## Practice set 5.1

### Q. 1. By using variables x and y form any five linear equations in two variables.

- **Answer : a)** x + y = 5
- **b)** x + 2y = 6
- **c)** 2x + y = 4
- **d)** 3x + 4y = 8
- **e)** 5x + 9y = 1

### Q. 2. Write five solutions of the equation x + y = 7.

- Answer : (a)
- Let x = 1,
- As, x + y = 7
- $\Rightarrow$  1 + y = 7
- $\Rightarrow$  y = 6

Hence, solution is x = 1 and y = 6.

### (b)

- Let x = 2,
- As, x + y = 7
- $\Rightarrow$  2 + y = 7
- $\Rightarrow$  y = 5

Hence, solution is x = 2 and y = 5.

(C)



Let x = 3, As, x + y = 7 $\Rightarrow$  3 + y = 7  $\Rightarrow$  y = 4 Hence, solution is x = 3 and y = 4. (d) Let x = 4, As, x + y = 7 $\Rightarrow$  4 + y = 7  $\Rightarrow$  y = 3 Hence, solution is x = 4 and y = 3. (e) Let x = 5, As, x + y = 7 $\Rightarrow$  5 + y = 7  $\Rightarrow$  y = 2 Hence, solution is x = 5 and y = 2.

## Q. 3. Solve the following sets of simultaneous equations.

8

iv. 2y - x =0; 10x + 15y =105

v. 
$$2x + 3y + 4 = 0$$
;  $x - 5y = 11$ 



Answer : (i)

x + y = 4 eq.[1]

2x - 5y = 1 eq.[2]

We can write eq.[1] as,

x = 4 - y eq.[3]

Substituting eq.[3] in eq.[2],

 $\Rightarrow$  2(4 - y) - 5y = 1

⇒ 8 - 2y - 5y = 1

⇒ -7y = -7

Substituting 'y' in eq.[3]

 $\Rightarrow$  x = 4 - 1

 $\Rightarrow$  x = 3

Hence, solution is x = 3 and y = 1.

(ii)

2x + y = 5 eq.[1]

3x - y = 5 eq.[2]

We can write eq.[1] as,

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y = 5 - 2x eq.[3]
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Substituting eq.[3] in eq.[2],

 $\Rightarrow$  3x - (5 - 2x) = 5

 $\Rightarrow 3x - 5 + 2x = 5$ 

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\Rightarrow 5x = 10
\Rightarrow x = 2
Substituting 'x' in eq.[3]
\Rightarrow y = 5 - 2(2)
\Rightarrow y = 1
Hence, solution is x = 2 and y = 1.
(iii)
3x - 5y = 16 \text{ eq.}[1]
x - 3y = 8 eq.[2]
We can write eq.[2] as,
x = 8 + 3y eq.[3]
Substituting eq.[3] in eq.[1],
\Rightarrow 3(8 + 3y) - 5y = 16
\Rightarrow 24 + 9y - 5y = 16
\Rightarrow 4y = -8
⇒ y = -2
Substituting 'y' in eq.[3]
\Rightarrow x = 8 + 3(-2)
\Rightarrow x = 8 - 6 = 2
Hence, solution is x = 2 and y = -2
(iv)
2y - x = 0 eq.[1]
10x + 15y = 105 \text{ eq.}[2]
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We can write eq.[1] as,

x = 2y eq.[3]

Substituting eq.[3] in eq.[2],

 $\Rightarrow$  10(2y) + 15y = 105

 $\Rightarrow$  20y + 15y = 105

⇒ 35y = 105

```
\Rightarrow y = 3
```

Substituting 'y' in eq.[3]

 $\Rightarrow$  x = 2(3)

 $\Rightarrow x = 6$ 

Hence, solution is x = 6 and y = 3.

(v)

2x + 3y + 4 = 0 eq.[1]

x - 5y = 11 eq.[2]

We can write eq.[2] as,

x = 11 + 5y eq.[3]

Substituting eq.[3] in eq.[1],

 $\Rightarrow 2(11+5y)+3y+4=0$ 

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\Rightarrow 22 + 10y + 3y + 4 = 0
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\Rightarrow 13y + 26 = 0
```

⇒ 13y = -26

⇒ y = -2

```
Substituting 'y' in eq.[3]
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 $\Rightarrow$  x = 11 + 5(-2)  $\Rightarrow$  x = 11 - 10 = 1 Hence, solution is x = 1 and y = -2. (vi) 2x - 7y = 7 eq.[1]3x + y = 22 eq.[2]We can write eq.[2] as, y = 22 - 3x eq.[3]Substituting eq.[3] in eq.[1],  $\Rightarrow$  2x - 7(22- 3x) = 7  $\Rightarrow 2x - 154 + 21x = 7$  $\Rightarrow 23x = 161$  $\Rightarrow x = 7$ Substituting 'x' in eq.[3]  $\Rightarrow$  y = 22 - 3(7)  $\Rightarrow$  y = 22 - 21 = 1 Hence, solution is x = 7 and y = 1.

## Practice set 5.2

Q. 1. In an envelope there are some 5 rupee notes and some 10 rupee notes. Total amount of these notes together is 350 rupees. Number of 5 rupee notes are less by 10 than number of 10 rupee notes. Then find the number of 5 rupee and 10 rupee notes.

**Answer :** Let the number of 5 rupees notes = x

Let the number of 10 rupees notes = y

Given, Total amount is 350 Rupees





```
\Rightarrow 5x + 10y = 350 eq.[1]
```

Also,

Number of 5 rupees notes are less by 10 than number of 10 rupees note,

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y = x - 10

\Rightarrow x = y + 10 \text{ eq.}[2]

Putting [2] in [1]

\Rightarrow 5(y + 10) + 10y = 350

\Rightarrow 5y + 50 + 10y = 350

\Rightarrow 15y = 300

\Rightarrow y = 20

Then, x = y + 10

\Rightarrow x = 20 + 10

\Rightarrow x = 30.
```

Answer: 30 notes of Rs 5 and 20 notes of Rs. 10.

Q. 2. The denominator of a fraction is 1 more than twice its numerator. If 1 is added to numerator and denominator respectively, the ratio of numerator to denominator is

1: 2. Find the fraction.

Answer : Let the numerator be 'x' and denominator be 'y'

Given,

The denominator of a fraction is 1 more than twice its numerator

⇒ y =2 x + 1

 $\Rightarrow y - 2x = 1 \qquad \dots \dots (1)$ 

If 1 is added to numerator and denomination, the ratio of the numerator to denominator becomes 1:2.





 $\Rightarrow \frac{x+1}{y+1} = \frac{1}{2}$  $\Rightarrow 2(x+1) = y+1$  $\Rightarrow 2x+2 = y+1$  $\Rightarrow y - 2x = 1 \dots (2)$ 

As (1) and (2) are the same, there can be infinitely many solutions for x and y.One such solution is: x = 4 and y = 9Now, y - 2x = 9 - 2(4) = 9 - 8 = 1

## Q. 3. The sum of ages of Priyanka and Deepika is 34 years. Priyanka is elder to Deepika by 6 years. Then find their today's ages.

Answer : Let the ages of Priyanka and Deepika be 'x' and 'y' respectively.

Given,

Sum of ages is 34

 $\Rightarrow$  x + y = 34

 $\Rightarrow$  y = 34 - x eq.[1]

Also, Priyanka is elder to Deepika by 6 years

 $\Rightarrow$  x = y + 6

Using eq.[1] we have

 $\Rightarrow$  x = 34 - x + 6

 $\Rightarrow 2x = 40$ 

 $\Rightarrow$  x = 20

Putting this value in eq.[1]

 $\Rightarrow$  y = 34 - 20 = 14 years.

Hence, Age of Priyanka = x = 20 Years

Age of Deepika = y = 14 years.



Q. 4. The total number of lions and peacocks in a certain zoo is 50. The total number of their legs is 140. Then find the number of lions and peacocks in the zoo.

Answer : Let the number of lions be 'x' and peacocks be 'y'

Given, Total no of lions and peacocks is 50

 $\Rightarrow$  x + y = 50

 $\Rightarrow$  x = 50 - y eq.[1]

Also, Total no of their legs is 140, as lion has four legs and peacocks has 2 legs

 $\Rightarrow$  4x + 2y = 140

$$\Rightarrow 4(50 - y) + 2y = 140$$

- $\Rightarrow$  200 4y + 2y = 140
- $\Rightarrow 2y = 60$
- $\Rightarrow$  y = 30

Using this in eq.[1]

 $\Rightarrow$  x = 50 - 30 = 20

Therefore,

No of lions, x = 20

No of peacocks, y = 30

Q. 5. Sanjay gets fixed monthly income. Every year there is a certain increment in his salary. After 4 years, his monthly salary was Rs. 4500 and after 10 years his monthly salary became 5400 rupees, then find his original salary and yearly increment.

Answer : Let the original salary be 'x' and yearly increment be 'y'

After 4 years, his salary was Rs. 4500

 $\Rightarrow$  x + 4y = 4500

 $\Rightarrow$  x = 4500 - 4y eq.[1]





After 10 years, his salary becomes 5400

 $\Rightarrow x + 10y = 5400$   $\Rightarrow 4500 - 4y + 10y = 5400$   $\Rightarrow 6y = 900$   $\Rightarrow y = 150$ Putting this in eq.[1],  $\Rightarrow x = 4500 - 4(150)$ 

⇒ x = 4500 - 600 = 3900

Hence, his original salary was Rs. 3900 and increment per year was 150 Rs.

## Q. 6. The price of 3 chairs and 2 tables is 4500 rupees and price of 5 chairs and 3 tables is 7000 rupees, then find the price of 2 chairs and 2 tables.

Answer : Let the price of one chair be 'x' and one table be 'y'.

Given,

Price of 3 chairs and 2 tables = 4500 Rs

 $\Rightarrow$  3x + 2y = 4500

Multiplying by 3 both side,

 $\Rightarrow$  9x + 6y = 13500

 $\Rightarrow 6y = 13500 - 9x eq.[1]$ 

Price of 5 chairs and 3 tables = 7000 Rs

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\Rightarrow 5x + 3y = 7000
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Multiplying by eq.[2] both side,

 $\Rightarrow$  10x + 6y = 14000

 $\Rightarrow$  10x + 13500 - 9x = 14000 eq.[From 1]

⇒ x = 500





Putting this in eq.[1]  $\Rightarrow 6y = 13500 - 9(500)$   $\Rightarrow 6y = 13500 - 4500$   $\Rightarrow 6y = 9000$   $\Rightarrow y = 1500$ Also, Price of 2 chairs and 2 tables = 2x + 2y

= 2(500) + 2(1500)

= 1000 + 3000 = 4000 Rs.

Q. 7. The sum of the digits in a two-digits number is 9. The number obtained by interchanging the digits exceeds the original number by 27. Find the two-digit number.

Answer : Let the unit digit be 'x'

Let the digit at ten's place be 'y'

The original number will be 10y + x

Given,

Sum of digits = 9

 $\Rightarrow$  x + y = 9

```
\Rightarrow x = 9 - y eq.[1]
```

Also,

If the digits are interchanged,

Reversed number will be = 10x + y

As, reversed number exceeds the original number by 27,

$$\Rightarrow (10x + y) - (10y + x) = 27$$

$$\Rightarrow 10x + y - 10y - x = 27$$





 $\Rightarrow 9x - 9y = 27$   $\Rightarrow x - y = 3$   $\Rightarrow 9 - y - y = 3 \text{ eq.[using 1]}$   $\Rightarrow -2y = -6$  $\Rightarrow y = 3$ 

Using this in eq.[1]

 $\Rightarrow$  x = 9 - 3 = 6

Hence the original number is 10y + x = 10(3) + 6 = 30 + 6 = 36.

Q. 8. In  $\triangle ABC$ , the measure of angle A is equal to the sum of the measures of  $\angle B$  and  $\angle C$ . Also the ratio of measures of  $\angle B$  and  $\angle C$  is 4 : 5. Then find the measures of angles of the triangle.

Answer : Given that, In **ABC** 

 $\angle A = \angle B + \angle C \text{ eq.}[1]$ 

Let  $\angle B = x$  and  $\angle C = y$ 

Then,

 $\angle A = x + y$ 

In ΔABC, By angle sum property of triangle

- $\angle A + \angle B + \angle C = 180^{\circ}$
- $\Rightarrow$  x + y + x + y = 180
- $\Rightarrow$  2x + 2y = 180
- $\Rightarrow$  x + y = 90

⇒ x = 90 - y eq.[2]

Also, Given that

 $\frac{\angle B}{\angle C} = \frac{4}{5}$ 



 $\Rightarrow \frac{x}{y} = \frac{4}{5}$   $\Rightarrow 5x = 4y$ From eq.[2]  $\Rightarrow 5(90 - y) = 4y$   $\Rightarrow 450 - 5y = 4y$   $\Rightarrow 9y = 450$   $\Rightarrow y = 50^{\circ}$ Putting this in eq.[2]  $\Rightarrow x = 90 - 50 = 40^{\circ}$ Therefore, we have  $\angle A = x + y = 40^{\circ} + 50^{\circ} = 90^{\circ}$   $\angle B = x = 40^{\circ}$ 

Q. 9. Divide a rope of length 560 cm into 2 parts such that twice the length of the smaller part is equal to 1/3 of the larger part. Then find the length of the larger part.

Answer : Let the length of smaller part be 'x' cm and larger part be 'y' cm.

Length of rope = 560 cm

 $\Rightarrow$  x + y = 560

Also,

Twice the length of smaller part is equal to  $\frac{1}{3}$  of the larger part





 $\Rightarrow 2x = \frac{1}{3}y$   $\Rightarrow 6x = y$   $\Rightarrow 6x = 560 - x$   $\Rightarrow 7x = 560$   $\Rightarrow x = 80$ Using this in eq.[1]  $\Rightarrow y = 560 - 80 = 480$ Therefore,

Length of smaller part = 'x' cm = 80 cm

Length of larger part = 'y' cm = 480 cm

Q. 10. In a competitive examination, there were 60 questions. The correct answer would carry 2 marks, and for incorrect answer 1 mark would be subtracted. Yashwant had attempted all the questions and he got total 90 marks. Then how many questions he got wrong?

Answer : Let the no of questions he got wrong be 'x'

And the no of questions he got right be 'y'

As, he attempted all the questions,

 $\Rightarrow$  x + y = 60

 $\Rightarrow$  y = 60 - x eq.[1]

Also, he carries 2 for each corrects question and (-1) for each wrong question, also he got 90 marks

 $\Rightarrow y(2) + x(-1) = 90$  $\Rightarrow 2y - x = 90$  $\Rightarrow 2(60 - x) - x = 90 \text{ eq.}[\text{Using 1}]$  $\Rightarrow 120 - 2x - x = 90$ 



 $\Rightarrow -3x = -30$ 

 $\Rightarrow$  x = 10

 $\Rightarrow$  he got 10 wrong questions.

## **Problem set 5**

#### Q. 1 A. Choose the correct alternative answers for the following questions.

If 3x + 5y = 9 and 5x + 3y = 7 then What is the value of x + y?

A. 2 B. 16 C. 9 D. 7

**Answer** : 3x + 5y = 9 eq.[1]

5x + 3y = 7 eq.[2]

Adding eq.[1] and eq.[2] we get

3x + 5y + 5x + 3y = 9 + 7

 $\Rightarrow$  8x + 8y = 16

Dividing both side by 8, we get

 $\Rightarrow$  x + y = 2

Q. 1 B. 'When 5 is subtracted from length and breadth of the rectangle, the perimeter becomes 26.' What is the mathematical form of the statement?

A. x - y = 8 B. x + y = 8 C. x + y =23 D. 2x + y = 21

**Answer :** Let the length be 'x' and breadth be 'y' units.

Perimeter of triangle = 2(x + y) units

If 5 is subtracted from length and breadth

Perimeter = 26 units eq.[Given]





$$\Rightarrow 2(x - 5 + y - 5) = 26$$
$$\Rightarrow 2(x + y - 10) = 26$$
$$\Rightarrow x + y - 10 = 13$$
$$\Rightarrow x + y = 23$$

Q. 1 C. Ajay is younger than Vijay by 5 years. Sum of their ages is 25 years. What is Ajay's age?

A. 20

B. 15

**C.** 10

D. 5

Answer : Let Ajay's age be 'x' years and Vijay's age be 'y' years.

Given, Ajay is younger than Vijay by 5 years

 $\Rightarrow$  x = y - 5 eq.[1]

Also, Sum of their ages is 25 years,

 $\Rightarrow$  x + y = 25

From eq.[1]

 $\Rightarrow$  y - 5 + y = 25

 $\Rightarrow 2y = 30$ 

⇒ y = 15

Putting this in eq.[1]

⇒ x = 15 - 5 = 10

Age of Ajay = x = 10 Years

Age of Vijay = y = 15 Years

## Q. 2. Solve the following simultaneous equations.

i. 2x + y = 5; 3x - y = 5 ii. x - 2y = -1; 2x - y = 7





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iii. x + y = 11; 2x - 3y = 7
iv. 2x + y = -2; 3x - y = 7
v. 2x - y = 5; 3x + 2y = 11
vi. x - 2y = -2; x + 2y = 10
Answer : (i)
2x + y = 5
\Rightarrow y = 5 - 2x eq.[1]
3x - y = 5
Using eq.[1] we have
\Rightarrow 3x - (5 - 2x) = 5
\Rightarrow 3x - 5 + 2x = 5
\Rightarrow 5x = 10
\Rightarrow x = 2
Using 'x' in eq.[1]
\Rightarrow y = 5 - 2(2)
\Rightarrow y = 5 - 4 = 1 cm
(ii)
x - 2y = -1
\Rightarrow x = 2y - 1 eq.[1]
2x - y = 7
Using eq.[1], we have
\Rightarrow 2(2y - 1) - y = 7
\Rightarrow 4y - 2 - y = 7
\Rightarrow 3y = 9
\Rightarrow y = 3
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Using this value in eq.[1]
\Rightarrow x = 2(3) - 1
\Rightarrow x = 5
(iii)
x + y = 11
\Rightarrow y = 11 - x eq.[1]
2x - 3y = 7
Using eq.[1], we have
\Rightarrow 2x - 3(11 - x) = 7
\Rightarrow 2x - 33 + 3x = 7
\Rightarrow 5x = 40
\Rightarrow x = 8
Using this in eq.[1]
⇒ y = 11 - 8
\Rightarrow y = 3
(iv)
2x + y = -2
\Rightarrow y = -2x - 2 eq.[1]
3x - y = 7
Using eq.[1]
3x - (-2x - 2) = 7
\Rightarrow 3x + 2x + 2 =7
\Rightarrow 5x = 5
```





$\Rightarrow$ x = 1
Using this in eq.[1]
⇒ y = -2(1) - 2
⇒ y = -2 - 2 = -4
(v)
2x - y = 5
⇒ y = 2x - 5 eq.[1]
3x + 2y = 11
Using eq.[1]
$\Rightarrow 3x + 2(2x - 5) = 11$
$\Rightarrow$ 3x + 4x - 10 = 11
$\Rightarrow$ 7x = 21
$\Rightarrow$ x = 3
Using this in eq.[1]
⇒ y = 2(3) - 5
$\Rightarrow$ y = 1
(vi)
x - 2y = -2
x = 2y - 2 eq.[1]
x + 2y = 10
using eq.[1], we have
$\Rightarrow$ 2y - 2 + 2y = 10
$\Rightarrow 4y = 12$





 $\Rightarrow$  y = 3

Using this in eq.[1]

 $\Rightarrow$  x = 2(3) - 2

 $\Rightarrow$  x = 4

Q. 3. By equating coefficients of variables, solve the following equations.

i. 3x - 4y = 7; 5x + 2y = 3ii. 5x + 7y = 17; 3x - 2y = 4iii. x - 2y = -10; 3x - 5y = -12iv. 4x + y = 34; x + 4y = 16

Answer : (i)

3x - 4y = 7 eq.[1]

5x + 2y = 3 eq.[2]

Multiplying eq.[2] by 2 both side, we get

10x + 4y = 6 eq.[3]

Adding eq.[1] and eq.[3], we get

3x - 4y + 10x + 4y = 7 + 6  $\Rightarrow 13x = 13$   $\Rightarrow x = 1$ Putting this in eq.[1], we get 3(1) - 4y = 7  $\Rightarrow -4y = 7 - 3$   $\Rightarrow -4y = 4$   $\Rightarrow y = -1$ (ii)

5x + 7y = 17 eq.[1]





3x - 2y = 4 eq.[2]

Multiplying eq.[1] by 3 both side and Multiplying eq.[2] by 5 both side we get,

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15x + 21y = 51 \text{ eq.}[3]
15x - 10y = 20 \text{ eq.}[4]
Subtracting eq.[4] from eq.[3], we get
15x + 21y - 15x + 10y = 51 - 20
\Rightarrow 31y = 31
\Rightarrow y = 1
Putting this in eq.[1], we get
5x + 7(1) = 17
\Rightarrow 5x = 10
\Rightarrow x = 2
(iii)
x - 2y = -10 eq.[1]
3x - 5y = -12 \text{ eq.}[2]
Multiplying eq.[1] by 3
3x - 6y = -30 eq.[3]
Subtracting eq.[2] from eq.[3], we get
3x - 6y - 3x + 5y = -30 + 12
⇒ -y = -18
\Rightarrow y = 18
Putting this in eq.[1], we get
x - 2(18) = -10
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 $\Rightarrow x - 36 = -10$   $\Rightarrow x = 26$ (iv) 4x + y = 34 eq.[1] x + 4y = 16 eq.[2]Multiplying eq.[2] by 4 both side, we get 4x + 16y = 64 eq.[3]Subtracting eq.[3] from eq.[1], we get 4x + 16y - 4x - y = 64 - 34

 $\Rightarrow 15y = 30$ 

Putting this in eq.[2], we get

$$x + 4(2) = 16$$

 $\Rightarrow$  x + 8 = 16

 $\Rightarrow x = 8$ 

Q. 4. Solve the following simultaneous equations.

i. 
$$\frac{x}{3} + \frac{y}{4} = 4$$
;  $\frac{x}{2} - \frac{y}{2} - \frac{y}{4} = 1$   
ii.  $\frac{x}{3} + 5y = 13$ ;  $2x + \frac{y}{2} = 19$   
iii.  $\frac{2}{x} + \frac{3}{y} = 13$ ;  $\frac{5}{x} - \frac{4}{y} = -2$ 

Answer : (i)

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

$$\Rightarrow \frac{4x + 3y}{12} = 4$$
  

$$\Rightarrow 4x + 3y = 48 \text{ eq.}[1]$$
  

$$\frac{x}{2} - \frac{y}{2} - \frac{y}{4} = 1$$
  

$$\frac{2x - 2y - y}{4} = 1$$
  

$$\Rightarrow 2x - 3y = 4 \text{ eq.}[2]$$
  
Adding eq.[1] and eq.[2], we get  

$$\Rightarrow 4x + 3y + 2x - 3y = 48 + 4$$
  

$$\Rightarrow 6x = 52$$
  

$$\Rightarrow x = \frac{52}{6} = \frac{26}{3}$$
  
Using this in eq.[1], we have  

$$4\left(\frac{26}{3}\right) + 3y = 48$$
  

$$\Rightarrow \frac{104 + 9y}{3} = 48$$
  

$$\Rightarrow 104 + 9y = 144$$
  

$$\Rightarrow 9y = 40$$
  

$$\Rightarrow y = \frac{40}{9}$$
  
(ii)  

$$\frac{x}{3} + 5y = 13$$
  

$$\Rightarrow \frac{x + 15y}{3} = 13$$





$$\Rightarrow x + 15y = 39$$
  

$$\Rightarrow x = 39 - 15y \text{ eq.}[1]$$
  

$$2x + \frac{y}{2} = 19$$
  

$$\Rightarrow \frac{4x + y}{2} = 19$$
  

$$\Rightarrow 4x + y = 38$$
  
Using eq.[1], we have  

$$\Rightarrow 4(39 - 15y) + y = 38$$
  

$$\Rightarrow 156 - 60y + y = 38$$
  

$$\Rightarrow 59y = 118$$
  

$$\Rightarrow y = 2$$
  
Putting this value in eq.[2]  

$$\Rightarrow x = 39 - 15(2)$$
  

$$\Rightarrow x = 39 - 15(2)$$
  

$$\Rightarrow x = 39 - 30$$
  

$$\Rightarrow x = 9$$
  
(iii)  

$$\frac{2}{x} + \frac{3}{y} = 13$$
  

$$\Rightarrow \frac{(2y + 3x)}{xy} = 13$$
  

$$\Rightarrow 2y + 3x = 13xy \text{ eq.}[1]$$
  

$$\frac{5}{x} - \frac{4}{y} = -2$$



$$\Rightarrow \frac{5y - 4x}{xy} = -2$$

 $\Rightarrow$  5y - 4x = -2xy eq.[2]

Multiplying eq.[1] by 4 both side, and Multiplying eq.[2] by 3 both side, we get

8y + 12x = 52xy eq.[3]  
15y - 12x = -6xy eq.[4]  
Adding eq.[3] and eq.[4]  

$$\Rightarrow$$
 8y + 12x + 15y - 12x = 52xy - 6xy  
 $\Rightarrow$  23y = 46xy  
 $\Rightarrow$  1 = 2x  
 $\Rightarrow$  x =  $\frac{1}{2}$ 

Putting this in eq.[1]

 $\Rightarrow 2y + 3\left(\frac{1}{2}\right) = 13\left(\frac{1}{2}\right)y$  $\Rightarrow 2y + \frac{3}{2} = \frac{13}{2}y$  $\Rightarrow \frac{13}{2}y - 2y = \frac{3}{2}$  $\Rightarrow \frac{9y}{2} = \frac{3}{2}$  $\Rightarrow y = \frac{3}{9} = \frac{1}{3}$ 

Q. 5. A two-digit number is 3 more than 4 times the sum of its digits. If 18 is added to this number, the sum is equal to the number obtained by interchanging the digits. Find the number.

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Answer : Let the unit digit be 'x'

Let the digit at ten's place be 'y'

The original number will be 10y + x

Given, number is 3 more than 4 times the sum of its digits

$$\Rightarrow 10y + x = 4(x + y) + 3$$
$$\Rightarrow 10y + x = 4x + 4y + 3$$
$$\Rightarrow 6y - 3x = 3$$
$$\Rightarrow 2y - x = 1$$

Also,

If the digits are interchanged,

Reversed number will be = 10x + y

As, reversed number exceeds the original number by 18,

$$\Rightarrow (10x + y) - (10y + x) = 18$$
  

$$\Rightarrow 10x + y - 10y - x = 18$$
  

$$\Rightarrow 9x - 9y = 18$$
  

$$\Rightarrow x - y = 2$$
  

$$\Rightarrow 2y - 1 - y = 2 \text{ eq.[using 1]}$$
  

$$\Rightarrow y = 3$$
  
Using this in eq.[1]

$$\Rightarrow x = 2(3) - 1 = 5$$

Hence the original number is 10y + x = 10(3) + 5 = 30 + 5 = 35.

# Q. 6. The total cost of 6 books and 7 pens is 79 rupees and the total cost of 7 books and 5 pens is 77 ruppees. Find the cost of 1 book and 2 pens.

Answer : Let the cost of one book be 'x' rupees and cost of one pen be 'y' rupees.

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Cost of 6 books and 7 pens = 79 Rs

 $\Rightarrow$  6x + 7y = 79 eq.[1]

Cost of 7 books and 5 pens = 77 Rs

 $\Rightarrow$  7x + 5y = 77 eq.[2]

Multiplying eq.[1] by 5 both side, and Multiplying eq.[2] by 7 both side, we get

 $\Rightarrow$  30x + 35y = 395 eq.[3]  $\Rightarrow$  49x + 35y = 539 eq.[4] Subtracting eq.[3] from eq.[4], we get  $\Rightarrow$  49x + 35y - 30x - 35y = 539 - 395  $\Rightarrow$  19x = 144  $\Rightarrow x = \frac{144}{19}$ Using this in eq.[1]  $\Rightarrow 6\left(\frac{144}{19}\right) + 7y = 79$  $\Rightarrow \frac{864}{19} + 7y = 79$  $\Rightarrow$  864 + 19×7y = 79×19  $\Rightarrow$  19×7y = 79×19 - 864  $y = \frac{1501 - 864}{19 \times 7}$  $\Rightarrow$  y = 5 & 6x + 7y = 79 $\Rightarrow 6x + 35 = 79$  $\Rightarrow 6x = 44$ 





#### $\Rightarrow$ x = 7

Hence, the cost of 1 pen & 2 books = Rs 1(y) + 2x

= 5 + 14 = Rs 19.

## Q. 7. The ratio of incomes of two persons is 9 : 7. The ratio of their expenses is 4 : 3. Every person saves rupees 200, find the income of each.

Answer : As the ratio of incomes is 9 : 7,

Let income of first person = 9x

Income of second person = 7x

Also, ratio of incomes is 4 : 3,

Let expenses of first person = 4y

Expenses of second person = 3y

Each person saves 200 Rs,

 $\Rightarrow$  9x - 4y = 200 eq.[1]

 $\Rightarrow$  7x - 3y = 200 eq.[2]

Multiplying eq.[1] by 3 both side and Multiplying eq.[2] by 4 both side, we get

$$\Rightarrow 27x - 12y = 600 \text{ eq.}[3]$$

 $\Rightarrow$  28x - 12y = 800 eq.[4]

Subtracting eq.[3] from eq.[4], we get

 $\Rightarrow 28x - 12y - (27x - 12y) = 800 - 600$ 

$$\Rightarrow 28x - 12y - 27x + 12y = 200$$

$$\Rightarrow$$
 x = 200

Income of first person = 9x = 9(200) = 1800 Rs

Income of second person = 7x = 7(200) = 1400 Rs



Q. 8. If the length of a rectangle is reduced by 5 units and its breadth is increased by 3 units, then the area of the rectangle is reduced by 8 square units. If length is reduced by 3 units and breadth is increased by 2 units, then the area of rectangle will increase by 67 square units. Then find the length and breadth of the rectangle.

**Answer :** Let the length be 'x' and breadth be 'y'

Area of rectangle = length × breadth

Area of rectangle = xy

#### First case:

Length = x - 5

Breadth = y + 3

As, area is reduced by 8 sq. units

$$\Rightarrow xy - (x - 5)(y + 3) = 8$$

 $\Rightarrow$  xy - (xy + 3x - 5y - 15) = 8

 $\Rightarrow$  xy - xy - 3x + 5y + 15 = 8

$$\Rightarrow$$
 3x - 5y = 7 eq.[1]

#### Second case:

Length = x - 3

Breadth = y + 2

As, the area is increased by 67 units

$$\Rightarrow (x - 3)(y + 2) - xy = 67$$

 $\Rightarrow$  xy + 2x - 3y - 6 - xy = 67

 $\Rightarrow 2x - 3y = 73 \text{ eq.}[2]$ 

Multiplying eq.[1] by 2 both side, and Multiplying eq.[2] by 3 both side, we get

 $\Rightarrow$  6x - 10y = 14 eq.[3]





 $\Rightarrow 6x - 9y = 219 \text{ eq.}[4]$ Subtracting eq.[3] from eq.[4]  $\Rightarrow 6x - 9y - 6x + 10y = 219 - 14$  $\Rightarrow y = 205$ Using this in eq.[1]  $\Rightarrow 3x - 5(205) = 7$  $\Rightarrow 3x - 1025 = 7$  $\Rightarrow 3x = 1032$  $\Rightarrow x = 344$ Hence, length = x = 344 units Breadth = y = 219 units.

Q. 9. The distance between two places A and B on road is 70 kilometers. A car starts from A and the other from B. If they travel in the same direction, they will meet after 7 hours. If they travel towards each other they will meet after 1 hour, then find their speeds.

Answer : Let the speed of car at place A is x km/h and that of car at place B is y km/h

If they travel in same direction, they will meet after 7 hours, i.e. the difference of distance covered by them in 7 hours will be equal to distance b/w A and B.

As, distance = speed × time, and distance from A to B is 70 km

 $\Rightarrow$  7x - 7y = 70

 $\Rightarrow$  x - y = 10

 $\Rightarrow$  x = y + 10 eq.[1]

If they, travel in opposite direction, they will meet after 1 hour i.e. sum of distance travelled by both cars will be equal to the distance b/w A and B.

 $\Rightarrow$  x + y = 70

Using eq.[1], we have





 $\Rightarrow y + 10 + y = 70$  $\Rightarrow 2y = 60$ 

 $\Rightarrow$  y = 30

Using this in eq.[1], we have

x = 30 + 10 = 40

Hence,

Speed of car at A = x = 40 km/h

Speed of car at B = y = 30 km/h

# Q. 10. The sum of a two-digit number and the number obtained by interchanging its digits is 99. Find the number.

Answer : Let the unit digit be 'x' and digit at ten's place be 'y'

Original Number = 10y + x

Number obtained by interchanging digits = 10x + y

Given,

10y + x + 10x + y = 99

 $\Rightarrow$  11x + 11y = 99

 $\Rightarrow$  x + y = 9

If x = 1, y = 8 and number is 18

If x = 2, y = 7 and number is 27

If x = 3, y = 6 and number is 36

If x = 4, y = 5 and number is 45

If x = 5, y = 4 and number is 54

If x = 6, y = 3 and number is 63

If x = 7, y = 2 and number is 72



If x = 8, y = 1 and number is 81



