Class- X Session- 2020-21

Subject- Mathematics -Standard

Sample Question Paper -3

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

1. Write the rational number $\frac{1}{7}$ in decimal form.

OR

Express 140 as a product of its prime factors.

2. Given that HCF (306, 657) = 9, find LCM (306, 657).

3. The area of a rectangular plot is 528 m^2. The length of the plot (in metres) is one more than twice its breadth. We need to find the length and breadth of the plot. Represent the situation in the form of quadratic equation.

4. Draw the graph for the lines x-y = 8, 3x – 3y = 16 and mention they are consistent or inconsistent.

5. Find the nature of the roots of the quadratic equation $3x^2 - 4\sqrt{3}x + 4 = 0$.

OR

Find the values of k for the quadratic equation $2x^2 + kx + 3 = 0$ so that they have two distinct roots.

6. Fill in the blanks in the following table, given that a is the first term, d the common difference and the nth term of the AP:

a	**d**	**n**	**a_n**
7	3	8	_____
-18	_____	10	0

7. Find the sum of the AP 2, 7, 12,…… to 10 terms.

OR

In an AP given a = 7, a_{13} = 35, find common difference.

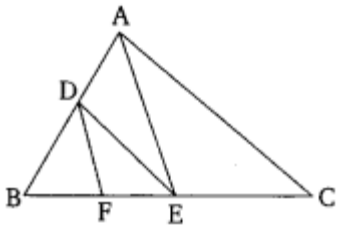
8. Find the distance between the following pairs of points(a, b) and (-a, -b)

9. Determine if the points A(1, 5), B(2, 3) and C(-2, -11) are collinear.

OR

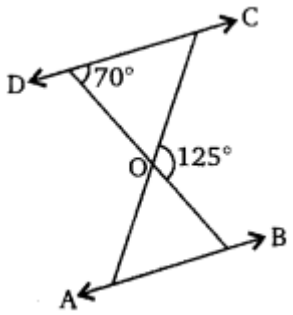
Check whether P(5, -2), Q(6, 4) and R(7, -2) are the vertices of an isosceles triangle.

10. In the given figure, DE || AC and DF || AE. Prove that $\frac{BF}{FE} = \frac{BE}{EC}$.

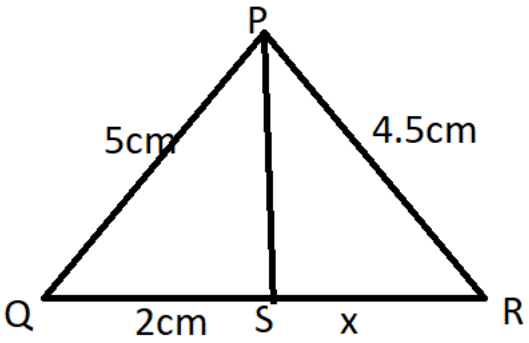


OR

In the given figure, ΔODC ~ ΔOBA, ∠BOC = 125° and ∠CDO = 70°. Find ∠OAB.

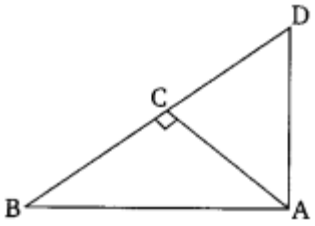


11. In the given figure, PS is the bisector of ∠QPR of ΔPQR. Find x

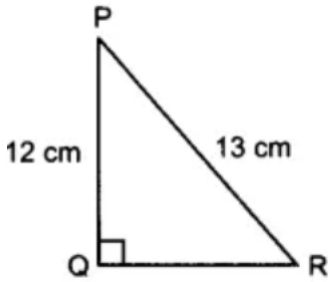


12. From a point Q, the length of the tangent to a circle is 24 cm and the distance of Q from the centre is 25 cm. Find the radius of the circle.

13. In the given figure, ABD is a triangle right angled at A and AC ⊥ BD. Then AB^2 = BC . ____



14. In given figure, find tan P – cot R.



15. If tan 2A = cot (A – 18°), where 2A is an acute angle, find the value of A.

16. Express the trigonometric ratios sin A in terms of cot A solution.

Section-II

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

17. Case Study based-1 ROLLER COASTER POLYNOMIALS: Aakash, Meena, Rohan, and Shreya enjoy roller Coasters. Whenever a new roller Coaster opens near their city, they try to be among the first to ride. One Sunday afternoon, the four friends decide to ride a new coaster. While waiting in line, Aakash notices that part of this coaster resembles the graph of a polynomial function that they have been studying in their 10th class.

a)Refer to graph above Write the number of zeroes which is possible.

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

b) The cubic polynomial $2x^3 + x^2 - 5x + 2$ has correct zero is
(i) 1/4 (ii) -1 (iii) 3 (iv) 0

c) Refer to (b), without actual finding the zeroes the sum of all zeroes is

(i) 1/4 (ii) 8 (iii)-6 (iv) -1/2

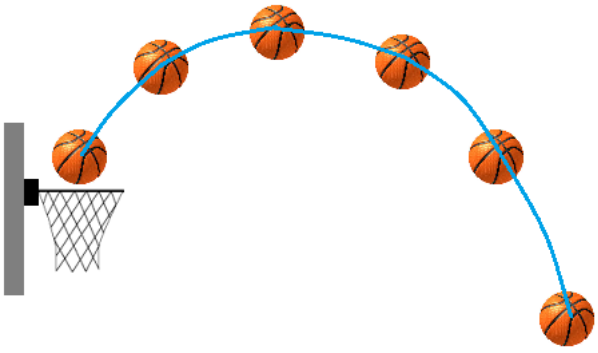
d) Refer to (b) product of all zeroes is.

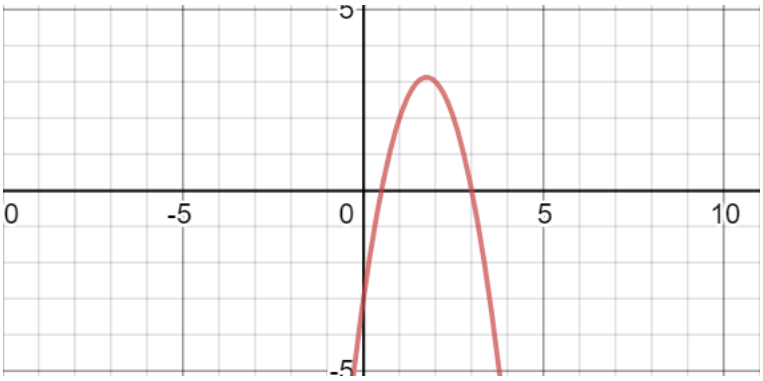
(i) 8 (ii) 4 (iii) 0 (iv) -1

e) Which is correct formula for $\alpha\beta + \beta\gamma + \alpha\gamma$

(i) -d/a (ii)d/a (iii) -c/a (iv)c/a

18.Case Study based-2 Basketball Quadratic : When a ball is thrown, kicked, or hit, the trajectory it follows is parabolic and is described algebraically by a quadratic equation. This is a somewhat of a simplification – it does not take into account things like wind resistance - but it is a good basic model of the trajectory.





The graph above shows the quadratic equation $-2x^2 + 7x - 3 = 0$.

a) Which zero of the above polynomial is closest to origin.

(i) -1/2 (ii) 1/2(iii)3 (iv) 0

b) Which zero of the above polynomial is farthest from origin.
(i) 1/2 (ii) 3 (iii) 4 (iv) 0

c) What is the y intercept of the given quadratic polynomial.

(i) 1/2 (ii) 0 (iii) -5 (iv)-3

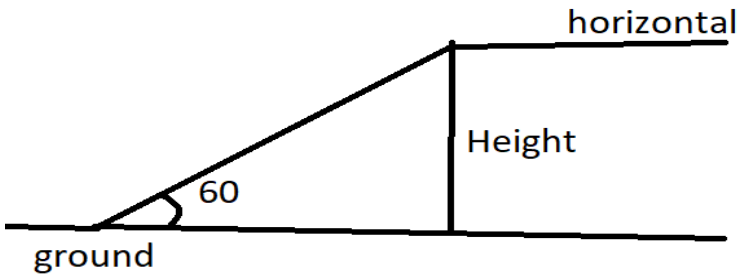
d) If the graph is to be made upside down which coefficient sign is to be changed?

(i) -2 (ii) 7 (iii)-3 (iv)can't be changed

e) How many ways basketball can be thrown if we have sum of roots as 2 and one root is 1.

(i) 1 (ii) 2(iii)3 (iv)more than 3

19.Case Study based-3 Aircraft takeoff Trigonometry: In the diagram, Aircraft is shown taking off from the runway. Its inclination in the air with angle of elevation of 60°. Its speed is 250 km/hr. It continues to fly at this speed till it reaches the height at which it is horizontal to the surface. Its inclined flight duration was 2mins and 24 seconds.



a) What is the maximum height aeroplane reaches when it flies horizontal to the surface

(i) 5 √3 km (ii) 10√3 km (iii) 5√3/2 km (iv) 7√3 km

b) Distance between start of elevation and to the point on the ground when it starts flying in horizontal direction.
(i) 5km (ii) 10km (iii) 5√3 km (iv) 15km

c) A tree of certain height breaks from its point in ratio of 1:2 due to storm and the broken part bends so that the top of the tree touches the ground. The distance between the foot of the tree to the point where the top touches the ground is 8 m. What is the angle of elevation?

(i) 60 (ii) 30 (iii)45 (iv)90

d) Ref to c. what is the height of the tree?

(i) 8 √3 (ii) 16√3 (iii)24√3 (iv)8/√3

e) In a right-angled triangle if the opposite to adjacent ratio changes from 1 to √3 then the change in the angle of elevation will be

(i) 45 (ii) 60 (iii)30 (iv)15

20.Case Study based-4 Rubiks cube Surface areas and volumes: The Rubik's Cube is a 3-D combination puzzle invented in 1974 by Hungarian sculptor and professor of architecture Ernő Rubik. Originally called the Magic Cube, the puzzle was licensed by Rubik to be sold by Ideal Toy Corp. in 1980. Gopal wants to understand the surface areas and volumes of all the three cubes which are of different sizes.

a)What is the surface area of smallest cube?

(i) 6 (ii) 1.5 (iii)8 (iv) 4

b)What is the ratio of surface area of largest cube to smallest cube?
(i) 3:1 (ii) 9:1 (iii) 6:1 (iv) 4:1

c)The volume of the middle cube is

(i) 64 (ii) 27 (iii)8 (iv)3

d) For bigger cube ratio of surface area to volume is?

(i) 2 (ii) 3 (iii)4 (iv)6

e) Smallest cube is kept over the middle cube then new surface area is

(i) 26 (ii) 24 (iii) 30 (iv) 28

Part – B

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

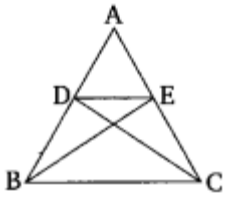
Q. Nos 21 to 26 carry 2 marks each.

21. Solve for x: $x^2 + 5x - 1800 = 0$.

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

OR

In the figure, if ΔABE ≅ ΔACD, show that ΔADE ~ ΔABC.



23. Prove that: $(\text{cosec}\ \theta + \sin\theta)(\text{cosec}\ \theta - \sin\theta) = \cot^2\theta + \cos^2\theta$.

OR

Prove that $(1 + \tan^2\theta)(1 - \sin\theta)(1 + \sin\theta) = 1$.

24. The first term of an AP is 5, the last term is 45 and the sum is 400. Find the number of terms and the common difference.

25.A die is thrown. Find the probability of getting:

i. An even prime number.

ii. A number lying between 2 and 6.

26. Calculate the mean for the following distribution:

Class marks	5	6	7	8	9
frequency	4	8	14	11	3

Q. Nos 27 to 33 carry 3 marks each.

27. Solve the following pair of equations:

$$\frac{5}{x-1} + \frac{1}{y-2} = 2$$

$$\frac{6}{x-1} - \frac{3}{y-2} = 1$$

OR

Solve for x

$$\frac{2}{\sqrt{x}} + \frac{3}{\sqrt{y}} = 2$$

$$\frac{4}{\sqrt{x}} - \frac{9}{\sqrt{y}} = -1$$

28. How many terms of AP: 9, 17, 25, ... must be taken to give a sum of 636?

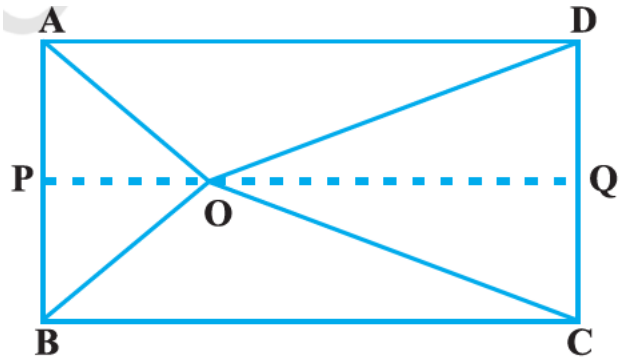
OR

Find the sum of first 22 terms of an AP in which d = 7 and 22nd term is 149.

29. Solve for x $\frac{1}{x-2} + \frac{2}{x-1} = \frac{6}{x}$.

30. Find the centre of a circle passing through the points (6, -6), (3, -7) and (3, 3).

31.O is any point inside a rectangle ABCD. Prove that $OB^2 + OD^2 = OA^2 + OC^2$.



32.ABCD is a trapezium in which AB || DC and P, Q are points on AD and BC, respectively such that PQ || DC. If PD = 18 cm, BQ = 35 cm and QC = 15 cm, find AD.

33. Prove the following identity:
$2(\sin^6 A + \cos^6 A) - 3(\sin^4 A + \cos^4 A) + 1 = 0$

Q. Nos 34 to 36 carry 5 marks each.

34. A chord of a circle of radius 10 cm subtends a right angle at the centre. Find the area of the corresponding:
(i) minor segment
(ii) major segment (Use π = 3.14)?

35. Weekly income of 600 families is tabulated below.

Income	0-1000	1000-2000	2000-3000	3000-4000	4000-5000	5000-6000	Total
No. of families	250	190	100	40	15	5	600

Compute the median income

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

OR

A spherical glass vessel has a cylindrical neck 8 cm long, 2 cm in diameter; the diameter of the spherical part is 8.5 cm. By measuring the amount of water it holds, a child finds its volume to be 345 cm3. Check whether she is correct, taking the above as the inside measurements, and $\pi = 3.14$?