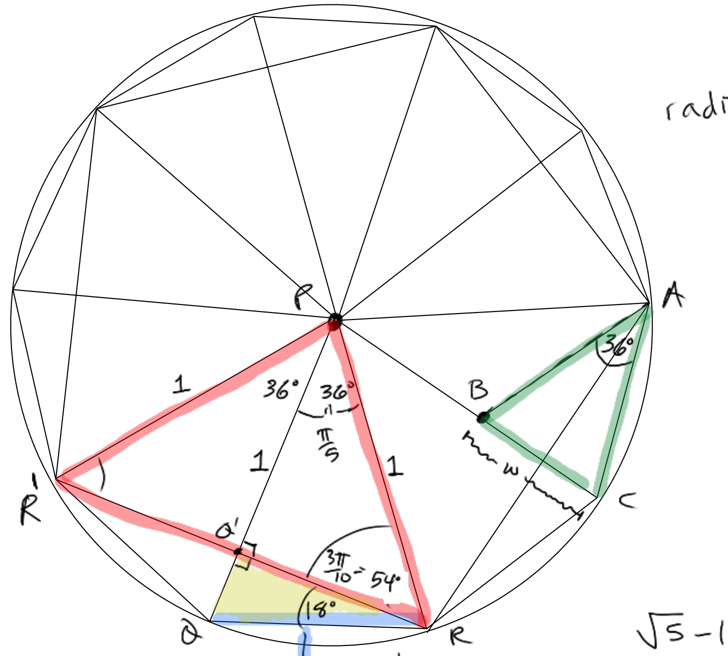
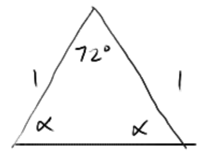


radius = 1

$72 + 2\alpha = 180$

$\alpha = 54$



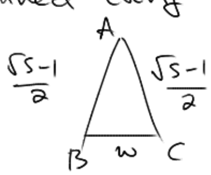
$72° - 54° = 18°$

part (a) $\Rightarrow x = \dfrac{\sqrt{5}-1}{2}$

① Start by in-laying unit-length isosceles 36° Δ @ center, 10 times to get decahedron.

② It's base length is $\frac{\sqrt{5}-1}{2}$ by (a)

③ Connect every other vertex for pentagon, making 18° angle. Double it to get ΔABC.



which is similar to first ΔPQR

④ Similar Δ's $\Rightarrow$ $\dfrac{\frac{\sqrt{5}-1}{2}}{w} = \dfrac{1}{\frac{\sqrt{5}-1}{2}}$ $\Rightarrow w = \left(\dfrac{\sqrt{5}-1}{2}\right)^2 = \dfrac{5-2\sqrt{5}+1}{4} = \dfrac{3-\sqrt{5}}{2}$

⑤ Finally, w is twice QQ', so $QQ' = \dfrac{3-\sqrt{5}}{4}$

⑥ So Pythag. $\Rightarrow (Q'R)^2 = \left(\dfrac{\sqrt{5}-1}{2}\right)^2 - \left(\dfrac{3-\sqrt{5}}{4}\right)^2 = \dfrac{5-2\sqrt{5}+1}{4} - \left(\dfrac{9-6\sqrt{5}+5}{16}\right)$

$$= \frac{24-8\sqrt{5}}{16} - \frac{14+6\sqrt{5}}{16} = \frac{10-2\sqrt{5}}{16}$$

$$Q'R = \sqrt{\frac{10-2\sqrt{5}}{16}} = \sqrt{\frac{5-\sqrt{5}}{8}} = \frac{\sqrt{5-\sqrt{5}}}{\sqrt{8}} = \frac{\sqrt{5-\sqrt{5}}}{2\sqrt{2}} = \frac{1}{2}\sqrt{\frac{5-\sqrt{5}}{2}}$$

⑦ And Q'R is exactly ½ of side of inscribed Pentagon

$$\overline{RR'} = \sqrt{\frac{5-\sqrt{5}}{2}}$$