(*d*) Apply the mnemonic "all, sin, tan, cos" (which tells which ratios are *positive* in the four quadrants 1, 2, 3, 4 in order). Prefix the negative sign as in equation (1).

We have $\cos \overset{3}{250}° = -\cos 70°, \ldots\ldots\ldots\ldots\ldots\ldots (1)$
$= -0{\cdot}3420$ from the Tables.

Similarly $\tan \overset{3}{240}° = +\tan 60°$, following (*a*), (*b*), (*c*), (*d*),
$= \sqrt{3}$, without Tables
$= 1{\cdot}7321$.

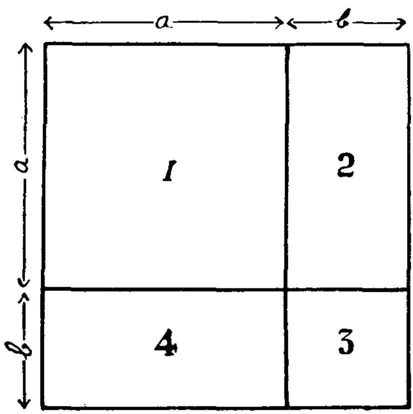
The pupil should draw the corresponding diagrams till he can do without drawing them.

W. Anderson.

Geometrical Illustrations of Algebraic Identities.—All these identities may be proved after one method as follows:—

Draw two straight lines at right angles and mark off parts *a* and *b* as indicated in the figures. At the points of section draw perpendiculars to the lines. All the figures thus formed are rectangles, and therefore have their opposite sides equal. The proofs should then be obvious.

I. $(a+b)^2$ = whole figure
= fig. 1 + fig. 2 + fig. 3 + fig. 4
$= a^2 + ab + b^2 + ab$
$= a^2 + 2ab + b^2$.



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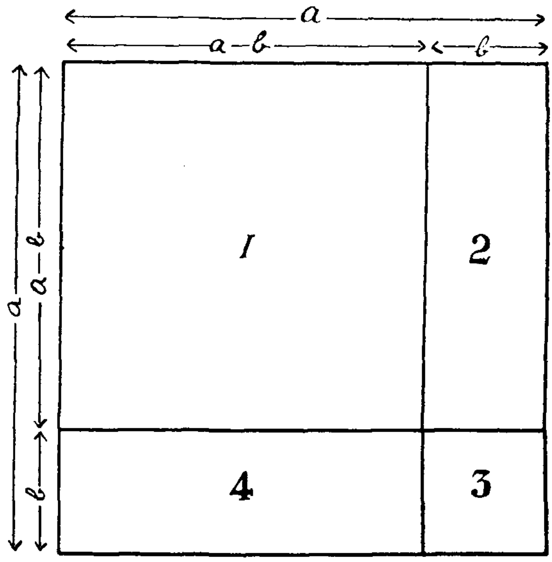
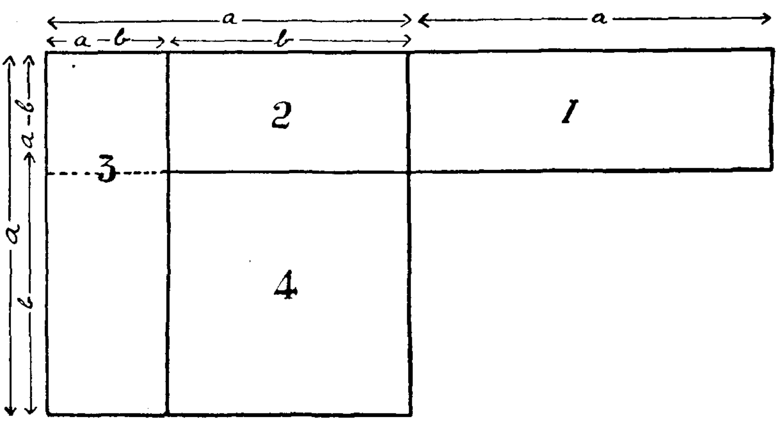
II. $(a-b)^2 = \text{fig. } 1$

$$= \overline{\text{fig. } 1 + \text{fig. } 2 + \text{fig. } 3 + \text{fig. } 4} + \text{fig. } 3 - (\overline{\text{fig. } 2 + \text{fig. } 3} + \overline{\text{fig. } 4 + \text{fig. } 3})$$
$$= \quad a^2 \quad + \quad b^2 \quad - \quad (ab + ab)$$
$$= \quad a^2 \quad + \quad b^2 \quad - \quad 2ab.$$



III. $(a+b)(a-b) = \text{fig. } 1 + \text{fig. } 2\,;$

$$= \text{fig. } 3 + \text{fig. } 2\,; \quad (\text{fig. } 3 = a(a-b) = \text{fig. } 1)$$
$$= \underbrace{\text{fig. } 3 + \text{fig. } 2 + \text{fig. } 4} - \text{fig. } 4\,;$$
$$= \quad a^2 \quad - \quad b^2.$$



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The pupils should be asked to state in words, in various ways, what they have proved.

PETER COMRIE.

Similar Figures.—(1) Let A, B, C represent Aberdeen, Glasgow, Edinburgh respectively on a map of Scotland. Let D, E, F represent the same places in order on a map of Scotland on a different scale. The straight line AB represents the road from Aberdeen to Glasgow, the straight line AC represents the road from Aberdeen to Edinburgh. The angle A represents the angle between these roads. The angle D represents the same angle. Hence $\widehat{A}=\widehat{D}$. Similarly $\widehat{B}=\widehat{E}$; $\widehat{C}=\widehat{F}$. The Δs ABC, DEF are equiangular. Now suppose the scale of the first map is, say, 7″ to 1 mile, and the scale of the second, 3″ to 1 mile.

Then $$\frac{AB}{DE}=\frac{7}{3};\ \frac{BC}{EF}=\frac{7}{3};\ \frac{CA}{FD}=\frac{7}{3};\ \text{or, } \frac{AB}{DE}=\frac{BC}{EF}=\frac{CA}{FD}.$$

Hence: *If two triangles are equiangular, the ratio of corresponding sides is the same for all; and conversely.*

(2) $$\frac{\Delta ABC}{\Delta DEF}=\frac{\textit{area of first map of Scotland}}{\textit{area of second map of Scotland}},$$

$$\text{or} = \frac{\textit{area of the first map of any county}}{\textit{area of the second map of the same county}},$$

$$\text{or} = \frac{\textit{any area on first map}}{\textit{corresponding area on second map}}.$$

Now describe on AB, DE the similarly situated squares ABPQ, DEXY. P and X represent the same place; Q and Y represent the same place: ABPQ, DEXY are corresponding areas. Hence

$$\frac{\Delta ABC}{\Delta DEF}=\frac{ABPQ}{DEXY}=\frac{AB^2}{DE^2}=\frac{BC^2}{EF^2}=\frac{CA^2}{FD^2}.$$

The ratio of the areas of similar triangles is the square of the ratio of corresponding sides of the triangles.

(3) Let ABCDE, PQRST be corresponding polygonal "counties" on the two maps. Then