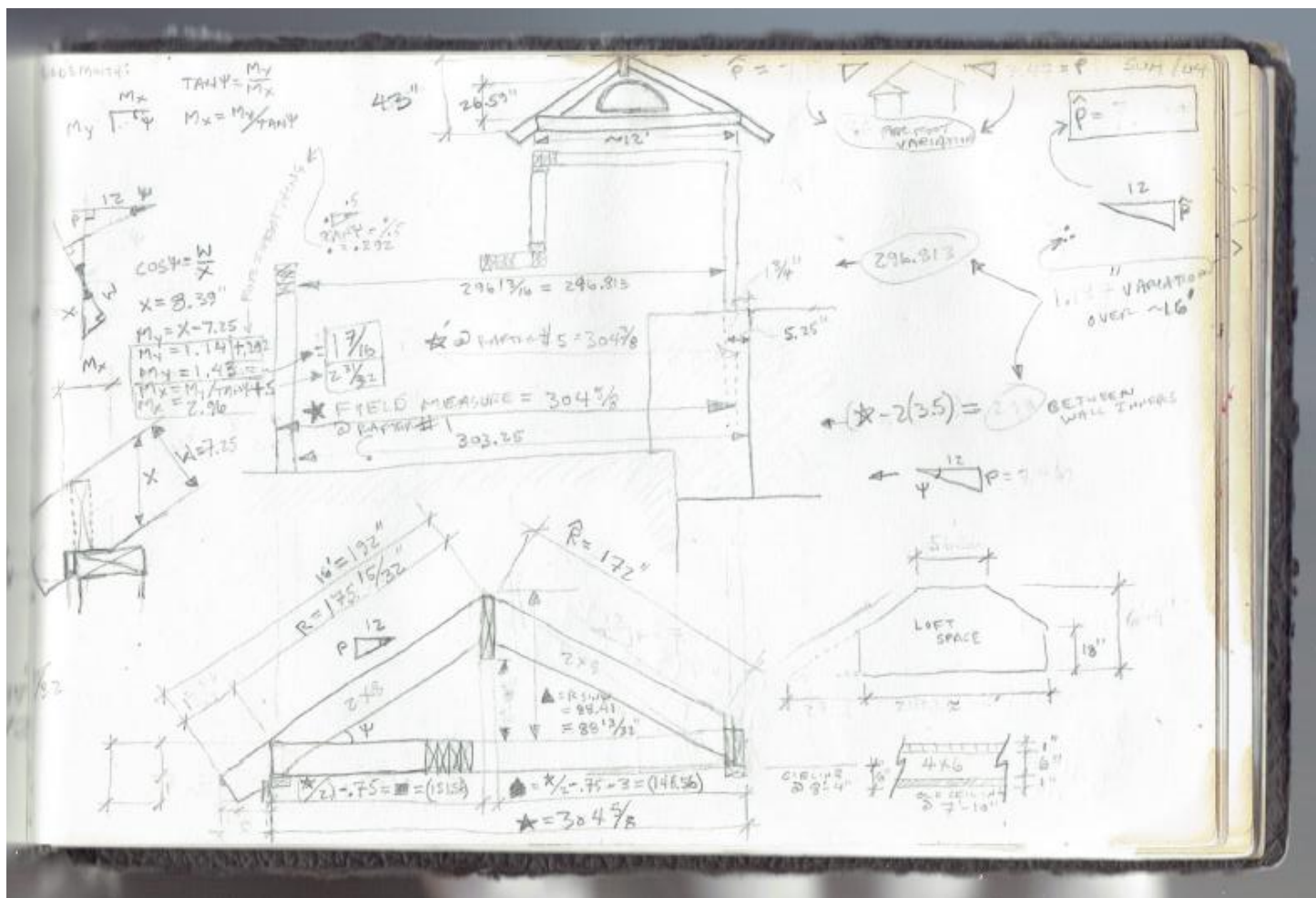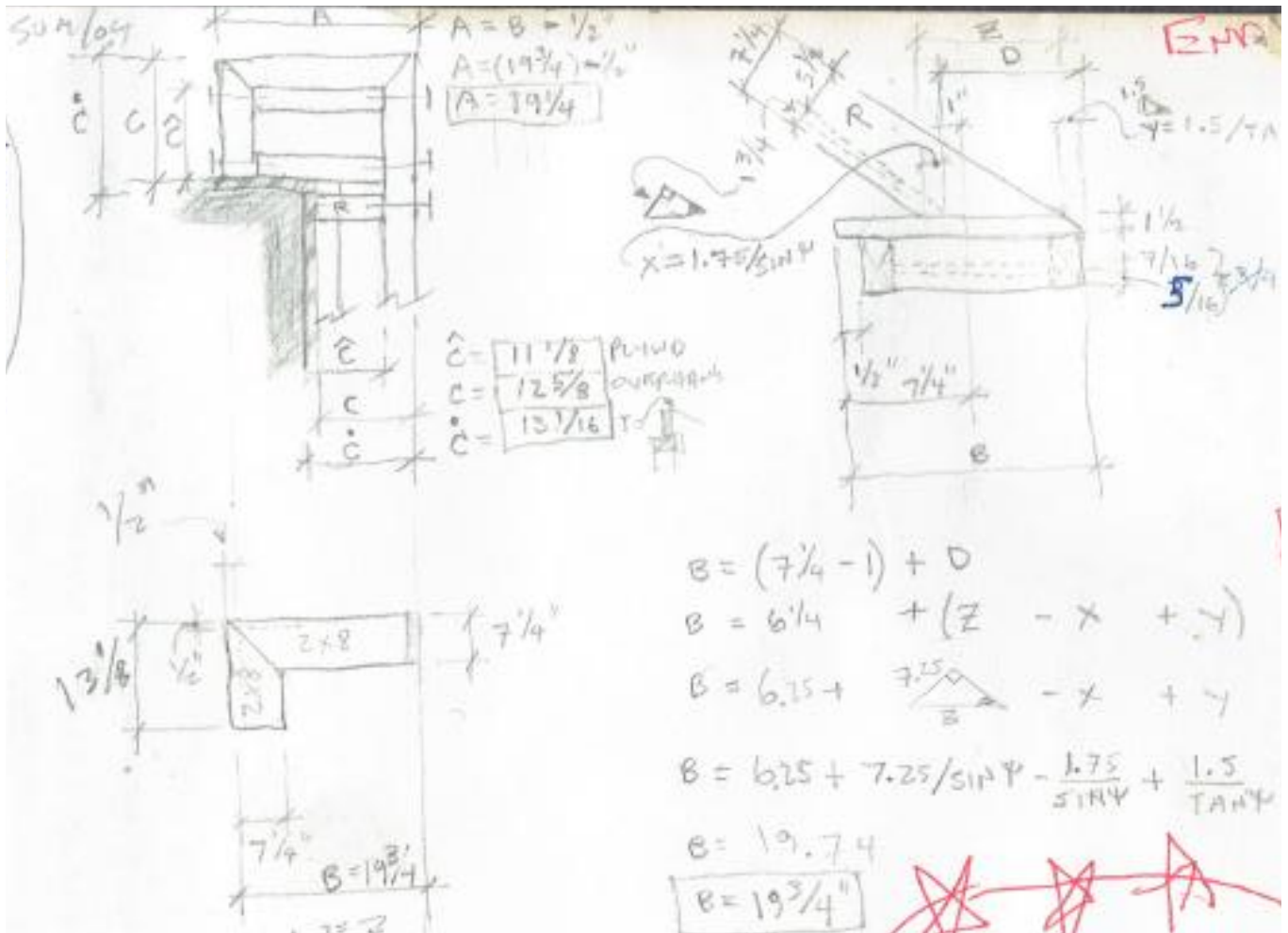**EDUCATIONAL ASSIGNMENT for JOSEPH JOHN WUNDERLICH** for his 3rd trimester of 10th grade
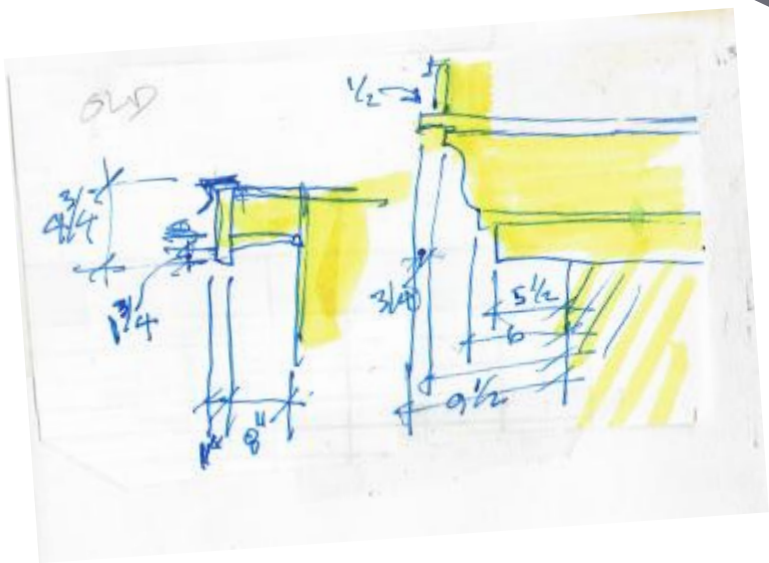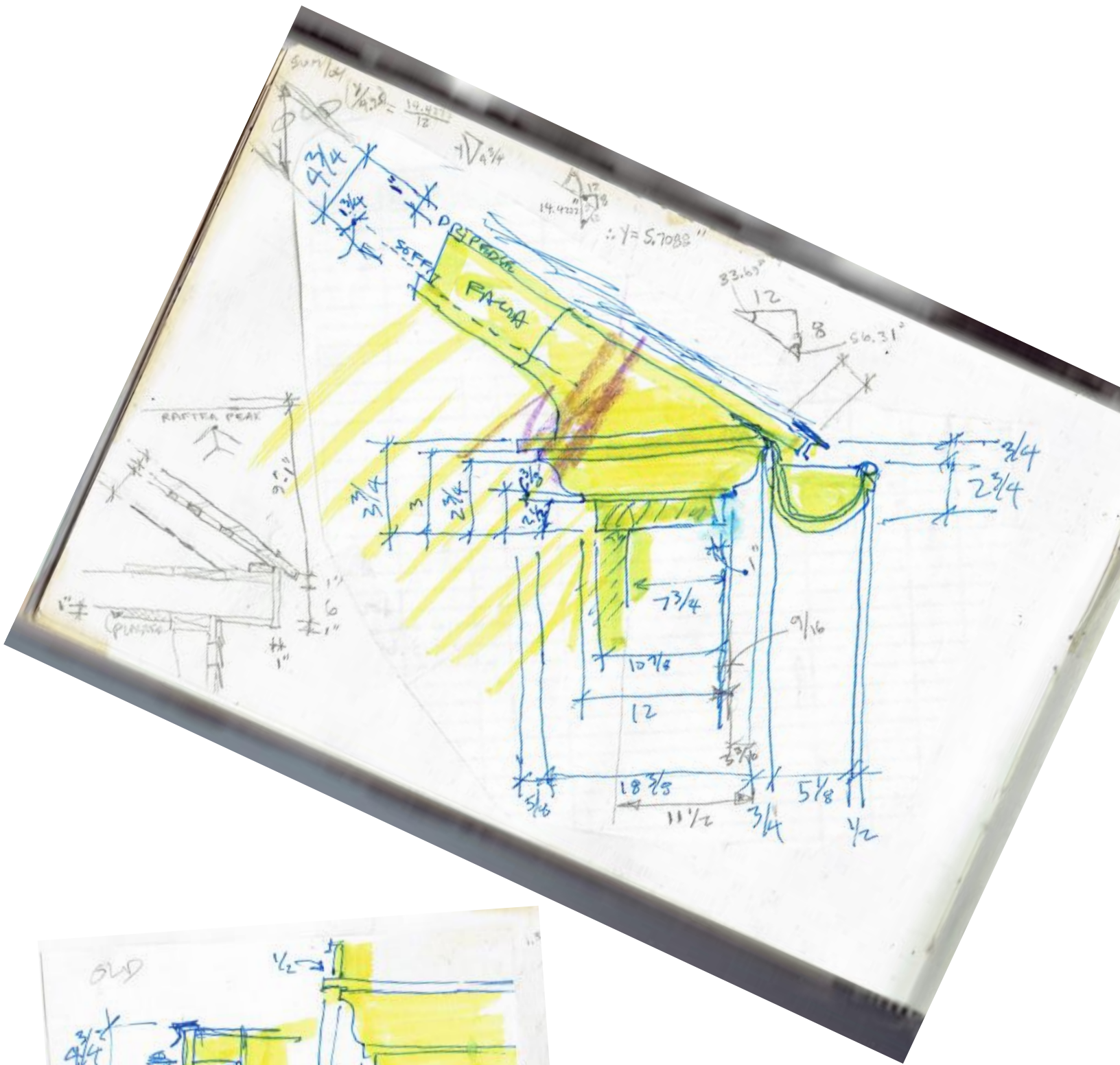 This assignment covers the following Educational Objectives (Subjects marked with a "■" are the main subject, and those marked with an "□" are secondary subjects):

- □ 1. READING (ENGLISH)
- ■ 2. WRITING (ENGLISH)
- ■ 3. ALGEBRA 2
-    4. CHEMISTRY
-    5. WORLD HISTORY
-    6. LATIN II
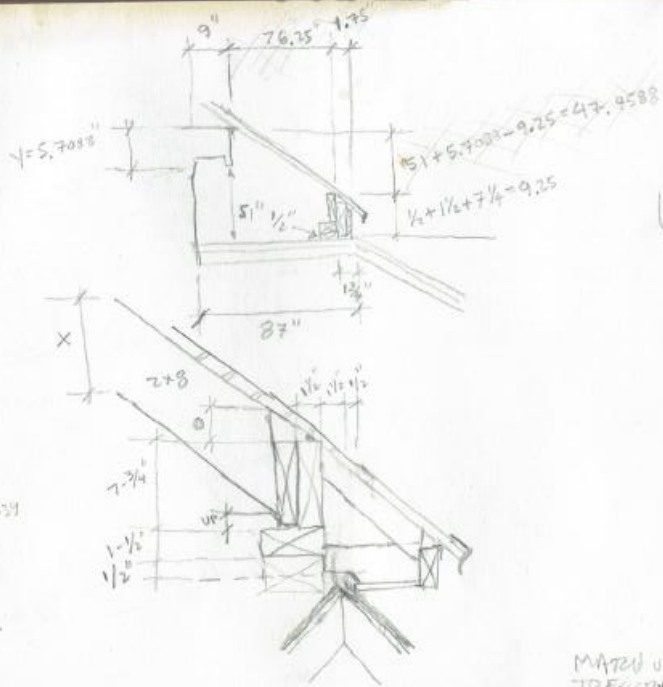-   7. WORLD CULTURAL ARTS
-    8. PHYSICAL EDUCATION

ASSIGNMENT: *Recall Dad's lectures on Trigonometry, and recall his use of Algebra and Trigonometry in his Journal shown below, that he used to design our house renovation in Pennsylvania that you've been working on for many years;*

SUM/04

A = B - ½"
A = (19¾") - ½"
A = 19¼"

$\hat{C} = 11\frac{1}{8}$ PLYWD
$C = 12\frac{5}{8}$ OVERHANG
$\dot{C} = 13\frac{1}{16}$ T=

END

$X = 1.75/SIN\ \Psi$

$Y = 1.5/TAN$

5/16

2×8
7¼"

13⅜

7¼"
B = 19¾

$B = (7\frac{1}{4} - 1) + D$

$B = 6\frac{1}{4} + (Z - X + Y)$

$B = 6.25 + \frac{7.25}{B} - X + Y$

$B = 6.25 + 7.25/SIN\ \Psi - \frac{1.75}{SIN\ \Psi} + \frac{1.5}{TAN\ \Psi}$

$B = 19.74$

$B = 19\frac{3}{4}"$

SUN/04 $\frac{1}{4}$ = $\frac{14.4333}{12}$ $4\sqrt{4\frac{3}{4}}$

$4\frac{3}{4}$ 5   DRIP EDGE   14.4333 $\div Y = 5.7088"$

$1\frac{3}{4}$ FACIA   33.69° 12

SOFFIT   8   56.31°

RAFTER PEAK

$9\frac{1}{2}$ $3\frac{1}{4}$ 3 $2\frac{3}{4}$ $3\frac{3}{16}$ $2\frac{1}{2}$ $3\frac{3}{4}$

$1"$ $7\frac{3}{4}$ $9/16$ $2\frac{3}{4}$

PLATE $1"$ 6 $1"$ $10\frac{7}{8}$

12 $3\frac{3}{16}$

$5\frac{3}{16}$ $18\frac{2}{5}$ $11\frac{1}{2}$ $3/4$ $5\frac{1}{8}$ $1/2$

OLD $1/2$

$3\frac{1}{2}$ $4\frac{1}{4}$ $3/4$ $5\frac{1}{2}$ 6

$1\frac{3}{4}$ $9\frac{1}{2}$ $8"$

THIS DICTATES
NEW ROOF
SLOPE:

$\Psi = 31.399°$

$51 + 5.7088 - 9.25 = 47.4588$

76.25

47.4588

$\cos\Psi = W/X$
$X = 8.39$

$\frac{1}{2} + 1\frac{1}{2} + 7\frac{1}{4} = 9.25$

$Y = 5.7088"$

12 7
30.256°

Ψ

12 8
33.690°

Ψ 12
P

$\tan\Psi = \frac{Q}{3}$
$Q = 1.75$

$UP = (W + Q) - X$
$= 7.25 + 1.75 - 8.39$
$= .61$
$UP \approx 5/8"$

87"

2×8

$\tan\Psi = \frac{P}{12}$
$P = 7.469$

$R \cdot \cos(\Psi) = W = (151.56)$
$R = \frac{W}{\cos\Psi} = 175.46 = 175$
$R = \frac{W}{\sin\Psi} = 171.99 = 172$
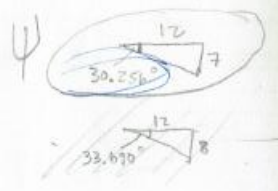
MATCH UP
TO EXISTING
FACIA + SOFFET
THEN MEASURE

$F = W \cos\Psi$
$F = .61$

$\Psi = 30.256$

12 7

W_c

$F \cos\Psi = W$
$F = W / \cos\Psi$
$F = 7.25 / \cos(\ldots)$
$F = 8.39$
$E = 8\frac{29}{64} \approx 8\frac{3}{8}"$
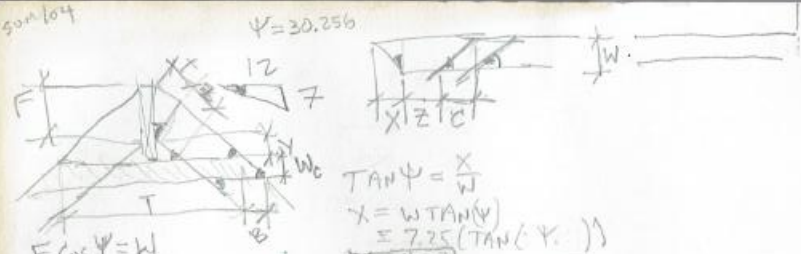
$Y = 11.25 - F$
$Y = 2.86$

$Z \sin\Psi = Y$
$Z = Y / \sin\Psi$
$Z = 2.86 / \sin(\Psi)$
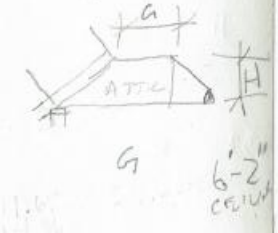$Z = 5.68$
$Z = 5\frac{11}{16}"$!

$\tan\Psi = \frac{X}{W}$
$X = W \tan(\Psi)$
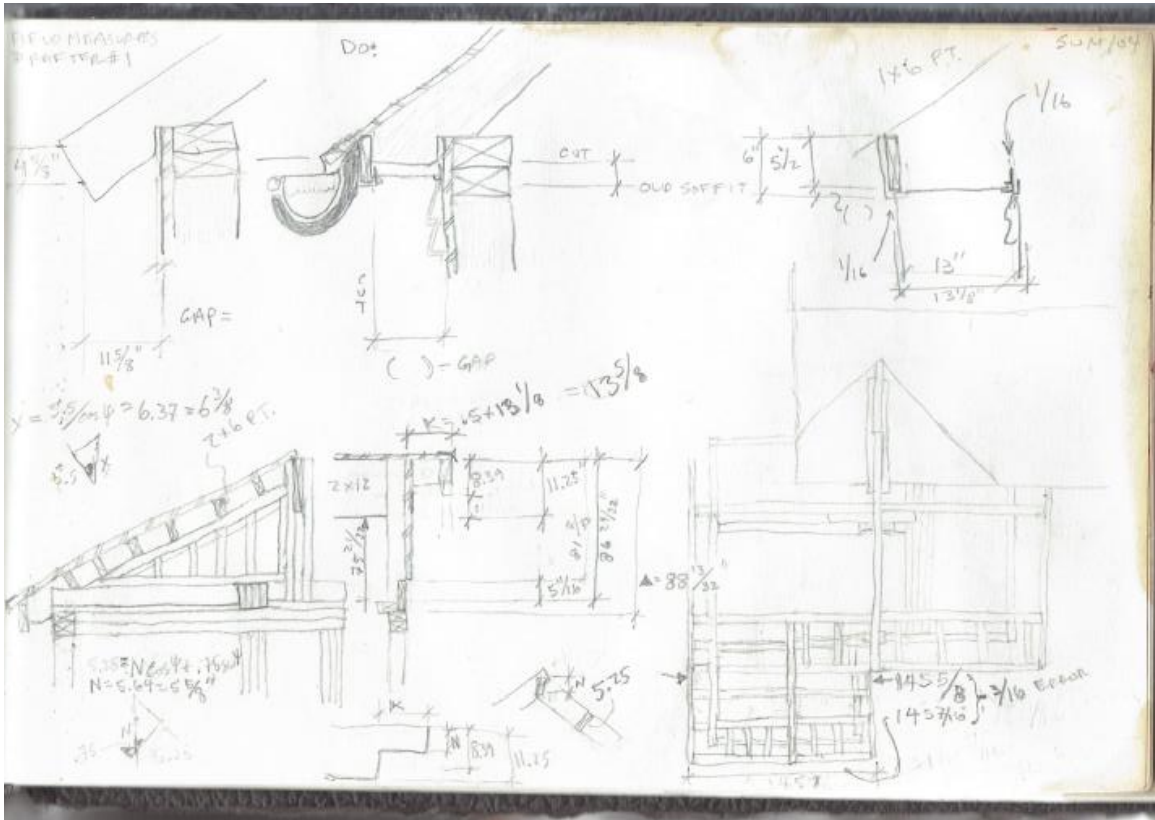$= 7.25 (\tan(\Psi))$
$X = 4.23$
$X = 4\frac{7}{32}" \approx 4\frac{1}{4}$

$\tan(\Psi) = \frac{W}{C}$
$C = W / \tan\Psi$
$C = 7.25 / \tan\Psi$
$C = 12.43$
$C = 12\frac{7}{16}"$!

$\sin\Psi = W$

$T = 1.5 + 2(Z \cos\Psi + W/\sin\Psi)$
$T = 1.5 + 2(5.68 \cos\Psi + 7.25/\sin\Psi)$
$T = 40.089$
$T = 40\frac{3}{32}"$

2×8
2×10
2×12

$B = W_c / \tan\Psi$
$B = 7.25 / \tan\Psi = 11.4$
$B = 9.25 / \tan\Psi = 14.4$
$B = 11.25 / \tan\Psi = 3.$

$\tan\Psi = W_c / \theta$
$B = W_c / \tan\Psi$

2×4 $B = 3.5 / \tan\Psi = 6.00$
$B = T + 2B$
$G = 52.089 = 52\frac{3}{32}$
$G = 6' - 5"$

$G = T + 2B$

ATTIC

G

6'-2"
CEILING

Also recall how you liked to draw on Dad's Journal sketches like you did for specifying a secret door on this sketch when you were a little boy:

*Then write an essay about how math is a great tool for Architecture*

JOSEPH'S WORK:

Mathematics is important for architecture because it gives the builders and engineers a technical understanding of the building and where the pieces fit together. Any building with a roof has an equation for the slope, and any circular window or room needs a more complicated one as well, such as the one below.
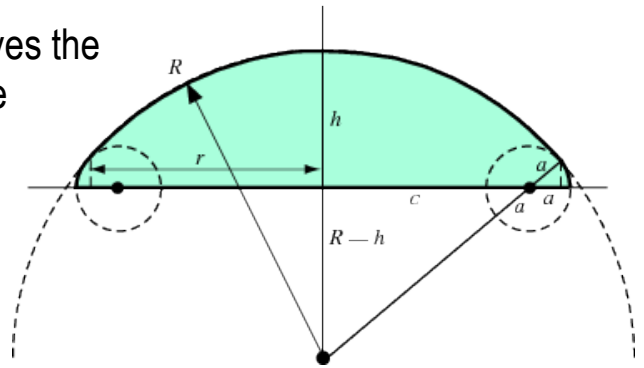
Accurate measurements are the most important, especially when choosing what size of materials to order because there isn't enough time or money to reorder new materials or redesign the building when workers are on site and need pay.

When designing 3 dimensional objects such as a dome, you must use an equation for the curve to get a completely symmetrical dome.

Shown below is a town center in Padua where our friend Mario lives nearby. This shows that math was clearly used back then, as a shape of this size can only be made this accurately by using precise measurements and calculations
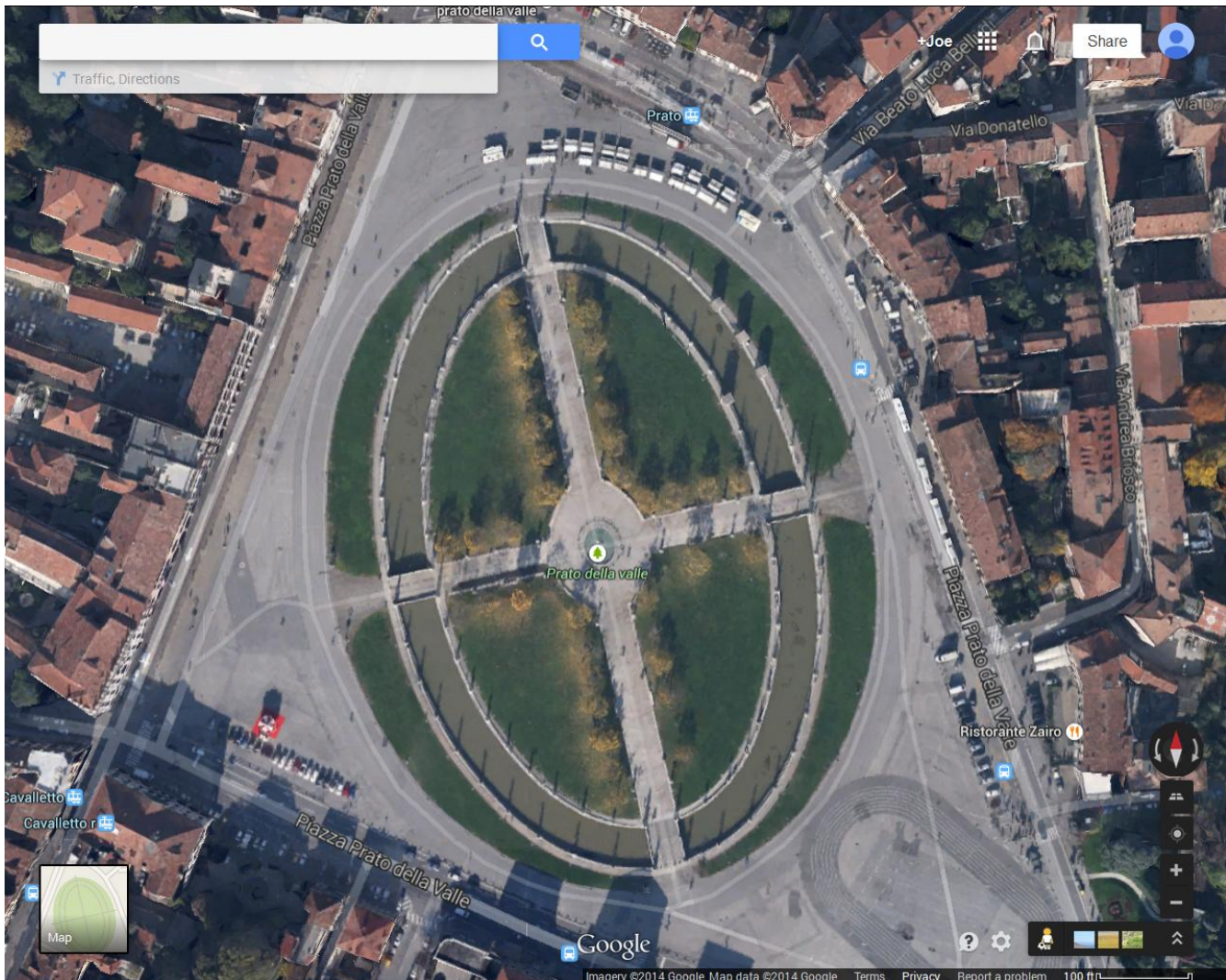
For buildings to be built without falling over on sloped streets such as the ones around Padua, levels of some sort would have to be used to build houses in line with gravity.

As I read in my book, Brunelleschi's dome, many small, but big enough to walk into, models were built to showcase designs for the dome's construction. Some basic physics would need to be understood to even create a model that can hold up. In the end, Fillipo Brunelleschi's model was chosen because he demonstrated to judges the strength of an egg and how his dome used a similar shape.

The picture to the right is my favorite entrance of any building in all of Italy. I love this front because I feel that every part is perfectly spaced apart, and that detail is used only in the door and arches. If the measurements here were not done by a professional and were improvised by what fit or something, this might not come together as perfectly.