## EXERCISE 12.1

**Solve the following equations:**

**1.**

**(i) 5x – 3 = 3x – 5**

**(ii) 3x – 7 = 3(5 – x)**

**Solution:**

(i) 5x – 3 = 3x - 5

5x – 3x = - 5 + 3

2x = - 2

We get,

x = - 2 / 2

x = - 1

(ii) 3x – 7 = 3(5 – x)

3x – 7 = 15 – 3x

3x + 3x = 15 + 7

We get,

6x = 22

x = 22 / 6

x = 11 / 3



**2.**

**(i) 4(2x + 1) = 3(x – 1) + 7**

**(ii) 3(2p – 1) = 5 – (3p – 2)**

**Solution:**

(i) 4(2x + 1) = 3(x – 1) + 7

8x + 4 = 3x – 3 + 7

8x + 4 = 3x + 4

On further calculation, we get,

8x – 3x = 4 – 4

We get,

x = 0

(ii) 3(2p – 1) = 5 – (3p – 2)

6p – 3 = 5 – 3p + 2

6p + 3p = 5 + 3 + 2

We get,

9p = 10

p = 10 / 9

p = $1\frac{1}{9}$

**3.**
**(i) 5y – 2{y – 3(y – 5)} = 6**
**(ii) 0.3(6 – x) = 0.4(x + 8)**
**Solution:**
(i) 5y – 2 {y – 3(y – 5)} = 6
5y – 2 (y – 3y + 15) = 6
5y – 2 (- 2y + 15) = 6
On simplification, we get,
5y + 4y – 30 = 6
5y + 4y = 6 + 30
9y = 36
y = 36 / 9
We get,
y = 4
(ii) 0.3 (6 – x) = 0.4 (x + 8)
1.8 – 0.3x = 0.4x + 3.2
- 0.3x – 0.4x = 3.2 – 1.8
We get,
- 0.7x = 1.4
x = - (1.4 / 0.7)
x = - (14 / 7)
x = - 2



**4.**
**(i) (x – 1) / 3 = {(x + 2) / 6} + 3**
**(ii) (x + 7) / 3 = 1 + {(3x – 2) / 5}**
**Solution:**
(i) {(x – 1) / 3} = {(x + 2) / 6} + 3
{(x – 1) / 3} – {(x + 2) / 6} = 3
On further calculation, we get,
{2 (x – 1) – 1(x + 2)} / 6 = 3
(2x – 2 – 1x – 2) / 6 = 3
(x – 4) / 6 = 3
We get,
x – 4 = 6 × 3
x – 4 = 18
x = 18 + 4
We get,
x = 22

(ii) (x + 7) / 3 = 1 + {(3x – 2) / 5}
{(x + 7) / 3} – {(3x – 2) / 5} = 1
On further calculation, we get,
{5 (x + 7) – 3 (3x – 2)} / 15 = 1
{(5x + 35) – (9x - 6)} / 15 = 1
(5x – 9x + 35 + 6) / 15 = 1
(- 4x + 41) / 15 = 1
- 4x + 41 = 15
- 4x = 15 – 41
- 4x = - 26
x = - 26 / - 4
We get,
x = 13 / 2
x = $6\frac{1}{2}$

**5.**
**(i) {(y + 1) / 3} – {(y – 1) / 2} = (1 + 2y) / 3**
**(ii) (p / 3) + (p / 4) = 55 – {(p + 40) / 5}**
**Solution:**
(i) {(y + 1) / 3} – {(y – 1) / 2} = (1 + 2y) / 3
{2 (y + 1) – 3 (y – 1)} / 6 = (1 + 2y) / 3
(2y + 2 – 3y + 3) / 6 = (1 + 2y) / 3
We get,
(- y + 5) / 6 = (1 + 2y) / 3
3 (- y + 5) = 6 (1 + 2y)
- 3y + 15 = 6 + 12y
- 3y – 12y = 6 – 15
- 15y = - 9
y = - 9 / - 15
We get,
y = 3 / 5
(ii) (p / 3) + (p / 4) = 55 – {(p + 40) / 5}
(p / 3) + (p / 4) + {(p + 40)} / 5 = 55
Here, L.C.M. of 3, 4, 5 is 60
We get,
{20p +15p + 12(p + 40)} / 60 = 55
(20p + 15p + 12p + 480) / 60 = 55
(47p + 480) / 6 = 55

47p + 480 = 55 × 60
47p + 480 = 3300
47p = 3300 – 480
47p = 2820
p = 2820 / 47
We get,
p = 60

**6.**
**(i) n – {(n – 1) / 2} = 1 – {(n – 2) / 3}**
**(ii) {(3t – 2) / 3} + {(2t + 3) / 2} = t + (7 / 6)**
**Solution:**
(i) n – {(n – 1) / 2} = 1 – {(n – 2) / 3}
(2n – n + 1) / 2 = (3 – n + 2) / 3
(n + 1) / 2 = (5 – n) / 3
3 (n + 1) = 2 (5 – n)
3n + 3 = 10 – 2n
3n + 2n = 10 – 3
5n = 7
n = 7 / 5
We get,
n = $1\frac{2}{5}$
(ii) {(3t – 2) / 3} + {(2t + 3) / 2} = t + (7 / 6)
{2 (3t – 2) + 3 (2t + 3)} / 6 = (6t + 7) / 6
(6t – 4) + (6t + 9) = 6t + 7
On further calculation, we get,
6t + 6t + 9 – 4 = 6t + 7
12t + 5 = 6t + 7
12t – 6t = 7 – 5
6t = 2
t = 2 / 6
We get,
t = 1 / 3

**7.**
**(i) 4 (3x + 2) – 5 (6x – 1) = 2 (x – 8) – 6 (7x – 4)**
**(ii) 3 (5x + 7) + 5 (2x – 11) = 3 (8x – 5) – 15**
**Solution:**

(i) 4 (3x + 2) – 5 (6x – 1) = 2 (x – 8) – 6 (7x – 4)
12x + 8 – 30x + 5 = 2x – 16 – 42x + 24
On further calculation, we get,
- 18x + 13 = - 40x + 8
- 18x + 40x = 8 – 13
We get,
22x = - 5
x = - 5 / 22
(ii) 3 (5x + 7) + 5 (2x – 11) = 3 (8x – 5) – 15
15x + 21 + 10x – 55 = 24x – 15 – 15
On further calculation, we get,
25x – 34 = 24x – 30
25x – 24x = - 30 + 34
We get,
x = 4

**8.**
**(i) (3 – 2x) / (2x + 5) = - (3 / 11)**
**(ii) (5p + 2) / (8 – 2p) = 7 / 6**
**Solution:**
(i) (3 – 2x) / (2x + 5) = - (3 / 11)
11 (3 – 2x) = - 3 (2x + 5)
On simplification, we get,
33 – 22x = - 6x – 15
- 22x + 6x = - 15 – 33
- 16x = - 48
x = 48 / 16
We get,
x = 3
(ii) (5p + 2) / (8 – 2p) = 7 / 6
6 (5p + 2) = 7 (8 – 2p)
On further calculation, we get,
30p + 12 = 56 – 14p
30p + 14p = 56 – 12
44p = 44
p = 44 / 44
We get,
p = 1

**9.**
**(i) 5 / x = 7 / (x – 4)**
**(ii) 4 / (2x + 3) = 5 / (x + 4)**
**Solution:**
(i) 5 / x = 7 / (x – 4)
5 (x – 4) = 7x
5x – 20 = 7x
We get,
5x – 7x = 20
- 2x = 20
x = 20 / - 2
x = (- 20 / 2)
We get,
x = - 10
(ii) 4 / (2x + 3) = 5 / (x + 4)
4 (x + 4) = 5 (2x + 3)
4x + 16 = 10x + 15
On further calculation, we get,
4x – 10x = 15 – 16
- 6x = - 1
x = - 1 / - 6
We get,
x = 1 / 6



**10.**
**(i) {(2x + 5) / 2} – {5x / (x – 1)} = x**
**(ii) 1 / 5 {(1 / 3x) – 5} = 1 / 3 {3 – (1 / x)}**
**Solution:**
(i) {(2x + 5) / 2} – {5x / (x – 1)} = x
{(2x + 5) (x – 1) – (5x) (2)} / {2 (x – 1)} = x
On further calculation, we get,
{2x (x – 1) + 5 (x – 1) – 10x} / (2x – 2) = x
$(2x^2 – 2x + 5x – 5 – 10x) / (2x – 2) = x$
$(2x^2 – 7x – 5) / (2x – 2) = x$
$2x^2 – 7x – 5 = x (2x – 2)$
$2x^2 – 7x – 5 = 2x^2 – 2x$
- 7x – 5 = - 2x
- 7x + 2x = 5
- 5x = 5

x = 5 / - 5
We get,
x = - 1
(ii) 1 / 5 {(1 / 3x) – 5} = 1 / 3 {3 – (1 / x)}
1 / 5 [{1 – 5 (3x)} / 3x] = 1 / 3 [{(3x – 1)} / x]
On further calculation, we get,
1 / 5 {(1 – 15x) / 3x} = 1 / 3 {(3x – 1) / x}
We get,
(1 – 15x) / 15x = (3x – 1) / 3x
3x (1 – 15x) = 15x (3x – 1)
3 (1 – 15x) = 15 (3x – 1)
3 – 45x = 45x – 15
- 45x – 45x = - 15 – 3
- 90x = - 18
x = 18 / 90
We get,
x = 1 / 5

**11.**
**(i) {(2x – 3) / (2x – 1)} = {(3x – 1) / (3x + 1)}**
**(ii) {(2y + 3) / (3y + 2)} = {(4y + 5) / (6y + 7)}**
**Solution:**
(i) {(2x – 3) / (2x – 1)} = {(3x – 1) / (3x + 1)}
(2x – 3) (3x + 1) = (3x – 1) (2x – 1)
On further calculation, we get,
$6x^2 + 2x – 9x – 3 = 6x^2 – 3x – 2x + 1$
$6x^2 – 7x – 3 = 6x^2 – 5x + 1$
$6x^2 – 7x – 6x^2 + 5x = 1 + 3$
- 7x + 5x = 4
- 2x = 4
We get,
x = 4 / - 2
x = - 2
(ii) {(2y + 3) / (3y + 2)} = {(4y + 5) / (6y + 7)}
(2y + 3) (6y + 7) = (4y + 5) (3y + 2)
$12y^2 + 14y + 18y + 21 = 12y^2 + 8y + 15y + 10$
On simplification, we get,
32y + 21 = 23y + 10
32y – 23y = 10 – 21

9y = - 11
We get,
y = - 11 / 9

**12. If x = p + 1, find the value of p from the equation (1 / 2) (5x – 30) – (1/ 3) (1 + 7p) = 1 / 4**
**Solution:**
Given
x = p + 1 ….. (1)
(1 / 2) (5x – 30) – (1 / 3) (1 + 7p) = 1 / 4 ……. (2)
Substituting the value of x from (1) in (2), we get,
(1 / 2) {5 (p + 1) – 30} – (1 / 3) (1 + 7p) = 1 / 4
1 / 2 (5p + 5 – 30) – 1 / 3 (1 + 7p) = 1 / 4
On further calculation, we get,
1 / 2 (5p – 25) – 1 / 3 (1 + 7p) = 1 / 4
(5p – 25) / 2 - (1 + 7p) / 3 = 1 / 4
{3 (5p – 25) – 2 (1 + 7p)} / 6 = 1 / 4
(15p – 75 – 2 – 14p) / 6 = 1 / 4
(p – 77) / 6 = 1 / 4
On simplification, we get,
4 (p – 77) = 6 (1)
4p – 308 = 6
4p = 6 + 308
4p = 314
p = 314 / 4
We get,
p = 157 / 2
p = $78\frac{1}{2}$

**13.**
**Solve {(x + 3) / 3} – {(x – 2) / 2} = 1, Hence find p if (1 / x) + P = 1**
**Solution:**
{(x + 3) / 3} – {(x – 2) / 2} = 1
{2 (x + 3) – 3(x – 2)} / 6 = 1
(2x + 6 – 3x + 6) / 6 = 1
On further calculation, we get,
(- x + 12) / 6 = 1
- x + 12 = 1 × 6

- x + 12 = 6
- x = 6 – 12
- x = - 6

We get,

x = 6

Now,

(1 / x) + P = 1

Substituting x = 6, we get,

(1 / 6) + P = 1

(1 + 6P) / 6 = 1

(1 + 6P) = 6

6P = 6 – 1

6P = 5

P = 5 / 6

## EXERCISE 12.2

**1. Three more than twice a number is equal to four less than the number. Find the number.**

**Solution:**

Let the number be x

Twice the number = 2x

As per the given statement,

3 + 2x = x – 4

3 + 2x + 4 = x

We get,

7 = x – 2x

7 = - x

- x = 7

We get,

x = - 7

Therefore, the required number is -7

**2. When four consecutive integers are added, the sum is 46. Find the integers.**

**Solution:**

Let the first integer be x, then the next three consecutive integers will be,

(x + 1), (x + 2) and (x + 3)

According to the problem,

x + (x + 1) + (x + 2) + (x + 3) = 46

x + x + 1 + x + 2 + x + 3 = 46

On further calculation, we get,

4x + 6 = 46

4x = 46 – 6

4x = 40

x = 40 / 4

We get,

x = 10

Therefore, four consecutive integers are 10, (10 + 1), (10 + 2) and (10 + 3)

i.e. 10, 11, 12 and 13

**3. Manjula thinks a number and subtracts 7 / 3 from it. She multiplies the result by 6. The result now obtained is 2 less than twice the same number she thought of. What is the number?**

**Solution:**

Let a number thought by Manjula be x

According to the statement,
$(x – 7 / 3) \times 6 = 2x – 2$
$6x – 14 = 2x – 2$
On further calculation, we get,
$6x – 2x = - 2 + 14$
$4x = 12$
$x = 12 / 4$
We get,
$x = 3$
Therefore, the required number is 3

**4. A positive number is 7 times another number. If 15 is added to both the numbers, then one of the new numbers becomes (5 / 2) times the other new number. What are the numbers?**
**Solution:**
Let the required number be x
Then the other number = x / 7
According to the condition,
$x + 15 = 5 / 2 \{(x / 7) + 15\}$
$2 (x + 15) = (5x / 7) + (5 \times 15)$
$2x + 30 = (5x / 7) + 75$
On simplification, we get,
$2x – (5 / 7) x = 75 – 30$
$\{(14 – 5) / 7\}x = 45$
$9x / 7 = 45$
$x = 45 \times 7 / 9$
We get,
$x = 35$
Hence,
One number = 35
Other number = 35 / 7 = 5
Therefore, the numbers are 35 and 5

**5. When three consecutive even integers are added, the sum is zero. Find the integers.**
**Solution:**
Let the first even integer = x
Then next two consecutive even integers = (x + 2) and (x + 4)
According to the given statement,

x + (x + 2) + (x + 4) = 0
x + x + 2 + x + 4 = 0
3x + 6 = 0
3x = - 6
x = - 6 / 3
We get,
x = - 2
Therefore, three consecutive integers are -2, (- 2 + 2) and (- 2 + 4) i.e. -2, 0 and 2

**6. Find two consecutive odd integers such that two-fifth of the smaller exceeds two-ninth of the greater by 4.**
**Solution:**
Let the first odd integer = x
Then next consecutive odd integers = (x + 2)
According to the given problem,
(2 / 5) (x) = (2 / 9) (x + 2) + 4
2x / 5 = {2 (x + 2)} / 9 + 4
On further calculation, we get,
(2x / 5) – {2 (x + 2)} / 9 = 4
{18x – 10 (x + 2)} / 45 = 4
(18x – 10x – 20) / 45 = 4
(8x – 20) / 45 = 4
8x – 20 = 4 × 45
8x – 20 = 180
8x = 180 + 20
8x = 200
x = 200 / 8
We get,
x = 25
So, two consecutive odd integers are x = 25 and
(x + 2) = (25 + 2) = 27
Therefore, two consecutive odd integers are 25 and 27

**7. The denominator of a fraction is 1 more than twice its numerator. If the numerator and denominator are both increased by 5, it becomes (3 / 5). Find the original fraction.**
**Solution:**
Let the numerator of the original fraction = x
Then, its denominator = 2x + 1

Hence,
The fraction = x / (2x + 1)
According to the given problem,
(x + 5) / {(2x + 1) + 5} = 3 / 5
(x + 5) / (2x + 1 + 5) = 3 / 5
On further calculation, we get,
5 (x + 5) = 3 (2x + 6)
5x + 25 = 6x + 18
5x – 6x = 18 – 25
-x = - 7
We get,
x = 7
Now,
Original fraction = x / (2x + 1)
= 7 / {2 (7) + 1}
= 7 / (14 + 1)
We get,
= 7 / 15
Therefore, the original fraction is 7 / 15



**8. Find two positive numbers in the ratio 2: 5 such that their difference is 15.**
**Solution:**
Let the two numbers be 2x and 5x
Because the ratio of these two numbers = 2x / 5x
= 2 / 5
= 2: 5
According to the given problem,
5x – 2x = 15
3x = 15
x = 15 / 3
We get,
x = 5
So, the numbers are 2x = 2 × 5 = 10 and 5x = 5 × 5 = 25
Therefore the required numbers are 10 and 25

**9. What number should be added to each of the numbers 12, 22, 42 and 72 so that the resulting numbers may be in proportion?**
**Solution:**
Let x be the required number

According to the given problem,
(12 + x), (22 + x), (42 + x) and (72 + x) are in proportion
So,
(12 + x) / (22 + x) = (42 + x) / (72 + x)
On cross multiplication, we get,
(12 + x) (72 + x) = (42 + x) (22 + x)
On simplification, we get,
12 (72 + x) + x (72 + x) = 42 (22 + x) + x (22 + x)
$864 + 12x + 72x + x^2 = 924 + 42x + 22x + x^2$
We get,
$864 + 84x + x^2 = 924 + 64x + x^2$
$864 + 84x + x^2 – 924 – 64x – x^2 = 0$
864 + 84x – 64x – 924 = 0
84x – 64x = 924 – 864
20x = 60
We get,
x = 60 / 20
x = 3
Therefore, the required number is 3



**10. The digits of a two-digit number differ by 3. If the digits are interchanged and the resulting number is added to the original number, we get 143. What can be the original number?**
**Solution:**
Let one's digit of a two-digit number be x
Given that the difference between both the digits is 3,
Then ten's digit = x + 3
Hence, the number = x + 10 (x + 3)
= x + 10x + 30
= 11x + 30
By interchanging the digits, we get,
One's digit of a new number = x + 3 and
Ten's digit of a new number = x
Hence,
Number = x + 3 + 10x = 11x + 3
According to the condition,
11x + 30 + 11x + 3 = 143
22x + 33 = 143
22x = 143 – 33

We get,
22x = 110
x = 110 / 22
x = 5
Therefore, original number = 11x + 30
= 11 × 5 + 30
= 55 + 30
We get,
= 85
Hence, the original number is 85

**11. Sum of the digits of a two-digit number is 11. When we interchange the digits, it is found that the resulting new number is greater than the original number by 63. Find the two- digit number.**
**Solution:**
Given
Sum of the digits of a two-digit numbers = 11
Let unit's digit of a 2-digit number be x
Then ten's digit will be 11 – x
So, number = x + 10 (11 – x)
= x + 110 – 10x
= 110 – 9x
Now, by interchanging the digits, we get,
One's digit of a new number = 11 – x
And ten's digit will be = x
Hence, number = 11 – x + 10x
= 11 + 9x
According to the condition,
11 + 9x – (110 – 9x) = 63
11 + 9x – 110 + 9x = 63
18x = 63 – 11 + 110
18x = 162
We get,
x = 162 / 18
x = 9
So, original number = 110 – 9x
= 110 – 9 × 9
= 110 – 81
= 29

Therefore, the original number is 29

**12. Ritu is now four times as old as his brother Raju. In 4 years time, her age will be twice of Raju's age. What are their present ages?**
**Solution:**
Let the age of Raju be x years
Then the age of Ritu will be = 4 × x years
In 4 years time,
Age of Raju = (x + 4) years
Age of Ritu = (4x + 4) years
According to the given problem,
4x + 4 = 2 (x + 4)
4x + 4 = 2x + 8
4x – 2x = 8 – 4
2x = 4
We get,
x = 4 / 2
x = 2
Therefore, Raju's age = 2 years and
Ritu's age = 4 × 2 = 8 years



**13. A father is 7 times as old as his son. Two years ago, the father was 13 times as old as his son. How old are they now?**
**Solution:**
Let the present age of son be x years
Then, age of his father will be 7x years
Two years ago, age of son = (x – 2) years
Two years ago, age of his father = (7x – 2) years
According to the given problem,
7x – 2 = 13 (x – 2)
7x – 2 = 13x – 26
7x – 13x = - 26 + 2
- 6x = - 24
x = - 24 /- 6
We get,
x = 4
Therefore, age of son = 4 years and
Age of his father = 7x = 7 × 4 = 28 years

**14. The ages of Sona and Sonali are in the ratio 5: 3. Five years hence, the ration of their ages will be 10: 7. Find their present ages.**

**Solution:**

Given

Ratio of ages of Sona and Sonali = 5: 3

Let us consider the present age of Sona and Sonali be 5x and 3x years respectively

Five years hence,

The age of Sona = 5x + 5 and

The age of Sonali = 3x + 5

According to the given problem,

(5x + 5) / (3x + 5) = 10 / 7

On cross multiplication, we get,

7 (5x + 5) 10 (3x + 5)

35x + 35 = 30x + 50

35x – 30x = 50 – 35

5x = 15

x = 15 / 5

We get,

x = 3

Now,

Present age of Sona = 5x = 5 × 3 = 15 years and

Present age of Sonali = 3x = 3 × 3 = 9 years

Therefore, the present age of Sona and Sonali is 15years and 9 years



**15. An employee works in a company on a contract of 30 days on the condition that he will receive Rs 200 for each day he works and he will be fined Rs 20 for each day if he is absent. If he receives Rs 3800 in all, for how many days did he remain absent?**

**Solution:**

Given

Period of contract = 30 days

If an employee works a day, he will get = Rs 200

If he is absent, he will be fined = Rs 20 per day

At the end of contract period, he gets = Rs 3800

Let an employee remain absent for x days

Then, number of days, he worked = (30 – x) days

According to the given condition,

(30 – x) × 200 – x × 20 = 3800

6000 – 200x – 20x = 3800

6000 – 220x = 3800
220x = 6000 – 3800
220x = 2200
x = 2200 / 220
We get,
x = 10
Therefore, an employee remained absent for 10 days.

**16. I have a total of Rs 300 in coins of denomination Rs 1, Rs 2 and Rs 5. The number of coins is 3 times the number of Rs 5 coins. The total number of coins is 160. How many coins of each denomination are with me?**
**Solution:**
Given
Amount of coins = Rs 300
Total number of coins = 160
Le t the number of coins of Rs 5 = x
Then number of coins of Rs 2 = 3x
And number of coins of Rs 1 = 160 – (x + 3x)
= 160 – 4x
According to the given problem,
(160 – 4x) × 1 + 3x × 2 + x × 5 = 300
160 – 4x + 6x + 5x = 300
We get,
160 + 7x = 300
7x = 300 – 160
7x = 140
x = 140 / 7
We get,
x = 20
Hence, 5 Rs coins = 20
2 Rs coins = 3x = 3 × 20 = 60 and
1 Rs coins = 160 – 60 – 20 = 80

**17. A local bus is carrying 40 passengers, some with Rs 5 tickets and the remaining with Rs 7.50 tickets. If the total receipts from these passengers are Rs 230, find the number of passengers with Rs 5 tickets.**
**Solution:**
Let the number of passengers with Rs 5 tickets = x
Then, the number of passengers with Rs 7.50 tickets = (40 – x)

According to the given statement,
$5 \times x + (40 - x) \times 7.50 = 230$
On simplification, we get,
$5x + 300 - 7.5x = 230$
$5x - 7.5x = 230 - 300$
$-2.5x = -70$
$x = -70 / -2.5$
We get,
$x = 28$
Therefore, the number of passengers with Rs 5 tickets = 28

**18. On a school picnic, a group of students agree to pay equally for the use of a full boat and pay Rs 10 each. If there had been 3 more students in the group, each would have paid Rs 2 less. How many students were there in the group?**
**Solution:**
Let the number of students in a group be x
If there are 3 more students in a group, then,
The total number of students in a group = x + 3
According to the given problem,
$10 \times x = (x + 3) \times (10 - 2)$
On simplification, we get,
$10x = (x + 3) \times 8$
$10x = 8 (x + 3)$
$10x = 8x + 24$
$10x - 8x = 24$
$2x = 24$
$x = 24 / 2$
We get,
$x = 12$
Therefore, the total number of students in the group = 12

**19. Half of a herd of deer are grazing in the field and three-fourths of the remaining are playing nearby. The rest 9 are drinking water from the pond. Find the number of deer in the herd.**
**Solution:**
Let the number of deer in the herd = x
Number of deer grazing in the field = x / 2
Remaining = x – (x / 2)
= x / 2

Given that the (3 / 4) of the remaining deer are playing
= (3 / 4) × (1 / 2) x
We get,
= (3 / 8) x
Hence,
Rest of deer = (x / 2) – (3 / 8) x
= (1 / 8) x
Therefore,
(1 / 8) x = 9
x = 9 × 8
We get,
x = 72
Hence, total number of deer in the herd = 72

**20. Sakshi takes some flowers in a basket and visits three temples one by one. At each temple, she offers one-half of the flowers from the basket. If she is left with 6 flowers at the end, find the number of flowers she had in the beginning.**
**Solution:**
Let the total number of flowers in the basket = x
Flowers offered in first temple = x / 2
Remaining flowers = x – (x / 2)
= (x / 2)
Flowers offered in the second temple
(x / 2) × (1 / 2) = x / 4
Remaining flowers = (x / 2) - (x / 4)
= (x / 4)
Flowers offered in the third temple = (x / 4) × (1 / 2)
= (x / 8)
Remaining flowers = (x / 4) – (x / 8)
= (x / 8)
Hence,
(x / 8) = 6
We get,
x = 6 × 8
x = 48
Therefore, number of flowers she had in the beginning = 48

**21. Two supplementary angles differ by $50^0$. Find the measure of each angle.**
**Solution:**

Let the measure of angle be x
Then, its supplementary angle = $180^0 – x$
According to the given problem,
$x – (180^0 – x) = 50^0$
On simplification, we get,
$x – 180^0 + x = 50^0$
$2x – 180^0 = 50^0$
$2x = 180^0 + 50^0$
$2x = 230^0$
$x = 230^0 / 2$
We get,
$x = 115^0$
Measurement of each angle = $x = 115^0$ and
$(180^0 – x) = 180^0 – 115^0$
$= 65^0$
Therefore, the measurement of each angel is $115^0$ and $65^0$

**22. If the angles of a triangle are in the ratio 5: 6: 7, find the angles.**
**Solution:**
Let the angles of a triangle are 5x, 6x and 7x
We know that,
$5x + 6x + 7x = 180^0$
$18x = 180^0$
$x = 180^0 / 18$
We get,
$x = 10^0$
Now, the angles of a triangle are,
$5x = 5 \times 10^0 = 50^0$
$6x = 6 \times 10^0 = 60^0$
$7x = 7 \times 10^0 = 70^0$
Therefore, the angles of a triangle are $50^0$, $60^0$ and $70^0$

**23. Two equal sides of an isosceles triangle are 3x – 1 and 2x + 2 units. The third side is 2x units. Find x and the perimeter of the triangle.**
**Solution:**
Given
Two equal sides of an isosceles triangle are 3x – 1 and 2x + 2
That is, 3x – 1 = 2x + 2
3x – 2x = 2 + 1

x = 3
Given that,
Third side of triangle = 2x
= 2 × 3
= 6 units
Equal sides of a triangle = 3x – 1
= 3 × 3 – 1
= 9 – 1
= 8 units
Perimeter of the triangle = 8 + 8 + 6
= 22 units
Therefore, the perimeter of the triangle = 22 units

**24. If each side of a triangle is increased by 4 cm, the ratio of the perimeters of the new triangle and the given triangle is 7: 5. Find the perimeter of the given triangle.**
**Solution:**
Let the perimeter of original triangle be x cm
If each side of a triangle is increased by 4, then,
The perimeter will be = x + 4 × 3
= (x + 12) cm
Now,
Ratio of perimeter of new triangle and given triangle = 7: 5
(x + 12) / x = 7 / 5
On cross multiplication, we get,
5 (x + 12) = 7x
5x + 60 = 7x
7x – 5x = 60
2x = 60
x = 60 / 2
We get,
x = 30
Therefore, the perimeter of the given triangle is 30 cm

**25. The length of a rectangle is 5 cm less than twice its breadth. If the length is decreased by 3 cm and breadth increased by 2 cm, the perimeter of the resulting rectangle is 72 cm. Find the area of the original rectangle.**
**Solution:**
Let the breadth of the original rectangle be x cm
Then, length of the original rectangle will be (2x – 5) cm

If the length is decreased by 3 cm, then,
New length = {(2x – 5) – 3}
= (2x – 8) cm
If breadth is increased by 2 cm, then,
New breadth = (x + 2) cm
New perimeter = 2 (new length + new breadth)
= 2 {(2x – 8) + (x + 2)}
= 2 (2x – 8 + x + 2)
= 2 (3x – 6)
We get,
= 6x – 12
According to the given problem,
6x – 12 = 72
6x = 72 + 12
6x = 84
x = 84 / 6
We get,
x = 14
Breadth of the original rectangle = 14 cm and
Length of the original rectangle = (2x – 5)
= 2 × 14 – 5
= 28 – 5
= 23 cm
Area of original rectangle = Length × Breadth
= (23 × 14) $cm^2$
= 322 $cm^2$
Therefore, area of the original rectangle is 322 $cm^2$

**26. A rectangle is 10 cm long and 8 cm wide. When each side of the rectangle is increased by x cm, its perimeter is doubled. Find the equation in x and hence find the area of the new rectangle.**
**Solution:**
Given
Length of rectangle (l) = 10 cm and
Breadth of the rectangle = 8 cm
Perimeter = 2 (Length + Breadth)
= 2 (10 + 8) cm
= 2 × 18
= 36 cm

If each side of the rectangle is increased by x cm, then,
Perimeter = 2 (10 + x + 8 + x)
= 2 (18 + 2x)
= (36 + 4x) cm
According to the given condition,
36 + 4x = 2 (36)
36 + 4x = 72
4x = 72 – 36
4x = 36
x = 36 / 4
We get,
x = 9
Hence,
Length of new rectangle = 1 + x = 10 + 9 = 19 cm and
Breadth of new rectangle = b + x = 8 + 9 = 17 cm
Area = Length × Breadth = 19 × 17 $cm^2$ = 323 $cm^2$

**27. A streamer travels 90 km downstream in the same time as it takes to travel 60 km upstream. If the speed of the steamer is 5 km/ hr, find the speed of the steamer in still water.**
**Solution:**
Let the speed of the steamer = x km/ h
The speed downstream = (x + 5) km/h and
The speed upstream = (x – 5) km/ h
According to the given problem,
90 / (x + 5) = 60 / (x – 5)
On cross multiplication, we get,
90 (x - 5) = 60 (x + 5)
90x – 450 = 60x + 300
90x – 60x = 300 + 450
We get,
30x = 750
x = 750 / 30
x = 25
Therefore, the speed of the streamer in still water is 25 km/ h

**28. A steamer goes downstream and covers the distance between two ports in 5 hours while it covers the same distance upstream in 6 hours. If the speed of the stream is 1 km/h, find the speed of the streamer in still water and the distance**

**between two ports.**

**Solution:**

Given

Speed of the stream in still water = 1 km/h

Let speed of the streamer = x km/h

Speed downstream = (x + 1) km/h

Speed upstream = (x – 1) km/h

According to the given condition,

$(x + 1) \times 5 = (x – 1) \times 6$

$5x + 5 = 6x – 6$

Calculating further, we get,

$6x – 5x = 5 + 6$

$x = 11$

Hence,

Speed of streamer in still water is 11 km/h and

Distance between two ports = $(11 + 1) \times 5 = 60$ km/h

**29. Distance between two places A and B is 350 km. Two cars start simultaneously from A and B towards each other and the distance between them after 4 hours is 62 km. If the speed of one car is 8 km/h less than the speed of other cars, find the speed of each car.**

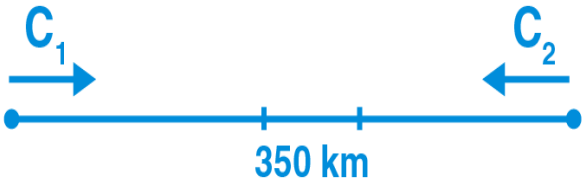
**Solution:**

Given

Distance between two places A and B = 350 km

Let the speed of car $C_1$ = x km/h and

Speed of car $C_2$ = (x – 8) km/h




After 4 hours, the distance between two cars is 62 km

Hence,

$x \times 4 + (x – 8) \times 4 = 350 – 62$

$4x + 4x – 32 = 288$

$8x = 288 + 32$

$8x = 320$

$x = 320 / 8$

We get,

$x = 40$

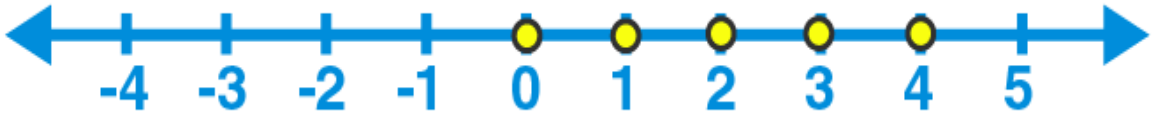
Therefore, speed of car $C_1$ = 40 km/h
Speed of car $C_2$ = (x – 8) = (40 – 8) = 32 km/h

## EXERCISE 12.3

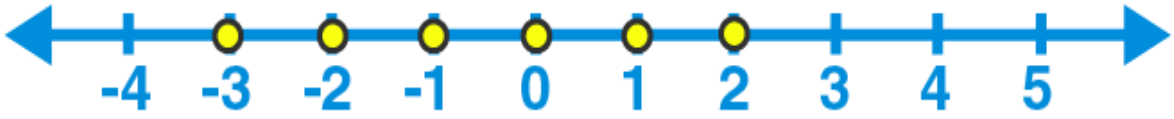
**1. If the replacement set = {-7, -5, -3, -1, 1, 3}, find the solution set of:**
**(i) x > - 2**
**(ii) x < - 2**
**(iii) x > 2**
**(iv) -5 < x ≤ 5**
**(v) -8 < x < 1**
**(vi) 0 ≤ x ≤ 4**
**Solution:**
Given
Replacement set = {-7, -5, -3, -1, 1, 3}
The solution set for the given replacement set is as follows:
(i) Solution set of x > - 2 is {-1, 0, 1, 3}
(ii) Solution set of x < - 2 is {-7, -5, -3}
(iii) Solution set of x > 2 is {3}
(iv) Solution set of -5 < x ≤ 5 is {-3, -1, 0, 1, 3}
(v) Solution set of -8 < x < 1 is {-7, -5, -3, -1, 0}
(vi) Solution set of 0 ≤ x ≤ 4 is {0, 1, 3}

**2. Represent the solution of the following inequalities graphically:**
**(i) x ≤ 4, x ε N**
**(ii) x < 5, x ε W**
**(iii) -3 ≤ x < 3, x ε I**
**Solution:**
(i) Given
x ≤ 4, x ε N
The solution set = {1, 2, 3,4}
These four numbers are shown indicating with thick dots on the number line given below


(ii) Given
x < 5, x ε W
The solution set = {0, 1, 2, 3, 4}
These five numbers are shown indicating with thick dots on the number line given below




(iii) Given
$-3 \leq x < 3, x \varepsilon I$
The solution set = {-3, -2, -1, 0, 1, 2}
These six numbers are shown indicating with thick dots on the number line given below




**3. If the replacement set is {-6, -4, -2, 0, 2, 4, 6}; then represent the solution set of the inequality $-4 \leq x < 4$ graphically.**
**Solution:**
Given
Replacement set = {-6, -4, -2, 0, 2, 4, 6} and
Inequality = $-4 \leq x < 4$
Solution set = {-4, -2, 0, 2}
Graphically representation of solution set is as follows:


**4. Find the solution set of the inequality $x < 4$ if the replacement set is**
**(i) {1, 2, 3, ….. , 10}**
**(ii) {-1, 0, 1, 2, 5, 8}**
**(iii) {-5, 10}**
**(iv) {5, 6, 7, 8, 9, 10}**
**Solution:**
(i) Given
Inequality = $x < 4$
Replacement set = {1, 2, 3, ……., 10}
Therefore, solution set = {1, 2, 3}
(ii) Given
Inequality = $x < 4$
Replacement set = {-1, 0, 1, 2, 5, 8}
Therefore, solution set = {-1, 0, 1, 2}

(iii) Given
Inequality = $x < 4$
Replacement set = {-5, 10}
Therefore, solution set = {-5}
(iv) Given
Inequality = $x < 4$
Replacement set = {5, 6, 7, 8, 9, 10}
Therefore, solution set = $\phi$

**5. If the replacement set = {-6, -3, 0, 3, 6, 9, 12}, find the truth set of the following:**
**(i) $2x – 3 > 7$**
**(ii) $3x + 8 \leq 2$**
**(iii) $-3 < 1 – 2x$**
**Solution:**
Given
Replacement set = {-6, -3, 0, 3, 6, 9, 12}
(i) $2x – 3 > 7$
$2x > 7 + 3$
$2x > 10$
$x > 10 / 2$
We get,
$x > 5$
Therefore, solution set = {6, 9, 12}
(ii) $3x + 8 \leq 2$
$3x \leq 2 – 8$
$3x \leq - 6$
$x \leq - 6 / 3$
We get,
$x \leq - 2$
Therefore, solution set = {-6, -3}
(iii) $-3 < 1 – 2x$
$2x – 3< 1$
$2x < 1 + 3$
$2x < 4$
$x < 4 / 2$
We get,
$x < 2$
Therefore, solution set = {-6, -3, 0}

**6. Solve the following inequations:**
**(i) 4x + 1 < 17, x ε N**
**(ii) 4x + 1 ≤ 17, x ε W**
**(iii) 4 > 3x – 11, x ε N**
**(iv) -17 ≤ 9x – 8, x ε Z**
**Solution:**
(i) 4x + 1 < 17
4x < 17 – 1
4x < 16
x < 16 / 4
We get,
x < 4
As x ε N
Hence, solution set = {1, 2, 3}

(ii) 4x + 1 ≤ 17
4x ≤ 17 – 1
4x ≤ 16
x ≤ 16 / 4
We get,
x ≤ 4
As x ε W
Hence, solution set = {0, 1, 2, 3, 4}
(iii) 4 > 3x – 11
4 + 11 > 3x
15 > 3x
15 / 3 > x
We get,
5 > x
x < 5
As x ε N
Hence, solution set = {1, 2, 3, 4}
(iv) -17 ≤ 9x – 8
-17 + 8 ≤ 9x
- 9 ≤ 9x
- 9 / 9 ≤ x
-1 ≤ x
x ≥ -1
As x ε Z

Hence, solution set = {-1,0, 1, 2,…}

**7. Solve the following inequations:**
**(i) {(2y – 1) / 5} ≤ 2, y ε N**
**(ii) {(2y + 1) / 3} + 1 ≤ 3, y ε W**
**(iii) (2 / 3)p + 5 < 9, p ε W**
**(iv) – 2 (p + 3) > 5, p ε l**
**Solution:**
(i) {(2y – 1) / 5} ≤ 2
2y – 1 ≤ 2 × 5
2y – 1 ≤ 10
2y ≤ 10 + 1
2y ≤ 11
We get,
y ≤ 11 / 2
As y ε N,
Therefore, solution set = {1, 2, 3, 4, 5}
(ii) {(2y + 1) / 3} + 1 ≤ 3
{(2y + 1 + 3) / 3} ≤ 3
{(2y + 4) / 3} ≤ 3
(2y + 4) ≤ 3 × 3
2y + 4 ≤ 9
2y ≤ 9 – 4
2y ≤ 5
We get,
y ≤ 5 / 2
As y ε N,
Therefore, solution set = {0, 1, 2}
(iii) (2 / 3) p + 5 < 9
(2 / 3) p < 9 – 5
(2 / 3) p < 4
2p < 4 × 3
2p < 12
We get,
p < 12 / 2
p < 6
As p ε W,
Therefore, solution set = {0, 1, 2, 3, 4, 5}
(iv) – 2 (p + 3) > 5

- 2p – 6 > 5
- 2p > 5 + 6
- 2p > 11
We get,
p > (11 / - 2)
p > - 11 / 2
As p ε l,
Therefore, solution set = {…-8, - 7, - 6}

**8. Solve the following inequations:**
**(i) 2x – 3 < x + 2, x ε N**
**(ii) 3 – x ≤ 5 – 3x, x ε W**
**(iii) 3 (x – 2) < 2 (x – 1), x ε W**
**(iv) (3 / 2) – (x / 2) > - 1, x ε N**
**Solution:**
(i) 2x – 3 < x + 2
2x – x < 2 + 3
We get,
x < 5
As x ε N,
Hence, solution set = {1, 2, 3, 4}
(ii) 3 – x ≤ 5 – 3x
3x – x ≤ 5 – 3
2x ≤ 2
We get,
x ≤ 1
As x ε W,
Hence, solution set = {0, 1}
(iii) 3 (x – 2) < 2 (x – 1)
3x – 6 < 2x – 2
3x – 2x < - 2 + 6
We get,
x < 4
As x ε W,
Hence, solution set = {0, 1, 2, 3}
(iv) (3 / 2) – (x / 2) > - 1
(3 / 2) + 1 > (x / 2)
{(3 + 2) / 2} > (x / 2)
(5 / 2) > (x / 2)

So,
5 > x
x < 5
As x ε N,
Hence, solution set = {1, 2, 3, 4}

**9. If the replacement set is {-3, -2, -1, 0, 1, 2, 3}, solve the inequation {(3x – 1) / 2} < 2. Represent its solution on the number line.**
**Solution:**
Given
Replacement set = {-3, -2, -1, 0, 1, 2, 3} and
Inequation = {(3x – 1) / 2} < 2
3x – 1 < 2 × 2
3x – 1 < 4
3x < 4 + 1
3x < 5
We get,
x < 5 / 3
Therefore, solution set = {…-3, -2, -1, 0, 1}
Graphical representation of this solution set is as follows:


**10. Solve (x / 3) + (1 / 4) < (x / 6) + (1 / 2), x ε W. Also represent its solution on the number line.**
**Solution:**
Given
(x / 3) + (1 / 4) < (x / 6) + (1 / 2)
(x / 3) – (x / 6) < (1 / 2) – (1 / 4)
(2x – x) / 6 < (2 – 1) / 4
x / 6 < 1 / 4
x < 6 / 4
We get,
x < 3 / 2
As x ε W,
Hence, solution set = {0, 1}
Graphical representation of this solution set is as follows:


**11. Solve the following inequations and graph their solutions on a number line**
**(i) - 4 ≤ 4x < 14, x ε N**
**(ii) - 1 < (x / 2) + 1 ≤ 3, x ε l**
**Solution:**
(i) Given
- 4 ≤ 4x < 14
Dividing by 4, we get,
(-4 / 4) ≤ (4x / 4) < (14 / 4)
-1 ≤ x < 7 / 2
As x ε N,
Therefore, solution set = {1, 2, 3}
The graphical representation for this solution set is as follows:


(ii) Given
- 1 < (x / 2) + 1 ≤ 3
By subtracting - 1, we get,
-1 – 1 < {(x / 2) + 1} – 1 ≤ 3 – 1
- 2 < (x / 2) ≤ - 2
Multiplying by 2, we get,
- 2 × 2 < (x / 2) × 2 ≤ - 2 × 2
- 4 < x ≤ - 4
As x ε l,
Therefore, solution set = {-3, -2, -1, 0, 1, 2, 3, 4}
The graphical representation for this solution set is as follows: