CHAPTER 3

Pair of Linear Equations in Two Variables

1. OBJECTIVE QUESTIONS

1. A can do a piece of work in 24 days. If B is 60% more efficient than A, then the number of days required by B to do the twice as large as the earlier work is

(a) 24 (b) 36

(c) 15 (d) 30

Ans : (d) 30

$$\text{Work ratio of } A:B = 100:160 \text{ or } 5:8$$

$$\text{Time ratio} = 8:5 \text{ or } 24:15$$

If A takes 24 days, B takes 15 days, Hence, B takes 30 days to do double the work.

2. A motor boat takes 2 hours to travel a distance 9 km. down the current and it takes 6 hours to travel the same distance against the current. The speed of the boat in still water and that of the current (in km/hour) respectively are

(a) 3, 1.5 (b) 3, 2

(c) 3.5, 2.5 (d) 3, 1

Ans : (a) 3, 1.5

$$\text{Downrate} = 9 \div 2 = 4.5 \text{ km/hr}$$

$$\text{Uprate} = 9 \div 6 = 1.5 \text{ km/hr}$$

$$\text{Speed of the boat} = (4.5 + 1.5) \div 2 = 3 \text{ km/hr}$$

$$\text{Speed of the current} = (4.5 - 1.5) \div 2 = 1.5 \text{ km/hr}$$

3. X's salary is half that of Y's. If X got a 50% rise in his salary and Y got 25% rise in his salary, then the percentage increase in combined salaries of both is

(a) 30 (b) $33\frac{1}{3}$

(c) $37\frac{1}{2}$ (d) 75

Ans : (b) $33\frac{1}{3}$

$$96\% \text{ of C.P.} = < 240$$

$$110\% \text{ of C.P.} = < \frac{240}{960} \times 1100 = < 275$$

4. The 2 digit number which becomes (5/6)th of itself when its digits are reversed. The difference in the digits of the number being 1, then the two digits number is

(a) 45 (b) 54

(c) 36 (d) None of these

Ans : (b) 54

If the two digits are x and y, then the number is $10x + y$.

$$\text{Now} \quad \frac{5}{6}(10x + y) = 10y + x$$

Solving, we get $44x + 55y$

$$\frac{x}{y} = \frac{5}{4}$$

Also $x - y = 1$. Solving them, we get $x = 5$ and $y = 4$. Therefore, number is 54.

5. The points (7, 2) and $(-1, 0)$ lie on a line

(a) $7y = 3x - 7$ (b) $4y = x + 1$

(c) $y = 7x + 7$ (d) $x = 4y + 1$

Ans : (b) $4y = x + 1$

The point satisfy the line, $4y = x + 1$.

6. In a number of two digits, unit's digit is twice the tens digit. If 36 be added to the number, the digits are reversed. The number is

(a) 36 (b) 63

(c) 48 (d) 84

Ans : (c) 48

Let unit's digit : x

tens digit : y

$$\text{Then,} \quad x = 2y$$

$$\text{Number} = 10y + x$$

$$\text{Also,} \quad 10y + x + 36 = 10x + y$$

$$9x - 9y = 36$$

$$\text{or} \quad x - y = 4$$

$$\text{Solve,} \quad x = 2y$$

$$x - y = 4$$

7. At present ages of a father and his son are in the ratio $7:3$, and they will be in the ratio 2 : 1 after 10 years. Then the present age of father (in years) is

(a) 42 (b) 56

(c) 70 (d) 77

Ans : (c) 70

Let the ages of father and son be $7x$, $3x$

Hence, $(7x+10):(3x+10) = 2:1$

or $x = 10$

Age of the father is 70 years.

8. If $3x+4y:x+2y = 9:4$, then $3x+5y:3x-y$ is equal to

(a) 4 : 1 (b) 1 : 4

(c) 7 : 1 (d) 1 : 7

Ans : (c) 7 : 1

$$\frac{3x+4y}{x+2y} = \frac{9}{4}$$

Hence, $12x+16y = 9x+18y$

or $3x = 2y$

$$x = \frac{2}{3}y$$

Substiture $x = \frac{2}{3}y$ in the required expression.

$$\frac{3x\frac{2}{3}y+5y}{3x\frac{2}{3}y-y} = \frac{7y}{y} = \frac{7}{1} = 7:1$$

9. A fraction becomes 4 when 1 is added to both the numerator and denominator and it becomes 7 when 1 is subtracted from both the numerator and denominator. The numerator of the given fraction is

(a) 2 (b) 3

(c) 5 (d) 15

Ans : (d) 15

Let the fraction be $\frac{x}{y}$,

$$\frac{x+1}{y+1} = 4 \quad ...(1)$$

and $$\frac{x-1}{y-1} = 7 \quad ...(2)$$

Solving (1) and (2),

We have $x = 15,\ y = 3,$

i.e. $x = 15$

10. x and y are 2 different digits. If the sum of the two digit numbers formed by using both the digits is a perfect square, then value of $x+y$ is

(a) 10 (b) 11

(c) 12 (d) 13

Ans : (b) 11

The numbers that can be formed are xy and yx. Hence, $(10x+y)+(10y+x) = 11(x+y)$. If this is a perfect square that $x+y = 11$.

11. The pair of equations $3^{x+y} = 81,\ 81^{x-y} = 3$ has

(a) no solution

(b) unique solution

(c) infinitely many solutions

(d) $x = 2\frac{1}{8}, y = 1\frac{7}{8}$

Ans : (d) $x = 2\frac{1}{8}, y = 1\frac{7}{8}$

Given, $3^{x+y} = 81$

$$3^{x+y} = 3^4$$

$$x+y = 4 \quad ...(1)$$

and $81^{x-y} = 3$

$$3^{4(x-y)} = 3^1$$

$$4(x-y) = 1$$

$$x-y = \frac{1}{4} \quad ...(2)$$

On adding Eq. (1) and (2), we get

$$2x = 4+\frac{1}{4} = \frac{17}{4}$$

$$x = \frac{17}{8} = 2\frac{1}{8}$$

From. Eq. (1), we get

$$y = \frac{15}{8} = 1\frac{7}{8}$$

12. A man can row a boat in still water at the rate of 6 km per hour. If the stream flows at the rate of 2 km/hour, he takes half the time going downstream than going upstream the same distance. His average speed for upstream and down stream trip is

(a) 6 km/hour

(b) 16/3 km/hour

(c) Insufficient data to arrive at the answer

(d) none of the above

Ans : (b) 16/3 km/hour

Upstream speed $= 4$ km/hr

and time $= x$ hrs

Downstream $= 8$ km/hr

and time taken $=$ x/2 hrs

Hence, average speed $= \frac{4x+8\times x/2}{x+x/2} = \frac{16}{3}$ km/hr.

13. A boat travels with a speed of 15 km/h in still water. In a river flowing at 5 km/hr. the boat travels some distance downstream and them returns. The ratio of average speed to the speed in still water is

(a) 8 : 3 (b) 3 : 8

(c) 8 : 9 (d) 9 : 8

Ans : (c) 8 : 9

Let distance $= d$

Time taken upstream $= \frac{d}{15-5} = \frac{d}{10}$

Time taken downstream $= \frac{d}{15+5} = \frac{d}{20}$

Hence, average speed $= \frac{2d}{\frac{d}{10}+\frac{d}{20}} = \frac{2d\times 20}{3d}$

$$= \frac{40}{3} \text{ km/hr}$$

$$\text{Ratio} = \frac{40}{3}:15$$

$$= 40:45 = 8:9$$

14. The pair of linear equations $2kx+5y = 7,\ 6x-5y = 11$ has a unique solution, if

(a) $k \neq -3$ (b) $k \neq \frac{2}{3}$

(c) $k \neq 5$ (d) $k \neq \frac{2}{9}$

Ans : (a) $k \neq -3$

Given the pair of linear equations are

$$2kx + 5y - 7 = 0$$
and $$6x - 5y - 11 = 0$$
On comparing with
$$a_1x + b_1y + c_1 = 0$$
and $$a_2x + b_2y + c_2 = 0$$
we get, $$a_1 = 2k,\ b_1 = 5,\ c_1 = -7$$
and $$a_2 = 6,\ b_2 = -5,\ c_2 = -11$$
For unique solution,
$$\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$$
$$\frac{2k}{6} \neq \frac{5}{-5}$$
$$\frac{k}{3} =\neq -1$$
$$k \neq -3$$

15. A and B together can do a piece of work in 12 days, B and C together in 15 days. If A is twice as good a workman as C, then in how many days will B alone do it?

(a) 10 days (b) 15 days
(c) 20 days (d) 25 days

Ans : (c) 20 days

Let A alone complete the work in x days. C alone will take $2x$ days to complete it. Let B alone complete the work in y days. According to the question,
$$\frac{1}{x} + \frac{1}{y} = \frac{1}{12} \qquad ...(1)$$
and $$\frac{1}{y} + \frac{1}{2x} = \frac{1}{15} \qquad ...(2)$$
Let $\frac{1}{x} = u$ and $\frac{1}{y} = v$, then Eq. (1) and (2) become
$$u + v = \frac{1}{12} \qquad ...(3)$$
and $$\frac{1}{2}u + v = \frac{1}{15} \qquad ..(4)$$
Subtracting Eq. (4) from Eq. (3), we get
$$u - \frac{1}{2}u = \frac{1}{12} - \frac{1}{15}$$
$$\frac{u}{2} = \frac{5-4}{60} = \frac{1}{60}$$
$$u = \frac{2}{60} = \frac{1}{30}$$
Putting the value of u in Eq. (3), we get
$$\frac{1}{30} + v = \frac{1}{12}$$
$$v = \frac{1}{12} - \frac{1}{30} = \frac{5-2}{60} = \frac{3}{60} = \frac{1}{20}$$
Now, we have $u = \frac{1}{30}$ and $v = \frac{1}{20}$
$$\frac{1}{x} = \frac{1}{30}$$
and $$\frac{1}{y} = \frac{1}{20} \Rightarrow x = 30,\ y = 20$$
Hence, B alone will complete the work in 20 days.

16. When a man travels equal distance at speed x km/h and y km/h, his average speed is 4 km/h. But when he travels at these speed for equal time, his average speed is 4.5 km/h. The difference of the two speed is

(a) 2 km/h (b) 4 km/h
(c) 3 km/h (d) 5 km/h

Ans : (c) 3 km/h

Suppose the equal distance $= D$ km

Then, time taken with x and y speed are $\frac{D}{x}$ h and $\frac{D}{y}$ h, respectively,

Case I:
$$\text{Average speed} = \frac{\text{Total distance}}{\text{Total time}}$$
$$4 = \frac{2D}{\frac{D}{x} + \frac{D}{y}} \Rightarrow \frac{2xy}{x+y} = 4 \qquad ...(1)$$

Case II:
$$\text{Average speed} = \frac{x+y}{2} = 4.5 \text{ km/h}$$
$$x + y = 9 \qquad ...(2)$$
On putting this value in Eq. (1), we get,
$$\frac{2xy}{9} = 4 \Rightarrow xy = 18 \qquad ...(3)$$
Now, difference between two speed $= x - y$

Now, $$(x-y)^2 = (x+y)^2 - 4xy = (9)^2 - 4(18)$$
[From Eq. (2) and (3)]
$$= 81 - 72$$
$$(x-y)^2 = 9 \Rightarrow x - y = 3 \qquad ...(4)$$
On adding Eq. (2) and (4), we get
$$2x = 12$$
$$x = \frac{12}{2} = 6$$
On putting the value of x in Eq. (4), we get
$$6 - y = 3$$
$$y = 3$$
Hence, $x = 6$ km/h and $y = 3$ km/h

and, their difference $= 6 - 3 = 3$ km/h.

17. 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, then the cost of the saree and the list price (price before discount) of the sweater is

(a) 300, 400 (b) 400, 300
(c) 400, 600 (d) 600, 400

Ans : (d) 600, 400

Let, the cost price of the saree and the list price of the sweater be ₹x and ₹y, respectively.

Case I: Sells a saree at 8% profit + Sells a sweater at 10% discount = ₹1008
$$(100+8)\% \text{ of } x + (100-10)\% \text{ of } y = 1008$$
$$108\% \text{ of } x + 90\% \text{ of } y = 1008$$
$$1.08x + 0.9y = 1008 \qquad ...(1)$$
Case II: Sold the saree at 10% profit + Sold the sweater at 8% discount = ₹1028
$$(100+10)\% \text{ of } x + (100-8)\% \text{ of } y = 1028$$
$$110\% \text{ of } x + 92\% \text{ of } y = 1028$$
$$1.1x + 0.92y = 1028 \qquad ...(2)$$

On putting the value of y from Eq. (1) into Eq. (2), we get,

$$1.1x + 0.92\left(\frac{1008 - 1.08x}{0.9}\right) = 1028$$

$$1.1 \times 0.9x + 927.36 - 0.9936x = 1028 \times 0.9$$

$$0.99x - 0.9936x = 925.2 - 927.36$$

$$-0.0036x = -2.16$$

$$x = \frac{2.16}{0.0036} = 600$$

On putting the value of x in Eq. (1), we get

$$1.08 \times 600 + 0.9y = 1008$$

$$648 + 0.9y = 1008$$

$$0.9y = 1008 - 648$$

$$0.9y = 360$$

$$y = \frac{360}{0.9} = 400$$

Hence, the cost price of the saree and the list price (price before discount) of the sweater are ₹600 and ₹400, respectively.

18. If $3|x| + 5|y| = 8$ and $7|x| - 3|y| = 48$, then the value of $x + y$ is

(a) 5
(b) -4
(c) 4
(d) The value does not exist

Ans : (d) The value does not exist

Let $|x| = a$ and $|y| = b$. Then, given equations becomes

$$3a + 5b = 8 \quad \text{...(1)}$$

and $$7a - 3b = 48 \quad \text{...(2)}$$

Now, on multiplying Eq. (1) by 3 and Eq. (2) by 5, we get

$$9a + 15b = 24 \quad \text{...(3)}$$

$$35a - 15b = 240 \quad \text{...(4)}$$

On adding Eq. (3) and (4), we get

$$44a = 264$$

$$a = 6$$

Now, on substituting $a = 6$ in Eq. (1), we get

$$18 + 5b = 8$$

$$5b = -10$$

$$b = -2$$

Thus, we get $a = 6$ and $b = -2$.

But $b = -2$ $|y| = -2$, which is not possible. Hence, the value of $x + y$ does not exist.

19. A fraction becomes 4/5 when 1 is added to each of the numerator and denominator. However, If we subtract 5 from each of them, it becomes 1/2. Then, numerator of the fraction is

(a) 6 (b) 7
(c) 8 (d) 9

Ans : (b) 7

Let the fraction be $\frac{x}{y}$

Then, according to question

$$\frac{x+1}{y+1} = \frac{4}{5}$$

$$5x + 5 = 4y + 4$$

$$5x - 4y = -1 \quad \text{...(1)}$$

and $$\frac{x-5}{y-5} = \frac{1}{2}$$

$$2x - 10 = y - 5$$

$$2x - y = 5 \quad \text{...(2)}$$

On multiplying Eq. (1) by 2 and Eq. (2) by 5 and then subtracting Eq. (2) from Eq. (1), we get

$$\begin{array}{r} 10x - 8y = -2 \\ 10x - 5y = 25 \\ - \quad + \quad - \\ \hline -3\cancel{y} = -27 \\ \hline y = 9 \end{array}$$

Substituting the value of y in Eq. (1), we get

$$5x - 4 \times 9 = -1$$

$$5x = -1 + 36$$

$$x = 7$$

Hence, Fraction $= \frac{7}{9}$

Therefore, numerator of this fraction is 7.

20. Which of the following pair of equations are inconsistent?

(a) $3x - y = 9$, $x - \frac{y}{3} = 3$
(b) $4x + 3y = 24$, $-2x + 3y = 6$
(c) $5x - y = 10, 10x - 2y = 20$
(d) $-2x + y = 3$, $-4x + 2y = 10$

Ans : (d) $-2x + y = 3$, $-4x + 2y = 10$

On comparing the above equations with standard from of pair of linear equations $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$, we get

(a) $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ as $\frac{3}{1} = \frac{3}{1} = \frac{-9}{-3}$, consistent

(b) $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$ as $\frac{4}{-2} \neq -1$, consistent

(c) $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ as $\frac{5}{10} = \frac{1}{2} = \frac{10}{20}$, consistent

(d) $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$ as $\frac{-2}{-4} = \frac{1}{2} \neq \frac{3}{10}$, inconsistent

21. The value of a for which the lines $x = 1$, $y = 2$ and

$a^2x+2y-20=0$ are concurrent, is

(a) 1 (b) 8

(c) -4 (d) -2

Ans : (c) -4

Given lines are, $x=1,\ y=2$

and $a^2x+2y-20=0$

Since, $x=1,\ y=2$

and $a^2x+2y-20=0$ are concurrent.

i.e., $x=1,\ y=2$

and $a^2x+2y-20=0$ having a common solution.

So, $x=1,\ y=2$ is a solution of given equation

$$a^2\cdot 1+2\cdot 2-20=0$$
$$a^2-16=0$$
$$a^2=16\quad a=-4,4$$

22. Vijay had some bananas and he divided them into two lots A and B. He sold the first lot at the rate of ₹2 for 3 bananas and the second lot at the rate of ₹1 per banana and got a total of ₹400. If he had sold the first lot at the rate of ₹1 per banana and the second lot at the rate of ₹4 for 5 bananas, his total collection would have been ₹460. Total number of bananas, he had is

(a) 200 (b) 300

(c) 400 (d) 500

Ans : (d) 500

Let, the number of bananas in lots A and B be x and y, respectively.

Case I: When rate for first lots is ₹2 for 3 bananas and rate for second lot is ₹1 per banana.

$$\frac{2}{3}x+y=400$$

$$2x+3y=1200 \qquad ...(1)$$

Case II: When rate for first lot is ₹1 per banana and rate for second lot is ₹4 for 5 bananas

$$x+\frac{4}{5}y=460$$

$$5x+4y=2300 \qquad ...(2)$$

On multiplying Eq. (1) by 4 and Eq. (2) by 3 and then subtracting them, we get,

$$\begin{array}{r} 8x+12y=4800 \\ 15x+12y=6900 \\ -\quad -\quad - \\ \hline -7x=-2100 \\ x=300 \end{array}$$

Now, on putting the value of x in Eq. (1), we get

$$2\times 300+3y=1200$$
$$600+3y=1200$$
$$3y=1200-600$$
$$3y=600\Rightarrow y=200$$

Hence, Total number of bananas $=$ Number of bananas in lot A $+$ Number of bananas in lot B

$$=x+y$$
$$=300+200=500$$

Hence, he had 500 bananas.

23. Shashi is decided fixed distance to walk on a tread mill. First day, she walks at a certain speed. Next day, she increases the speed of the tread mill by 1 km/h, she takes 6 min less and if she reduces the speed by 1 km/h, then she takes 9 min more. What is the distance that she has decided to walk everyday?

(a) 4 km (b) 6 km

(c) 5 km (d) 3 km

Ans : (d) 3 km

Let the speed of Shashi on first day be x km/h and let the time taken on first day be yh. Thus, distance walked everyday by Shashi is xy. Now, when she increases her speed by 1 km/h, then according to given condition

$$(x+1)(y-0.1)=xy$$

$$\left[\text{Since, }6\text{ min}=\frac{6}{60}\text{h}=0.1\text{h}\right]$$

$$-0.1x+y=0.1 \qquad ...(1)$$

and when she decrease her speed by 1 km/h, then according to given condition

$$(x-1)(y+0.15)=xy$$

$$\left[\text{since },9\text{ min}=\frac{9}{60}\text{h}=0.15\text{h}\right]$$

$$0.15x-y=0.15 \qquad ...(2)$$

on adding Eq. (1) and (2), we get

$$0.05x=0.25$$
$$x=5$$

On substituting the value of x in Eq. (1), we get

$$y=0.1+0.5=0.6$$

The distance that shashi decided to walk everyday is

$$xy=5\times 0.6=3\text{ km}$$

24. A vessel contain a mixture of 24 L milk and 6 L water and second vessel contains a mixture of 15 L milk and 10 L water, then how much mixture of milk and water should be taken from the first and the second vessel separately and kept in a third vessel so that the third vessel may contain a mixture of 25 L milk and 10 L water.

(a) 15 L and 15 L (b) 20 L and 10 L

(c) 20 L and 15 L (d) None of these

Ans : (c) 20 L and 15 L

Let xL of mixture be taken from 1st vessel and y L of the mixture be taken from 2nd vessel and kept in 3rd vessel, such that $(x+y)$L of the mixture in 3rd vessel may contain 25 L of milk and 10 L of water.

A mixture of xL from 1st vessel contains $\frac{24}{30}x=\frac{4}{5}x$ L of milk and $x/5$ L of water.

A mixture of yL from 2nd vessel contains $3y/5$ L of milk and $2y/5$ L of water.

According to the question

$$\frac{4}{5}x+\frac{3}{5}y=25$$

$$4x+3y=125 \qquad ...(1)$$

$$\frac{x}{5}+\frac{2}{5}y=10$$

$$x+2y=50 \qquad ...(2)$$

On multiplying Eq. (2) by 4 and then subtracting Eq.

(1) from it, we get

$$5y = 200 - 125$$
$$5y = 75$$
$$y = 15$$

On substituting $y = 15$ in Eq. (2), we get

$$x + 2 \times 15 = 50$$
$$x = 20$$

Hence, 20 L of mixture be taken from first vessel and 15 L of mixture be taken from second vessel.

25. The ratio of the areas of the two triangles formed by the lines representing the equations $2x + y = 6$ and $2x - y + 2 = 0$ with the X-axis and the lines with the Y-axis is

(a) 1:2 (b) 2:1

(c) 4:1 (d) 1:4

Ans : (c) 4:1

Given equations are $2x + y = 6$

and $2x - y + 2 = 0$

Table for equation, $2x + y = 6$ or $y = 6 - 2x$

x	0	1	3
$y = 6 - 2x$	6	4	0
Points	$A(0,6)$	$B(1,4)$	$C(3,0)$

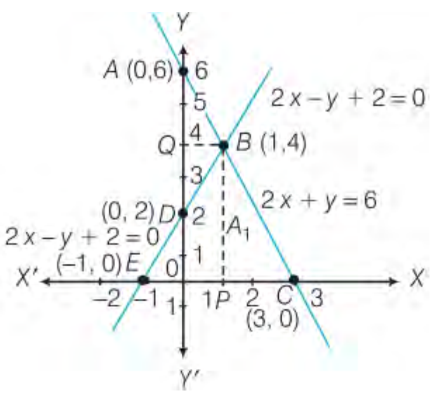
Table for equation $2x - y + 2 = 0$

or $y = 2x + 2$

x	0	-1	1
$y = 2x + 2$	2	0	4
Points	$D(0,2)$	$E(-1,0)$	$B(1,4)$

Now, plot all the points on a graph paper and join them to get the lines ABC and BDE.

It is clear from the graph that pair of equations intersects graphically at point $B(1,4)$, i.e. $x = 1$ and $y = 4$.



Thus, from the graph we get two triangles ΔBCE (triangle formed by lines and X-axis) and ΔABD (triangle formed by the lines and Y-axis). Let A_1 and A_2 represent the areas of ΔBCE and ΔABD, respectively.

Now, area of $\Delta BCE = \frac{1}{2} \times CE \times BP$

$$= \frac{1}{2} \times 4 \times 4 = 8 \text{ sq. units}$$

and, area of $\Delta ABD = \frac{1}{2} \times AD \times QB = \frac{1}{2} \times 4 \times 1$

$$= 2 \text{ sq. units}$$

Ratio of areas of $\Delta BCE : \Delta ABD = 8:2 = 4:1$

2. FILL IN THE BLANK

1. If the lines intersect at a point, then that point gives the unique solution of the two equations. In this case, the pair of equations is ....

Ans : consistent

2. An equation whose degree is one is known as a .... equation.

Ans : linear

3. If the lines are parallel, then the pair of equations has no solution. In this case, the pair of equations is ....

Ans : inconsistent

4. A pair of linear equations has .... solution (s) if it is represented by intersecting lines graphically.

Ans : unique

5. Two distinct natural numbers are such that the sum of one number and twice the other number is 6. The two numbers are ....

Ans : 4 and 1

6. The number of common solutions for the system of linear equations $5x + 4y + 6 = 0$ and $10x + 8y = 12$ is ....

Ans : zero

7. If $2x + 3y = 5$ and $3x + 2y = 10$, then $x - y =$ ....

Ans : 5

8. Every solution of a linear equation in two variables is a point on the .... representing it.

Ans : line

9. If $\frac{1}{x} + \frac{1}{y} = k$ and $\frac{1}{x} - \frac{1}{y} = k$, then the value of y is ....

Ans : Does not exist

10. If a pair of linear equations has infinitely many solutions, then its graph is represented by a pair of .... lines.

Ans : coincident

11. A pair of linear equations is .... if it has no solution.

Ans : inconsistent

12. If $p + q = k$, $p - q = n$ and $k > n$, then q is ....

(positive/negative).
Ans : positive

13. A pair of .... lines represent the pair of linear equations having no solution.
Ans : parallel

14. If a pair of linear equations has solution, either a unique or infinitely many, then it is said to be ....
Ans : consistent

3. TRUE/FALSE

1. The pair of equations $4x-5y=8$ and $8x-10y=3$ has a unique solution.
Ans : False

2. A pair of intersecting lines representing a pair of linear equations in two variables has a unique solution.
Ans : True

3. $\sqrt{2}\,x+\sqrt{3}\,y=0$, $\sqrt{3}\,x-\sqrt{8}\,y=0$ has no solution.
Ans : False

4. A pair of linear equations cannot have exactly two solutions.
Ans : True

5. If a pair of linear equations is given by $a_1x+b_1y+c_1=0$ and $a_2x+b_2y+c_2=0$ and $\frac{a_1}{a_2}\neq\frac{b_1}{b_2}$. In this case, the pair of linear equations is consistent.
Ans : True

6. A pair of linear equations in two variables is said to be consistent if it has no solution.
Ans : False

7. If a pair of linear equations is given by $a_1x+b_1y+c_1=0$ and $a_2x+b_2y+c_2=0$ and $\frac{a_1}{a_2}=\frac{b_1}{b_2}=\frac{c_1}{c_2}$. In this case, the pair of linear equations is consistent.
Ans : True

8. A pair of linear equations in two variables may not have infinitely many solutions.
Ans : True

9. $3x-y=3, 9x-3y=9$ has infinite solution.
Ans : True

10. A linear equation in two variables always has infinitely many solutions.
Ans : False

11. If two lines are parallel, then they represent a pair of inconsistent linear equations.
Ans : True

12. If a pair of linear equation is given by $a_1x+b_1y+c_1=0$ and $a_2x+b_2y+c_2=0$ and $\frac{a_1}{a_2}=\frac{b_1}{b_2}\neq\frac{c_1}{c_2}$. In this case, the pair of linear equations is consistent.
Ans : False

13. For all real values of c, the pair of equations $x-2y=8, 5x+10y=c$ have a unique solution.
Ans : True

14. $3x+2y=5,\quad 2x-3y=7$ are consistent pair of equation.
Ans : True

15. An equation of the form $ax+by+c=0$, where a, b and c are real numbers is called a linear equation in two variables.
Ans : True

16. In a ΔABC, $\angle C=3$, $\angle B=2(\angle A+\angle B)$, then angles are $20°, 40°, 100°$.
Ans : False

4. MATCHING QUESTIONS

DIRECTION : Each question contains statements given in two columns which have to be matched. Statements (A, B, C, D) in column I have to be matched with statements (p, q, r, s) in column II.

1. Column-II give value of x and y for pair of equation given in Column-I.

	Column-I		Column-II
(A)	$2x+y=8$, $x+6y=15$	(p)	(3, 4)
(B)	$5x+3y=35$, $2x+4y=28$	(q)	(1/14, 1/6)
(C)	$\frac{1}{7x}+\frac{1}{6y}=3$, $\frac{1}{2x}-\frac{1}{3y}=5$	(r)	(4, 5)
(D)	$15x+4y=61$ $4x+15y=72$	(s)	(3, 2)

Ans : (A) – s, (B) – r, (C) – q, (D) – p.

2.

	Column-I		Column-II
(A)	$5y-4=14$ $y-2x=1$	(p)	Infinite solutions
(B)	$6x-3y+10=0$ $2x-y+9=0$	(q)	Consistent
(C)	$3x-2y=4$ $9x-6y=12$	(r)	No solution
(D)	$2x-3y=8$ $4x-6y=9$	(s)	Inconsistent

Ans : (A) – q, (B) – s, (C) – p, (D) – r

3.

	Column-I		Column-II
(A)	No solution	(p)	$5x-15y=8$ $3x-9y=\frac{24}{5}$
(B)	Infinitely many solutions	(q)	$2x+4y=10$ $3x+6y=12$
(C)	Unique solution	(r)	$3x-2y=4$ $6x-4y=8$
(D)	System is consistent	(s)	$2x+y=6$ $4x-2y-4=0$
		(t)	$3x-y=8,\ x-\frac{y}{3}=3$
		(u)	$x-y=8,\ 3x-3y=16$

Ans : (A) – (q, t, u), (B) – (p, r), (C) – s, (D) – (p, r, s)

5. ASSERTION AND REASON

DIRECTION : In the following questions, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:

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

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

(c) Assertion (A) is true but reason (R) is false.

(d) Assertion (A) is false but reason (R) is true.

1. **Assertion :** If the system of equations $2x+3y=7$ and $2ax+(a+b)y=28$ has infinitely many solutions, then $2a-b=0$

Reason : The system of equations $3x-5y=9$ and $6x-10y=8$ has a unique solution.

Ans : (c) Assertion (A) is true but reason (R) is false.

Assertion : given system of equations has infinitely many solutions if,

$$\frac{2}{2a}=\frac{3}{a+b}=\frac{-7}{-28}$$

i.e. $\frac{1}{4}$

$$\frac{1}{a}=\frac{3}{a+b}=\frac{1}{4}$$

$$3a=a+b$$

$$2a-b=0$$

Also clearly, $a=4$, and $a+b=12$

$$b=8$$

$$2a-b=8-8=0$$

Assertion is true But reason is false,

$$\frac{3}{6}=\frac{-5}{-10}$$

$$[3(-10)=(-5)(6)=-30]$$

For unique solution if,

$$a_1x+b_2y+c_2=0,$$

then $\frac{a_1}{a_2}\neq\frac{b_1}{b_2}$

2. **Assertion :** $3x+4y+5=0$ and $6x+ky+9=0$ represent parallel lines if $k=8$.

Reason : $a_1x+b_1y+c_1=0$ and $a_2x+b_2y+c_2=0$ represent parallel lines if $\frac{a_1}{a_2}=\frac{b_1}{b_2}\neq\frac{c_1}{c_2}$.

Ans : (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

In Assertion, given lines represent parallel lines if

$$\frac{3}{6}=\frac{4}{k}\neq\frac{5}{9}$$

$$k=\frac{6\times4}{3}=8$$

Reason is also true

Also, reason is the correct explanation for assertion.

3. **Assertion :** The value of $q=\pm2$, if $x=3,y=1$ is the solution of the line $2x+y-q^2-3=0$.

Reason : The solution of the line will satisfy the equation of the line.

Ans : (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

As $x=3,y=1$ is the solution of

$$2x+y-q^2-3=0$$

$$2\times3+1-q^2-3=0$$

$$4-q^2=0$$

$$q^2+4=0$$

$$q=\pm2$$

So, both A and R are correct and R explains A.

4. **Assertion :** For $k=6$, the system of linear equations $x+2y+3=0$ and $3x+ky+6=0$ is inconsistent.

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

Ans : (c) Assertion (A) is true but reason (R) is false.

For inconsistent solution we have $\frac{a_1}{a_2}=\frac{b_1}{b_2}\neq\frac{c_1}{c_2}$

So, A is correct but R is incorrect.

5. **Assertion :** If the pair of lines are coincident, then we say that pair of lines is consistent and it has a unique solution.

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

Ans : (d) Assertion (A) is false but reason (R) is true.

Assertion is clearly false.

[If the lines are coincident, then it has infinite number of solutions]

Reason is clearly true.

6. **Assertion :** The value of k for which the system of equations $kx-y=2, 6x-2y=3$ has a unique solution in 3.

Reason : The system of linear equations

$a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ has a unique solutions if $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$

Ans : (d) Assertion (A) is false but reason (R) is true.

Given system of linear equations has a unique solution if

$$\frac{k}{6} \neq \frac{-1}{-2}$$

$$\frac{k}{6} \neq \frac{1}{2}$$

$$k \neq 3$$

So, A is incorrect and R is correct.

7. **Assertion :** $x + y - 4 = 0$ and $2x + ky - 3 = 0$ has no solution if $k = 2$.
Reason : $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ are consistent if $\frac{a_1}{a_2} \neq \frac{k_1}{k_2}$.

Ans : (b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

For assertion, given equation has no solution if

$$\frac{1}{2} = \frac{1}{k} \neq \frac{-4}{-3} \text{ i.e. } \frac{4}{3}$$

$$k = 2\left[\frac{1}{2} \neq \frac{4}{3}\text{holds}\right]$$

Assertion is true.
Reason does not give result of assertion.

8. **Assertion :** Pair of linear equations : $9x + 3y + 12 = 0$, $8x + 6y + 24 = 0$ have infinitely many solutions.
Reason : Pair of linear equations $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ have infinitely many solutions, if $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

Ans : (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

From the given equations, we have

$$\frac{9}{18} = \frac{3}{6} = \frac{12}{24}$$

$$\frac{1}{2} = \frac{1}{2} = \frac{1}{2} \text{ i.e., } \frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$$

So, both A and R are correct and R explains A.

9. **Assertion :** If $kx - y - 2 = 0$ and $6x - 2y - 3 = 0$ are inconsistent, then $k = 3$
Reason : $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ are inconsistent of $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

Ans : (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

10. **Assertion :** The lines $2x - 5y = 7$ and $6x - 15y = 8$ are parallel lines.
Reason : The system of linear equations $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ have infinitely many solutions if $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

Ans : (b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

Two lines $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ are parallel if $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

So, both A and R are correct but R does not explain A.

11. **Assertion :** $3x - 4y = 7$ and $6x - 8y = k$ have infinite number of solution if $k = 14$.
Reason : $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ have a unique solution if $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$.

Ans : (b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

12. **Assertion :** The linear equations $x - 2y - 3 = 0$ and $3x + 4y - 20 = 0$ have exactly one solution.
Reason : The linear equations $2x + 3y - 9 = 0$ and $4x + 6y - 18 = 0$ have a unique solution.

Ans : (c) Assertion (A) is true but reason (R) is false.