CBSE EXAMINATION PAPER-2023

MATHEMATICS

(Solved)

Time allowed : 3 hours | Maximum Marks : 88

General Instructions :

Read the following instructions carefully and follow them :

i. This question paper contains **44 questions.** All questions are **compulsory.**

ii. This question paper is divided into **5 sections.**

iii. **Section A** – questions number **1 to 3** are case based questions

iv. **Section B** – questions number **4 to 23** are multiple choice questions

v. **Section C** – questions number **24 to 30** are very short answer

vi. **Section D** – questions number **31 to 38** are short answer

vii. **Section E** – questions number **39 to 44** are long answer

viii. There is no overall choice given in the question paper. However, an internal choice has been provided in few questions.

ix. Use of calculator is NOT allowed.

Section A

Question 1.

Two schools 'P' and 'Q' decided to award prizes to their students for two games of Hockey ₹ x per student and Cricket ₹ y per student. School 'P' decided to award a total of ₹ 9,500 for the two games to 5 and 4 students respectively; while school 'Q' decided to award ₹ 7,370 for the two games to 4 and 3 students respectively.

Based on the above information, answer the following questions :



(1)

What is the prize amount for hockey?

[2 Marks]

(2) Represent the following information algebraically (in terms of x and y).

[1 Marks]

(3) What will be the total prize amount if there are 2 students each from two games?

[1 Marks]

(4)

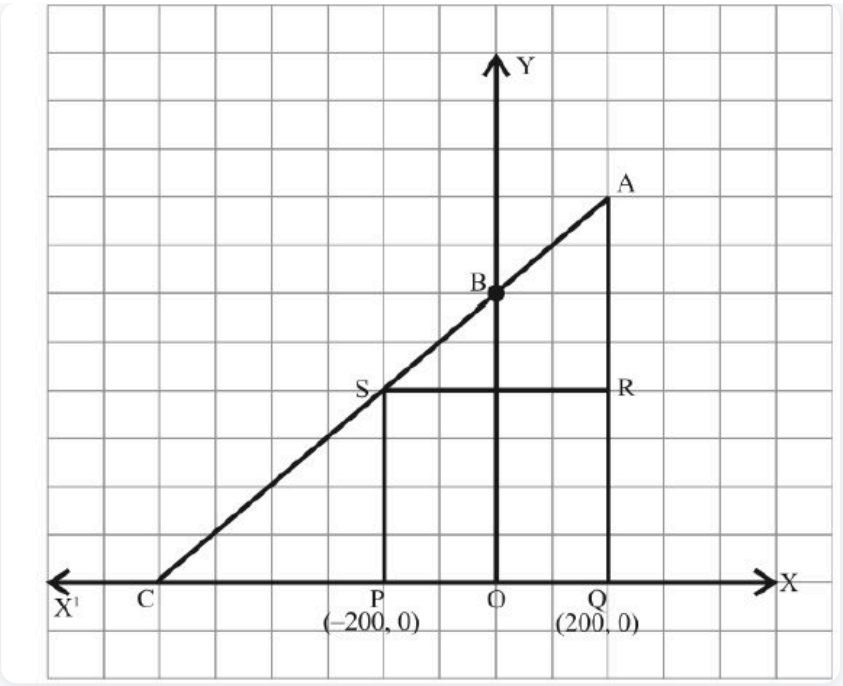
Prize amount on which game is more and by how much?

[2 Marks]

Question 2.

Jagdish has a field which is in the shape of a right angled triangle AQC. He wants to leave a space in the form of a square PQRS inside the field for growing wheat and the remaining for growing vegetables (as shown in the figure). In the field, there is a pole marked as O.

Based on the above information, answer the following questions :



(1) Taking O as origin, coordinates of P are (–200, 0) and of Q are (200, 0). PQRS being a square, what are the coordinates of R and S?

[1 Marks]

(2)

What is the area of square PQRS?

[2 Marks]

(3) If S divides CA in the ratio K:1, what is the value of K, where point A is (200, 800)?

[1 Marks]

(4)

What is the length of diagonal PR in square PQRS?

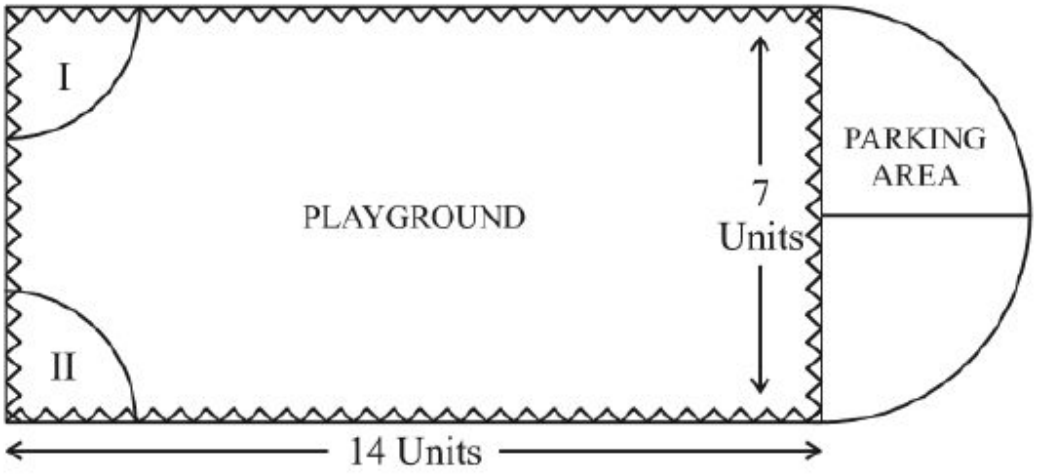
[2 Marks]

Question 3.

Governing council of a local public development authority of Dehradun decided to build an adventurous playground on the top of a hill, which will have adequate space for parking. After survey, it was decided to build rectangular playground, with a semi-circular area allotted for parking at one

end of the playground. The length and breadth of the rectangular playground are 14 units and 7 units, respectively. There are two quadrants of radius 2 units on one side for special seats.

Based on the above information, answer the following questions :



(1) What is the total perimeter of the parking area?

[1 Marks]

(2)

What is the total area of parking and the two quadrants?

[2 Marks]

(3) Find the cost of fencing the playground and parking area at the rate of ₹ 2 per unit.

[1 Marks]

(4)

What is the ratio of area of playground to area of parking area?

[2 Marks]

Section B

Question 4. The ratio of HCF to LCM of the least composite number and the least prime number is:

[1 Marks]

(A) 1:2

(B) 2:1

(C) 1:1

(D) 1:3

Question 5. The roots of the equation $x^2 + 3x – 10 = 0$ are:

[1 Marks]

(A) 2, –5

(B) –2, 5

(C) 2, 5

(D) –2, –5

Question 6.

The next term of the A.P. : √6, √24, √54 is:

[1 Marks]

(A) √60

(B) √96

(C) √72

(D) √216

Question 7.

The distance of the point (–1, 7) from x-axis is:

[1 Marks]

(A) 7

(B) –1

(C) 6

(D) √50

Question 8. What is the area of a semi-circle of diameter ‘d’?

[1 Marks]

(A) $1/4\ \pi\ d^2$

(B) $1/16\ \pi\ d^2$

(C) $1/8\ \pi\ d^2$

(D) $1/2\ \pi\ d^2$

Question 9. The empirical relation between the mode, median and mean of a distribution is:

[1 Marks]

(A) Mode = 3 Mean – 2 Median

(B) Mode = 3 Median – 2 Mean

(C) Mode = 2 Mean – 3 Median

(D) Mode = 2 Median – 3 Mean

Question 10.

The pair of linear equations $2x = 5y + 6$ and $15y = 6x – 18$ represents two lines which are:

[1 Marks]

(A) parallel

(B) intersecting

(C) coincident

(D) either intersecting or parallel

Question 11. If α, β are zeroes of the polynomial $x^2 – 1$, then value of $(\alpha + \beta)$ is:

[1 Marks]

(A) 1

(B) 2

(C) –1

(D) 0

Question 12.

If a pole 6 m high casts a shadow $2\sqrt{3}$ m long on the ground, then sun's elevation is:

[1 Marks]

(A) 60°

(B) 45°

(C) 90°

(D) 30°

Question 13.

sec θ when expressed in terms of cot θ, is equal to:

[1 Marks]

(A) $\sqrt{1-\cot^2\theta}/\cot\theta$

(B) $\sqrt{1+\cot^2\theta}$

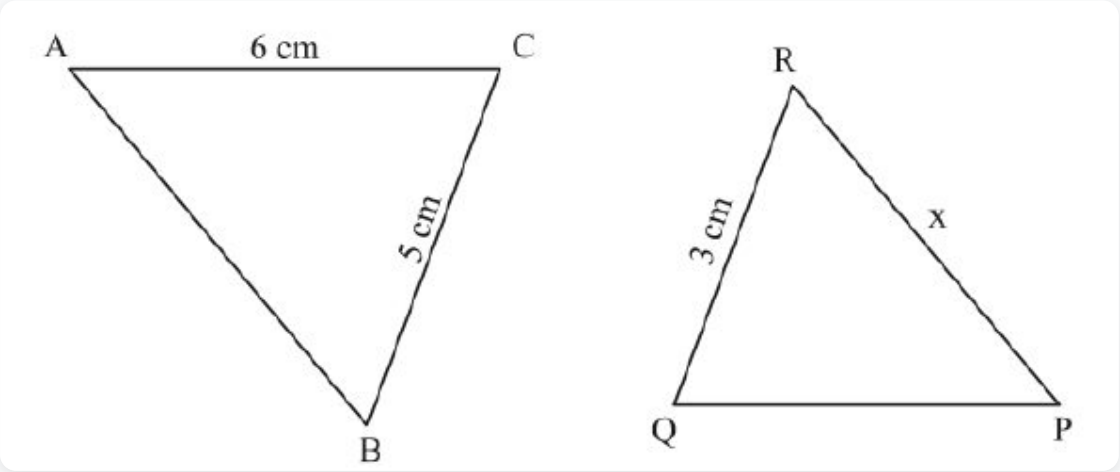
(C) $1+\cot^2\theta/\cot\theta$

(D) $\sqrt{1+\cot^2\theta}/\cot\theta$

Question 14.

In the given figure, △ABC ~ △QPR. If AC = 6 cm, BC = 5 cm, QR = 3 cm and PR = x; then the value of x is:

[1 Marks]



(A) 10 cm

(B) 2.5 cm

(C) 3.6 cm

(D) 3.2 cm

Question 15.

The distance of the point (–6, 8) from origin is:

[1 Marks]

(A) 6

(B) –6

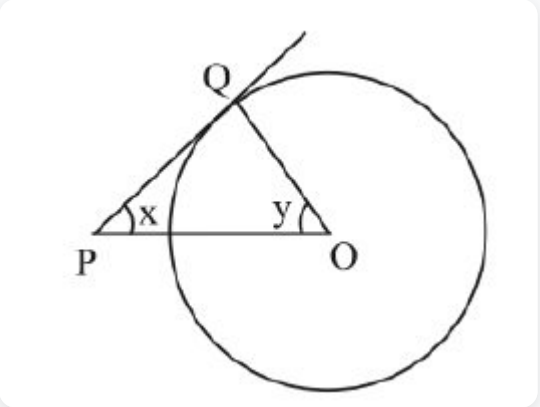
(C) 8

(D) 10

Question 16.

In the given figure, PQ is a tangent to the circle with centre O. If ∠OPQ = x, ∠POQ = y, then x + y is:

[1 Marks]



(A) 60°

(B) 90°

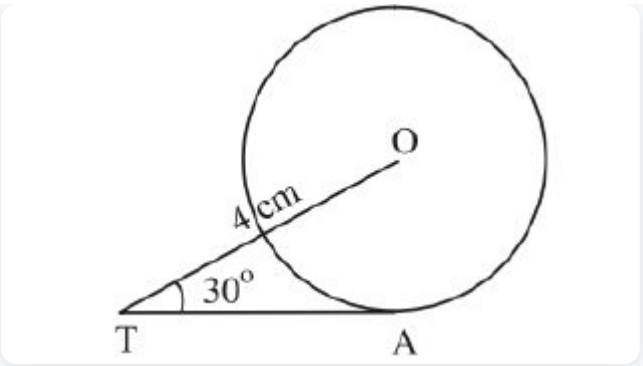
(C) 45°

(D) 180°

Question 17.

In the given figure, TA is a tangent to the circle with centre O such that OT =4 cm, ∠OTA = 30°, then length of TA is :

[1 Marks]



(A) 2√2 cm

(B) 2 cm

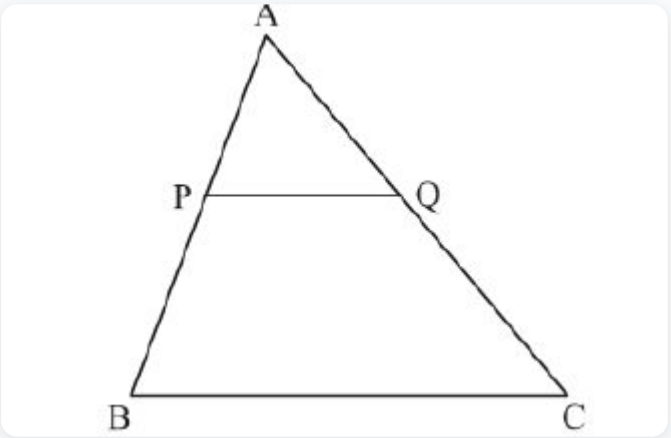
(C) 2√3 cm

(D) √3 cm

Question 18.

In △ABC, PQ || BC. If PB = 6 cm, AP = 4 cm, AQ = 8 cm, find the length of AC.

[1 Marks]



(A) 6 cm

(B) 14 cm

(C) 20 cm

(D) 12 cm

Question 19.

If α, β are the zeroes of the polynomial $p(x) = 4x^2 – 3x – 7$, then $(1/\alpha + 1/\beta)$ is equal to:

[1 Marks]

(A) -7/3

(B) 7/3

(C) -3/7

(D) 3/7

Question 20. A card is drawn at random from a well-shuffled pack of 52 cards. The probability that the card drawn is not an ace is:

[1 Marks]

(A) 1/13

(B) 9/13

(C) 12/13

(D) 4/13

Question 21.

Assertion (A) : The probability that a leap year has 53 Sundays is 2/7.

Reason (R) : The probability that a non-leap year has 53 Sundays is 5/7.

[1 Marks]

(A) Both Assertion (A) and Reason (R) are true and Reason (R) is not the correct explanation of Assertion (A).

(B) Assertion (A) is false but Reason (R) is true.

(C) Assertion (A) is true but Reason (R) is false.

(D) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

Question 22.

Assertion (A) : a, b, c are in AP. if and only if $2b=a+c$.

Reason (R) : The sum of first n odd natural numbers is n^2.

[1 Marks]

(A) Assertion (A) is false but Reason (R) is true.

(B) Both Assertion (A) and Reason (R) are true and Reason (R) is not the correct explanation of Assertion (A).

(C) Assertion (A) is true but Reason (R) is false.

(D) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

Question 23.

Two dice are thrown together. The probability of getting the difference of numbers on their upper faces equals to 3 is:

[1 Marks]

(A) 1/6

(B) 1/12

(C) 1 /9

(D) 2/9

Section C

Question 24. Two numbers are in the ratio 2 : 3 and their LCM is 180. What is the HCF of these numbers?

[2 Marks]

Question 25. If one zero of the polynomial $p(x) = 6x^2 + 37x – (k – 2)$ is reciprocal of the other, then find the value of k.

[2 Marks]

Question 26. Find the sum and product of the roots of the quadratic equation $2x^2 – 9x + 4 = 0$.

[2 Marks]

Question 27. Find the discriminant of the quadratic equation $4x^2 – 5 = 0$ and hence comment on the nature of roots of the equation.

[2 Marks]

Question 28. If a fair coin is tossed twice, find the probability of getting ‘atmost one head’.

[2 Marks]

Question 29.

Evaluate $5 \cos^2 60° + 4 \sec^2 30° - \tan^2 45° / \sin^2 30° + \cos^2 30°$.

[2 Marks]

Question 30. If A and B are acute angles such that sin(A – B) = 0 and 2 cos(A + B) – 1 = 0, then find angles A and B.

[2 Marks]

Section D

Question 31. How many terms are there in an A.P. whose first and fifth terms are –14 and 2, respectively, and the last term is 62?

[3 Marks]

Question 32. Which term of the A.P. : 65, 61, 57, 53, ... is the first negative term?

[3 Marks]

Question 33.

Prove that $\sqrt{5}$ is an irrational number.

[3 Marks]

Question 34. Prove that the angle between the two tangents drawn from an external point to a circle is supplementary to the angle subtended by the line segment joining the points of contact at the centre.

[3 Marks]

Question 35.

Prove that: $\sin A - 2\sin^3 A / 2\cos^3 A - \cos A = \tan A$

[3 Marks]

Question 36. Prove that sec A (1 – sin A)(sec A + tan A) = 1.

[3 Marks]

Question 37. Two concentric circles are of radii 5 cm and 3 cm. Find the length of the chord of the larger circle which touches the smaller circle.

[3 Marks]

Question 38. Find the value of ‘p’ for which the quadratic equation px(x – 2) + 6 = 0 has two equal real roots.

[3 Marks]

Section E

Question 39. A straight highway leads to the foot of a tower. A man standing on the top of the 75 m high tower observes two cars at angles of depression of 30° and 60°, which are approaching the foot of the tower. If one car is exactly behind the other on the same side of the tower, find the distance between the two cars. (Use $\sqrt{3} = 1.73$)

[5 Marks]

Question 40. From the top of a 7 m high building, the angle of elevation of the top of a cable tower is 60° and the angle of depression of its foot is 30°. Determine the height of the tower.

[5 Marks]

Question 41.

D is a point on the side BC of a triangle ABC such that $\angle ADC = \angle BAC$. Prove that $CA^2 = CB.CD$

[5 Marks]

Question 42.

If AD and PM are medians of triangles ABC and PQR respectively where $\triangle ABC \sim \triangle PQR$, prove that $AB/PQ = AD/PM$.

[5 Marks]

Question 43. A student was asked to make a model shaped like a cylinder with two cones attached to its ends by using a thin aluminium sheet. The diameter of the model is 3 cm and its total length is 12 cm. If each cone has a height of 2 cm, find the volume of air contained in the model.

[5 Marks]

Question 44.

The monthly expenditure on milk in 200 families of a Housing Society is given below:

Find the value of x and also, find the median and mean expenditure on milk.

[5 Marks]

Monthly Expenditure (in ₹)	1000-1500	1500-2000	2000-2500	2500-3000	3000-3500	3500-4000	4000-4500	4500-5000
Number of families	24	40	33	x	30	22	16	7