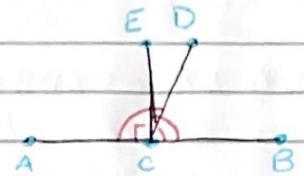
I-13: If DC meets AB at C (between A & B), then $\angle ACD + \angle DCB = 2\llcorner = \frown$

$\llcorner$: right angle; $\frown$: straight angle

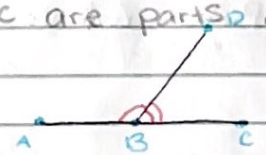


Proof:

1. make a right angle $\angle ACE$ at C. Then $\angle ECB$ is also a right angle. But $\angle ACB = \angle ACE + \angle ECB = 2\llcorner$.

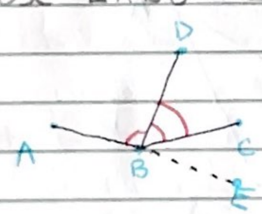
$\angle ACB = \angle ACD + \angle DCB = \frown$

I-14: If $\angle ABD + \angle DBC = 2\llcorner = \frown$ then AB & BC are parts of the same straight line



Proof:

Suppose $\angle ABD + \angle DBC = 2\llcorner$



1. Suppose by way of contradiction, that C is not on any extension of AB.
2. Extend AB past B (assuming C is on the other side of DB from A) to a point E such that $|BE| > |BC|$.

By I-13, $\angle ABD + \angle DBE = 2\llcorner$

$\underbrace{\angle ABD + \angle BDC}_{=2\llcorner} + \angle CBE > 2\llcorner$

So $2\llcorner > 2\llcorner$, violating Postulate IV.

Hence A, B, C are on the same straight line

Jan. 18 2024

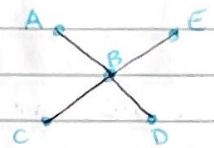
Lecture 5: Proposition I-15 and I-16

Jan. 18 2024

I-15: (Opposite Angle Theorem)

If two straight lines cross each other, then the opposite angles are equal

Proof: To show $\angle ABE = \angle CBD$ & $\angle ABC = \angle DBE$



Suppose AD crosses CE at B

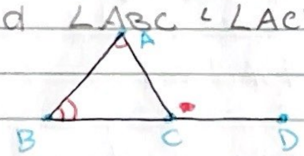
$\angle ABE + \angle EBD = 2\llcorner$ by I-13

$\angle CBD + \angle DBE = 2\llcorner$ by I-13

$\therefore \angle ABE = 2\llcorner - \angle EBD = \angle CBD$

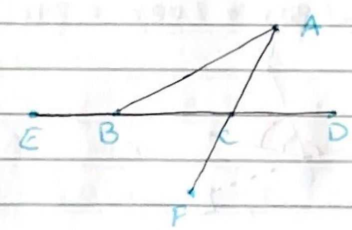
I-16:

Suppose we extend side BC of $\triangle ABC$ past C to D. Then $\angle BAC < \angle ACD$ and $\angle ABC < \angle ACD$



ie $\angle \bullet > \angle$ & $\angle \bullet > \angle$

Proof:



Complete proof Next time!
(2 hours :))