

**RD SHARMA**  
**Solutions**  
**Class 10 Maths**  
**Chapter 3**  
**Ex 3.7**

**Q.1: The sum of two numbers is 8. If their sum is four times their difference, find the numbers.**

**Soln:** Let the numbers are  $x$  and  $y$ . One of them must be greater than or equal to the other. Let us assume that  $x$  is greater than or equal to  $y$ .

The sum of the two numbers is 8. Thus, we have  $x+y = 8$

The sum of the two numbers is four times their difference. Thus, we have

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

$$\Rightarrow x+y = 4x-4y$$

$$\Rightarrow 4x - 4y - x - y = 0$$

$$\Rightarrow 3x-5y = 0$$

So, we have two equations

$$x+y=8$$

$$3x-5y = 0$$

Here  $x$  and  $y$  are unknowns.

We have to solve the above equations for  $x$  and  $y$ .

Multiplying the first equation by 5 and then adding with the second equation, we have

$$5(x+y)+(3x-5y) = 5 \times 8 + 0$$

$$\Rightarrow 5x+5y+3x-5y = 40$$

$$\Rightarrow 8x = 40$$

$$\Rightarrow x = 5$$

$x =$  Substituting the value of  $x$  in the first equation, we have

$$5+y=8$$

$$\Rightarrow y=8-5$$

$$\Rightarrow y=3$$

Hence, the numbers are 5 and 3.

**Q. 2: The sum of digits of a two digit number is 13. If the number is subtracted from the one obtained by interchanging the digits, the result is 45. What is the number?**

**Soln:** Let the digits at units and tens place of the given number be  $x$  and  $y$  respectively. Thus, the number is  $10y+x$ .

The sum of the digits of the number is 13. Thus, we have  $x+y = 13$

After interchanging the digits, the number becomes  $10x+y$ .

The difference between the number obtained by interchanging the digits and the original number is 45. Thus, we have

$$(10x + y) - (10y + x) = 45$$

$$\Rightarrow 10x+y-10y-x= 45$$

$$\Rightarrow 9x-9y=45$$

$$\Rightarrow 9(x - y) = 45$$

$$\Rightarrow x-y=5$$

So, we have two equations

$$x+y=13$$

$$x- y =5$$

Here  $x$  and  $y$  are unknowns. We have to solve the above equations for  $x$  and  $y$ .

Adding the two equations, we have

$$(x+y)+(x-y)=13+5$$

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

$$\Rightarrow 2x=18$$

$$\Rightarrow x= 9$$

Substituting the value of  $x$  in the first equation, we have

$$9+y = 13$$

$$\Rightarrow y = 13 - 9$$

$$\Rightarrow y = 4$$

Hence, the number is  $10 \times 4 + 9 = 49$

**Q.3:** A number consists of two digits whose sum is five. When the digits are reversed, the number becomes greater by nine. Find the number.

**Soln:** Let the digits at units and tens place of the given number be  $x$  and  $y$  respectively. Thus, the number is  $10y+x$ .

The sum of the digits of the number is 5. Thus, we have  $x + y = 5$

After interchanging the digits, the number becomes  $10x + y$ .

The number obtained by interchanging the digits is greater by 9 from the original number. Thus, we have

$$10x + y = 10y + x + 9$$

$$\Rightarrow 10x + y - 10y - x = 9$$

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

$$\Rightarrow 9(x - y) = 9$$

$$\Rightarrow x - y = 1$$

So, we have two equations

$$x + y = 5$$

$$x - y = 1$$

Here  $x$  and  $y$  are unknowns. We have to solve the above equations for  $x$  and  $y$ .

Adding the two equations, we have

$$(x + y) + (x - y) = 5 + 1$$

$$\Rightarrow x + y + x - y = 5 + 1$$

$$\Rightarrow 2x = 6$$

$$\Rightarrow x = 6/2$$

$$\Rightarrow x = 3$$

Substituting the value of  $x$  in the first equation, we have

$$3 + y = 5$$

$$\Rightarrow y = 5 - 3$$

$$\Rightarrow y = 2$$

Hence, the number is  $10 \times 2 + 3 = 23$

**Q.4: 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.**

**Soln:** Let the digits at units and tens place of the given number be  $x$  and  $y$  respectively. Thus, the number is  $10y+x$ .

The sum of the digits of the number is 15. Thus, we have  $x+ y = 15$

After interchanging the digits, the number becomes  $10x + y$ .

The number obtained by interchanging the digits is exceeding by 9 from the original number. Thus, we have

$$10x+y=10y+x+ 9$$

$$\Rightarrow 10x + y - 10y -x = 9$$

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

$$\Rightarrow 9(x -y) = 9$$

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

$$\Rightarrow x-y = 1$$

So, we have two equations

$$x+y =15$$

$$x-y = 1$$

Here  $x$  and  $y$  are unknowns. We have to solve the above equations for  $x$  and  $y$ . Adding the two equations, we have

$$(x+ y)+(x - y)=15+1$$

$$\Rightarrow x+y+x-y=16$$

$$\Rightarrow 2x = 16$$

$$\Rightarrow x = 16/2$$

$$\Rightarrow x = 8$$

Substituting the value of  $x$  in the first equation, we have

$$8+ y = 15$$

$$\Rightarrow y = 15-8$$

$$\Rightarrow y = 7$$

Hence, the number is  $10 \times 7 + 8 = 78$

**Q.5: The sum of two- digit number and the number formed by reversing the order of digits is 66.If the two digits differ by 2, find the number. How many such numbers are there?**

**Soln:** Let the digits at units and tens place of the given number be  $x$  and  $y$  respectively. Thus, the number is  $10y+x$ .

The two digits of the number are differing by 2. Thus, we have  $x-y=\pm 2$

After interchanging the digits, the number becomes  $10x + y$ .

The sum of the numbers obtained by interchanging the digits and the original number is 66. Thus, we have

$$(10x+ y)+(10y+x)=66$$

$$\Rightarrow 10x+y+10y+x = 66$$

$$\Rightarrow 11x +11y= 66$$

$$\Rightarrow 11(x + y) = 66$$

$$\Rightarrow x + y = 66/11$$

$$\Rightarrow x + y = 6$$

So, we have two systems of simultaneous equations

$$x-y = 2,$$

$$x +y = 6$$

$$x - y = -2,$$

$$x + y = 6$$

Here  $x$  and  $y$  are unknowns. We have to solve the above systems of equations for  $x$  and  $y$ .

**(i)** First, we solve the system

$$x-y= 2,$$

$$x+y=6$$

Adding the two equations, we have

$$(x- y)+(x + y) = 2+6$$

$$\Rightarrow x-y+x+y=8$$

$$\Rightarrow 2x =8$$

$$\Rightarrow x = 8/2$$

$$\Rightarrow x = 4$$

Substituting the value of  $x$  in the first equation, we have

$$4-y=2$$

$$\Rightarrow y=4-2$$

$$\Rightarrow y=2$$

Hence, the number is  $10 \times 2 + 4 = 24$

**(ii)** Now, we solve the system

$$x-y = -2,$$

$$x+y=6$$

Adding the two equations, we have

$$(x - y) + (x + y) = -2 + 6$$

$$\Rightarrow x-y+x+y=4$$

$$\Rightarrow 2x = 4$$

$$\Rightarrow x = 4/2$$

$$\Rightarrow x=2$$

Substituting the value of  $x$  in the first equation, we have

$$2-y = -2$$

$$\Rightarrow y=2+2$$

$$\Rightarrow y=4$$

Hence, the number is  $10 \times 4 + 2 = 42$

There are two such numbers.

**6. The sum of two numbers is 1000 and the difference between their square is 256000. Find the numbers.**

**Soln:** Let the numbers are  $x$  and  $y$ . One of them must be greater than or equal to the other. Let us assume that  $x$  is greater than or equal to  $y$ .

The sum of the two numbers is 1000. Thus, we have  $x+y = 1000$

The difference between the squares of the two numbers is 256000. Thus, we have

$$x^2 - y^2 = 256000$$

$$\Rightarrow (x+y)(x-y) = 256000$$

$$\Rightarrow 1000(x-y) = 256000$$

$$\Rightarrow x-y = 256000/1000$$

$$\Rightarrow x-y = 256$$

So, we have two equations

$$x+y = 1000$$

$$x-y = 256$$

Here  $x$  and  $y$  are unknowns. We have to solve the above equations for  $x$  and  $y$ . Adding the two equations, we have

$$(x+y)+(x-y) = 1000 + 256$$

$$\Rightarrow x+y+x-y = 1256$$

$$\Rightarrow 2x = 1256$$

$$\Rightarrow x = 1256/2$$

$$x = 628$$

Substituting the value of  $x$  in the first equation, we have

$$628+y = 1000$$

$$\Rightarrow y = 1000-628$$

$$\Rightarrow y = 372$$

Hence, the numbers are 628 and 372

**7. The sum of a two digit number and the number obtained by reversing the order of its digits is 99. If the digits differ by 3, find the number.**

**Soln:** Let the digits at units and tens place of the given number be  $x$  and  $y$  respectively. Thus, the number is  $10y + x$ .

The two digits of the number are differing by 3. Thus, we have  $x - y = \pm 3$

After interchanging the digits, the number becomes  $10x + y$ .

The sum of the numbers obtained by interchanging the digits and the original number is 99. Thus, we have

$$(10x+y)+(10y+x) = 99$$

$$\Rightarrow 10x+y+10y+x = 99$$

$$\Rightarrow 11x+11y = 99$$

$$\Rightarrow 11(x+y) = 99$$

$$\Rightarrow x+y = 99/11$$



$$\Rightarrow x = 9$$

So, we have two systems of simultaneous equations

$$x - y = 3,$$

$$x + y = 9$$

$$x - y = -3,$$

$$x + y = 9$$

Adding the two equations, we have

$$(x - y) + (x + y) = 3 + 9$$

$$\Rightarrow x - y + x + y = 12$$

$$\Rightarrow 2x = 12$$

$$\Rightarrow x = 12/2$$

$$\Rightarrow x = 6$$

Substituting the value of  $x$  in the first equation, we have

$$6 - y = 3$$

$$\Rightarrow y = 6 - 3$$

$$\Rightarrow y = 3$$

Hence, the number is  $10 \times 3 + 6 = 36$

(ii) Now, we solve the system

$$x - y = -3,$$

$$x + y = 9$$

Adding the two equations we have

$$(x - y) + (x + y) = -3 + 9$$

$$\Rightarrow x - y + x + y = 6$$

$$\Rightarrow 2x = 6$$

$$\Rightarrow x = 3$$

Substituting the value of  $x$  in the first equation, we have

$$3 - y = -3$$

$$\Rightarrow y = 3 + 3$$

$$\Rightarrow y = 6$$

Hence, the number is  $10 \times 6 + 3 = 63$

Note that there are two such numbers.

**8. A two-digit number is 4 times the sum of its digits. If 18 is added to the number, the digits are reversed. Find the number.**

**Soln:** Let the digits at units and tens place of the given number be  $x$  and  $y$  respectively. Thus, the number is  $10y+x$ .

The number is 4 times the sum of the two digits. Thus, we have

$$10y+x = 4(x + y)$$

$$\Rightarrow 10y+x = 4x+ 4y$$

$$\Rightarrow 4x +4y -10y -x =0$$

$$\Rightarrow 3x-6y = 0$$

$$\Rightarrow 3(x - 2y) = 0$$

$$\Rightarrow x-2y=0$$

After interchanging the digits, the number becomes  $10x+y$ .

If 18 is added to the number, the digits are reversed. Thus, we have

$$(10y+x)+18=10x+y$$

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

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

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

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

$$\Rightarrow x-y =2$$

So, we have the systems of equations

$$x- 2y =0,$$

$$x-y=2$$

Here  $x$  and  $y$  are unknowns. We have to solve the above systems of equations for  $x$  and  $y$ . Subtracting the first equation from the second, we have

$$(x- y)- (x - 2y) = 2-0$$

$$\Rightarrow x-y-x+ 2y =2$$

$$\Rightarrow y=2$$

Substituting the value of  $y$  in the first equation, we have

$$x-2 \times 2=0$$

$$\Rightarrow x-4=0$$

$$\Rightarrow x = 4$$

Hence, the number is  $10 \times 2 + 4 = 24$

**9. A two-digit number is 3 more than 4 times the sum of its digits. If 18 is added to the number, the digits are reversed. Find the number.**

**Soln:** Let the digits at units and tens place of the given number be  $x$  and  $y$  respectively. Thus, the number is  $10y + x$ .

The number is 3 more than 4 times the sum of the two digits. Thus, we have

$$10y+x=4(x+y)+3$$

$$\Rightarrow 10y+x=4x+4y+3$$

$$\Rightarrow 4x+4y-10y-x=-3$$

$$\Rightarrow 3x - 6y = -3$$

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

$$\Rightarrow x-2y= -3/3$$

$$\Rightarrow x-2y= -1$$

After interchanging the digits, the number becomes  $10x + y$ .

If 18 is added to the number, the digits are reversed. Thus, we have

$$(10y+x)+18 = 10x+y$$

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

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

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

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

$$\Rightarrow x-y= 2$$

So, we have the systems of equations  $x-2y=-1$ ,

$$x-y= 2$$

Here  $x$  and  $y$  are unknowns. We have to solve the above systems of equations for  $x$  and  $y$ . Subtracting the first equation from the second, we have

$$(x - y) - (x - 2y) = 2 - (-1)$$

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

$$\Rightarrow y = 3$$

Substituting the value of  $y$  in the first equation, we have

$$x - 2 \times 3 = -1$$

$$\Rightarrow x - 6 = -1$$

$$\Rightarrow x = -1 + 6$$

$$\Rightarrow x = 5$$

Hence the number is  $10 \times 3 + 5 = 35$

**10. A two-digit number is 4 more than 6 times the sum of its digits. If 18 is subtracted from the number, the digits are reversed. Find the number.**

**Soln:** Let the digits at units and tens place of the given number be  $x$  and  $y$  respectively. Thus, the number is  $10y + x$ .

The number is 4 more than 6 times the sum of the two digits. Thus, we have

$$10y + x = 6(x + y) + 4$$

$$\Rightarrow 10y + x = 6x + 6y + 4$$

$$\Rightarrow 6x + 6y - 10y - x = -4$$

$$\Rightarrow 5x - 4y = -4$$

After interchanging the digits, the number becomes  $10x + y$ .

If 18 is subtracted from the number, the digits are reversed. Thus, we have

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

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

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

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

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

$$\Rightarrow x - y = -2$$

So, we have the systems of equations

$$5x - 4y = -4,$$

$$x - y = -2$$

Here  $x$  and  $y$  are unknowns. We have to solve the above systems of equations for  $x$  and  $y$ . Multiplying the second equation by 5 and then subtracting from the first, we have

$$(5x - 4y) - (5x - 5y) = -4 - (-2 \times 5)$$

$$\Rightarrow 5x - 4y - 5x + 5y = -4 + 10$$

$$\Rightarrow y = 6$$

Substituting the value of  $y$  in the second equation, we have

$$x - 6 = -2$$

$$\Rightarrow x = 6 - 2$$

$$\Rightarrow x = 4$$

Hence, the number is  $10 \times 6 + 4 = 64$

**11. A two-digit number is 4 times the sum of its digits and twice the product of the digits. Find the number.**

**Soln:** Let the digits at units and tens place of the given number be  $x$  and  $y$  respectively. Thus, the number is  $10y + x$ .

The number is 4 times the sum of the two digits. Thus, we have

$$10y + x = 4(x + y)$$

$$\Rightarrow 10y + x = 4x + 4y$$

$$\Rightarrow 4x + 4y - 10y - x = 0$$

$$\Rightarrow 3x - 6y = 0$$

$$3(x - 2y) = 0$$

$$\Rightarrow x - 2y = 0$$

$$\Rightarrow x = 2y$$

After interchanging the digits, the number becomes  $10x + y$ .

The number is twice the product of the digits. Thus, we have  $10y + x = 2xy$

So, we have the systems of equations

$$x = 2y,$$

$$10y + x = 2xy$$

Here  $x$  and  $y$  are unknowns. We have to solve the above systems of equations for  $x$  and  $y$ . Substituting  $x = 2y$  in the second equation, we get

$$10y + 2y = 2 \times 2y \times y$$

$$\Rightarrow 12y = 4y^2$$

$$\Rightarrow 4y^2 - 12y = 0$$

$$\Rightarrow 4y(y - 3) = 0$$

$$\Rightarrow y(y - 3) = 0$$

$$\Rightarrow y = 0 \text{ or } y = 3$$

Substituting the value of  $y$  in the first equation, we have

$y$	0	3
$x$	0	6

Hence, the number is  $10 \times 3 + 6 = 36$

Note that the first pair of solution does not give a two digit number

**12. A two-digit number is such that the product of its digits is 20. If 9 is added to the number, the digits interchange their places. Find the number.**

**Soln:** Let the digits at units and tens place of the given number be  $x$  and  $y$  respectively. Thus, the number is  $10y + x$ .

The product of the two digits of the number is 20. Thus, we have  $xy = 20$

After interchanging the digits, the number becomes  $10x + y$

If 9 is added to the number, the digits interchange their places. Thus, we have

$$(10y + x) + 9 = 10x + y$$

$$\Rightarrow 10y + x + 9 = 10x + y$$

$$\Rightarrow 10x + y - 10y - x = 9$$

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

$$\Rightarrow 9(x - y) = 9$$

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

$$\Rightarrow x - y = 1$$

So, we have the systems of equations

$$xy = 20,$$

$$x-y=1$$

Here  $x$  and  $y$  are unknowns. We have to solve the above systems of equations for  $x$  and  $y$ .

Substituting  $x = 1 + y$  from the second equation to the first equation, we get

$$(1 + y)y = 20$$

$$\Rightarrow y + y^2 = 20$$

$$\Rightarrow y^2 + y - 20 = 0$$

$$\Rightarrow y^2 + 5y - 4y - 20 = 0$$

$$\Rightarrow y(y + 5) - 4(y + 5) = 0$$

$$\Rightarrow (y+5)(y-4) = 0$$

$$\Rightarrow y = -5 \text{ or } y = 4$$

Substituting the value of  $y$  in the second equation, we have

$y$	-5	4
$x$	-4	5

Hence, the number is  $10 \times 4 + 5 = 45$

Note that in the first pair of solution the values of  $x$  and  $y$  are both negative. But the digits of the number can't be negative. So, we must remove this pair.

**13. The difference between two numbers is 26 and one number is three times the other. Find them.**

**Soln:** Let the numbers are  $x$  and  $y$ . One of them must be greater than or equal to the other. Let us assume that  $x$  is greater than or equal to  $y$ .

The difference between the two numbers is 26. Thus, we have  $x - y = 26$

One of the two numbers is three times the other number. Here, we are assuming that  $x$  is greater than or equal to  $y$ . Thus, we have  $x = 3y$

So, we have two equations

$$x - y = 26$$

$$x = 3y$$

Here  $x$  and  $y$  are unknowns. We have to solve the above equations for  $x$  and  $y$ .

Substituting  $x = 3y$  from the second equation in the first equation, we get

$$3y - y = 26$$

$$\Rightarrow 2y = 26$$

$$\Rightarrow y = 13$$

Substituting the value of  $y$  in the first equation, we have

$$x - 13 = 26$$

$$\Rightarrow x = 13 + 26$$

$$\Rightarrow x = 39$$

Hence, the numbers are 39 and 13.

**14. The sum of the digits of a two-digit number is 9. Also, nine times this number is twice the number obtained by reversing the order of the digits. Find the number.**

**Soln:** Let the digits at units and tens place of the given number be  $x$  and  $y$  respectively. Thus, the number is  $10y + x$ .

The sum of the two digits of the number is 9.

$$\text{Thus, we have } x + y = 9$$

After interchanging the digits, the number becomes  $10x + y$ .

Also, 9 times the number is equal to twice the number obtained by reversing the order of the digits. Thus, we have

$$9(10y + x) = 2(10x + y)$$

$$\Rightarrow 90y + 9x = 20x + 2y$$

$$\Rightarrow 20x + 2y - 90y - 9x = 0$$

$$\Rightarrow 11x - 88y = 0$$

$$\Rightarrow 11(x - 8y) = 0$$

$$\Rightarrow x - 8y = 0$$

So, we have the systems of equations

$$x + y = 9,$$



$$x - 8y = 0$$

Here  $x$  and  $y$  are unknowns. We have to solve the above systems of equations for  $x$  and  $y$ . Substituting  $x = 8y$  from the second equation to the first equation, we get

$$8y + y = 9$$

$$\Rightarrow 9y = 9$$

$$\Rightarrow y = 9/9$$

$$\Rightarrow y = 1$$

Substituting the value of  $y$  in the second equation, we have

$$x - 8 \times 1 = 0$$

$$\Rightarrow x - 8 = 0$$

$$\Rightarrow x = 8$$

Hence, the number is  $10 \times 1 + 8 = 18$

**15. Seven times a two-digit number is equal to four times the number obtained by reversing the digits. If the difference between the digits is 3. Find the number.**

**Soln:** Let the digits at units and tens place of the given number be  $x$  and  $y$  respectively. Thus, the number is  $10y + x$ .

The difference between the two digits of the number is 3. Thus, we have  $x - y = \pm 3$

After interchanging the digits, the number becomes  $10x + y$ .

Seven times the number is equal to four times the number obtained by reversing the order of the digits. Thus, we have

$$7(10y + x) = 4(10x + y)$$

$$\Rightarrow 70y + 7x = 40x + 4y$$

$$\Rightarrow 40x + 4y - 70y - 7x = 0$$

$$\Rightarrow 33x - 66y = 0$$

$$\Rightarrow 33(x - 2y) = 0$$

$$\Rightarrow x - 2y = 0$$

So, we have two systems of simultaneous equations

$$x - y = 3,$$

$$x - 2y = 0$$

$$x - y = -3,$$

$$x - 2y = 0$$

Here  $x$  and  $y$  are unknowns. We have to solve the above systems of equations for  $x$  and  $y$ .

(i) First, we solve the system

$$x - y = 3,$$

$$x - 2y = 0$$

Multiplying the first equation by 2 and then subtracting from the second equation, we have

$$(x - 2y) - 2(x - y) = 0 - 2 \times 3$$

$$\Rightarrow x - 2y - 2x + 2y = -6$$

$$\Rightarrow -x = -6$$

$$\Rightarrow x = 6$$

Substituting the value of  $x$  in the first equation, we have

$$6 - y = 3$$

$$\Rightarrow y = 6 - 3$$

$$\Rightarrow y = 3$$

Hence, the number is  $10 \times 3 + 6 = 36$

(ii) Now, we solve the system

$$x - y = -3,$$

$$x - 2y = 0$$

Multiplying the first equation by 2 and then subtracting from the second equation we have

$$(x - 2y) - 2(x - y) = 0 - (-3 \times 2)$$

$$\Rightarrow x - 2y - 2x + 2y = 6$$

$$\Rightarrow -x = 6$$

$$\Rightarrow x = -6$$

Substituting the value of  $x$  in the first equation, we have

$$-6 - y = -3$$

$$\Rightarrow y = -6 + 3$$

$$\Rightarrow y = -3$$

But, the digits of the number can't be negative. Hence, the second case must be removed.

**16. Two numbers are in the ratio 5: 6. If 8 is subtracted from each of the numbers the ratio becomes 4: 5. Find the numbers.**

**Soln:** Let the numbers be  $5x$  and  $6x$

Now subtracting 8 we get the numbers as

$$5x - 8 \text{ and } 6x - 8$$

$$\text{Thus, } (5x - 8) / (6x - 8) = 4 : 5$$

By cross multiplying we get,

$$5(5x - 8) = 4(6x - 8)$$

$$\Rightarrow 25x - 40 = 24x - 32$$

$$\Rightarrow x = 8$$

Hence, the numbers are

$$5x = 5 \times 8 = 40$$

$$6x = 6 \times 8 = 48$$

**17. A two-digit number is obtained by either multiplying the sum of the digits by 8 and then subtracting 5 or by multiplying the difference of the digits by 16 and then adding 3. Find the number.**

**Soln:** Let the unit digit and ten's digit of the number be  $x$  and  $y$  respectively.

Therefore the number =  $10y + x$

$$\text{Sum of digits} = x + y$$

$$10y + x = 8(x + y) - 5$$

$$10y + x = 8x + 8y - 5$$

$$7x - 2y = 5 \dots\dots (1)$$

Difference of the digits =  $y - x$  [if  $x < y$ ]

$$10y + x = 16(y - x) + 3$$

$$10y + x = 16y - 16x + 3$$

$$17x - 6y = 3 \dots\dots (2)$$

Multiply equation (1) and (2) and subtracting equation (2)

$$21x - 6y = 15$$

$$17x - 6y = 3$$

$$4x = 12$$

$$x = 12/4 = 3$$

Putting the value of  $x = 3$  in equation (1)

$$7 \times 3 - 2y = 5$$

$$2y = 21 - 5$$

$$2y = 16$$

$$y = 16/2 = 8$$

Thus the unit digit of the number is 3 and ten's digit is 8.

Therefore the number is 83.

### Exercise 3.7

**Q.1: The sum of two numbers is 8. If their sum is four times their difference, find the numbers.**

**Soln:** Let the numbers are  $x$  and  $y$ . One of them must be greater than or equal to the other. Let us assume that  $x$  is greater than or equal to  $y$ .

The sum of the two numbers is 8. Thus, we have  $x+y = 8$

The sum of the two numbers is four times their difference. Thus, we have

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

$$\Rightarrow x+y = 4x-4y$$

$$\Rightarrow 4x - 4y - x - y = 0$$

$$\Rightarrow 3x-5y = 0$$

So, we have two equations

$$x+y=8$$

$$3x-5y = 0$$

Here  $x$  and  $y$  are unknowns.

We have to solve the above equations for  $x$  and  $y$ .

Multiplying the first equation by 5 and then adding with the second equation, we have

$$5(x + y) + (3x - 5y) = 5 \times 8 + 0$$

$$\Rightarrow 5x + 5y + 3x - 5y = 40$$

$$\Rightarrow 8x = 40$$

$$\Rightarrow x = 5$$

x = Substituting the value of x in the first equation, we have

$$5 + y = 8$$

$$\Rightarrow y = 8 - 5$$

$$\Rightarrow y = 3$$

Hence, the numbers are 5 and 3.

**Q. 2: The sum of digits of a two digit number is 13. If the number is subtracted from the one obtained by interchanging the digits, the result is 45. What is the number?**

**Soln:** Let the digits at units and tens place of the given number be x and y respectively. Thus, the number is  $10y + x$ .

The sum of the digits of the number is 13. Thus, we have  $x + y = 13$

After interchanging the digits, the number becomes  $10x + y$ .

The difference between the number obtained by interchanging the digits and the original number is 45. Thus, we have

$$(10x + y) - (10y + x) = 45$$

$$\Rightarrow 10x + y - 10y - x = 45$$

$$\Rightarrow 9x - 9y = 45$$

$$\Rightarrow 9(x - y) = 45$$

$$\Rightarrow x - y = 5$$

So, we have two equations

$$x + y = 13$$

$$x - y = 5$$

Here x and y are unknowns. We have to solve the above equations for x and y.

Adding the two equations, we have

$$(x+y)+(x-y)=13+5$$

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

$$\Rightarrow 2x=18$$

$$\Rightarrow x=9$$

Substituting the value of  $x$  in the first equation, we have

$$9+y=13$$

$$\Rightarrow y=13-9$$

$$\Rightarrow y=4$$

Hence, the number is  $10 \times 4 + 9 = 49$

**Q.3: A number consists of two digits whose sum is five. When the digits are reversed, the number becomes greater by nine. Find the number.**

**Soln:** Let the digits at units and tens place of the given number be  $x$  and  $y$  respectively. Thus, the number is  $10y+x$ .

The sum of the digits of the number is 5. Thus, we have  $x+y=5$

After interchanging the digits, the number becomes  $10x+y$ .

The number obtained by interchanging the digits is greater by 9 from the original number. Thus, we have

$$10x+y=10y+x+9$$

$$\Rightarrow 10x+y-10y-x=9$$

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

$$\Rightarrow 9(x-y)=9$$

$$\Rightarrow x-y=1$$

So, we have two equations

$$x+y=5$$

$$x-y=1$$

Here  $x$  and  $y$  are unknowns. We have to solve the above equations for  $x$  and  $y$ .

Adding the two equations, we have

$$(x+y)+(x-y)=5+1$$

$$\Rightarrow x + y + x - y = 5 + 1$$

$$\Rightarrow 2x = 6$$

$$\Rightarrow x = 6/2$$

$$\Rightarrow x = 3$$

Substituting the value of x in the first equation, we have

$$3 + y = 5$$

$$\Rightarrow y = 5 - 3$$

$$\Rightarrow y = 2$$

Hence, the number is  $10 \times 2 + 3 = 23$

**Q.4: 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.**

**Soln:** Let the digits at units and tens place of the given number be x and y respectively. Thus, the number is  $10y + x$ .

The sum of the digits of the number is 15. Thus, we have  $x + y = 15$

After interchanging the digits, the number becomes  $10x + y$ .

The number obtained by interchanging the digits is exceeding by 9 from the original number. Thus, we have

$$10x + y = 10y + x + 9$$

$$\Rightarrow 10x + y - 10y - x = 9$$

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

$$\Rightarrow 9(x - y) = 9$$

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

$$\Rightarrow x - y = 1$$

So, we have two equations

$$x + y = 15$$

$$x - y = 1$$

Here x and y are unknowns. We have to solve the above equations for x and y. Adding the two equations, we have

$$(x + y) + (x - y) = 15 + 1$$

$$\Rightarrow x + y + x - y = 16$$

$$\Rightarrow 2x = 16$$

$$\Rightarrow x = 16/2$$

$$\Rightarrow x = 8$$

Substituting the value of x in the first equation, we have

$$8 + y = 5$$

$$\Rightarrow y = 15 - 8$$

$$\Rightarrow y = 7$$

Hence, the number is  $10 \times 7 + 8 = 78$

**Q.5: The sum of two- digit number and the number formed by reversing the order of digits is 66.If the two digits differ by 2, find the number. How many such numbers are there?**

**Soln:** Let the digits at units and tens place of the given number be x and y respectively. Thus, the number is  $10y + x$ .

The two digits of the number are differing by 2. Thus, we have  $x - y = \pm 2$

After interchanging the digits, the number becomes  $10x + y$ .

The sum of the numbers obtained by interchanging the digits and the original number is 66. Thus, we have

$$(10x + y) + (10y + x) = 66$$

$$\Rightarrow 10x + y + 10y + x = 66$$

$$\Rightarrow 11x + 11y = 66$$

$$\Rightarrow 11(x + y) = 66$$

$$\Rightarrow x + y = 66/11$$

$$\Rightarrow x + y = 6$$

So, we have two systems of simultaneous equations

$$x - y = 2,$$

$$x + y = 6$$

$$x - y = -2,$$



$$x + y = 6$$

Here  $x$  and  $y$  are unknowns. We have to solve the above systems of equations for  $x$  and  $y$ .

**(i)** First, we solve the system

$$x - y = 2,$$

$$x + y = 6$$

Adding the two equations, we have

$$(x - y) + (x + y) = 2 + 6$$

$$\Rightarrow x - y + x + y = 8$$

$$\Rightarrow 2x = 8$$

$$\Rightarrow x = 8/2$$

$$\Rightarrow x = 4$$

Substituting the value of  $x$  in the first equation, we have

$$4 - y = 2$$

$$\Rightarrow y = 4 - 2$$

$$\Rightarrow y = 2$$

Hence, the number is  $10 \times 2 + 4 = 24$

**(ii)** Now, we solve the system

$$x - y = -2,$$

$$x + y = 6$$

Adding the two equations, we have

$$(x - y) + (x + y) = -2 + 6$$

$$\Rightarrow x - y + x + y = 4$$

$$\Rightarrow 2x = 4$$

$$\Rightarrow x = 4/2$$

$$\Rightarrow x = 2$$

Substituting the value of  $x$  in the first equation, we have

$$2 - y = -2$$

$$\Rightarrow y=2+2$$

$$\Rightarrow y=4$$

Hence, the number is  $10 \times 4 + 2 = 42$

There are two such numbers.

**6. The sum of two numbers is 1000 and the difference between their square is 256000. Find the numbers.**

**Soln:** Let the numbers are  $x$  and  $y$ . One of them must be greater than or equal to the other. Let us assume that  $x$  is greater than or equal to  $y$ .

The sum of the two numbers is 1000. Thus, we have  $x+y = 1000$

The difference between the squares of the two numbers is 256000. Thus, we have

$$x^2 - y^2 = 256000$$

$$\Rightarrow (x+y)(x-y) = 256000$$

$$\Rightarrow 1000(x-y) = 256000$$

$$\Rightarrow x-y = 256000/1000$$

$$\Rightarrow x-y = 256$$

So, we have two equations

$$x+y = 1000$$

$$x-y = 256$$

Here  $x$  and  $y$  are unknowns. We have to solve the above equations for  $x$  and  $y$ . Adding the two equations, we have

$$(x+y) + (x-y) = 1000 + 256$$

$$\Rightarrow x+y+x-y = 1256$$

$$\Rightarrow 2x = 1256$$

$$\Rightarrow x = 1256/2$$

$$x = 628$$

Substituting the value of  $x$  in the first equation, we have

$$628+y = 1000$$

$$\Rightarrow y = 1000-628$$

$$\Rightarrow y = 372$$

Hence, the numbers are 628 and 372

**7. The sum of a two digit number and the number obtained by reversing the order of its digits is 99. If the digits differ by 3, find the number.**

**Soln:** Let the digits at units and tens place of the given number be  $x$  and  $y$  respectively. Thus, the number is  $10y + x$ .

The two digits of the number are differing by 3. Thus, we have  $x - y = \pm 3$

After interchanging the digits, the number becomes  $10x + y$ .

The sum of the numbers obtained by interchanging the digits and the original number is 99. Thus, we have

$$(10x+y)+(10y+x)= 99$$

$$\Rightarrow 10x+y+10y+x = 99$$

$$\Rightarrow 11x+11y = 99$$

$$\Rightarrow 11(x + y)= 99$$

$$\Rightarrow x+y = 99/11$$

$$\Rightarrow x = 9$$

So, we have two systems of simultaneous equations

$$x-y= 3,$$

$$x+y = 9$$

$$x-y = -3,$$

$$x+y=9$$

Adding the two equations, we have

$$(x - y)+(x + y)= 3 + 9$$

$$\Rightarrow x-y+x+y=12$$

$$\Rightarrow 2x =12$$

$$\Rightarrow x= 12/2$$

$$\Rightarrow x =6$$

Substituting the value of  $x$  in the first equation, we have

$$6-y=3$$

$$\Rightarrow y = 6 - 3$$

$$\Rightarrow y = 3$$

Hence, the number is  $10 \times 3 + 6 = 36$

(ii) Now, we solve the system

$$x - y = -3,$$

$$x + y = 9$$

Adding the two equations we have

$$(x - y) + (x + y) = -3 + 9$$

$$\Rightarrow x - y + x + y = 6$$

$$\Rightarrow 2x = 6$$

$$\Rightarrow x = 3$$

Substituting the value of  $x$  in the first equation, we have

$$3 - y = -3$$

$$\Rightarrow y = 3 + 3$$

$$\Rightarrow y = 6$$

Hence, the number is  $10 \times 6 + 3 = 63$

Note that there are two such numbers.

**8. A two-digit number is 4 times the sum of its digits. If 18 is added to the number, the digits are reversed. Find the number.**

**Soln:** Let the digits at units and tens place of the given number be  $x$  and  $y$  respectively. Thus, the number is  $10y + x$ .

The number is 4 times the sum of the two digits. Thus, we have

$$10y + x = 4(x + y)$$

$$\Rightarrow 10y + x = 4x + 4y$$

$$\Rightarrow 4x + 4y - 10y - x = 0$$

$$\Rightarrow 3x - 6y = 0$$

$$\Rightarrow 3(x - 2y) = 0$$

$$\Rightarrow x - 2y = 0$$

After interchanging the digits, the number becomes  $10x+y$ .

If 18 is added to the number, the digits are reversed. Thus, we have

$$(10y+x)+18=10x+y$$

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

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

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

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

$$\Rightarrow x-y=2$$

So, we have the systems of equations

$$x-2y=0,$$

$$x-y=2$$

Here  $x$  and  $y$  are unknowns. We have to solve the above systems of equations for  $x$  and  $y$ . Subtracting the first equation from the second, we have

$$(x-y)-(x-2y)=2-0$$

$$\Rightarrow x-y-x+2y=2$$

$$\Rightarrow y=2$$

Substituting the value of  $y$  in the first equation, we have

$$x-2 \times 2=0$$

$$\Rightarrow x-4=0$$

$$\Rightarrow x=4$$

Hence, the number is  $10 \times 2 + 4 = 24$

**9. A two-digit number is 3 more than 4 times the sum of its digits. If 18 is added to the number, the digits are reversed. Find the number.**

**Soln:** Let the digits at units and tens place of the given number be  $x$  and  $y$  respectively. Thus, the number is  $10y + x$ .

The number is 3 more than 4 times the sum of the two digits. Thus, we have

$$10y+x=4(x+y)+3$$

$$\Rightarrow 10y+x=4x+4y+3$$

$$\Rightarrow 4x+4y-10y-x=-3$$

$$\Rightarrow 3x - 6y = -3$$

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

$$\Rightarrow x-2y= -3/3$$

$$\Rightarrow x-2y= -1$$

Alter interchanging the digits, the number becomes  $10x+ y$ .

If 18 is added to the number, the digits are reversed. Thus, we have

$$(10y+x)+18 =10x+y$$

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

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

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

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

$$\Rightarrow x-y= 2$$

So, we have the systems of equations  $x-2y=-1$ ,

$$x-y= 2$$

Here  $x$  and  $y$  are unknowns. We have to solve the above systems of equations for  $x$  and  $y$ . Subtracting the first equation from the second, we have

$$(x- y)-(x-2y) = 2 - (-1)$$

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

$$\Rightarrow y=3$$

Substituting the value of  $y$  in the first equation, we have

$$x-2 \times 3=-1$$

$$\Rightarrow x-6=-1$$

$$\Rightarrow x=-1+6$$

$$\Rightarrow x =5$$

Hence the number is  $10 \times 3 + 5 = 35$

**10. A two-digit number is 4 more than 6 times the sum of its digits. If 18 is subtracted from the number, the digits are reversed. Find the number.**

**Soln:** Let the digits at units and tens place of the given number be  $x$  and  $y$  respectively. Thus, the number is  $10y+x$ .

The number is 4 more than 6 times the sum of the two digits. Thus, we have

$$10y + x = 6(x + y) + 4$$

$$\Rightarrow 10y + x = 6x + 6y + 4$$

$$\Rightarrow 6x + 6y - 10y - x = -4$$

$$\Rightarrow 5x - 4y = -4$$

After interchanging the digits, the number becomes  $10x + y$ .

If 18 is subtracted from the number, the digits are reversed. Thus, we have

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

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

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

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

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

$$\Rightarrow x - y = -2$$

So, we have the systems of equations

$$5x - 4y = -4,$$

$$x - y = -2$$

Here  $x$  and  $y$  are unknowns. We have to solve the above systems of equations for  $x$  and  $y$ . Multiplying the second equation by 5 and then subtracting from the first, we have

$$(5x - 4y) - (5x - 5y) = -4 - (-2 \times 5)$$

$$\Rightarrow 5x - 4y - 5x + 5y = -4 + 10$$

$$\Rightarrow y = 6$$

Substituting the value of  $y$  in the second equation, we have

$$x - 6 = -2$$

$$\Rightarrow x = 6 - 2$$

$$\Rightarrow x = 4$$

Hence, the number is  $10 \times 6 + 4 = 64$

**11. A two-digit number is 4 times the sum of its digits and twice the product of the digits. Find the number.**

**Soln:** Let the digits at units and tens place of the given number be  $x$  and  $y$  respectively. Thus, the number is  $10y + x$ .

The number is 4 times the sum of the two digits. Thus, we have

$$10y + x = 4(x + y)$$

$$\Rightarrow 10y + x = 4x + 4y$$

$$\Rightarrow 4x + 4y - 10y - x = 0$$

$$\Rightarrow 3x - 6y = 0$$

$$3(x - 2y) = 0$$

$$\Rightarrow x - 2y = 0$$

$$\Rightarrow x = 2y$$

After interchanging the digits, the number becomes  $10x + y$ .

The number is twice the product of the digits. Thus, we have  $10y + x = 2xy$

So, we have the systems of equations

$$x = 2y,$$

$$10y + x = 2xy$$

Here  $x$  and  $y$  are unknowns. We have to solve the above systems of equations for  $x$  and  $y$ . Substituting  $x = 2y$  in the second equation, we get

$$10y + 2y = 2 \times 2y \times y$$

$$\Rightarrow 12y = 4y^2$$

$$\Rightarrow 4y^2 - 12y = 0$$

$$\Rightarrow 4y(y - 3) = 0$$

$$\Rightarrow y(y - 3) = 0$$

$$\Rightarrow y = 0 \text{ or } y = 3$$

Substituting the value of  $y$  in the first equation, we have

$y$	0	3
$x$	0	6

Hence, the number is  $10 \times 3 + 6 = 36$



Note that the first pair of solution does not give a two digit number

**12. A two-digit number is such that the product of its digits is 20. If 9 is added to the number, the digits interchange their places. Find the number.**

**Soln:** Let the digits at units and tens place of the given number be  $x$  and  $y$  respectively. Thus, the number is  $10y + x$ .

The product of the two digits of the number is 20. Thus, we have  $xy = 20$

After interchanging the digits, the number becomes  $10x + y$

If 9 is added to the number, the digits interchange their places. Thus, we have

$$(10y + x) + 9 = 10x + y$$

$$\Rightarrow 10y + x + 9 = 10x + y$$

$$\Rightarrow 10x + y - 10y - x = 9$$

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

$$\Rightarrow 9(x - y) = 9$$

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

$$\Rightarrow x - y = 1$$

So, we have the systems of equations

$$xy = 20,$$

$$x - y = 1$$

Here  $x$  and  $y$  are unknowns. We have to solve the above systems of equations for  $x$  and  $y$ .

Substituting  $x = 1 + y$  from the second equation to the first equation, we get

$$(1 + y)y = 20$$

$$\Rightarrow y + y^2 = 20$$

$$\Rightarrow y^2 + y - 20 = 0$$

$$\Rightarrow y^2 + 5y - 4y - 20 = 0$$

$$\Rightarrow y(y + 5) - 4(y + 5) = 0$$

$$\Rightarrow (y + 5)(y - 4) = 0$$

$$\Rightarrow y = -5 \text{ or } y = 4$$

Substituting the value of  $y$  in the second equation, we have

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y	-5	4
x	-4	5

Hence, the number is  $10 \times 4 + 5 = 45$

Note that in the first pair of solution the values of x and y are both negative. But the digits of the number can't be negative. So, we must remove this pair.

**13. The difference between two numbers is 26 and one number is three times the other. Find them.**

**Soln:** Let the numbers are x and y. One of them must be greater than or equal to the other. Let us assume that x is greater than or equal to y.

The difference between the two numbers is 26. Thus, we have  $x - y = 26$

One of the two numbers is three times the other number. Here, we are assuming that x is greater than or equal to y. Thus, we have  $x = 3y$

So, we have two equations

$$x - y = 26$$

$$x = 3y$$

Here x and y are unknowns. We have to solve the above equations for x and y.

Substituting  $x = 3y$  from the second equation in the first equation, we get

$$3y - y = 26$$

$$\Rightarrow 2y = 26$$

$$\Rightarrow y = 13$$

Substituting the value of y in the first equation, we have

$$x - 13 = 26$$

$$\Rightarrow x = 13 + 26$$

$$\Rightarrow x = 39$$

Hence, the numbers are 39 and 13.

**14. The sum of the digits of a two-digit number is 9. Also, nine times this number is twice the number obtained by reversing the order of the digits. Find the number.**

**Soln:** Let the digits at units and tens place of the given number be  $x$  and  $y$  respectively. Thus, the number is  $10y+x$ .

The sum of the two digits of the number is 9.

Thus, we have  $x + y = 9$

After interchanging the digits, the number becomes  $10x + y$ .

Also, 9 times the number is equal to twice the number obtained by reversing the order of the digits. Thus, we have

$$9(10y + x) = 2(10x + y)$$

$$\Rightarrow 90y + 9x = 20x + 2y$$

$$\Rightarrow 20x + 2y - 90y - 9x = 0$$

$$\Rightarrow 11x - 88y = 0$$

$$\Rightarrow 11(x - 8y) = 0$$

$$\Rightarrow x - 8y = 0$$

So, we have the systems of equations

$$x + y = 9,$$

$$x - 8y = 0$$

Here  $x$  and  $y$  are unknowns. We have to solve the above systems of equations for  $x$  and  $y$ . Substituting  $x = 8y$  from the second equation to the first equation, we get

$$8y + y = 9$$

$$\Rightarrow 9y = 9$$

$$\Rightarrow y = 9/9$$

$$\Rightarrow y = 1$$

Substituting the value of  $y$  in the second equation, we have

$$x - 8 \times 1 = 0$$

$$\Rightarrow x - 8 = 0$$

$$\Rightarrow x = 8$$

Hence, the number is  $10 \times 1 + 8 = 18$

**15. Seven times a two-digit number is equal to four times the number obtained by reversing the digits. If the difference between the digits is 3. Find the number.**

**Soln:** Let the digits at units and tens place of the given number be  $x$  and  $y$  respectively. Thus, the number is  $10y+x$ .

The difference between the two digits of the number is 3. Thus, we have  $x-y = \pm 3$

After interchanging the digits, the number becomes  $10x + y$ .

Seven times the number is equal to four times the number obtained by reversing the order of the digits. Thus, we have

$$7(10y + x) = 4(10x + y)$$

$$\Rightarrow 70y + 7x = 40x + 4y$$

$$\Rightarrow 40x + 4y - 70y - 7x = 0$$

$$\Rightarrow 33x - 66y = 0$$

$$\Rightarrow 33(x - 2y) = 0$$

$$\Rightarrow x - 2y = 0$$

So, we have two systems of simultaneous equations

$$x - y = 3,$$

$$x - 2y = 0$$

$$x - y = -3,$$

$$x - 2y = 0$$

Here  $x$  and  $y$  are unknowns. We have to solve the above systems of equations for  $x$  and  $y$ .

(i) First, we solve the system

$$x - y = 3,$$

$$x - 2y = 0$$

Multiplying the first equation by 2 and then subtracting from the second equation, we have

$$(x - 2y) - 2(x - y) = 0 - 2 \times 3$$

$$\Rightarrow x - 2y - 2x + 2y = -6$$

$$\Rightarrow -x = -6$$

$$\Rightarrow x = 6$$

Substituting the value of  $x$  in the first equation, we have

$$6 - y = 3$$

$$\Rightarrow y = 6 - 3$$

$$\Rightarrow y = 3$$

Hence, the number is  $10 \times 3 + 6 = 36$

(ii) Now, we solve the system

$$x - y = -3,$$

$$x - 2y = 0$$

Multiplying the first equation by 2 and then subtracting from the second equation we have

$$(x - 2y) - 2(x - y) = 0 - (-3 \times 2)$$

$$\Rightarrow x - 2y - 2x + 2y = 6$$

$$\Rightarrow -x = 6$$

$$\Rightarrow x = -6$$

Substituting the value of  $x$  in the first equation, we have

$$-6 - y = -3$$

$$\Rightarrow y = -6 + 3$$

$$\Rightarrow y = -3$$

But, the digits of the number can't be negative. Hence, the second case must be removed.

**16. Two numbers are in the ratio 5: 6. If 8 is subtracted from each of the numbers the ratio becomes 4: 5. Find the numbers.**

**Soln:** Let the numbers be  $5x$  and  $6x$

Now subtracting 8 we get the numbers as

$$5x - 8 \text{ and } 6x - 8$$

$$\text{Thus, } (5x - 8) / (6x - 8) = 4 : 5$$

By cross multiplying we get,

$$5(5x - 8) = 4(6x - 8)$$

$$\Rightarrow 25x - 40 = 24x - 32$$

$$\Rightarrow x = 8$$

Hence, the numbers are

$$5x = 5 \times 8 = 40$$

$$6x = 6 \times 8 = 48$$

**17. A two-digit number is obtained by either multiplying the sum of the digits by 8 and then subtracting 5 or by multiplying the difference of the digits by 16 and then adding 3. Find the number.**

**Soln:** Let the unit digit and ten's digit of the number be  $x$  and  $y$  respectively.

$$\text{Therefore the number} = 10y + x$$

$$\text{Sum of digits} = x + y$$

$$10y + x = 8(x + y) - 5$$

$$10y + x = 8x + 8y - 5$$

$$7x - 2y = 5 \dots\dots (1)$$

$$\text{Difference of the digits} = y - x \text{ [if } x < y]$$

$$10y + x = 16(y - x) + 3$$

$$10y + x = 16y - 16x + 3$$

$$17x - 6y = 3 \dots\dots (2)$$

Multiply equation (1) and (2) and subtracting equation (2)

$$21x - 6y = 15$$

$$17x - 6y = 3$$

$$4x = 12$$

$$x = 12/4 = 3$$

Putting the value of  $x = 3$  in equation (1)

$$7 \times 3 - 2y = 5$$

$$2y = 21 - 5$$

$$2y = 16$$

$$y = 16/2 = 8$$

Thus the unit digit of the number is 3 and ten's digit is 8.

Therefore the number is 83.