



**PREREQUISITE REVIEW FOR PANS OPS
(Not presented)**



TO REVIEW :

- Basic useful concepts in Instrument Flight Procedure Design.

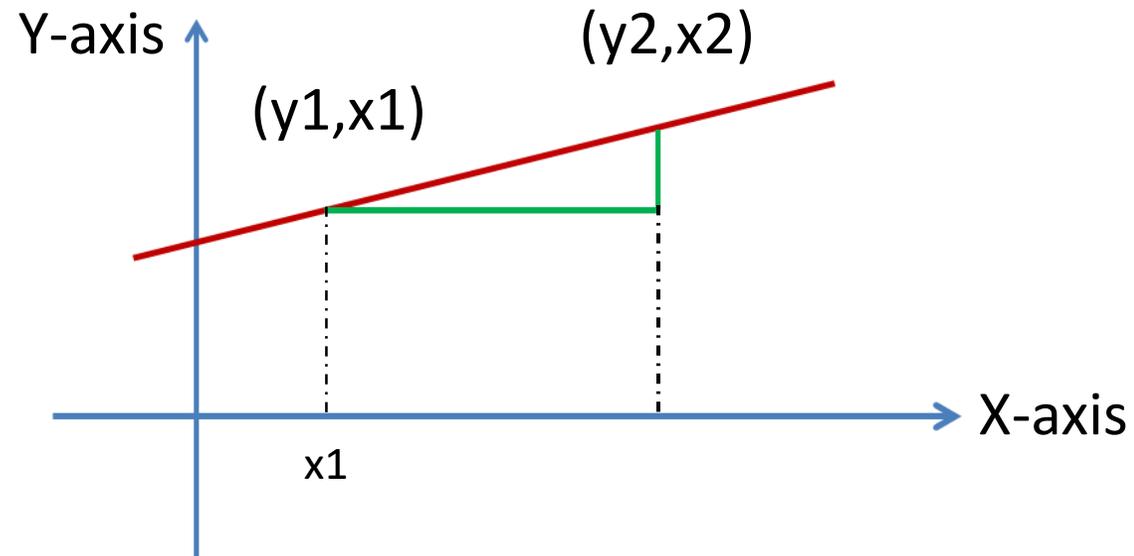
- ❑ LINEAR AND 3D EQUATION
- ❑ TRIGONOMETRIC RATIOS
- ❑ CONVERSION OF UNITS (SI UNITS & NON SI UNITS)
- ❑ SCALE OF MAP
- ❑ NORTH DATUMS
- ❑ IFR NAVIGATION GUIDANCES
- ❑ CONCLUSION /QUESTIONS

□ Format for the linear equation :

$$Y = MX + C,$$

- Where: Y is dependent variable,
X is independent variable,
M is the gradient/Slope and
C is a constant called Y- Intercept.
- Y- intercept is the value of Y when X=0,
- X-intercept is when Y=0.

Gradient/Slope of the line.



$$\begin{aligned}\text{Gradient (M)} &= \text{change of Y} / \text{change of X} \\ &= (y_2 - y_1) / (x_2 - x_1)\end{aligned}$$

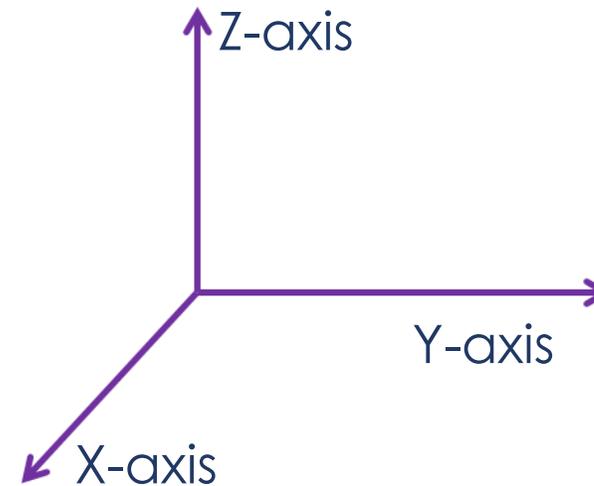
3D representation of the surface

African flight Procedure Programme (AFPP)

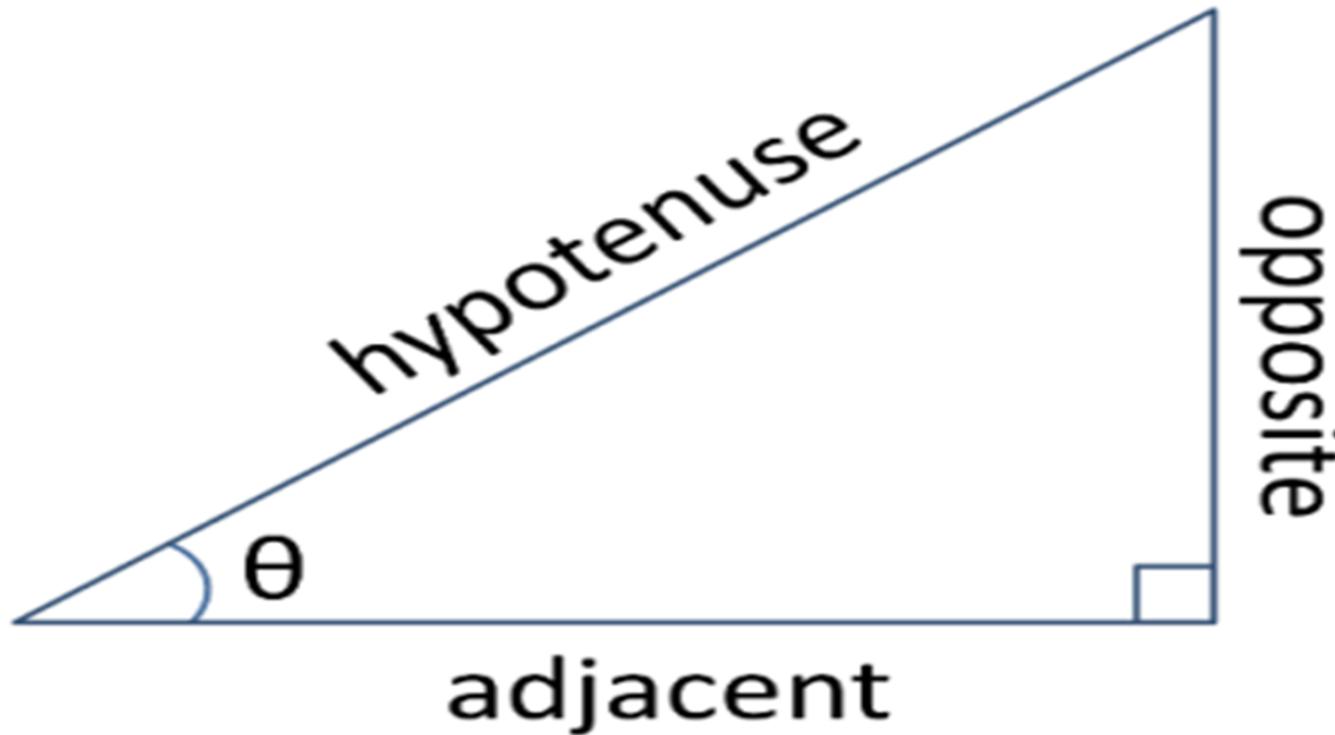
□ FORMAT :

$$Z = AX + BY + C,$$

- A, B & C are constants;
- Graphically.



Considering “A RIGHT ANGLED TRIANGLE”



- ❑ $\sin \theta = \text{Opposite} / \text{Hypotenuse}$
- ❑ $\cos \theta = \text{Adjacent} / \text{Hypotenuse}$
- ❑ $\tan \theta = \text{Opposite} / \text{Adjacent}$
- ❑ $\tan \theta = \sin \theta / \cos \theta$
 $= \text{Gradient of hypotenuse.}$
- ❑ $\cot \theta = 1 / \tan \theta = \text{Adjacent} / \text{Opposite}$
 $= \cos \theta / \sin \theta.$



S.I UNITS:

Length/height (Kilometer (km)/Meter(m))

Non S.I UNITS:

Length/distance (Nautical miles: NM)

Height/Altitude (Feet: ft.)

Definition.

- ❑ A NM is defined as one minute of arc length along a great circle of the Earth.
- ❑ It is the length of an arc on the surface of the earth which subtends an angle of one minute at the center of the earth

Definition:

- ❑ **1/10 000** part of the distance from the equator and either pole.
- ❑ **1 km** = $(90 \times 60) \text{ NM} / 10\,000 = \mathbf{0.54 \text{ NM}}$
- ❑ **1 NM** = $1/0.54 \text{ Km} = 1.8518 = \mathbf{1.852 \text{ Km.}}$

CONVERSION OF FACTORS.

African flight Procedure Programme (AFPP)

1 NM = 1.852 km;

1 km = 1 000 m;

1 ft = 0.3048 m;

1 kt = 1.852 km/h;

1 h = 60 min = 3 600 sec.

Definition:

- ❑ A ratio of the chart length to the earth distance that it represents.

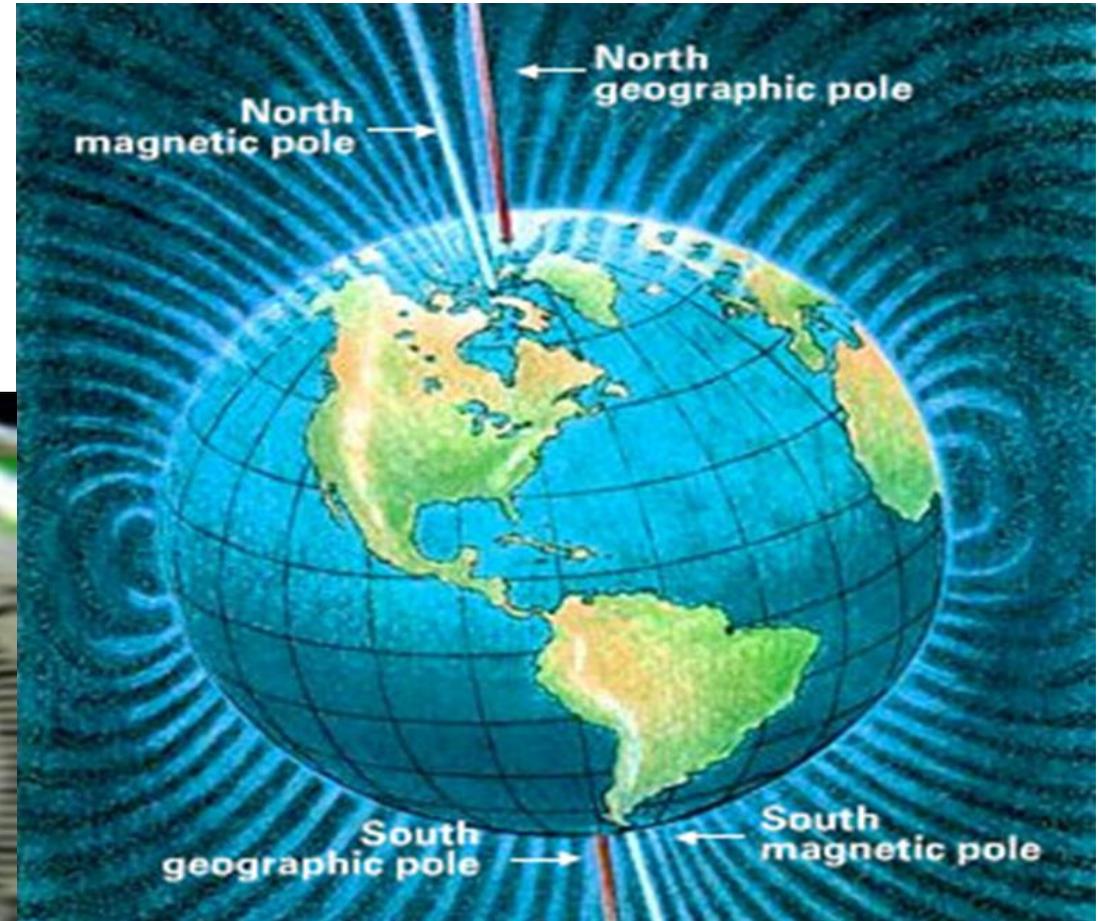
Types:

- ❑ Representative fraction (RF);
- ❑ Graduated line scale;
- ❑ Statement in words;
- ❑ Latitude scale.

Graphic Scale:	
Verbal Scale:	1 cm = 1 km <small>(One centimeter on the map equals 1 kilometer on Earth)</small>
Representative Fraction:	1:100,000

Types:

- True North
- Magnetic North
- Compass North



VARIATION (VAR):

- ❑ The angular difference between the true North and the magnetic North.

RULE OF THUMB:

“VAR East - Magnetic Least”
“VAR West - Magnetic Best”

DEVIATION:

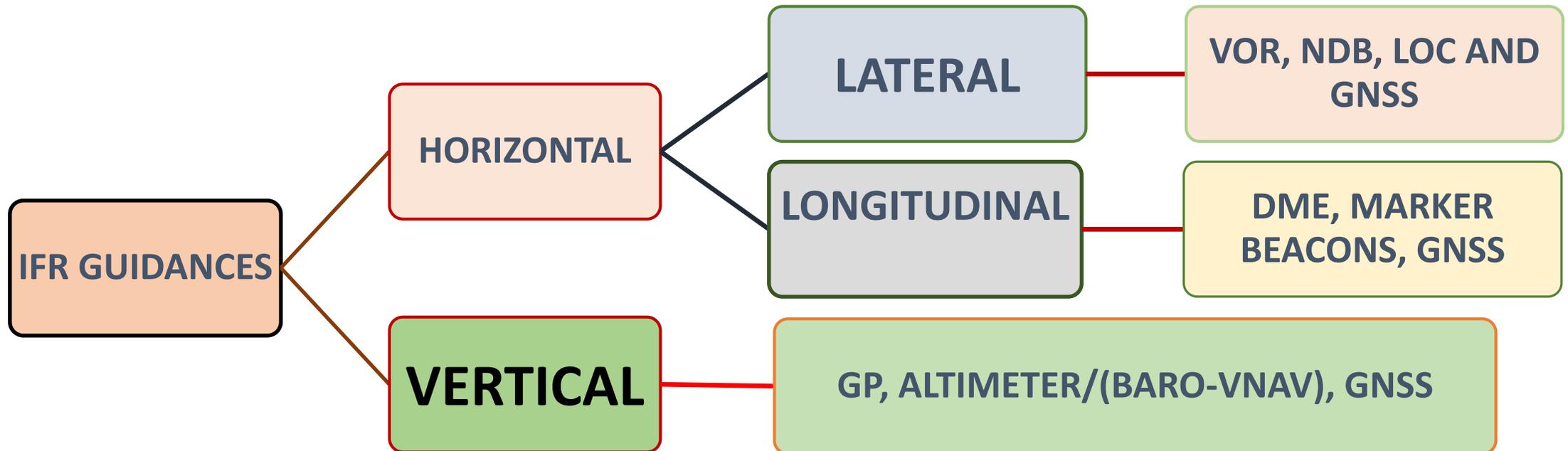
- ❑ The angular difference between the magnetic North and the compass North.

RULE OF THUMB

“DEV East - Compass Least”
“DEV West - Compass Best”

IFR NAVIGATION GUIDANCES

African flight Procedure Programme (AFPP)



1. Convert:
 - a. 240 000 ft into NM:
 - b. 5 NM into ft :
 - c. 200 kt into m/s:
2. Find the gradient of the equation of the straight line below
$$2Y - 0.104X - 100 = 0$$
3. If VAR is 2° E and the True bearing of final approach track is 047°
Calculate the Magnetic bearing of the final approach track.
4. Given a scale of a map 1:100,000,
what is the actual distance if measured distance on the map is 10 cm?.

1. Convert:

a. 240 000 ft into NM: **39.5 NM**

b. 5 NM into ft : **30 380 ft**

c. 200 kt into m/s: **102.89 m/s**

2. Find the gradient of the equation of the straight line below

$$2Y - 0.104X - 100 = 0 \text{ (gradient is } \mathbf{0,052})$$

3. If VAR is 2° E and the True bearing of final approach track is 047°

Calculate the Magnetic bearing of the final approach track. **A = 045°**

4. Given a scale of a map 1:100,000,

what is the ground distance if measured distance on the map is 10 cm?

Ground distance is 10 000 m

