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TO DIVIDE THE GIVEN ANGLE INTO ANY NUMBER OF EQUAL PARTS

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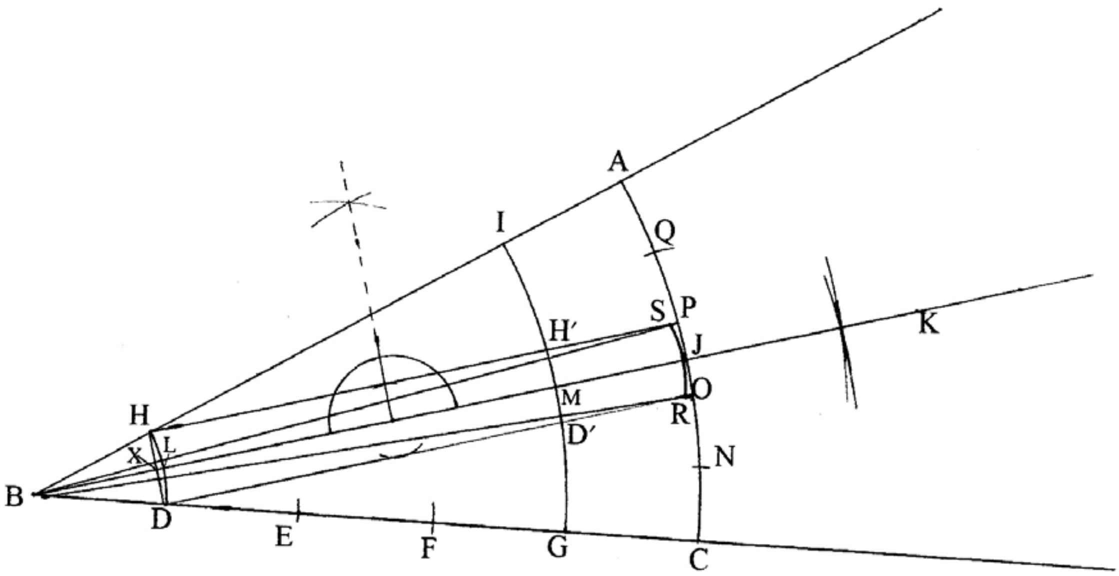

GIVEN: ∠ABC is the given angle.

REQUIRED: Let us divide ∠ABC into five equal parts.

CONSTRUCTION: Cut the five equal parts BD, DE, EF, FG and GC.

Divide ∠ABC in two equal parts with line BK. Draw an arc HD from centre B with radius BD. Which cuts the line BA at H and BK at L. Join HD which cuts BK at X.

Draw an arc from centre B with radius BC which cuts BA at A and BK at J. Draw an arc from centre B with radius BG which cuts BA at I and BK at M.

Draw line HH' and DD' parallel BK from H and D. Draw an arc from centre M with radius MJ which cuts DD' at R and HH' at S. Join BR and BS to cut the arc AC at O and P. Thus OP is the fifth part of arc AC.

Cut arc AC into five equal parts CN, NO, OP, PQ and QA with radius OP. Join BN, BO, BP, and BQ.

Thus ∠ABQ, ∠QBP, ∠PBO, ∠OBN, and ∠NBC are the five equal parts of ∠ABC.

Proof: Let ∠ABC = θ and BD = r
$\therefore$ BC = 5r
$\therefore$ HD = rθ

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and arc AC = 5rθ

$\therefore$ arc AC = 5 arc HD

arc RS = rθ

$$\therefore \theta = \frac{arc\ RS}{r}$$

If the length of arc RS is fixed then

$$\theta \propto \frac{1}{r}$$

$$\Rightarrow \quad \frac{\theta}{2} \propto \frac{1}{2r}$$

$$\Rightarrow \quad \frac{\theta}{3} \propto \frac{1}{3r}$$

$$\Rightarrow \quad \frac{\theta}{4} \propto \frac{1}{4r}$$

$$\text{and} \quad \frac{\theta}{5} \propto \frac{1}{5r}$$

To draw an arc for angle θ we take the centre M and radius MJ, for $\frac{\theta}{2}$ centre M_2 and radius M_2J, for $\frac{\theta}{3}$ centre M_3 and radius M_3J, for $\frac{\theta}{4}$ centre L and radius LJ and for $\frac{\theta}{5}$ centre B and radius BJ.

These arcs will be equal in length but not in shape and these arcs will go from the point J.

Remarks: (We can divide the arc AC with chord OP into five equal parts. This will be better method than that of division of $\angle$ABP and $\angle$CBO into two equal parts.) In my opinion this proof satisfy the learned mathematicians.

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