In triangle DAQ_1, $r = FA \cdot \tan(FAQ_1)$ and $r = FD \cdot \tan(FDQ_1)$

$FA = \dfrac{r}{\tan(FAQ_1)}$ and $FD = \dfrac{r}{\tan(FDQ_1)}$, but FA + FD = AD

$r \cdot \tan(FDQ_1) + r \cdot \tan(FAQ_1) = AD \cdot \tan(FAQ_1) \cdot \tan(FDQ_1)$, so $r = \dfrac{AD \cdot \tan(FAQ_1) \cdot \tan(FDQ_1)}{\tan(FAQ_1) + \tan(FDQ_1)}$

Let AD=1 and let tan(m) = t

Angle DAE= 90°–2m; tan DAE = tan(45°–m); $\tan(45^\circ - m) = \dfrac{1 - \tan(m)}{1 + \tan 45^\circ \cdot \tan(m)} = \dfrac{1-t}{1+t}$

$$r = \frac{\frac{1\cdot(1-t)}{1+t}\cdot t}{\frac{(1-t)}{(1+t)}\cdot t} = \frac{\frac{t\cdot(1-t)}{(1+t)}}{\frac{(1-t)+t\cdot(1+t)}{(1+t)}} = \frac{t\cdot(1-t)}{1+t^2} \quad \text{.......}[1]$$

In triangle DCB, $CD = DE + EC = 2 \cdot \cos(2m) = 2 \cdot \dfrac{1 - \tan^2 m}{1 + \tan^2 m} = 2 \cdot \dfrac{1 - t^2}{1 + t^2}$

$r = CG \cdot \tan(GCQ_2)$ and $r = DG \cdot \tan(GDQ_2)$

$CG = \dfrac{r}{\tan(GCQ_2)}$ and $GD = \dfrac{r}{\tan(GDQ_2)}$, but CG + GD = CD

$r \cdot \tan(GDQ_2) + r \cdot \tan(GCQ_2) = CD \cdot \tan(GDQ_2) \cdot \tan(GCQ_2)$, so $r = \dfrac{AD \cdot \tan(GDQ_2) \cdot \tan(GCQ_2)}{\tan(GDQ_2) + \tan(GCQ_2)}$

$\measuredangle$ACD=2m; $\measuredangle$CAJ=$\measuredangle$CJA = 90°–m = $\measuredangle Q_2JD$; so $\measuredangle JQ_2G$=m and $\measuredangle Q_2AH$ = 90°–3m
$CQ_2 = AQ_2$ and $Q_2G = Q_2H = r$ so $\measuredangle Q_2CG$ = 90°–3m

$\tan(DCQ_2) = \tan(90^\circ - 3m) = \cot(3m) = \dfrac{1 - 3\cdot\tan^2 m}{3\cdot\tan m - \tan^3 m} = \dfrac{1 - 3t^2}{3t - t^3}$

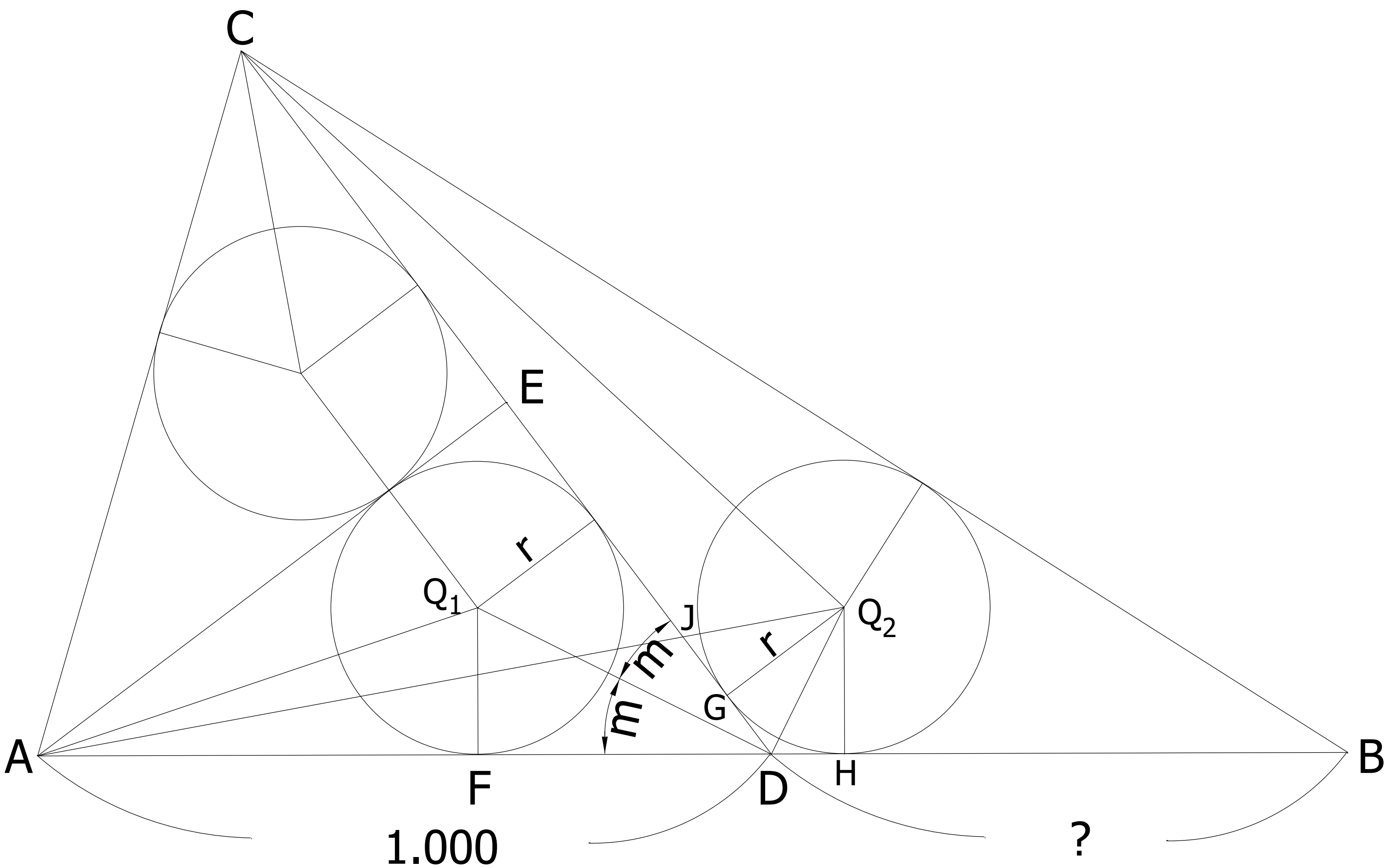
$$r = \frac{2(1-t^2)}{(1+t^2)} \cdot \frac{\frac{1}{t}\cdot\frac{(1-3t^2)}{(3t-t^3)}}{\frac{1}{t}\cdot\frac{(1-3t^2)}{(3t-t^3)}} = \frac{2(1-t^2)(1-3t^2)}{(1+t^2)(4t-4t^3)} = \frac{(1-3t^2)}{2t(1+t^2)} \quad \text{.......}[2]$$

Equating [1] and [2]: $\dfrac{t\cdot(1-t)}{1+t^2} = \dfrac{(1-3t^2)}{2t(1+t^2)}$; $2t^2(1-t) = 1-3t^2$ and $2t^3 - 5t^2 + 1 = 0$

or $2(t-1)(t^2-2t-1) = 0$ from which t = ½ or $t = 1 \pm \sqrt{2}$ and m=26°33'54.2" and 135°
Using t = ½, r= 1/5; AE = sin(2m)= 0.8 and DE=cos(2m)= 0.6

Angle ACB = angle CAB = 180°– 4m = 73°44'23.3", making angle CBA = 32°31'13.6"
AD must equal AC for the symmetry to exist, so

$\dfrac{1}{\sin 32^\circ 31' 13.6''} = \dfrac{AB}{\sin 73^\circ 44' 23.2''}$ and AB = 1.7857124 so DB = 0.7857124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