of k. [1]

Q3.Write the number of solutions of the following pair of linear equations

3x-7y=1 and 6x-14y-3=0 [1]

Q4. Find the relation between p and q if x=3, y=1 is a solution of a pair of lines x-4y+p=0 and 2x+y-q-2=0. [1]

Q5. Find the number of natural numbers between 101and 999 which is divisible by 2 and 5.

Or

How many terms of the A.P 18,16,14,… be taken so that their sum is zero?[1]

Q6.What is the discriminant of the quadratic equation $3\sqrt{3}\,x^2 10x + \sqrt{3}$=0?[1]

Q7.A two digit number is four times the sum of the digits. It is also equal to 3 times the product of digits . Find the number.

Or

If a and b are the roots of the equation x^2+ax-b=0 then find a and b. [1]

Q8.$\Delta DEF \sim \Delta ABC,\ if\ DE: AB = 2:3\ \ and\ ar(\Delta DEF)$=44sq.units.
$Find\ the\ ar(\Delta ABC)$ [1]

Q9. If PQ is a tangent drawn from an external point P to circle with center O and QOR is a diameter where length of QOR is 8cm such that $\angle POR = 120^0$ then find OP.[1]

Or

There are two concentric circles of radii 6cm and4cm with center O. If AP is a tangent to the larger circle and BP to the smaller circle and length of AP is 8cm, find the length of BP. [1]

Q10. If $\Delta\ ABC \sim \Delta DEF\ such\ that \angle A = 45^0 and\ \angle F = 56^0\ find\ the\ value\ of \angle C$ [1]

Q11. In order to divide a line segment PQ in the ratio 3:7 a ray PX is drawn such that $\angle QPX$ is an acute angle and then points P_1, P_2,.....are located at equal distances on the ray PX. With which point is the point Q joined ?[1]

Q12. What is the maximum value of $\frac{1}{sec\theta}$? [1]

Q13. Find $\frac{2tan30^0}{1+tan^2 30^0}$ [1]

Q14. Find the radius of a semi circular protactor whose perimeter is 36cm.[1]

Q15. 2.2cubic dm of brass is to be drawn to a cylindrical wire of diameter 0.25cm. Find the length of the wire. [1]

Q16. If P(E)= 0.05 what is the probability of “not E ” ? [1]

Or

Someone is asked to choose a number from 1 to 100. What is the probability of its being a prime number ?

Section-II

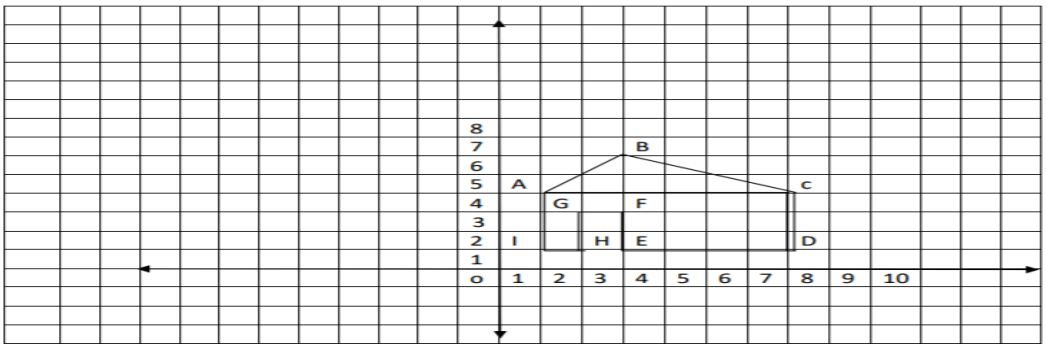
Case study based questions are compulsory. Attempt any four sub parts of each question. Each subpart carries 1 mark

Q17 CASE STUDY-I [4]

MATHEMATICS IN ART



Mrs.Sylvia Das, an Art teacher , observes that these days, students are taking too much interest in Mathematics,and are least interested in Art Education ,so she innovates a method to use mathematics in art.



(a) Find the mid point of the ceiling of the house

(i) (0,5) (ii) (5,5) (iii) (4,4) (iv)(4,5)

(b)Length of the wall BC

(i) $2\sqrt{2}$units (ii) 2units (iii) 1unit (iv) $\sqrt{2}\ units$

(c) ΔABC is (i) right triangle (ii) scalene (iii) equilateral (iv) isosceles

(d) What is the ceiling height of the house

(i) 1unit (ii) 2 units (iii) 3units (iv) 4units

(e)In what ratio does F divides BE

(i)1:1 (ii) 2:2 (iii) 2:3 (iv) 3:2

Q18. CASE STUDY -II [4]

TRIANGLES IN ARCHITECTURE

A key concept in architecture is the use of triangles. Triangles are known as the sturdiest figure in the architecture world. Architects commonly use these shapes to construct their buildings. The inequalities help prove that the shape is actually valid and can be build without causing problems. Equilateral triangles are the most common way triangles are used in architecture. These triangles measure 60 degrees and all sides are congruent. The equilateral triangle is used in many pyramids such as the the pyramid complex of Giza in Egypt. In architecture, the concepts of triangles are used everywhere. These concepts are especially used when designing buildings. Knowing the different properties of triangles helps architects design and build the best, strongest structures possible.



(a)In an equilateral triangleABC if AD $\perp BC$, $then\ AD^2 =$

(i)CD^2 (ii) $2CD^2$ (iii)$3CD^2$ (iv) $4CD^2$

(b) In an equilateral triangleABC if AD $\perp BC$,then

(i) $5AB^2=4AD^2$ (ii) $3AB^2=4AD^2$ (iii) $4AB^2=3AD^2$ (iv)$2AB^2=3AD^2$

(c) ΔABC is an isosceles triangle in which $\angle C = 90^0$. If AC=6cm,then AB=

(i) $6\sqrt{2}\ cm$(ii) 6cm (iii) $2\sqrt{6}$ cm (iv)$4\sqrt{2}$ cm

(d)InΔABC, AD is bisector of$\angle BAC$. If AB=8cm BD=6cm and DC=3cm.Find AC.

(i) 4cm (ii) 6cm (iii) 3cm (iv) 8cm

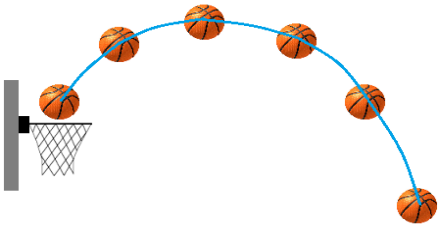
(e) In two triangles ABC and DEF, $\frac{AB}{DE} = \frac{BC}{FE} = \frac{CA}{FD}$, then

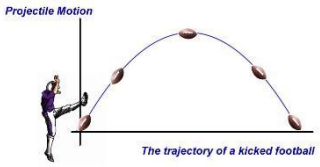
(i)$\Delta FDE \sim \Delta CAB$ (ii) $\Delta FD\ E \sim \Delta ABC$ (iii)$\Delta CBA \sim \Delta FDE$ (iv) $\Delta BCA \sim \Delta FDE$

Q19.CASE STUDY-III MY FAVOURITE SPORT

PROJECTILE-The projectile is any object thrown into space upon which the only acting force is gravity. In other words, the primary force acting on a projectile is gravity. This doesn't necessarily mean that the other forces do not act on it, just that their effect is minimal compared to gravity. The path followed by a projectile is known as a trajectory. A baseball batted or thrown and the instant the bullet exits the barrel of a gun are all examples of the projectile.

PROJECTILE MOTION-When a particle is thrown obliquely near the earth's surface, it moves along a curved path under constant acceleration that is directed towards the center of the earth (we assume that the particle remains close to the surface of the earth). The path of such a particle is called a projectile and the motion is called **projectile motion**. Air resistance to the motion of the body is to be assumed absent in projectile motion.





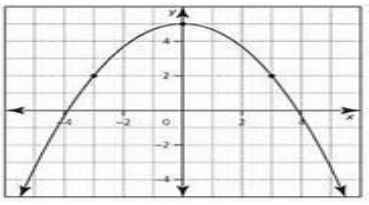
(a) In the above the path traced by the ball is
(i) Circular (ii) elliptical (iii) hyperbola (iv) parabola

(b) The coefficient of x^2 in a downward parabola is
(i)always positive (ii) always negative (iii) may be positive or negative
(iv)positive irrational

(c) Parabola is the graph of a
(i) linear polynomial (ii) quadratic polynomial (iii) cubic polynomial
(iv) polynomial of any degree

(d) A quadratic polynomial has
(i) atleast two real zeroes (ii) atmost two real zeroes a (iii) exactly two real zeroes (iv) no real zeroes

(e) The polynomial for the adjoining figure is
(i)x^2-8x+16
(ii) -x^2+8x -16
(iii)x^2 -16
(iv)-x^2+16



Q20. CASE STUDY IV PERFORMANCE OF STUDENTS



The following distribution depicts the performance of the students in Math in Half yearly exam.

Marks	Number of students
Below 10	3
Below 20	12
Below 30	27
Below 40	57
Below 50	75
Below 60	80

(a) Which is the modal class
(i)20-30 (ii) 30-40 (iii) 40-50 (iv) 50-60

(b) Number of students who scored marks less than 20
(i) 3 (ii) 9 (iii) 12 (iv) 15

(c) Modal marks scored by students
(i) 30 (ii) 35.5 (iii) 40 (iv) 80

(d) Median class is
(i) 10-20 (ii) 20-30 (iii)30-40 (iv) 40-50

(e)Total students whose marks have been recorded
(i) 80 (ii)254 (iii) 60 (iv)100

Part –B

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

Q21. On a morning walk three persons step off together and their steps measure 40cm,42cm,and 45cm respectively. What is the minimum distance each should walk so that each can cover the same distance in complete steps. [2]

Q22.The x coordinate of a point P is twice its y coordinate. If P is equidistant from Q(2,-5) and R(-3,6), find the coordinates of P. [2]

Or

What is the distance between the points $(10\cos 30^0, 0)$ and $(0, 10\cos 60^0)$

Q23.If one zero of the polynomial $(a^2+9)x^2+13x+6a$ is reciprocal of the other, find the value of a. [2]

Q24. [2]

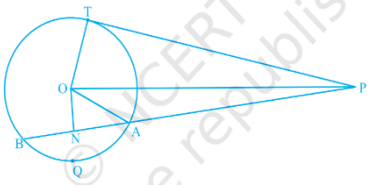
Two line segments AB and AC include an angle of 60° where AB = 5 cm and AC = 7 cm. Locate points P and Q on AB and AC, respectively such that $AP = \frac{3}{4}AB$ and $AQ = \frac{1}{4}AC$. Join P and Q and measure the length PQ.

Q25. If $\text{cosec}\theta = \frac{13}{12}$, $evaluate\ \frac{2sin\theta - 3cos\theta\theta}{4sin\theta - 9cos\theta}$

Or

Prove that $1+\frac{cot^2\alpha}{1+cosec\alpha} = cosec\alpha$ [2]

Q26.From an external point P , a tangent PT and a line segment PAB is drawn to a circle with centre O. ON is perpendicular to the chord AB. Prove that



(i) $PA.PB=PN^2- AN^2$ (ii) $PN^2 – AN^2 = OP^2- OT^2$ [2]

Q27. Write the denominator of the rational number $\frac{257}{5000}$ in the form $2^n x 5^m$, where m,n are non negative integers. Hence , write their decimal expansion without their actual division. [3]

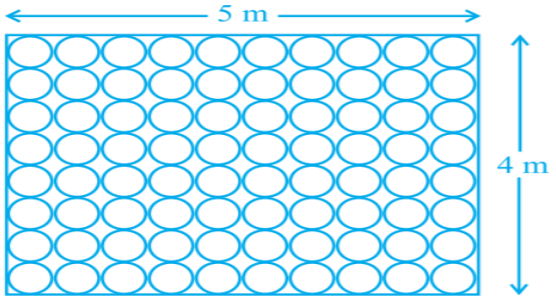
Q28. Solve for x: $x^2 +5x- (a^2+a-6) =0$

Or

Find the value of k for which the quadratic equation $k^2x^2-2(2k-1)x+4 =0$ has real and equal roots. [3]

Q29.

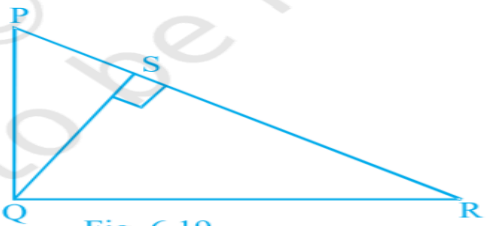
Floor of a room is of dimensions 5 m × 4 m and it is covered with circular tiles of diameters 50 cm each as shown in Fig. 11.18. Find the area of floor that remains uncovered with tiles. (Use $\pi = 3.14$)



[3]

Q30.

In Fig. 6.19, PQR is a right triangle right angled at Q and QS ⊥ PR . If PQ = 6 cm and PS = 4 cm, find QS, RS and QR.



OR

ABCD is a trapezium in which AB//DC and its diagonals intersect each other at at a point O . Show that $\frac{AO}{BO} = \frac{CO}{DO}$ [3]

Q31The frequency distribution table for agricultural holdings in a village [3]

Area of land (in hectares)	1-3	3-5	5-7	7-9	9-11	11-13
Number of families	20	45	80	55	40	12

Find the modal agricultural holdings of the village.

Q32. [3]

The angle of elevation of an airplane from a point on the ground is 60◦ . After a flight of 30 seconds, the angle of elevation becomes 30◦ . If the airplane is flying at a constant height of 3000√3 m, find the speed of the airplane.

Q33. [3]

. Find the unknown entries a, b, c, d, e, f in the following distribution of heights of students in a class :

Height (in cm)	Frequency	Cumulative frequency
150-155	12	a
155-160	b	25
160-165	10	c
165-170	d	43
170-175	e	48
175-180	2	f
Total	**50**	

Q34. [5]

Two poles of equal heights are standing opposite each other on either side of the road, which is 100 m wide. From a point between them on the road, the angles of elevation of the top of the poles are 60° and 30° respectively. Find the height of the poles and the distances of the point from the poles.

Or

The angles of depression of the top and bottom of a tower as seen from the top of a $60\sqrt{3}$ m high cliff are 45° and 60° respectively. Find the height of the tower. (Use $\sqrt{3} = 1{\cdot}73$)

Q35. [5]

In Figure-5, a solid toy is in the form of a hemisphere surmounted by a right circular cone. The height of the cone is 2 cm and the diameter of the base is 4 cm. Determine the volume of the toy. (Take $\pi = 3{\cdot}14$)

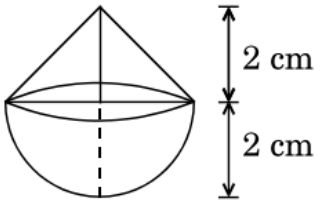


Figure-5

Q36. [5]

A and B jointly finish a piece of work in 15 days. When they work separately, A takes 16 days less than the number of days taken by B to finish the same piece of work. Find the number of days taken by B to finish the work.