PRE-BOARD / X / MATHEMATICS / 2020-21

Time: 3 Hrs. **MM: 80**

General Instructions:

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

Part A:

1. It consists of two sections I and II.
2. Section I has 16 questions, internal choice is provided in 5 questions.
3. Section II has four case study based questions. Each case study has 5 case based sub parts. The 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.
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

Q1. The given number 3X5X7+7 is composite number or not. Give reason. 1

Q2. Find the zeroes of the given quadratic polynomial $9y^2 - 6y + 1$. 1

Q3. Check whether $(6)^n$ can end with with the digit zero for any natural no. n.

Or

Express 945 as product of its prime factors. 1

Q4. Solve for x and y: $x+y= 3$ and $x-y=1$. 1

Q5. Find the H.C.F. of 105 and 120. 1

Q6. If the perimeter of a semi circular protractor is 36 cm, then find its diameter.(use $\pi = 22/7$) 1

Or

If the perimeter of a circle is equal to the perimeter of a square, then find the ratio of the area of a circle to that of a square..(use $\pi = 22/7$)

Q7 If ΔABC and ΔDEF are similar triangles such that angle A = 47° and angle E = 83°, then find angle C. 1

Or

In an isosceles ΔABC if AC = BC and $AB^2 = 2AC^2$, then find angle C.

Q8. Find the area of a circle that can be inscribed in a square of side 10 cm.(use $\pi = 22/7$). 1

Q9. The ratio of the length of a rod and its shadow is $1/\sqrt{3}$. Find the angle of elevation of sun. 1

Q10. Two cubes each of 10 cm edge are joined end to end. Find the surface area of the resulting cuboid. 1

Q11. Find the median of first 5 positive multiples of 5. 1

Q12. A man goes 15 metres due west and then 8 metres due north. How far is he from the starting point? 1

Q13. Find x and y if $\sqrt{3}x + \sqrt{5}y = 0$ and $\sqrt{5}x - \sqrt{3}y = 0$. 1

Or

Find the value of K for which the given system of equations has a unique solution x- Ky =2 and 3x + 2y = -5.

Q14. In a simultaneous throw of a pair of dice, find the probability of getting a doublet. 1

Or

Find the probability that a number selected at random from the numbers 1,2,3----------10 is prime number.

Q15. The angle pf elevation of a ladder leaning against a wall is of 60° and the foot of the ladder is 9.5 m away from the wall. Find the length of the ladder. 1

Q16. If a number is chosen at random from the numbers -2,-1,0,1,2. What is the probability that $x^2 < 2$? 1

SECTION II

Q17. CASE STUDY 1 1X4=4

To make the teaching learning process easier, creative and innovative, a teacher brings clay in the classroom to teach the topic Mensuration . She thought this method of teaching is more interesting leaving a long lasting impact. She forms a cylinder of radius 6 cm and height 8 cm with the clay, then she moulds the cylinder into a sphere and asks some questions to students (use $\pi = 3.14$)

17.(1) Find the radius of sphere
(a) 6cm (b) 7cm (c) 4cm (d) 8cm.

17.(2) The volume of the sphere so formed is
(a) 902.32 cm^3 (b) 899.34 cm^3 (c) 904.32 cm^3 (d) 999.33 cm^3

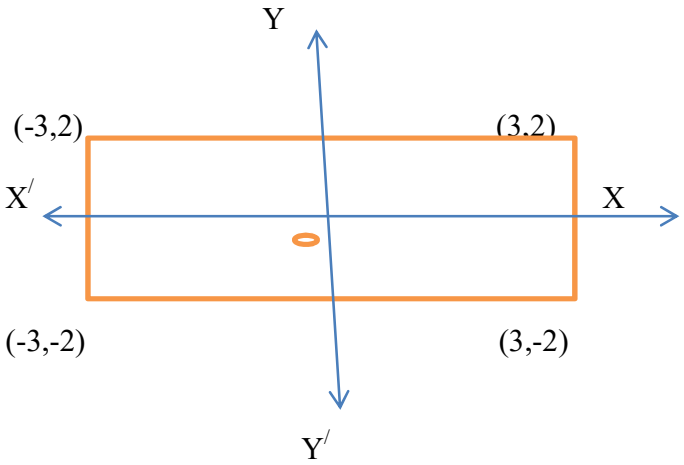
17.(3) What is the ratio of the volume of a sphere to the volume of a cylinder?
(a) 1:2 (b) 2:1 (c) 1:1 (d) 3:1.

17(4) The total surface area of a cylinder is
(a) 525.57 cm^2 (b) 557.55 cm^2 (c) 534.32 cm^2
(d) 527.52 cm^2.

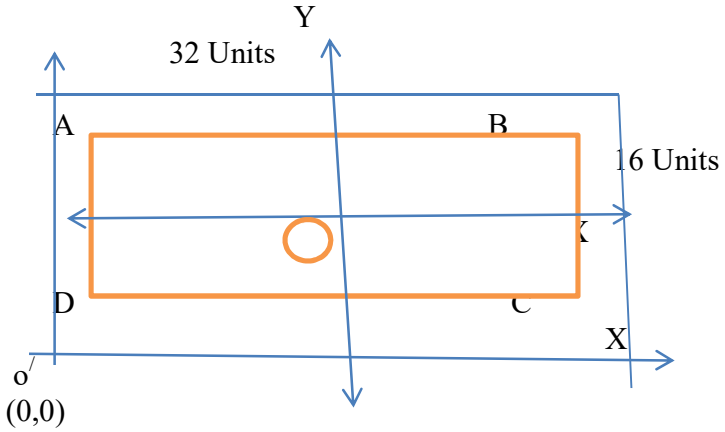
17(5) During the conversion of a solid from one shape to another the volume of the new shape will
(a)Increase (b) Decrease (c) Remains onaltered (d) be double

18 CASE STUDY 2 1X4=4

Suresh has a rectangular sketch, which he needs to draw on a paper of length and breadth 32 units and 16 units respectively using a plotter. Plotter is device which is attached to a computer like a printer. It is used for drawing complicated sketches. Plotter accepts only positive coordinates where the point(0,0) is the left bottom corner of the paper. The sketch ABCD needs to be centrally aligned on the paper. Find the coordinates of A,B,C and D to be plotted to get the sketch plotted as needed.



SKETCH 1.



SKETCH 2

18.1 The coordinates of point O in the sketch 2 is ----------

(a) (0,0) (b) (16,8)

(c)I(8,16) (d) (16,32)

18.2 The coordinates of A, B,C, D are

(a) (32,10), (32.-10), (32,6), (32,-6)
(b) (19,10), (19.,-10), (13,,6), (13,-6)
(c) (13,10), (19.10), (19,6), (13,6)
(d) (13,-10), (19.10), (13,-6), (19,-6)

18.3 In the sketch 2, if the point O divides AC in the ratio k:1, then the value of k is ----------

(a) 2 (b) 1 (c) ½ (d) 3

18.4 The point on the y axis (in sketch 2) which is equidistant from the points B and C is ----------

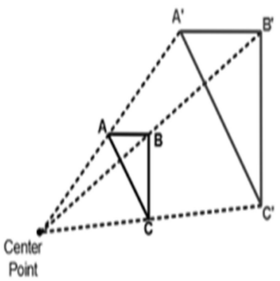
(a) (0,8) (b) (8,0) (c) (-8,0) (d) 0,-8)

18.5 The point on the x axis (in sketch 2) which is equidistant from the points C and D is ++++++++++++++++++++++

(a) (0,-16) (b) (16,0) (c) (-16,0) (d) (0,16)

Q19. CASE STUDY 3 1X4=4

A dialation stretches or shrinks a figure. The image created by a dialation is similar to the original figure. The scale factor (k) of a dialation is the ratio of corresponding side lengths. The center of a dialation is a fixed point in the plane about which all points are expanded or contracted.



$$\frac{image}{pre-image}: \frac{A'C'}{AC} = \frac{C'B'}{CB} = \frac{A'B'}{AB} = \frac{2}{1} = k \text{ (say)}$$

Scale Factor, *k*:

- If $k > 1$, enlargement.
- If $0 < k < 1$, reduction.
- If $k = 1$, congruence.

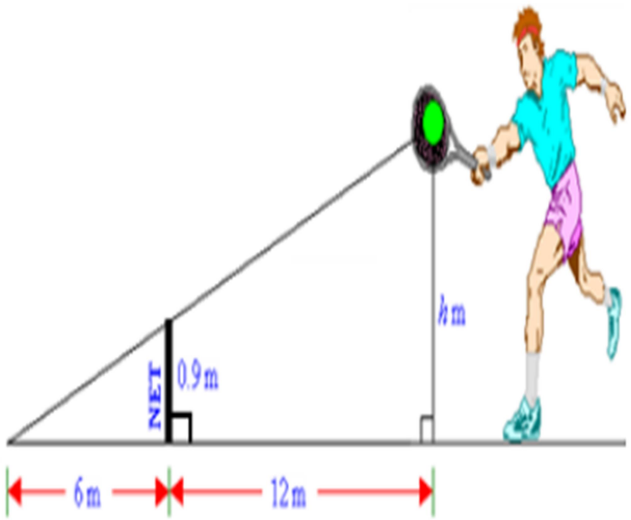
19.1 From the above given in formation , triangles ABC and $A'B'C'$ are similar. Which of the following options will hold good?

(a) $\Delta BAC \sim \Delta A'B'C'$ (b) $\Delta BCA \sim \Delta C' B' A'$
(c) $\Delta ACB \sim \Delta B' C' A'$ (d) $\Delta CAB \sim \Delta C' A'B'$

19.2 The dimensions of the model of a multi-storey building are 1.2 m X75 cm X 2 m. If the scale factor is 1:30, what is the actual dimensions of the building?

(a) 36m X 22.5m X 60m (b) 10.2m X 2m X 15m
(b) 120cm X 150cm X 200cm (d) 24m X 14.4m X 80m

19.3

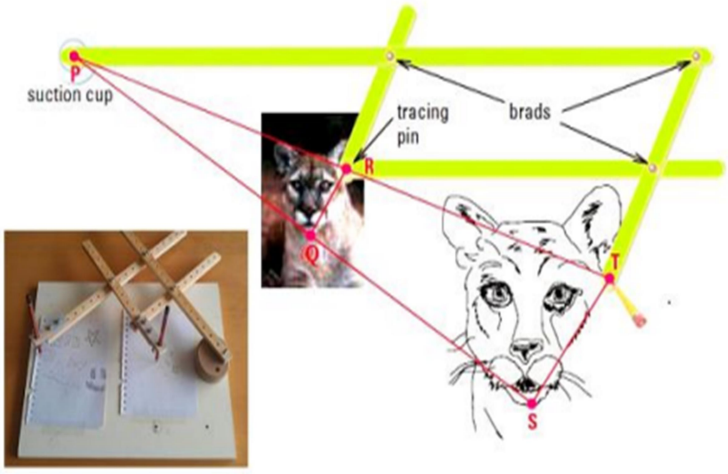


With what scale factor 0.9 m is to be multiplied to get the value of h in the above given real life situation.

(a) 3:1 (b) 1:2 (c) 1:3 (d) 2:1

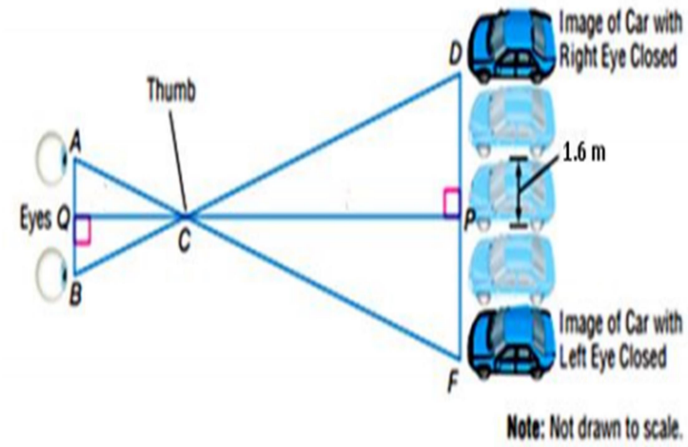
19.4 A pantograph is a mechanical linkage connected in a manner based on parallelograms so that the movement of one pin .in tracing an image, produces identical movements in second pin. As we move the tracing pin of a pantograph along a figure, the pencil attached to the far end draws an enlargement .As the pantograph expands and contracts, the three brads and the tracing pin always form the vertices of a parallelogram. The ratio of PR to PT is always equal to the ratio of PQ to PS . Also, the suction cup, the tracing pin, and the pencil remain collinear.

In the picture given below , PR is 25.4 cm and RT is 50>8 cm. The length of the cat RQ, in the original print is 6.1 cm. What is the length of TS in the enlargement.



(a) 18.3 cm (b)12.2 cm (c) 6.1 cm (d) 11 cm

19.5

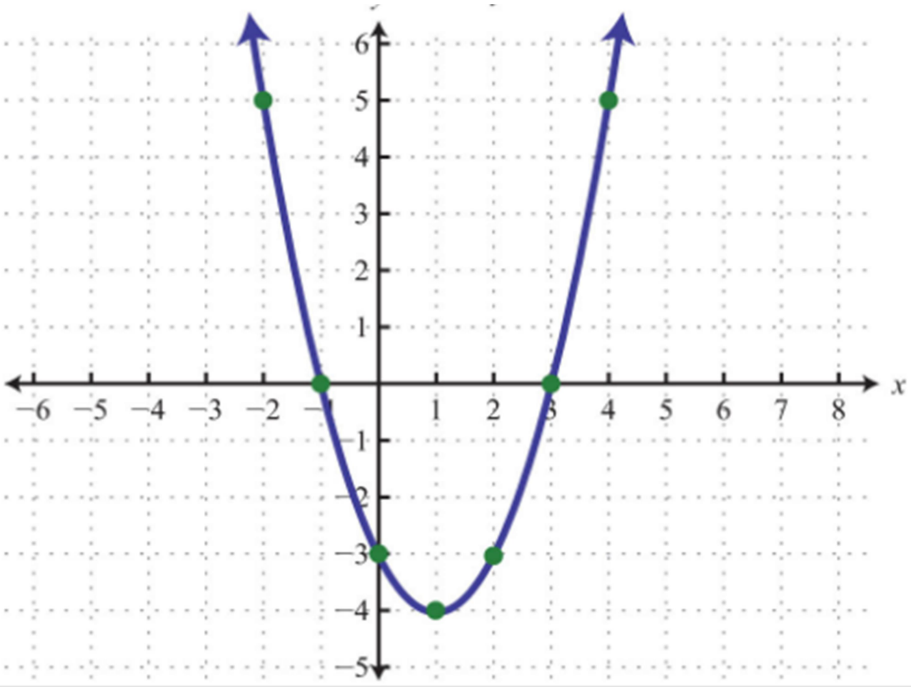


In the above picture, what is the
Height of PC if QC = 3 m where QC is 10 times of AB and DF is 4 times the width of a car where width of the car is 1.6 m

(a) 33 m (b) 64 m (c) 44 m (d) 11 m

Q20. CASE STUDY 4 1X4=4

Due to heavy storm an electric wire got bent as shown in the figure . It followed a Mathematical shape. Answer the following questions



20.1. Name the shape in which the wire is bent.

(a) Spiral (b) Ellipse (c) Linear (d) Parabola.

20.2 How many zeroes are for the polynomial (shape of the wire)?
(a) 1 (b) 2 (c) 3 (d) 0

20.3 The zeroes of the polynomial are
(a) -1,5 (b) -1,3 (c) 3,5 (d) -4,2

20.4 What will be the expression of the polynomial?
(a) x^2+2x-3 (b) x^2-2x+3 (c) x^2-2x-3 (d) x^2+2x+3

20.5 What is the value of the polynomial if x = -1?
(a) 0 (b) 18 (c)-18 (d) 6

PART B

Q21. Find the coordinates of the point which divides the join of (-1,7) and (4,-3) in the ratio of 2:3. 2

Or

Two vertices of a triangle are (3,-5) and (-7,4). If its centroid is (2,-1), find the third vertex of a triangle.

Q22. Prove that the tangents drawn at the ends of a diameter of a circle are parallel 2

Q23. Draw a pair of tangents to a circle of radius 4 cm which are inclined to each other at angle of 60°. 2

Q24. If $\sec^2\Theta(1+\sin\Theta)(1-\sin\Theta) = k$, find the value of k. 2

Q25. Which term of the A.P. 5,9,13,17,---------is 81? 2

Or

The third term of an A.P. is p and the fourth term is q. Find the tenth term.

Q26. The two tangents from an external point to a circle P to a circle with centre O are PA and PB. If angle APB =70°, what is the value of angle AOB? 2

Q27. Prove that $2+5\sqrt{3}$ is an irrational number given that $\sqrt{3}$ is an irrational number. 3

Q28. A circle is touching the side BC of a Δ ABC at P and is touching AB and AC when produced at Q and R respectively. Prove that AQ = ½ (perimeter of ΔABC). 3

Q29. Solve for X and Y : 99X + 101Y = 499 and 101X + 99Y = 501. 3

Q30. A solid metallic sphere of diameter 21 cm is melted and recast into a number of smaller cones each of diameter 7 cm and height 3 cm. Find the number of cones so formed. 3

Q31. All the three face cards of spades are removed from a well shuffled pack of 52 cards. A card is then drawn at random from the remaining pack. Find the probability of getting; 3
a.Black face card b. A queen c. A black card.

Q32. If $x = a.\sec\alpha + b.\tan\alpha$ and $y = a.\tan\alpha + b.\sec\alpha$, prove that $x^2 - y^2 = a^2 - b^2$. 3

Q33. If the roots of the quadratic equation $(a - b)x^2 + (b - c)x + (c - a) = 0$ are equal, Prove that $2a = b+c$ 3

Or

Solve for x: $(x+1)/(x-1) + (x-2)/(x+2) = 4-(2x+3)/(x-2)$; $x \neq 1, -2, 2$

Q34. The angle of elevation of a jet plane from a point A on the ground is 60^o. After a flight of 30 seconds, the angle of elevation changes to 30^o. If the jet plane is flying at a constant height of $3000\sqrt{3}$ m, find the speed of the jet plane in km/hr? 5

Or

From the top of a 100m high building the angles of the depression of the top and bottom of the tower are observed to be 45^o and 60^o. Calculate the height of the tower.

Q35. The sum of the first n terms of an A.P. is given by $S_n = 3n^2 - n$. Determine the A.P. and its 25^{th} term. 5

Q36. The mean of the following distribution table is 50. But the frequencies m and n in class 20- 40 and 60-80 are missing. Find the missing frequencies. 5

Class interval	0-20	20-40	40-60	60-80	80-100	Total
Frequency	17	m	32	n	19	120.