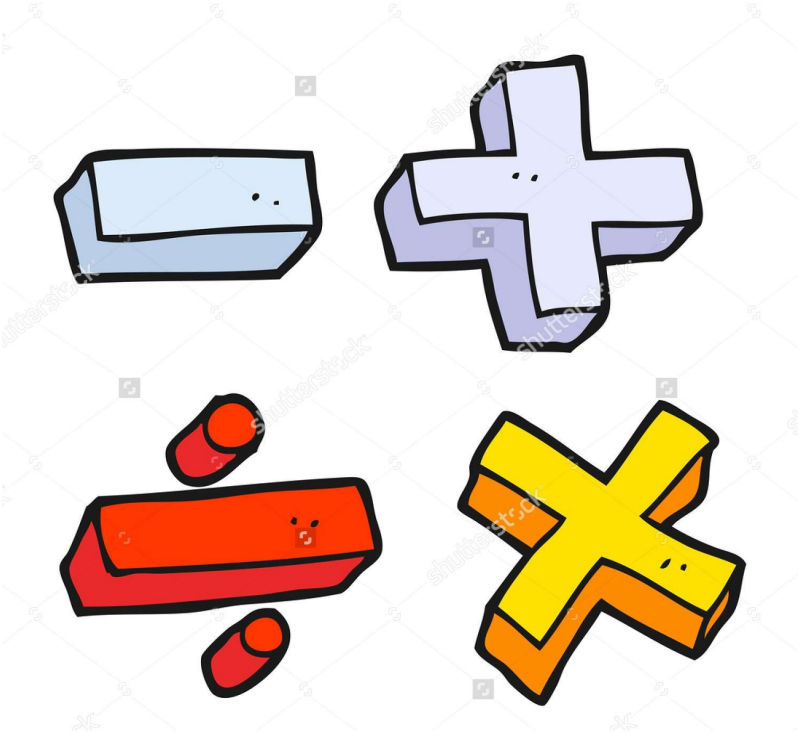
Quick Math Review

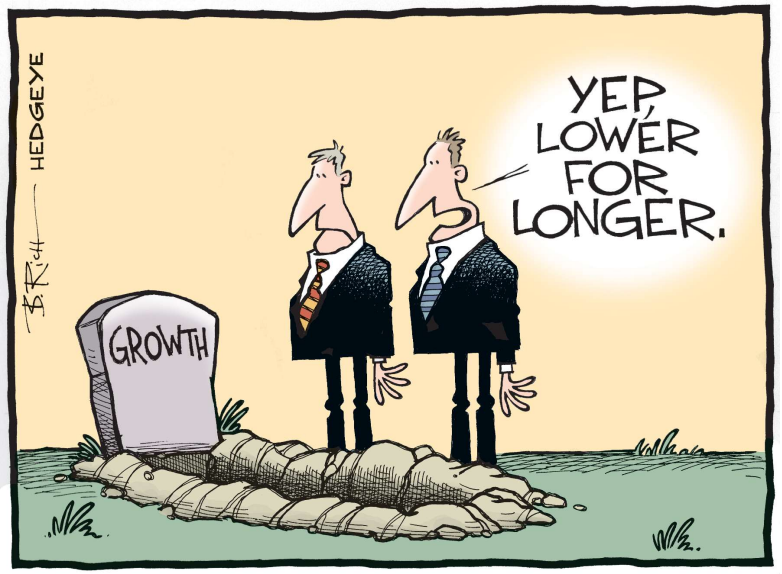
Technician Class

Jim Grover



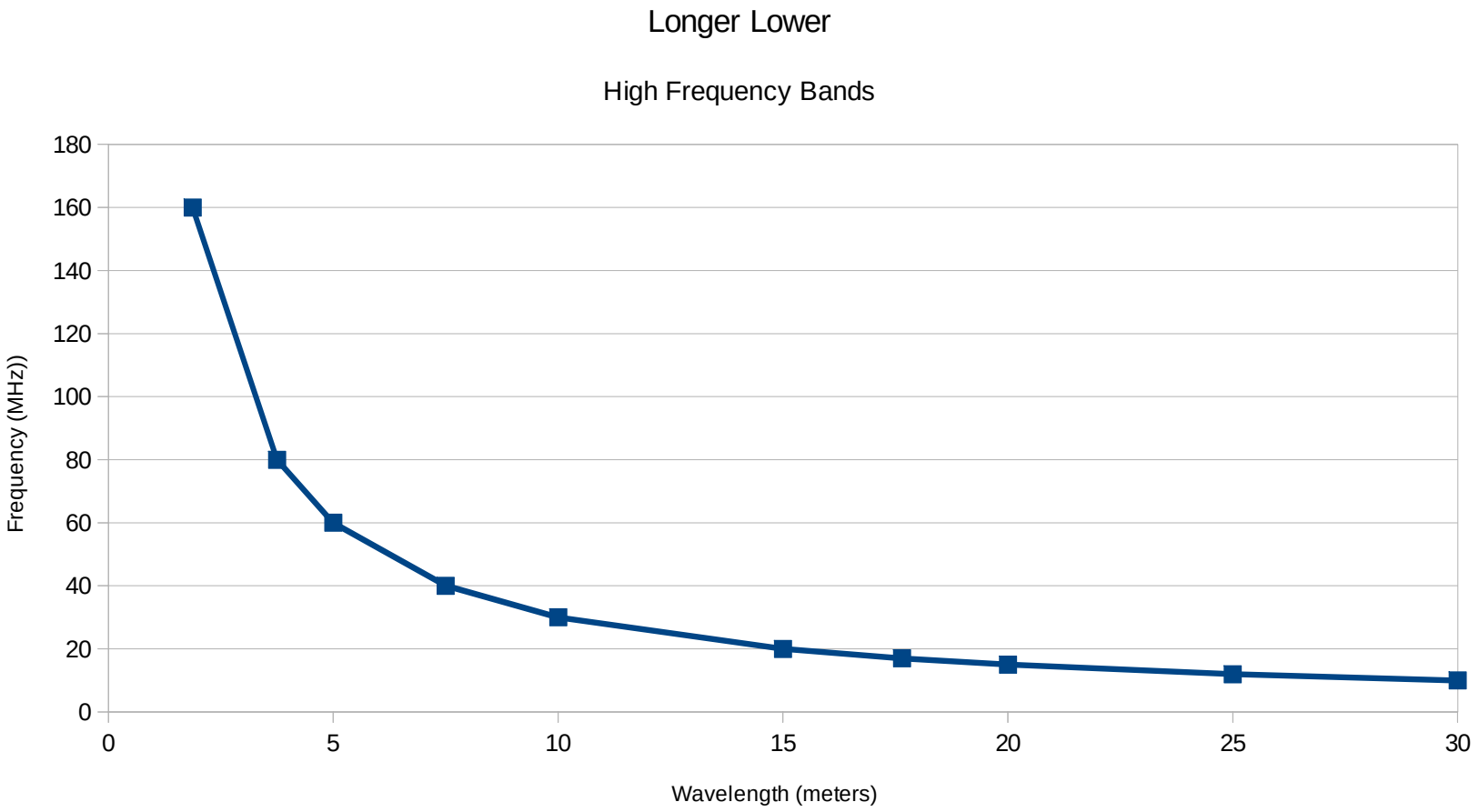
Longer is Lower ($\lambda \alpha 1/f$)

- Band designations are approximate
- 2 meters is 144.0 MHz to 148 MHz
  - $\lambda = 300/144.0 = 2.08\overline{33}$ meters
  - $\lambda = 300/148.0 = 2.\overline{027}$
- Or shorter is higher.



Longer is Lower (λ α 1/f)

- 2 meter Band (f = 300/2 ≈ 150 MHz)
- 30 meter Band (f = 300/30 ≈ 10 MHz)

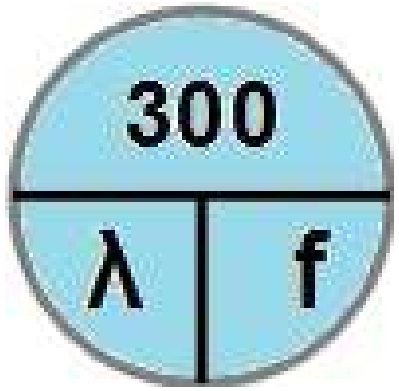


Wavelength – Frequency Calculation

Which 70 cm frequency is authorized to a Technician Class license holder operating in ITU Region 2?

A. 53.350 MHz
B. 146.520 MHz
C. 443.350 MHz
D. 222.520 MHz

Convert 70 cm to 0.7 meters and then to frequency and f = 300/0.7 = 428.57 MHz and C is the correct answer.



λ in meters
f in MHz

E = I x R

- All correct answers are exact and not approximations
  - Eagle flies over the Indian and rabbit.

- Given voltage (E) and resistance (R) find current (I)T5D07 page 161.
  - E = 120 volts
  - R = 80 ohms
  - I = 120/80 = 1.5 amps

I = E ÷ R
Finding Current

E = I x R

- Given current (I) and Resistance (R) find voltage (E) T5D10 page 160.
  - I = 0.5 amps
  - R = 2 ohms
  - E = 0.5 x 2 = 1 volt

E = I × R
Finding Voltage

- Given current (I) and voltage (E) find resistance (R) T5D04 page 162.
  - I = 4 amps
  - E = 12 volts
  - R =3 ohms

R = E ÷ I
Finding Resistance

P = I x E

- Given current (I) and voltage (E) calculate power (P) T5C10 on page 159.
  - E = 12 volts
  - I = 2.5 amps
  - P = 12 x 2.5 = 30 watts

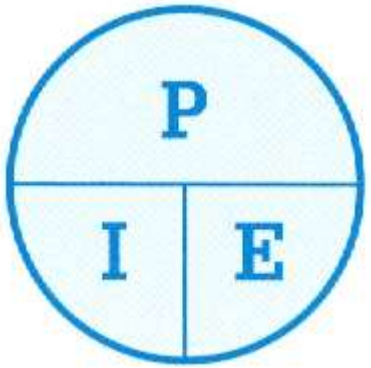
P = I × E
Finding Power

- Given power (P) and voltage(E) calculate current (I) T5C11 on page 160.
  - P = 120 watts
  - E = 12 volts
  - I = 120/12 = 10 amps

I = P ÷ E
Finding Amperes

P = I x E

- All correct answers are exact and not approximations



- Given power (P) and current (I) calculate voltage (E).
  - Wow, none on test...
  - P = 30 watts
  - I = 2.5 amps
  - E = 12 volts

E = P ÷ I
Finding Voltage

Decibel Table

- Increase in power use positive sign
- Decrease in power ($P_{out}/P_{in} < 1$) add negative sign

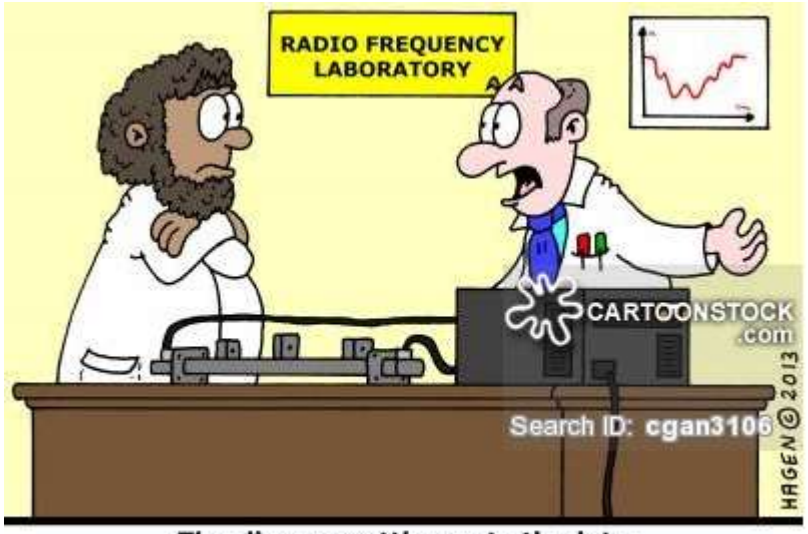
dB	Power Change
3 dB	2× Power change
6 dB	4× Power change
9 dB	8× Power change
10 dB	10× Power change
20 dB	100× Power change
30 dB	1000× Power change
40 dB	10,000× Power change

$dB = 10 \text{ Log}_{10} P_{out}/P_{in}$

- $10^{0.3} \approx 2$, $10^{0.6} \approx 4$, $10^{1} = 10$
- Given power out (P_{out}) and power in (P_{in}) calculate power increase in dB T5B09 on page 168.
  - Pout = 10 watts
  - Pin = 5 watts
  - $dB = 10 \text{ Log}_{10} 10/5$
    $= 10 \text{ Log}_{10} 2$
    $= 10 \times 0.3$
    $= 3 \text{ dB}$

$dB = 10 \text{ Log}_{10} P_{out}/P_{in}$

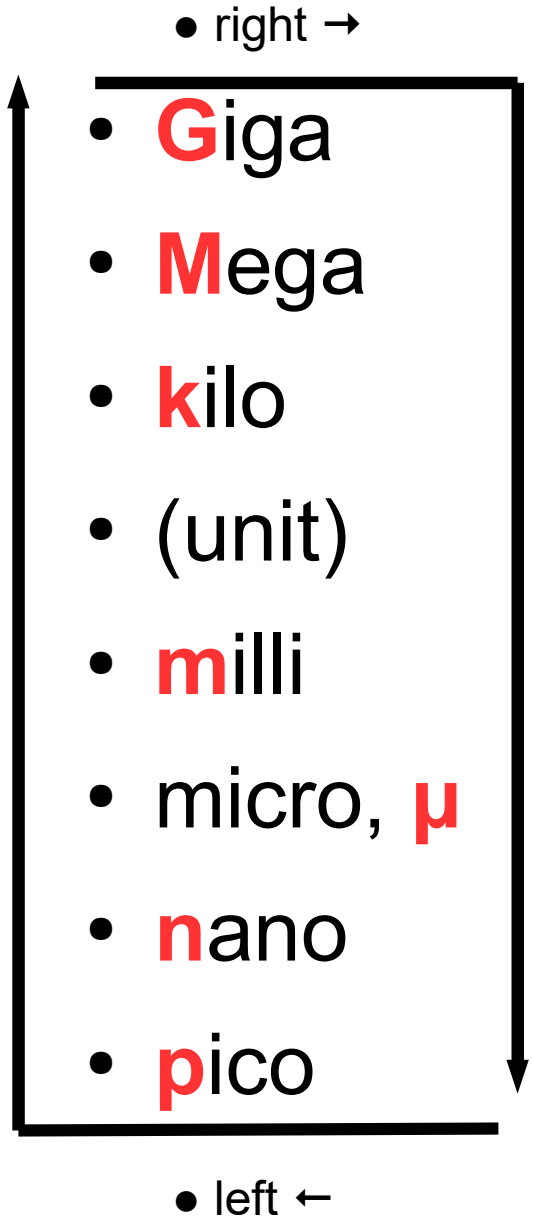
- -3 dB is equivalent to what power ratio?
  - $10^{-3/10} = 10^{-0.3} \approx ½$ or 0.5
- Given power out (P_{out}) and power in (P_{in}) calculate power increase in dB T5B10 on page 168.
  - Pout = 3 watts
  - Pin = 12 watts
  - $dB = 10 \text{ Log}_{10} 3/12$
    $= 10 \text{ Log}_{10} ¼$
    $= 10 \times -0.6$
    $= -6 \text{ dB}$



The divorce settlement stipulates she gets - 3 dB of all the assets...

SI Prefixes

- Use factor of 3 exponent for engineering notation or
  - 3 x 3 = 9 for Giga,
  - 3 x 2 = 6 for Mega,
  - 3 x 1 = 3 for kilo,
  - 3 x 0 = 0 for units,
  - 3 x -1 = -3 for milli,
  - 3 x -2 = -6 for micro,
  - 3 x -3 = -9 for nano, and
  - 3 x -4 = -12 for pico.



SI Prefixes

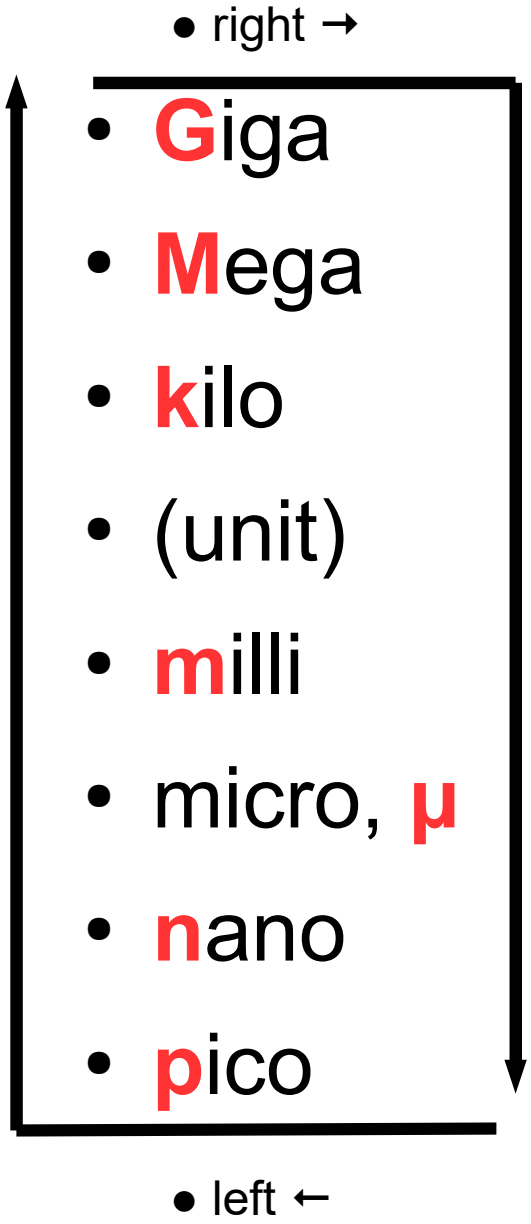
- T5B13 If a frequency readout shows a reading of 2425 **MHz,** what frequency is that in **GHz**?
- From MHz to GHz must move decimal point to left and go up chart
- 2425 MHz → 2.425 GHz

A) 0.002425 GHz

B) 24.25 GHz

C) 2.425 GHz

D) 2425 GHz



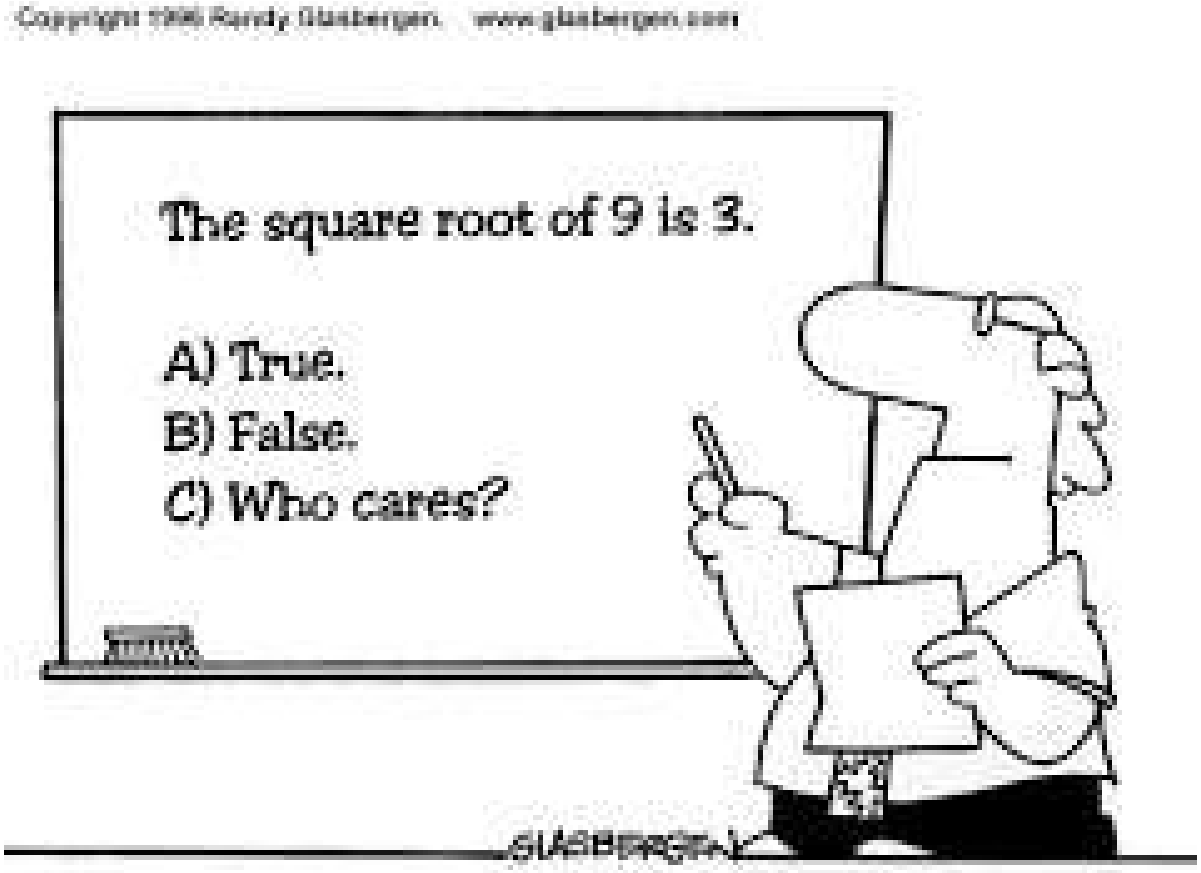
Calculator Rules

- A calculator with the memory erased and formulas cleared is allowed.
- You may **NOT** bring any written notes or calculations into the exam session.
- Slide rules and logarithmic tables are acceptable, as long as they're free of notes and formulas.

Calculator Rules

- Cell phone must be silenced or turned off during the exam session and the phones' calculator function may not be used.
- In addition, iPhones, iPads, Androids, smartphones, Blackberry devices and all similar electronic devices with a calculator capability, may **NOT** be used.

Questions?



Many students actually look forward to Mr. Atwadder's math tests.