1) Depth

1 Fathom = 6 Feet

Velocity of sound in sea water = \( \frac{4800 \text{ ft}}{\text{sec}} = \frac{1450 \text{ m}}{\text{sec}} \)

Sonar Depth

\[ \frac{V}{T} = \text{velocity} \]

\[ D = \frac{Vt}{2} \]

D = Depth
V = Velocity
T = 2-way travel time

2) Vertical exaggeration for profiles

\[ \text{V.E.} = \frac{V}{H} = \frac{\text{vertical scale}}{\text{horizontal scale}} \]

3) Distance

1 m = 3.281 ft

Land distance = "Statute Miles" 1 statute mi = 5280 ft

1 km = 0.62 mi (statute) =

Nautical mile = 1° of latitude (1° LAT = 60 n. mile)

1 nautical mile = 1.15 statute miles = 6072 ft

4) Travel Velocity

1 knot = \( \frac{1 \text{ nautical mile}}{\text{hr}} = 1.15 \text{ mile/hr} \)

(Knots) \times (1.85) = \text{Km}
5) **Time Zones**

Earth Rotation: \[\frac{360^\circ}{24 \text{ hrs}} = \frac{180^\circ}{12 \text{ hrs}} = \frac{15^\circ}{1 \text{ hr}}\]

Earth Time Zones:
- No. of Local Time Zones = 24
- Longitude / 1 hr Time Zone = 15° Long.

6) **Salt Concentration**

1 part salt / 1000 parts water = 1 ppt = 1‰

1‰ = 1 g / 1 Lm or water = \[\frac{1 \text{ g salt}}{1 \text{ kg H}_2\text{O}}\] = 1 ppt

Density of Pure H2O = \[\frac{1 \text{ gm}}{\text{ cm}^3}\] = \[\frac{1 \text{ gm}}{\text{ mL}}\] = 1 Kg / L

1 ppm = 1 part / million = 1 mg/L = 1 mg/kg
1 ppb = 1 part / billion = 1 mg/L = 1 mg/kg

7) **Waves**

Wavelength (\(\lambda\)) = length unit cm

\[T = \text{ period} = \text{ time for 1 wavelength to pass a pt.}\]

Wave Velocity = \[\frac{\lambda}{T}\] (m/sec)

\[f = \text{ frequency} = \text{ no. of cycles/sec} = \frac{1}{T}\]

Velocity = \(f \lambda\)
Slope Determination

A. From Cross-Section -
\[ \text{Slope} = \frac{\text{KNE}}{\text{Run}} = \frac{\Delta \text{EL}}{\Delta \text{DIST}} \]

B. From m\(\text{ap}\). (CE = 10 ft)

\[ \text{Sc} \quad \text{Slope} = \frac{\Delta \text{EL} \ A-B}{\Delta \text{DIST} \ A-B} = \frac{40\text{ft}-20\text{ft}}{50\text{ft}} \]
\[ d = 50\text{ft} \]

Sedimentation Rate = Thickness of Sediment / Time of Accumulation

Salinity Calculation

\[ \text{Salinity} (\text{ppt}) = 1.81 \times \left( \frac{\text{Chlorine Concentration}}{\text{ppt}} \right) \]

Density = \frac{\text{mass}}{\text{volume}}

1 \text{cm}^3 = 1 \text{ml} \quad \text{for pure water}

1 \text{Kg} = 1 \text{L} \quad \text{for pure water}

Pure Water Density = 1 \text{g/cm}^3

Density Factor for Sea Water

\[ 6t = \left( \frac{\text{Density} - 1}{\text{gm/cm}^3} \right) \times 1000 \]

Eq. 6t = 1.0281 \text{gm/cm}^3

6t = (1.0281 - 1) \times 1000 = 28.1
WAVE EQUATIONS

\[ \lambda = \text{WAVELENGTH} \]
\[ A = \text{WAVE AMPLITUDE} \]
\[ T = \text{Period (time for 1 wavelength to pass)} \]
\[ f = \text{frequency} = \frac{1}{T} \quad \text{(cycs/sec or Hz)} \]

WAVE BASE = \( \frac{1}{2} \lambda \)
WAVE HEIGHT = \( 2 \cdot A \)

General Rule for wave height:

WAVE HEIGHT (ft) = 0.5(WIND SPEED)\(^2\)

\[ \text{WAVE VELOCITY} = f \lambda = \frac{\lambda}{T} \]

As WAVELENGTH \( \lambda \) increases, WAVE VELOCITY decreases.