Projector Math

Disclosure & Overview

In all the eexamples below, using a 1920x1080 projector at 8’ away projecting 16’ wide x 9’ high.

Special shout out here to Sean Leo who hooked me up with some of these.

You need to use projector math for all kinds of things – but mostly for Projector Positioning and engineering.

Throw Ratio Formulas

To get Projector Width = Distance x Throw Ratio

8 x .5 = 16

To get Projector Throw Ratio = Distance / Projector Width

8 / 16 = .5:1

To get Projector Distance = Throw Ratio x Width

.5 x 8 = 16

Diagonal Dimensions

// Based on a single Projector in a blend not the blended resolution

W Width = 16 ft to inches x 12 = 192 ″

H Height = 9 ft to inches x 12 = 108 ″

pxW Pixel Width = 1920//pixel Width = 1920

pxH Pixel Height = 1080//pixel Height = 1080

inW Inches in Width = W//inches Width = 192”

inH Inches in Height = H//inches Height = 108”

//functions

pxD Diagonal Pixels = sqrt (**pxW**^2 + **pxH**^2) = 2202.90717

inD Diagonal Inches = sqrt (**inW**^2 + **inH**^2) = 220.290717

Pixels Per Inch (PPI)

There are too many ways to calculate PPi. In an array of projectors, you should use values from a single projector, as the values from an array of projectors will give you different PPi for Height than Width (even though they are the same if the projectors are spec’d the same). I don’t really understand why it happens this way.

pxD Pixel Diagonal / **inD** Inch Diagonal of Screen = 10

Aspect Ratio

The basic “Aspect” is easily calculated. It’s the **pxW** / **pxH**: 1920/1080 = 1.7777777778

To get the ratio, that magical little 16:9, you need to find the GCD (greatest common divisor) of **pxW** and **pxH**. You can do this by using the **GCD** function in a spreadsheet: GCD(1920,1080) will return a GCD of 120. To get the aspect, you divide the **pxW** by that GCD: 1920/120 will return 16. To get your second number, you divide the **pxH** by that same GCD: 1080/120 will return 9.

// Spreadsheet formula - replace pxH, pxW with the cells that contain those numbers

=SUM(pxW/GCD(pxW,pxH))&":"&SUM(pxH/GCD(pxW,pxH))

Lumens

Foot Lamberts (fL) = (Projector Brightness in Lumens / Area of Screen in SqFt) * Gain

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