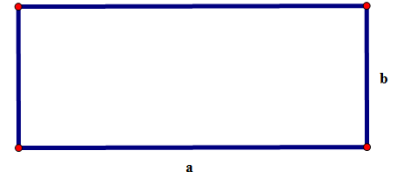


## Construct Square with Same Area as a Given Rectangle

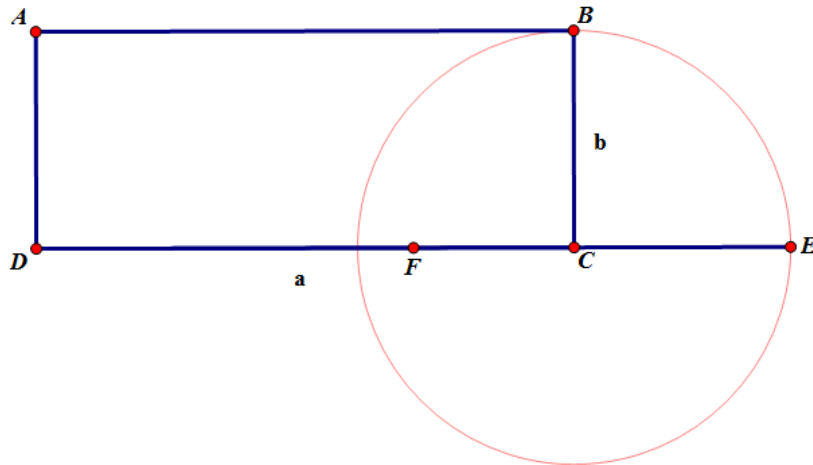
Problem: Given a rectangle with side lengths of  $a$  and  $b$ , construct a square with the same area.

Solution:

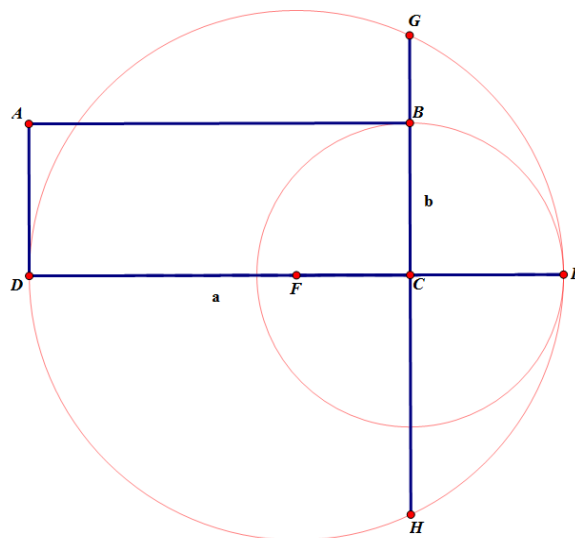
Given is the rectangle with i) sides  $a$  and  $b$ , ii) Area =  $ab$ . We want to construct a square with same area.



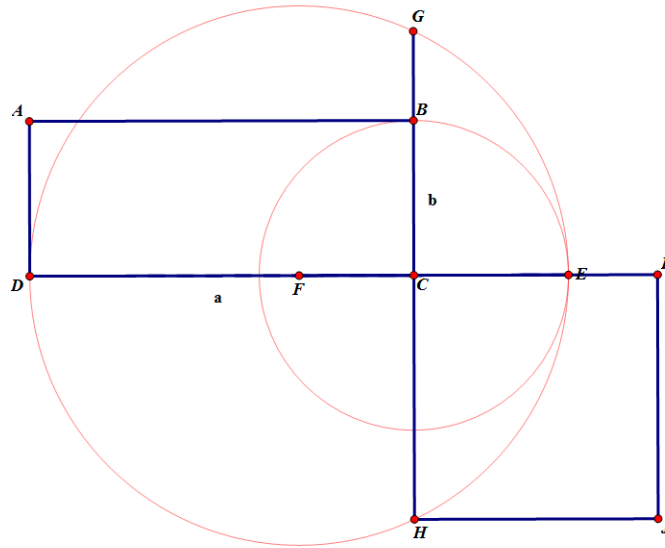
First, let's construct the segment  $BC$ . Then construct a circle with center at point  $C$  and radius  $BC$ . Then extend the segment  $DC$  and it intersect the circle at point  $E$ . Now  $F$  is the midpoint of segment  $DE$ .



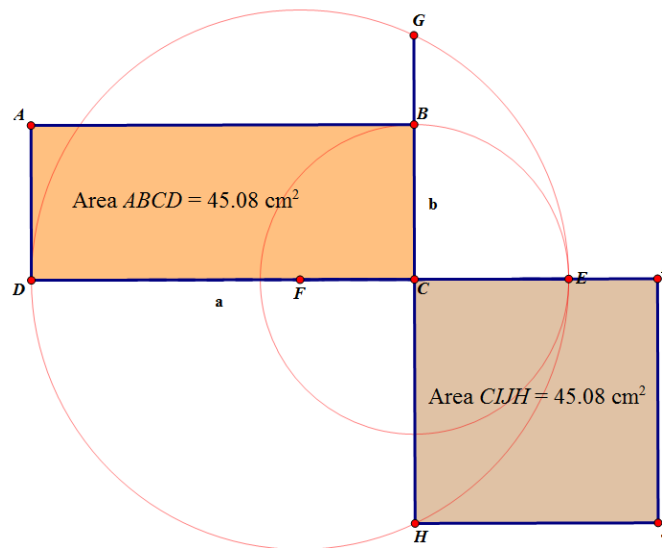
Now, construct a circle with center at point  $F$  and radius  $DF$ . If we extend the segment  $BC$  it intersect the circle at points  $G$  and  $H$ .



Next, construct a square with  $CH$  be the one side. So we have a Square  $CIJH$ .



Claim: Area of Rectangle  $ABCD$  is same as the area of Square  $CIJH$ .



By construction,  $CH$  is the geometric mean of sides  $DC$  and  $BC$ . So,  $CH = \sqrt{ab}$ . Hence area of Square  $CIJH = (\sqrt{ab})^2 = ab$ .

So, area of Rectangle  $ABCD$  is same as the area of the Square  $CIJH$ .