CENTRAL BOARD OF SECONDARY EDUCATION

SAMPLE PAPER

CLASS 10

2024



Sample Question Paper (2023-24)
Class – X
Basic Mathematics (241)

Time Allowed: 3 Hrs **Maximum Marks: 80**

General Instructions:

1. **This Question Paper has 5 Sections A, B, C, D, and E.**
2. **Section A has 20 Multiple Choice Questions (MCQs) carrying 1 mark each.**
3. **Section B has 5 Short Answer-I (SA-I) type questions carrying 2 marks each.**
4. **Section C has 6 Short Answer-II (SA-II) type questions carrying 3 marks each.**
5. **Section D has 4 Long Answer (LA) type questions carrying 5 marks each.**
6. **Section E has 3 sourced based/Case Based/passage based/integrated units of assessment (4 marks each) with sub-parts of the values of 1, 1 and 2 marks each respectively.**
7. **All Questions are compulsory. However, an internal choice in 2 Qs of 2 marks, 2 Qs of 3 marks and 2 Questions of 5 marks has been provided. An internal choice has been provided in the 2 marks questions of Section E.**
8. **Draw neat figures wherever required. Take π =22/7 wherever required if not stated.**

SECTION A

1. If two positive integers a and b are written as a = x^3y^2 and b = xy^3; x, y are prime numbers, then HCF (a,b) is:

   a) xy b) xy^2 c) x^3y^3 d) x^2y^2

2. The LCM of smallest two-digit composite number and smallest composite number is:

   a) 12 b) 4 c) 20 d) 44

3. If x = 3 is one of the roots of the quadratic equation $x^2 – 2kx – 6 = 0$, then the value of k is

   a) $-\frac{1}{2}$ b) $\frac{1}{2}$ c) 3 d) 2

4. The pair of equations y = 0 and y = -7 has:

   a) One solution b) Two solutions c) Infinitely many solutions d) No solution

5. Value(s) of k for which the quadratic equation $2x^2 – kx + k = 0$ has equal roots is :

   a) 0 only b) 4 c) 8 only d) 0,8

6. The distance of the point(3, 5) from x-axis is k units, then k equals:

   a) 3 b) - 3 c) 5 d) -5

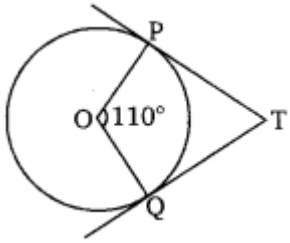
7. If in Δ ABC and Δ PQR, we have $\frac{AB}{QR} = \frac{BC}{PR} = \frac{CA}{PQ}$ then:

   a) ΔPQR ∼ΔCAB b) ΔPQR ∼ΔABC c) ΔCBA ∼ΔPQR d) ΔBCA ∼ΔPQR

8. Which of the following is NOT a similarity criterion?

   a) AA b) SAS c) AAA d) RHS

9. In figure, if TP and TQ are the two tangents to a circle with centre O so that ∠POQ = 110°, then ∠PTQ is equal to



   (a) 60° (b) 70° (c) 80° (d) 90°

10. If cos A = $\frac{4}{5}$ then the value of tan A is:

    a) $\frac{3}{5}$ b) $\frac{3}{4}$ c) $\frac{4}{3}$ d) $\frac{1}{8}$

11. If the height of the tower is equal to the length of its shadow, then the angle of elevation of the sun is _____

    a) 30° b) 45° c) 60° d) 90°

12. $1 - \cos^2 A$ is equal to

    a) $\sin^2 A$ b) $\tan^2 A$ c) $1 - \sin^2 A$ d) $\sec^2 A$

13. The radius of a circle is same as the side of a square. Their perimeters are in the ratio

    a) 1 : 1 b) $2 : \pi$ c) $\pi : 2$ d) $\sqrt{\pi} : 2$

14. The area of the circle is 154cm^2. The radius of the circle is

    a) 7cm b) 14cm c) 3.5cm d) 17.5cm

15. When a dice is thrown once, the probability of getting an even number less than 4 is

    a) 1/4 b) 0 c) 1/2 d) 1/6

16. For the following distribution:

Class	0-5	5-10	10-15	15-20	20-25
Frequency	10	15	12	20	9

    The lower limit of modal class is:

    a) 15 b) 25 c) 30 d) 35

17. A rectangular sheet of paper 40cm x 22cm, is rolled to form a hollow cylinder of height 40cm. The radius of the cylinder(in cm) is :

    a) 3.5 b) 7 c) $\frac{80}{7}$ d) 5

18. Consider the following frequency distribution:

Class	0-6	6-12	12-18	18-24	24-30
Frequency	12	10	15	8	11

The median class is:

a) 6-12 b) 12-18 c) 18-24 d) 24-30

19. Assertion (A): The point (0, 4) lies on y-axis.

Reason(R): The x coordinate of the point on y-axis is zero

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

(c) Assertions (A) is true but reason (R) is false.

(d) Assertions (A) is false but reason (R) is true.

20. Assertion (A): The HCF of two numbers is 5 and their product is 150. Then their LCM is 40.

Reason(R): For any two positive integers a and b, HCF (a, b) x LCM (a, b) = a x b.

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

(b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

(c) Assertions (A) is true but reason (R) is false.

(d) Assertions (A) is false but reason (R) is true.

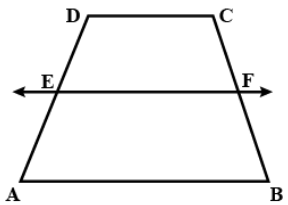
SECTION B

21. Find whether the following pair of linear equations is consistent or inconsistent:

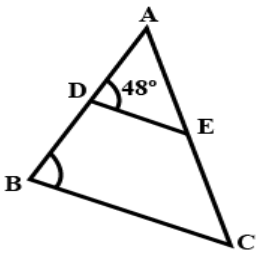
$3x + 2y = 8$

$6x – 4y = 9$

22. In the given figure, if ABCD is a trapezium in which AB ∥ CD ∥ EF, then prove that $\frac{AE}{ED} = \frac{BF}{FC}$.



OR



In figure, if AD = 6cm, DB = 9cm, AE = 8cm and EC = 12cm and ∠ADE = 48˚. Find ∠ABC.

23. The length of a tangent from a point A at distance 5cm from the centre of the circle is 4cm. Find the radius of the circle.

24. Evaluate: $\sin^2 60^\circ + 2\tan 45^\circ - \cos^2 30^\circ$.

25. What is the diameter of a circle whose area is equal to the sum of the areas of two circles of radii 40cm and 9cm?

OR

A chord of a circle of radius 10cm subtends a right angle at the centre. Find area of minor segment. (Use π = 3.14)

SECTION C

26. Prove that $\sqrt{3}$ is an irrational number.

27. Find the zeroes of the quadratic polynomial $4s^2 - 4s + 1$ and verify the relationship between the zeroes and the coefficients.

28. The coach of a cricket team buys 4 bats and 1 ball for Rs. 2050. Later, she buys 3 bats and 2 balls for Rs. 1600. Find the cost of each bat and each ball.

OR

A lending library has a fixed charge for the first three days and an additional charge for each day thereafter. Saritha paid Rs. 27 for a book kept for seven days, while Susy paid Rs. 21 for the book she kept for five days. Find the fixed charge and the charge for each extra day.

29. A circle touches all the four sides of quadrilateral ABCD. Prove that AB + CD = AD + BC.

30. Prove that

$$(\text{cosec}\,\theta - \cot\theta)^2 = \frac{1-\cos\theta}{1+\cos\theta}$$

OR

Prove that sec A (1 – sin A) (sec A + tan A) = 1.

31. A bag contains 6 red, 4 black and some white balls.

(i) Find the number of white balls in the bag if the probability of drawing a white ball is $\frac{1}{3}$.

(ii) How many red balls should be removed from the bag for the probability of drawing a white ball to be $\frac{1}{2}$?

SECTION D

32. A train travels 360km at a uniform speed. If the speed had been 5km/h more, it would have taken 1 hour less for the same journey. Find the speed of the train.

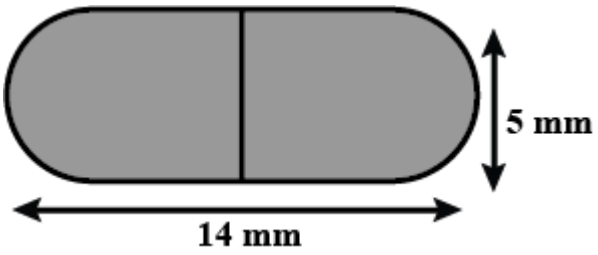
OR

A motor boat whose speed is 18km/h in still water takes 1 hour more to go 24km upstream than to return downstream to the same spot. Find the speed of the stream.

33. Prove that If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, the other two sides are divided in the same ratio.

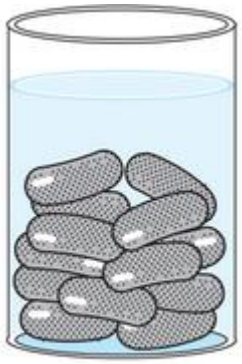
In ΔPQR, S and T are points on PQ and PR respectively. $\frac{PS}{SQ} = \frac{PT}{TR}$ and ∠PST = ∠PRQ. Prove that PQR is an isosceles triangle.

34. A medicine capsule is in the shape of a cylinder with two hemispheres stuck at each of its ends. The length of the entire capsule is 14mm and the diameter of the capsule is 5mm. Find its surface area.



OR

A gulab jamun, contains sugar syrup up to about 30% of its volume. Find approximately how much syrup would be found in 45 gulab jamuns, each shaped like cylinder with two hemispherical ends with length 5cm and diameter 2.8cm.



35. The following table gives the distribution of the life time of 400 neon lamps:

Life time (in hours)	Number of lamps
1500-2000	14
2000-2500	56
2500-3000	60
3000-3500	86
3500-4000	74
4000-4500	62
4500-5000	48

Find the average life time of a lamp.

SECTION E

36. **CASE STUDY 1**



India is competitive manufacturing location due to the low cost of manpower and strong technical and engineering capabilities contributing to higher quality production runs. The production of TV sets in a factory increases uniformly by a fixed number every year. It produced 16000 sets in 6th year and 22600 in 9th year.

1) In which year, the production is Rs 29,200.

2) Find the production during 8th year.

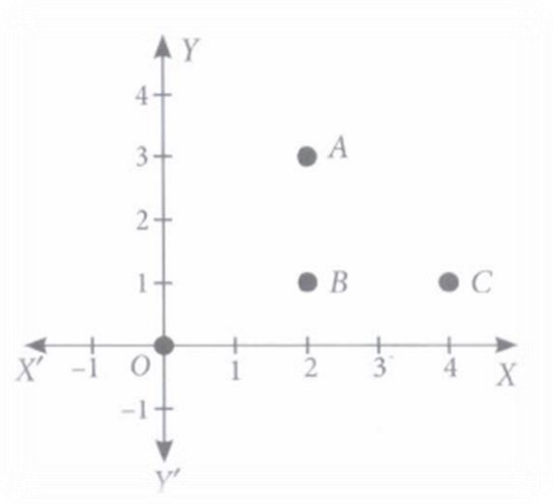
OR

Find the production during first 3 years.

3) Find the difference of the production during 7th year and 4th year.

37. **CASE STUDY 2**

Alia and Shagun are friends living on the same street in Patel Nagar. Shagun's house is at the intersection of one street with another street on which there is a library. They both study in the same school and that is not far from Shagun's house. Suppose the school is situated at the point *O*, i.e., the origin, Alia's house is at A. Shagun's house is at B and library is at C. Based on the above information, answer the following questions.



(i) How far is Alia's house from Shagun's house?

(ii) How far is the library from Shagun's house?

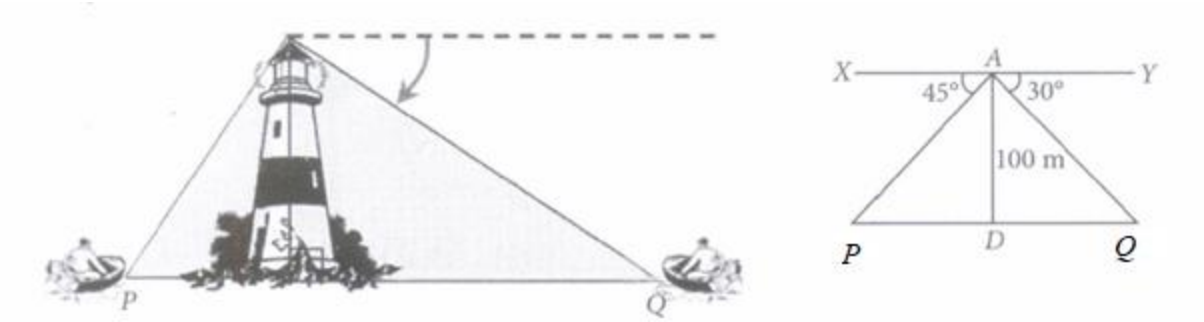
(iii) Show that for Shagun, school is farther compared to Alia's house and library.

OR

Show that Alia's house, shagun's house and library for an isosceles right triangle.

38. **CASE STUDY 3**

A boy is standing on the top of light house. He observed that boat P and boat Q are approaching the light house from opposite directions. He finds that angle of depression of boat P is 45° and angle of depression of boat Q is 30°. He also knows that height of the light house is 100 m.



Based on the above information, answer the following questions.

(i) What is the measure of ∠APD?

(ii) If ∠YAQ = 30°, then ∠AQD is also 30°, Why?

(iii) How far is boat P from the light house?

OR

How far is the boat Q from the light house?