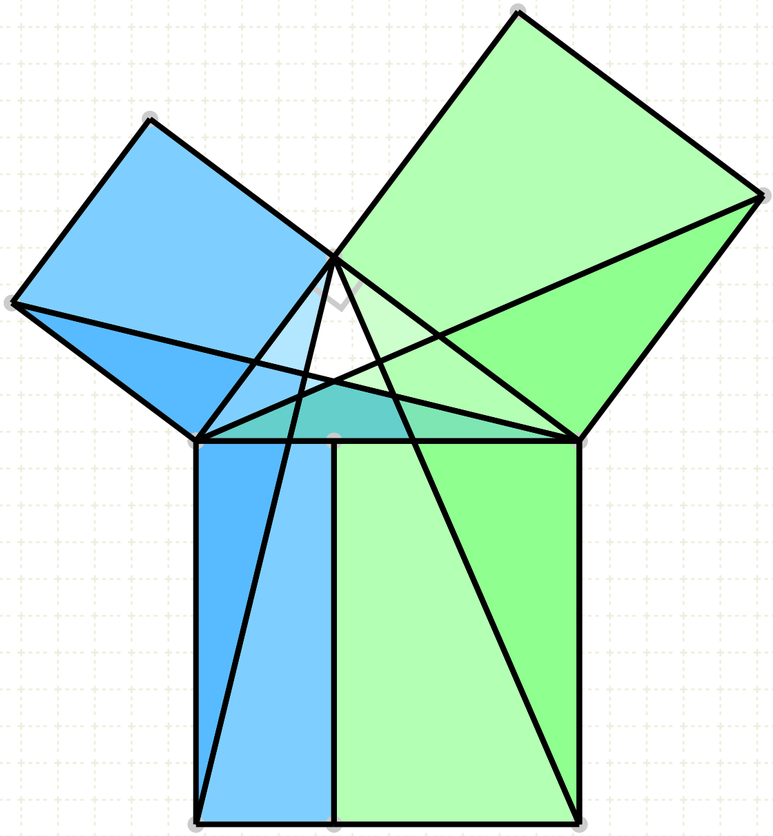
Euclid's Elements

Book I



If Euclid did not kindle your youthful enthusiasm, you were not born to be a scientific thinker.

Albert Einstein

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Proposition 2 of Book I

To place a straight line equal to a given straight line with one end at a given point.

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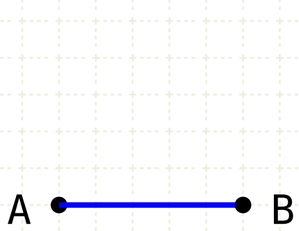

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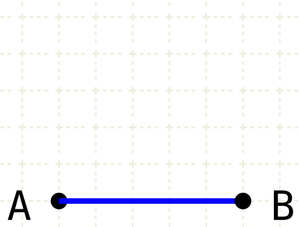

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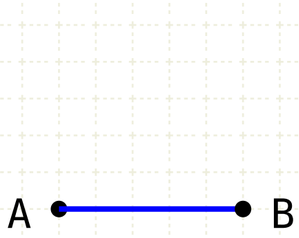

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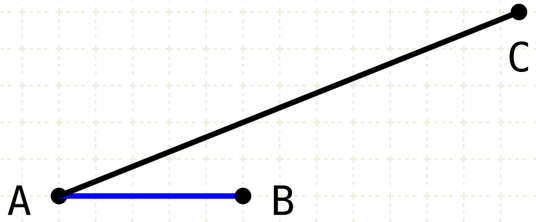

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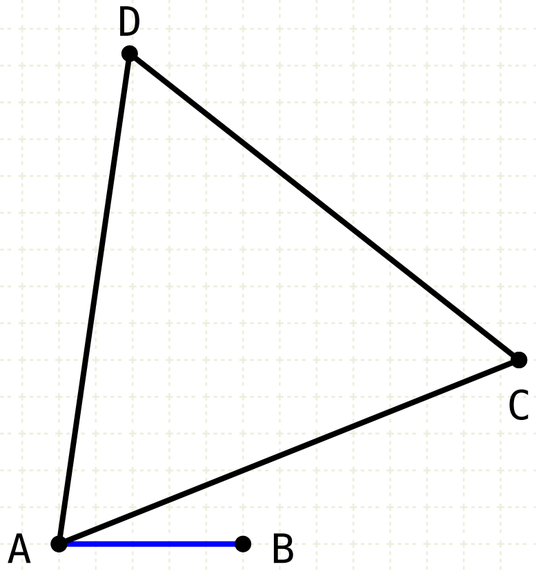

Construction:

Start with line segment AB and point C

Construct line segment AC

Construct an equilateral triangle on line AC (I·1)

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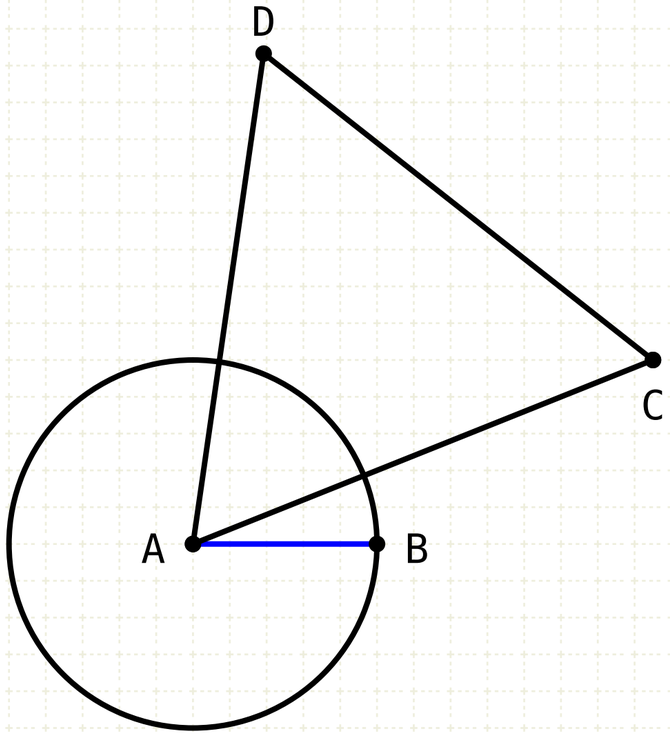

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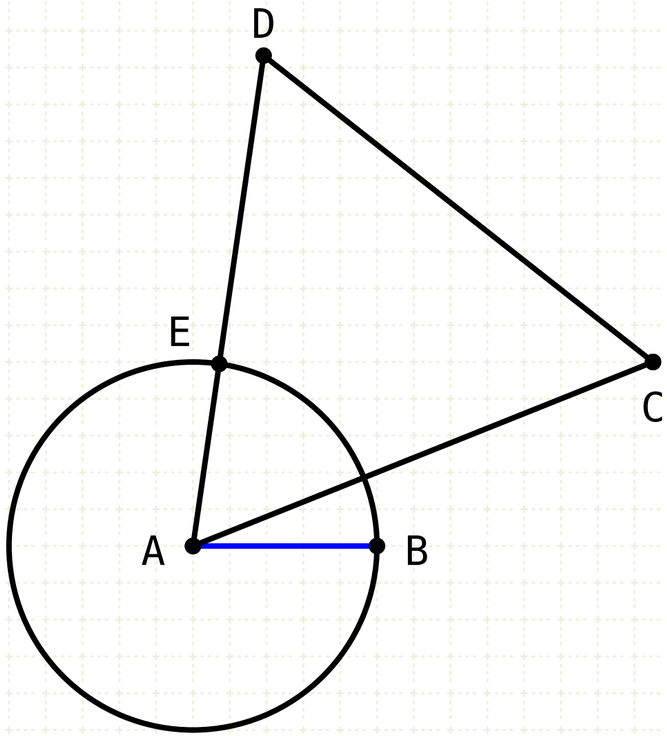

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Start with line segment AB and point C

Construct line segment AC

Construct an equilateral triangle on line AC (I·1)

Draw a circle with A as the center and AB as the radius

Label the intersection of the circle and line AD as E

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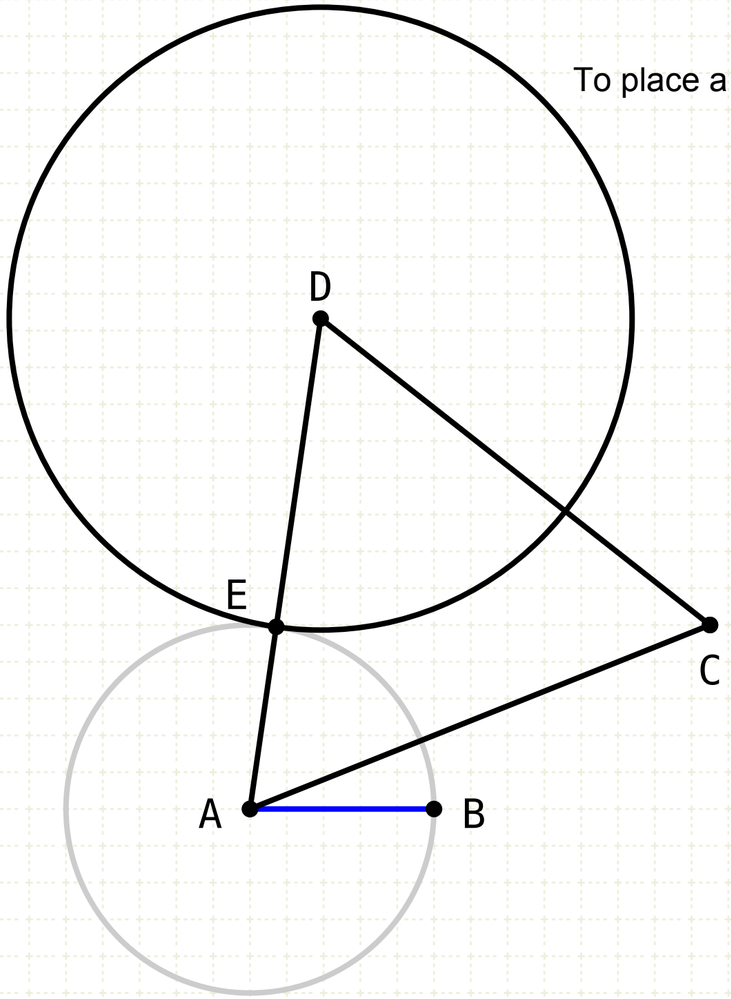

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Start with line segment AB and point C

Construct line segment AC

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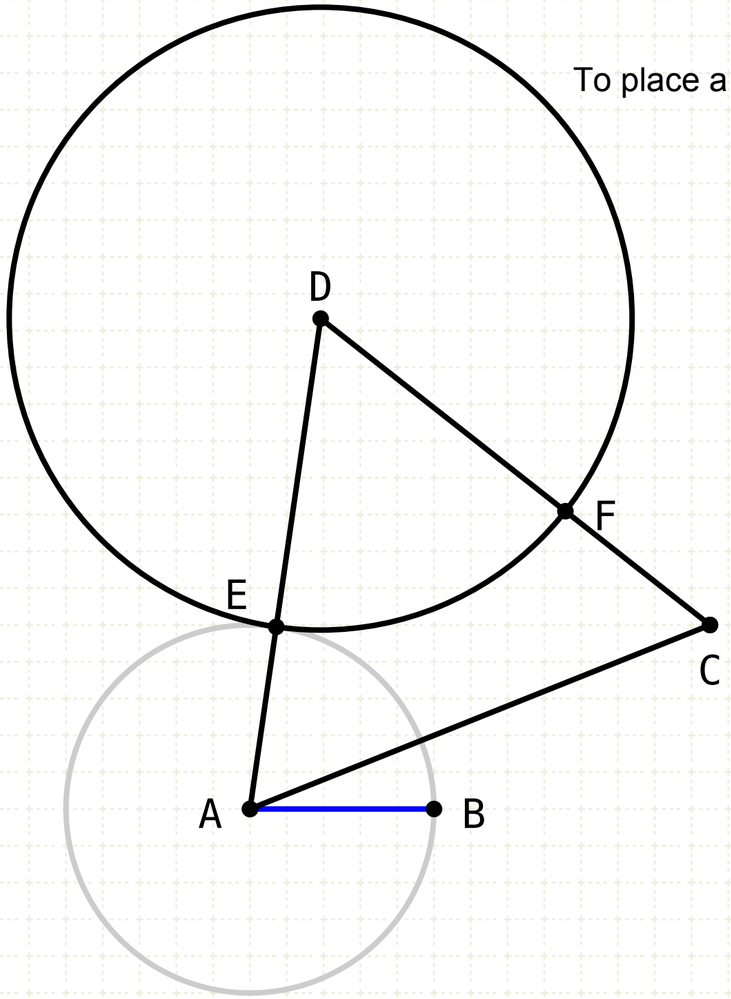

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Start with line segment AB and point C

Construct line segment AC

Construct an equilateral triangle on line AC (I·1)

Draw a circle with A as the center and AB as the radius

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Draw a circle with D as the center and ED as the radius

Label the intersection of the circle and line CD as F

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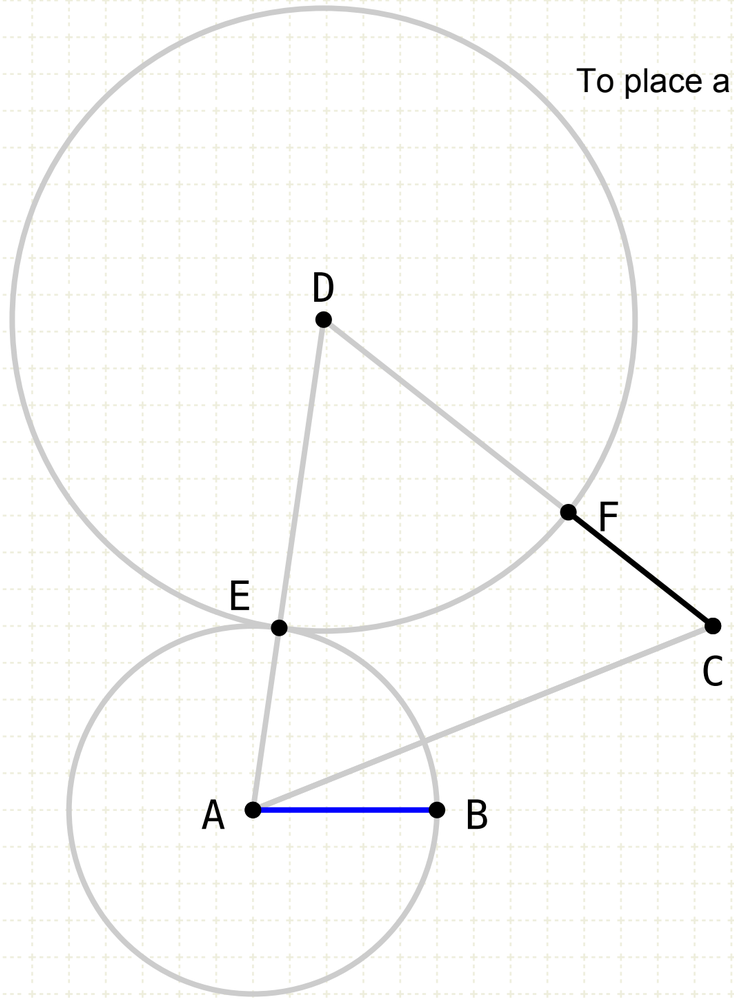

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Label the intersection of the circle and line AD as E

Draw a circle with D as the center and ED as the radius

Label the intersection of the circle and line CD as F

Line AB is equal to line CF

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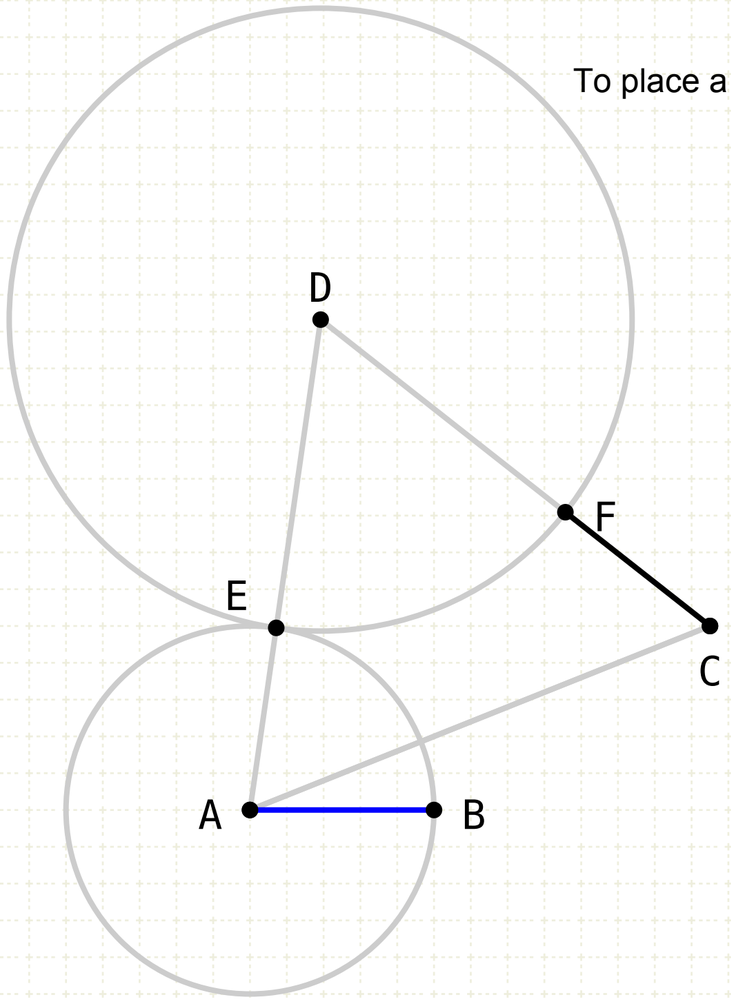

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Line AB is equal to line CF

Proof:

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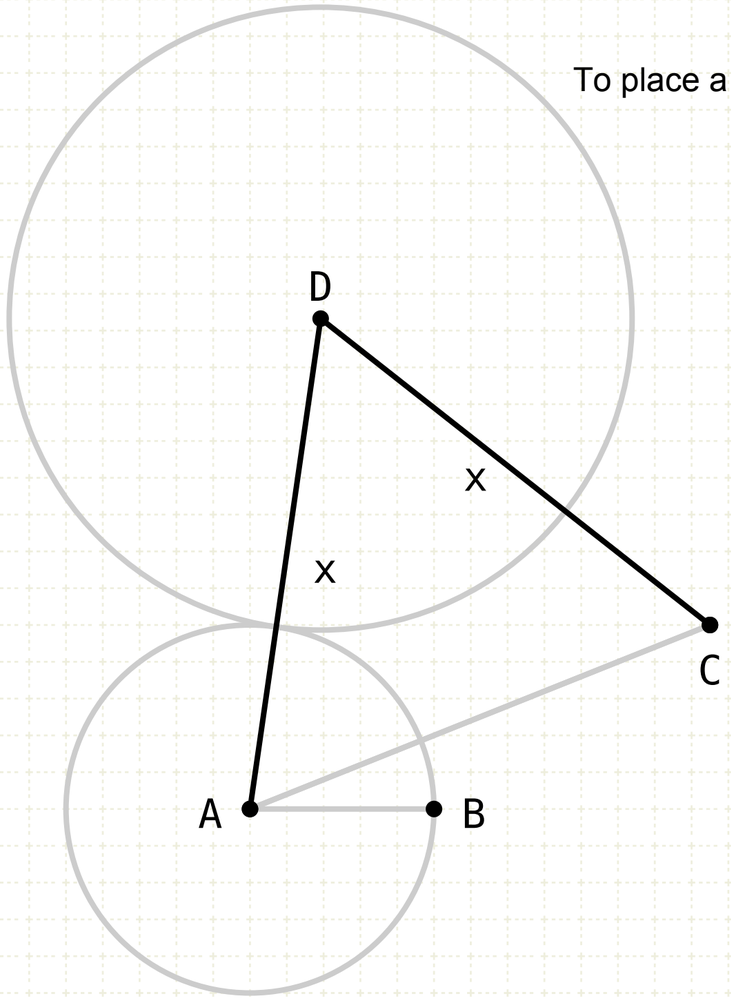
To place a straight line equal to a given straight line with one end at a given point.



$AD = DC = x$

Construction:

Start with line segment AB and point C

Construct line segment AC

Construct an equilateral triangle on line AC (I·1)

Draw a circle with A as the center and AB as the radius

Label the intersection of the circle and line AD as E

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Label the intersection of the circle and line CD as F

Line AB is equal to line CF

Proof:

Line AD is equal to line DC (equilateral triangle)

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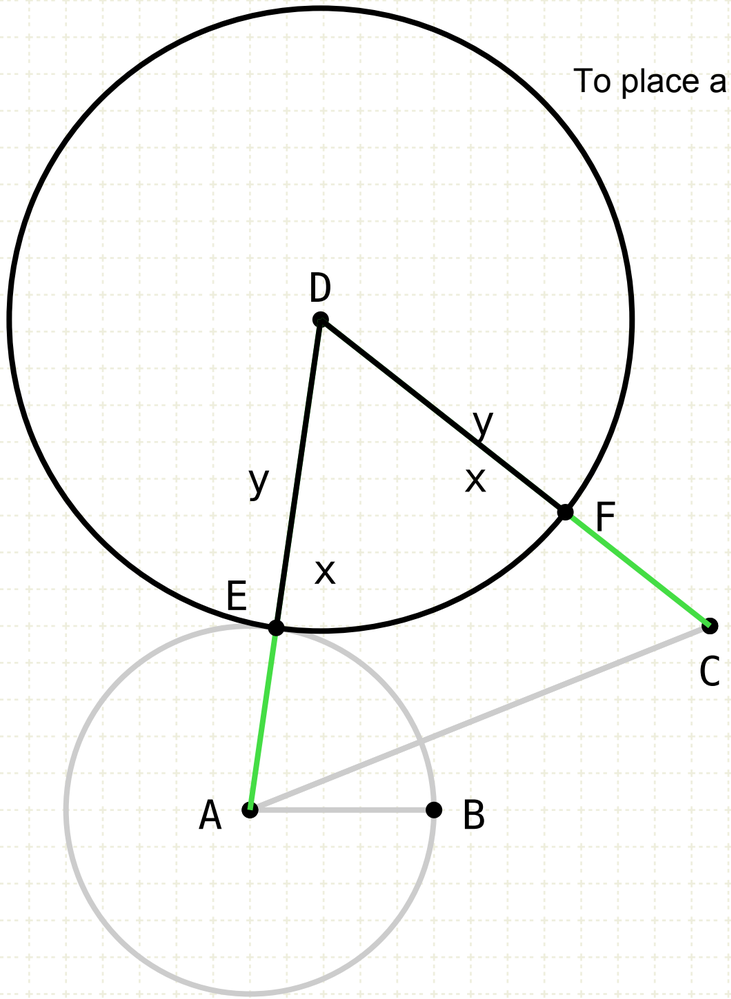

$$AD = DC = x$$
$$DE = DF = y$$

Construction:

Start with line segment AB and point C

Construct line segment AC

Construct an equilateral triangle on line AC (I·1)

Draw a circle with A as the center and AB as the radius

Label the intersection of the circle and line AD as E

Draw a circle with D as the center and ED as the radius

Label the intersection of the circle and line CD as F

Line AB is equal to line CF

Proof:

Line AD is equal to line DC (equilateral triangle)

DE and DF are equal (radii of the same circle)

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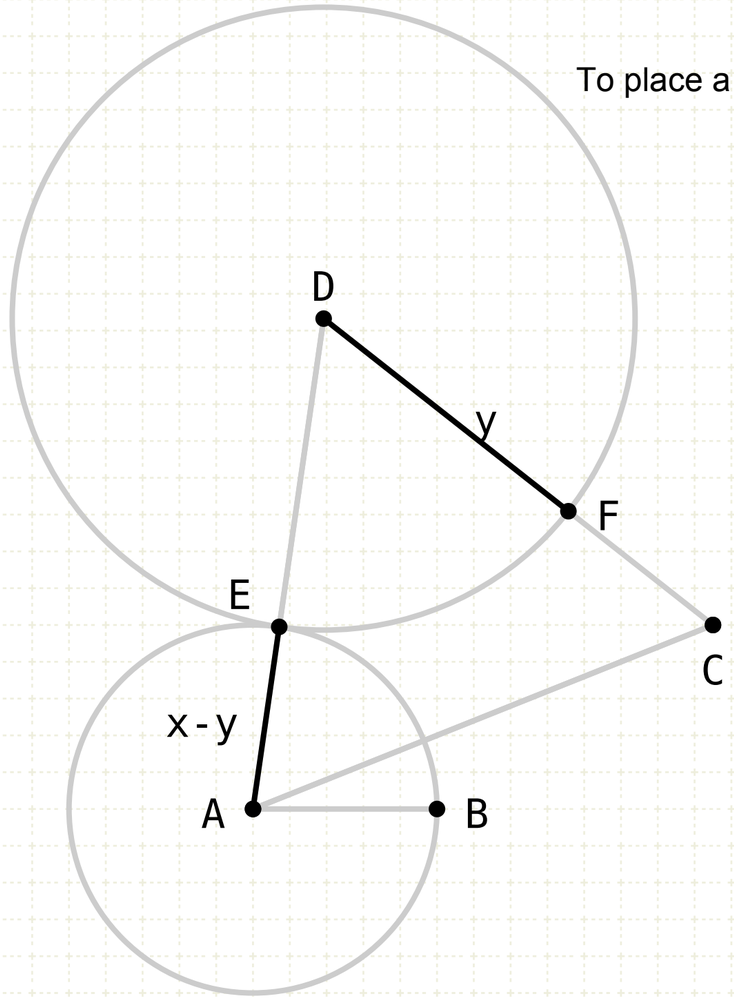

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Draw a circle with A as the center and AB as the radius

Label the intersection of the circle and line AD as E

Draw a circle with D as the center and ED as the radius

Label the intersection of the circle and line CD as F

Line AB is equal to line CF

```
AD = DC = x
DE = DF = y
AE = DA - DE
AE = x  - y
```

Proof:

Line AD is equal to line DC (equilateral triangle)

DE and DF are equal (radii of the same circle)

AE is the difference between DA and DE

Proposition 2 of Book I

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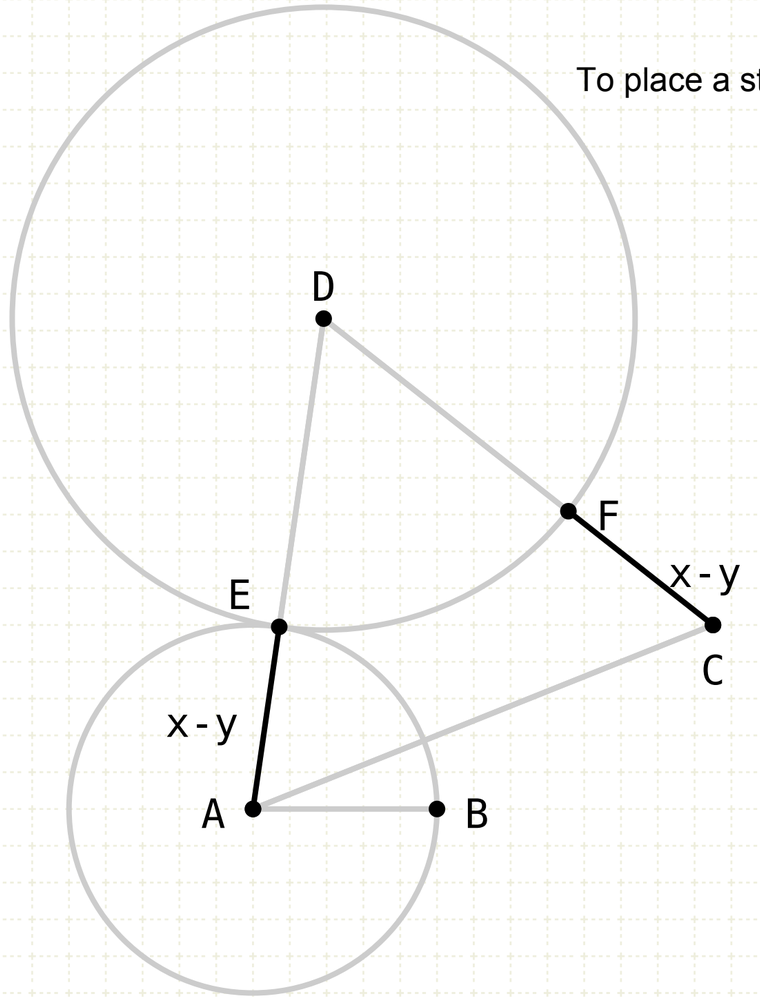

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Draw a circle with A as the center and AB as the radius

Label the intersection of the circle and line AD as E

Draw a circle with D as the center and ED as the radius

Label the intersection of the circle and line CD as F

Line AB is equal to line CF

```
AD = DC = x
DE = DF = y
AE = DA - DE
AE = x  - y
CF = DC - DF
CF = x  - y
```

Proof:

Line AD is equal to line DC (equilateral triangle)

DE and DF are equal (radii of the same circle)

AE is the difference between DA and DE

CF is the difference between DC and DF

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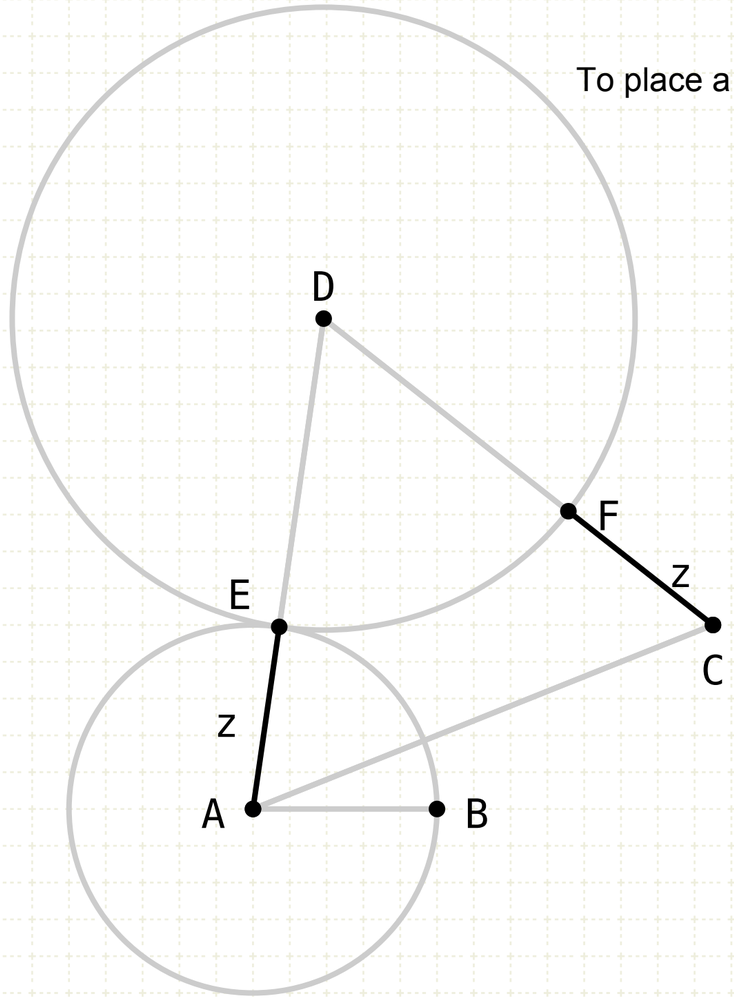

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```
AD = DC = x
DE = DF = y
AE = DA - DE
AE = x  - y
CF = DC - DF
CF = x  - y
AE = CF = z
```

Proof:

Line AD is equal to line DC (equilateral triangle)

DE and DF are equal (radii of the same circle)

AE is the difference between DA and DE

CF is the difference between DC and DF

AE and FC are the differences of equals, so they are equal

Proposition 2 of Book I

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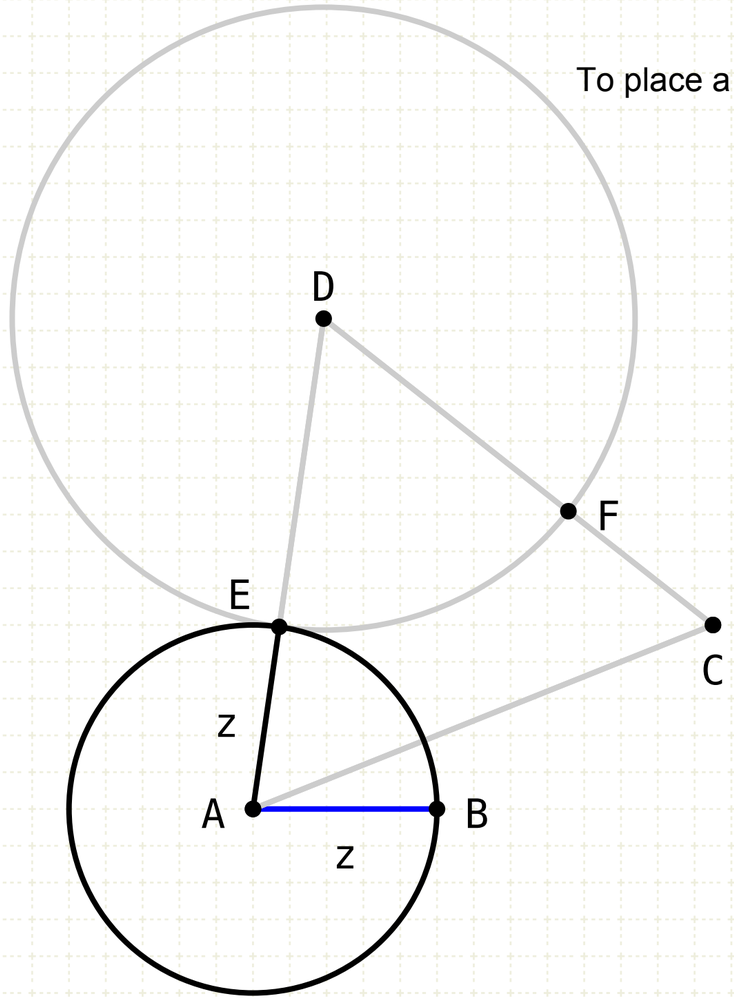


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AD = DC = x
DE = DF = y
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AE = x  - y
CF = DC - DF
CF = x  - y
AE = CF = z
AB = AE = z
```

Construction:

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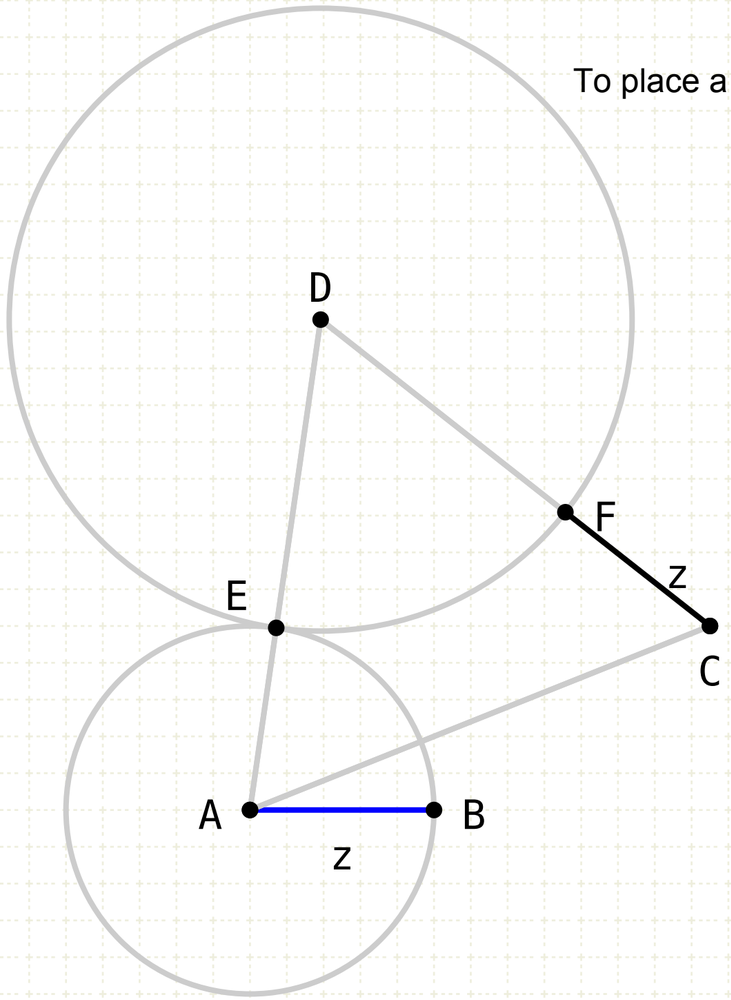

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AE = CF = z
AB = AE = z
AB = CF = z
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Proof:

Line AD is equal to line DC (equilateral triangle)

DE and DF are equal (radii of the same circle)

AE is the difference between DA and DE

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AE and FC are the differences of equals, so they are equal

AB and AE are radii of the same circle

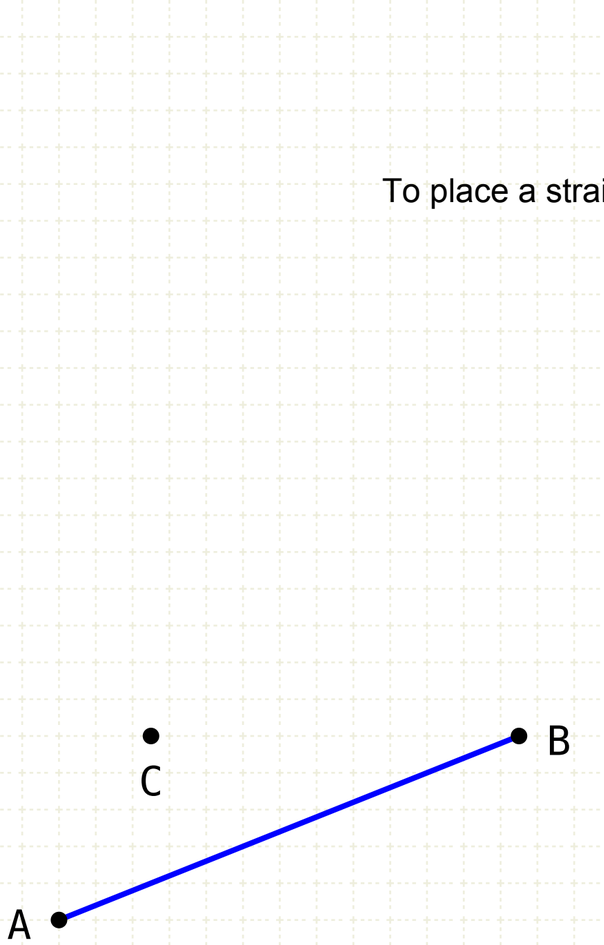
AB and CF are equal

Proposition 2 of Book I

To place a straight line equal to a given straight line with one end at a given point.

But what if?

Start with line segment AB and point C



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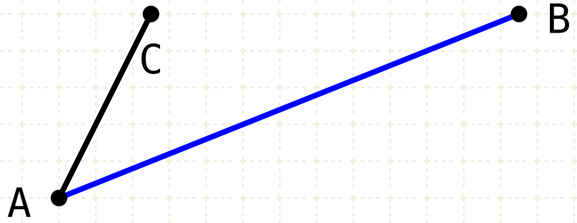

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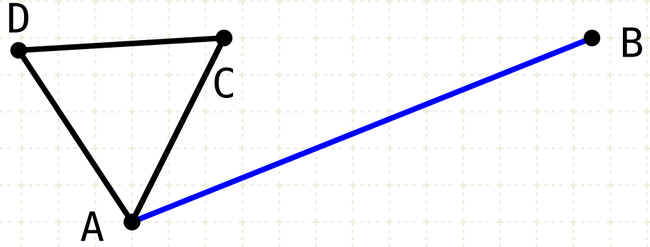

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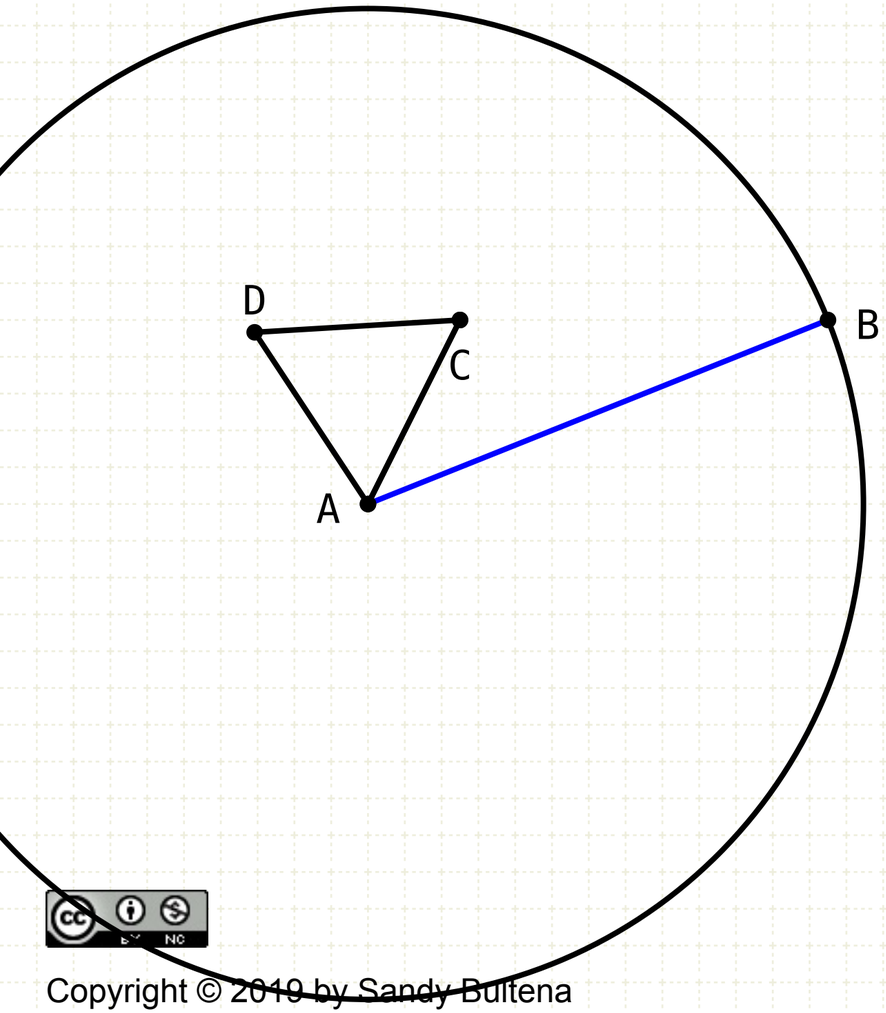

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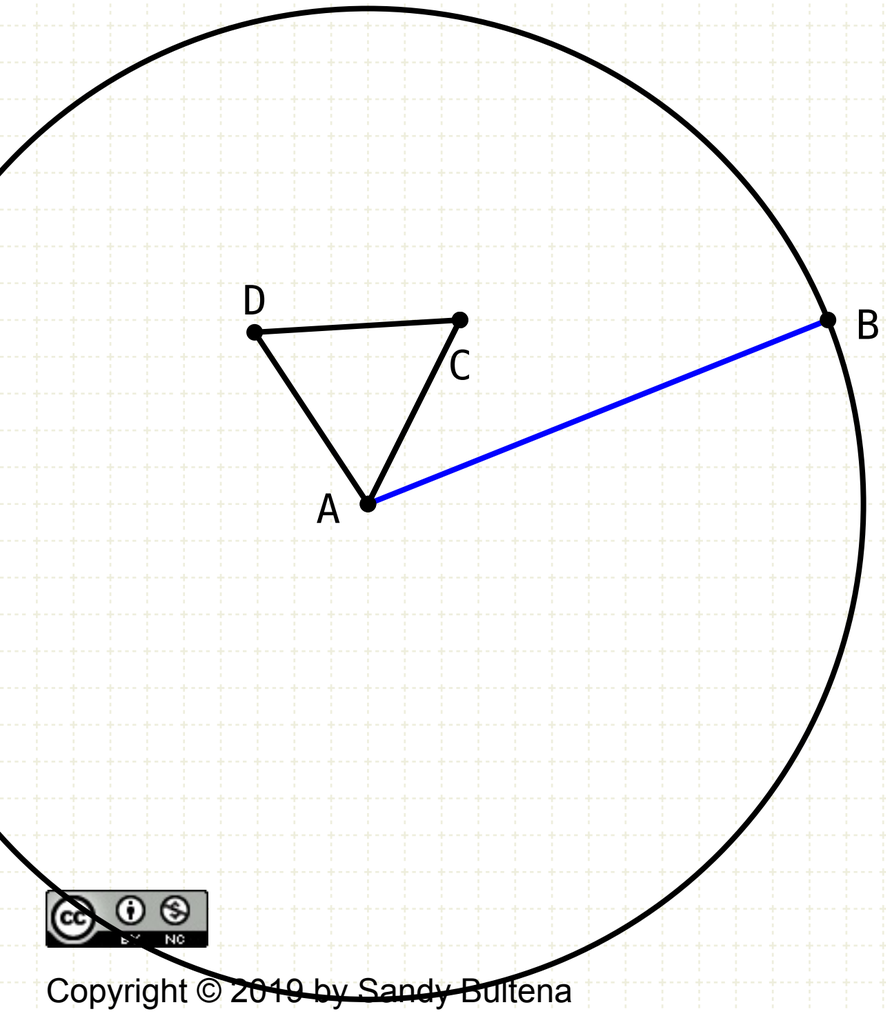

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Draw a circle with A as the center and AB as the radius

Label the intersection of the circle and line AD as E

…hang on… there isn't any intersection point, what now?

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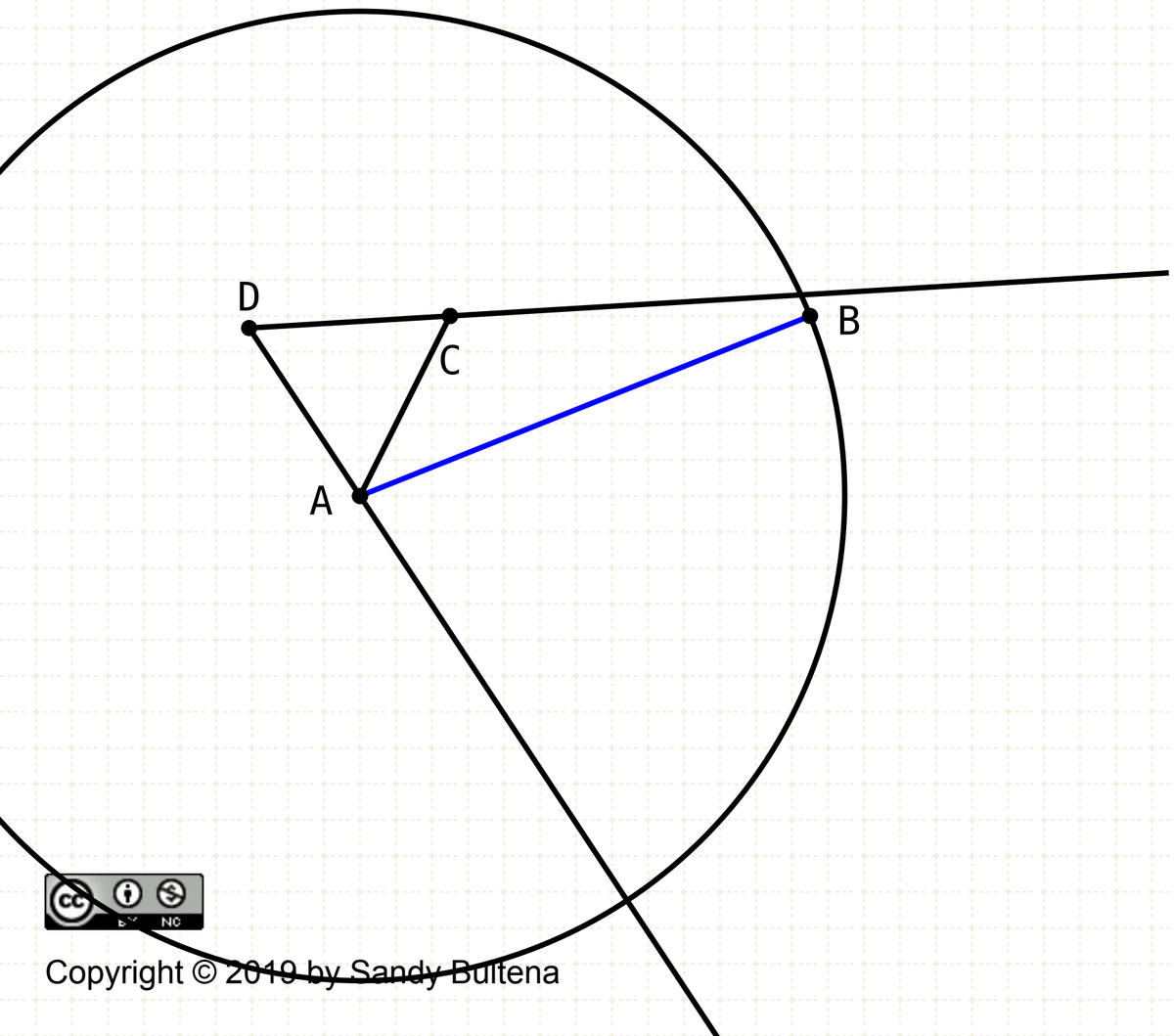

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Extend DA and DC such that they intersect the circle

Proposition 2 of Book I

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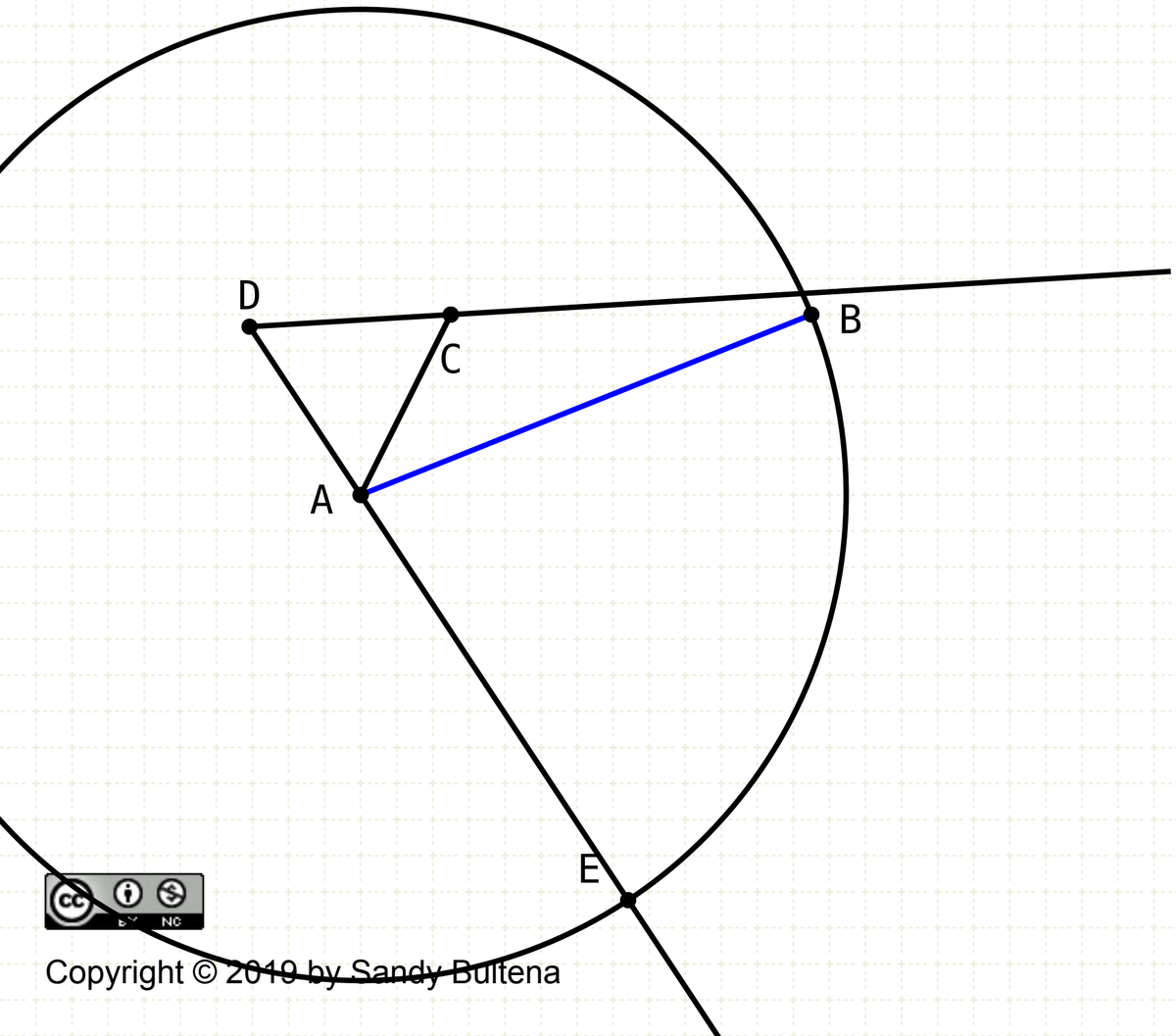

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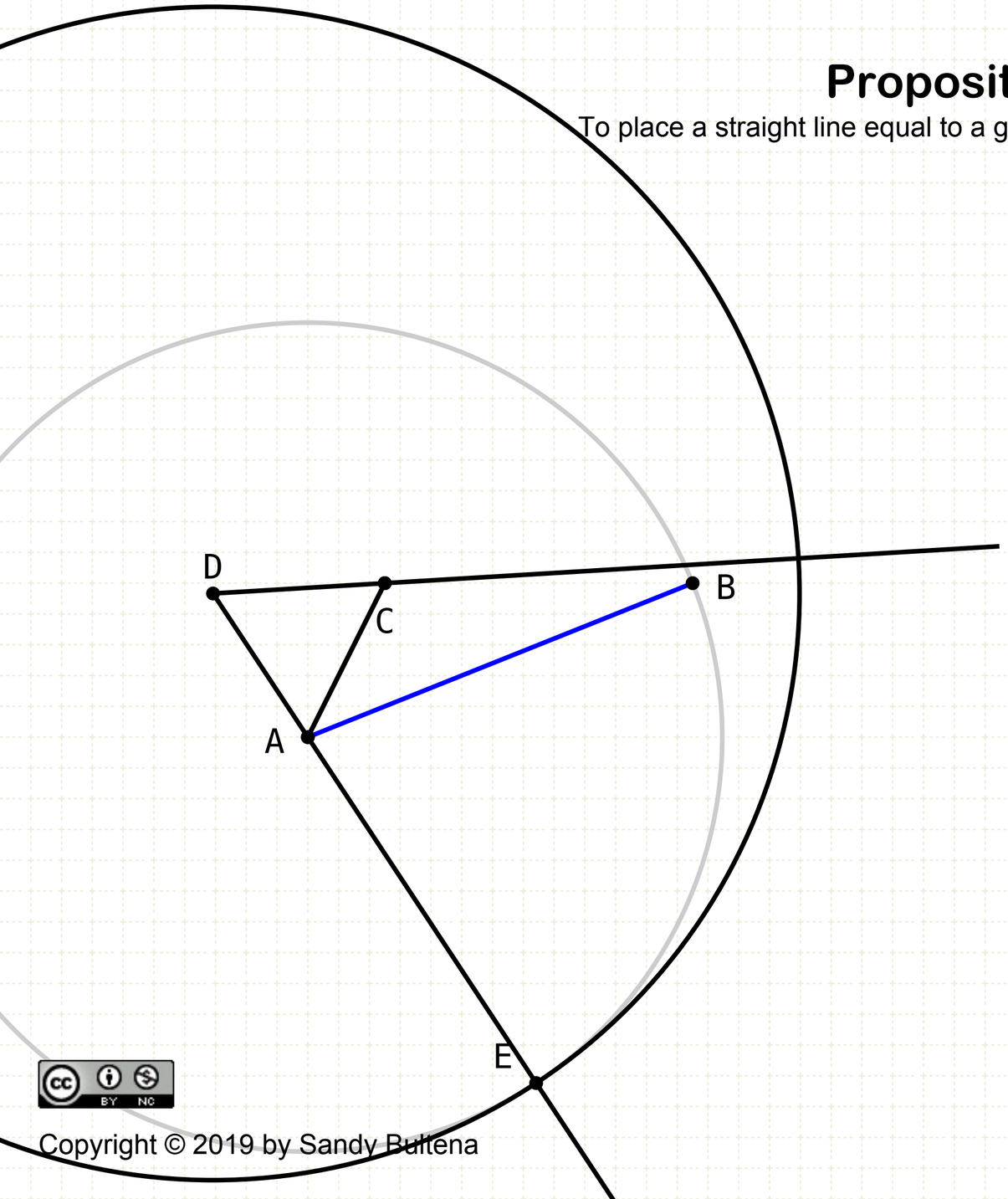

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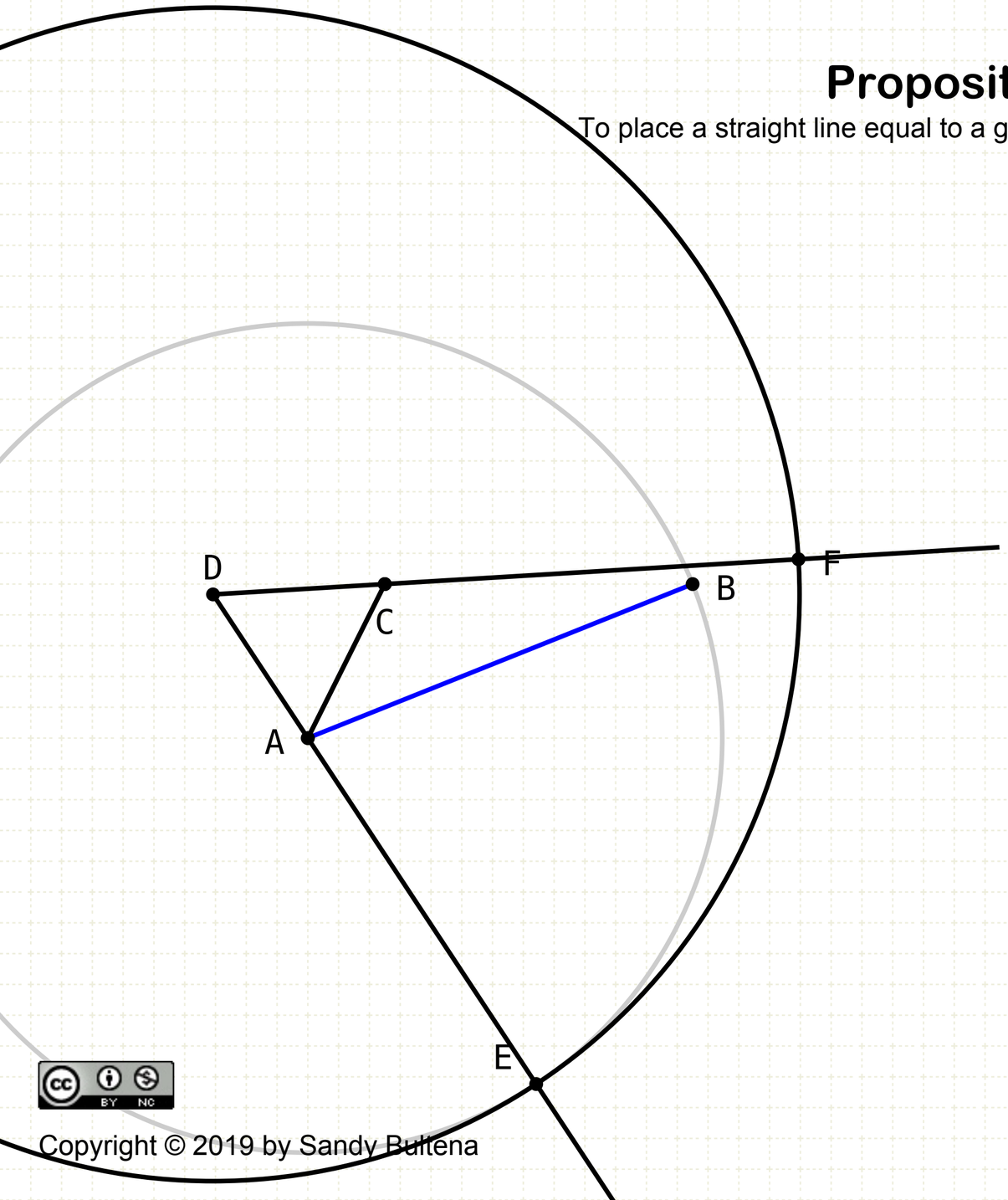

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Draw a circle with D as the center and ED as the radius

Label the intersection of the circle and line CD as F

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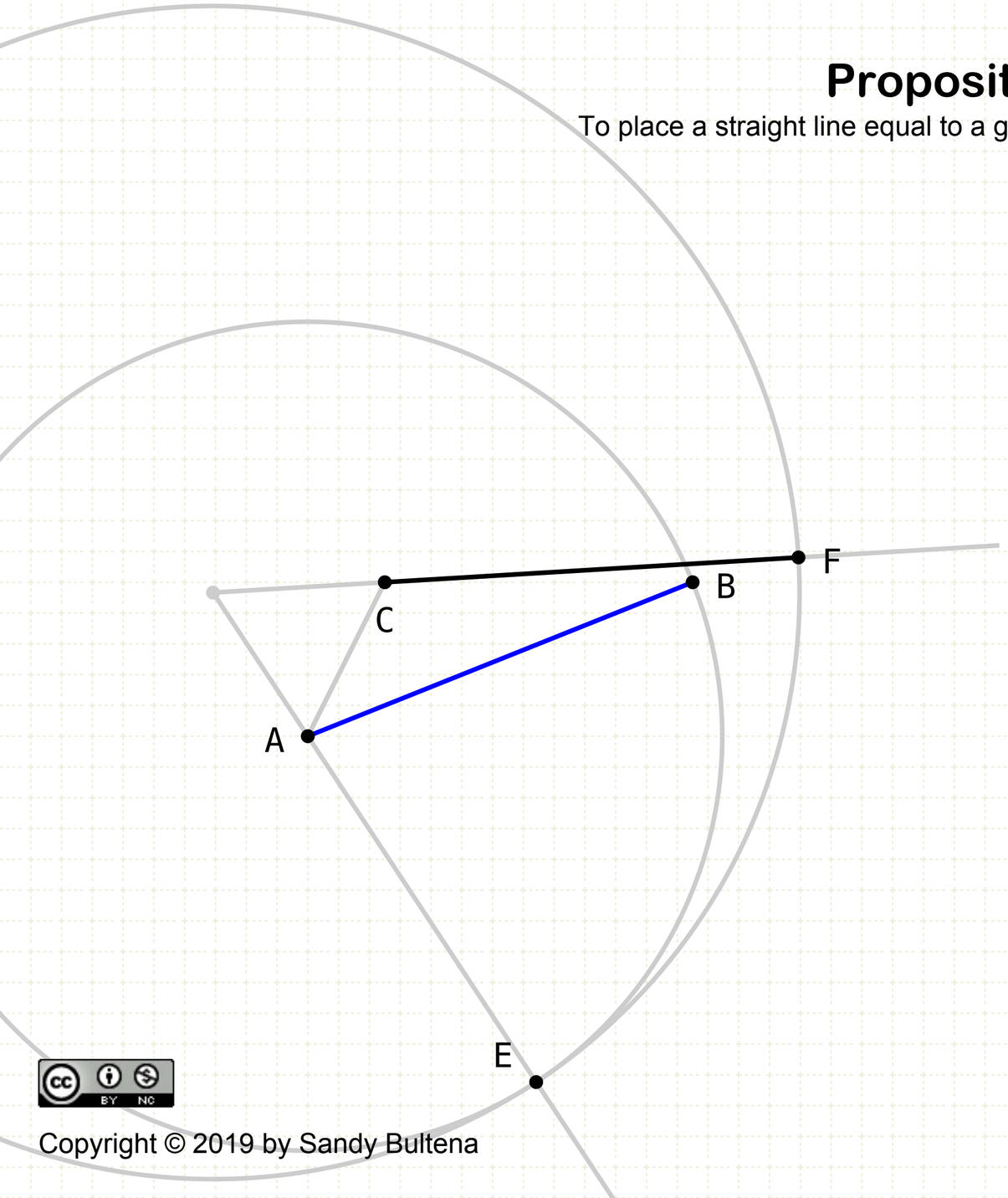

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Line AB is equal to line CF

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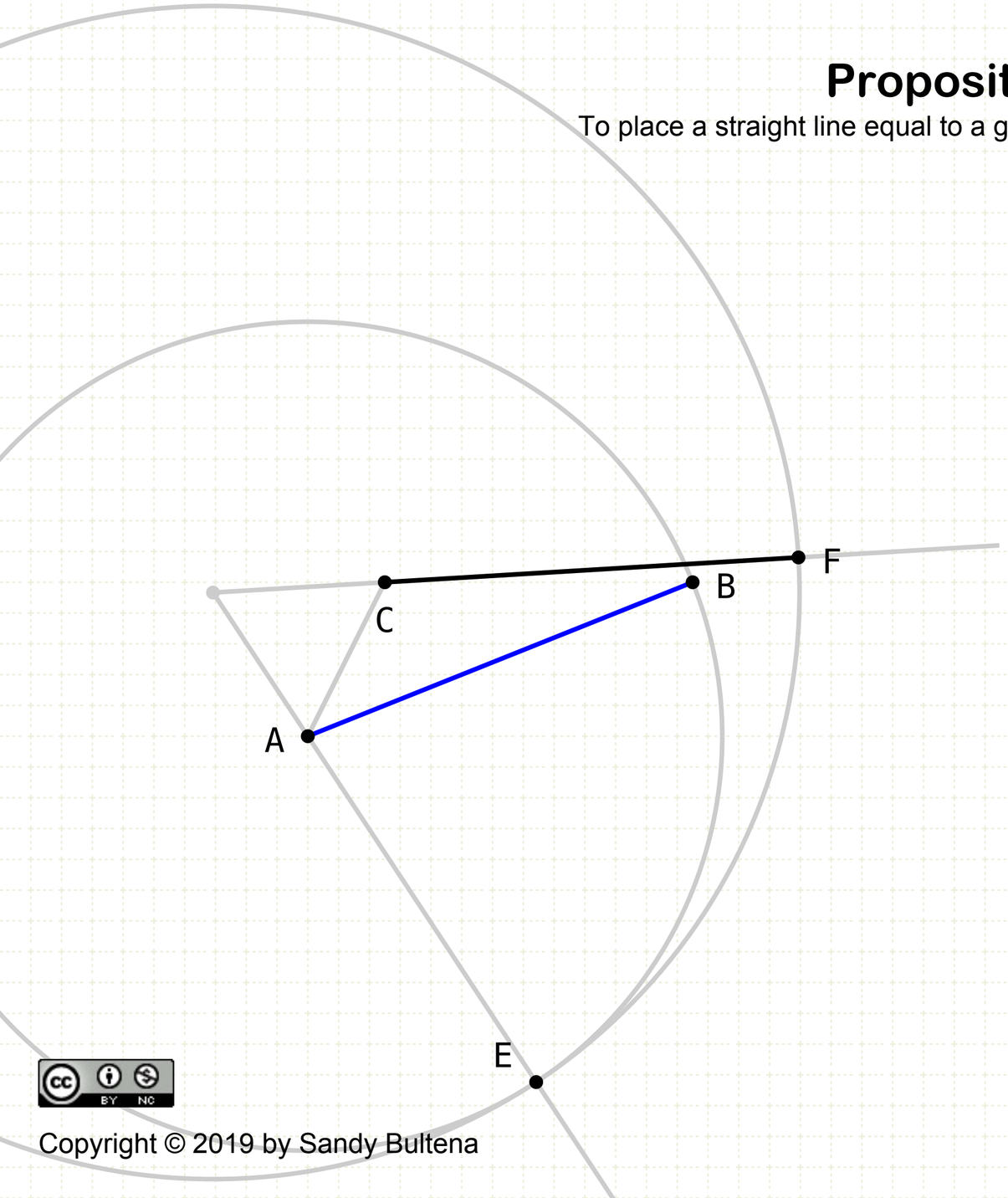

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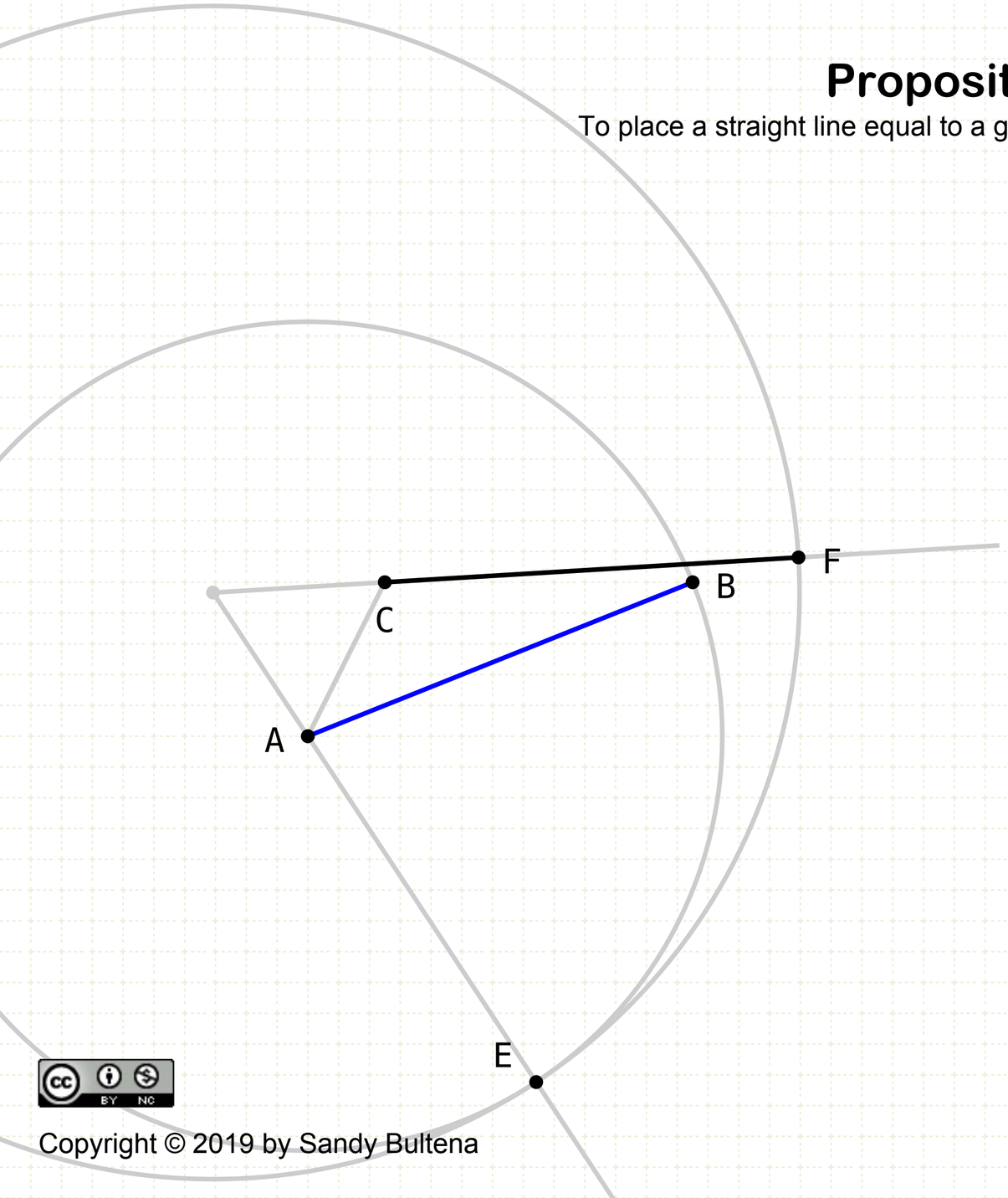

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Line AB is equal to line CF

Proof:

… I will leave it to the reader to prove …

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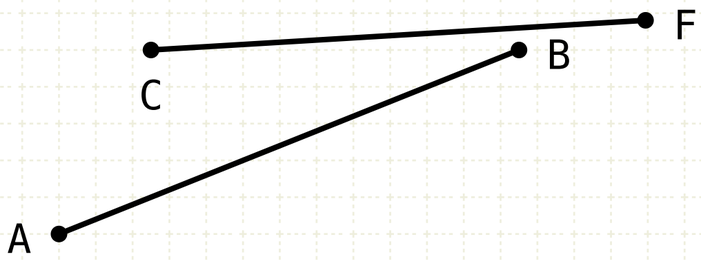

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Label the intersection of the circle and line AD as E

…hang on… there isn't any intersection point, what now?

Extend DA and DC such that they intersect the circle

Label the intersection of the circle and line AD as E

Draw a circle with D as the center and ED as the radius

Label the intersection of the circle and line CD as F

Line AB is equal to line CF

Proof:

… I will leave it to the reader to prove …

Youtube Videos

https://www.youtube.com/c/SandyBultena