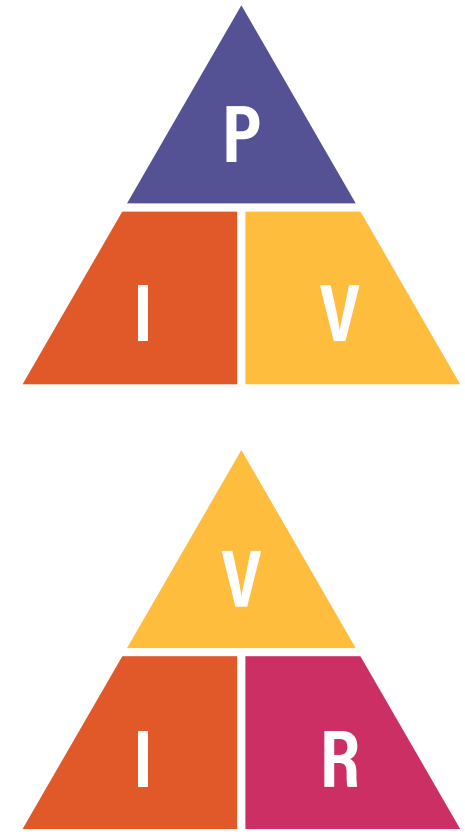


AV PRO CHEAT SHEET

Design Formulae & Concepts for AV Pros

Learn more at AV University - www.legrandav.com/AVU

Ohm's Law



V ▶ V (volts) & E (electromagnetic force) are the same

I ▶ I (amperes) is from the French for "intensity"

P ▶ P is power in watts

R ▶ R (Ω) resistance in ohms in a DC circuit

Z ▶ Z (impedance) is also Ω in an AC circuit

Ω in series is additive = $Z_1 + Z_2 + Z_3 \dots$

Ω in parallel use $ZT = Z_i / N$, where N is the number of speakers with an identical impedance. When impedances differ use "the reciprocal of the reciprocal" formula

$$\frac{1}{Z_1} + \frac{1}{Z_2} + \frac{1}{Z_3} \dots$$

Conduit Area Fill Allowance

- 1 Cable **53%**
- 2 Cables **31%**
- 3 Cables **40%**

ANALOG VIDEO BANDWIDTH =
 $H_{pix} * V_{pix} * F_{rate} * 3_{RGB} / 2$

KILO (K) =
 10^3 (thousands)

MEGA (M) =
 10^6 (millions)

GIGA (G) =
 10^9 (billions)

Digital audio bandwidth =
 Bit rate X sample rate X number of channels

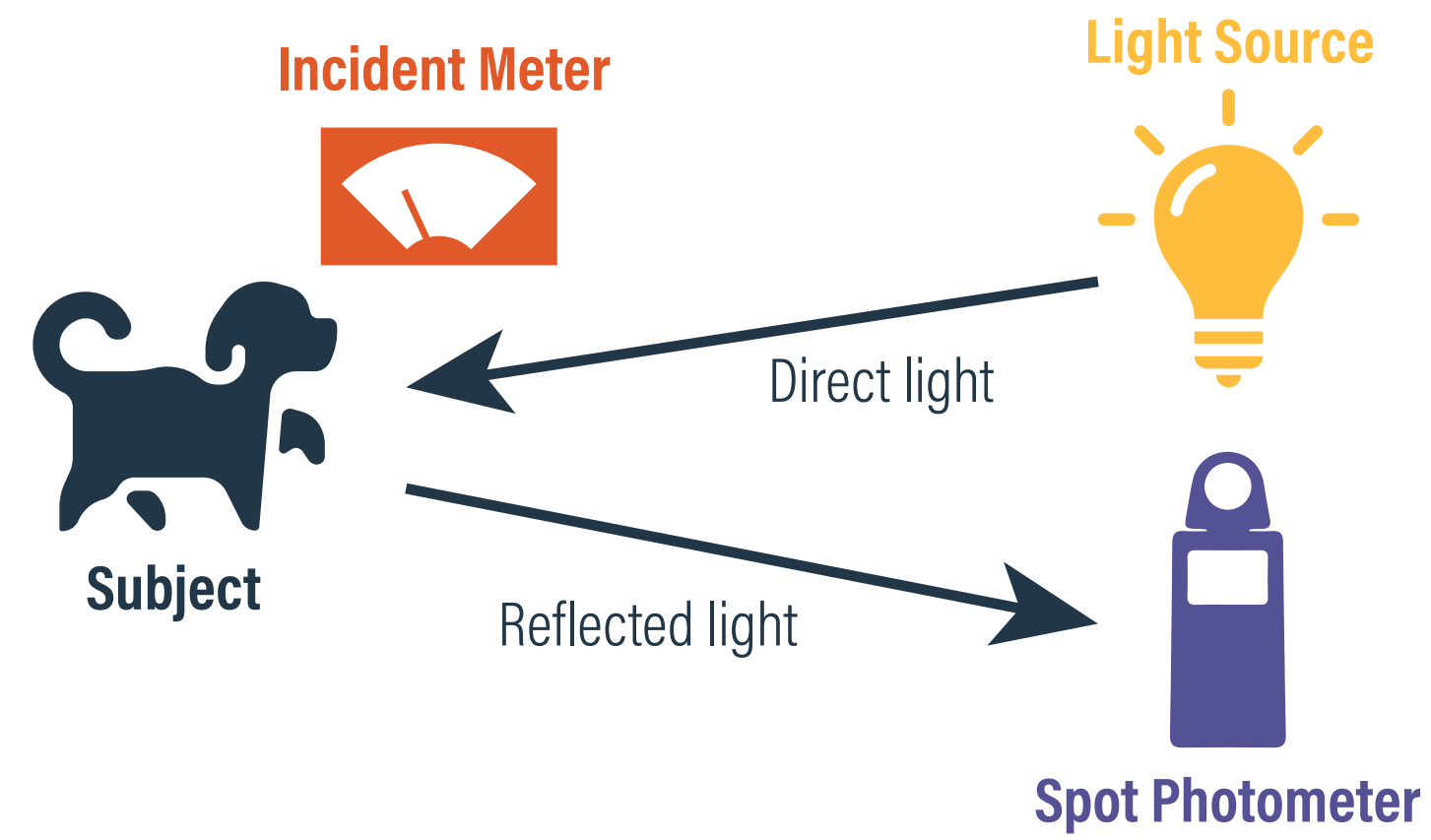
BTU (British thermal unit)
 is a unit of heat required to raise the temperature of one pound of water by one degree Fahrenheit

1 Watt = 3.14 BTU

Bit Depth

2-bits	2^2	4
8-bits	2^8	256
16-bits	2^{16}	65,536
24-bits	2^{24}	16,777,216

BPS = bits per second **BYTE = 8 bits**
BIT RATE = sample rate * bit depth



Light Temp in Kelvin	Light Source
1900K	Candle
2200 - 3000K	"Warm white" LED
4000 - 6000K	"Daylight" LED
5500K	Noon sunlight
6500K (D65)	SMPTE white reference
3000 - 9000K	Typical video display range

CANDELA - luminous intensity

LUMEN - 1 candela / m²

ANSI LUMEN - 9 zone average

LUX - 1 lux = 1 lumen / m²

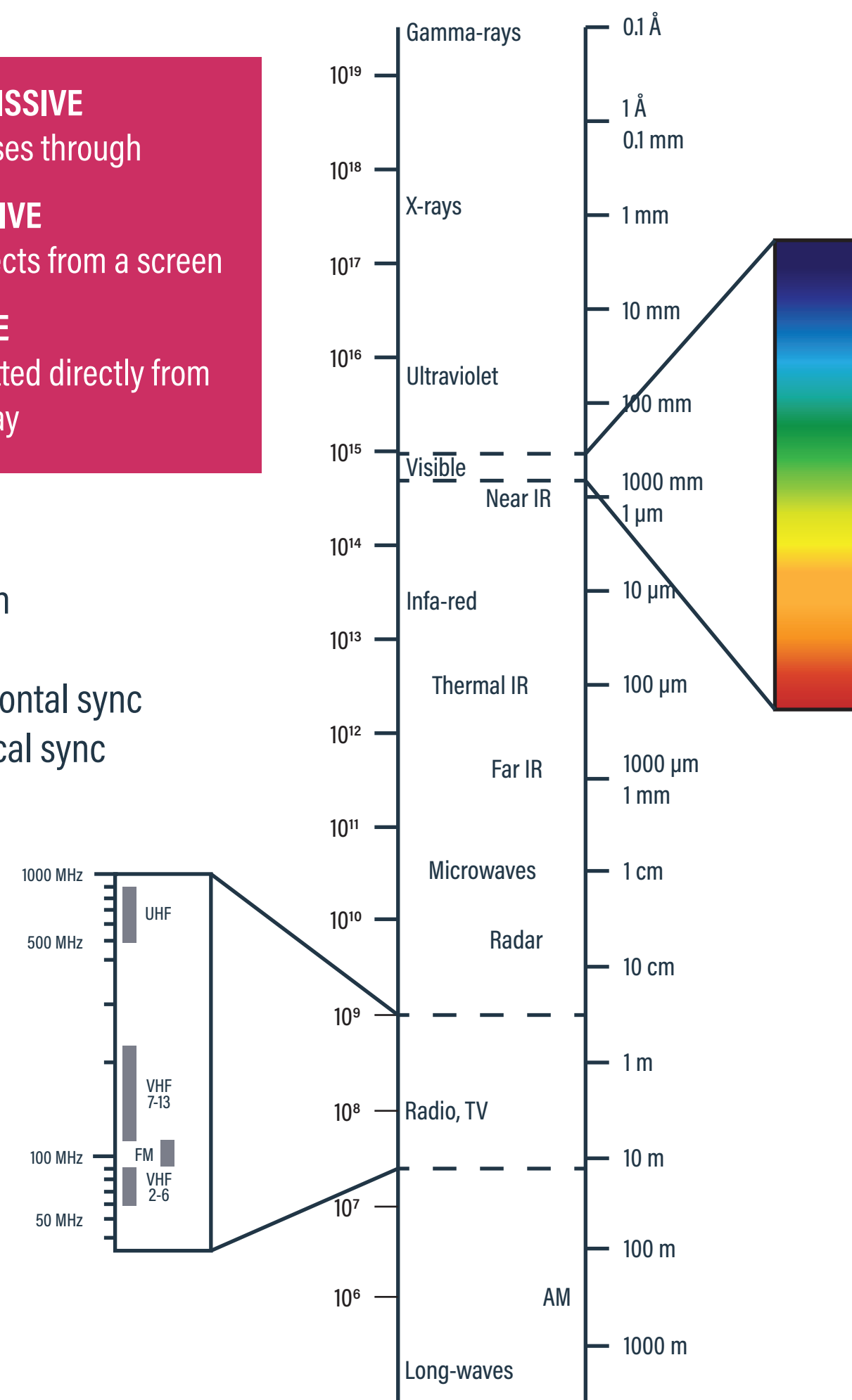
FOOT-CANDLE - 1 fc = 1 lumen / ft²

NIT - 1 nt = 1 candela / m²

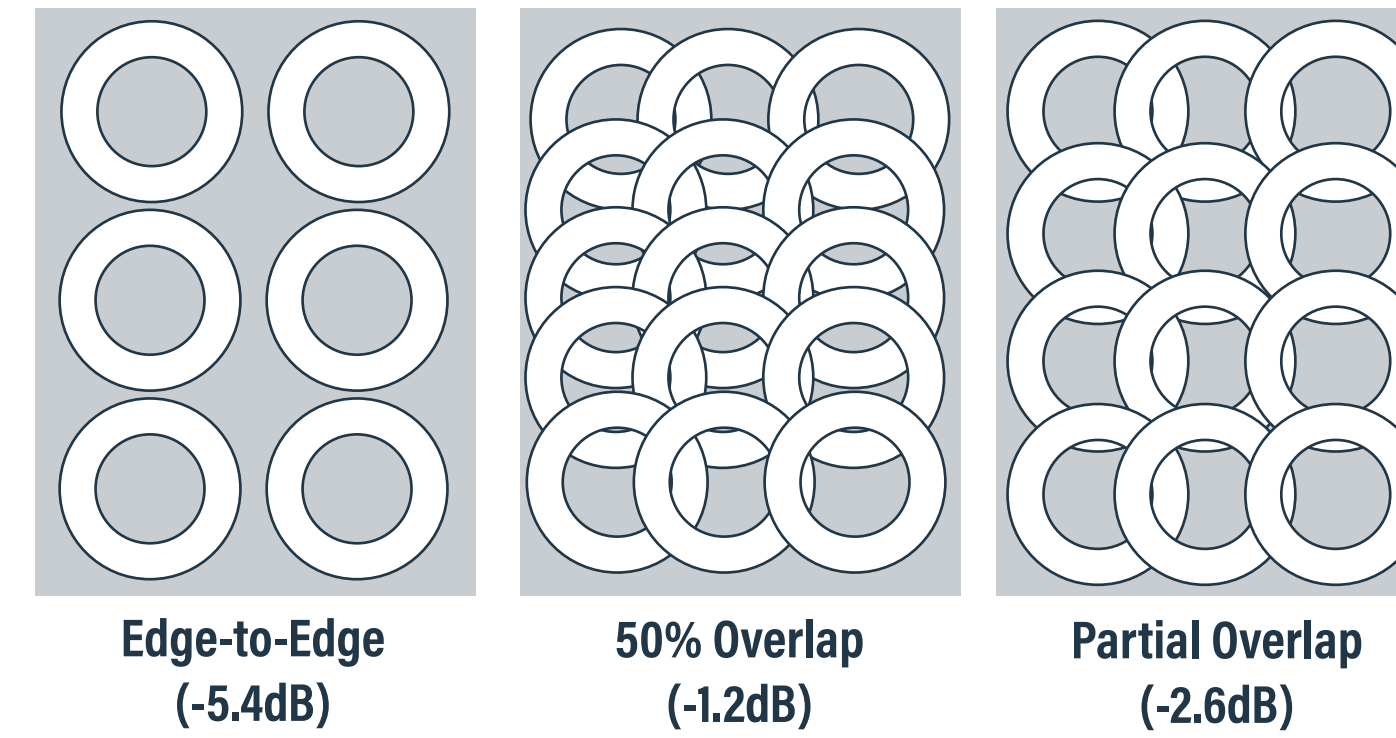
FOOT-LAMBERT - 1 fl = 3.43 candela / m²

- TRANSMISSIVE** light passes through
- REFLECTIVE** light reflects from a screen
- EMISSIVE** light emitted directly from the display

- R** - red
- G** - green
- B** - blue
- H** - horizontal sync
- V** - vertical sync



Distributed Loudspeaker Coverage



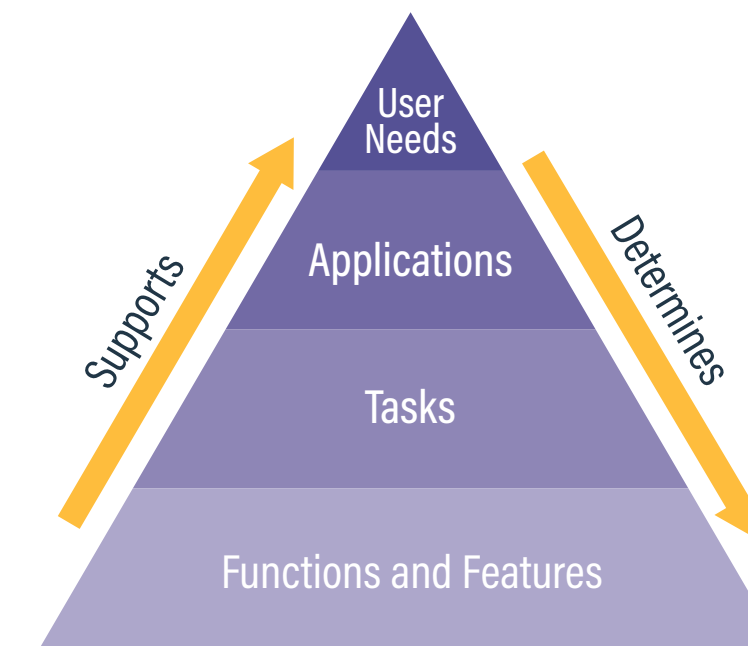
OCTAVE - doubling or halving of a frequency
 *Humans can hear 10 bands, each an octave wide, in a frequency range of 20Hz to 20KHz

Power	Decibels
1 watt	0dBW
10 watts	10dBW
100 watts	20dBW
1000 watts	30dBW

POWER CHANGE
 $10 \log(P1/P2)$
 A doubling or halving of power results in a 3dB change in SPL

3dB is the smallest change in volume the untrained listener will hear

DISTANCE OR VOLTAGE CHANGE
 $20 \log(D1/D2)$
 $20 \log(V1/V2)$



Needs Analysis Pyramid

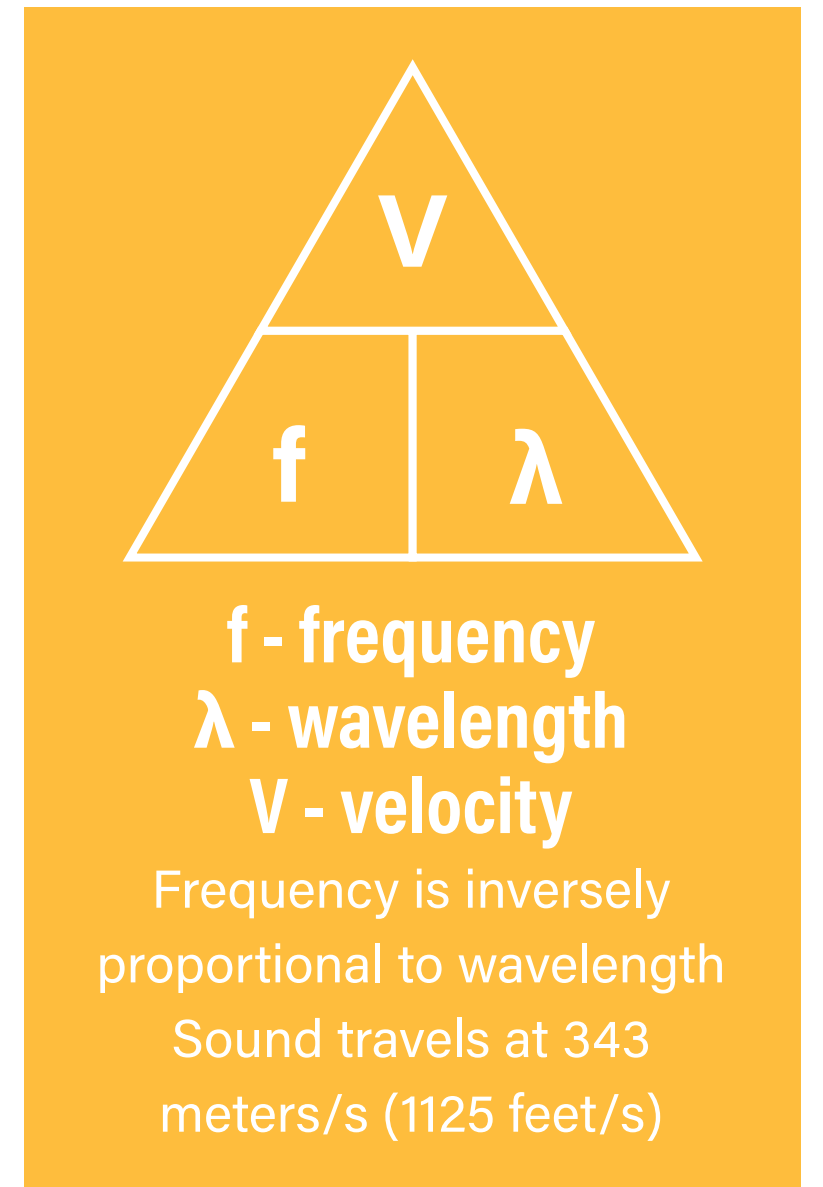
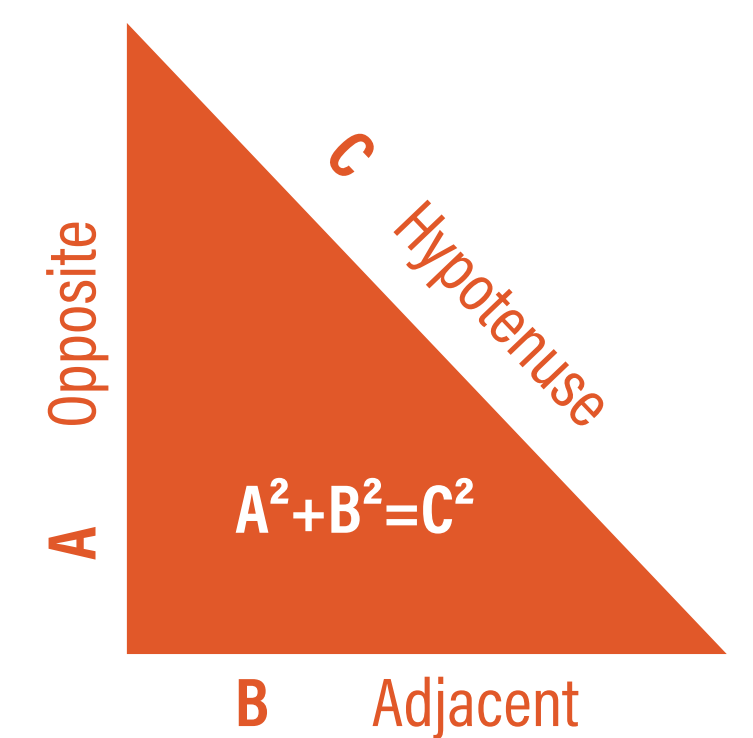
INVERSE SQUARE LAW
 Energy is inversely proportional to the square of the distance from the source

Double distance from source results in -6dB change

Half distance to source results in +6dB change

Aspect Ratios

4:3:5	1.33:1:1.66
16:9:18.36	1.78:1:2.04
16:10:18.87	1.6:1:1.89



OSI Model	TCP/IP Model
Application	Application
Presentation	
Session	
Transport	Transport
Network	Internet
Data Link	Network
Physical	Access

192.168.0.1/24 **IPV4 Address Example**
 /24 = Classless Interdomain Routing - **CIDR** - # of 1's
 11111111.11111111.11111111.0 = 255.255.255.0 - subnet

IPV6 - 8 groups, separated by colons, of 4 hexadecimal digits, may include MAC address as part of the IP address

Media Access Control - **MAC** example
 48:BA:4E:2C:72:DE

Signal Type	Voltage
Speaker Level	Up to 100 V
Professional Balanced Line Level	1.23 V
Consumer Line Level	316 mV
Microphone Level	0.1 mV

- CONTAINER** - holds metadata describing which codecs are used
- CODEC** - method for encoding and decoding a file
- WAN** - wide area network
- LAN** - local area network

- CAN** - campus area network
- SAN** - storage area network
- VLAN** - virtual local area network
- PAN** - personal area network

Basic Decision Making - BDM

An element is a character, image, or detail in an image that's of interest

%Element = element (pixels or value) / image height (pixels or value)

%Element ensures legibility independent of screen size or resolution

