6 Division

Division is repeated subtraction of the same number i.e 15 ÷ 3 = 5 called, 15 - 3 = 12, 12 - 3 = 9, 9 - 3 = 6, 6 - 3 = 3, 3 - 3 = 0;. therefore 15 ÷ 3 = 5

Division is equal distribution of given quantity.

For Example : 96 mangoes were shared equally among 12 girls.
Each girls gets 96 ÷ 12 = 8 mangoes.

In a division sum,

- The number to be divided is called the dividend.
- The number by which thus dividend is divide is called the divisor.
- The answer we get is called the quotient.

i.e, Dividend → 121 ÷ 11 = 11 → Quotient
(11 → Divisor)

$$\begin{array}{r} 11 \\ 11\overline{)121} \\ -11\downarrow \\ \hline 11 \\ -11 \\ \hline 0 \\ \hline \end{array}$$

Let the cricket team now divide 165 players among 15 states cricket team.
Let us know to find the actual simple methods, 165 ÷ 15 = 11 therefore, 11 each players selected for 15 states cricket team.

Facts of Division

- The number which is left over in the last by the process of division is known as remainder.
  Dividend = Quotient × Divisor + Remainder
- If a number is divided by 1, then the quotient is the number itself.
  For Example : 13 ÷ 1 = 13, 121 ÷ 1 = 121, 1316 ÷ 1 = 1316
- If number (except 0) is divided by itself then the quotient is 1.

For Example : $80 \div 80 = 1$, $333 \div 333 = 1$, $172120 \div 172120 = 1$

❖ If zero (0) is divided by any number then the quotient is zero (0). But no number can be divided by zero.

For Example : $0 \div 18 = 0$, $0 \div 16 = 0$, $0 \div 40 = 0$

Division by 1, 10, 100 and 1000

If we divide a number by 1, the quotient is the dividend.

For Example :

83 ÷ 1 ⇨ Quotient = 83, Remainder = 0

851 ÷ 1 ⇨ Quotient = 851, Remainder = 0

12512 ÷ 1 ⇨ Quotient = 12512, Remainder = 0

If a number is divided by 10, then the digit at ones place of the number is as remainder and the remaining digits of the number is as quotient.

For Example :

65 ÷ 10 ⇨ Quotient = 6, Remainder = 5

697 ÷ 10 ⇨ Quotient = 69, Remainder = 7

5632 ÷ 10 ⇨ Quotient = 563, Remainder = 2

If a number is divided by 100 then the digits at ones place and tens place of the number are as remainder and the remaining digits of the number are as quotient.

For Example :

723 ÷ 100 ⇨ Quotient = 7, Remainder = 23

57211 ÷ 100 ⇨ Quotient = 572, Remainder = 11

510624 ÷ 100 ⇨ Quotient = 5106, Remainder = 24

If a number is divided by 1000, then the digits at ones, tens and hundreds place are as remainder and the remaining digits of the number are as quotient.

For Example :

6108 ÷ 1000 ⇨ Quotient = 6, Remainder = 108

27512 ÷ 1000 ⇨ Quotient = 27, Remainder = 512

387169 ÷ 1000 ⇨ Quotient = 387, Remainder = 169

EXERCISE 6.1

1. Fill in the following blanks.

a. 767 ÷ 1 = ... b. 0 ÷ 817 = ...

c. 2458 ÷ 1 = ... d. 630 ÷ 315 = ...

e. .... ÷ 640 = 1 f. 2250 ÷ 1125 = ...

g. 2348 ÷ .... = 2348 h. 1232 ÷ 1232 = ...

I. .... ÷ 180 = 2 j. 495 ÷ 495 = ...

2. Find the quotient and the remainder without dividing the following by long division method.

a. 637 ÷ 10 b. 5178 ÷ 10 c. 9257 ÷ 100

d. 3451 ÷ 10 e. 8365 ÷ 100 f. 7634 ÷ 1000

g. 12524 ÷ 10 h. 84024 ÷ 100 i. 35764 ÷ 1000

j. 4254 ÷ 1000 k. 68217 ÷ 100 l. 19235 ÷ 100

Division by 1-digit Number

Example I : Divide 2859 by 6.

Solution :

```
      4 7 6        → Quotient
 6 ) 2 8 5 9
   – 2 4           → 6 x 4 = 24
       4 5
     – 4 2         → 6 x 7 = 42
         3 9
       – 3 6       → 6 x 6 = 36
           3       → Remainder
```

Quotient = **476**

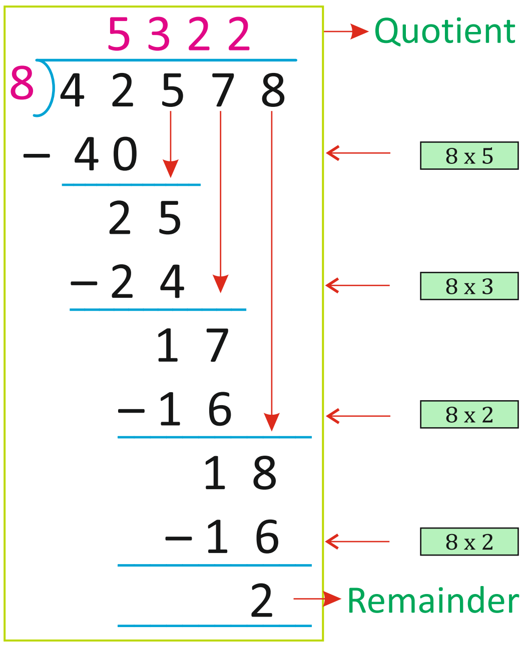
and Remainder = **3**.

Steps

1. The left- most digit is 2 which is less than 6. So, we can't divide 2 by 6.
2. Divide 28 by 6.
   We have 28 > 24 and 28 > 30.
   Thus, 6 goes 4 times in 28.
3. Subtract to get 28 - 24 = 4, which is the remainder.
4. Bring down 5 making 45.
   6 goes 7 times in 45, i.e. 6 x 7 = 42.
   Subtract 42 from 45 to got
   45 - 42 = 3, which is the remainder.
5. Bring down 9 making 39.
   6 goes 6 times in 39, i.e. 6 x 6 = 36.
   Subtract to get 39 - 36 = 3, which is the remainder

Example II : Divide 42578 by 8.

Solution :



Steps

1. Take 42 and divide it by 8.
2. 8 goes 5 times in 42, i.e. 8 x 5 = 40,
3. Subtract to get 42 - 40 = 2, which is the remainder.
4. Bring down 5 making 25.
5. 8 goes 3 times in 25, i.e. 8 x 3 = 24.
6. Subtract to get 25 - 24 = 1 as the remainder
7. Bring down 7 making 17.
8. 8 goes 2 times in 17, i.e. 8 x 2 = 16.
9. Subtract to get 17 - 16 = 1 as the remainder.
10. Bring down 8 making 18.
11. 8 goes 2 times in 18, i.e. 8 x 2 = 16.
12. Subtract to get 18 - 16 = 2, which is the remainder

Hence, 42578 ÷ 8 gives Quotient = **5322** and Remainder = 2

Division by 2-digit Number

Example III : Divide 795 by 13.

Solution : Divide as given following steps:

Step 1 : The leftmost digit of the dividend is 7 which is less than divisor 13, i.e. 7 < 13.

Therefore, 7 cannot be divided by 13, take next digit of the dividend to make it 79.

Step 2 : Using the multiplication table of 13 for 79,
$6 \times 13 = 78$, $7 \times 13 = 91$.
Since, $78 < 79$ and $91 > 79$, take 6 as quotient at tens place and 78 is written below 79.
Subtract $79 - 78 = 1$.

```
              H T O
                6 1      → Quotient
Divisor → 13) 7 9 5      → Dividend
             −7 8
               1 5
             − 1 3
                 2       → Remainder
```

Step 3 : Now, bring down the next digit 5.
Using the multiplication table of 13 for 15,
$1 \times 13 = 13$, $2 \times 13 = 26$.
Since, $13 < 15$ and $26 > 15$, take 1 as quotient at ones place and 13 is written below 15.
Subtract $15 - 13 = 2$.

Step 4 : 2 is smaller than the divisor 13, it is the remainder.
Therefore, Quotient = 61 and Remainder = 2.

Example III : Divide 4689 by 35.

Solution : Divide as given following steps:

Step 1 : The leftmost digit of the dividend is 4 which is less than the divisor 35, i.e. $4 < 35$.
Therefore, 4 cannot be divided by 35, take next digit of the dividend to make it 46.

Step 2 : 4 is the first digit of the dividend and 3 is the first digit of divisor.
4 can be divided by 3 one time, then
$1 \times 35 = 35$ and $2 \times 35 = 70$
but $35 < 46$ and $70 > 46$.

```
             Th H T O
                1 3 3    → Quotient
Divisor → 35) 4 6 8 9    → Dividend
            − 3 5
              1 1 8
            − 1 0 5
                1 3 9
              − 1 0 5
                  3 4    → Remainder
```

So, take 1 as quotient at hundreds place and 35 is written below 46.

Subtract 46 – 35 = 11.

Step 3 : Now, bring down the next digit 8.

In 118, we see that 35 goes 3 times, then

$3 \times 35 = 105$ and $4 \times 35 = 140$.

But $105 < 118$ and $140 > 118$, take 3 as quotient at tens place and 105 is written below 118.

Subtract 118 – 105 = 13.

Step 4 : Now, bring down the next and last digit 9 and see that 35 goes 3 times and 35 goes 4 times.

$3 \times 35 = 105$ and $4 \times 35 = 140$

Since, $105 < 139$ and $140 > 139$, take 3 as quotient at ones place and 105 is written below 139.

Subtract 139 – 105 = 34.

Step 5 : 34 is smaller than the divisor 35, it is remainder.

Therefore, Quotient = 133 and Remainder = 34.

Check the correctness of your answer.

In above example:

Dividend = 4689	Quotient = 133
Divisor = 35	Remainder = 34

Correctness of the answer : Divisor × Quotient + Remainder

$= 35 \times 133 + 34$

$= 4689$, which is dividend.

So, the answer is correct.

EXERCISE 6.2

1. find the quotient (Q) and remainder (R).

a. 2456 ÷ 9	b. 82561 ÷ 5	c. 4191 ÷ 8	d. 4450 ÷ 7
e. 5451 ÷ 5	f. 6752 ÷ 9	g. 27591 ÷ 5	h. 6728 ÷ 6
I. 7825 ÷ 4	j. 7829 ÷ 9	k. 9115 ÷ 8	l. 5229 ÷ 9
m. 17251 ÷ 4	n. 12578 ÷ 4	o. 34275 ÷ 3	p. 78257 ÷ 7

2. Write True or False :

a. $0 \div 4 = 0$

b. If we divide a number by 10, we get a quotient by removing ones digit of the number and ones digit is a remainder.

c. $37858 \div 1000$ gives $Q = 858$ and $R = 37$.

d. If the dividend and divisor are the same non-zero numbers, the quotient is 1.

Word Problems

Example IV : 56 people can travel in a bus. How many buses are required for 7000 people to travel?

Solution : Number of people travelling in a bus = 56
Total number of people = 7000
Therefore, required number of buses
$= 7000 \div 56 = 125$.

```
      Th H  T  O
         1  2  5
   ____________
56 )  7  0  0  0
    - 5  6
    ------
      1  4  0
    - 1  1  2
    ---------
         2  8  0
       - 2  8  0
       ---------
         ×  ×  ×
```

Example V : Find the greatest number of 4-digit which is divisible by 45.

Solution : The greatest number of 4-digit = 9999
Divide 9999 by 45.
We get remainder as 9.
So, we subtract 9 from 9999 and get 9990.
Hence, 9990 is 4-digit greatest number which is divisible by 45.

```
        2  2  2
   ____________
45 ) 9  9  9  9
   - 9  0
   ------
        9  9
     -  9  0
     -------
           9  9
         - 9  0
         ------
              9
```

Example VI : Find the smallest number of 5-digit which is divisible by 35.

Solution : The smallest number of 5-digit = 10000.
Divide 10000 by 35.
∴ The required number
$= 10000 - 25 + 35 = 10010$.
10010 is 5-digit smallest number which is divisible by 35.

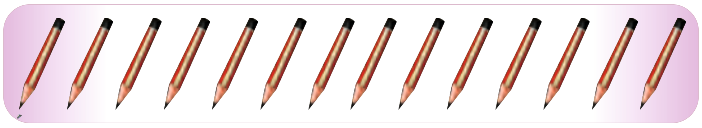
```
      2 8 5
   __________
35 ) 1 0 0 0 0
   - 7 0
   -----
       3 0 0
     - 2 8 0
     -------
         2 0 0
       - 1 7 5
       -------
           2 5
```

7 Factors and Multiples

Factors

When we multiply any two or more numbers we get a product, The product is a multiple of each of the numbers multiplied and each number is a factor of the product.

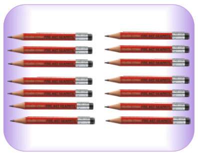
Parashar has 14 pencils. He wants to arrange the pencils in different orders. He can work in the following ways.



1 row of 14 pencils, $1 \times 14 = 14$.

2 rows of 7 pencils each, $2 \times 7 = 14$.

3 rows of 3 pencils each, $3 \times 3 = 9$.



7 rows of 2 pencils each, $7 \times 2 = 14$.

5 rows of 2 pencils each, $5 \times 2 = 10$.

14 rows of 1 pencil each, $14 \times 1 = 14$.

Here, we observe that the numbers 1, 2, 3, 4, 6, and 14 are all exactly dividing the number 14. We say that 1, 2, 3, 4, 6, and 14 are all factors of 14. Thus, a factor is a number which divides a given number without leaving a remainder.

Let us consider the product of two numbers.

$5 \times 3 = 15$

15 is a multiple of 5 and 3. ← → 5 and 3 are the factors of 15.

Let us consider the product of three numbers.

$2 \times 3 \times 5 = 30$

30 is a multiple of 2, 3 and 5. ← → 2, 3, and 5 are the factors of 30.

Finding Factors

Factors of a number can be found by either using division or multiplication.

Example I : Find the factors of 28 by division.

Solution :

Number		Factor		Quotient
28	÷	1	=	28
28	÷	2	=	14
28	÷	3	=	cannot divide 28 exactly
28	÷	4	=	7
28	÷	(5)	→	cannot divide 28 exactly
28	÷	6	=	cannot divide 28 exactly

All the divisors and quotients are factors of the number. When factors are repeated, no further division takes place.

Thus, the factors of 28 in ascending order are : 1, 2, 4, 7, 14 and 28.

Example II : Find the factors of 24 by multiplication.

Solution : We express 24 as a product of two factors (factor pair). To go systematically, we write the products in serial order.

Factor		Factor		Product	
1	×	24	=	24	
2	×	12	=	24	
3	×	8	=	24	
4	×	6	=	24	
5	×	?	=	24	→ 5 is not a factor of 24.
6	×	4	=	24	→ 6 is repeated so no need to continue.

So, the factors of 24 in ascending order are : 1, 2, 3, 4, 6, 8, 12 and 24.

Facts about factors

From the above examples, we can observe these facts about factors.

- 1 is a factor of every number.
- The biggest factor of a number is the number itself.
- 1 is the only number which has only one factor.
- A factor of a number is smaller than or equal to a number.
- A number has limited number of factors.

EXERCISE 7.1

1. Find the factors of 18, 32, 28, 42, 45, 56 through division.
2. Find the factors of 36, 27, 48, 52, 72, 64 through multiplication.
3. **Work mentally. Put a tick (✓) if the smaller number is a factor of the bigger number and put a cross (×) if it is not.**

a. 6, 38	b. 7, 91	c. 8, 32	d. 6, 42	e. 12, 96
f. 13, 52	g. 9, 40	h. 12, 85	i. 11, 66	j. 14, 36

Multiples

When we learnt multiplication with the help of tables, we also learnt the terms factors and product.

Look at the examples :

Table of 5					Table of 8				
Factor		Factor		Product	Factor		Factor		Product
1	×	5	=	5	1	×	8	=	8
2	×	5	=	10	2	×	8	=	16
3	×	5	=	15	3	×	8	=	24
4	×	5	=	20	4	×	8	=	32

The products of the above factors are called the multiples of 5 and 8.

A multiple is the product of two or more factors.

FACTS

- If the table of 6 or any number is written without its factors, we find the multiples of that number, e.g. 7, 14, 21, 28,...

Facts about multiples

- The first multiple of every number is the number itself.

  For Example : Multiples of 6 are

6	12	18	24, ...
1st multiple	2nd multiple	3rd multiple	4th multiple

  Clearly, the 1st multiple of 6 is 6 itself.

  Similarly, 1st multiple of 10 is 10, 21 is 21 etc. This also concludes that every counting number is a multiple of itself.

- Multiples of a number have no last multiple as they can carry on and on. They are unlimited.

  For Example : Multiples of 20 are 20, 40, 60, 80, ...

- Every number is a multiple of 1.

  For Example : $1 \times 1 = 1$; $1 \times 95 = 95$;
  $1 \times 4795 = 4795$.

  But 1 is the multiple of only the number 1.

  For Example : $1 \times 1 = 1$.

INFO ZONE

- The multiple of a number is either greater than or equal to the number, e.g.: multiples of 1 are 1, 2, 3 ... , multiples of 4 are 4, 8, 12,...

EXERCISE 7.2

1. Observe the patterns in multiples and fill in the blanks.

a. Multiples of 10 → 10, 20, 30, ... , ... , ...

b. Multiples of 100 → 100, 200, 300, ... , ... , ...

c. Multiples of 1000 → .... , ... , ... , ... , ...

2. Observe the numbers and fill in the blanks.

a. 4 → 4, ... ,12, ... , ... , ... , ...

b. 8 → 8, ... , ... , 32, ... , ... , ...

c. 10 → 10, ... , ... , ... , ... , ... , ...

Observation : The multiples of even numbers are .... numbers.

3. Observe the numbers and fill in the blanks.

a. 5 → 5, 10, 15, ... , ... , ... , ...

b. 7 → 7, 14, ... , ... , ... , ... , ...

c. 13 → 13, 26, ... , ... , ... , ... , ...

Observation : The multiples of odd numbers are .... and .... numbers alternatively.

4. Fill in the blanks.

a. Multiples of a number are ....

b. The multiple of a number is either .... or .... the number.

c. All multiples of 10 end with a ....

d. 1 is the multiple of only the number ....

Common Multiples and Least Common Multiples

Common multiples

Consider the numbers 2 and 3.

Multiples of 2 = 2, 4, (6), 8, 10, (12), 14, 16, (18), 20, ...

Multiples of 3 = 3, (6), 9, (12), 15, (18), 21, 24, 27, 30, ...

Observe the circled numbers in the lists of multiples of 2 and 3.
Common multiples = 6, 12, 18.
Do you think there can be more common multiples of 2 and 3? Yes, if the list of multiples continue.
Let us now find the common multiples of 2, 3, and 4.

Multiples of 2 = 2, 4, 6, 8, 10, (12), 14, 16, 18, 20, 22, (24), ...
Multiples of 3 = 3, 6, 9, (12), 15, 18, 21, (24), ...
Multiples of 4 = 4, 8, (12), 16, 20, (24), ...

Observe the circled multiples of the given numbers.
Common multiples = 12, 24, ... If we continue to find more multiples of these numbers, more common multiples will be found.

Least common multiple

You have learnt to find the common multiples of two and three numbers.
Let us now find the least common multiple (LCM) of the given numbers.

For Example : Look at the multiples of 2 and 3.
Multiples of 2 = 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, ...
Multiples of 3 = 3, 6, 9, 12, 15, 18, 21, 24, ...
Common multiples = 6,12,18, ... and LCM is 6.

To check if the bigger number is a multiple of the smaller number.

The bigger number must be divided exactly by the smaller number to be its multiple.

For Example : Is 48 a multiple of 6?
To find we divide 48 by 6. We see that 48 ÷ 6 = 8.
So, 48 is a multiple of 6.

$$\begin{array}{r} 8 \\ 6\overline{)48} \\ -48 \\ \hline 0 \end{array}$$

For Example : Is 42 a multiple of 8?
We divide 42 by 8.
Since, 42 is not exactly divisible by 8, it is not a multiple of 8.

$$\begin{array}{r} 5 \\ 8\overline{)42} \\ -40 \\ \hline 2 \end{array}$$

EXERCISE 7.3

1. Write the multiples of 3 and 4 up to the 8th place. Also, find their common multiples.

2. a. Write the least non-zero multiple of 18.
   b. Write all the multiples of 8 which lie between 30 and 70.
3. Find the first three common multiples of 5 and 10. What is their LCM?
4. Find the common multiples of 4 and 8 by finding the multiples of each number to the 5th place and encircle the LCM.
5. **Find out if the bigger number is a multiple of the smaller number.**
   a. 8, 96   b. 11, 121   c. 12, 84   d. 9, 88   e. 16, 257
6. **Find the LCM of the following.**
   a. 5, 8   b. 6, 18   c. 6, 11   d. 9, 12   e. 14, 16

Relationship between Factors and Multiples

- We know that 1 is the only number which has only one factor.
  $1 \times 1 = 1$. So, 1 is the only factor of 1. It is also the multiple of 1.
- Some numbers have only 2 factors.
  Number 5 has two factors 1 and 5 ($1 \times 5 = 5$).
  The product of these factors is their multiple.
- Numbers can have more than 2 factors.
  Look at the factors of 12.
  $1 \times 12 = 12$, $2 \times 6 = 12$, $3 \times 4 = 12$.
  1 and 12; 2 and 6; 3 and 4 are factor pairs of 12.
  The product of the factor pairs is the multiple of the factors.
- Factors are less then or equal to the multiple of the number.
- The number itself is the smallest multiple and the greatest factor of itself.

Common Factors and Highest Common Factor

To find common factors, we find the factors of two, three, or more numbers.

Example III : Find the common factors of 18 and 24.

Solution :

Factors of 18		
1 × 18	=	18
2 × 9	=	18
3 × 6	=	18

Factors of 24		
1 × 24	=	24
2 × 12	=	24
3 × 8	=	24
4 × 6	=	24

Factors of 18 = 1 , 2 , 3 , 6 , 9, 18

Factors of 24 = 1 , 2 , 3 ,4, 6 , 8, 12, 24

Common factors of 18 and 24 = 1, 2, 3, 6

Each of the common factors divides both 18 and 24.

Observe that the Highest Common Factor (HCF) from the list of common factors of 18 and 24 is 6. So, the HCF of two or three given numbers is the number which divides each of the numbers exactly.

Interesting relationship between HCF and LCM

Take two numbers 7 and 63.

Can the smaller number divide the bigger number exactly?

Yes, 63 ÷ 7 = 9.

If the smaller number divides the larger number without leaving a remainder, the smaller number is the HCF and the bigger number is the LCM of the two numbers.

Let us consider one more pair of numbers, e.g. : 8 and 72.

Divide the bigger number by the smaller one and find the HCF and LCM.

72 ÷ 8 = 9, no remainder.

So, HCF = 8 and LCM = 72.

EXERCISE 7.4

1. Find the factors of 12 and 20. Find their common factors and the HCF.
2. **Find the HCF of the following numbers by finding all the common factors.**
   a. 8, 20 b. 18, 40 c. 6, 9, 12 d. 2, 4, 6
   e. 8, 12, 16 f. 15,35 g. 42, 56 h. 25, 50
3. **Find the HCF and LCM of the following pairs of numbers.**
   a. 72, 9 b. 16, 80 c. 8, 104 d. 7, 91 e. 12, 108

Tests of Divisibility

The word divisibility relates to division without actually doing division. Tests of divisibility help you to take a look at a number and find out if it can be divided by 2, 3, 5 and so on. Tests of divisibility also help to find out factors of a number.

Take a look at the following tests.

Divisibility by 2

The digit in the ones place should be 2, 4, 6, 8, 0 or an even number for the number to be divisible by 2.

For Example :

a. 5682 → divisible by 2 as 2 is in the ones place.

b. 4596 → divisible by 2 as 6 is in the ones place.

c. 4871 → not divisible by 2 as none of 2, 4, 6, 8 or 0 is in the ones place.

Divisibility by 3

The sum of the digits should be divisible by 3 for the number to be divisible by 3.

For Example :

a. 8424 → divisible by 3 as $8 + 4 + 2 + 4 = 18$, which is divisible by 3.

b. 6329 → not divisible by 3 as $6 + 3 + 2 + 9 = 20$, which is not divisible by 3.

Divisibility by 5

The digit in the ones place should be 5 or 0 for the number to be divisible by 5.

For Example :

a. 29325 → divisible by 5

b. 4095 → divisible by 5

c. 67528 → not divisible by 5

Divisibility by 10

The digit in the ones place should be 0 for the number to be divisible by 10.

For Example :

a. 128930 → divisible by 10

b. 45653 → not divisible by 10

EXERCISE 7.5

1. Which of the following numbers are divisible by 2?

a. 6540 b. 5924 c. 34726 d. 8838 e. 8937 f. 67825

2. Which of the following numbers are divisible by 3?

a. 8007 b. 3693 c. 6982 d. 20805 e. 78462 f. 36283

3. Which of the following numbers are divisible by 5 and 10?

a. 38265 b. 43800 c. 91255 d. 72895 e. 67820 f. 89990

4. Check the divisibility of the following numbers by 2, 3, 5, 10. Complete the table by putting (✓) for yes and (×) for no.

	Numbers	By 2	By 3	By 5	By 10
a.	27895				
b.	67280				
c.	4974				
d.	3090				
e.	34385				

Prime and Composite Numbers

These are following numbers given below :

- Natural numbers → 1, 2, 3, 4, ...
- Whole numbers → 0, 1, 2, 3, 4, ...
- Even numbers → 2, 4, 6, 8, ...
- Odd numbers → 1, 3, 5, 7, ...
- Consecutive numbers → 1, 2, 3, 4, 5, 6, 7, i.e. which come one after the other.

Now, we shall learn about Prime and Composite numbers.

Prime numbers

The numbers which have only two factors are called prime numbers.

For Example : 2, 3, 5, 7, 9, 11, 13, 17, ...

Composite numbers

The numbers which have more than two factors, i.e. three and more factors are called composite numbers.

For Example : 4, 6, 8, 9, 10, 12, ...

Discovering prime and composite numbers

The process of factorisation with the help of tests of divisibiltiy, help us to discover the prime and composite numbers.

Look at the factors of natural numbers from 1 to 10.

Number	Factors		
1	$1 \times 1 = 1$	only 1 factor	
2	$1 \times 2 = 2$	2 factors	Prime number
3	$1 \times 3 = 3$	2 factors	Prime number
4	$1 \times 4 = 4$ $2 \times 2 = 4$	3 factors	Composite number
5	$1 \times 5 = 5$	2 factors	Prime number
6	$1 \times 6 = 6$ $2 \times 3 = 6$	4 factors	Composite number
7	$1 \times 7 = 7$	2 factors	Prime number
8	$1 \times 8 = 8$ $2 \times 4 = 8$	4 factors	Composite number
9	$3 \times 3 = 9$	3 factors	Composite number
10	$1 \times 10 = 10$ $2 \times 5 = 10$	4 factors	Composite number

From the above table we observe that :

- 1 is the only number with 1 factor.
  It is called a unique number or special number. It is neither prime nor composite.
- 2, 3, 5, 7 have two factors. So, they are prime numbers between 1 and 10. Also 2 is the smallest and only even prime number.
- 4, 6, 8, 9, 10 are composite numbers between 1 to 10. 4 is the smallest composite number.
- 2 and 3 are consecutive prime numbers.
- 3 and 5 or 5 and 7 are prime numbers with one composite number in between them. Such prime numbers are called twin prime numbers or twin primes.

- When you factorise two numbers and find only 1 as the common factor, such numbers are called co-prime numbers or co-primes.
  A few pairs of co-primes are : 7 and 8; 5 and 9; 8 and 13 etc.

Prime Factorisation

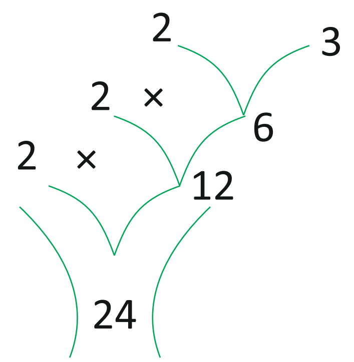
Writing a number as a product of its factors is called factorisation.

A factorisation in which every factor is prime is called prime factorisation of the number.

Observe these examples.

Example IV : Find prime factorisation of 24 by a factor tree method.

Solution :



The prime factorisation of 24 is $2 \times 2 \times 2 \times 3$.

EXERCISE 7.6

1. Fill in the blanks.

a. The number 1 is a .... number.

b. The smallest composite number is ....

c. The smallest prime number is ....

d. .... is the only even prime number.

e. Composite numbers have .... or more factors.

2. Factorise natural numbers from 11 to 20 to discover which numbers are prime and which are composite.

3. Find the prime factorisation of the following numbers by the factor tree method in your notebook.

a. 18 b. 21 c. 25 d. 30 e. 36

POINTS TO REMEMBER

- Factors of a number can be found by either using division and multiplication.
- 1 is a factor of every number.
- A number has limited number of factors.
- All even numbers are multiples of 2.
- All numbers with 5 or 0 in the ones place are multiples of 5.
- The first multiple of every number is the number itself.
- All numbers whose sum of the digits is divisible by 3 are multiples of 3.
- A factor is a number which divides a given number without leaving a remainder.
- The product of the factors pairs is the multiple of the factors.
- Prime numbers have two factors.
- Composite numbers have three or more factors.

RECAP EXERCISE

1. Multiple Choice Questions (MCQs)
Tick (☐) the correct options:

a. Prime numbers have only .... factors.

(i) 1 ☐ (ii) 2 ☐ (iii) 3 ☐ (iv) 4 ☐

b. The LCM of 6 and 12 is............. .

(i) 6 ☐ (ii) 12 ☐ (iii) 24 ☐ (iv) 36 ☐

c. All the numbers with 5 or 0 in the ones place are multiples of ....

(i) 2 ☐ (ii) 3 ☐ (iii) 5 ☐ (iv) 10 ☐

2. Write multiples of 13 and 17 to the 6th place.

3. Find all the factors of the following numbers by multiplication and division.

a. 24 b. 25 c. 32 d. 42

4. Find the common factors of the following numbers and write the HCF.

a. 12 and 20 b. 15 and 45 c. 18 and 24

5. **Find out if the smaller number is a factor of the larger number by divison.**

a. 18, 72 b. 28, 114 c. 15, 135

6. **Find the Prime factorisation of the following numbers by factor tree method.**

a. 45 b. 48 c. 56 d. 63

HOTS

Sohan is placing flower pots on the steps of a building. He places a pot on every fifth step. If the building has 40 steps, find the step numbers on which he places pots. How many pots will he need?

Lab Activity

Objective : Understanding the multiples and patterns formed by them.

Materials : A 10 × 10 squared paper per child, crayons, one sheet of paper (per child) to write down their observation.

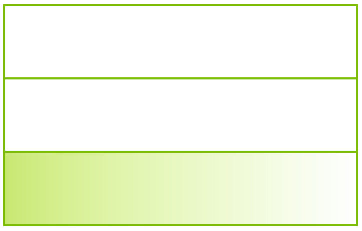
Presentation :

1. On the squared paper, numbers from 1 to 100 to be written.
   - With a red crayon, counting in 2s, all squares holding the numbers to be coloured, e.g. 2, 4, 6, ...
   - Counting is 3s and using a blue crayon, these squares are coloured, e.g. 3, 6, 9, 12, ...
   - The teacher asks the students to observe if there are numbers which need both colours and write them down.
   - The smallest common number is to be circled.
2. Now using the tables of 6 and 8, and with two different crayons (green, yellow) such squares coming in the tables of 6 and 8 are coloured.
   - The numbers coloured by the table of 6 are written down. The numbers coloured by the table of 8 are also written down.
   - The smallest common number is circled.
3. If there is time 2 more numbers can be taken.
4. The sheets should be displayed in the class.

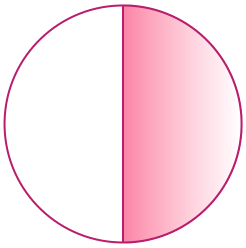
8 Fractional Numbers

Let find the equivalent fractions, we multiply or divide the numerator and denominator of a fraction by the same number.

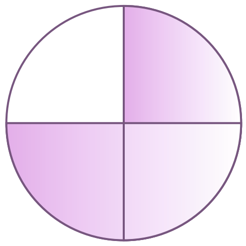
A fraction is a part of a whole. The numbers , , , , , , , , etc., are called fractional numbers. A fraction represents an equal part or parts of a whole or a group. The fraction means an object is divided into two equal parts and one part is taken. Similarly, the fraction represents that an object is divided into 4 equal parts out of which 3 parts are taken. Each fraction has two numbers which are separated by a line called line bar. The number written above the line bar is called numerator and the number below the line bar is called denominator. For example, in the fraction , 7 is numerator and 8 is denominator.



Represents fraction



Represents fraction



Represents fraction

Equivalent Fractions

Fractions are said to be equivalent fractions if all of them represent the same fractional numbers. If the numerator and the denominator of a fraction is multiplied by the same number (other than zero), the equivalent fraction is obtained.

For Example : , , , , ... are equivalent fractions.

Example I : Write the equivalent fraction to .

Solution : ...

= = = = = = ...

Therefore, equivalent fractions to are , , , , ...

Example II : Write the next four equivalent fractions to .

Solution : = = = =

= = = = .

Therefore, the next four equivalent fractions to are

, , ,

Finding Equivalent Fraction with Given Numerator or Denominator

How to find an equivalent fraction with a given numerator or denominator?

For Example : = numerators 4 and 16 $16 \div 4 = 4$,

= or =

= , denominators 4 and 16 $16 \div 4 = 4$.

So, = or =

To find an equivalent fraction with a higher numerator or denominator, multiply the numerator and denominator of given fraction by the same number (other than zero).

For Example : = , numerators 45 and 3 $45 \div 3 = 15$.

So, or = .

= , denominators 24 and 4 24 ÷ 4 = 6

So, or = .

To find an equivalent fraction with lowest numerator or denominator divide the numerator and denominator of given fraction by same number (other than zero).

Example III : Find an equivalent fraction of with numerator 8.

Solution : =

For an equivalent fraction with higher numerator, multiply the numerator and denominator of the given fraction by same number. Then, 8 ÷ 2 = 4.

So, = = .

Therefore, = .

EXERCISE 8.1

1. Write the next four equivalent fractions.

a. $\frac{1}{3}, \frac{2}{5}, \frac{3}{7}$, ..., ..., ..., ...

b. , , , ..., ..., ..., ...

c. , , , ..., ..., ..., ...

d. , , , ..., ..., ..., ...

2. Write the first five equivalent fractions to each of the following.

a. b. c. d.

3. Find an equivalent fraction of with...

a. numerator 3 b. denominator 8

c. numerator 9 d. denominator 16

4. Fill in the missing numerals.

a. = b. = c. = d. =

e. = f. = g. = h. =

Whether or not the Two Fractions are Equivalent

Two fractions are equivalent if their cross product are same.

For Example : $3 \times 12 = 36$, $4 \times 9 = 36$ — is equivalent to .

$3 \times 8 = 24$, $4 \times 6 = 24$ — is equivalent to .

$4 \times 20 = 80$, $5 \times 16 = 80$ — is equivalent to .

Example IV : Find if and are equivalent fractions or not.

Solution : Two fractions are equivalent if their cross product are same.

$2 \times 6 = 12$, $3 \times 4 = 12$ — is equivalent to .

Example V : Are and equivalent fractions?

Solution : $2 \times 5 = 10$, $9 \times 3 = 27$ — is not equivalent to .

Fraction in the Lowest Term

A fraction is said to be in its lowest term or in its simplest form if the common factor of the numerator and denominator is 1. To reduce a fraction in its lowest term, divide the numerator and denominator of the fraction by their HCF or by their common factors.

Example VI : Is the fraction in its lowest term?

Solution : Factors of the numerator 2 = 1, 2

Factors of the denominator 8 = 1, 2, 4, 8

The common factors of 2 and 8 = 1, 2

Therefore, is not in its lowest term.

How to Reduce a Fraction in its Lowest Form

To reduce the fraction in its lowest form, find the HCF of numerator and denominator of the fraction and divide them by their HCF.

Example VII : Reduce to its lowest form.

Solution : Find the HCF of numerator 9 and denominator 12 by prime factorization.

3	9
3	3
	1

2	12
2	6
3	3
	1

The prime factors of 9 = 3 × 3.

The prime factors of 12 = 2 × 2 × 3.

Therefore, HCF of 9 and 12 is 3.

Then, = =

Therefore, is the lowest form of

EXERCISE 8.2

1. Are the following fractions equivalent? Write Yes or No in the answers.

a. and b. and c. and

d. and e. and f. and

2. Which of the following is in its lowest form?

a. b. c. d. e.

f. g. h. i. j.

3. Reduce the following fractions in their simplest form.

a. b. c. d. e.

f. g. h. i. j.

Types of Fractions

Like Fractions : Fractions having the same denominators are called like fractions.

For Example : , , , , etc., are like fractions.

Unlike Fractions : Fractions having different denominators are called unlike fractions.

For Example : , , , etc., are unlike fractions.

Unit Fractions : Fractions with numerator 1 are called unit fractions.

For Example : , , , , , etc., are unit fractions.

Proper Fractions : Fractions with numerators smaller than the denominators are called proper fractions.

For Example : , , , , , etc., are proper fractions.

Improper Fractions : Fractions with numerators greater than or equal to denominators are called improper fractions.

For Example : , , , , , etc., are improper fractions.

Mixed Numeral : A mixed numeral is a combination of a whole number and a proper fractional number.

Or, when an improper fraction is written as a combination of a whole and a proper fraction then it is called a mixed numeral.

For Example : , , , etc., are mixed numerals.

EXERCISE 8.3

1. Which groups are of like fractions?

a. , , and
b. , , and
c. , , and
d. , , 1 and
e. , , and
f. , , and

2. Which of the following are groups of unlike fractions?

a. , , and
b. , , and
c. , , and 1
d. , , and

3. Which of the following are proper fractions?

a.
b.
c.
d.
e.
f.

4. Which of the following are improper fractions?

a.
b.
c.
d.
e.
f.

5. Which of the following are unit fractions?

a. b. c. d. e. f.

6. Which of the following are mixed numerals?

a. b. c. d. e.

Addition & Subtraction of Like Fractions

Addition of like fractions

To add like fractions, we simply add the numerators and write the sum over the same denominator.

FACTS

After addition, the fraction obtained should be reduced to the lowest terms.

Example VIII : Rohit reads of a book on Saturday and of the book on Sunday. How much of the book has Rohit read on both days?

Solution : On Saturday, Rohit reads of the book. On Sunday, Rohit reads of the book.

Total book read

→Numerators are added.
→Denominator is the same.

So, Rohit reads of the book in both the days.

Example IX : Add and and express the answer as a mixed number.

Solution :

$$\begin{array}{r} 1 \\ 11\overline{)\,12} \\ -11 \\ \hline 1 \end{array}$$

Hence,

Subtraction of Like Fractions

To subtract like fractions, the same method is followed as in addition of like fractions. The numerators are subtracted and written over the same denominator.

Example X : Find .

Solution :

→ Numerators are subtracted.

→ Denominator is the same.

Example XI : Vicky was given of a pizza. He gave away of the pizza to his brother. How much pizza is left with him?

Solution : To get the answer, subtract from .

So, Vicky has of the pizza now.

EXERCISE 8.4

1. Add the following and reduce the sum to the lowest terms.

a. b. c. d. e.

2. Subtract the following fractions and reduce to the lowest terms.

a. b. c. d. e.

3. Shikhar ate of a cake, and then ate another . How much cake has he eaten altogether?

4. Mother gave of a pizza to Manisha and to Ayera. Who has eaten more pizza and how much more?

5. Disha has completed of her homework. How much work is left?

Addition & Subtraction of Unlike Fractions

Addition of unlike fractions

To add unlike fractions, first the denominators of the fractions are made the same e.g. fractions are converted into like fractions, and then they are added as like fractions.

Example XII : Sanchit ate of a cake and Vaibhav ate of a cake. How much cake did they eat together?

Solution : Total cake eaten by them is .

Converting the given fractions into like fractions, we get

Adding like fractions, we get

Expressing as a mixed number, we get .

So, Sanchit and Vaibhav together ate cake.

Addition of mixed numbers

To add mixed numbers, we first covert them into improper fractions and then convert the improper fractions into like fractions. The like fractions so obtained are added as usual.

Example XIII: Add

Solution : (On changing mixed numbers into improper fractions)

Now, convert the fractions into like fractions as follows:

Finally, add

Hence,

EXERCISE 8.5

1. Add the following and reduce to the lowest terms.

a. b. c. d. e.

2. Subtract the following and reduce to the lowest terms.

a. b. c. d. e.

3. Check the symbol and perform the operation in each of the following.

a. b. c. d. e.

4. Rohan walked km to his school. Then, he walked km to the library. How much did he walk altogether?

5. Rekha bought 2 kg sugar. She used kg sugar to bake a cake. How much sugar is left?

6. Vinay reads of a storybook on the first day and the second day. How much of the book has been read?

POINTS TO REMEMBER

- A fraction shows an equal part or parts of a whole or a group.
- A fraction has two parts-the numerator and the denominator, separated by a dividing line.
- Two or more fractions that represent the same amount (fractional number) are called equivalent fractions.
- To reduce a fraction to the lowest terms, divide the numerator and denominator by their highest common factor (HCF).
- When the numerator divides the denominator without leaving a remainder, the numerator is the HCF and the denominator is the LCM.
- Addition and subtraction of unlike fractions is done by finding the like fractions of the given fractions.

RECAP EXERCISE

1. Multiple Choice Questions (MCQs)

Tick (☐) the correct options:

a. of 32 is equal to........................ .

(i) 10 ☐ (ii) 20 ☐

(iii) 40 ☐ (iv) 50 ☐

b. Which of the following is an equivalent fraction to ?

(i) ☐ (ii) ☐

(iii) ☐ (iv) ☐

c. is........................ .

(i) 1 ☐ (ii) ☐

(iii) ☐ (iv) ☐

d. written in lowest term is........................ .

(i) ☐ (ii) ☐

(iii) ☐ (iv) none of these ☐

e. of 50 is equal to........................ .

(i) 30 ☐ (ii) 40 ☐ (iii) 50 ☐ (iv) 60 ☐

2. Identify the proper fractions from the following.

a. b. c. d. e. f. g.

3. Evaluate the following.

a. b. c. d.

4. Find an equivalent fraction of each of the following.

a. b. c. d. e. f.

5. Build equivalent fractions to the 5th place for each of the following.

a. ...., ..., ..., ... , ...

b. , ..., ..., ..., ... , ...

6. Reduce each of the following fractions to its lowest terms.

a. b. c. d.

7. Add or subtract and reduce to the lowest terms.

a. b. c. d.

e. f. g. h.

8. Sakshi received a huge bunch of flowers from her friend. She counted 84 flowers in all. of the flowers were roses. How many roses were there in the bouquet?

9. A packet has 75 sheets of paper. Malika uses of the sheets. How many sheets has she used?

10. During the class election, Sidhant got of the 42 votes polled. How many votes did Sidhant get?

HOTS

If Harsh gets ₹ 100 to spend in a week and he spends ₹ 75 only, what part of money does he save?

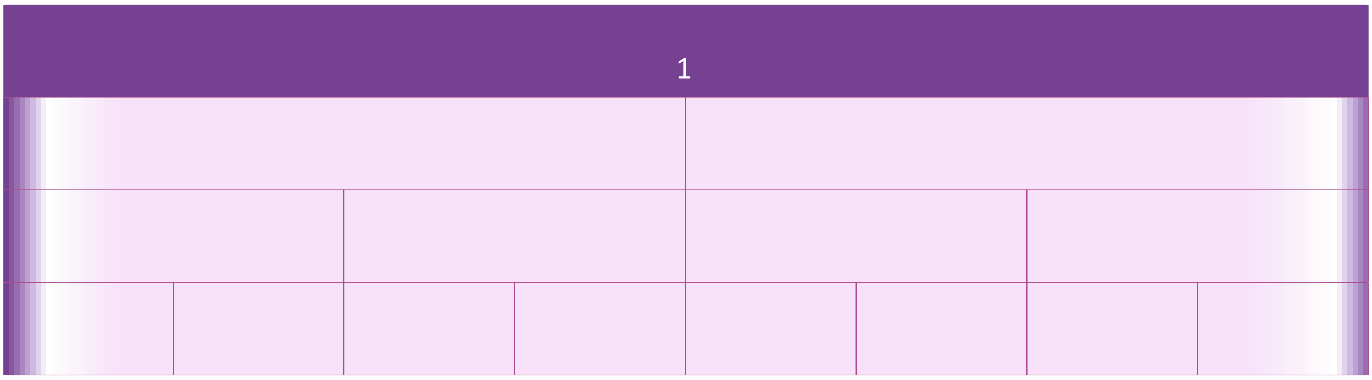
If there are 25 girls and 35 boys in a class, what fraction of the boys is in the class?

Lab Activity

Objective : To understand the order of fractions.

Materials : A white sheet of paper, glazed paper, a pair of scissors, pencil, scale and fevicol.

Fraction Strips



Presentation :

- Cut out 4 equal strips of glazed paper of any colour of length 12 cm and width 3 cm.
- Paste one strip on the sheet of paper.
- Take the second strip. Fold it neatly into two equal parts. Mark the fold line and paste it below the first strip. Mark for each part.
- Now take the third strip. Fold it into four equal parts. Mark the folds. Paste it below the second strip. Write for each part.
- Then take the fourth strip and fold it into 8 equal parts. Mark the folds. Paste the strip below the third strip. Write for each part.

  a. What happens when the number in the denominator gets bigger? ....

  b. What is a unit fraction? ....

  c. Which is bigger or ? ....

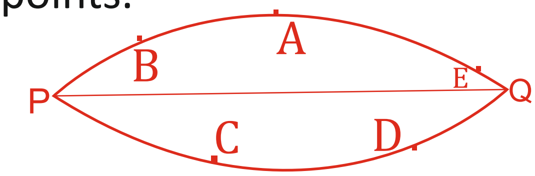
  d. If you get 2 shares of or one share of , which would be more? ....

  e. How many parts will make ? ....

9 Geometry

Point : A point is an exact location in Shape. It is represented by a dot (.) it is very small, that it has no size, it has no length, breadth or thickness. It is denoted by capital letters i.e. A, B C, D and E are points.

• A • B • C • D • E



Line Segment : Suppose P and Q are two points. There can be many ways to reach P to Q or Q to P. But the shortest path is the straight path that joins P and Q.

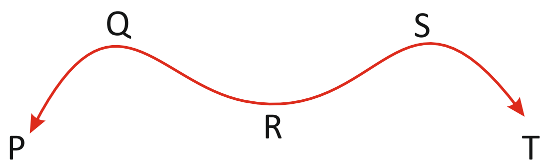
The straight path from P to Q is called line segment P Q. The line segment P Q is denoted by $\overline{PQ}$. P and Q are the end points of the line segment $\overline{PQ}$.

Line : A line is a straight path which extends endlessly in both directions.

The line segment has two end points whereas a line has no end points. Through two given points one and only one line can be drawn.

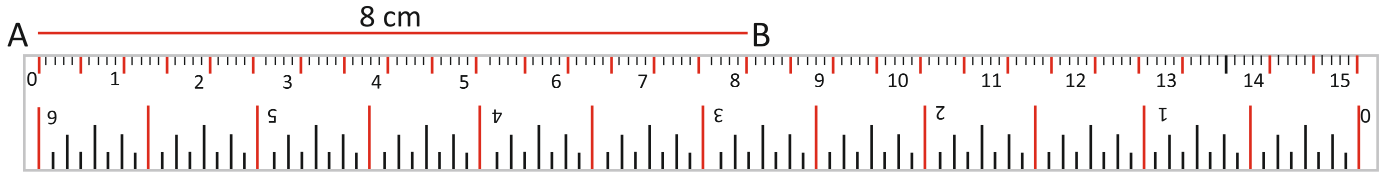
Ray : A straight path which extends endlessly in one direction only is called a ray. It has one end point called initial point.

Curved Line : Curved lines can not drawn with the help of a scale.



Measuring of Line Segments: To measure the given line segments we use scale (ruler). The upper edge of the scale has centimetre marks. Each centimetre is divided into 10 equal parts. Each part is called a millimetre.

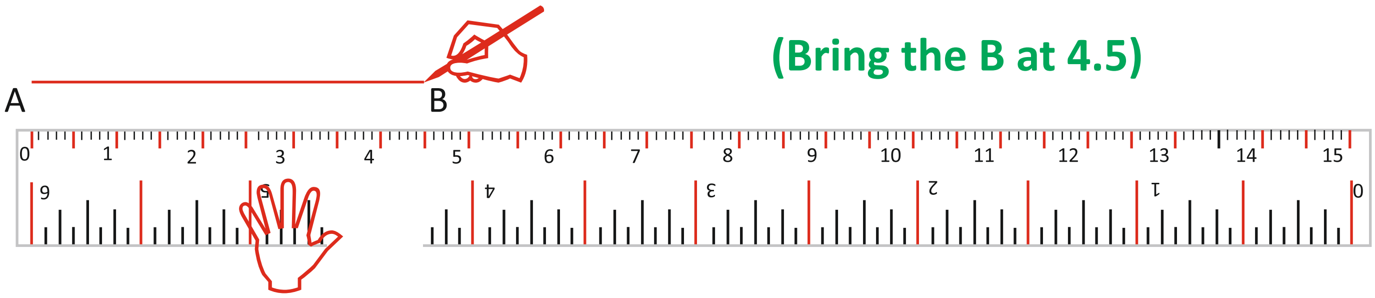
Example I : Measure the length of line segment AB.



Solution : Place the edge of the scale along the line segment AB. Keeping the zero centimetre mark of the scale at point A. We can see from the scale that the 8 cm mark is where against the point B. Therefore, in this way the length of the line segment is measured 8 cm and it is written as $\overline{AB}$ = 8 cm.

Example II : Draw a line segment of length 4.5 cm.

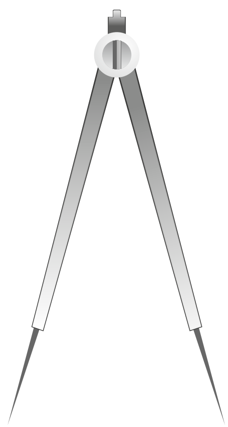
Solution : Place the scale on the paper and hold it as shown below :



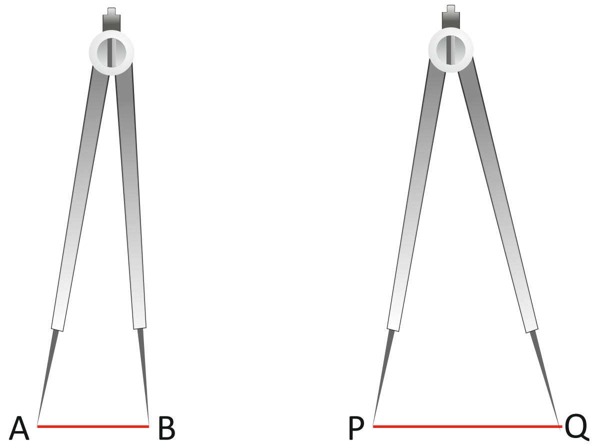
Mark two points, A and B against the marks of the scale which indicate '0' and 4.5 cm (4 big divisions and 5 small divisions). Pressing the scale evenly, join the points A and B by moving the tip of the sharp pencil along the edge of the scale. Lift the scale and obtain the required line segment AB of given line, i.e. $\overline{AB}$ = 4.5 cm.

Comparison of Line Segments

Two line segments AB and PQ can be compared by using an instrument called divider. It has two arms with pointed ends. The distance can be adjusted between its two ends.



Place the end points of the divider on the end points A and B of the line segment AB as given here :



Now lift the divider without disturbing its arms, and place one end point of the divider on point P of the line segment PQ. Observe where the other end point of the divider falls on the line segment PQ. Here, it falls before the point Q. We can say that line segment AB is shorter than the line segment PQ.

If the other end point of the divider falls exactly on Q, then the line segments AB and PQ are equal and if it falls beyond the point Q then the line segment AB is longer than line segment PQ.

EXERCISE 9.1

1. Construct a line segment of length.

a.	5 cm 5mm	b.	7.9 cm	c.	3.4 cm
d.	4 cm 3 mm	e.	6.4 cm	f.	5.4 cm

2. How many line segments joining any two given points among three non- straight points can be drawn?

3. How many line segments joining any two given points among three straight points can be drawn?

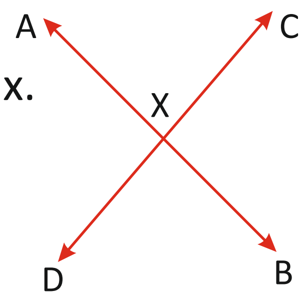
4. How many millimetres are there in a centimetre?

5. Which of the following is correct?

a.	1 cm = 0.1 mm	b.	1 mm = 0.1 cm
c.	1 m = 0.01 cm	d.	1 cm = 0.1 m

More About Lines, Line Segments and Rays

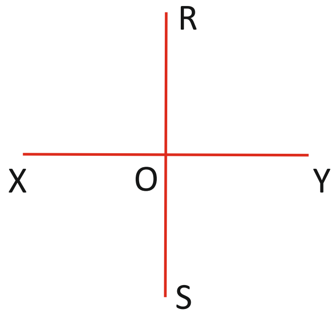
Intersecting lines



$\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$ are intersecting or crossing each other at point x.

For Example : The letter X.

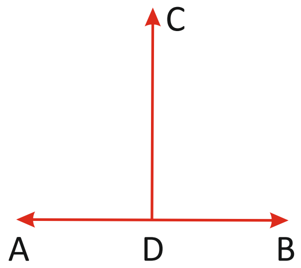
Intersecting line segments



$\overline{RS}$ and $\overline{XY}$ are intersecting at point O.

For Example : Adjacent edges of a table top.

Perpendicular lines



When a vertical ray, line or line segment meets a horizontal ray, line or line segment, perpendicular lines are formed.

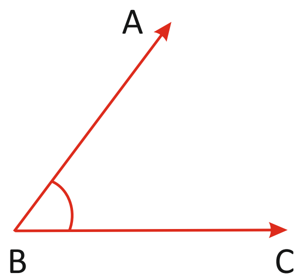
For Example : The letter T and L.

Parallel lines

Lines which never meet are called parallel lines. They are always at an equal distance from each other.

For Example : The edges of your scale and rails of a railways track.

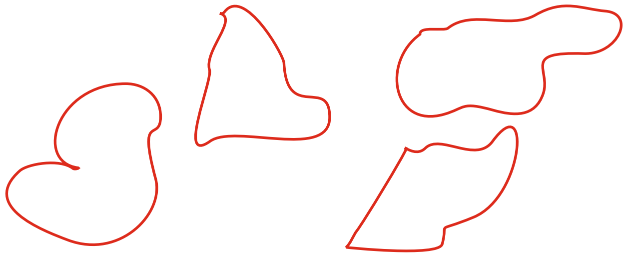
Angle



When two rays or line segments meet at a point, an angle is formed. The symbol used for angle is $\angle$. Thus, figure shows $\angle ABC$.

Closed Figures

Figures that start and end at the same place are closed figures. Figures given below are closed figure.

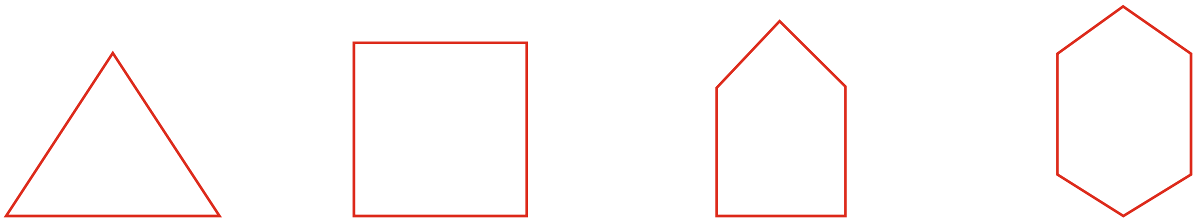


Open Figures

Figures that start at one place and end at another place are open figures. Figures given below are open figures.

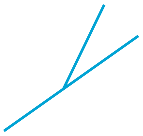
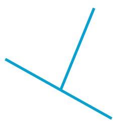
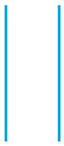
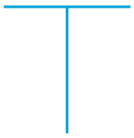
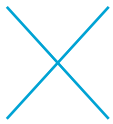
Polygons

Figures made up of only straight line segments as their sides are called polygons.

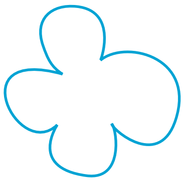
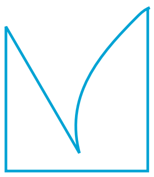
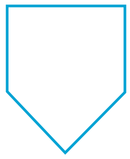
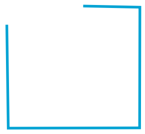


EXERCISE 9.2

1. Find intersecting lines, perpendicular lines and parallel lines in the given figure.

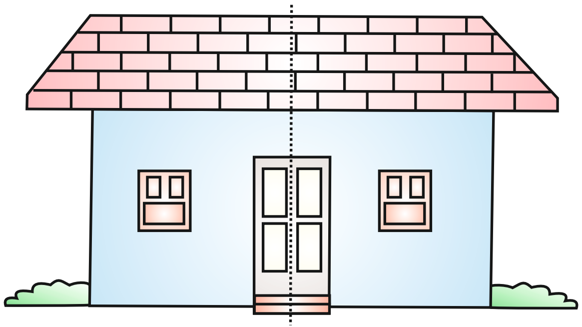
a.  b.  c.  d.  e.  f. 

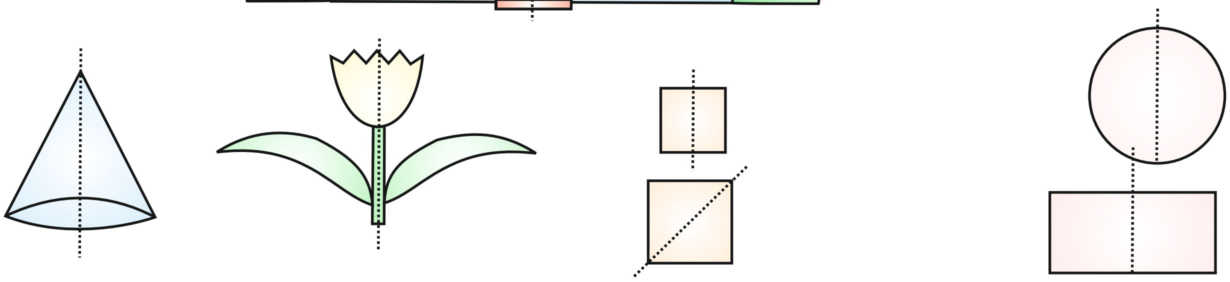
2. Find closed figures, open figures and polygons in the given figures.

a.  b.  c.  d.  e. 

Line of Symmetry

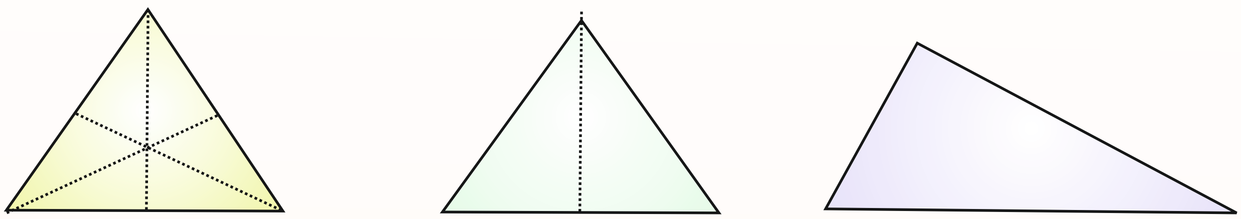
Look at the figures given below and the dotted lines.



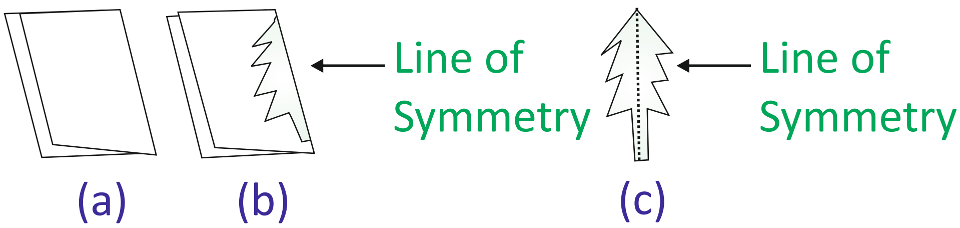


The above figures can be divided into two equal parts with the help of a dotted line. After marking the separation line, fold along with dotted lines, one part will fit exactly over the other part. The dotted lines are called the Line of Symmetry of the respective figures and the figures are called as the Symmetric Figures.

INFO ZONE

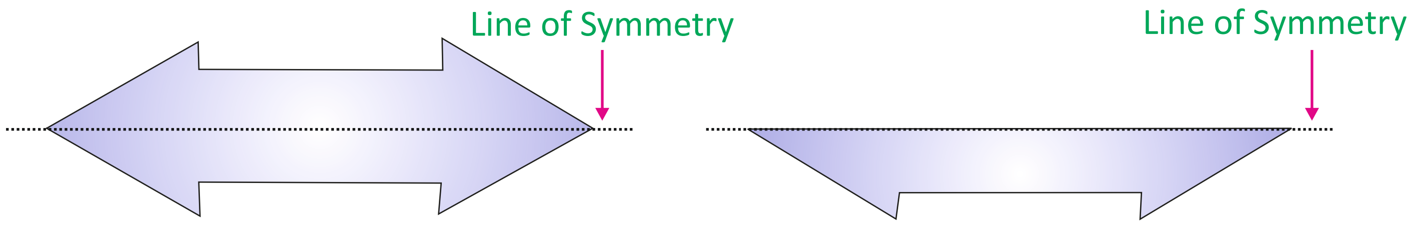


Three Lines of Symmetry | Single Lines of Symmetry | No Line of Symmetry

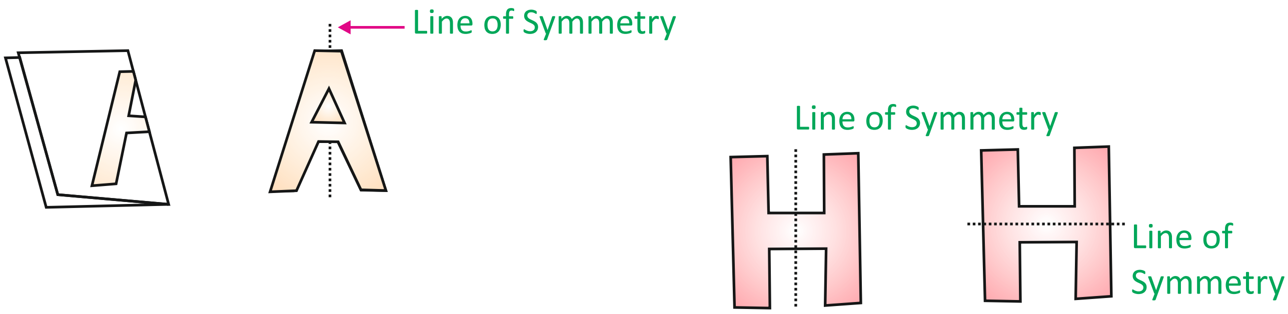


Try the given example. Fold a piece of a paper into two halves as in figure (a).

Draw a shape and cut it out as in figure (b). When you unfold the paper, the shape you will get is same as in figure (c). The shape in figure (c) is symmetric because both the halves are exactly the same.



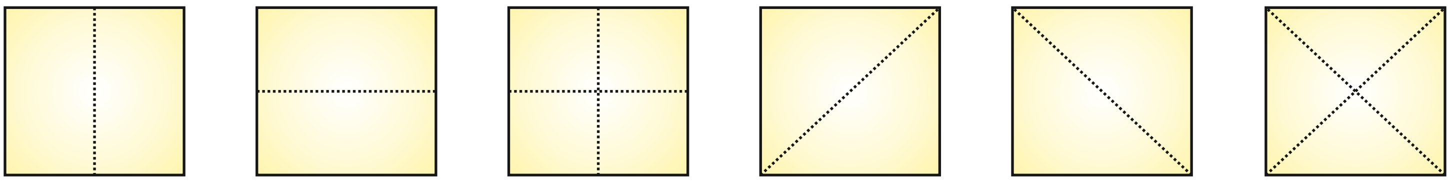
Here are some more examples. You should try to make some of your own.



Figures with More than One Line of Symmetry

Some shapes have more than one line of symmetry. For example, a rectangle has two lines of symmetry and a square has four lines of symmetry.

A rectangle has TWO lines of Symmetry.



A square has FOUR lines of Symmetry.

Mirror Image : When you look at a mirror you see your own image. This is your reflection. The reflection is at the same distance from mirror as you are.

Look at the figures given below. The dotted line is the line of the mirror.

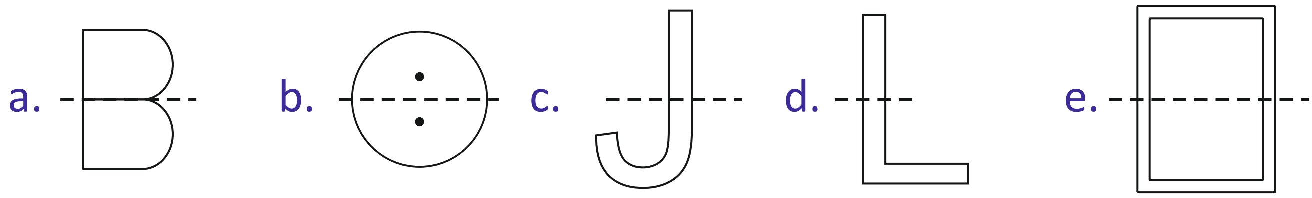
All these are examples of reflection.

Look at the figures given below. Are they reflections of each other?

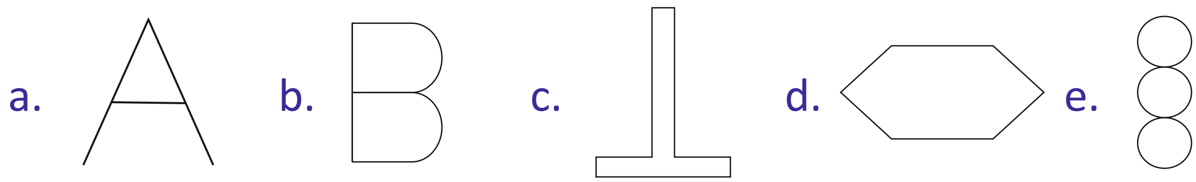
These are just rotated from left to right.

EXERCISE 9.3

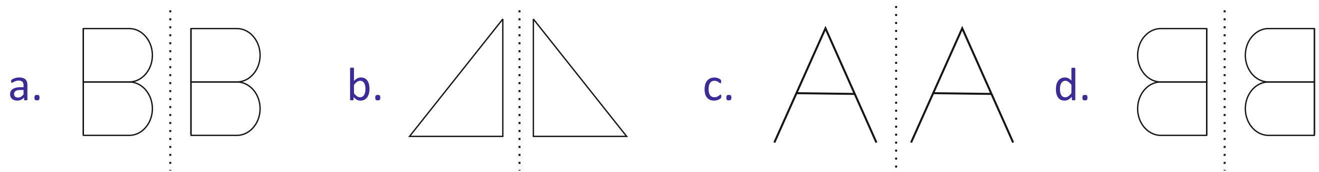
1. Tick (✓) on the figure which are symmetrical.



2. Draw the line of symmetry for each of the following.



3. Are the things given below examples of reflection?



4. Draw the mirror image of each of the following.

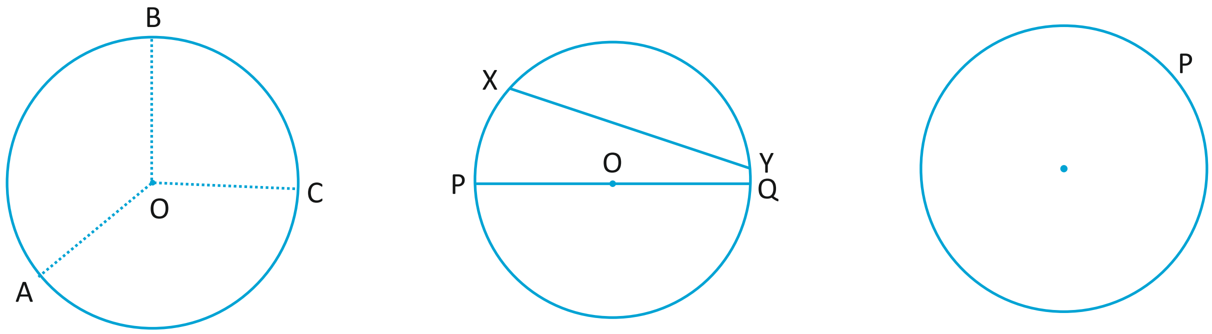
Circle

A round plane figure whose boundary consists of points equidistant from the centre is called circle. Look at the following figures. In the circle, there is a point O. This point is called the centre of the circle.

The distance of a point on the boundary of the circle from its centre is called the radius of the circle. Thus, OA represents the radius of the circle. OB and OC also represent the radius of the circle.

Let X and Y be two points on the boundary of the circle. Join X and Y by the line segment XY. The line segment XY is called a chord of the circle. PQ is also a chord of a circle. But the centre O of the circle is on this chord.

The length of such a chord is called the diameter of the circle. Every chord of the circle through the centre O is called a diameter.



The whole length of the boundary of a circle is called its circumference. If P is a point on the boundary of the circle, we say that P is a point on the circumference of the circle.

INFO ZONE

- Every diameter is a chord, but every chord is not a diameter.
- The diameter is the longest chord in any circle.
- A circle has many radii, chords and diameters but it has only one centre.

Compass

Have you seen a compass? Your instrument box should contain one compass. By using the compass you can make a circle. Look at the following steps :

a. Open your compass.

b. Press the tip of the compass on the paper. Hold the compass from the top.

c. Without moving the tip, try to move the pencil around.

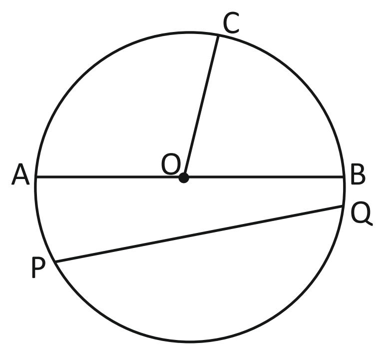
d. Now you get a circle.

EXERCISE 9.4

1. Draw the circles whose radii are :

a. 7 cm b. 5.4 cm c. 6.5 cm

2. In the figure O is the centre of the circle. Fill in the blanks :



a. AB is a .... of the circle.

b. OC is a .... of the circle.

c. PQ is a .... of the circle.

POINTS TO REMEMBER

- A point is the smallest shape in geometry.
- A line segment has a definite length and is marked by two end points.
- A line extends in both directions endlessly. It has no end points.
- A ray starts from an end point and can extend in one direction only.
- Squares and rectangles are special quadrilaterals.
- If we join the centre to a point on the circle, we get a radius. A circle has many radii.
- If we join any two points on a circle we get a chord.
- Diameter = 2 × radius

RECAP EXERCISE

1. Multiple Choice Questions (MCQs)

Tick (☐) the correct options:

a. A line has .... end points.

(i) one ☐ (ii) two ☐ (iii) no ☐ (iv) none of these ☐

b. Two lines can intersect at maximum .... point.

(i) one ☐ (ii) two ☐ (iii) three ☐ (iv) four ☐

c. A polygon has .... sides.

(i) three ☐ (ii) four ☐ (iii) five ☐ (iv) all of these ☐

d. A circle may have .... centre.

(i) one ☐ (ii) two ☐ (iii) three ☐ (iv) four ☐

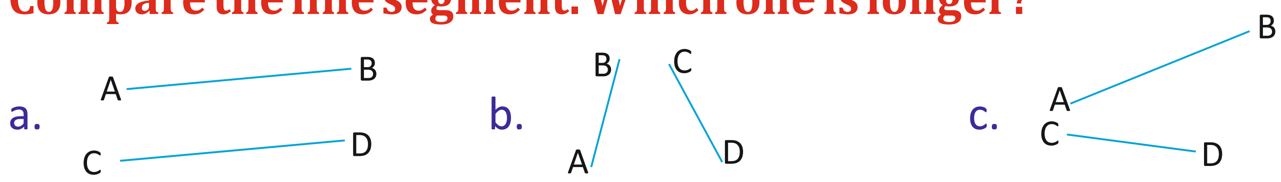
e. To draw a triangle we require.

(i) Scale ☐ (ii) Divider ☐ ii) Compass ☐ None of these ☐

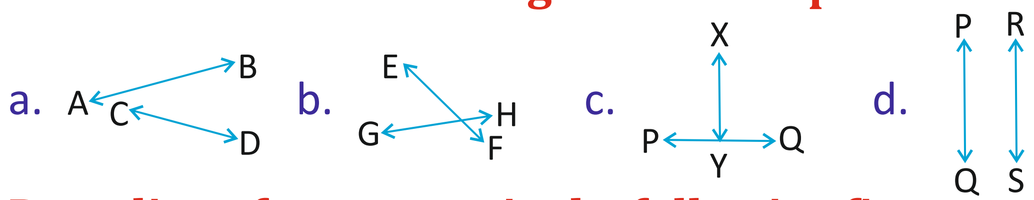
2. Construct the line segment of length.

a. 4.6 cm b. 5.4 cm c. 6.5 cm d. 8.2 cm

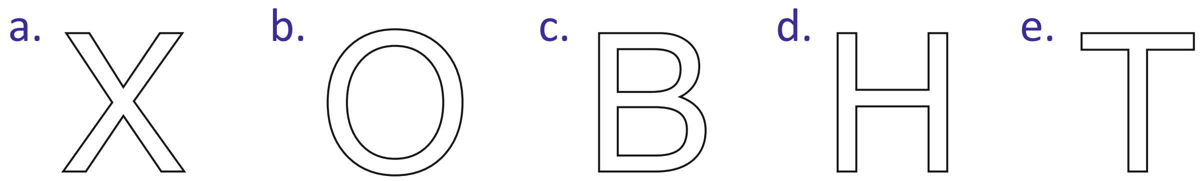
3. Compare the line segment. Which one is longer?



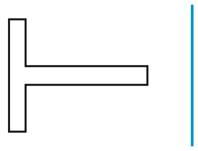
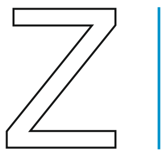
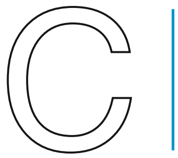
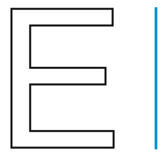
4. Which one is intersecting line in each pair of lines.



5. Draw line of symmetry in the following figures.



6. Draw the mirror images of each of the following figures.

a.  b.  c.  d. 

7. Draw the circle of the following radii.

a. 2.5 cm b. 3.2 cm c. 5.4 cm d. 6.8 cm

HOTS

How many lines of symmetry are there in a circle?

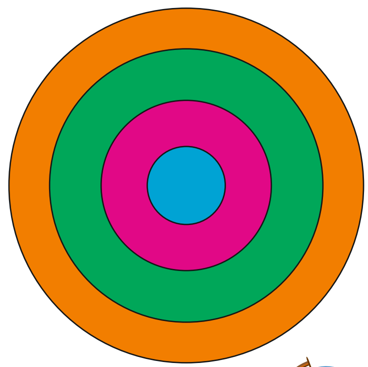
Lab Activity

Objective : To build the skill of using the compass to draw circles.

Materials : Compass, pencil, pair of scissors, papers of four different colours, thermocol board (circular shape), glue etc.

Presentation :

- This activity will be performed in groups of 4 students.
- A student will use the compass and draw a small circle on a coloured paper.
- Another student will draw a slightly bigger circle on another coloured paper.
- Similarly, two more slightly bigger and bigger circles will be drawn by other partners.
- The centres will be marked and the circles will be cut out.
- They will be stuck one on top of the other as shown in the figure, taking care to see that the centres are also on the top of each other.



- Then the whole lot will be stuck on the thermocol board.
- A dart board has been prepared, which can be hung on the wall.
- Pencils can be used as darts and points scored, as per the position of the circles.

10 Measurement

Measurement of length, weigth and capacity were calculated in a different manner till the measruement is that staring from the smallest to higher units or bigger.

Different Units of Measurement

The length, mass and capacity are basic measurements. The standard units of length, mass and capacity are metre (m), gram (g) and litre (ℓ) respectively. Some of these units are higher than the basic or standard units and some of these units are lower than the standard units.

Prefixes like kilo, hecto, deca, deci, centi and milli are used to relate to these units. Let us understand this concept using the place value chart.

Place value	Thousands	Hundreds	Tens	Ones	Tenths	Hundredths	Thousandths
Prefix	kilo	hecto	deca		deci	centi	milli

FACTS

- No prefix is put at ones place as we put units metre or gram or litre there.

The higher units are as follows:

Length	Mass	Capacity
Kilometre	Kilogram	Kilolitre
Hectometre	Hectogram	Hectolitre
Decametre	Decagram	Decalitre

The lower units are as follows:

Length	Mass	Capacity
Decimetre	Decigram	Decilitre
Centimetre	Centigram	Centilitre
Millimetre	Milligram	Millilitre

Units of Measurement:

Length	Mass	Capacity
Kilometre (km)	Kilogram (kg)	Kilolitre (kℓ)
↑	↑	↑
Hectometre (hm)	Hectogram (hg)	Hectolitre (hℓ)
↑	↑	↑
Decametre (dam)	Decagram (dag)	Decalitre (daℓ)

↑	↑	↑
Metre (m)	Gram (g)	Litre (ℓ)
↓	↓	↓
Decimetre (dm)	Decigram (dg)	Decilitre (dℓ)
↓	↓	↓
Centimetre (cm)	Centigram (cg)	Centilitre (cℓ)
↓	↓	↓
Millimetre (mm)	Milligram (mg)	Millilitre (mℓ)

Upward arrows show increasing trend of unit whereas downward arrows show decreasing trend of unit.

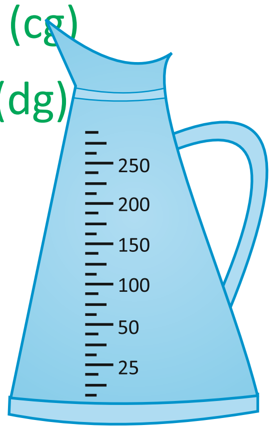
When we move upward from below (lowest unit), then the each unit is 10 times the previous unit and when we move downward from the highest unit then each unit is $\frac{1}{10}$ of the previous unit.

A relationship between the units of length is given below :

10 millimetre (mm)	=	1 centimetre (cm)
10 centimetre (cm)	=	1 decimetre (dm)
10 decimetre (dm)	=	1 metre (m)
10 metre (m)	=	1 decametre (dam)
10 decametre (dam)	=	1 hectometre (hm)
10 hectometre (hm)	=	1 kilometre (km)

A relationship between the units of mass is given below :

10 milligram (mg)	=	1 centigram (cg)
10 centigram (cg)	=	1 decigram (dg)
10 decigram (dg)	=	1 gram (g)
10 gram (g)	=	1 decagram (dag)
10 decagram (dag)	=	1 hectogram (hg)
10 hectogram (hg)	=	1 kilogram (kg)



A relationship between the units of capacity is given below :

10 millilitre (mℓ)	=	1 centilitre (cℓ)
10 centilitre (cℓ)	=	1 decilitre (dℓ)
10 decilitre (dℓ)	=	1 litre (ℓ)
10 litre (ℓ)	=	1 decalitre (daℓ)
10 decalitre (daℓ)	=	1 hectolitre (hℓ)
10 hectolitre (hℓ)	=	1 kilolitre (kℓ)

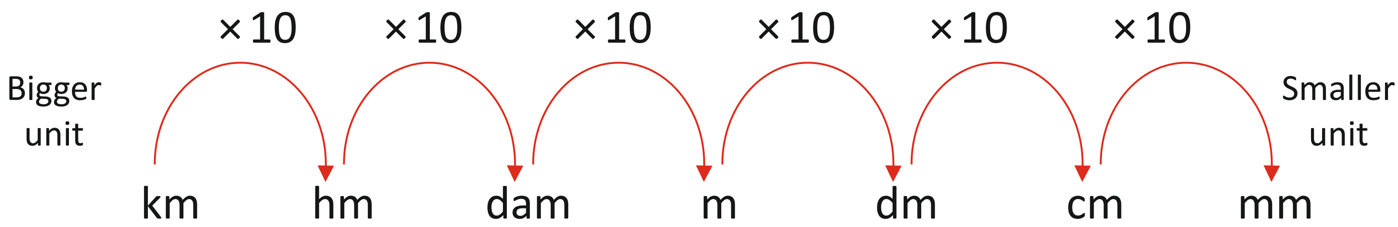
1 KILOLITRE
= 1000 LITRES

How to Measure Length?

The basic unit of length is metre. Kilometre, hectometre and decametre are bigger units and decimetre, centimetre and millimetre are the smaller units of length.

Conversion from bigger unit to smaller unit

When we move from left to right, each time we multiply by 10.



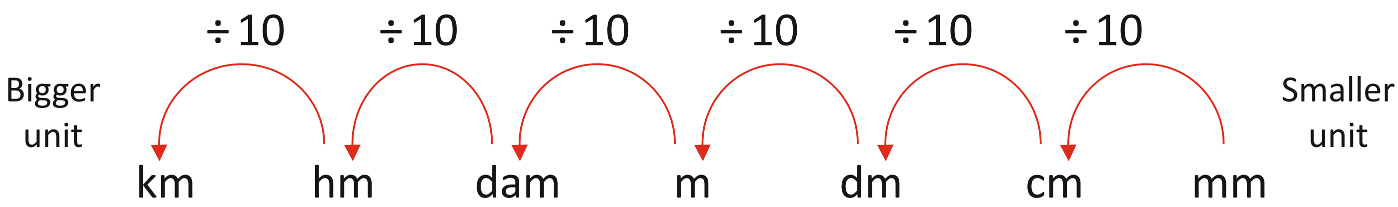
Example I : Convert 15 hm to m.

Solution : hm to m is two moves, so, we multiply by 100.

$$1 \text{ hm} = 100 \text{ m}$$
$$15 \text{ hm} = 15 \times 100$$
$$= 1500 \text{ m}$$

Conversion from smaller unit to bigger unit

When we move from right to left, each time we divide by 10.



Example II : Convert 5000 mm to m.

Solution : mm to m is three moves, so, we divide by 1000.

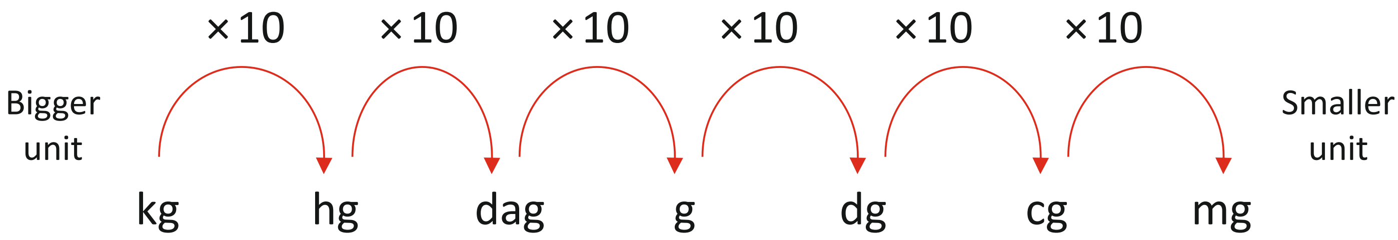
5000 mm = m = 5 m

How to Measure Mass?

The basic or standard unit of mass is gram. Kilogram, Hectogram and decagram are the bigger units and decigram, centigram and milligram are smaller units of mass.

Conversion from bigger unit to smaller unit

When we move from left to right, each time we multiply by 10.



Example III : Convert 25 g to mg.

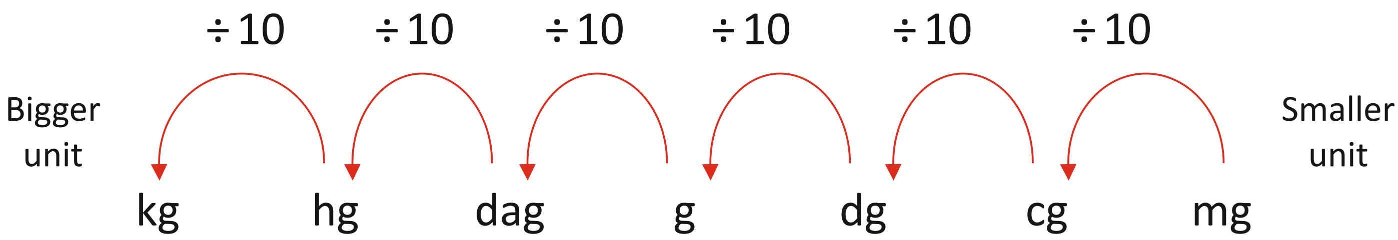
Solution : g to mg is three moves, so, we multiply by 1000.

1 g = 1000 mg

25 g = 25 × 1000 = 25000 mg

Conversion from smaller unit to bigger unit

When we move from right to left, each time we divide by 10.



Example IV : Convert 8000 cg to g.

Solution : cg to g is two moves, so, we divide by 100.

1 cg = g

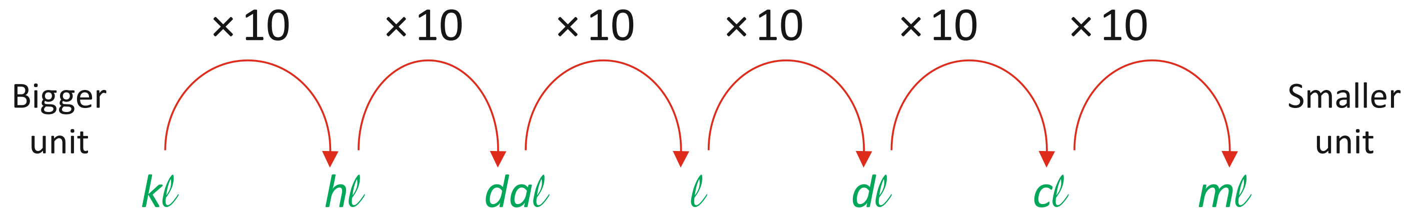
8000 cg = = 80 g

How to Measure Capacity?

The standard unit of capacity is litre. Kilolitre, hectolitre and decalitre are bigger units and decilitre, centilitre and millilitre are smaller units.

Conversion from bigger unit to smaller unit

When we move from left to right, each time we multiply by 10.



Example V : Convert 50 ℓ to dℓ.

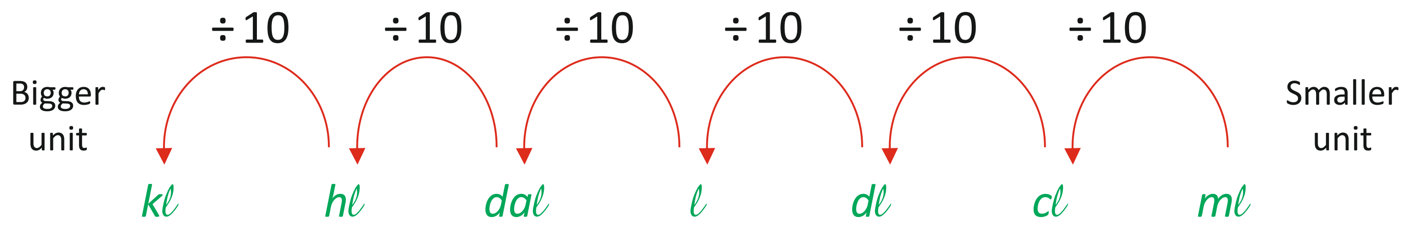
Solution : ℓ to dℓ is one move, so, we multiply by 10.

1 ℓ = 10 dℓ

50 ℓ = 50 × 10 = 500 dℓ

Conversion from smaller unit to bigger unit

When we move from right to left, each time we divide by 10.



Example VI : Convert 750 dℓ to daℓ.

Solution : dℓ to daℓ is two moves, so, we divide by 100.

1 dℓ = daℓ

750 dℓ = = 7.5 daℓ

EXERCISE 10.1

1. What is the basic unit of mass?
2. What are the lowest and highest units of capacity?
3. What is the highest unit of length?
4. What is the standard or basic unit of length?

5. What is the lowest unit of mass?

6. **Fill in the blanks.**

a. 1 kilolitre = 1000 ....   b. 1 kilometre = 100 ....

c. 1 decagram = 1000 ....   d. 1 hectometre = 10 ....

7. **Change the following into kg.**

a. 5000 g   b. 6315 g   c. 4068 g   d. 5079 g

8. **Change the following into km.**

a. 6070 m   b. 6250 m   c. 8375 m   d. 5586 m

9. **Change the following into 'ℓ'.**

a. 6351 mℓ   b. 5301 mℓ   c. 4007 mℓ   d. 2180 mℓ

10. **Change the following.**

a. 22 m 65 cm into cm   b. 25 km 156 m into m

c. 2[illegible] into mℓ   d. 25 kg 58 g into g

Addition of Measures

Example VII : Add the following.

a. 28 m 45 cm and 7 m 54 cm

b. 5 km 300 m and 3 km 400 m

Solution : Arranging the given measures in column and add.

a.

	m	cm
	①	
	2 8	4 5
+	7	5 4
	3 5	9 9

b.

	km	m
	5	3 0 0
+	3	4 0 0
	8	7 0 0

Example VIII : Add the following.

a. 64 kg 400 g and 15 kg 300 g

b. 15 kg 642 g and 82 kg 548 g

Solution :

a.

	kg	g
	6 4	4 0 0
+	1 5	3 0 0
	7 9	7 0 0

b.

	kg	g
	①	①
	1 5	6 4 2
+	8 2	5 4 8
	9 8	1 9 0

Example IX : Add the following.

a. 26 *kℓ* 475 *ℓ* and 15 *kℓ* 352 *ℓ*

b. 72 *ℓ* 318 *mℓ* and 9 *ℓ* 201 *mℓ*

Solution :

a.

	kℓ	ℓ
	(1)	(1)
	26	475
+	15	352
	41	827

b.

	ℓ	mℓ
	(1)	
	72	318
+	9	201
	81	519

Subtraction of Measures

Example X : Subtract the following.

a. 7 m 46 cm from 23 m 70 cm

b. 39 km 484 m from 78 km 631 m

Solution : Arranging the given measures in column and subtract.

a.

	m		cm	
	(1)	(13)	(6)	(10)
	~~2~~	~~3~~	~~7~~	~~0~~
–		7	4	6
	1	6	2	4

b.

	km		m		
	(6)	(18)	(5)	(12)	(11)
	~~7~~	~~8~~	~~6~~	~~3~~	~~1~~
–	3	9	4	8	4
	3	9	1	4	7

Example XI : Find the difference of the following.

a. 29 kg 471 g and 43 kg 582 g

b. 15 kg 245 g and 19 kg 416 g

Solution :

a.

	kg		g		
	(3)	(13)			
	~~4~~	~~3~~	5	8	2
–	2	9	4	7	1
	1	4	1	1	1

b.

	kg		g		
			(3)	(11)	
	1	9	~~4~~	~~1~~	6
–	1	5	2	4	5
		4	1	7	1

Example XII : Find the difference of the following.

a. 34 ℓ 860 mℓ and 67 ℓ 765 mℓ

b. 6 ℓ 826 mℓ and 29 ℓ 458 mℓ

Solution : a.

	ℓ	mℓ
	(6)	(17)
	6 ~~7~~	~~7~~ 6 5
–	3 4	8 6 0
	3 2	9 0 5

b.

	ℓ	mℓ
	(8)	(14)
	2 ~~9~~	~~4~~ 5 8
–	6	8 2 6
	2 2	6 3 2

Word Problems

Example XIII : There was 86 ℓ 500 mℓ of water in a tub. 43 ℓ 450 mℓ of water was used. Find the remaining quantity of water in the tub.

	ℓ	mℓ
		(4)(10)
	8 6	~~5~~ ~~0~~ 0
–	4 3	4 5 0
	4 3	0 5 0

Solution : The quantity of water in the tub is 86 ℓ 500 mℓ.

The quantity of water used is 43 ℓ 450 mℓ

Therefore, remaining quantity of water in the tub

= 86 ℓ 500 mℓ – 43 ℓ 450 mℓ.

= 43 ℓ 50 mℓ

Example XIV : A public distribution shop has 72 kg 375 g of sugar. If 375 kg 500 g more sugar is brought to the shop then how much sugar is there now?

	kg	g
	(1)	
	7 2	3 7 5
+	3 7 5	5 0 0
	4 4 7	8 7 5

Solution : Quantity of sugar present in shop is 72 kg 375 g.

Quantity of sugar brought in shop is 375 kg 500 g.

Therefore, the total quantity of sugar in shop

= 72 kg 375 g + 375 kg 500 g.

= 447 kg 875 g

EXERCISE 10.2

1. Add the following.

a.

kg	g
64	225
+ 7	375

b.

kg	g
45	105
+ 5	864

c.

ℓ	mℓ
8	465
+ 3	134

d.

kℓ	ℓ
7	216
+ 5	124

e.

km	m
92	359
+ 3	110

f.

m	cm
54	56
45	21
+ 6	12

2. Subtract the following.

a.

kg	g
46	250
− 8	540

b.

km	m
43	500
− 28	230

c.

ℓ	mℓ
46	300
− 40	500

d.

m	cm
68	64
− 39	40

e.

kℓ	ℓ
32	653
− 28	303

f.

m	cm
55	55
− 19	20

3. The length of a rope is 442 m 52 cm. The length of another rope is 354 m 84 cm. Find the length of both the ropes together.

4. I travelled 75 km 620 m by train and 24 km 725 m by bus. What distance did I travel in all?

5. A bag has 65 kg 300 g of vegetables. 25 kg 600 g potatoes, 20 kg 500 g cabbage and the rest are onions. Find the weight of onions in the bag.

6. The weight of a cart is 76 kg 576 g. It is loaded with apples weighing 60 kg 315 g. Find the total weight .

7. A train is 86 m 95 cm long and another train is 74 m 82 cm long. How much is the first train longer?

8. A box contains 65 kg of mangoes. If 6 kg 110 g are in rotten state, then, find the weight of remaining mangoes .

POINTS TO REMEMBER

- Length, mass and capacity are main measures.
- The standard unit of length is metre.
- The standard unit of mass is gram.
- The standard unit of capacity is litre.
- Kilometre, hectometre and decametre are bigger units of length.
- Decimetre, centimetre and millimetre are smaller units of length.
- Kilogram, hectogram, decagram are bigger units of mass.
- Decigram, centigram and milligram are smaller unit of mass.
- Kilolitre, hectolitre and decalitre are bigger units of capacity.
- Decilitre, centilitre and millilетre are smaller units of capacity.
- We can convert bigger unit to smaller unit by multiplying it with the multiple of 10.
- We can convert smaller unit to bigger unit by dividing it with the multiple of 10.

RECAP EXERCISE

1. Multiple Choice Questions (MCQs)

Tick (☐) the correct options:

a. The basic unit of length is....................... .

(i) km ☐ (ii) m ☐ (iii) mm ☐ (iv) cm ☐

b. The basic unit of mass is....................... .

(i) kg ☐ (ii) mg ☐ (iii) cg ☐ (iv) g ☐

c. The basic unit of capacity is....................... .

(i) *kℓ* ☐ (ii) *mℓ* ☐ (iii) *ℓ* ☐ (iv) *cℓ* ☐

d. The bigger unit of mass is...................... .

(i) kg ☐ (ii) g ☐ (iii) cg ☐ (iv) mg ☐

e. kg is .... times of mg.

(i) 1000 ☐ (ii) 10000 ☐

(iii) 100000 ☐ (iv) 1000000 ☐

2. Convert the following.

a. 750 m into mm b. 476 hm into m

3. Convert into km.

a. 4567 m b. 725 dam c. 4735 hm

d. 9668 dm e. 26975 cm f. 185 m

4. Convert the following into kg.

a. 52 dag b. 74 g c. 605 hg

d. 752 cg e. 3447 g f. 26472 dg

5. Convert the following into ℓ, dℓ and cℓ.

a. 2905 *m*ℓ b. 3070 *m*ℓ c. 5400 *m*ℓ

d. 7000 *m*ℓ e. 6276 *m*ℓ f. 6009 *m*ℓ

6. The weight of coconut is 17 kg 500 g, berrys is 3 kg 750 g and peach is 3 kg 250 g. Find the total weight of fruits.

7. Capacity of a water tank is 1500 ℓ. It is filled with 880 ℓ of water. How much water can still be filled?

HOTS

Your weight is 28 kg 500 g. Three friends of yours weigh 25 kg 225 g, 32 kg 750 g and 35 kg 250 g. Calculate whose weight is higher and smaller than you.

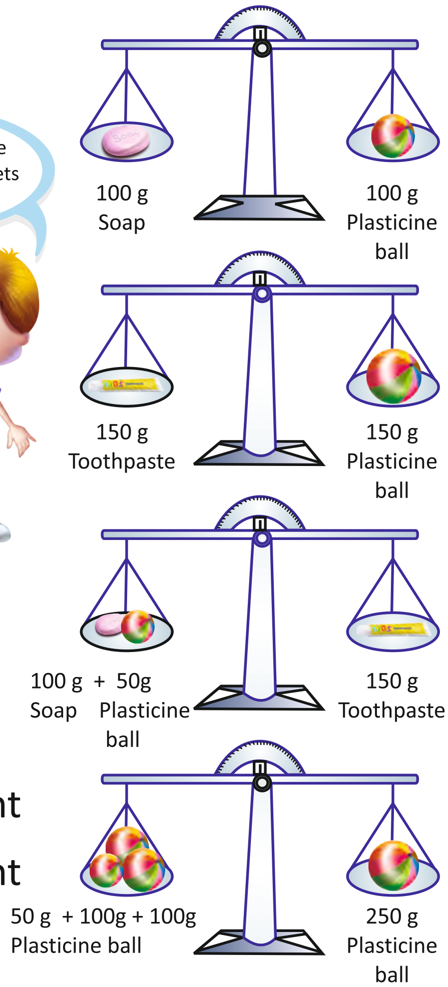
Lab Activity

Objective : Comparing and using weights.

Materials : A soap of 100g, a toothpaste of 150 g, a weighing scale and plasticine (clay).

Presentation : Students can work in pairs.

Use the pictures to compare :



- 100 g plasticine ball
- 150 g plasticine ball
- 50 g plasticine ball
- Use one 50 g and one 100 g balls to make a 250 g plasticine ball.
- Combine two 100 g balls to make a 200 g ball.
- Combine two 250 g balls to make a 500 g ball.
- Combine two 500 g balls to make a 1 kg ball.

Investigate further and record.

.... 50 g balls = one 100 g weight

.... 50 g balls = one 200 g weight

.... 200 g balls = one 1 kg weight

.... 250 g balls = one 1 kg weight

.... 500 g balls = one 1 kg weight