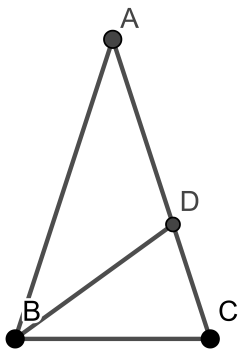
GEOMETRY | Activity 0510 | Name:
DR. PAUL L. BAILEY | Monday, May 10, 2021

Problem 1. Compute $\cos 72^\circ$ as follows.

Let $\triangle ABC$ be an isosceles triangle with apex at A and base angle at B with $m\angle B = 72^\circ$. By Euclid I.5, $m\angle C = 72^\circ$, whence $m\angle A = 36^\circ$.

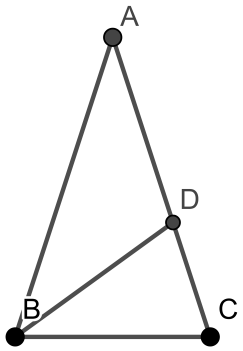
Let D be the point of intersection of $\overline{BC}$ and the angle bisector of $\angle B$. Join $\overline{BD}$.



(a) Show that $\triangle ABC \sim \triangle BCD$.

(b) Let $AB = 1$ and $BC = x$. Show that $BD = x$ and $AD = x$.

Problem 1 (continued)**.** Compute $\cos 72°$.



(c) Write CD in terms of x.

(d) By similarity, $\dfrac{AB}{BC} = \dfrac{BC}{CD}$.
Rewrite this equation as an equation whose only variable is x, and solve it for x.

(e) Say why $\cos(72°) = \dfrac{x}{2}$, and find $\cos(72°)$.