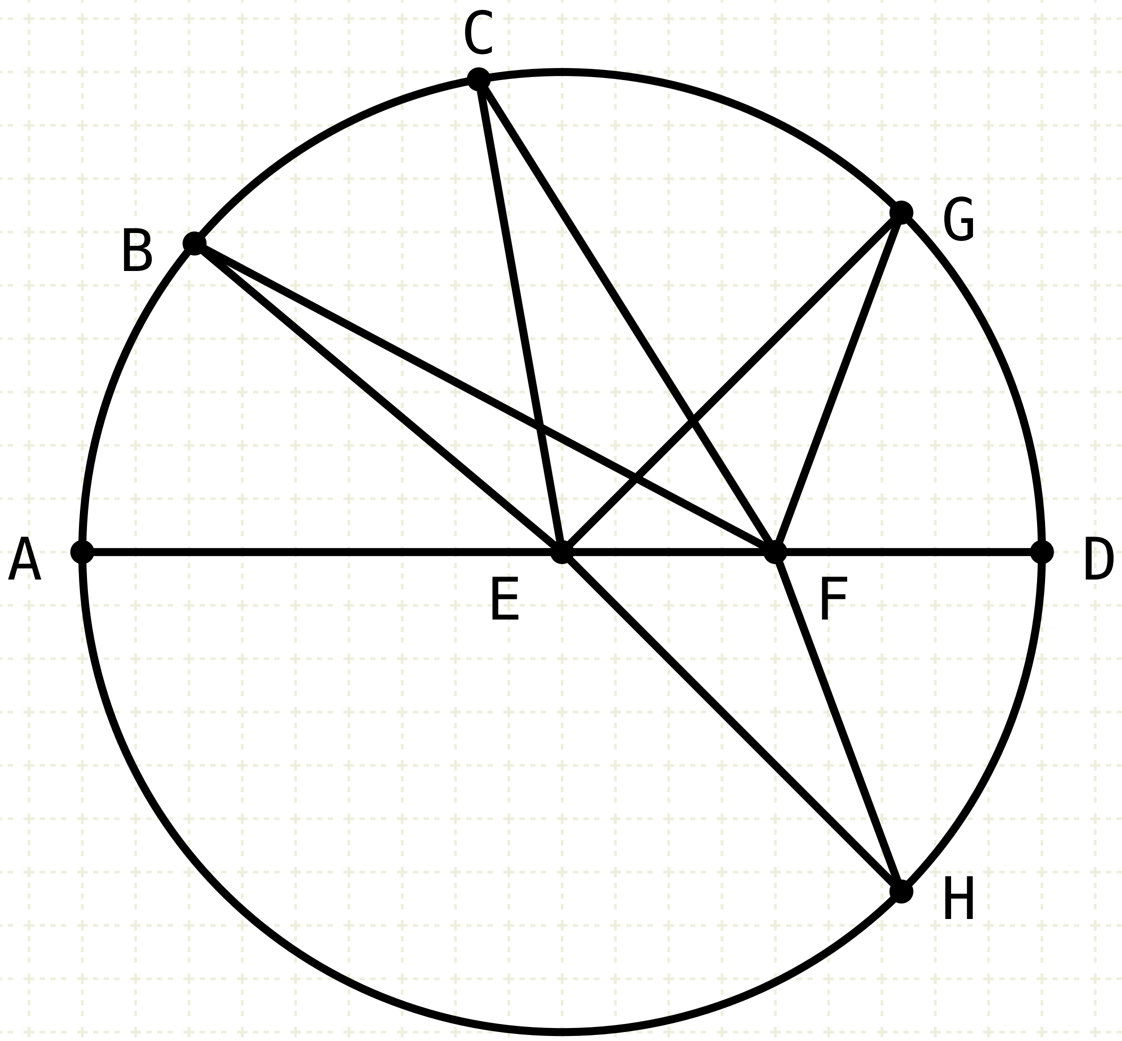
# Euclid's Elements

# Book III




*A circle is a round straight line with a hole in the middle.*

**Mark Twain**

quoting a schoolchild in "-English as She Is Taught-"

*If people stand in a circle long enough, they'll eventually begin to dance.*

**George Carlin, Napalm and Silly Putty (2001)**

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# Proposition 5 of Book III

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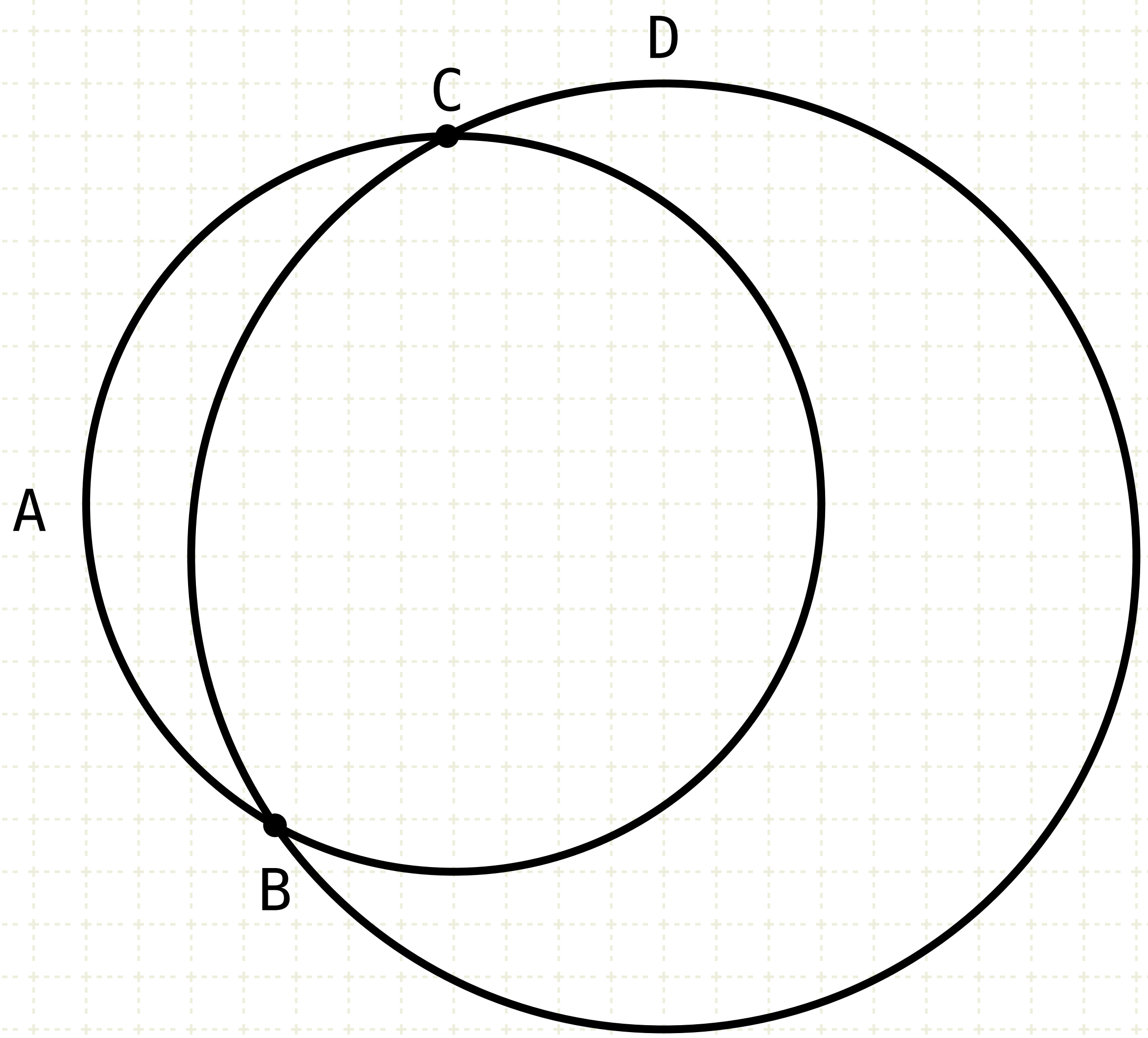


## In other words

If two circles ABC, and BCD cut each other, then the center of the ABC is not the same as the center of BCD

# Proposition 5 of Book III

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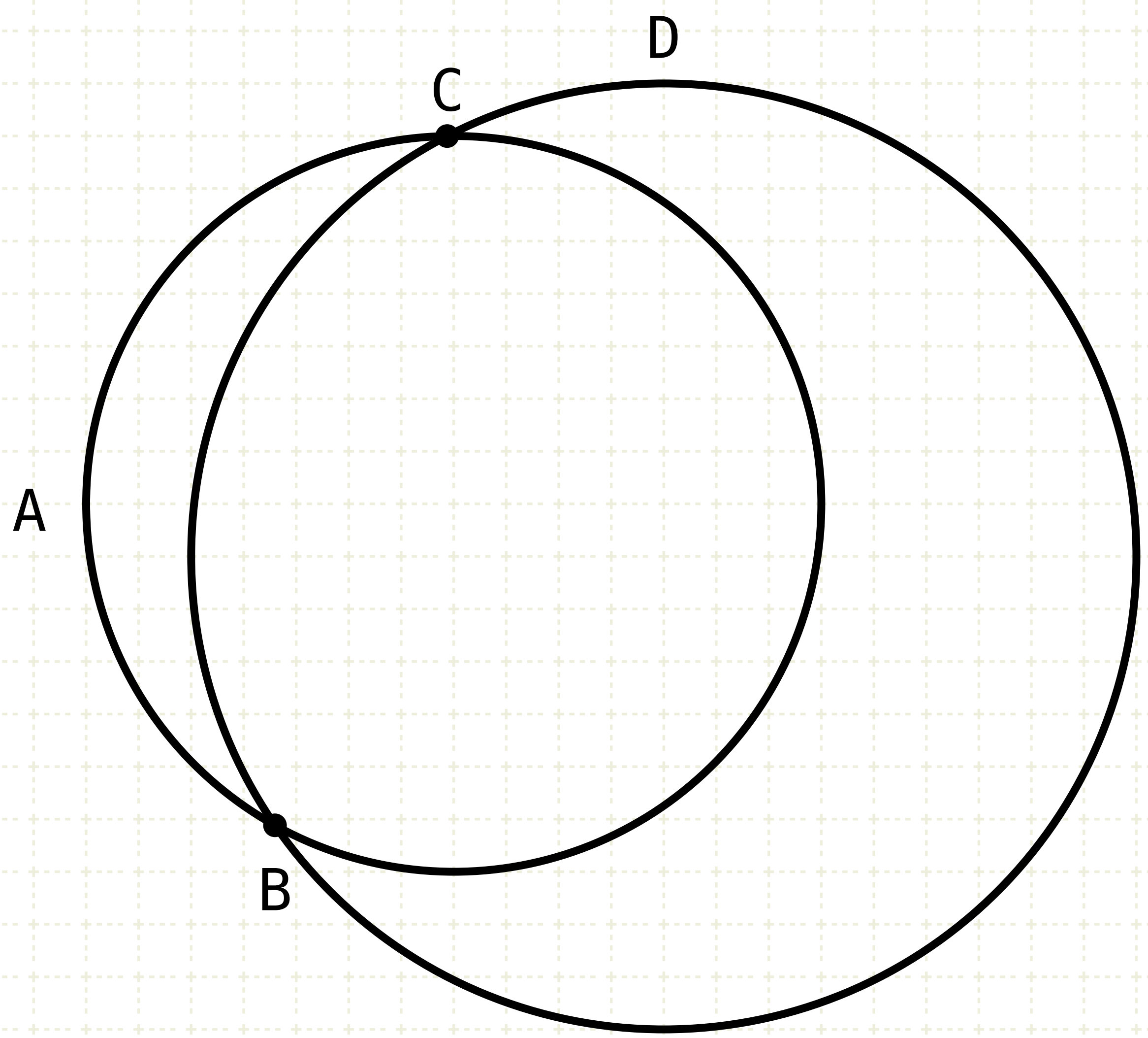


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If two circles ABC, and BCD cut each other, then the center of the ABC is not the same as the center of BCD

## Proof by contradiction

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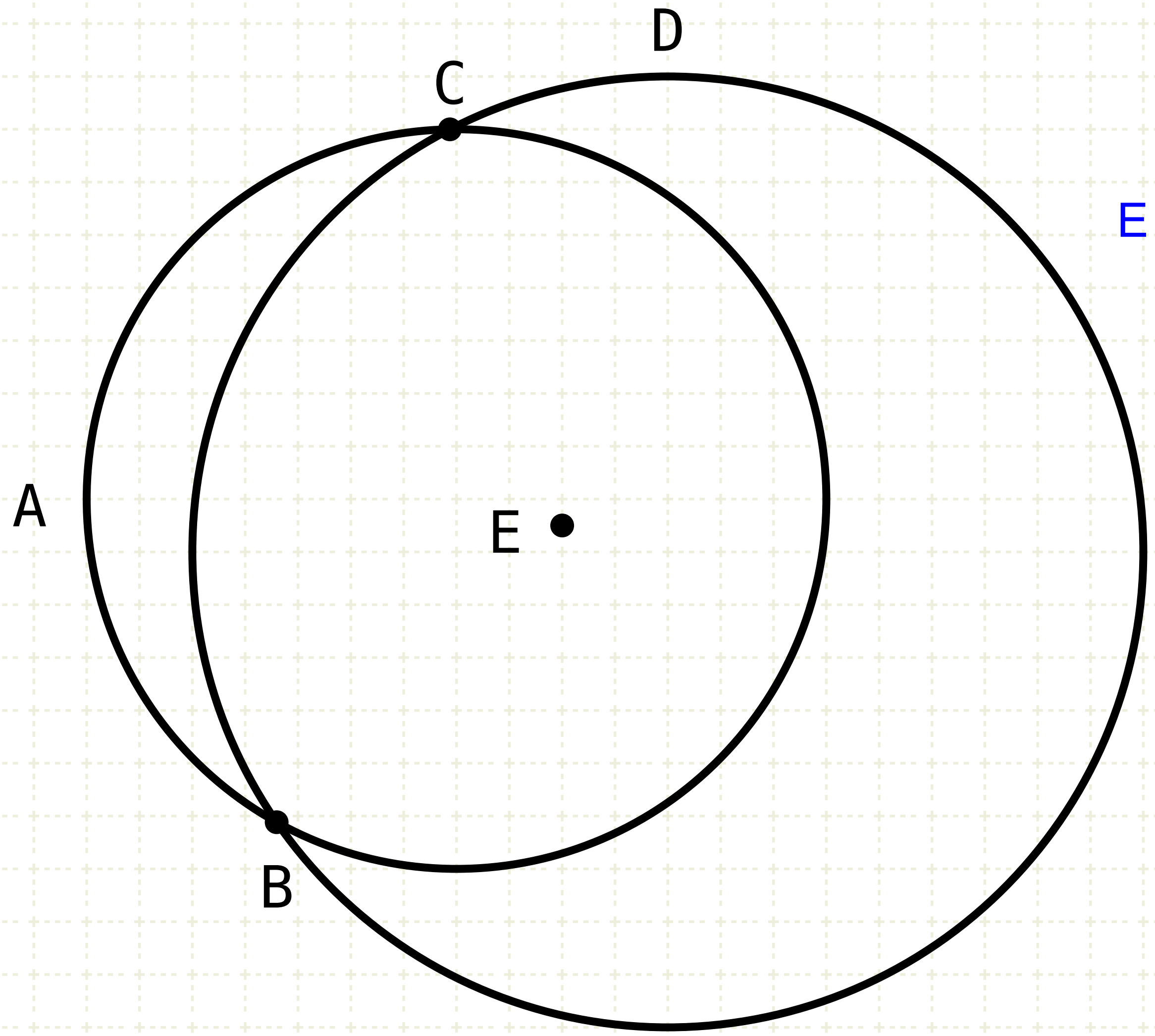


E is centre of both circles

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If two circles ABC, and BCD cut each other, then the center of the ABC is not the same as the center of BCD

## Proof by contradiction

Assume that E is the center of both circles

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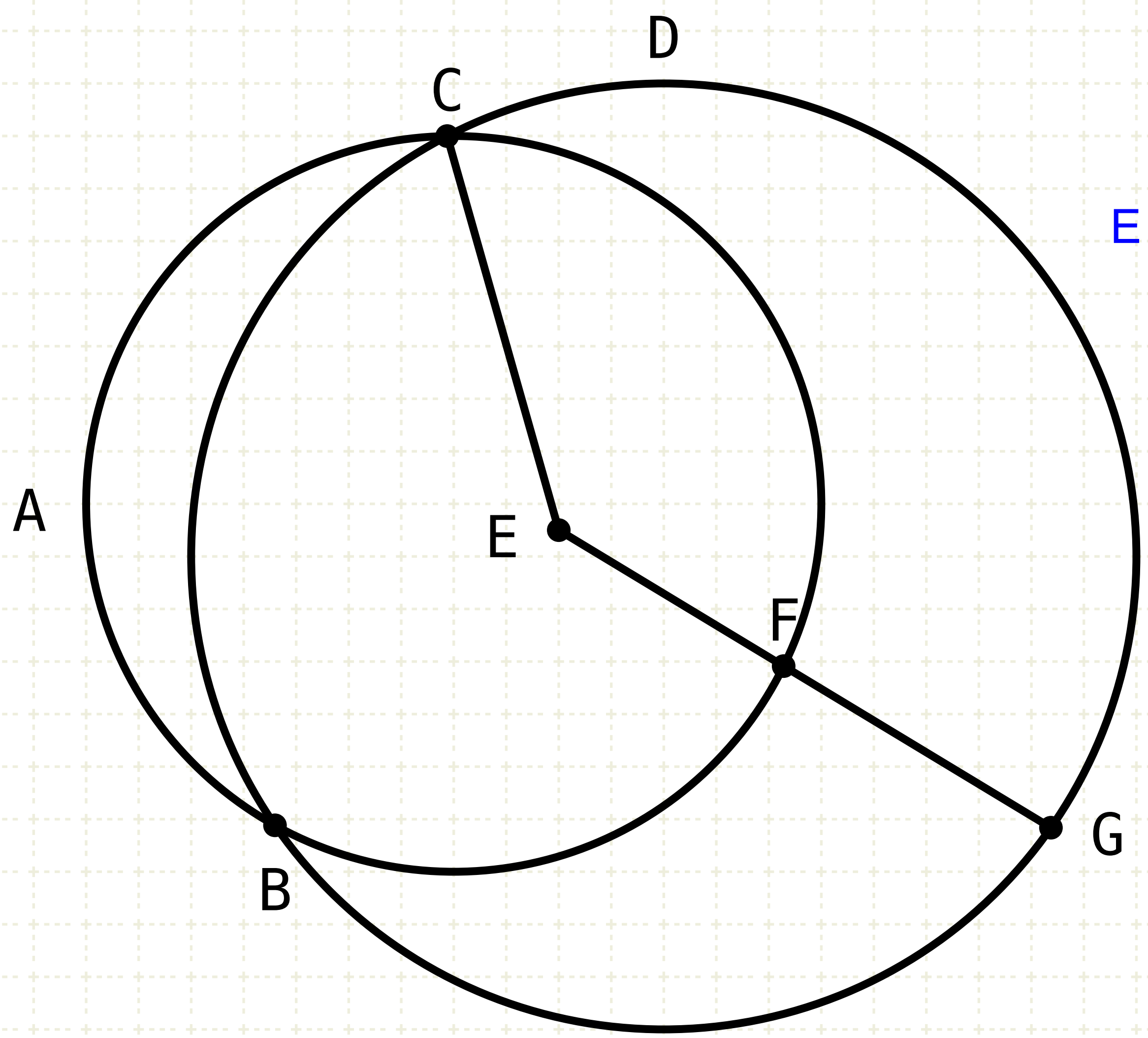


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If two circles ABC, and BCD cut each other, then the center of the ABC is not the same as the center of BCD

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Assume that E is the center of both circles

Join EC and draw a line EFG at random

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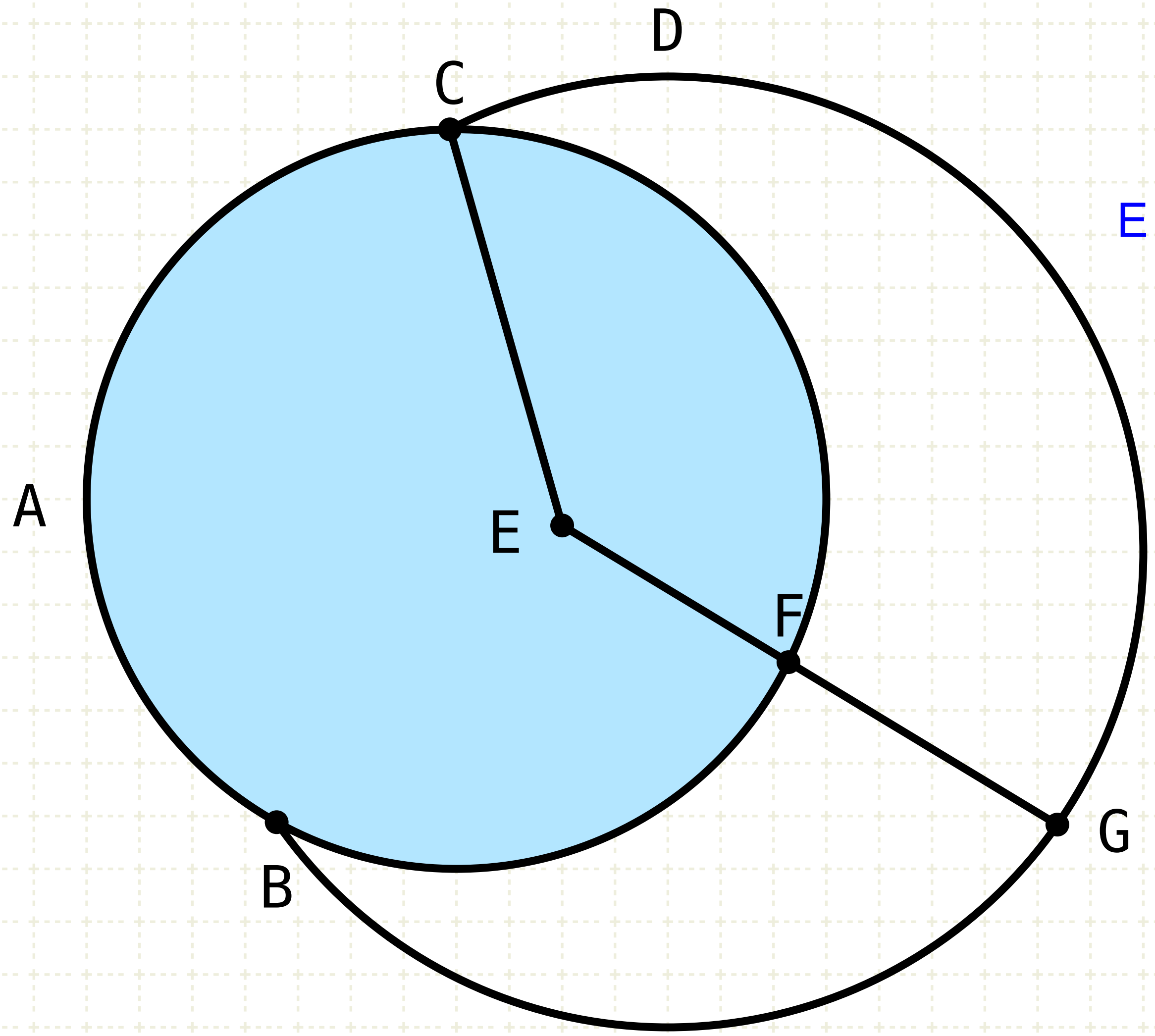


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CE = EF

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If two circles ABC, and BCD cut each other, then the center of the ABC is not the same as the center of BCD

## Proof by contradiction

Assume that E is the center of both circles

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Since CE and EF are radii of the circle ABC, they are equal

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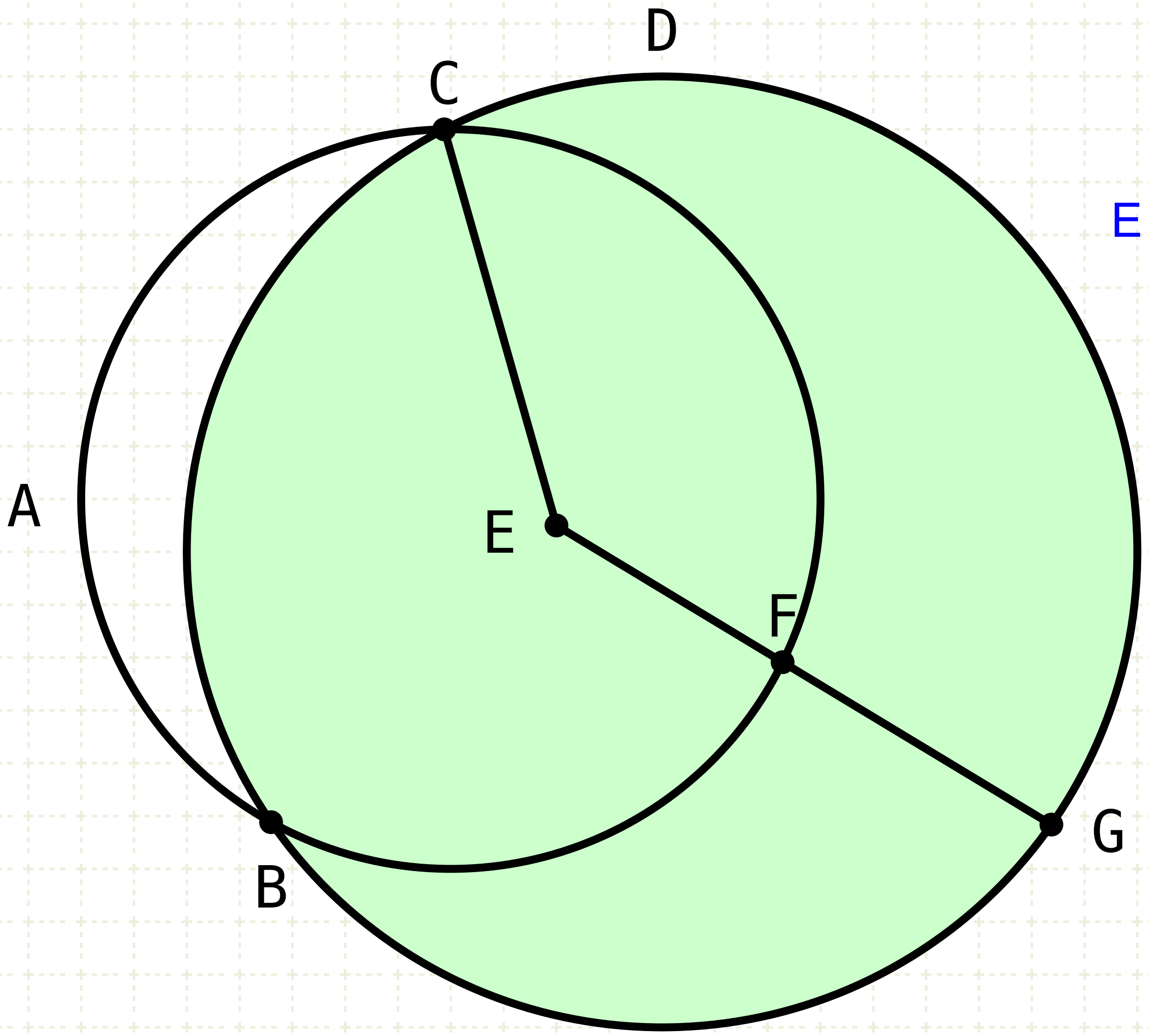


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If two circles ABC, and BCD cut each other, then the center of the ABC is not the same as the center of BCD

## Proof by contradiction

Assume that E is the center of both circles

- Join EC and draw a line EFG at random
- Since CE and EF are radii of the circle ABC, they are equal
- Since CE and EG are radii of the circle BCD, they are equal

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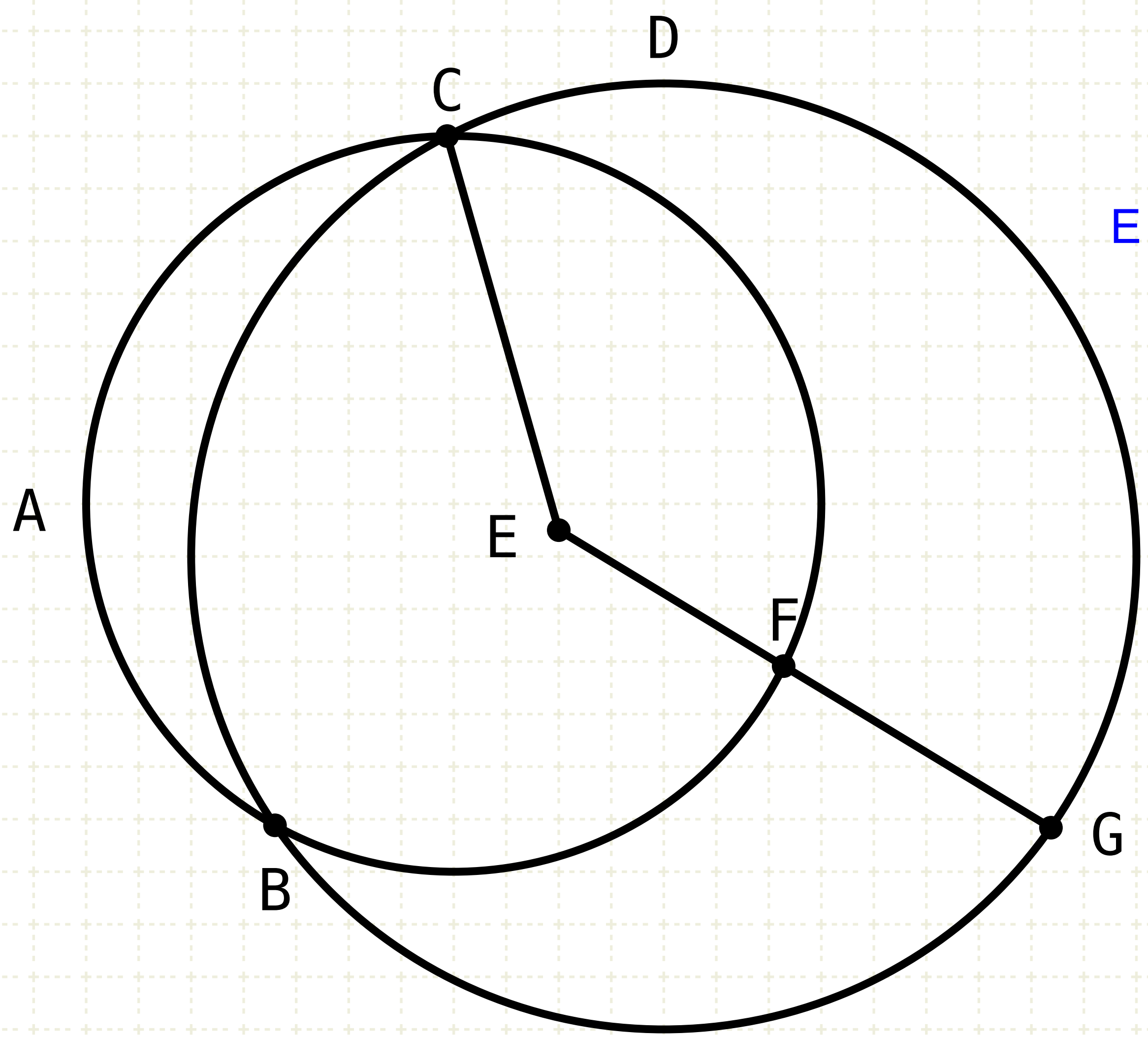


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Since EF and EG are both equal to CE, they are equal to each other

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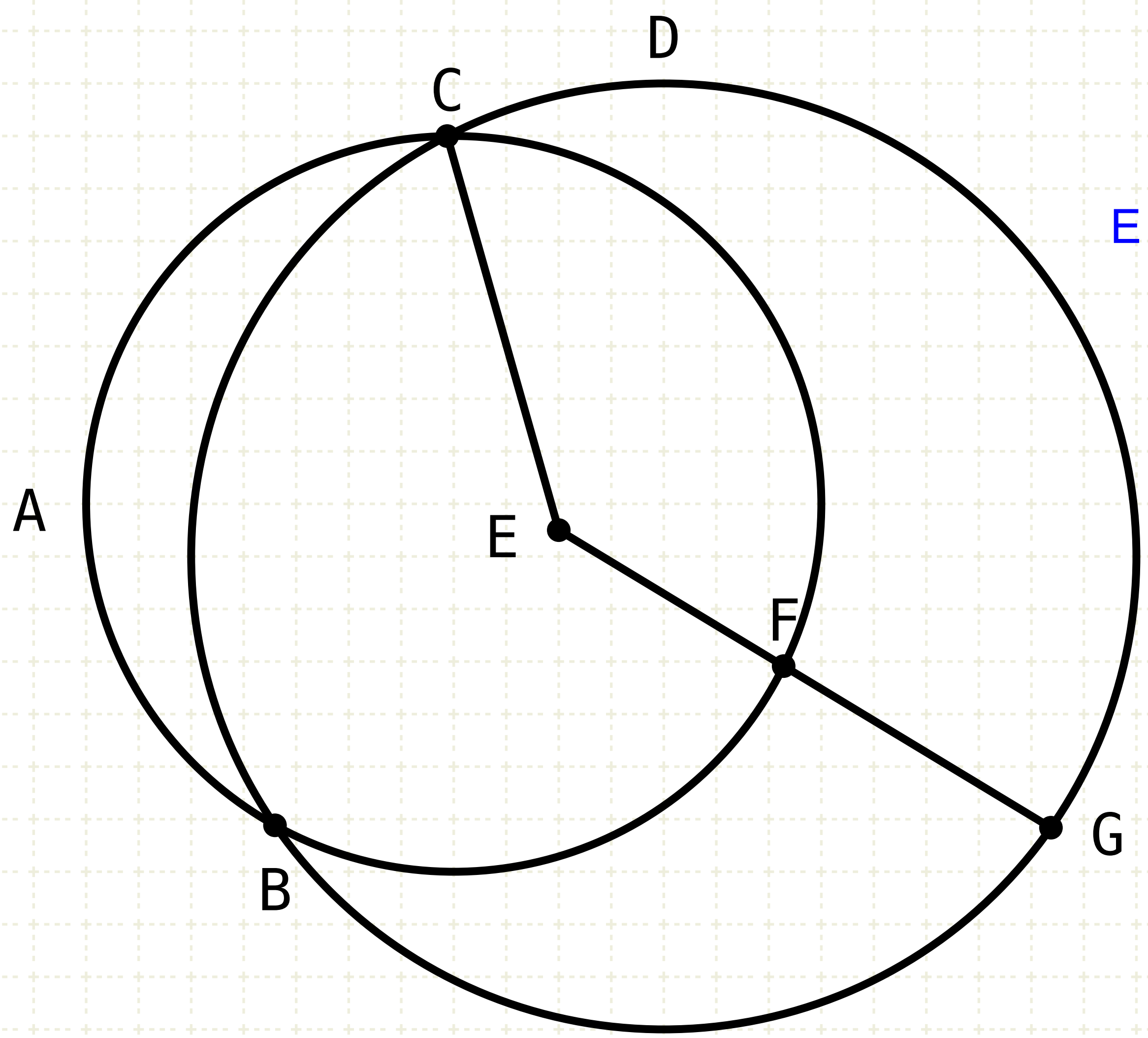


E is centre of both circles

CE = EF
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EF < EG

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- But EF is less than EG, which is inconsistent with the above statement

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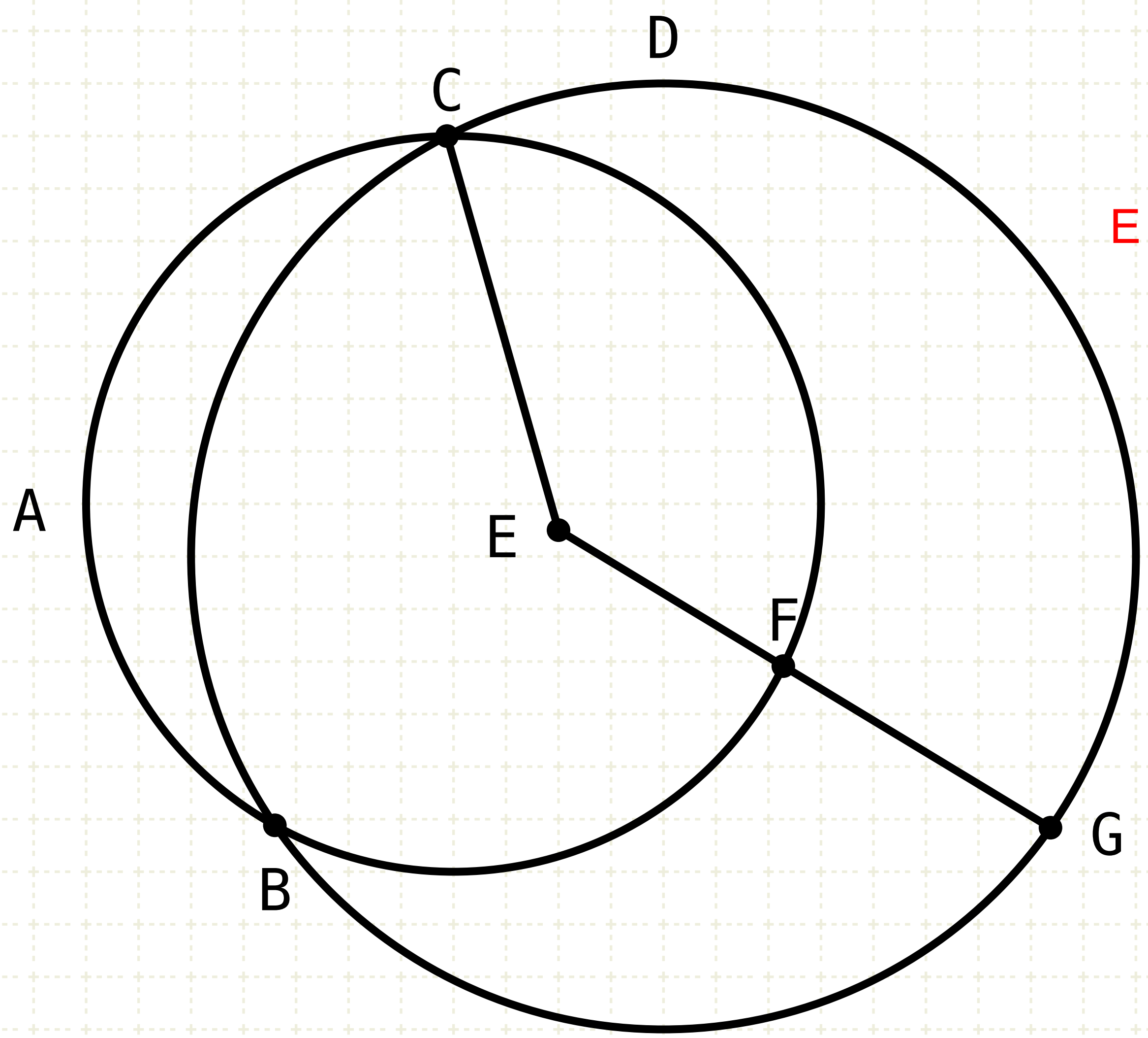


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Therefore E cannot be the center of both circles

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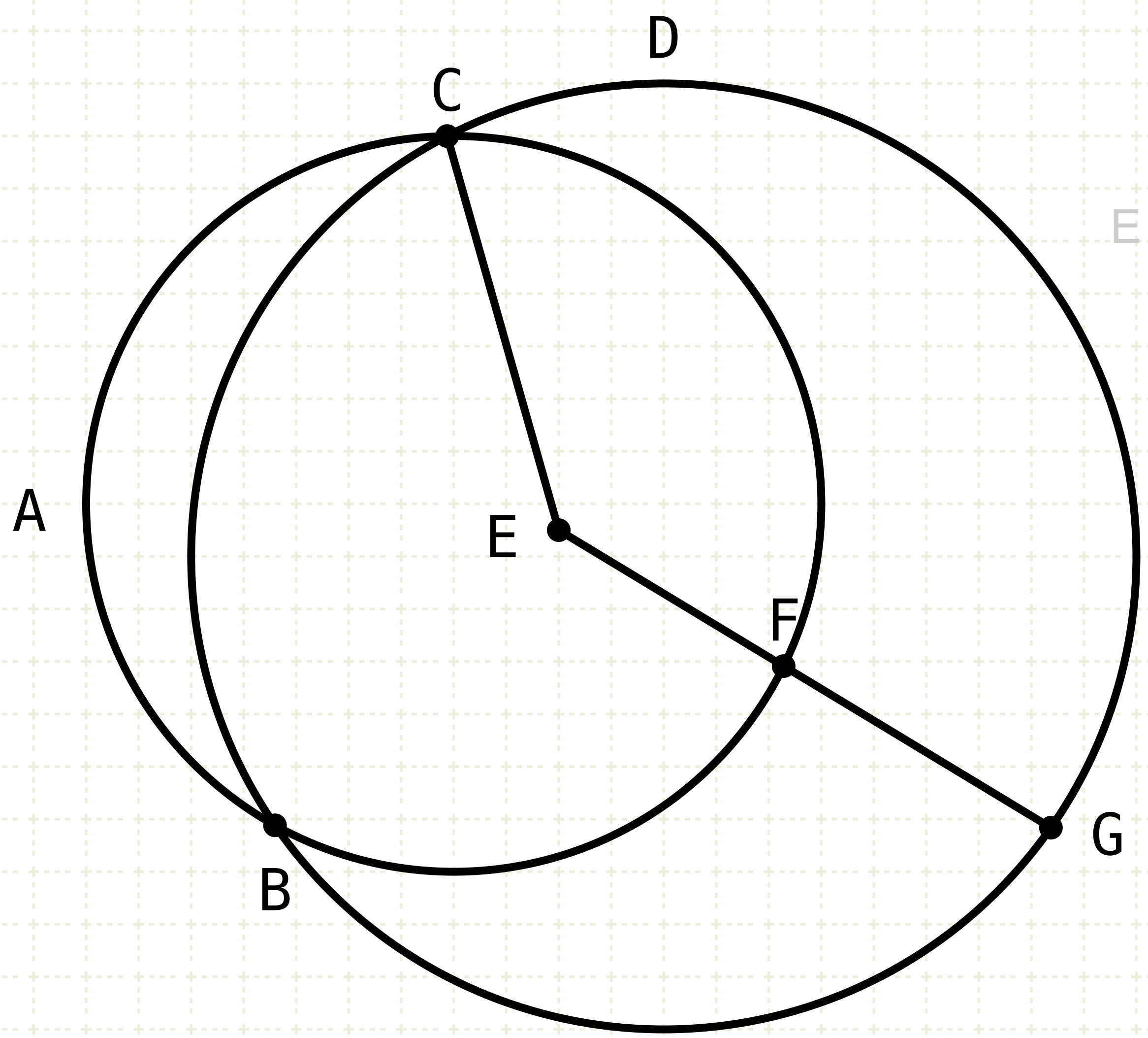


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