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Terminal App Assignment

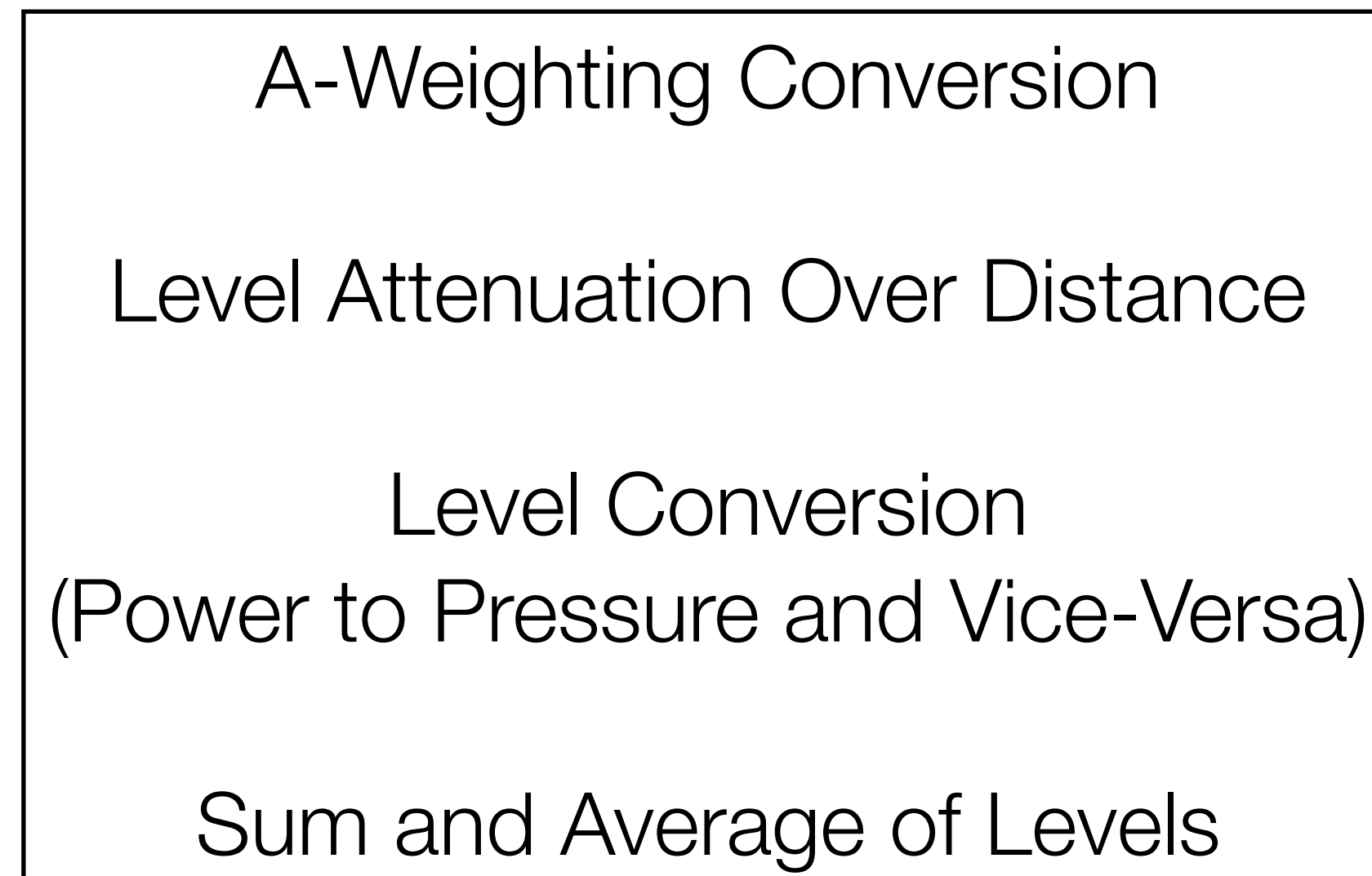
Acoustics Calculator

General Calculations



Speed of Sound

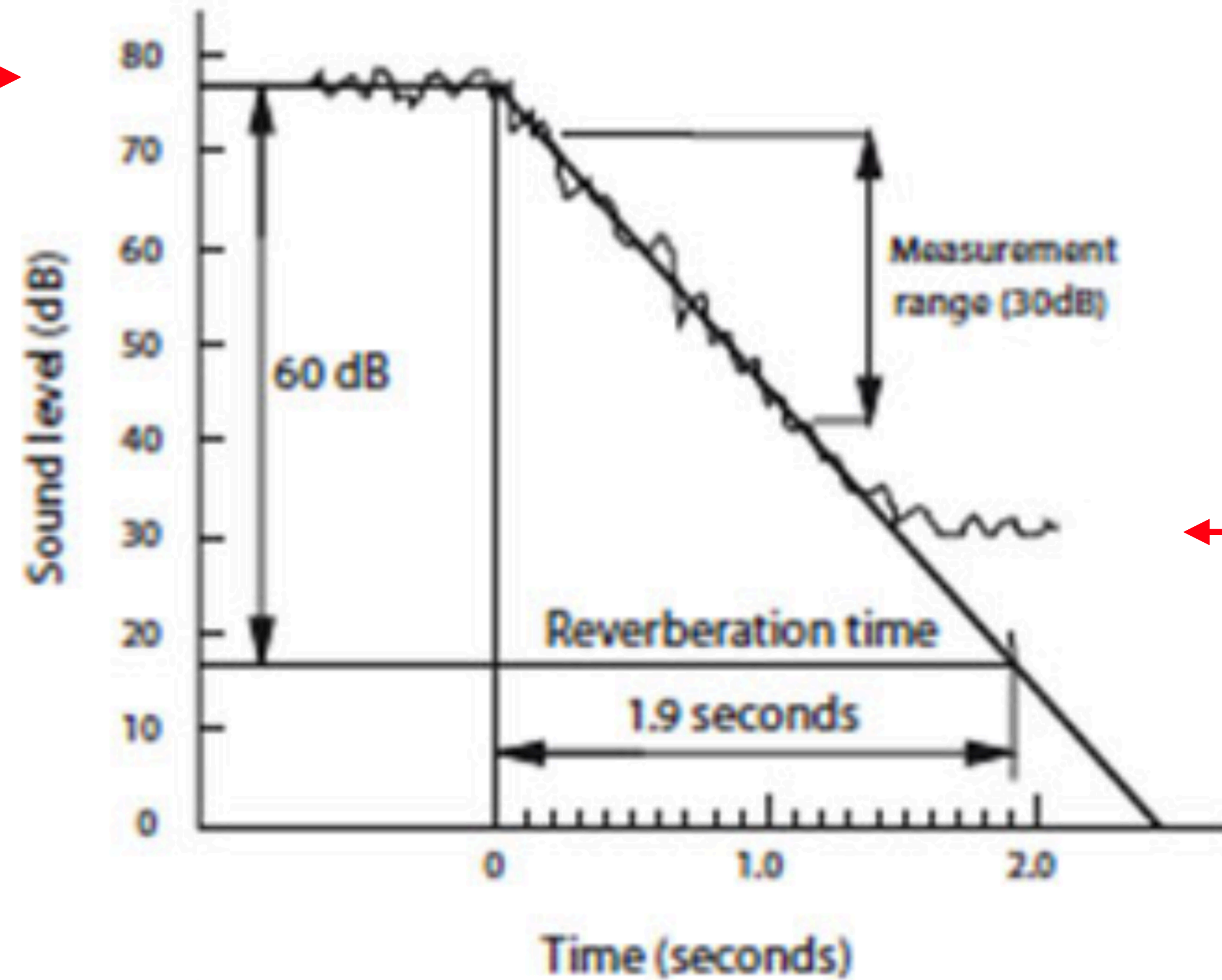
Sound Level



Reverberation Time

What is Reverberation Time?

Loudest



Background Noise

Absorption Coefficients

Vary from 0 to 1, where 0 = no absorption; 1 = complete absorption

	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
smooth concrete	0.05	0.04	0.02	0.04	0.05	0.05
thin carpet	0.10	0.15	0.25	0.30	0.30	0.30
mineral wool tiles	0.42	0.72	0.83	0.88	0.89	0.80

$$\text{Absorption} = \alpha S,$$

where:

S = surface area

a = absorption coefficient

$$\text{Total Absorption} = \sum \alpha_i S_i$$

where:

S = surface area

a = absorption coefficient

Sabine RT Equation:

$$T = \frac{0.161V}{A} \text{ in seconds}$$

where:

V = volume of the room

A = total absorption of the room

Norris-Eyring RT Equation:

$$T = \frac{0.16V}{[-\ln(1 - \bar{\alpha})]S} = \frac{0.16V}{-2.3S \log_{10}(1 - \bar{\alpha})}$$

where:

V = volume of the room

S = total surface area

a = average absorption coefficient

```
floor_coeffs = {}  
ceiling_coeffs = {}  
front_wall_coeffs = {}  
back_wall_coeffs = {}  
left_wall_coeffs = {}  
right_wall_coeffs = {}  
door_coeffs = {}  
window_coeffs = {}
```

```
floor_absorption = {}  
ceiling_absorption = {}  
front_wall_absorption = {}  
back_wall_absorption = {}  
left_wall_absorption = {}  
right_wall_absorption = {}  
door_absorption = {}  
window_absorption = {}
```

```
total_surface_area = 0.0
```

```
module Absorption
```

```
  Coefficients = [
```

```
    ## Floor
```

```
    {
```

```
      material: "thin_carpet_concrete",
```

```
      coeffs: {
```

```
        "125Hz" => 0.10,
```

```
        "250Hz" => 0.15,
```

```
        "500Hz" => 0.25,
```

```
        "1000Hz" => 0.30,
```

```
        "2000Hz" => 0.30,
```

```
        "4000Hz" => 0.30
```

```
      }
```

```
    },
```

```
    ...
```

```
  ]
```

```
end
```



```
while true
  puts "\nCeiling:"
  puts "\n1. Mineral wool tiles with 180mm of airspace".colorize(:green)
  puts "2. Gypsum plaster titles".colorize(:green)
  ceiling_type = gets.chomp.to_i
  case ceiling_type
  when 1
    Absorption::Coefficients.each do |key|
      if key[:material] == "mineral_wool_tiles"
        ceiling_coeffs = key[:coeffs]
      end
    end
    ceiling_coeffs.each do |frequency, coeff|
      ceiling_absorption[frequency] = (coeff * ceiling_surface_area).truncate(2)
    end
    break
  when 2 ...
  else
    invalid_material_error()
  end
end
end
```

```
total_surface_area = floor_surface_area + ceiling_surface_area + front_wall_surface_area +  
back_wall_surface_area + left_wall_surface_area + right_wall_surface_area + door_surface_area +  
window_surface_area
```

```
absorption_all_surfaces = Array.new  
absorption_all_surfaces.push(  
  floor_absorption,  
  ceiling_absorption,  
  front_wall_absorption,  
  back_wall_absorption,  
  left_wall_absorption,  
  right_wall_absorption,  
  door_absorption,  
  window_absorption  
)
```



```
total_absorption_125Hz = absorption_all_surfaces.map{|freq| freq["125Hz"]}.inject(:+)
total_absorption_250Hz = absorption_all_surfaces.map{|freq| freq["250Hz"]}.inject(:+)
total_absorption_500Hz = absorption_all_surfaces.map{|freq| freq["500Hz"]}.inject(:+)
total_absorption_1000Hz = absorption_all_surfaces.map{|freq| freq["1000Hz"]}.inject(:+)
total_absorption_2000Hz = absorption_all_surfaces.map{|freq| freq["2000Hz"]}.inject(:+)
total_absorption_4000Hz = absorption_all_surfaces.map{|freq| freq["4000Hz"]}.inject(:+)
```

```
total_absorption = {
  "125Hz" => total_absorption_125Hz,
  "250Hz" => total_absorption_250Hz,
  "500Hz" => total_absorption_500Hz,
  "1000Hz" => total_absorption_1000Hz,
  "2000Hz" => total_absorption_2000Hz,
  "4000Hz" => total_absorption_4000Hz
}
```

```
avg_absorption_coeff_125Hz = (total_absorption_125Hz / total_surface_area).truncate(2)
avg_absorption_coeff_250Hz = (total_absorption_250Hz / total_surface_area).truncate(2)
avg_absorption_coeff_500Hz = (total_absorption_500Hz / total_surface_area).truncate(2)
avg_absorption_coeff_1000Hz = (total_absorption_1000Hz / total_surface_area).truncate(2)
avg_absorption_coeff_2000Hz = (total_absorption_2000Hz / total_surface_area).truncate(2)
avg_absorption_coeff_4000Hz = (total_absorption_4000Hz / total_surface_area).truncate(2)
```

```
avg_absorption_coeffs = {
    "125Hz" => avg_absorption_coeff_125Hz,
    "250Hz" => avg_absorption_coeff_250Hz,
    "500Hz" => avg_absorption_coeff_500Hz,
    "1000Hz" => avg_absorption_coeff_1000Hz,
    "2000Hz" => avg_absorption_coeff_2000Hz,
    "4000Hz" => avg_absorption_coeff_4000Hz
}
```


Demo

Thank you!