Applied Surveying

Units of Linear Measurements

Building and Construction Eng.

Technology Department

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Units of Linear Measurements

Metric, or international System of Units (SI)

A. English, used only in the US, Burma, and Liberia. Two definition of ft:

B. US survey foot = 0.3048006 m

C. The US is changing to the metric system.

METRIC LINEAR UNITS

- **The following list shows several units of linear measure and their lengths in meters:**

1 kilometer (km)   =   1000 meters (m)

1 meter (m)   =   1   meter (m)

1 decimeter (dm)   =   0.1   meter (m)

1 centimeter (cm)   =   0.01   meter (m)

1 millimeter (mm) =   0.001   meter (m)

METRIC-CUSTOMARY CONVERSIONS

➡ Length

   ➡ 1 in = 2.54 cm

   ➡ 1 ft   = 30.48 cm

   ➡ 1 yd = 0.9144 m

   ➡ 1 mi = 1.6093 km

➡ Volume

   ➡ 1 cu in. (in^3) = 16.387 cm^3

CONVERTING METRIC LENGTHS

- Express 75 decimeters as meters

$$\frac{75dm}{1} \times \frac{1m}{10dm} = 7.5m$$

- Express 1.95 centimeters as millimeters

$$\frac{1.95\ cm}{1} \times \frac{1m}{100cm} \times \frac{1000mm}{1m} = 19.5mm$$

METRIC AREA CONVERSIONS

- Express 84.5 square centimeters as square decimeters

$$\frac{84.5cm^2}{1} \text{ x } \frac{1m^2}{10000cm^2} \text{ x } \frac{100dm^2}{1m^2} = 0.845dm^2$$

- These conversions are not all on your sheet but to go from first to second dimension you are squaring measurements from the first….so 10dm in a meter in linear (first) so $100dm^2 = 1m^2$

METRIC VOLUME UNITS

➡ Express 38,500 cubic millimeters as cubic decimeters

$$\frac{38500\,mm^3}{1} \times \frac{1m^3}{10^9\,mm^3} \times \frac{1000\,dm^3}{1m^3} = 0.0385\,dm^3$$

➡ Convert 2.5 km^3 as cm^3

$$\frac{2.5km^3}{1} \times \frac{10^9\,m^3}{1km^3} \times \frac{10^6\,cm^3}{1m^3} = 2.5x10^{15}$$

EXAMPLES

- Convert 8.24 inch to millimeters

$$\frac{8.24 \text{ in}}{1} \times \frac{2.54 \text{ cm}}{1 \text{ in}} \times \frac{10 \text{ mm}}{1 \text{ cm}} = 209.296 \text{ mm } Ans$$
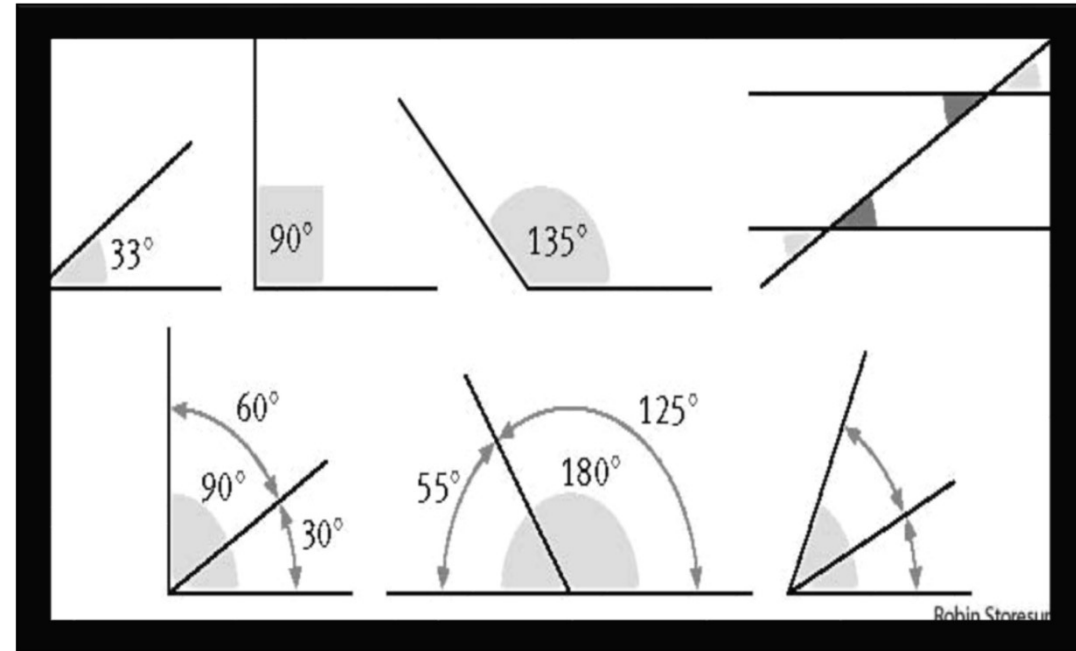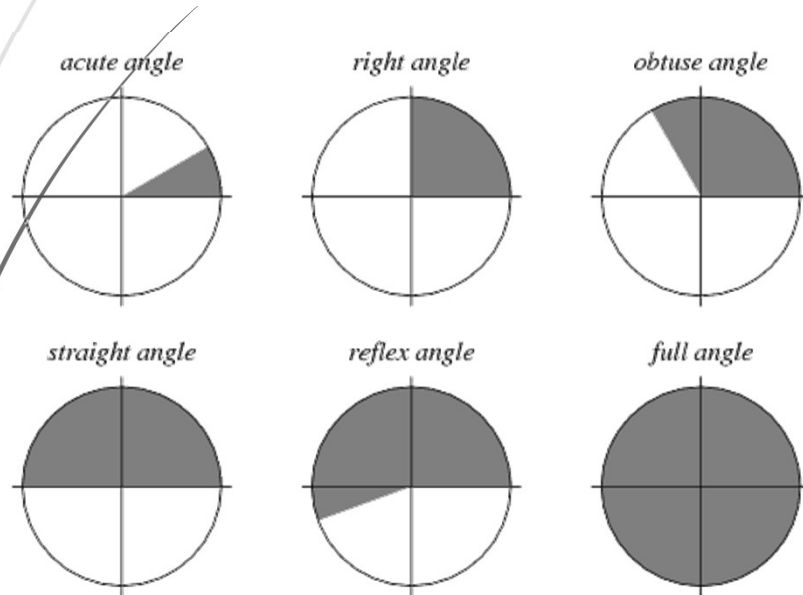
- Convert 9.25 ft^2 to square centimeters

$$\frac{9.25 \text{ ft}^2}{1} \times \frac{0.0929 \text{ m}^2}{1 \text{ ft}^2} \times \frac{10\,000 \text{ cm}^2}{1 \text{ m}^2} = 8593.25 \text{ cm}^2 \, Ans$$

Angular units measurements
وحدات القياسات الزاوية

- **SEXAGESIMAL SYSTEM**
- **Radian Measure**
- **Centesimal System**

النظام الستيني
النظام القطري
النظام المئوي

Angular units measurements

SEXAGESIMAL SYSTEM النظام الستيني

One degree 1º= 60' minute
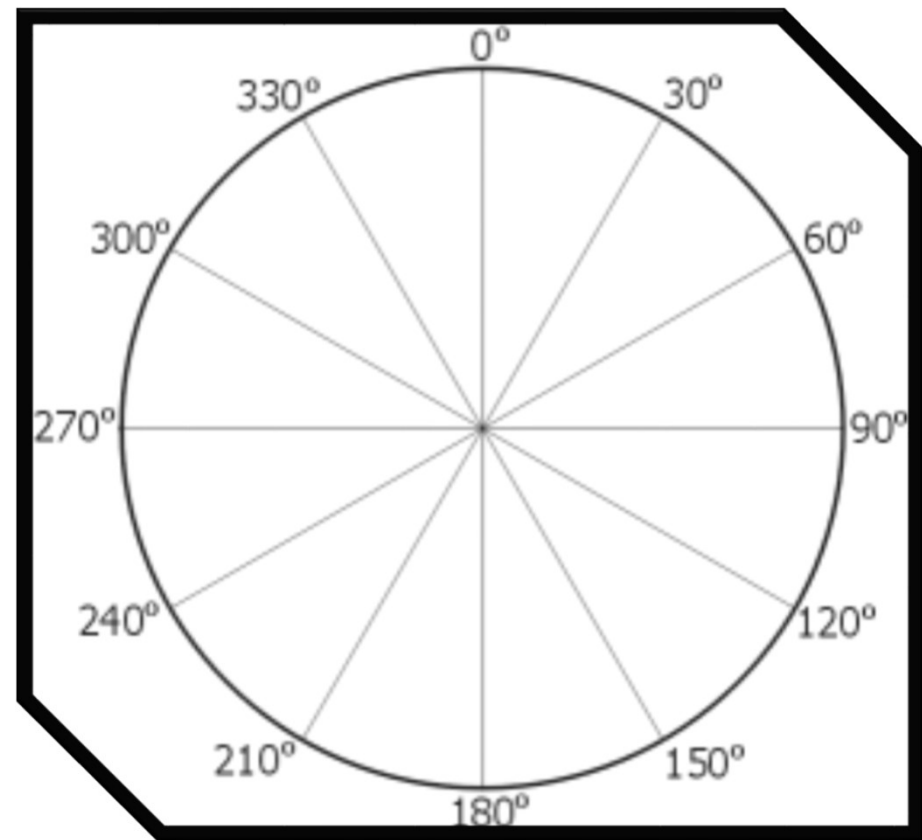
One minute 1'= 60'' second.

One second 1''= 100 parts

Examples:

16º 50'30''
51º 45' 59''

1º 60'60''
60º 60'60'' ?

Radian Measure النظام القطري
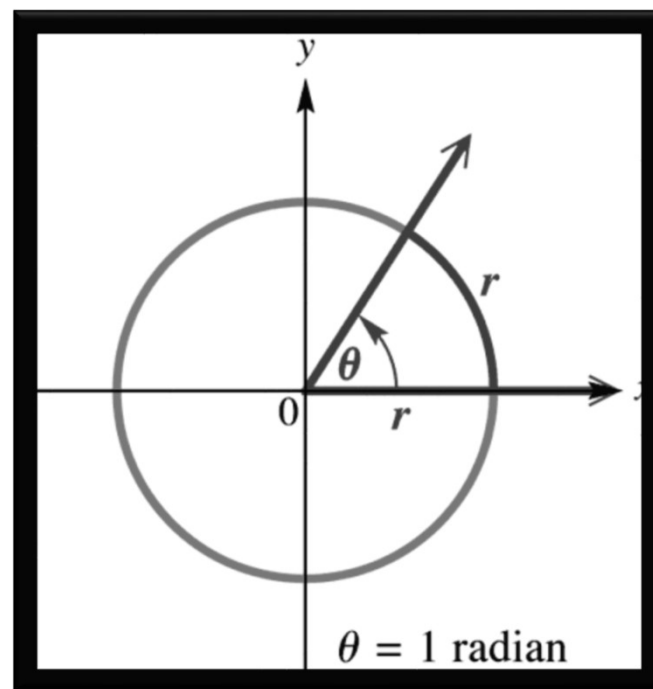
The Radian (Rad):
One radian is defined as the angle at the center of
a circle that is subtended by an arc having exactly
the same length as the radius.

$$2\pi \text{ rad} = 360^0$$
$$\pi \text{ rad} = 180^0$$
$$1 \text{ rad} = \frac{180^0}{\pi} \approx 57.3^0$$

$\theta = 1$ radian

Exercises

➡ **Convert each degree measure to radian.**

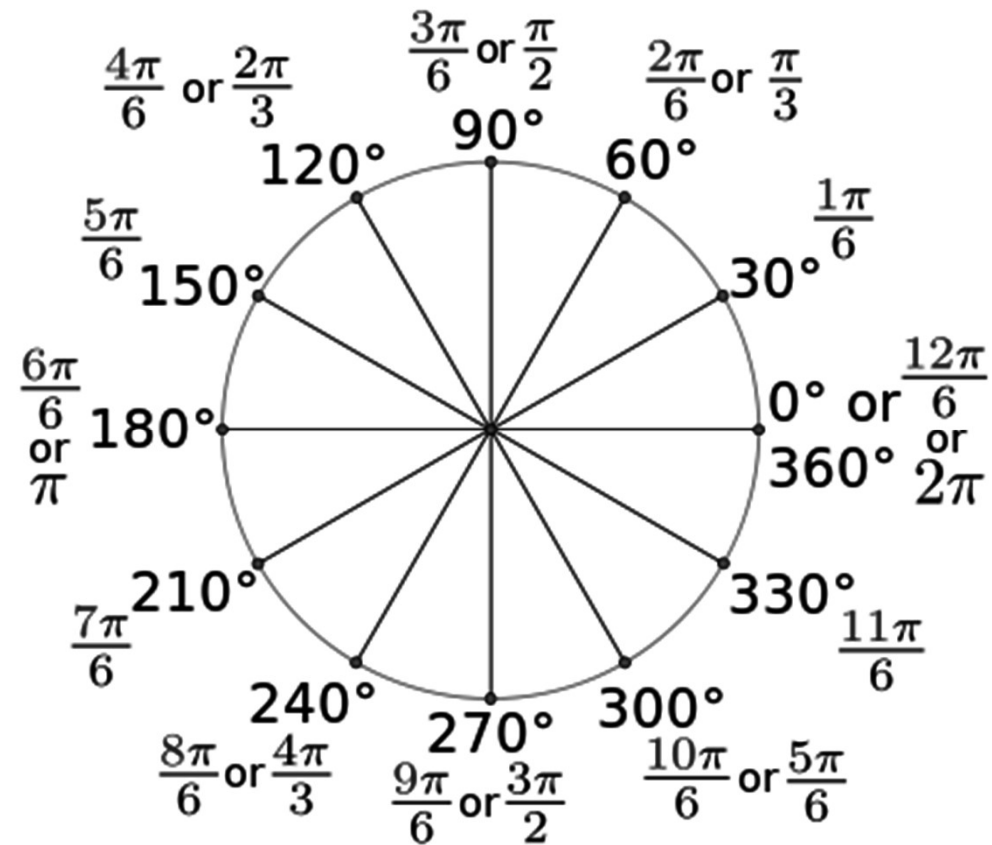➡ **a) 60°**

$$60^0 = 60^0 \cdot \frac{\pi \text{ rad}}{180^0} = \frac{\pi}{3} \text{ rad}$$

➡ **b) 221.7°**
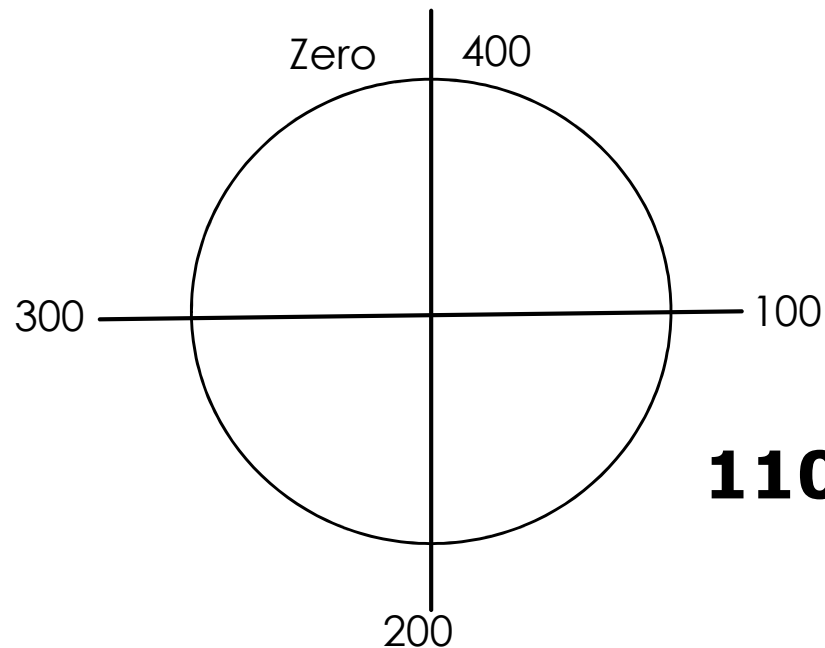
$$221.7^0 = 221.7^0 \cdot \frac{\pi \text{ rad}}{180^0} \approx 3.896 \text{ rad}$$

Angles in Degrees and Radians continued

Centesimal System: النظام المئوي

- **Circumference is divided into 400 grads or (400g)**
- **One grad is divided into 100 centesimal minutes (1g=100c)**
- **One centesimal minute is divided into 100centesimal seconds (1c=100cc)**

Zero | 400

300 — 100

200

110g 90c 45cc

Lecture End