

# 10th CBSE MATHEMATICS

2006-07

## 1 SECTION A

1.1. Solve for x and y:

a)  $47x + 31y = 63$

$31x + 47y = 15$

b)  $\frac{ax}{b} - \frac{by}{a} = a + b$   
 $ax - by = 2ab$

1.2. Given that  $P = \frac{2}{x^2-x-6}$ ,  $Q = \frac{3}{x^2+x-3}$ ,  $R = \frac{4}{x^2-4x+3}$ . Find  $(P + Q) + R$

1.3. If  $(x-2)(x+3)$  is the HCF of the polynomials

$P(x) = (x^2 - 3x + 2)(2x^2 + 7x + a)$  and  
 $Q(x) = (x^2 + 4x + 3)3x^2 - 7x + b$

Find the values of  $a$  and  $b$

1.4. a) Solve for 'x',  $12abx^2 - (9a^2 - 8b^2) \cdot x - 6ab = 0$

b) A two-digit number is such that the product of its digits is 35. When 18 is added the number the digits interchange their places. Find the number

1.5. The 6th term of an Arithmetic Progression (AP) is -10 and the term is -26. Determine the 15<sup>th</sup> term of AP

1.6. Find the sum of all the two digit natural numbers which are divisible by 4.

1.7. A household article is available for Rs. 2,500

cash or Rs.520 cash down payment followed by four equal monthly installments. If the rate of interest charged under the installment plan is 25% per annum. Find the amount of each installment.

1.8. A man borrows Rs. 36,410 from a finance company and has to repay it in three equal annual installments. Find the amount of each installment if the rate of interest is 10% per annum compounded annually.

1.9. In Fig 1.9,  $\angle ACB = 90^\circ$ ,  $CD \perp AB$ , prove that  $CD^2 = BD \cdot AD$

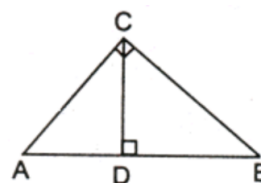


Fig. 1.9.

1.10. In Fig 1.10,  $PA = 3\text{cm}$ ,  $AB = 9$ ,  $CD = 5$ . Find the length of PC

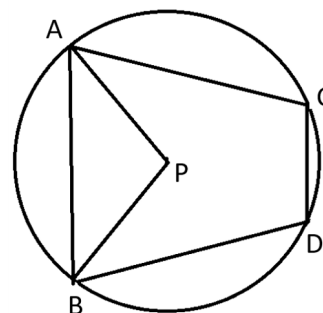


Fig. 1.10.

## 2 SECTION B

2.1. Draw the graphs of the equations  
 $4x - y - 8 = 0$

$$2x - 3y + 6 = 0$$

Also determine the vertices of the triangle formed by the lines and the x axis

- 2.2. A train travels the distance of 300km in a uniform speed. If the speed is increased by 5 kmph, the journey would have taken 2 hours less. Find the original speed of the train.

- 2.3. The radius of the base and the height of a solid right circular cylinder are in the ratio of 2:3, and its volume is  $(1617\text{cm}^3)$ . Find the total surface area of the cylinder. ( Use  $\pi$  as  $\frac{22}{7}$  )

- 2.4. a) Prove that:

$$\frac{\sin \theta + \cos \theta}{\sin \theta - \cos \theta} + \frac{\sin \theta - \cos \theta}{\sin \theta + \cos \theta} = \frac{2 \sec^2 \theta}{\tan^2 \theta - 1}$$

- b) Evaluate the following without using the trigonometric tables:

$$\frac{\sec^2 (90^\circ - \theta) - \cot^2 \theta}{\sin^2 25^\circ + \sin^2 65^\circ} + \frac{2 \cos^2 60^\circ \tan^2 28^\circ \tan^2 62^\circ}{3 (\sec^2 43^\circ - \cot^2 47^\circ)}$$

- 2.5. Construct a triangle ABC in which  $BC = 7\text{cm}$ ,  $\angle A = 60^\circ$  and altitude  $AD = 5\text{cm}$ . Write the steps of construction as well.

- 2.6. a) Show that the points  $A = (1, 2)$ ,  $B (5, 4)$ ,  $C = (3, 8)$ ,  $D = (-1, 6)$  are the vertices of a square

- b) Find the coordinates of the point equidistant from the 3 points given,  $A(5, 1)$ ,  $B(-3, -7)$ ,  $C(7, -1)$ .

- 2.7. Find the value of p for which the point  $(-1, 3)$ ,  $(2, p)$  and  $(5, -1)$  are collinear.

- 2.8. The Arithmetic mean of the following frequency distribution is 50. Find the value of p

Classes	0-20	20-40	40-60	60-80	80-100
Frequency	17	p	32	24	19

- 2.9. The following table shows the monthly expenditure of a family . Draw a Pie Chart for

this data.

Item	Rent	Food	Clothing	Education	Misc.
Amount(Rs)	1500	3600	1200	2100	2400

- 2.10. A box contains 20 balls bearing numbers 1,2,3.....20. A ball is drawn at random from the box. What is the probability that the ball is
- an odd number
  - divisible by 2 or 3
  - prime number
  - not divisible by 10

### 3 SECTION C

- 3.1. Prove that the ratio of the areas of 2 similar triangles, is equal to the ratio of the squares of their corresponding sides. Using the above, prove that the area of the equilateral triangle described on the side of a right angled isosceles, is half the area of an equilateral triangle described on its hypotenuse.

- 3.2. Prove that the angle subtended by an arc is double the angle subtended by it at any point, on the remaining part of the circle, Using the above, find  $x$  in Fig 3.2

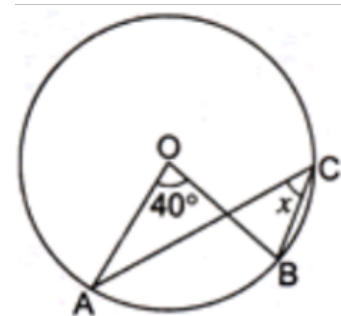


Fig. 3.2.

- 3.3. a) The rain water from a roof  $22\text{m} \times 20\text{m}$  drains into a cylindrical vessel, having a diameter at the base of  $2\text{m}$  and a height of  $3.5\text{m}$ . If the vessel is just full, find the rainfall in centimeters.

- b) A bucket made up of a metal sheet is in the form of a frustum of a cone of height  $16\text{cm}$ , with its radii of its lower and upper ends at  $8$  and  $20$  cm respectively, Find the cost of the bucket if the cost of the metal

sheet used is Rs 15 per  $100\text{cm}^2$ . Use ( $\pi$  as 3.14)

3.4. a) The angles of depression of the top and the bottom of a building 50 meters high as observed from the top of a tower are  $30^\circ$  and  $60^\circ$  respectively. Find the height of the tower and also the horizontal distance between the building and the tower

b) The angle of elevation of the top of a tower is observed from a point on the ground as  $\alpha$  and moving from that point the angle of elevation can be found to be  $\beta$  metres towards the tower, the angle of elevation is  $\theta$ . Prove that the height of the tower is  $\left(\frac{\tan \alpha \times \tan \beta}{\tan \beta - \tan \alpha}\right)$

3.5. The annual income from the salary of Mrs. Usha, who is a senior citizen is Rs. 3,85,000, she donates Rs. 10,000 to the Prime Minister's relief fund (100% exemption), and another Rs. 10,000 to a Charitable Society (50% exemption), she contributes Rs. 70,000 to PPF annually, and pays a quarterly premium of Rs. 3,500 towards life insurance, She also purchases NSC's, for Rs. 20,000, she pays 1,600 per month towards income tax for 11 months. What is her tax liability ?

Use the following for calculating income tax:

1. Savings: 100% exemption for savings upto Rs. 1,00,000
2. Rate of income tax for senior citizens

Slab	Income tax
Upto Rs. 1,85,000	No tax
From 1,85,001 to 2,50,000	20% of taxable income income above 1,85,000
From 2,50,001 and above	Rs 13000 + 30% of the income exceeding Rs 2,50,000

3. Education cess: 2% of income tax