

## EXERCISE 8.1

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**1. Verify by substitution that:**

**(i)  $x = 4$  is the root of  $3x - 5 = 7$**

**(ii)  $x = 3$  is the root of  $5 + 3x = 14$**

**(iii)  $x = 2$  is the root of  $3x - 2 = 8x - 12$**

**(iv)  $x = 4$  is the root of  $(3x/2) = 6$**

**(v)  $y = 2$  is the root of  $y - 3 = 2y - 5$**

**(vi)  $x = 8$  is the root of  $(1/2)x + 7 = 11$**

**Solution:**

**(i) Given  $x = 4$  is the root of  $3x - 5 = 7$**

Now, substituting  $x = 4$  in place of 'x' in the given equation, we get

$$= 3(4) - 5 = 7$$

$$= 12 - 5 = 7$$

$$7 = 7$$

Since, LHS = RHS

Hence,  $x = 4$  is the root of  $3x - 5 = 7$ .

**(ii) Given  $x = 3$  is the root of  $5 + 3x = 14$ .**

Now, substituting  $x = 3$  in place of 'x' in the given equation, we get

$$= 5 + 3(3) = 14$$

$$= 5 + 9 = 14$$

$$14 = 14$$

Since, LHS = RHS

Hence,  $x = 3$  is the root of  $5 + 3x = 14$ .

**(iii) Given  $x = 2$  is the root of  $3x - 2 = 8x - 12$ .**

Now, substituting  $x = 2$  in place of 'x' in the given equation, we get

$$= 3(2) - 2 = 8(2) - 12$$

$$= 6 - 2 = 16 - 12$$

$$4 = 4$$

Since, LHS = RHS

Hence,  $x = 2$  is the root of  $3x - 2 = 8x - 12$ .

**(iv) Given  $x = 4$  is the root of  $3x/2 = 6$ .**

Now, substituting  $x = 4$  in place of 'x' in the given equation, we get

$$= (3 \times 4)/2 = 6$$

$$= (12/2) = 6$$

$$6 = 6$$

Since, LHS = RHS

Hence,  $x = 4$  is the root of  $(3x/2) = 6$ .

(v) Given  $y = 2$  is the root of  $y - 3 = 2y - 5$ .

Now, substituting  $y = 2$  in place of 'y' in the given equation, we get

$$= 2 - 3 = 2(2) - 5$$

$$= -1 = 4 - 5$$

$$-1 = -1$$

Since, LHS = RHS

Hence,  $y = 2$  is the root of  $y - 3 = 2y - 5$ .

(vi) Given  $x = 8$  is the root of  $(1/2)x + 7 = 11$ .

Now, substituting  $x = 8$  in place of 'x' in the given equation, we get

$$= (1/2)(8) + 7 = 11$$

$$= 4 + 7 = 11$$

$$= 11 = 11$$

Since, LHS = RHS

Hence,  $x = 8$  is the root of  $12x + 7 = 11$ .

**2. Solve each of the following equations by trial – and – error method:**

(i)  $x + 3 = 12$

(ii)  $x - 7 = 10$

(iii)  $4x = 28$

(iv)  $(x/2) + 7 = 11$

(v)  $2x + 4 = 3x$

(vi)  $(x/4) = 12$

(vii)  $(15/x) = 3$

(viii)  $(x/18) = 20$

**Solution:**

(i) Given  $x + 3 = 12$

Here LHS =  $x + 3$  and RHS = 12

x	LHS	RHS	Is LHS = RHS
1	$1 + 3 = 4$	12	No
2	$2 + 3 = 5$	12	No
3	$3 + 3 = 6$	12	No
4	$4 + 3 = 7$	12	No
5	$5 + 3 = 8$	12	No
6	$6 + 3 = 9$	12	No
7	$7 + 3 = 10$	12	No
8	$8 + 3 = 11$	12	No
9	$9 + 3 = 12$	12	Yes

Therefore, if  $x = 9$ , LHS = RHS.

Hence,  $x = 9$  is the solution to this equation.

(ii) Given  $x - 7 = 10$

Here LHS =  $x - 7$  and RHS = 10

x	LHS	RHS	Is LHS = RHS
9	$9 - 7 = 2$	10	No
10	$10 - 7 = 3$	10	No
11	$11 - 7 = 4$	10	No
12	$12 - 7 = 5$	10	No
13	$13 - 7 = 6$	10	No
14	$14 - 7 = 7$	10	No
15	$15 - 7 = 8$	10	No
16	$16 - 7 = 9$	10	No
17	$17 - 7 = 10$	10	Yes

Therefore if  $x = 17$ , LHS = RHS

Hence,  $x = 17$  is the solution to this equation.

(iii) Given  $4x = 28$

Here LHS =  $4x$  and RHS = 28

x	LHS	RHS	Is LHS = RHS
1	$4 \times 1 = 4$	28	No
2	$4 \times 2 = 8$	28	No
3	$4 \times 3 = 12$	28	No
4	$4 \times 4 = 16$	28	No
5	$4 \times 5 = 20$	28	No
6	$4 \times 6 = 24$	28	No
7	$4 \times 7 = 28$	28	Yes

Therefore if  $x = 7$ , LHS = RHS

Hence,  $x = 7$  is the solution to this equation.

(iv) Given  $(x/2) + 7 = 11$

Here LHS =  $(x/2) + 7$  and RHS = 11

Since RHS is a natural number,  $(x/2)$  must also be a natural number, so we must substitute values of  $x$  that are multiples of 2.

x	LHS	RHS	Is LHS = RHS
2	$(2/2) + 7 = 1 + 7 = 8$	11	No
4	$(4/2) + 7 = 2 + 7 = 9$	11	No
6	$(6/2) + 7 = 3 + 7 = 10$	11	No
8	$(8/2) + 7 = 4 + 7 = 11$	11	Yes

Therefore if  $x = 8$ , LHS = RHS

Hence,  $x = 8$  is the solutions to this equation.

(v) Given  $2x + 4 = 3x$

Here LHS =  $2x + 4$  and RHS =  $3x$

x	LHS	RHS	Is LHS = RHS
1	$2(1) + 4 = 2 + 4 = 6$	$3(1) = 3$	No
2	$2(2) + 4 = 4 + 4 = 8$	$3(2) = 6$	No
3	$2(3) + 4 = 6 + 4 = 10$	$3(3) = 9$	No
4	$2(4) + 4 = 8 + 4 = 12$	$3(4) = 12$	Yes

Therefore if  $x = 4$ , LHS = RHS

Hence,  $x = 4$  is the solutions to this equation.

(vi) Given  $(x/4) = 12$

Here LHS =  $(x/4)$  and RHS = 12

Since RHS is a natural number,  $x/4$  must also be a natural number, so we must substitute values of  $x$  that are multiples of 4.

x	LHS	RHS	Is LHS = RHS
16	$(16/4) = 4$	12	No
20	$(20/4) = 5$	12	No
24	$(24/4) = 6$	12	No
28	$(28/4) = 7$	12	No
32	$(32/4) = 8$	12	No
36	$(36/4) = 9$	12	No
40	$(40/4) = 10$	12	No
44	$(44/4) = 11$	12	No
48	$(48/4) = 12$	12	Yes

Therefore if  $x = 48$ , LHS = RHS

Hence,  $x = 48$  is the solutions to this equation.

(vii) Given  $(15/x) = 3$

Here LHS =  $(15/x)$  and RHS = 3

Since RHS is a natural number,  $15x$  must also be a natural number, so we must substitute values of  $x$  that are factors of 15.

x	LHS	RHS	Is LHS = RHS
1	$(15/1) = 15$	3	No
3	$(15/3) = 5$	3	No
5	$(15/5) = 3$	3	Yes

Therefore if  $x = 5$ , LHS = RHS

Hence,  $x = 5$  is the solutions to this equation.

(viii) Given  $(x/18) = 20$

Here LHS =  $(x/18)$  and RHS = 20

Since RHS is a natural number,  $(x/18)$  must also be a natural number, so we must substitute values of  $x$  that are multiples of 18.

x	LHS	RHS	Is LHS = RHS
324	$(324/18) = 18$	20	No
342	$(342/18) = 19$	20	No
360	$(360/18) = 20$	20	Yes

Therefore if  $x = 360$ ,  $LHS = RHS$

Hence,  $x = 360$  is the solutions to this equation.



## EXERCISE 8.2

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Solve each of the following equations and check your answers:

1.  $x - 3 = 5$

**Solution:**

Given  $x - 3 = 5$

Adding 3 to both sides we get,

$$x - 3 + 3 = 5 + 3$$

$$x = 8$$

Verification:

Substituting  $x = 8$  in LHS, we get

$$\text{LHS} = x - 3 \text{ and RHS} = 5$$

$$\text{LHS} = 8 - 3 = 5 \text{ and RHS} = 5$$

$$\text{LHS} = \text{RHS}$$

Hence, verified.

2.  $x + 9 = 13$

**Solution:**

Given  $x + 9 = 13$

Subtracting 9 from both sides i.e. LHS and RHS, we get

$$x + 9 - 9 = 13 - 9$$

$$x = 4$$

Verification:

Substituting  $x = 4$  on LHS, we get

$$\text{LHS} = 4 + 9 = 13 = \text{RHS}$$

$$\text{LHS} = \text{RHS}$$

Hence, verified.

3.  $x - (3/5) = (7/5)$

**Solution:**

Given  $x - (3/5) = (7/5)$

Add  $(3/5)$  to both sides, we get

$$x - (3/5) + (3/5) = (7/5) + (3/5)$$

$$x = (7/5) + (3/5)$$

$$x = (10/5)$$

$$x = 2$$

Verification:

Substitute  $x = 2$  in LHS of given equation, then we get

$$2 - (3/5) = (7/5)$$

$$(10 - 3)/5 = (7/5)$$

$$(7/5) = (7/5)$$

$$\text{LHS} = \text{RHS}$$

Hence, verified

#### 4. $3x = 0$

**Solution:**

Given  $3x = 0$

On dividing both sides by 3 we get,

$$(3x/3) = (0/3)$$

$$x = 0$$

Verification:

Substituting  $x = 0$  in LHS we get

$$3(0) = 0$$

And  $\text{RHS} = 0$

Therefore  $\text{LHS} = \text{RHS}$

Hence, verified.

#### 5. $(x/2) = 0$

**Solution:**

Given  $x/2 = 0$

Multiplying both sides by 2, we get

$$(x/2) \times 2 = 0 \times 2$$

$$x = 0$$

Verification:

Substituting  $x = 0$  in LHS, we get

$$\text{LHS} = 0/2 = 0 \text{ and } \text{RHS} = 0$$

$$\text{LHS} = 0 \text{ and } \text{RHS} = 0$$

Therefore  $\text{LHS} = \text{RHS}$

Hence, verified.



**6.  $x - (1/3) = (2/3)$**

**Solution:**

Given  $x - (1/3) = (2/3)$

Adding  $(1/3)$  to both sides, we get

$$x - (1/3) + (1/3) = (2/3) + (1/3)$$

$$x = (2 + 1)/3$$

$$x = (3/3)$$

$$x = 1$$

Verification:

Substituting  $x = 1$  in LHS, we get

$$1 - (1/3) = (2/3)$$

$$(3 - 1)/3 = (2/3)$$

$$(2/3) = (2/3)$$

Therefore LHS = RHS

Hence, verified.

**7.  $x + (1/2) = (7/2)$**

**Solution:**

Given  $x + (1/2) = (7/2)$

Subtracting  $(1/2)$  from both sides, we get

$$x + (1/2) - (1/2) = (7/2) - (1/2)$$

$$x = (7 - 1)/2$$

$$x = (6/2)$$

$$x = 3$$

Verification:

Substituting  $x = 3$  in LHS we get

$$3 + (1/2) = (7/2)$$

$$(6 + 1)/2 = (7/2)$$

$$(7/2) = (7/2)$$

Therefore LHS = RHS

Hence, verified.

**8.  $10 - y = 6$**

**Solution:**

Given  $10 - y = 6$

Subtracting 10 from both sides, we get

$$10 - y - 10 = 6 - 10$$

$$-y = -4$$

Multiplying both sides by -1, we get

$$-y \times -1 = -4 \times -1$$

$$y = 4$$

Verification:

Substituting  $y = 4$  in LHS, we get

$$10 - y = 10 - 4 = 6 \text{ and RHS} = 6$$

Therefore LHS = RHS

Hence, verified.

**9.  $7 + 4y = -5$**

**Solution:**

Given  $7 + 4y = -5$

Subtracting 7 from both sides, we get

$$7 + 4y - 7 = -5 - 7$$

$$4y = -12$$

Dividing both sides by 4, we get

$$y = -12/4$$

$$y = -3$$

Verification:

Substituting  $y = -3$  in LHS, we get

$$7 + 4y = 7 + 4(-3) = 7 - 12 = -5, \text{ and RHS} = -5$$

Therefore LHS = RHS

Hence, verified.

**10.  $(4/5) - x = (3/5)$**

**Solution:**

Given  $(4/5) - x = (3/5)$

Subtracting  $(4/5)$  from both sides, we get

$$(4/5) - x - (4/5) = (3/5) - (4/5)$$

$$-x = (3 - 4)/5$$

$$-x = (-1/5)$$

$$x = (1/5)$$

Verification:

Substituting  $x = (1/5)$  in LHS we get

$$(4/5) - (1/5) = (3/5)$$

$$(4 - 1)/5 = (3/5)$$

$$(3/5) = (3/5)$$

Therefore LHS = RHS

Hence, verified.

**11.  $2y - (1/2) = (-1/3)$**

**Solution:**

Given  $2y - (1/2) = (-1/3)$

Adding  $(1/2)$  from both the sides, we get

$$2y - (1/2) + (1/2) = (-1/3) + (1/2)$$

$$2y = (-1/3) + (1/2)$$

$$2y = (-2 + 3)/6 \text{ [LCM of 3 and 2 is 6]}$$

$$2y = (1/6)$$

Now divide both the side by 2, we get

$$y = (1/12)$$

Verification:

Substituting  $y = (1/12)$  in LHS we get

$$2(1/12) - (1/2) = (-1/3)$$

$$(1/6) - (1/2) = (-1/3)$$

$$(2 - 6)/12 = (-1/3) \text{ [LCM of 6 and 2 is 12]}$$

$$(-4/12) = (-1/3)$$

$$(-1/3) = (-1/3)$$

Therefore LHS = RHS

Hence, verified.

**12.  $14 = (7x/10) - 8$**

**Solution:**

Given  $14 = (7x/10) - 8$

Adding 8 to both sides we get,

$$14 + 8 = (7x/10) - 8 + 8$$

$$22 = (7x/10)$$

Multiply both sides by 10 we get,

$$220 = 7x$$

$$x = (220/7)$$

Verification:

Substituting  $x = (220/7)$  in RHS we get,

$$14 = (7/10) \times (220/7) - 8$$

$$14 = 22 - 8$$

$$14 = 14$$

Therefore LHS = RHS.

Hence, verified.

**13.  $3(x + 2) = 15$**

**Solution:**

Given  $3(x + 2) = 15$

Dividing both sides by 3 we get,

$$3(x + 2)/3 = (15/3)$$

$$(x + 2) = 5$$

Now subtracting 2 by both sides, we get

$$x + 2 - 2 = 5 - 2$$

$$x = 3$$

Verification:

Substituting  $x = 3$  in LHS we get,

$$3(3 + 2) = 15$$

$$3(5) = 15$$

$$15 = 15$$

Therefore LHS = RHS

Hence, verified.

**14.  $(x/4) = (7/8)$**

**Solution:**

Given  $(x/4) = (7/8)$

Multiply both sides by 4 we get,

$$(x/4) \times 4 = (7/8) \times 4$$

$$x = (7/2)$$

Verification:

Substituting  $x = (7/2)$  in LHS we get,

$$(7/2)/4 = (7/8)$$

$$(7/8) = (7/8)$$

Therefore LHS = RHS

Hence, verified.

**15.  $(1/3) - 2x = 0$**

**Solution:**

Given  $(1/3) - 2x = 0$

Subtract  $(1/3)$  from both sides we get,

$$(1/3) - 2x - (1/3) = 0 - (1/3)$$

$$- 2x = - (1/3)$$

$$2x = (1/3)$$

Divide both side by 2 we get,

$$2x/2 = (1/3)/2$$

$$x = (1/6)$$

Verification:

Substituting  $x = (1/6)$  in LHS we get,

$$(1/3) - 2 (1/6) = 0$$

$$(1/3) - (1/3) = 0$$

$$0 = 0$$

Therefore LHS = RHS

Hence, verified.

**16.  $3(x + 6) = 24$**

**Solution:**

Given  $3(x + 6) = 24$

Divide both the sides by 3 we get,

$$3(x + 6)/3 = (24/3)$$

$$(x + 6) = 8$$

Now subtract 6 from both sides we get,

$$x + 6 - 6 = 8 - 6$$

$$x = 2$$

Verification:

Substituting  $x = 2$  in LHS we get,

$$3(2 + 6) = 24$$

$$3(8) = 24$$

$$24 = 24$$

Therefore LHS = RHS

Hence, verified.

**17.  $3(x + 2) - 2(x - 1) = 7$**

**Solution:**

Given  $3(x + 2) - 2(x - 1) = 7$

On simplifying the brackets, we get

$$3 \times x + 3 \times 2 - 2 \times x + 2 \times 1 = 7$$

$$3x + 6 - 2x + 2 = 7$$

$$3x - 2x + 6 + 2 = 7$$

$$x + 8 = 7$$

Subtracting 8 from both sides, we get

$$x + 8 - 8 = 7 - 8$$

$$x = -1$$

Verification:

Substituting  $x = -1$  in LHS, we get

$$3(x + 2) - 2(x - 1) = 7$$

$$3(-1 + 2) - 2(-1 - 1) = 7$$

$$(3 \times 1) - (2 \times -2) = 7$$

$$3 + 4 = 7$$

Therefore LHS = RHS

Hence, verified.

**18.  $8(2x - 5) - 6(3x - 7) = 1$**

**Solution:**

Given  $8(2x - 5) - 6(3x - 7) = 1$

On simplifying the brackets, we get

$$(8 \times 2x) - (8 \times 5) - (6 \times 3x) + (-6) \times (-7) = 1$$

$$16x - 40 - 18x + 42 = 1$$

$$16x - 18x + 42 - 40 = 1$$

$$-2x + 2 = 1$$

Subtracting 2 from both sides, we get

$$-2x + 2 - 2 = 1 - 2$$

$$-2x = -1$$

Multiplying both sides by -1, we get

$$-2x \times (-1) = -1 \times (-1)$$

$$2x = 1$$

Dividing both sides by 2, we get

$$2x/2 = (1/2)$$

$$x = (1/2)$$

Verification:

Substituting  $x = (1/2)$  in LHS we get,

$$(8 \times (2 \times (1/2) - 5) - (6 \times (3 \times (1/2) - 7)) = 1$$

$$8(1 - 5) - 6(3/2 - 7) = 1$$

$$8 \times (-4) - (6 \times 3/2) + (6 \times 7) = 1$$

$$-32 - 9 + 42 = 1$$

$$-41 + 42 = 1$$

$$1 = 1$$

Therefore LHS = RHS

Hence, verified.

**19.  $6(1 - 4x) + 7(2 + 5x) = 53$**

**Solution:**

Given  $6(1 - 4x) + 7(2 + 5x) = 53$

On simplifying the brackets, we get

$$(6 \times 1) - (6 \times 4x) + (7 \times 2) + (7 \times 5x) = 53$$

$$6 - 24x + 14 + 35x = 53$$

$$6 + 14 + 35x - 24x = 53$$

$$20 + 11x = 53$$

Subtracting 20 from both sides, we get  $20 + 11x - 20 = 53 - 20$

$$11x = 33$$

Dividing both sides by 11, we get

$$11x/11 = 33/11$$

$$x = 3$$

Verification:

Substituting  $x = 3$  in LHS, we get

$$6(1 - 4 \times 3) + 7(2 + 5 \times 3) = 53$$

$$6(1 - 12) + 7(2 + 15) = 53$$

$$6(-11) + 7(17) = 53$$

$$- 66 + 119 = 53$$

$$53 = 53$$

Therefore LHS = RHS

Hence, verified.

**20.  $5(2 - 3x) - 17(2x - 5) = 16$**

**Solution:**

Given  $5(2 - 3x) - 17(2x - 5) = 16$

On expanding the brackets, we get

$$(5 \times 2) - (5 \times 3x) - (17 \times 2x) + (17 \times 5) = 16$$

$$10 - 15x - 34x + 85 = 16$$

$$10 + 85 - 34x - 15x = 16$$

$$95 - 49x = 16$$

Subtracting 95 from both sides, we get

$$- 49x + 95 - 95 = 16 - 95$$

$$- 49x = -79$$

Dividing both sides by  $- 49$ , we get

$$- 49x / -49 = -79 / -49$$

$$x = 79/49$$

Verification:

Substituting  $x = (79/49)$  in LHS we get,

$$5(2 - 3 \times (79/49)) - 17(2 \times (79/49) - 5) = 16$$

$$(5 \times 2) - (5 \times 3 \times (79/49)) - (17 \times 2 \times (79/49)) + (17 \times 5) = 16$$

$$10 - (1185/49) - (2686/49) + 85 = 16$$

$$(490 - 1185 - 2686 + 4165)/49 = 16$$

$$784/49 = 16$$

$$16 = 16$$

Therefore LHS = RHS

Hence, verified.

**21.  $(x - 3)/5 - 2 = -1$**

**Solution:**

Given  $(x - 3)/5 - 2 = -1$

Adding 2 to both sides we get,



$$((x - 3)/5) - 2 + 2 = -1 + 2$$

$$(x - 3)/5 = 1$$

Multiply both sides by 5 we get

$$(x - 3)/5 \times 5 = 1 \times 5$$

$$x - 3 = 5$$

Now add 3 to both sides we get,

$$x - 3 + 3 = 5 + 3$$

$$x = 8$$

Verification:

Substituting  $x = 8$  in LHS we get,

$$((8 - 3)/5) - 2 = -1$$

$$(5/5) - 2 = -1$$

$$1 - 2 = -1$$

$$-1 = -1$$

Therefore LHS = RHS

Hence, verified.

**22.  $5(x - 2) + 3(x + 1) = 25$**

**Solution:**

Given  $5(x - 2) + 3(x + 1) = 25$

On simplifying the brackets, we get

$$(5 \times x) - (5 \times 2) + 3 \times x + 3 \times 1 = 25$$

$$5x - 10 + 3x + 3 = 25$$

$$5x + 3x - 10 + 3 = 25$$

$$8x - 7 = 25$$

Adding 7 to both sides, we get

$$8x - 7 + 7 = 25 + 7$$

$$8x = 32$$

Dividing both sides by 8, we get

$$8x/8 = 32/8$$

$$x = 4$$

Verification:

Substituting  $x = 4$  in LHS, we get

$$5(4 - 2) + 3(4 + 1) = 25$$

$$5(2) + 3(5) = 25$$

$$10 + 15 = 25$$

$$25 = 25$$

Therefore LHS = RHS

Hence, verified.



## EXERCISE 8.3

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Solve each of the following equations. Also, verify the result in each case.

1.  $6x + 5 = 2x + 17$

**Solution:**

Given  $6x + 5 = 2x + 17$

Transposing  $2x$  to LHS and  $5$  to RHS, we get

$$6x - 2x = 17 - 5$$

$$4x = 12$$

Dividing both sides by  $4$ , we get

$$4x/4 = 12/4$$

$$x = 3$$

Verification:

Substituting  $x = 3$  in the given equation, we get

$$6 \times 3 + 5 = 2 \times 3 + 17$$

$$18 + 5 = 6 + 17$$

$$23 = 23$$

Therefore LHS = RHS

Hence, verified.

2.  $2(5x - 3) - 3(2x - 1) = 9$

**Solution:**

Given  $2(5x - 3) - 3(2x - 1) = 9$

Simplifying the brackets, we get

$$2 \times 5x - 2 \times 3 - 3 \times 2x + 3 \times 1 = 9$$

$$10x - 6 - 6x + 3 = 9$$

$$10x - 6x - 6 + 3 = 9$$

$$4x - 3 = 9$$

Adding  $3$  to both sides, we get

$$4x - 3 + 3 = 9 + 3$$

$$4x = 12$$

Dividing both sides by  $4$ , we get

$$4x/4 = 12/4$$

Therefore  $x = 3$ .

Verification:

Substituting  $x = 3$  in LHS, we get

$$2(5 \times 3 - 3) - 3(2 \times 3 - 1) = 9$$

$$2 \times 12 - 3 \times 5 = 9$$

$$24 - 15 = 9$$

$$9 = 9$$

Thus, LHS = RHS

Hence, verified.

**3.  $(x/2) = (x/3) + 1$**

**Solution:**

Given  $(x/2) = (x/3) + 1$

Transposing  $(x/3)$  to LHS we get

$$(x/2) - (x/3) = 1$$

$$(3x - 2x)/6 = 1 \text{ [LCM of 3 and 2 is 6]}$$

$$x/6 = 1$$

Multiplying 6 to both sides we get,

$$x = 6$$

Verification:

Substituting  $x = 6$  in given equation we get

$$(6/2) = (6/3) + 1$$

$$3 = 2 + 1$$

$$3 = 3$$

Thus LHS = RHS

Hence, verified.

**4.  $(x/2) + (3/2) = (2x/5) - 1$**

**Solution:**

Given  $(x/2) + (3/2) = (2x/5) - 1$

Transposing  $(2x/5)$  to LHS and  $(3/2)$  to RHS, then we get

$$(x/2) - (2x/5) = -1 - (3/2)$$

$$(5x - 4x)/10 = (-2 - 3)/2 \text{ [LCM of 5 and 2 is 10]}$$

$$x/10 = -5/2$$

Multiplying both sides by 10 we get,

$$x/10 \times 10 = (-5/2) \times 10$$

$$x = (-50/2)$$

$$x = -25$$

Verification:

Substituting  $x = -25$  in given equation we get

$$(-25/2) + (3/2) = (-50/5) - 1$$

$$(-25 + 3)/2 = -10 - 1$$

$$(-22/2) = -11$$

$$-11 = -11$$

Thus LHS = RHS

Hence, verified.

**5.  $(3/4)(x - 1) = (x - 3)$**

**Solution:**

Given  $(3/4)(x - 1) = (x - 3)$

On simplifying the brackets both sides we get,

$$(3/4)x - (3/4) = (x - 3)$$

Now transposing  $(3/4)$  to RHS and  $(x - 3)$  to LHS

$$(3/4)x - x = (3/4) - 3$$

$$(3x - 4x)/4 = (3 - 12)/4$$

$$-x/4 = (-9/4)$$

Multiply both sides by  $-4$  we get

$$-x/4 \times -4 = (-9/4) \times -4$$

$$x = 9$$

Verification:

Substituting  $x = 9$  in the given equation:

$$(3/4)(9 - 1) = (9 - 3)$$

$$(3/4)(8) = 6$$

$$3 \times 2 = 6$$

$$6 = 6$$

Thus LHS = RHS

Hence, verified.

**6.  $3(x - 3) = 5(2x + 1)$**

**Solution:**

Given  $3(x - 3) = 5(2x + 1)$

On simplifying the brackets we get,

$$3x - 9 = 10x + 5$$

Now transposing  $10x$  to LHS and  $9$  to RHs

$$3x - 10x = 5 + 9$$

$$-7x = 14$$

Now dividing both sides by  $-7$  we get

$$-7x/-7 = 14/-7$$

$$x = -2$$

Verification:

Substituting  $x = -2$  in the given equation we get

$$3(-2 - 3) = 5(-4 + 1)$$

$$3(-5) = 5(-3)$$

$$-15 = -15$$

Thus LHS = RHS

Hence, verified.

$$7. 3x - 2(2x - 5) = 2(x + 3) - 8$$

**Solution:**

$$\text{Given } 3x - 2(2x - 5) = 2(x + 3) - 8$$

On simplifying the brackets on both sides, we get

$$3x - 2 \times 2x + 2 \times 5 = 2 \times x + 2 \times 3 - 8$$

$$3x - 4x + 10 = 2x + 6 - 8$$

$$-x + 10 = 2x - 2$$

Transposing  $x$  to RHS and  $2$  to LHS, we get

$$10 + 2 = 2x + x$$

$$3x = 12$$

Dividing both sides by  $3$ , we get

$$3x/3 = 12/3$$

$$x = 4$$

Verification:

Substituting  $x = 4$  on both sides, we get

$$3(4) - 2\{2(4) - 5\} = 2(4 + 3) - 8$$

$$12 - 2(8 - 5) = 14 - 8$$

$$12 - 6 = 6$$

$$6 = 6$$

Thus LHS = RHS

Hence, verified.

$$8. x - (x/4) - (1/2) = 3 + (x/4)$$

**Solution:**

$$\text{Given } x - (x/4) - (1/2) = 3 + (x/4)$$

Transposing  $(x/4)$  to LHS and  $(1/2)$  to RHS

$$x - (x/4) - (x/4) = 3 + (1/2)$$

$$(4x - x - x)/4 = (6 + 1)/2$$

$$2x/4 = 7/2$$

$$x/2 = 7/2$$

$$x = 7$$

Verification:

Substituting  $x = 7$  in the given equation we get

$$7 - (7/4) - (1/2) = 3 + (7/4)$$

$$(28 - 7 - 2)/4 = (12 + 7)/4$$

$$19/4 = 19/4$$

Thus LHS = RHS

Hence, verified.

$$9. (6x - 2)/9 + (3x + 5)/18 = (1/3)$$

**Solution:**

$$\text{Given } (6x - 2)/9 + (3x + 5)/18 = (1/3)$$

$$(6x(2) - 2(2) + 3x + 5)/18 = (1/3)$$

$$(12x - 4 + 3x + 5)/18 = (1/3)$$

$$(15x + 1)/18 = (1/3)$$

Multiplying both sides by 18 we get

$$(15x + 1)/18 \times 18 = (1/3) \times 18$$

$$15x + 1 = 6$$

Transposing 1 to RHS, we get

$$= 15x = 6 - 1$$

$$= 15x = 5$$

Dividing both sides by 15, we get

$$= 15x/15 = 5/15$$

$$= x = 1/3$$

Verification:

Substituting  $x = 1/3$  both sides, we get  
 $(6(1/3) - 2)/9 + (3(1/3) + 5)/18 = (1/3)$   
 $(2 - 2)/9 + (1 + 5)/18 = 1/3$   
 $(6/18) = (1/3)$   
 $(1/3) = (1/3)$   
Thus LHS = RHS  
Hence, verified.

**10.  $m - (m - 1)/2 = 1 - (m - 2)/3$**

**Solution:**

Given  $m - (m - 1)/2 = 1 - (m - 2)/3$   
 $(2m - m + 1)/2 = (3 - m + 2)/3$   
 $(m + 1)/2 = (5 - m)/3$   
 $(m + 1)/2 = (5/3) - (m/3)$   
 $(m/2) + (1/2) = (5/3) - (m/3)$   
Transposing  $(m/3)$  to LHS and  $(1/2)$  to RHS  
 $(m/2) + (m/3) = (5/3) - (1/2)$   
 $(3m + 2m)/6 = (10 - 3)/6$   
 $5m/6 = (7/6)$   
 $5m = 7$   
Dividing both sides by 5, we get  
 $5m/5 = 7/5$   
 $m = 7/5$   
Verification:  
Substituting  $m = 7/5$  on both sides, we get  
 $(7/5) - (7 - 5)/10 = 1 - (7 - 10)/15$   
 $(7/5) - (2/10) = (15 + 3)/15$   
 $(14 - 2)/10 = (15 + 3)/15$   
 $12/10 = 18/15$   
 $(6/5) = (6/5)$   
Thus LHS = RHS  
Hence, verified.

**11.  $(5x - 1)/3 - (2x - 2)/3 = 1$**

**Solution:**



$$\text{Given } (5x - 1)/3 - (2x - 2)/3 = 1$$

$$(5x - 1 - 2x + 2)/3 = 1$$

$$(3x + 1)/3 = 1$$

Multiplying both sides by 3 we get

$$(3x + 1)/3 \times 3 = 1 \times 3$$

$$(3x + 1) = 3$$

Subtracting 1 from both sides we get

$$3x + 1 - 1 = 3 - 1$$

$$3x = 2$$

Dividing both sides by 3, we get

$$3x/3 = 2/3$$

$$x = 2/3$$

Verification:

Substituting  $x = 2/3$  in LHS, we get

$$(5(2/3) - 1)/3 - (2(2/3) - 2)/3 = 1$$

$$(10/3 - 1)/3 - (4/3 - 2)/3 = 1$$

$$(7/3)/3 - (-2/3)/3 = 1$$

$$(7/9) + (2/9) = 1$$

$$(9/9) = 1$$

$$1 = 1$$

Thus LHS = RHS

Hence, verified.

$$\mathbf{12. 0.6x + 4/5 = 0.28x + 1.16}$$

**Solution:**

$$\text{Given } 0.6x + 4/5 = 0.28x + 1.16$$

Transposing  $0.28x$  to LHS and  $4/5$  to RHS, we get

$$0.6x - 0.28x = 1.16 - 4/5$$

$$0.32x = 1.16 - 0.8$$

$$0.32x = 0.36$$

Dividing both sides by  $0.32$ , we get

$$0.32 \times 0.32 = 0.360.32$$

$$x = 9/8$$

Verification:

Substituting  $x = 9/8$  on both sides, we get

$$0.6(9/8) + 45 = 0.28(9/8) + 1.16$$

$$5.4/8 + 4/5 = 2.52/8 + 1.16$$

$$0.675 + 0.8 = 0.315 + 1.16$$

$$1.475 = 1.475$$

Thus LHS = RHS

Hence, verified.

**13.  $0.5x + (x/3) = 0.25x + 7$**

**Solution:**

Given  $0.5x + (x/3) = 0.25x + 7$

$$(5/10)x + (x/3) = (25x/100) + 7$$

$$(x/2) + (x/3) = (x/4) + 7$$

Transposing  $(x/4)$  to LHS we get

$$(x/2) + (x/3) - (x/4) = 7$$

$$(6x + 4x - 3x)/12 = 7$$

$$(7x/12) = 7$$

Multiplying both sides by 12 we get

$$(7x/12) \times 12 = 7 \times 12$$

$$7x = 84$$

Dividing both sides by 7 we get

$$(7x/7) = (84/7)$$

$$x = 12$$

Verification:

Substituting  $x = 12$  in given equation we get

$$0.5(12) + (12/3) = 0.25(12) + 7$$

$$6 + 4 = 3 + 7$$

$$10 = 10$$

Thus LHS = RHS

Hence, verified.

## EXERCISE 8.4

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1. If 5 is subtracted from three times a number, the result is 16. Find the number.

**Solution:**

Let the required number be  $x$ .

Then, given that 5 subtracted from 3 times  $x$  i.e.  $3x - 5$

$$\Rightarrow 3x - 5 = 16$$

Adding 5 to both sides, we get

$$\Rightarrow 3x - 5 + 5 = 16 + 5$$

$$\Rightarrow 3x = 21$$

Dividing both sides by 3, we get

$$\Rightarrow 3x/3 = 21/3$$

$$\Rightarrow x = 7$$

Thus, the required number is  $x = 7$ .

2. Find the number which when multiplied by 7 is increased by 78.

**Solution:**

Let the required number be  $x$ .

Given that, when multiplied by 7, it gives  $7x$ , and  $x$  increases by 78.

According to the question we can write as  $7x = x + 78$

Transposing  $x$  to LHS, we get

$$\Rightarrow 7x - x = 78$$

$$\Rightarrow 6x = 78$$

Dividing both sides by 6, we get

$$\Rightarrow 6x/6 = 78/6$$

$$\Rightarrow x = 13$$

Thus, the required number is  $x = 13$ .

3. Find three consecutive natural numbers such that the sum of the first and second is 15 more than the third.

**Solution:**

Let first number be  $x$ .

According to the question second number is  $x + 1$  and the third is  $x + 2$

Sum of first and second numbers =  $(x) + (x + 1)$ .

According to question:

$$\Rightarrow (x) + (x + 1) = 15 + (x + 2)$$

$$\Rightarrow 2x + 1 = 17 + x$$

Transposing  $x$  to LHS and 1 to RHS, we get

$$\Rightarrow 2x - x = 17 - 1$$

$$\Rightarrow x = 16$$

So, first number =  $x = 16$ ,

$$\text{Second number} = x + 1 = 16 + 1 = 17$$

$$\text{And third number} = x + 2 = 16 + 2 = 18$$

Thus, the required consecutive natural numbers are 16, 17 and 18.

**4. The difference between two numbers is 7. Six times the smaller plus the larger is 77. Find the numbers.**

**Solution:**

Let the smaller number be ' $x$ '.

So, the larger number =  $x + 7$ .

According to question:

$$\Rightarrow 6x + (x + 7) = 77$$

$$\Rightarrow 6x + x + 7 = 77$$

On simplifying we get

$$\Rightarrow 7x + 7 = 77$$

Subtracting 7 from both sides, we get

$$\Rightarrow 7x + 7 - 7 = 77 - 7$$

$$\Rightarrow 7x = 70$$

Dividing both sides by 7, we get

$$\Rightarrow 7x/7 = 70/7$$

$$\Rightarrow x = 10$$

Thus, the smaller number =  $x = 10$

$$\text{And the larger number} = x + 7 = 10 + 7 = 17.$$

The two required numbers are 10 and 17.

**5. A man says, "I am thinking of a number. When I divide it by 3 and then add 5, my answer is twice the number I thought of". Find the number.**

**Solution:**

Let the required number be  $x$ .

So, according to question:

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

Transposing  $x/3$  to RHS, we get

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

$$\Rightarrow 5 = (6x - x)/3$$

$$\Rightarrow 5 = (5x/3)$$

Multiplying both sides by 3 we get,

$$\Rightarrow 5 \times 3 = (5x/3) \times 3$$

$$\Rightarrow 15 = 5x$$

Dividing both sides by 5 we get

$$\Rightarrow 15/5 = 5x/5$$

$$\Rightarrow 3 = x$$

Thus the number thought of by the man is 3.

**6. If a number is tripled and the result is increased by 5, we get 50. Find the number.**

**Solution:**

Let the required number be 'x'.

According to question:

$$\Rightarrow 3x + 5 = 50$$

Subtracting 5 from both sides, we get

$$\Rightarrow 3x + 5 - 5 = 50 - 5$$

$$\Rightarrow 3x = 45$$

Dividing both sides by 3, we get

$$\Rightarrow 3x/3 = 45/3$$

$$\Rightarrow x = 15$$

Therefore, the required number is 15.

**7. Shikha is 3 years younger to her brother Ravish. If the sum of their ages 37 years, what are their present age?**

**Solution:**

Let the present age of Shikha be x years.

Therefore, the present age of Shikha's brother Ravish =  $(x + 3)$  years.

So, sum of their ages =  $x + (x + 3)$

$$\Rightarrow x + (x + 3) = 37$$

$$\Rightarrow 2x + 3 = 37$$

Subtracting 3 from both sides, we get

$$\Rightarrow 2x + 3 - 3 = 37 - 3$$

$$\Rightarrow 2x = 34$$

Dividing both sides by 2, we get

$$\Rightarrow 2x/2 = 34/2$$

$$\Rightarrow x = 17$$

Therefore, the present age of Shikha = 17 years,

And the present age of Ravish =  $x + 3 = 17 + 3 = 20$  years.

**8. Mrs Jain is 27 years older than her daughter Nilu. After 8 years she will be twice as old as Nilu. Find their present ages?**

**Solution:**

Let the present age of Nilu be  $x$  years

Therefore the present age of Nilu's mother =  $(x + 27)$  years

So, after 8 years,

Nilu's age =  $(x + 8)$ , and Mrs Jain's age =  $(x + 27 + 8) = (x + 35)$  years

$$\Rightarrow x + 35 = 2(x + 8)$$

Expanding the brackets, we get

$$\Rightarrow x + 35 = 2x + 16$$

Transposing  $x$  to RHS and 16 to LHS, we get

$$\Rightarrow 35 - 16 = 2x - x$$

$$\Rightarrow x = 19$$

So, the present age of Nilu =  $x = 19$  years,

And the present age of Nilu's mother that is Mrs Jain =  $x + 27 = 19 + 27 = 46$  years.

**9. A man 4 times as old as his son. After 16 years, he will be only twice as old as his son. Find their present ages.**

**Solution:**

Let the present age of the son =  $x$  years.

Therefore, the present age of his father =  $4x$  years.

So, after 16 years,

Son's age =  $(x + 16)$  and father's age =  $(4x + 16)$  years

According to question:

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

$$\Rightarrow 4x + 16 = 2x + 32$$

Transposing  $2x$  to LHS and  $16$  to RHS, we get

$$\Rightarrow 4x - 2x = 32 - 16$$

$$\Rightarrow 2x = 16$$

Dividing both sides by  $2$ , we get

$$\Rightarrow 2x/2 = 16/2$$

$$\Rightarrow x = 8$$

So, the present age of the son =  $x = 8$  years,

And the present age of the father =  $4x = 4(8) = 32$  years.

**10. The difference in age between a girl and her younger sister is 4 years. The younger sister in turn is 4 years older than her brother. The sum of the ages of the younger sister and her brother is 16. How old are the three children?**

**Solution:**

Let the age of the girl =  $x$  years.

So, the age of her younger sister =  $(x - 4)$  years.

Thus, the age of the brother =  $(x - 4 - 4)$  years =  $(x - 8)$  years.

According to question:

$$\Rightarrow (x - 4) + (x - 8) = 16$$

$$\Rightarrow x + x - 4 - 8 = 16$$

$$\Rightarrow 2x - 12 = 16$$

Adding  $12$  to both sides, we get

$$\Rightarrow 2x - 12 + 12 = 16 + 12$$

$$\Rightarrow 2x = 28$$

Dividing both sides by  $2$ , we get

$$\Rightarrow 2x/2 = 28/2$$

$$\Rightarrow x = 14$$

Thus, the age of the girl =  $x = 14$  years,

The age of the younger sister =  $x - 4 = 14 - 4 = 10$  years,

The age of the younger brother =  $x - 8 = 14 - 8 = 6$  years.

**11. One day, during their vacation at beach resort, Shella found twice as many sea shells as Anita and Anita found 5 shells more than sandy. Together sandy and Shella found 16 sea shells. How many did each of them find?**

**Solution:**

Let the number of sea shells found by sandy =  $x$



So, the number of sea shells found by Anita =  $(x + 5)$ .

The number of sea shells found by Shella =  $2(x + 5)$ .

According to the question,

$$\Rightarrow x + 2(x + 5) = 16$$

$$\Rightarrow x + 2x + 10 = 16$$

$$\Rightarrow 3x + 10 = 16$$

Subtracting 10 from both sides, we get

$$\Rightarrow 3x + 10 - 10 = 16 - 10$$

$$\Rightarrow 3x = 6$$

Dividing both sides by 3, we get

$$\Rightarrow 3x/3 = 6/3$$

$$\Rightarrow x = 2$$

Thus, the number of sea shells found by Sandy =  $x = 2$ ,

The number of sea shells found by Anita =  $x + 5 = 2 + 5 = 7$ ,

The number of sea shells found by Shelia =  $2(x + 5) = 2(2 + 5) = 2(7) = 14$ .

**12. Andy has twice as many marbles as Pandy, and Sandy has half as many as Andy and Pandy put together. If Andy has 75 marbles more than Sandy. How many does each of them have?**

**Solution:**

Let the number of marbles with Pandy =  $x$

So, the number of marbles with Andy =  $2x$

Thus, the number of marbles with Sandy =  $(x/2) + (2x/2) = (3x/2)$

According to the question:

$$\Rightarrow 2x + 75 = (3x/2)$$

By transposing we get

$$\Rightarrow 2x - (3x/2) = -75$$

$$\Rightarrow (4x - 3x)/2 = -75$$

$$\Rightarrow (x/2) = -75$$

$$\Rightarrow x = -150$$

Since number of marbles cannot be negative

Therefore  $x = 150$

So, Pandy has 150 marbles,

Andy has  $2x = 2(150) = 300$  marbles,

Sandy has  $3x/2 = 225$  marbles.



**13. A bag contains 25 paise and 50 paise coins whose total value is Rs 30. If the number of 25 paise coins is four times that of 50 paise coins, find the number of each type of coins.**

**Solution:**

Let the number of 50 paise coins =  $x$

So, the money value contribution of 50 paise coins in bag =  $0.5x$ .

The number of 25 paise coins in bag =  $4x$

The money value contribution of 25 paise coins in bag =  $0.25 (4x) = x$ .

According to the question,

$$\Rightarrow 0.5x + x = 30$$

$$\Rightarrow 1.5x = 30$$

Dividing both sides by 1.5, we get

$$\Rightarrow 1.5x/1.5 = 30/1.5$$

$$\Rightarrow x = 20$$

Thus, the number of 50 paise coins =  $x = 20$ ,

The number of 25 paise coins =  $4x = 4 (20) = 80$ .

**14. The length of a rectangular field is twice its breadth. If the perimeter of the field is 228 meters, find the dimensions of the field.**

**Solution:**

Let the breadth of the rectangle =  $x$  metres.

According to the question,

Length of the rectangle =  $2x$  metres

Perimeter of a rectangle =  $2 (\text{length} + \text{breadth})$

$$\text{So, } 2 (2x + x) = 228$$

$$\Rightarrow 2 (3x) = 228$$

$$\Rightarrow 6x = 228$$

Dividing both sides by 6, we get

$$\Rightarrow 6x/6 = 228/6$$

$$\Rightarrow x = 38$$

So, the breadth of the rectangle =  $x = 38$  metres,

The length of the rectangle =  $2x = 2(38) = 76$  metres.

**15. There are only 25 paise coins in a purse. The value of money in the purse is Rs 17.50. Find the number of coins in the purse.**

**Solution:**

Let the number of 25-paise coins in the purse be  $x$

So, the value of money in the purse =  $0.25x$ .

But  $0.25x = 17.50$ .

Dividing both sides by 0.25, we get

$$\Rightarrow 0.25x/0.25 = 17.5/0.25$$

$$\Rightarrow x = 70$$

Thus, the number of 25 paise coins in the purse = 70.

**16. In a hostel mess, 50kg rice are consumed every day. If each student gets 400gm of rice per day, find the number of students who take meals in the hostel mess.**

**Solution:**

Let the number of students in the hostel be  $x$

Quantity of rice consumed by each student = 400 gm.

So, daily rice consumption in the hostel mess =  $400(x)$ .

But, daily rice consumption = 50 kg =  $50 \times 1000 = 50000$ gm [since 1 kg = 1000gm].

According to the question,

$$\Rightarrow 400x = 50000$$

Dividing both sides by 400, we get

$$\Rightarrow 400x/400 = 50000/400$$

$$\Rightarrow x = 125$$

Thus, 125 students have their meals in the hostel mess.

