

SAMPLE PAPER
Class: X
MATHEMATICS

Time: 3 hrs

Marks: 80

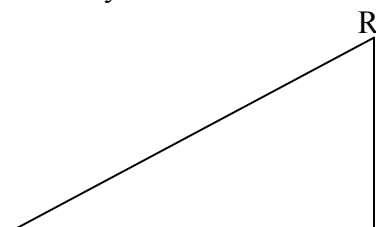
General Instructions:

- (i) All questions are compulsory.
 - (ii) The question paper consists of 25 questions divided into three sections – A, B and C. Section A contains 7 questions of 2 marks each. Section B is of 12 questions of 3 marks each and section C is of 6 questions of 5 marks each.
 - (iii) There is no overall choice. However, an internal choice has been provided in two questions of two marks each, two questions of three marks each and two questions of five marks each.
 - (iv) In question on construction, the drawing should be neat and exactly as per the given measurements.
 - (v) Use of calculator is not permitted.
-

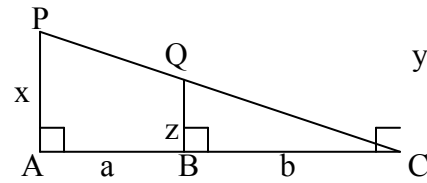
SECTION A

(Qns 1 – 7 carry 2 marks each)

1. Solve the following system of linear equations:
 $6(ax + by) = 3a + 2b$; $6(bx - ay) = 3b - 2a$.
or
If $(x - 4)$ is a factor of $x^3 + ax^2 + 2bx - 24$ and $a - b = 8$, find the values of a and b .
2. Find the L.C.M of $2x^2 - 128$, $x^2 - 9x + 20$ and $x^2 - 16$.
3. Solve the following equation:
$$2 \left(\frac{2x - 5}{x + 3} \right) - 3 \left(\frac{x + 3}{2x - 5} \right) = 5$$
4. How many terms of the A.P 24, 20, 16,..... must be taken so that the sum may be 72? Explain the double answer.
5. A C.D player is available for Rs 14,000 cash payment or Rs 4,000 cash down payment followed by five monthly instalments of Rs 2,200 each. Compute the rate of interest charged under the instalment plan.
6. A bag contains 25 cards numbered 1 to 25. One card is drawn from the bag. Find the probability that it is (i) a prime number. (ii) divisible by both 2 and 3.



7. In fig. PA, QB and RC are each perpendicular to AC and AP = x, QB = z, RC = y, AB = a and BC = b, prove that $\frac{1}{x} + \frac{1}{y} = \frac{1}{z}$



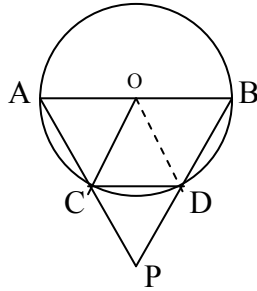
or

In a rhombus ABCD, prove that $AB^2 + BC^2 + CD^2 + DA^2 = AC^2 + BD^2$

SECTION B

(Qns 8 – 19 carry 3 marks each)

8. Solve graphically the system of linear equations: $2x + y = 8$ and $x + 1 = 2y$. Also find the coordinates of the points where the lines meet the y-axis.
9. If $P = \frac{1}{x-y} - \frac{1}{x+y}$, $Q = \frac{x^2 - y^2}{x^2y - xy^2}$ and $R = \frac{1}{x-y}$, express $P \times Q \div R$ as a rational expression in lowest terms.
10. Find the three terms in A.P, such that their sum is 27 and product is 648.
- Or
- For what values of n, the nth term of the series “3 + 10 + 17 +” and “63 + 65 + 67 +” are same?
11. AB is a diameter of the circle with centre O and chord CD is equal to radius OC. AC and BD produced meet at P. Prove that $\angle CPD = 60^\circ$.



12. A piece of cloth costs Rs 200. If the piece was 5m longer and each metre of cloth costs Rs 2 less the cost of the piece would have remained unchanged. How long is the piece and what is the original rate per metre?
13. A sum of Rs 24,600 was borrowed at 5% p.a. compound interest. The loan was paid back in two equal instalments. Find the value of each instalment.
14. Construct a quadrilateral PQRS such that PQ = 4.5 cm, PS = 4 cm, SQ = 5.4 cm, QR = 6.3 cm and $\angle Q = 110^\circ$. Construct another quadrilateral P'QR'S' similar to the quadrilateral PQRS so that the diagonal S'Q = 7.2 cm.
15. A semi-circular thin sheet of metal of diameter 28 cm is bent into an open conical cup. Find the depth and capacity of the cup.

16. Prove the following identity:

$$\frac{\cot\theta + \operatorname{cosec}\theta - 1}{\cot\theta - \operatorname{cosec}\theta + 1} = \frac{1 + \cos\theta}{\sin\theta}$$

or

Without using trigonometric tables evaluate the following:

$$\cot\theta \cdot \tan(90^\circ - \theta) - \sec(90^\circ - \theta) \cdot \operatorname{cosec}\theta + \sin^2 25^\circ + \sin^2 65^\circ + 3(\tan 5^\circ \tan 45^\circ \tan 85^\circ)$$

17. The following data shows the expenditure incurred by a person on the following items in a month. Draw a pie chart to represent the data:

Item	Education	Food	Rent	Clothing	Others
Expenditure (in Rs)	1600	3200	4000	2400	3200

18. Show that $(1, -1)$ is the centre of the circle circumscribing the triangle whose angular points are $(4, 3)$, $(-2, 3)$ and $(6, -1)$.

19. The vertices of a triangle are $(1, 2)$, $(h, -3)$ and $(-4, k)$. Find the values of h and k if the centroid of the triangle be at the point $(5, -1)$

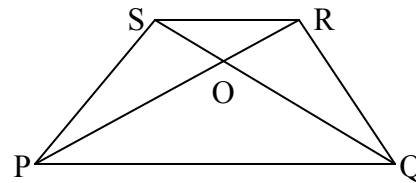
SECTION C

(Qns 20 - 25 carry 5 marks each)

20. Prove that the ratio of the areas of two similar triangles is equal to the ratio of the squares of their corresponding sides.

Using the above do the following:

In fig. PQRS is a trapezium in which $PQ \parallel RS$ and $PQ = 3RS$. Find the ratio of the areas of Δ s POQ and ROS.



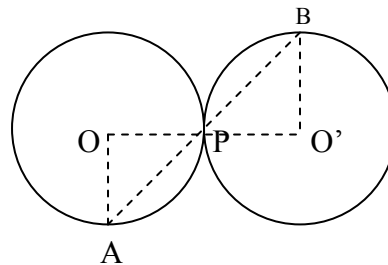
21. If two circles touch each other internally or externally, prove that the point of contact lies on the line joining their centres.

Using the above result prove the following.

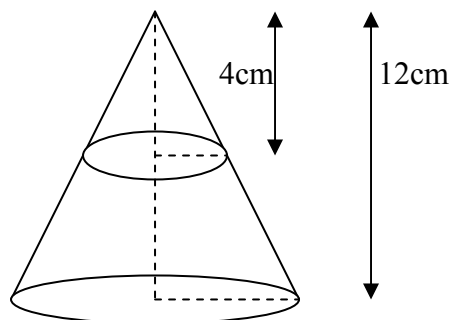
Two circles with centres O and O' and radii r_1 and r_2 touch each other externally at P .

AB is a line through P intersecting the two circles at A and B respectively.

Prove that $OA \parallel OB'$.



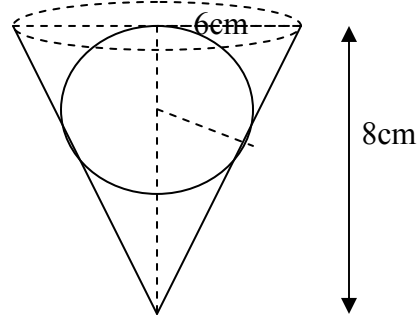
22. A solid cone of height 12 cm and base radius 6 cm has top 4 cm removed as shown in the fig. Find the whole surface area of the remaining solid cone



6cm

Or

A conical vessel of radius 6 cm and height 8 cm is completely filled with water. A sphere is lowered into the water and its size is such that when it touches the sides, it is just immersed. What fraction of water overflows?



23. A tree breaks due to the storm and broken part bends so that the top of the tree touches the ground making an angle of 30° with the ground. The distance from the foot of the tree to the point where the top touches the ground is 10m. Find the height of the tree.

or

23. The angle of elevation of the top of the tower from a point on the same level as the foot of tower is α , on advancing P metres towards the foot of the tower, the angle of elevation becomes β . Show that the height h of the tower is given by $h = \frac{P \tan \beta \tan \alpha}{\tan \beta - \tan \alpha}$. Also determine the height of the tower when $P = 150\text{m}$, $\alpha = 30^\circ$ and $\beta = 60^\circ$.

24. Following are the marks obtained by 60 students in an examination.

Marks (more than)	Number of students
0	60
10	56
20	40
30	20
40	10
50	0

Calculate the mean marks obtained by the students.

25. Anil has an annual income of Rs 3,60,000. He contributes Rs 4,000 per month in his P.F and pays an annual premium of Rs 15,000 for his LIC policy. How much should he invests in NSC's so as to get maximum deduction? After getting maximum deduction he wants to pay income tax. He pays Rs 2,500 per month for 11 months towards income tax. How much he has to pay in the last month of the year?

Rates of Income tax for male persons (Below 65 years)

Taxable income	Income tax
(I) Upto Rs 1,00,000	Nil

(ii) Rs 1,00,001 to Rs 1,50,000	10% of income exceeding Rs 1,00,000
(iii) Rs 1,50,001 to Rs 2,50,000	Rs 5000 + 20% of income exceeding Rs 1,50,000
(iv) More than Rs 2,50,000	Rs 25000 + 30% of income exceeding Rs 2,50,000

- (a) Savings: 100% exemption for permissible savings upto Rs 1,00,000.
(b) Education cess: 2% of the income tax.