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.

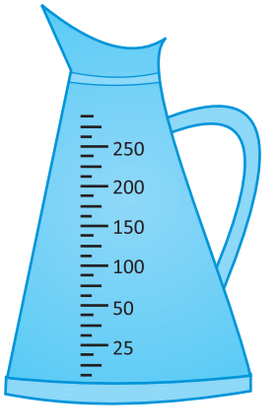
When we move upward from below (lowest unit), then the each unit is 10 times the previous unit and when we move downward from the highest unit then each unit is $\frac{1}{10}$ of the previous unit.

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 ($m\ell$)	=	1 centilitre ($c\ell$)
10 centilitre ($c\ell$)	=	1 decilitre ($d\ell$)
10 decilitre ($d\ell$)	=	1 litre (ℓ)
10 litre (ℓ)	=	1 decalitre ($da\ell$)
10 decalitre ($da\ell$)	=	1 hectolitre ($h\ell$)
10 hectolitre ($h\ell$)	=	1 kilolitre ($k\ell$)

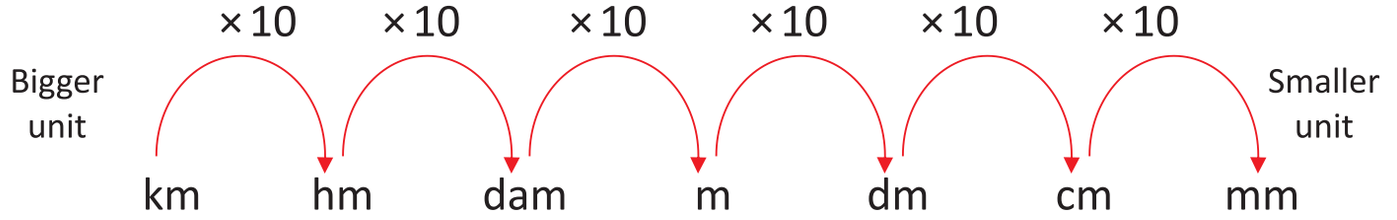
1 KILOLITRE
= 1000 LITRES

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.



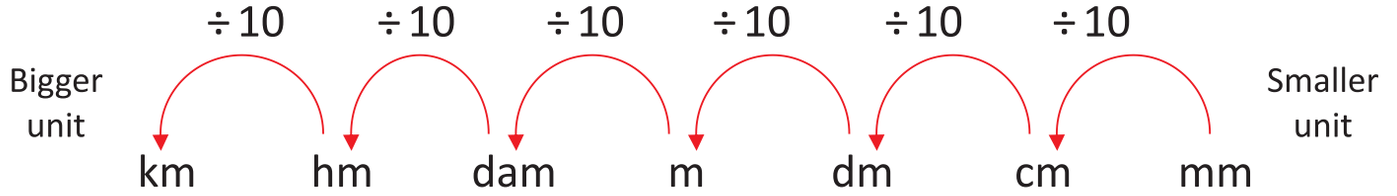
Example I : Convert 15 hm to m.

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.

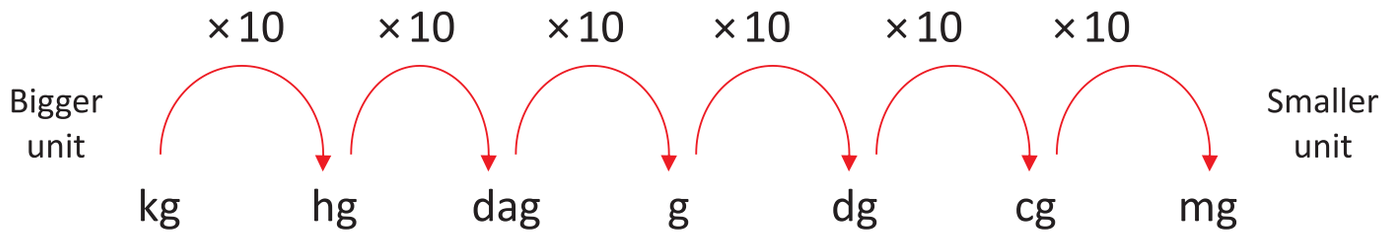
$$5000 \text{ mm} = \frac{5000}{1000} \text{m} = 5 \text{ m}$$

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.

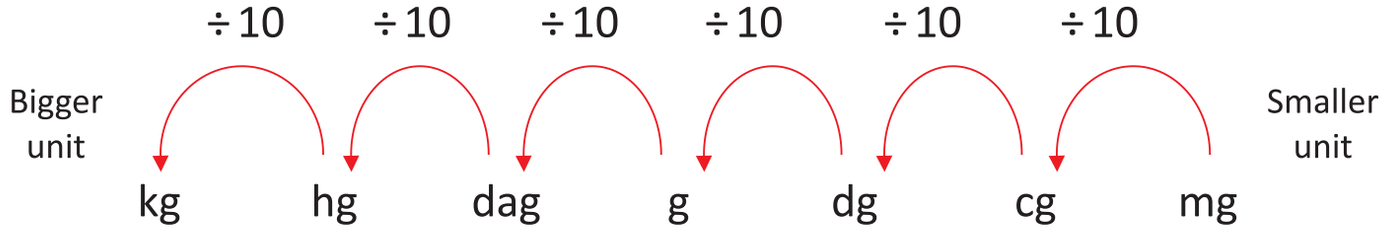
Solution : g to mg is three moves, so, we multiply by 1000.

$$1 \text{ g} = 1000 \text{ mg}$$

$$25 \text{ g} = 25 \times 1000 = 25000 \text{ mg}$$

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.

$$1 \text{ cg} = \frac{1}{100} \text{ g}$$

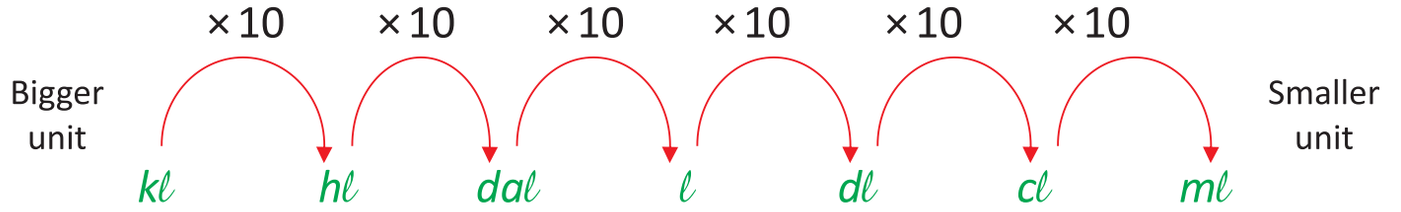
$$8000 \text{ cg} = \frac{8000}{100} = 80 \text{ g}$$

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.

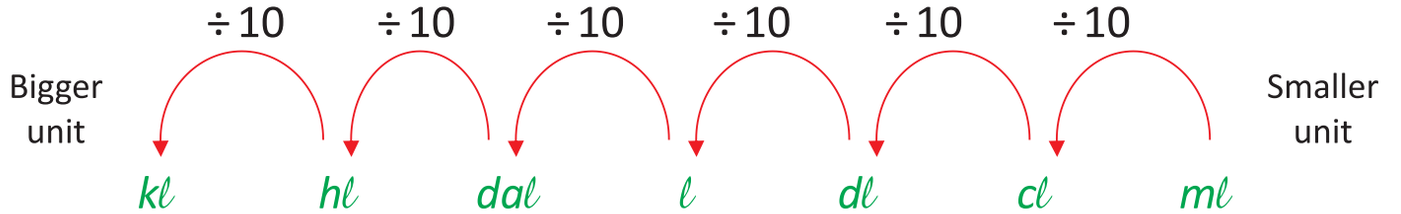
Solution : ℓ to dℓ is one move, so, we multiply by 10.

$1\,\ell = 10\,d\ell$

$50\,\ell = 50 \times 10 = 500\,d\ell$

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.

$1\,d\ell = \frac{1}{100}\,da\ell$

$750\,d\ell = \frac{750}{100} = 7.5\,da\ell$

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. 34 *ℓ* 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
16	24

b.

km	m		
6 (18)	5 (12)	(11)	
~~7~~ ~~8~~	~~6~~ ~~3~~	~~1~~	
− 39	4	8	4
39	14	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	82
− 29	4	71
14	1	11

b.

kg	g		
	3 (11)		
19	~~4~~ ~~1~~	6	
− 15	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 milliletre 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) $k\ell$ ☐ (ii) $m\ell$ ☐ (iii) ℓ ☐ (iv) $c\ell$ ☐

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 *mℓ* b. 3070 *mℓ* c. 5400 *mℓ*

d. 7000 *mℓ* e. 6276 *mℓ* f. 6009 *mℓ*

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?

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

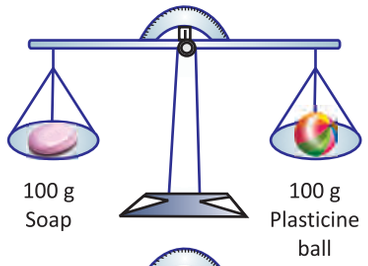
Objective : Comparing and using weights.

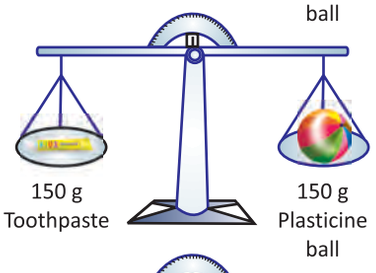
Materials : A soap of 100g, a toothpaste of 150 g, a weighing scale and plasticine (clay).

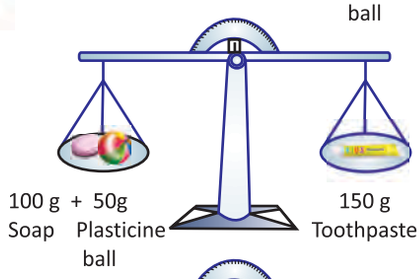
Presentation : Students can work in pairs.

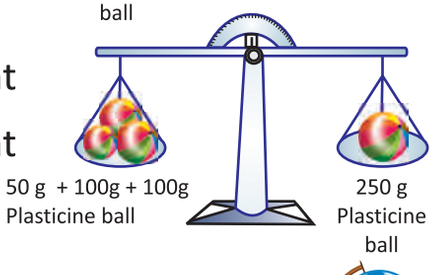
Use the pictures to compare :

- 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