



ST. LAWRENCE HIGH SCHOOL



First Term Test - 2019

Sub: Mathematics

Class: IX

F. M. 75

Duration: 2 hours 30 min

Model Answers

Date: 17.04.19.

GROUP-A

Q.1) Find the correct answer to each of the following question: 1x6=6

- 1) If  $4^x = 8$  then the value of X will be (d)
- (ii) The graph of the equation  $4x + 5 = 0$  is (b)
- (iii) The simultaneous equations  $8x + 7y = 56$  and  $4x + 4y = 28$  (a)
- (iv) In which of the following geometric figures the diagonals bisect each other perpendicularly? (d)
- (v) If in a number, digit in the units' place be Y and digit in the tens' place be X, then the number will be (c)
- (vi) If  $3^{2x} = 81$  then value of  $3^{-x}$  will be (b)

Q2) Fill in the blanks: 1x4=4

(i) Third (ii) 8 units (iii)  $1/25$  (iv) Other than 3 (v) Rs. 60

Q3) State True or False : 1x4=4

- (i) BD is the diagonal of the parallelogram ABCD. If  $\angle BAD = 75^\circ$  and  $\angle CBD = 55^\circ$  then measure of  $\angle BCD$  is 45 False
- (ii) Sum of two rational number is always whole number False
- (iii) If the denominator of a proper fraction is 3 greater than the numerator (x) then the fraction will be  $x/3$ . False
- (iv) If  $f(x) = 2x^3 + x^2 + x + 4$  then the value of  $f(1) + f(-1)$  will be 10. True

GROUP-B

Q4) Answer the following : 2x9=18

- (i) Write three rational numbers between  $1/3$  and  $1/2$ . Ans :  $5/12, 9/24, 17/48$
- (ii) In the parallelogram ABCD if  $\angle B = 65^\circ$  then find the value of  $\angle A$  and  $\angle D$

$\angle A + \angle B = 180^\circ$  (co interior angles are supplementary)

$\angle A = 115^\circ$

$\angle B = \angle D = 65^\circ$  (opposite angles are equal)

- (iii) If  $x^{1/a} = y^{1/b} = z^{1/c}$  and  $a+b+c = 0$  then prove that,  $xyz = 1$ .

Let  $x^{1/a} = y^{1/b} = z^{1/c} = k$

L.H.S =  $xyz = k^a \cdot k^b \cdot k^c = k^{a+b+c} = k^0 = 1 = R.H.S$

- (iv) If  $3 \times 27^x = 9^{x+4}$ , then find the value of x ?

$3^1 \times 3^{3x} = 3^{2x+8}$  or,  $3^{1+3x} = 3^{2x+8}$

Since bases are equal, powers must be equal

Hence  $1 + 3x = 2x + 8$ , or  $x = 7$

- (v) Show that the points (3,2) is equidistant from the points (-1,3) and (2,-2).

Distance between (3,2) and (-1,3) =  $\sqrt{(3+1)^2 + (2-3)^2} = \sqrt{17}$

Distance between (3,2) and (2,-2) =  $\sqrt{(3-2)^2 + (2+2)^2} = \sqrt{17}$  Hence proved

- (vi) If  $x/y = 5/16$  and  $x+y = 21$  then find the value of (x-y) ?

$16x = 5y$  and  $x + y = 21$ , By solving we get  $x = 5$  and  $y = 16$ , Hence  $x - y = 5 - 16 = -11$

- (vii)  $x^2 + y^2 - 2x + 4y = -5$ , then what are the values of x and y ?

$(x^2 - 2x + 1) + (y^2 + 4y + 4) = 0$

Or  $(x-1)^2 + (y+2)^2 = 0$

Therefore If the sum of the squares is zero then each term is zero.

Therefore  $x = 1$  and  $y = -2$

- (viii) If the ratio of CP and SP is 25:26, then what is the percentage of profit ?

Let C.P = Rs 25x and S.P = Rs. 26 x

Hence Profit % =  $(26x - 25x) \times 100 / 25x = 4\%$

- (ix) The length of the diagonal of a rhombus are 8cm and 6cm. Find the length of each side of the rhombus.

In a rhombus diagonals bisect each other at right angles. Hence side =  $\sqrt{4^2 + 3^2} = 5$ cm ( since dimensions cannot be negative )

Q5) Answer the following : ( Any 5) 3x5=15

- (i) Solve (by method of comparison) :  $2x + 3/4 = 5$ ;  $5x - 2/y = 3$

From 1<sup>st</sup> eq we get  $x = (5y - 3) / 2y$  -----(1) and from 2<sup>nd</sup> eq we get  $x = (3y + 2) / 5y$  -----(2)

Equating both (1) and (2) we get  $x = 1$  and  $y = 1$ .

- (ii) What will be the remainder if the polynomial  $8x^2 + 4x + 1$  is divided by  $(2x+1)$  ?

Putting  $x = -1/2$  we get  $f(-1/2) = 1$ , Hence R = 1

- (iii) What is the sum of the factors of  $x^3 - 1/x$  ?

$x(x^2 - 1/x^2) = x(x + 1/x)(x - 1/x)$ , Hence sum =  $x + x + 1/x + x - 1/x = 3x$   
 (iv) In the parallelogram ABCD,  $\angle A = 75^\circ$ . Then find the values of  $\angle B$  and  $\angle C$ .

$\angle B = 105^\circ$  and  $\angle C = 75^\circ$   
 (v) If  $p^a = q^b = r^c$  and  $pqr = 1$  then prove that  $1/a + 1/b + 1/c = 0$ .  
 $p^a = k$  or  $p = k^{1/a}$ , Similarly  $q = k^{1/b}$  and  $r = k^{1/c}$   
 Therefore  $pqr = k^{1/a} \cdot k^{1/b} \cdot k^{1/c}$   
 $1 = k^0 = k^{1/a + 1/b + 1/c}$

Hence  $1/a + 1/b + 1/c = 0$   
 (vi) Factorise :  $a^3 - 12a - 16$ .  
 $f(-2) = 0$ , Hence  $(a + 2)$  is a factor  
 $a^2(a + 2) - 2a(a + 2) - 8(a + 2)$   
 $(a + 2)(a^2 - 2a - 8) = (a + 2)(a + 2)(a - 4)$

Group-C

(6) Answer the following questions:-

(4 X 2 = 8)

a) Determine the solution of the given equation graphically:  $3x + 2y = 12 = 9x - 2y$   
 Find three co ordinates of each equation and their intersection point is (2, 3)  
 b) Prove that the point (-2, -11) is equidistant from two points (-3, 7) and (4, 6)  
 Distance between A (-2, -11) and B (-3, 7) is  
 $AB^2 = (-2+3)^2 + (-11-7)^2 = 325$   
 Distance between A (-2, -11) and C (4, 6) is  
 $AC^2 = (-2-4)^2 + (-11-6)^2 = 325$   
 Hence  $AB^2 = AC^2$   
 Therefore  $AB = AC$

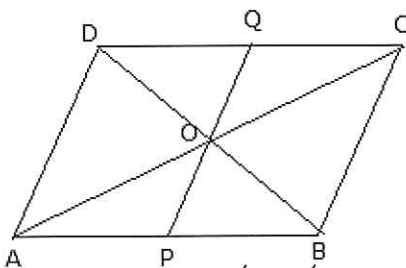
(c) The sum of the present ages of the father and the son is 46 years. When the age of the son will be equal to the age of the father, the sum of their ages will be 102 years. Find the present age of each of them.

Let the present age of father be x years and son be y years.  
 According to the eq we have  $x + y = 46$  -----(1)  
 Father is older than son by (x - y) years. Therefore after (x - y) years the age of the father will be (x + x - y) years, or (2x - y) years  
 Hence according to the condition we get  $(2x - y) + x = 102$ , or  $3x - y = 102$  -----(2)  
 From (1) and (2) we get  $x = 37$ . Putting value of x in (1) we get  $y = 9$   
 Hence age of father = 37 years and age of son is = 9 years.

(5 X 4 = 20)

(7) Answer the following questions:

a) Prove that the diagonals of a parallelogram bisect each other.  
 Refer to Theorem 15, page 91 of Ganit Prakash - IX  
 b) The diagonals AC and BD of the parallelogram ABCD intersect at the point O. A straight line through O intersects AB and DC at the points P and Q. Prove that  $OP = OQ$ .



In  $\Delta OAP$  and  $\Delta OCQ$  we get  $\angle AOP = \angle COQ$   
 and  $\angle OAP = \angle OCQ$  and  $OA = OC$   
 Therefore  $\Delta OAP$  is congruent to  $\Delta OCQ$   
 Therefore  $OP = OQ$  ( Proved )

c) Write the values of a and b if  $x^2 - 4$  is a factor of the polynomial  $ax^4 + 2x^3 - 3x^2 + bx - 4$

$f(x) = ax^4 + 2x^3 - 3x^2 + bx - 4$   
 Putting  $x = 2$  in the above eq we get  $f(2) = 16a + 2b$   
 Putting  $x = -2$  in the above eq we get  $f(-2) = 16a - 2b - 32$   
 But  $x^2 - 4$  is a factor of  $f(x)$   
 Hence  $16a + 2b = 0$  and  $16a - 2b - 32 = 0$

Solving  $a = 1$  and  $b = -8$   
 4) Factorize:  $5a^3 + 11a^2 + 4a - 2$   
 $5a^2(a + 1) + 6a(a + 1) - 2(a + 1)$   
 $(a + 1)(5a^2 + 6a - 2)$

5) A trader sold a bicycle at a profit of 10%. Had he bought the bicycle at 10% less price and sold it at a price ₹ 12 more, he would have gained 25%. What is the cost price of the bicycle?

Let the C.P of the bicycle be Rs. x. It is sold at a profit of 10%. So Selling price =  $Rs. 110x/100 = Rs. 11x/10$   
 Again if the C.P of the bicycle is 10% less, the C.P will be then is  $Rs. 90x/100 = Rs. 9x/10$  Hence the S.P of the bicycle at a profit of 25% =  $Rs. (125 \times 9x) / 100 \times 10 = Rs. 9x/8$

According to the question  $9x/8 = 11x/10 + 12$ . Solving for x, we get  $x = Rs. 480$   
 So, the reqd C.P of the bicycle is Rs. 480