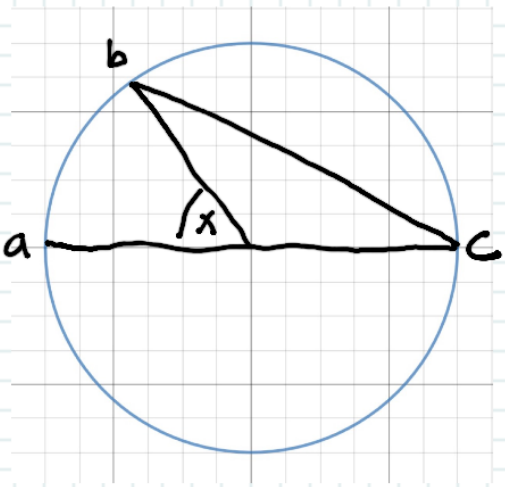
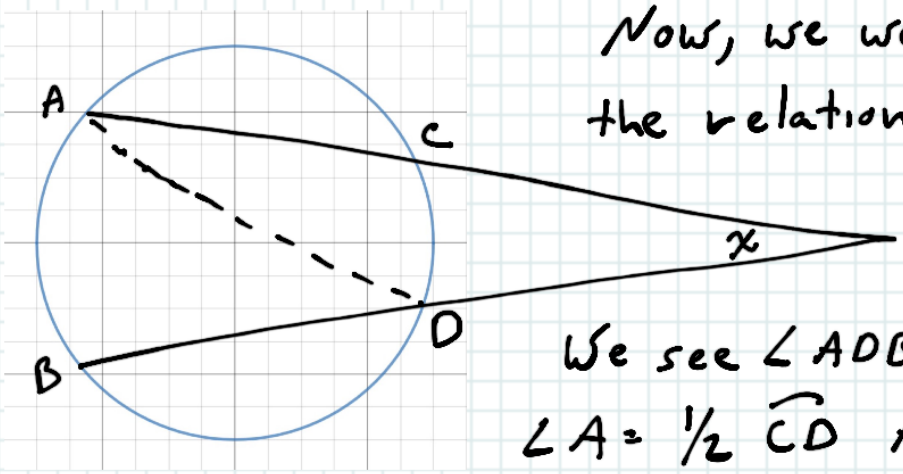
Proof of angle/arc relationships



$\angle x$ is a central angle with measure same as arc $\widehat{ab}$.

Note that $\angle b$ & $\angle c$ are congruent, as all radii are congruent.

$\angle x = \angle b + \angle c \therefore \angle c = \frac{1}{2}\angle x$



Now, we want to understand the relationship between angle x and the two arcs, $\widehat{ab}$ and $\widehat{CD}$.

We see $\angle ADB = \frac{1}{2}\widehat{AB}$ and $\angle A = \frac{1}{2}\widehat{CD}$ And we know that

$\angle ADB = \angle A + \angle x \therefore \angle x = \angle ADB - \angle A$

$= \frac{1}{2}\widehat{AB} - \frac{1}{2}\widehat{CD}$

or $\frac{1}{2}(\widehat{AB} - \widehat{CD})$