in F, and BC in G respectively. Shew that triangles ACG and BCF are similar.

The angle ACB is common to the two triangles ACG and BCF. We can easily prove that AB bisects HE (by 6th Book), thus we get $AH=AE$, and angle ABH equals angle ABE, since the two circles are equal. But angle ABH equals angle ACH, since both stand on the arc AH.

∴ In the two triangles ABF and ACD angle BAC is common, and angle ACD equals angle ABF.

∴ AFB equals angle ADC equals right angle. In the same manner angle AGB equals right angle.

∴ Angle BFC equals angle AGC equals right angle.

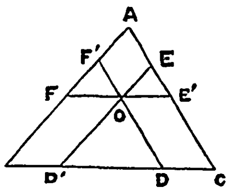
∴ Triangles AGC and BCF are similar.

113. Since angle AFB equals angle AGB equals right angle, a circle will go round quad. $ABGF$.

Solution by the proposer, Prof. Edgar Frisby, M.A., Washington, U.S. Frank Boultbee also solved this problem.

117. If α, β, γ are the lengths of the lines drawn through any point O within a triangle parallel to the sides, then will

$$\frac{\alpha}{a}+\frac{\beta}{b}+\frac{\gamma}{c}=2.$$



$$\frac{\alpha}{a}=\frac{AF}{AB}$$

$$\frac{\beta}{b}=\frac{BF'}{AB}$$

$$\frac{\gamma}{c}=\frac{ED'}{AB}=\frac{EO+OD'}{AB}=\frac{AF'+BF}{AB},$$

therefore

$$\frac{\alpha}{a}+\frac{\beta}{b}+\frac{\gamma}{c}=\frac{AF+BF+FF'+AF'+BF}{AB}=2.$$

PROBLEMS.

137. The sides of a triangle ABC are divided in order in ratio $m:n$, and the points of section joined and a new triangle formed; the sides of this being divided as before, and so on to the r^{th} triangle.

Shew that the areas of the given triangle and the r^{th} inscribed triangle are in ratio $\left\{\frac{(m+n)^2}{m^2-mn+n^2}\right\}^r$, and also that any rational algebraic function of the areas of the odd triangles of the series will be to the same function of the areas of the even triangles in ratio $\frac{(m+n)^2}{m^2-mn+n^2}$.

138. Sum the infinite series

$$\frac{1}{1.2}\tan\theta+\frac{1}{2.3}\tan^2\theta-\frac{1}{3.4}\tan^3\theta-\frac{1}{4.5}\tan^4\theta+\text{etc.}$$

139. Prove that

$$\begin{vmatrix} \frac{b+c}{a}, & \frac{a}{b+c}, & \frac{a}{b+c} \\ \frac{b}{c+a}, & \frac{c+a}{b}, & \frac{b}{c+a} \\ \frac{c}{a+b}, & \frac{c}{a+b}, & \frac{a+b}{c} \end{vmatrix}=\frac{2(a+b+c)^3}{(a+b)(b+c)(c+a)}$$

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