0.1

Theorem 0.0.1.1

To construct a triangle out of three straight lines which equal three given straight lines, it is necessary that the sum of any two of the straight lines should be greater than the remaining one.

Construction

1. Let $A = 4$, $B = 5$, and $C = 6$ be the three given straight lines. Construct a triangle with sides equal to A, B, and C if $A + B > C$, $A + C > B$, and $B + C > A$. I.20

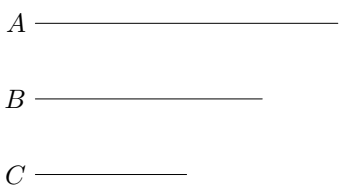

Figure 1: Triangle Construction Step:1

2. Set out a straight line $\overline{DE}$, terminated at D but of infinite length in the direction of E. Make

$$\overline{DF} = A$$

$$\overline{FG} = B$$

$$\overline{GH} = C$$

I.Post.3 I.Post.1

Figure 2: Triangle Construction Step:2

3. Describe $\mathscr{C}(F; FD)$.

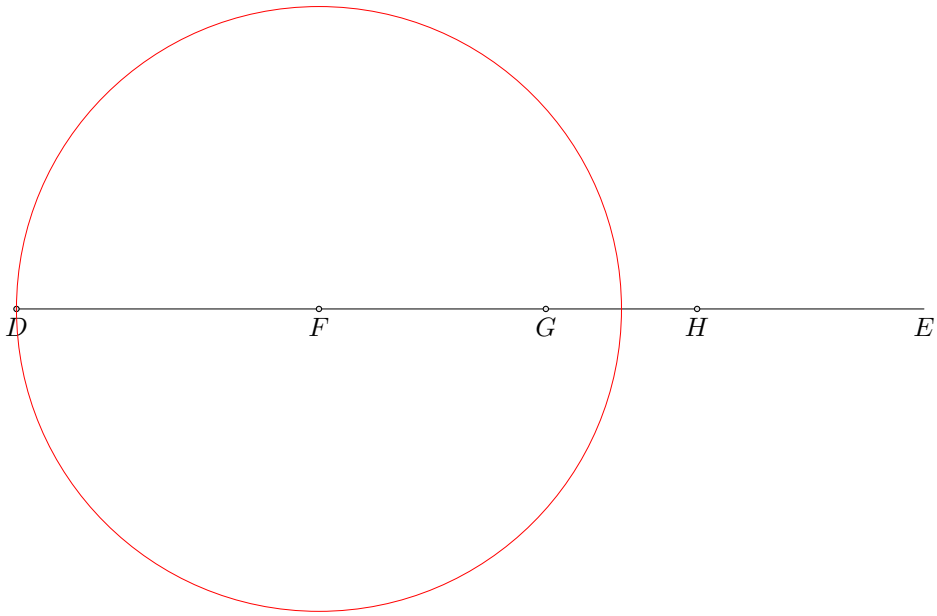

Figure 3: Triangle Construction Step:3

4. Again, describe $\mathscr{C}(G; GH)$.

5. Find the intersection of $\mathscr{C}(F; FD)$ and $\mathscr{C}(G; GH)$, K.

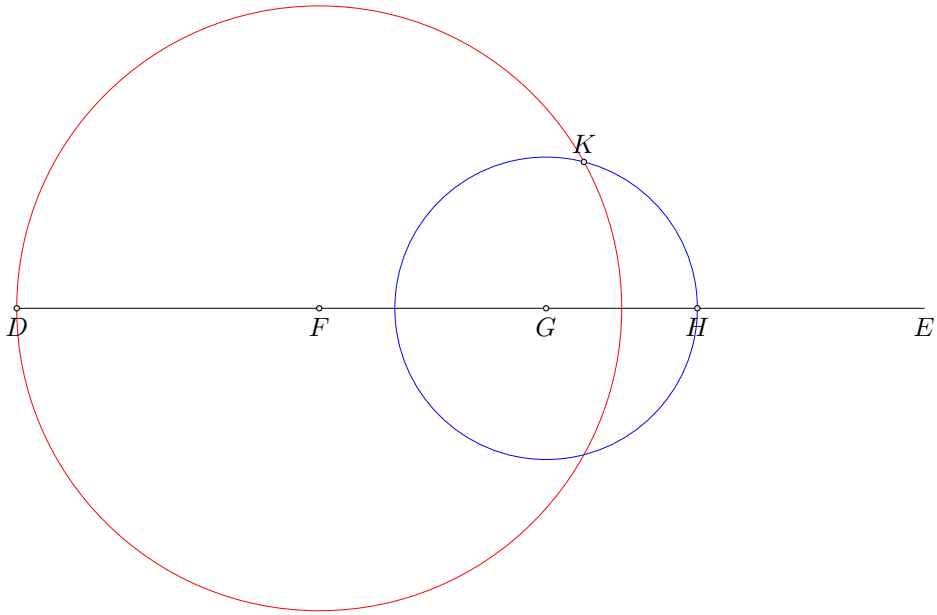

Figure 4: Triangle Construction Step:4

6. Join $\overline{KF}$ and $\overline{KG}$. I.Post.3, I,Post.1

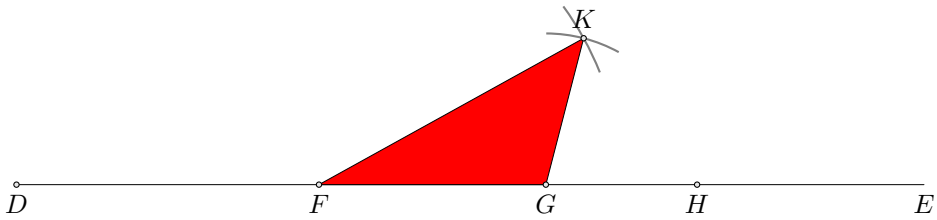

Figure 5: Triangle Construction Step:5

Claim: The $\widehat{KFG}$ has been constructed out of three straight lines equal to A, B, and C.

Proof.

- Since the point F is the center of $\mathscr{C}FD$,

$\therefore$

$$\overline{FD} = \overline{FK}$$

But

$$\overline{FD} = A$$

$\therefore$

$$\overline{KF} = A$$

I.Def.16 C.N.1

- Again, since the point G is the center of $\mathscr{G}GH$,

$\therefore$

$$\overline{GH} = \overline{GK}$$

But

$$\overline{GH} = C$$

$\therefore$

$$\overline{KG} = C$$

- And

$$\overline{FG} = B$$

$\therefore$ the three straight lines $\overline{KF}$, $\overline{FG}$, and $\overline{GK}$ equal the three straight lines A, B, and C.

$\therefore$ out of the three straight lines $\overline{KF}$, $\overline{FG}$, and $\overline{GK}$, which equal the three given straight lines A, B, and C, the $\widehat{KFG}$ has been constructed.

Q.E.F.