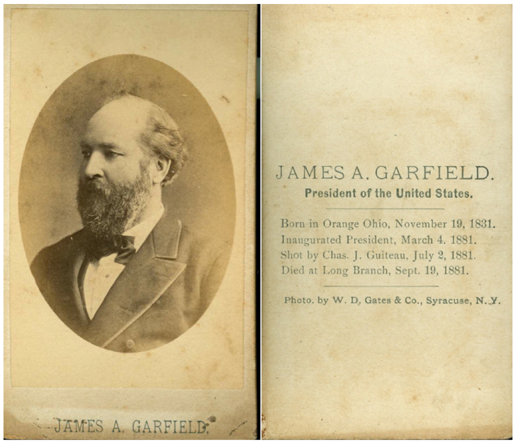


NEW-ENGLAND
JOURNAL OF EDUCATION.

Volume III. Boston, Mass., April 1, 1876. Number 14.

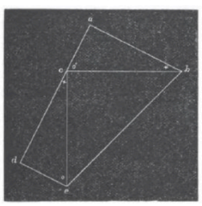
Figure 3. From the title page of the *New-England Journal of Education* (Vol. 3, No.14, April 1, 1876) (image from Google Books)

James A. Garfield: (1831 - 1881)

1. Only President to have a mathematical theorem.
2. Williams College alum
3. Taught @ Hiram College
4. Brigadier General in civil war.
5. Last of 7 Presidents to be born in log cabin.
6. First to be left handed
    a. at parties, would write simultaneously with both hands in latin & greek
7. Shot in back when he “turned down an attorney for government job”.
    a. Alexander Graham Bell had fashioned electric device to find the bullet
    b. The search for it caused infection, which killed him
8. His proof was given 5 years before he died
    a. Same year Bell invented the telephone.
    b. Published in New England Journal of Education
        i. Mistakenly (or in jest) given the latin name Pons Asinorum - Bridge of Asses

PONS ASINORUM.

[In a personal interview with Gen. James A. Garfield, Member of Congress from Ohio, we were shown the following demonstration of the *pons asinorum*, which he had hit upon in some mathematical amusements and discussions with other M. C.'s. We do not remember to have seen it before, and we think it something on which the members of both houses can unite without distinction of party.]

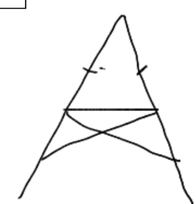


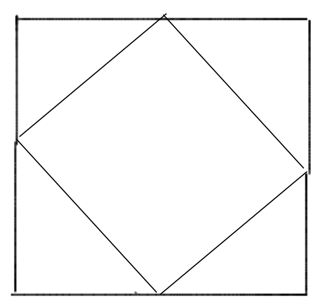
On the hypothenuse cb of the right-angled triangle abc, draw the half-square cbe. From e let fall the perpendicular ed, upon the side ac produced.

The triangles abc and dce are equal; the side $ab = dc$, and the side $ac = de$.

The area of the quadrilateral $adbe$ is measured by its base ad, multiplied by half the sum of its parallel sides de and ab, or $ad \times \frac{\overline{ab+de}}{2}$, which is $\frac{\overline{ac+ab}^2}{2}$

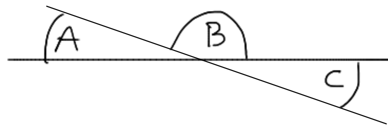
But the area of the quadrilateral $adbe$ consists of half of the square of bc plus the two equal triangles acb and dce; or $\frac{\overline{cb}^2}{2} + ab \times ac$. $\therefore \frac{\overline{cb}^2}{2} + ab \times ac = \frac{\overline{ab+ac}^2}{2}$; or $\overline{cb}^2 + 2(ab \times ac) = \overline{ab}^2 + 2(ab+ac) + \overline{ac}^2$. $\therefore \overline{cb}^2 = \overline{ab}^2 + \overline{ac}^2$. Q. E. D. [J. A. G.





Proofs & theorems from Book I

Prop I.15 Vertical Angles are equal



— Tool —

supplementary angle:

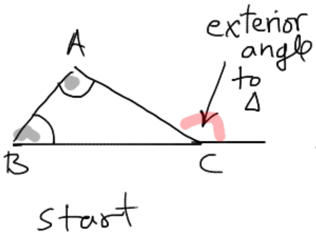
$$\left.\begin{array}{l}\angle A + \angle B = 180 \\ \angle B + \angle C = 180\end{array}\right\}$$

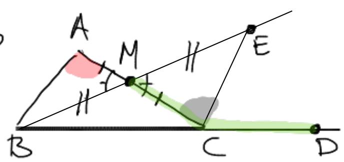
subtract

$$\angle A - \angle C = 0$$

$$\angle A = \angle C$$

Prop I.16 Exterior Angle Theorem: Ext. angle > either remote interior angle





$\triangle AMB \cong \triangle CME$

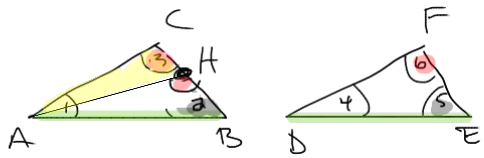
$\Rightarrow \angle BAM \cong \angle MCE$

whole > part $\Rightarrow$

$\angle MCD > \angle MCE = \angle MAB$

- extend BC, choose pt D.
- bisect AC, connect to this bisector
  $AM = MC$
- choose pt. on $\overrightarrow{BM}$ s.t. $BM = ME$
- connect C & E
- I.15 $\Rightarrow$ $\angle BMA \cong \angle EMC$

I. 26 AAS



Assumptions:

$\angle 3 = \angle 6$

$\angle 2 = \angle 5$

$AB = DE$

Show:

$\triangle ABC = \triangle DEF$

Note: Euclid avoids an easy proof here, why?

Triangle Angle Sum $= 180$ $\Longleftrightarrow$ Euclid's Parallel postulate

If $CB = FE$ done, else choose H s.t. $HB = FE$

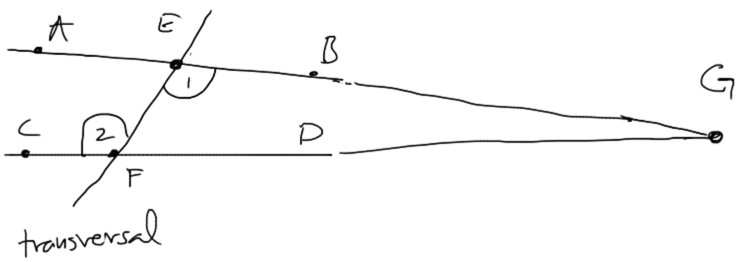
Now $\triangle AHB \cong \triangle DFE$ by SAS.

So $\angle AHB = \angle 6$ ... No $\angle AHB$ is exterior to $\triangle ACH$

thus EA. Thm $\Rightarrow$ $\angle AHB > \angle 3 = \angle 6$ $\otimes$

AIA - alternate interior angle & parallel lines

Prop. 1.27 If AIA's are = then the lines are parallel.
(true in neutral geometry (Euclidean, hyperbolic, spherical)

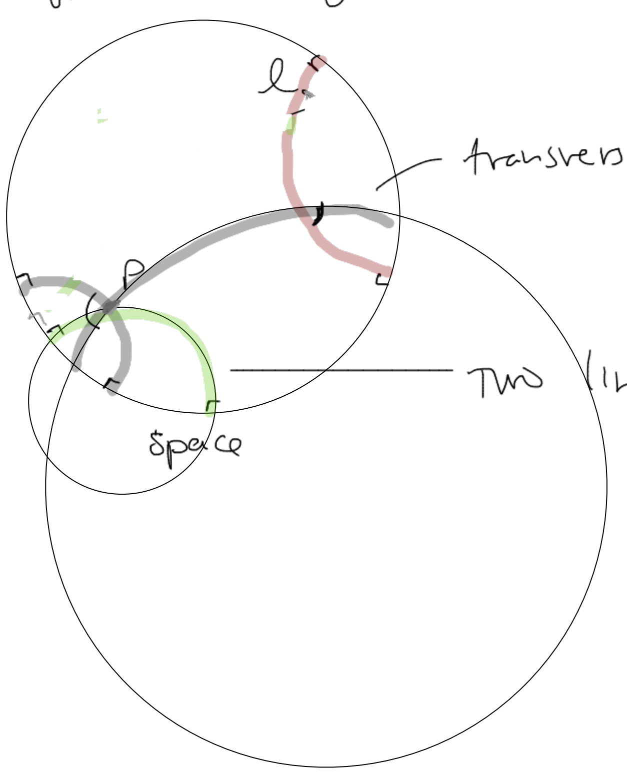


Assume $\angle 1 = \angle 2$

If AB meets CD, call that point G.
This gives ΔFGB w/ ext. angle $\angle 2$ that is = to interior angle $\angle 1$

X

Hyperbolic Geometry



Two lines thru P that are || to l