

Units of Measurements

1. Linear measurement: it may be taken in the horizontal such horizontal distance or in vertical plane such as heights or depth.

a. Units of length:

(*Metric units*): the meter is the unit of length.

$$1 \text{ cm} = 10 \text{ mm.}$$

$$1 \text{ m} = 100 \text{ cm.}$$

$$1 \text{ km} = 1000 \text{ m} = 10^5 \text{ cm.}$$

(*English units*): In English speaking countries the common Units are the yard, foot, inch, and mile.

$$1 \text{ ft} = 12 \text{ in.}$$

$$1 \text{ yd} = 3 \text{ ft.}$$

$$1 \text{ mile} = 1760 \text{ yd.}$$

$$1 \text{ mile} = 5280 \text{ ft.}$$

The relation between *English units* and *metric units*:

$$1 \text{ inch} = 2.54 \text{ cm.}$$

$$1 \text{ ft} = 12 * 2.54 = 30.48 \text{ cm.}$$

$$1 \text{ yd} = 3 * 30.48 = 91.44 \text{ cm.}$$

$$1 \text{ mile} = 1760 * 91.44 = 160934.4 \text{ cm.}$$
$$= 1.609344 \text{ km.}$$

$$1 \text{ m} = 100 \text{ cm} / 30.48 = 3.2808 \text{ ft.} = 1.0936 \text{ yd.}$$

$$1 \text{ m} = 39.370 \text{ inch.}$$

$$1 \text{ chain} = 20 \text{ m.}$$

$$1 \text{ link} = 20 \text{ cm.}$$

$$1 \text{ chain} = 100 \text{ link.}$$

b. Units of area:

(*Metric units*):

$$1 \text{ m}^2 = 100 \text{ dec}^2 = 10000 \text{ cm}^2 = 1000000 \text{ mm}^2.$$

$$1 \text{ olk} = 100 \text{ m}^2.$$

$$1 \text{ km}^2 = 1000000 \text{ m}^2.$$

$$1 \text{ hectare} = 10000 \text{ m}^2 = 4 \text{ donum} = 100 \text{ olk.}$$

$$1 \text{ km}^2 = 100 \text{ hectare.}$$

$$1 \text{ donum} = 2500 \text{ m}^2 = 25 \text{ olk.}$$

$$1 \text{ km}^2 = 400 \text{ donum.}$$

$$1 \text{ km}^2 = 10000 \text{ olk.}$$

$$1 \text{ faddan} = 4200 \text{ m}^2.$$

(English units):

$$1(\text{yd})^2 = 9(\text{ft})^2 = 1296(\text{inch})^2.$$

$$1 \text{ acre} = 4840(\text{yd})^2 = 43560(\text{ft})^2.$$

$$1(\text{mile})^2 = 640 \text{ acre} = 3097600(\text{yd})^2 = 27878400(\text{ft})^2.$$

The relation between English units and metrics units:

$$1(\text{km})^2 = (0.6214)^2(\text{mile})^2.$$

$$1(\text{mile})^2 = (1.6093)^2(\text{km})^2.$$

$$1\text{m}^2 = 11.96(\text{yd})^2 = 10.7636(\text{ft})^2 = 1550(\text{inch})^2.$$

Example:

Calculate the area in hectares represented by a plan area of 4cm^2 on each of the plans drawn to scale, $1/10000$, $1/2500$, $1/500$ respectively.

Sol :-

$$1\text{cm}: 10000\text{cm}.$$

$$1\text{cm}: 100\text{m}.$$

$$1\text{cm}^2: 10000\text{m}^2 \text{ hectare}$$

$$4\text{cm}^2: 4 \text{ hectares}$$

$$1\text{cm}: 2500\text{cm}.$$

$$1\text{cm}: 25\text{m}.$$

$$1\text{cm}: 625\text{m}^2$$

$$: 0.0625 \text{ hectares}$$

$$1\text{cm}: 0.25 \text{ hectares}$$

$$1\text{cm}: 500\text{cm}.$$

$$1\text{cm}: 5\text{m}.$$

$$1\text{cm}^2: 25\text{m}^2$$

$$1\text{cm}: 0.0025 \text{ hectares}$$

$$4\text{cm}: 0.01 \text{ hectares}$$

Example:

Convert 1282270m^2 into Donum; Olk; M^2

Sol;-

$$1282270 \div 2500 = 512.908 \text{ Donum}$$

$$0.908 * 25 = 22.7 \text{ Olk}$$

$$0.78100 = 70\text{M}^2$$

Donum	Olk	M^2
512	22	70

Example:

Convert 7850000m^2 into (km^2 , mile^2 , yd^2).

Sol;-

$$\begin{aligned} \text{a. } \quad & \text{Km}^2 = 1000000\text{m}^2 \\ & \frac{7850000}{1000000} = 7.85 \text{ km}_2 \end{aligned}$$

$$\begin{aligned} \text{b. } \quad & \text{km}_2 = (0.6214)^2 \text{ mile}_2 \\ & = 0.3861 \text{ mile}^2 \\ & 7.85 * 0.3861 = 3.031 \text{ mile}^2 \\ & = 3097600 \text{ yd}^2 \end{aligned}$$

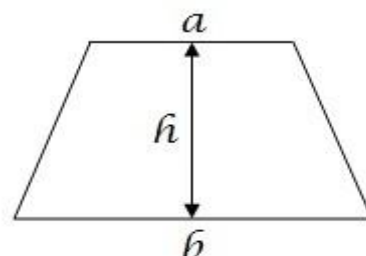
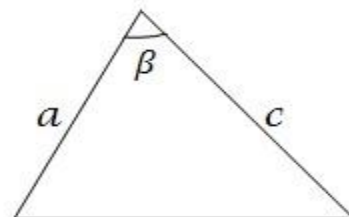
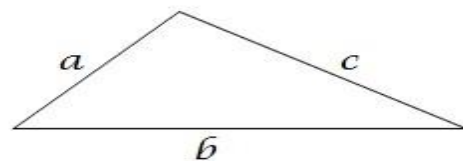
$$3.031 * 3097600 = 9388825.6 \text{ yd}^2$$

Area of Uniform Figures

$$\gg A = \sqrt{s(s-a)(s-b)(s-c)}$$

$$\gg s = \frac{a+b+c}{2}$$

;



$$\gg A = \frac{1}{2} a \times c \sin \beta$$

$$\gg A = h \left(\frac{a+b}{2} \right)$$

c. **Units of volume:** are a cubic meter

2. Units of angle:

a. **Sexagesimal system:** divide the center of a circle into 360 degree ()^o.

$$1()^o = 60 \text{ minutes } ()^{\circ}$$

$$1 \text{ minute} = 60 \text{ seconds } ()^{\circ}$$

$$\text{Right angle} = 90^o.$$

b. **Centesimal system:** divide the center of circle into 400 grad (g).

$$1^g = 100^c. \text{ [centi-grad],}$$

$$1^c = 100^{cc}. \text{ [centi-centigrad],}$$

$$90^o \approx 100^g; \text{ right angle} = 100^g.$$

c. **Radian system:** the angle subtended at the center of a circle by an arc equal to the length of the radius of the circle.

$$\pi = 22/7 = 3.14159.$$

$$\pi = 180^o = 200^g.$$

$$2\pi = 360^o = 400^g.$$

Example:

Convert 2 mile into: yd, ft, inch, cm, m.

sol:

$$1. 2 * 81760 * 91.44 = 321868.8 \text{ cm.}$$

$$2. 2 * 5280 = 10560 \text{ ft}$$

$$3. 10560 * 12 = 126720 \text{ inch}$$

$$4. 126720 * 2.54 = 321868.8 \text{ cm.}$$

$$5. 321868.8 \div 100 = 3218.688 \text{ m.}$$