

## HALF YEARLY EXAMINATION-2017-2018

## MATHEMATICS

Class - IX Std



MM. 100

Time : 2.5hrs

Section A compulsory and answer any 5 of Section B

SECTION : A (50 MARKS)

## Question 1

- (a) Solve the following pairs of linear equations by cross-multiplication method  
 $x - y = a + b$  ;  $ax + by = a^2 - b^2$ . (5)
- (b) The expression  $ax + by$  has value 7 when  $x = 2$ ,  $y = 1$ . When  $x = -1$ ,  $y = 1$ , it has value 1, find 'a' and 'b'. (5)
- (c) Solve the following systems of simultaneous linear equations  $3x + 2y = 4$  ;  $8x + 5y = 9$ . (3)

## Question 2

- (a) Shikha works in a factory. In one week she earned Rs 390 for working 47 hours, of which 7 hours were overtime. The next week she earned Rs 416 for working 50 hours, of which 8 hours overtime. What is Shikha's hourly earnings rate? (5)
- (b) The sum of the digits of two digit number is 7. If the digit is reversed, the new number is increased by 3 equal 4 times the original number. Find the number. (5)
- (c) Three years hence a man's age will be three times his son's age and 7 years ago he was Seven times as old as his son. How old are they now? (3)

## Question 3

- (a) In a parallelogram ABCD, the bisector of  $\angle A$  meets DC in E and  $AB = 2AD$ . Prove that BE bisects  $\angle B$ .  
 $\angle AEB =$  a right angle. (4)
- (b) ABCD is a parallelogram, bisectors of angles A and B meet at E which lies on DC. Prove that  $AB = 2AD$ . (3)
- (c) ABCD is a square and the diagonals intersect at O. If P is a point on AB such that  $AO = AP$ , Prove that  $3 \angle PGB = \angle AOP$ . (3)
- (d) A (4, -1), B (-1, 2) and C ( $\alpha$ , 5) are the vertices of an isosceles triangle. Find the value of  $\alpha$ , given that AB is the unequal side. (3)

## Question 4

- (a) Using ruler and compasses only, construct a rectangle each of whose diagonals measures 6 cm and the diagonals intersect at an angle of  $45^\circ$ . (3)
- (b) Using ruler and compasses only, construct a rhombus ABCD, given that  $AB = 5$  cm,  $AC = 6$  cm. Measure  $\angle BAD$ . (3)
- (c) Construct a trapezium in which  $AB \parallel CD$ ,  $AB = 4.6$  cm,  $\angle ABC = 90^\circ$ ,  $\angle DAB = 120^\circ$  and the distance between parallel sides is 2.9 cm. (4)
- (d)  $\sec 4\theta = \operatorname{cosec}(\theta - 20^\circ)$ , where  $4\theta$  and  $\theta - 20^\circ$  are acute angles. (3)

## SECTION B

Answer any ~~one~~ question (60 marks)

## Question 5

- (a) A triangle and a parallelogram have the same base and same area. If the sides of the triangle are 26 cm, 28 cm and 30 cm, and the parallelogram stands on the base 28 cm find the height of the parallelogram. (4)
- (b) The perimeter of a rectangular plot is 180 m and its area is  $1800 \text{ m}^2$ . Take the length of the plot as x m. Use the perimeter 180 m to write the value of the breadth in terms of x. Use the value of length, breadth and the area to write an equation in x, Solve the equation to calculate the length and breadth of the plot. (5)
- (c) The inner dimensions of a closed wooden box are 2 m, 1.2 m and .75 m. The thickness of the wood is 2.5 cm. Find the cost of wood required to make the box if  $1 \text{ m}^3$  of wood costs Rs 5400. (4)



Question 6

- a) If A (-3, 2), B ( $\alpha$ ,  $\beta$ ) and C (-1, 4) are the vertices of an isosceles triangle, prove that  $\alpha + \beta = 1$ , given  $AB = BC$ . (4)
- b) Show that the points (2, 1), (0, 3), (-2, 1) and (0, -1), taken in order, are the vertices of a square. Also find the area of the square. (4)
- c) The ends of a diagonal of a square have co-ordinates (-2, p) and (p, 2). Find p if the area of the square is 40 sq. units. (5)

Question 7

- a) If  $\sqrt{2} \tan 2\theta = \sqrt{6}$  and  $0^\circ < \theta < 90^\circ$ , find the value of  $\sin\theta + \sqrt{3} \cos\theta - 2 \tan^2 \theta$ . (3)
- b) If  $\tan(A + B) = \sqrt{3}$ ,  $\tan(A - B) = 1$  and A, B ( $B < A$ ) are acute angles, find the values of A and B. (4)
- c) Find the value of  $\theta$  if (i)  $\sin(\theta + 36^\circ) = \cos\theta$ , where  $\theta + 36^\circ$  are acute angles. (3)
- d) Using ruler and compasses only, construct a rectangle ABCD, Given  $AB = 5$  cm and  $AD = 3$  cm. (3)

Question 8

- a) M and N are the mid-points of the sides QR and PQ respectively of a  $\Delta$  POR, right-angled at Q.  
 Prove that : (i)  $PM^2 + RN^2 = 5MN^2$ . (ii)  $4 PM^2 = 4 PQ^2 + QR^2$   
 (iii)  $4 RN^2 = PQ^2 + 4 QR^2$  (iv)  $4 (PM^2 + RN^2) = 5 PR^2$ . (5)
- b) In a quadrilateral ABCD,  $\angle B = 90^\circ$  and  $\angle D = 90^\circ$ .  
 Prove that :  $2AC^2 - AB^2 = BC^2 + CD^2 + DA^2$ . (4)
- c) ABC is an isosceles triangle in which  $AB = AC = 20$  cm  $BC = 24$  cm. PQRS is a rectangle drawn inside the isosceles triangle. Given that  $PQ = SR = y$  cm and  $PS = QR = 2x$  cm.  
 Prove that :  $y = 16 - 4x/3$ . (4)

Question 9

- a) On Diwali eve, two candles, one of which is 3 cm longer than the other, are lighted. The longer one is lighted at 5.30 p.m. and the shorter at 7 p.m. At 9.30 p.m. they both are of the same length. The longer one burns out at 11.30 p.m. and the shorter one at 11 p.m. How long was each candle originally? (5)
- b) Construct a regular hexagon of side 2.5cm. (4)
- c) A square brass plate of side x cm is 1 mm thick and weighs 4725 g. If one cc of brass weighs 8.4 g, find the value of x. (4)

Question 10

- a) The lateral surface area of a cuboid is  $224 \text{ cm}^2$ . Its height is 7 cm and the base is a square. (i) a side of the square, and (ii) the volume of the cuboid. (4)
- b) Use graph paper for this question. Take 2 cm = 1 unit on both axes. (ii) (i) Draw the graphs of  $x + y + 3 = 0$  and  $3x - 2y + 4 = 0$ . Plot three points per line. (iii) (ii) Write down the coordinates of the point of intersection of the lines. (iv) (iii) Measure and record the distance of the point of intersection of the lines from the origin in cm. (5)
- c) In triangle ABC, angle A =  $90^\circ$ ,  $CA = AB$  and D is a point on AB produced. Prove that:  $DC^2 - BD^2 = 2AB \times AD$  (4)

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