SATISH SCIENCE ACADEMY

DHANORI PUNE-411015

PAIR OF LINEAR EQUATIONS IN TWO VARIABLES

Class 10 - Mathematics

Time Allowed: 3 hours **Maximum Marks: 170**

Section A

1. If the pair of linear equations x - y = 1, x + ky = 5 has a unique solution x = 2, y = 1, then the value of k is: **[1]**

   a) 3 b) -2

   c) -3 d) 4

2. If x - y = 2 and $\frac{2}{x+y} = \frac{1}{5}$ then **[1]**

   a) x = 6, y = 4 b) x = 7, y = 5

   c) x = 5, y = 3 d) x = 4, y = 2

3. The value of k, for which the system of equations kx - 3y + 6 = 0, 4x - 6y + 15 = 0 represent parallel lines, is _____. **[1]**

   a) 4 b) 2

   c) 1 d) 3

4. ₹ 9,000 were divided equally among a certain number of persons. If there been 20 more persons, each would have got ₹ 160 less. Find the original number of persons. **[1]**

   a) 26 b) 27

   c) 25 d) 24

5. For what value of k, do the equations kx - 2y = 3 and 3x + y = 5 represent two lines intersecting at a unique point? **[1]**

   a) all real values except -6 b) k = 3

   c) k = 6 d) k = -3

6. Which out of the following type of straight lines will be represented by the system of equations 3x + 4y = 5 and 6x + 8y = 7? **[1]**

   a) Perpendicular to each other b) Intersecting

   c) Coincident d) Parallel

7. In a given fraction, if 1 is subtracted from the numerator and 2 is added to the denominator, it becomes $\frac{1}{2}$. If 7 is subtracted from the numerator and 2 is subtracted from the denominator, it becomes $\frac{1}{3}$. The fraction is **[1]**

   a) $\frac{16}{21}$ b) $\frac{16}{27}$

   c) $\frac{15}{26}$ d) $\frac{13}{24}$

8. Value of x in pair of linear equations 36x + 24y = 702 and 24x + 36y = 558 is _____. **[1]**

a) $\frac{33}{2}$ b) 17

c) 16 d) $\frac{145}{7}$

9. The pair of linear equations x + 2y + 5 = 0 and -3x - 6y + 1 = 0 has: **[1]**

a) exactly two solutions b) a unique solution

c) no solution d) infinitely many solutions

10. The solution of the system of equations $\frac{2x+5y}{xy}$ = 6 and $\frac{4x-5y}{xy}$ + 3 = 0 (where x $\neq$0, y $\neq$0), is _____. **[1]**

a) 1, 2 b) 0, 0

c) 1, -2 d) -1, 2

11. The sum of the numerator and denominator of a fraction is 18. If the denominator is increased by 2, the fraction reduces to $\frac{1}{3}$. The fraction is **[1]**

a) $\frac{-7}{11}$ b) $\frac{5}{13}$

c) $\frac{-5}{13}$ d) $\frac{7}{11}$

12. Which of the following linear equation coincide with the line 4x + 5y = 15? **[1]**

a) 8x + 10y = 25 b) 12x + 15y = 45

c) 7x + 14y = 17 d) 2x + 3 y = 7

13. A and B are friends. A is elder to B by 5 years. B's sister C is half the age of B while A's father D is 8 years older than twice the age of B. If the present age of D is 48 years, then find the present ages of A, B and C respectively. **[1]**

a) 40 years, 20 years, 15 years b) 20 years, 15 years, 10 years

c) 50 years, 25 years, 20 years d) 25 years, 20 years, 10 years

14. Two numbers are in the ratio 1 : 3. If 5 is added to both the numbers, the ratio becomes 1 : 2. The numbers are **[1]**

a) 5 and 15 b) 7 and 21

c) 4 and 12 d) 6 and 18

15. If the system 6x – 2y = 3, kx – y = 2 has a unique solution, then **[1]**

a) k = 3 b) $k \neq 4$

c) $k \neq 3$ d) k = 4

16. In a cyclic quadrilateral ABCD, if $\angle$A = $(2x - 1)^o$, $\angle$B = $(y + 5)^o$, $\angle$C = $(2y + 15)^o$ and $\angle$D = $(4x - 7)^o$, then the value of $\angle C$ is **[1]**

a) 55^o b) 125^o

c) 65^o d) 115^o

17. If (-3, 2) is a solution of the linear equation 5x + 3 ky = 3, then the value of k is _____. **[1]**

a) 5 b) 6

c) 2 d) 3

18. The sum of the digits of a two-digit number is 15. The number obtained by interchanging the digits exceeds the given number by 9. The number is **[1]**

a) 69 b) 87

c) 78 d) 96

19. The sum of the digits of a two-digit number is 12. The number obtained by interchanging the two digits exceeds the given number by 18. Find the number. **[1]**

a) 58 b) 57

c) 85 d) 75

20. Graphically, the pair of equations 6x - 3y + 10 = 0, 2x - y + 9 = 0 represents two lines which are **[1]**

a) parallel b) Intersect at two points

c) coincident d) intersect at a point

21. **Assertion (A):** If kx - y - 2 = 0 and 6x - 2y - 3 = 0 are inconsistent, then k = 3 **[1]**

Reason (R): $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ are inconsistent if $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

a) Both A and R are true and R is the correct explanation of A. b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false. d) A is false but R is true.

22. **Assertion (A):** Every line represented by linear equation in two variables of type ax + by + c = 0 ($a \neq 0$, $b \neq 0$, $c \neq 0$) always meet both the axes (x-axis and y-axis) exactly at one point. **[1]**

Reason (R): Line represented by equation ax + by + c = 0 cuts x-axis at $-\frac{c}{a}$ and y-axis at $-\frac{c}{b}$ as equation of x-axis is y = 0 and equation y-axis is x = 0.

a) Both A and R are true and R is the correct explanation of A. b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false. d) A is false but R is true.

23. **Assertion (A):** The graphic representation of the equations x + 2y = 3 and 2x + 4y + 7 = 0 gives a pair of coincident lines. **[1]**

Reason (R): The graph of linear equations $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ gives a pair of coincident lines if $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$.

a) Both A and R are true and R is the correct explanation of A. b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false. d) A is false but R is true.

24. **Assertion (A):** If the pair of lines are coincident, then we say that pair of lines is consistent and it has a unique solution. **[1]**

Reason (R): If the pair of lines are parallel, then the pair has no solution and is called inconsistent pair of equations.

a) Both A and R are true and R is the correct explanation of A. b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false. d) A is false but R is true.

25. **Assertion (A):** Both lines represented by x + y = 0 and x – y = 0 meet at origin. **[1]**

Reason (R): Equations of type ax + by = 0 and bx + ay = 0 always pass through origin, i.e., meet at origin.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

26. **Assertion (A):** For k = 6, the system of linear equations x + 2y + 3 = 0 and 3x + ky + 6 = 0 is inconsistent. **[1]**

Reason (R): The system of linear equations $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ is inconsistent if $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

27. **Assertion (A):** Line represented by 2x + 2y = 0 and x + y = 0 do have non-zero solutions. **[1]**

Reason (R): Two lines represented by ax + by = 0 and px + qy = 0 always has non-zero solutions.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

28. **Assertion (A):** Lines represented by equations x + 2y = 3 and 2x – y = 1 intersects at a point, i.e., system has infinite solutions. **[1]**

Reason (R): System of parallel lines is known as inconsistent or no solution.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

29. **Assertion (A):** System of equations x + py = 6 and 2x + 3y = 8 can never have infinite solutions for any real value of k. **[1]**

Reason (R): Condition of inconsistency for system of linear equation in two variables is $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

30. **Assertion (A):** The system of linear equations 3x + 5y - 4 = 0 and 15x + 25y - 25 = 0 is inconsistent. **[1]**

Reason (R): The pair of linear equations $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ is inconsistent if $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

Section B

31. A number consists of two digits whose sum is 10. If 18 is subtracted from the number, its digits are reversed. Find the number. **[2]**

32. The sum of the digits of a two digit number is 13. The number obtained by interchanging the digits of the given number exceeds the number by 27. Find the number. **[2]**

33. A man bought 4 horses and 9 cows for Rs. 1340. He sells the horses at a profit of 10% and the cows at a profit of **[2]**

20% and his whole gain is Rs. 188. What price did he pay for the horse?

34. The sum of the digits of a two-digit number is 12. The number obtained by interchanging its digits exceeds the given number by 18. Find the number. **[2]**

35. The result of dividing a number of two digits by the number with the digits reversed is $\frac{7}{4}$. If the sum of the digits is 12, find the number. **[2]**

36. A number consists of three digits whose sum is 17. The middle one exceeds the sum of the other two by 1. If the digits be reserved, the number is diminished by 396. find the number. **[2]**

37. The sum of the digits of a two digit number is 9. The number obtained by reversing the order of digits of the given number exceeds the given number by 27. Find the given number. **[2]**

38. Half the perimeter of a rectangular garden, whose length is 12 m more than its width is 60 m. Find the length of the garden. **[2]**

39. On comparing the ratios $\frac{a_1}{a_2}, \frac{b_1}{b_2}$ and $\frac{c_1}{c_2}$, find out whether the lines representing the pair of linear equations intersect at a point, are parallel or coincident: 5x – 4y – 8 = 0; 7x + 6y – 9 = 0. **[2]**

40. Do the equations 4x + 3y – 1 = 5 and 12x + 9y = 15 represent a pair of coincident lines? Justify your answer. **[2]**

41. Ten students of class X took part in Mathematics quiz. If the number of girls is 4 more than the number of boys. Represent this situation algebraically and graphically. **[2]**

42. Find two numbers whose sum is 75 and difference is 15. **[2]**

43. Ratio between the girls and boys in a class of 40 students is 2:3. Five new students joined the class. How many of them must be boys so that the ratio between girls and boys becomes 4: 5? **[2]**

44. Two rails are represented by the equations: x + 2y – 4 = 0 and 2x + 4y – 12 = 0. Will the rails cross each other? **[2]**

45. Find the value(s) of p in the pair of the equation: 3x – y – 5 = 0 and 6x – 2y – p = 0, if the lines represented by these equations are parallel. **[2]**

46. Show that x = 3, y = 2 is not a solution of the system of linear equations 3x - 2y = 5, 2x + y = 7 **[2]**

47. Find whether the lines representing the following pair of linear equations intersect at a point, are parallel or coincident: **[2]**

$\frac{3}{2}x + \frac{5}{3}$y=7; $\frac{3}{2}x + \frac{2}{3}$y=6

48. 8 chairs and 5 tables for a classroom cost ₹10500, while 5 chairs and 3 tables cost ₹6450. Find the cost of each chair and that of each table. **[2]**

Section C

49. Solve: **[3]**

37x + 41y=70

41x + 37y =86

50. Solve the system of equations by using the method of substitution: **[3]**

x + 2y = -1

2x - 3y = 12

51. Determine by drawing the graphs, whether the system of linear equations has a unique solution or not: **[3]**

2x + 5y = 10; x - 3 = 0

52. The area of a rectangle remains the same if the length is increased by 7 metres and the breadth is decreased by 3 metres. The area remains unaffected if the length is decreased by 7 metres and breadth is increased by 5 metres. Find the dimensions of the rectangle. **[3]**

53. Champa went to a **Sale** to purchase some pants and skirts. When her friends asked her how many of each she had bought, she answered, **The number of skirts is two less than twice the number of pants purchased. Also,** **[3]**

the number of skirts is four less than four times the number of pants purchased. Help her friends to find how many pants and skirts Champa bought.

54. The sum of digits of a two digit number is 15. The number obtained by reversing the order of digits of the given number exceeds the given number by 9. Find the given number. **[3]**

55. Determine by drawing graphs, whether the following pair of linear equations has a unique solution or not: $3x + 4y = 12$; $y = 2$. **[3]**

56. Father's age is three times the sum of ages of his two children. After 5 years, his age will be twice the sum of ages of two children. Find the age of father. **[3]**

57. The cost of two kg of apples and 1 kg of grapes on a day was found to be Rs.160. After a month the cost of 4 kg apples and 2 kg grapes is Rs.300. Represent the situation algebraically and graphically. **[3]**

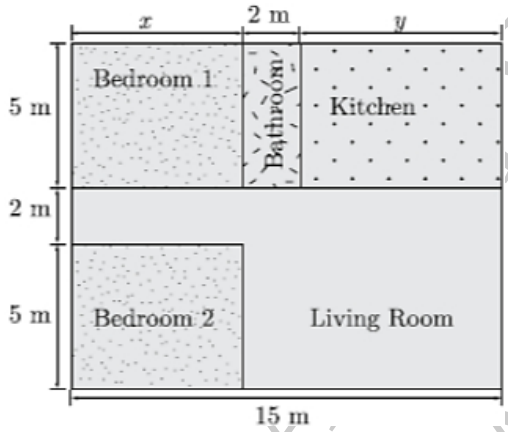
58. Solve $2x + 3y = 11$ and $2x - 4y = -24$ and hence find the value of 'm' for which $y = mx + 3$. **[3]**

Section D

59. **Read the following text carefully and answer the questions that follow:** **[4]**

Architect : An architect is a skilled professional who plans and designs buildings and generally plays a key role in their construction. Architects are highly trained in the art and science of building design. Since they bear responsibility for the safety of their buildings' occupants, architects must be professionally licensed.

Vishu is a licensed architect and design very innovative house. She has made a house layout for her client which is given below. In the layout, the design and measurements has been made such that area of two bedrooms and kitchen together is 95 sq. m.



i. Which pair of linear equations does describe this situation? (1)

ii. What is the length of the outer boundary of the layout? (1)

iii. What is the area of the bedroom 1? (2)

OR

What is the area of living room in the layout? (2)

60. **Read the following text carefully and answer the questions that follow:** **[4]**

TOWER OF PISA : To prove that objects of different weights fall at the same rate, Galileo dropped two objects with different weights from the Leaning Tower of Pisa in Italy. The objects hit the ground at the same time. An object dropped off the top of Leaning Tower of Pisa falls vertically with constant acceleration. If s is the distance of the object above the ground (in feet) t seconds after its release, then s and t are related by an equation of the form $s = a + bt^2$ where a and b are constants. Suppose the object is 180 feet above the ground 1 second after its

release and 132 feet above the ground 2 seconds after its release.

i. Find the constants a and b. (1)

ii. How high is the Leaning Tower of Pisa? (1)

iii. How long does the object fall? (2)

OR

At t = 2 sec, the object is at what height? (2)

61. **Read the following text carefully and answer the questions that follow:** **[4]**

A coaching institute of Mathematics conducts classes in two batches I and II and fees for rich and poor children are different. In batch I, there are 20 poor and 5 rich children, whereas in batch II, there are 5 poor and 25 rich children. The total monthly collection of fees from batch I is ₹ 9000 and from batch II is ₹ 26,000. Assume that each poor child pays ₹ x per month and each rich child pays ₹ y per month.

i. Represent the information given above in terms x and y. (1)

ii. Find the monthly fee paid by a poor child. (1)

iii. Find the difference in the monthly fee paid by a poor child and a rich child. (2)

OR

If there are 10 poor and 20 rich children in batch II, what is the total monthly collection of fees from batch II? (2)

62. **Read the following text carefully and answer the questions that follow:** **[4]**

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.

i. Represent the following information algebraically (in terms of x and y). (1)

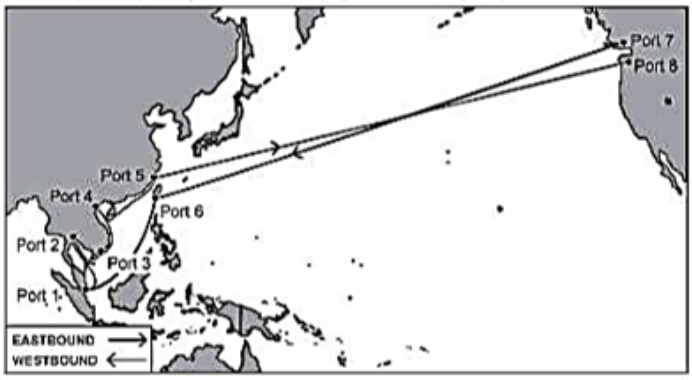
ii. What is the prize amount for hockey? (1)

iii. Prize amount on which game is more and by how much? (2)

OR

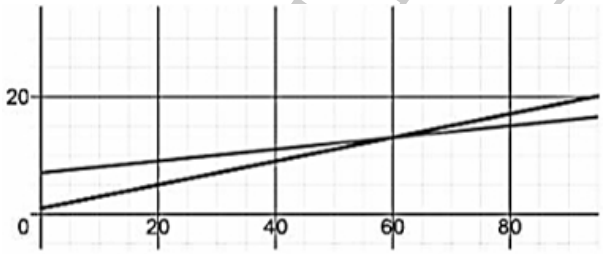
What will be the total prize amount if there are 2 students each from two games? (2)

63. Large cargo ships ferry cargo between ports. They take months to ferry them from one port to another. The distance in the sea is calculated in nautical miles (nm). The map shows the eastbound (grey) and westbound (black) cargo lines of a shipment company. **[4]**



The distance between port 6 and port 7 is approximately 20000 nm and a ship takes 95 days to travel between the ports in either direction.

The distance-time graph drawn by Pooja shows the journey of eastbound and westbound ships.



i. What do the two axes in the graph show?

ii. According to Pooja's graph, what is the approximate distance travelled by the eastbound ship during these 95 days?

iii. Anish looks at the graph and claims that an eastbound ship route meets the westbound route at 13000 nm. Is he correct? Give reasons.

iv. The eastbound and westbound journeys are of different length in 95 days. What can be the possible reason for it?

64. **Read the following text carefully and answer the questions that follow:** **[4]**

Essel World is one of India's largest amusement parks that offers a diverse range of thrilling rides, water attractions and entertainment options for visitors of all ages. The park is known for its iconic ''Water Kingdom'' section, making it a popular destination for family outings and fun-filled adventure. The ticket charges for the

park are ₹ 150 per child and ₹ 250 per adult.

On a day, the cashier of the park found that 300 tickets were sold and an amount of ₹ 55,000 was collected.

Based on the above, answer the following questions:

i. If the number of children visited be x and the number of adults visited be y, then write the given situation algebraically. **(1)**

ii. a. How many children visited the amusement park that day? **(2)**

OR

b. How many adults visited the amusement park that day? **(2)**

iii. How much amount will be collected if 250 children and 100 adults visit the amusement park? **(1)**

Section E

65. On selling a tea set at 5% loss and a lemon set at 15% gain, a crockery seller gains ₹ 7. If he sells the tea set at 5% gain and the lemon set at 10% gain, he gains ₹ 13. Find the actual price of each of the tea set and the lemon set. **[5]**

66. Solve the system of equations graphically: **[5]**

x + y =3

3x - 2y =4

67. Draw the graphs of the following equations: **[5]**

2x - 3y + 6 = 0

2x + 3y - 18 = 0

y - 2 = 0

Find the vertices of the triangle so obtained. Also, find the area of the triangle.

68. Determine graphically the vertices of a trapezium, the equations of whose sides are: x = 0, y = 0, y = 4 and 2x + y = 6 Also, determine its area. **[5]**

69. A fraction becomes $\frac{3}{4}$, if 2 is added to the numerator and 1 is added to the denominator. If 2 is subtracted from the numerator and 1 is subtracted from the denominator, it becomes $\frac{1}{2}$. Find the fraction. **[5]**

70. The area of a rectangle gets reduced by 9 square units, if its length is reduced by 5 units and the breadth is increased by 3 units. The area is increased by 67 square units if length is increased by 3 units and breadth is increased by 2 units. Find the perimeter of the rectangle. **[5]**

71. Form a pair of linear equations in two variables using the following information and solve it graphically. Five years ago, sagar was twice as old as Tiru. Sagar's age will be ten years more than Tiru's age. Find their present age. **[5]**

72. Two digit number is obtained by either multiplying the sum of digits by 8 and then subtracting 5 by multiplying the difference of digits by 16 and then adding 3. Find the number. **[5]**

73. A shopkeeper sells a saree at 8% profit and a sweater at 10% discount, thereby getting a sum of ₹ 1008. If she had sold the saree at 10% profit and the sweater at 8% discount, she would have got ₹ 1028. Find the cost price of the saree and the list price (price before discount) of the sweater. **[5]**

74. Solve the following pair of linear equations graphically : **[5]**

$x - y = 1$

$2x + y = 8.$

Also find the co-ordinates of the points where the lines represented by the above equation intersect Y-axis.