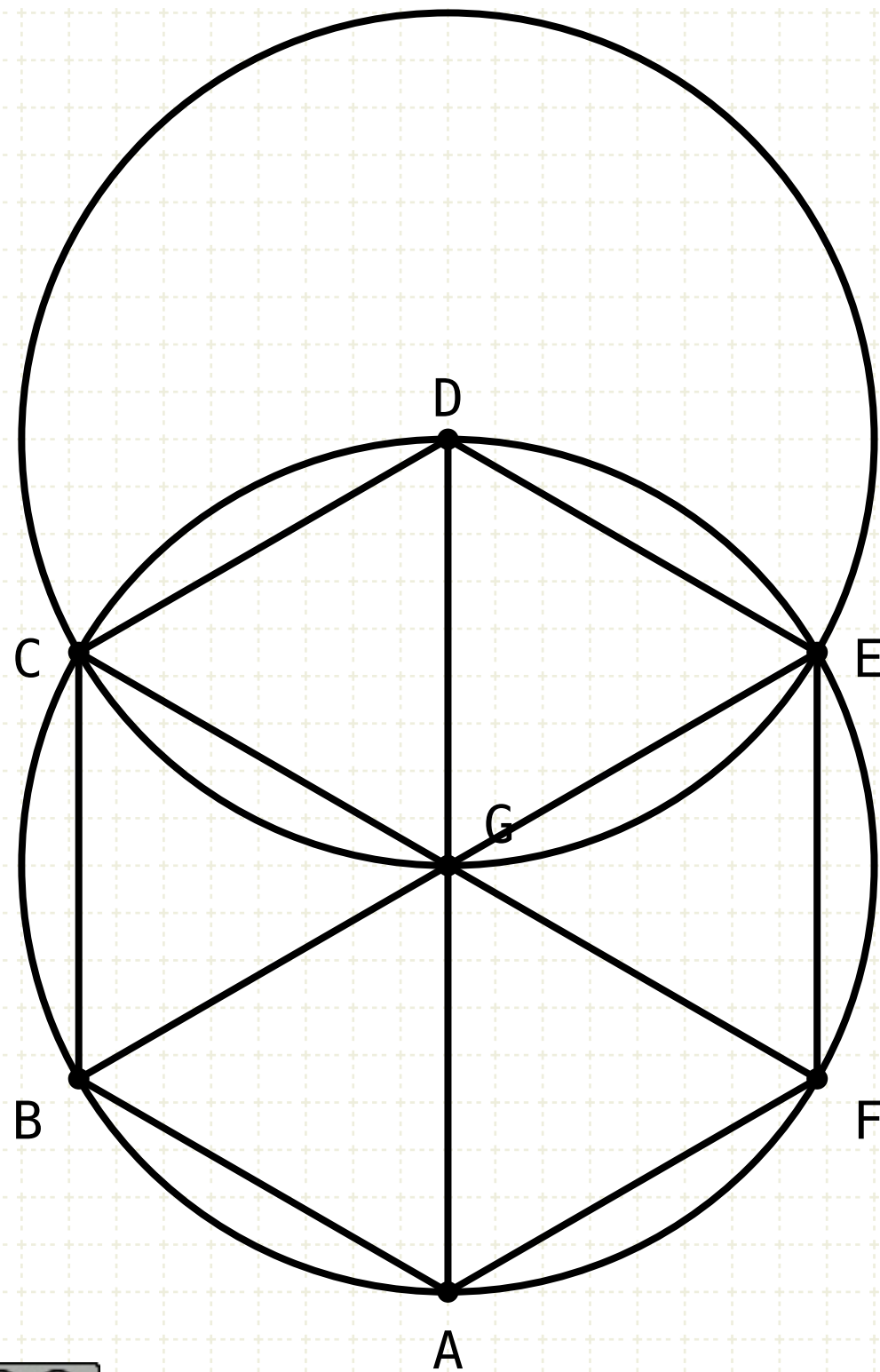


Euclid's Elements

Book IV



Philosophy (nature) is written in that great book which ever is before our eyes -- I mean the universe -- but we cannot understand it if we do not first learn the language and grasp the symbols in which it is written. The book is written in mathematical language, and the symbols are triangles, circles and other geometrical figures, without whose help it is impossible to comprehend a single word of it - without which one wanders in vain through a dark labyrinth.

Galileo Galilei



Proposition 16 of Book IV

In a given circle to inscribe a fifteen angled figure which shall be both equilateral and equiangular.



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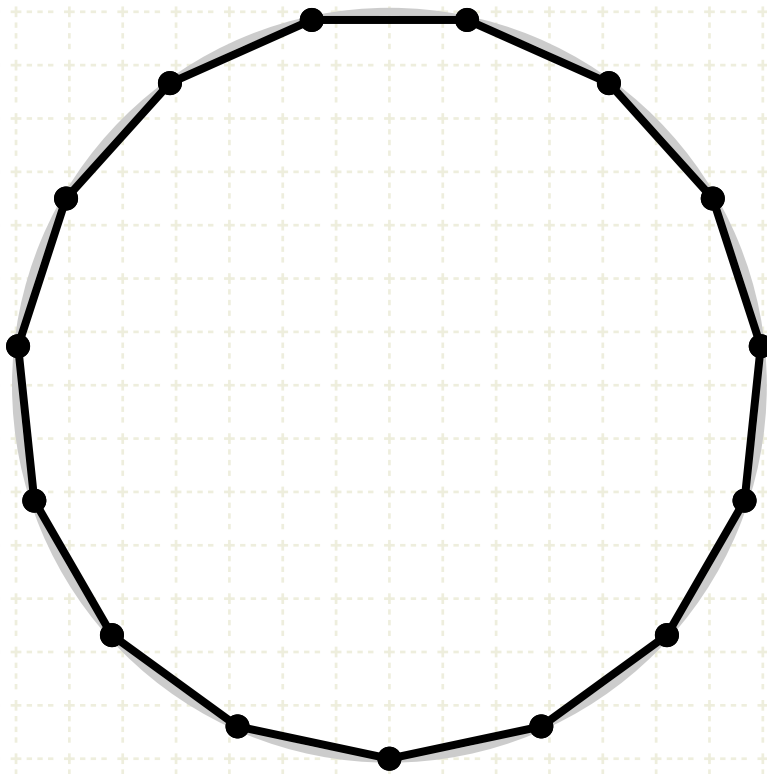
Proposition 16 of Book IV

In a given circle to inscribe a fifteen angled figure which shall be both equilateral and equiangular.



Proposition 16 of Book IV

In a given circle to inscribe a fifteen angled figure which shall be both equilateral and equiangular.



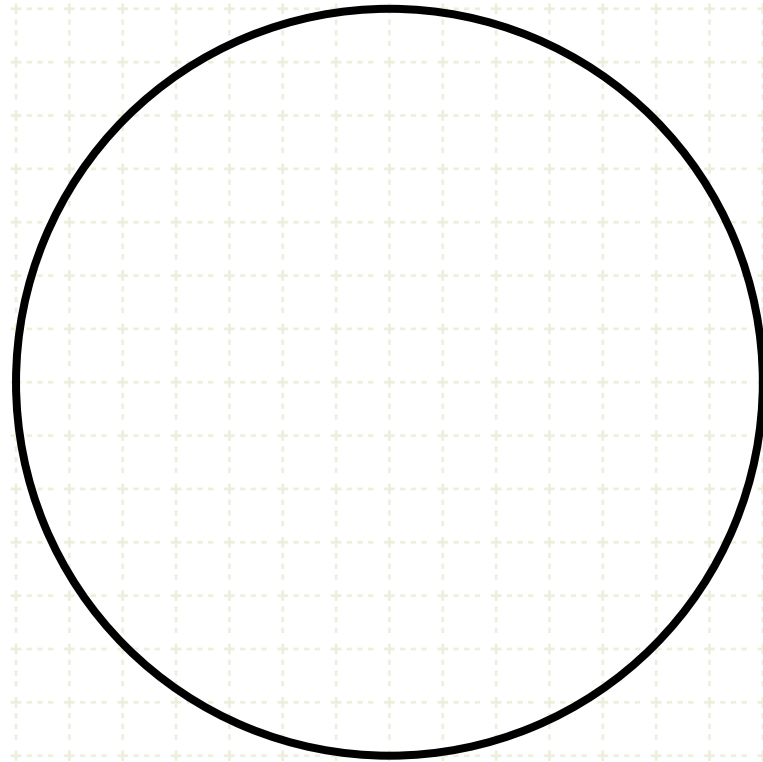
In other words

Given a circle, draw an fifteen sided polygon with equal sides and equal angles on the inside of the circle.

Proposition 16 of Book IV

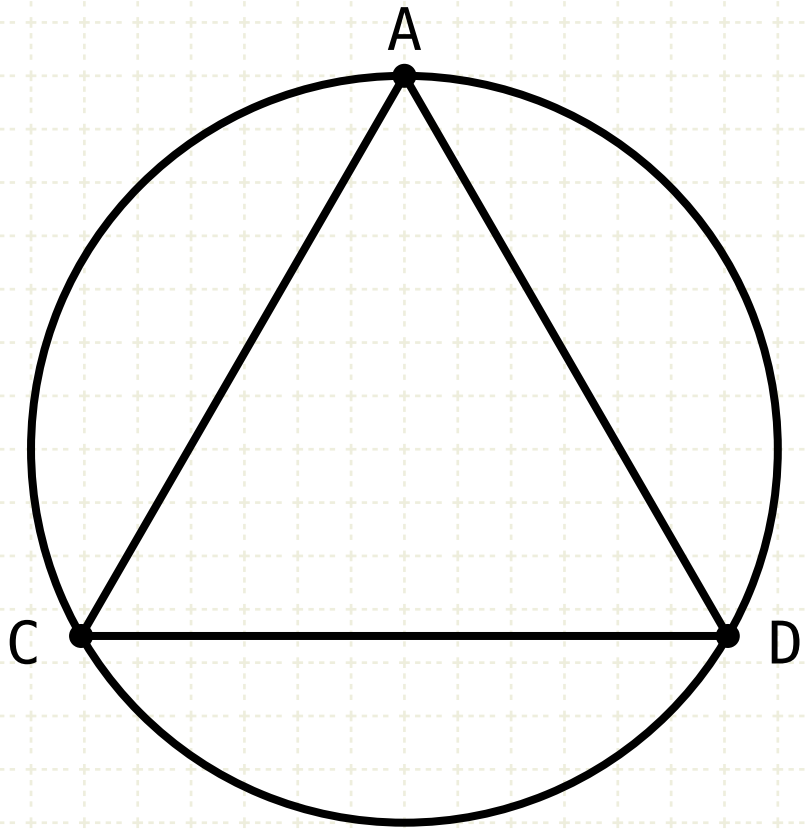
In a given circle to inscribe a fifteen angled figure which shall be both equilateral and equiangular.

Construction



Proposition 16 of Book IV

In a given circle to inscribe a fifteen angled figure which shall be both equilateral and equiangular.

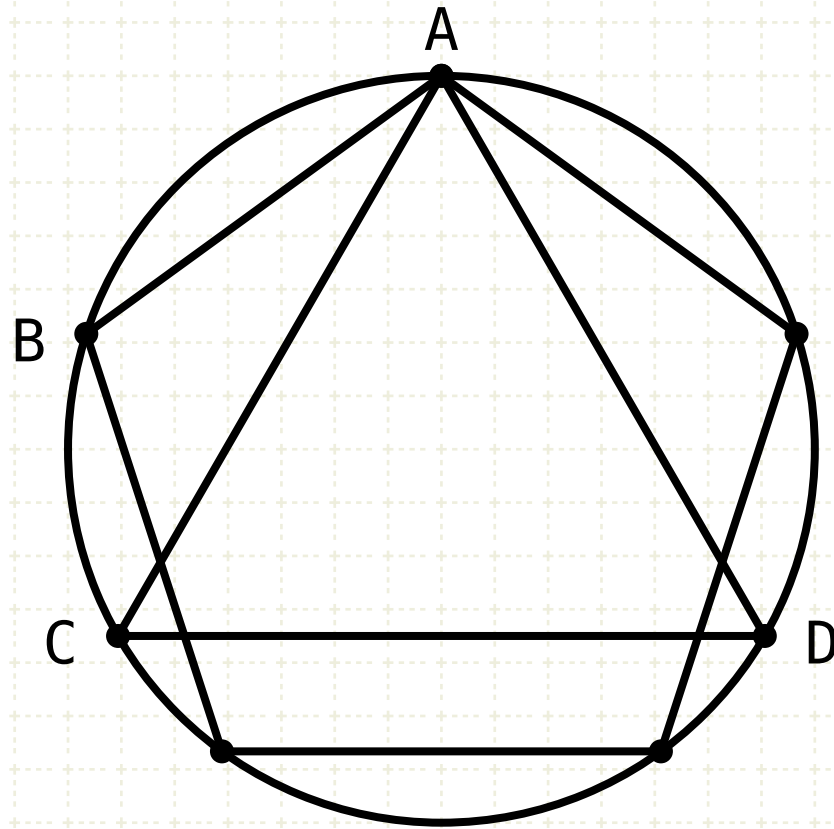


Construction

Draw an equilateral triangle (I·1) and copy an equiangular version into the circle (IV·2)

Proposition 16 of Book IV

In a given circle to inscribe a fifteen angled figure which shall be both equilateral and equiangular.



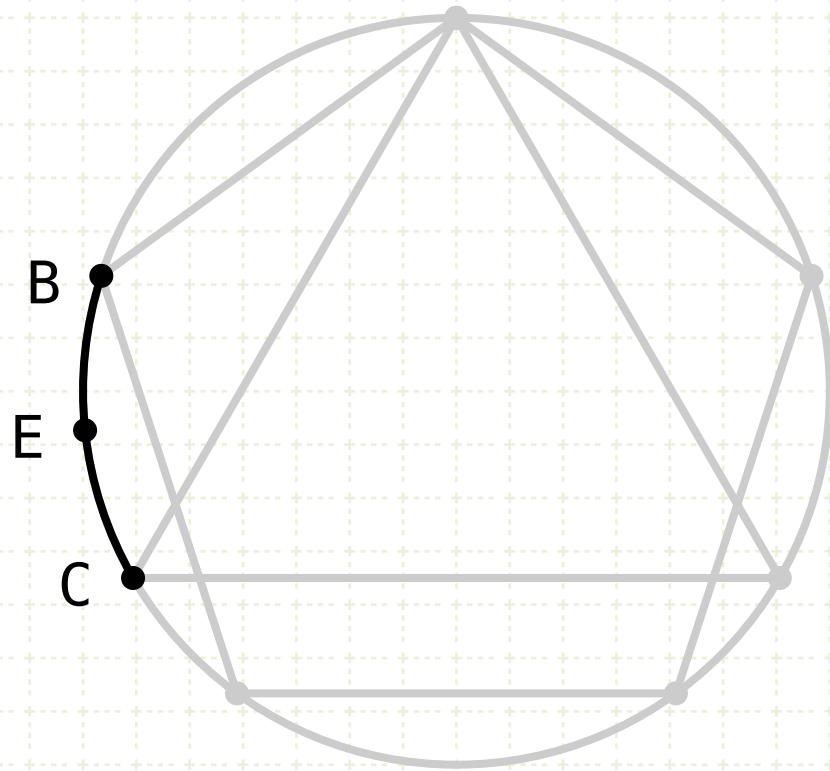
Construction

Draw an equilateral triangle (I·1) and copy an equiangular version into the circle (IV·2)

Inscribe a pentagon in the circle (IV·11)

Proposition 16 of Book IV

In a given circle to inscribe a fifteen angled figure which shall be both equilateral and equiangular.



Construction

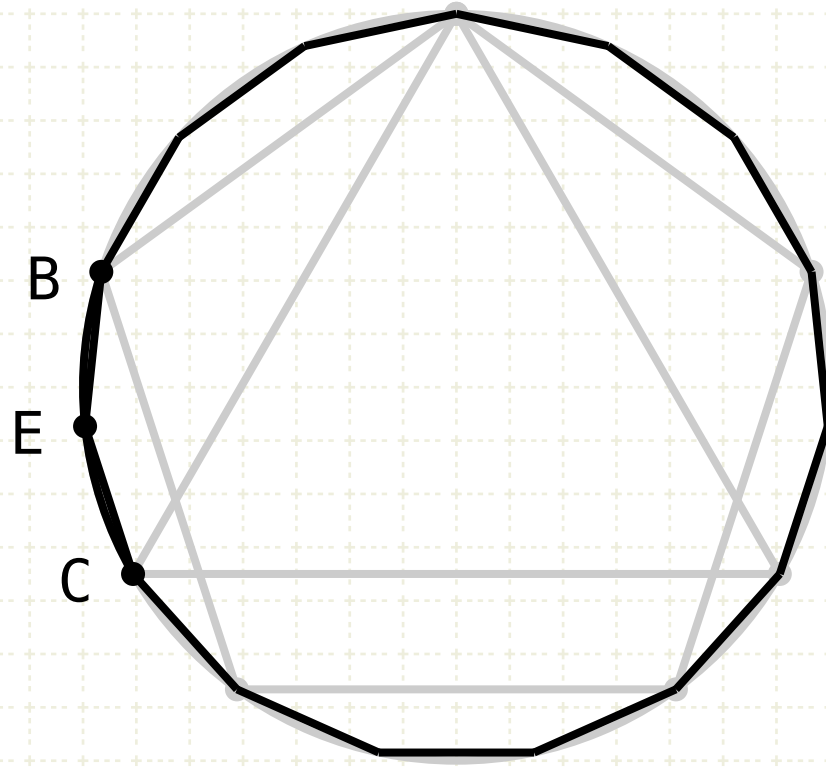
Draw an equilateral triangle (I·1) and copy an equiangular version into the circle (IV·2)

Inscribe a pentagon in the circle (IV·11)

Bisect the arc BC at point E

Proposition 16 of Book IV

In a given circle to inscribe a fifteen angled figure which shall be both equilateral and equiangular.



Construction

Draw an equilateral triangle (I·1) and copy an equiangular version into the circle (IV·2)

Inscribe a pentagon in the circle (IV·11)

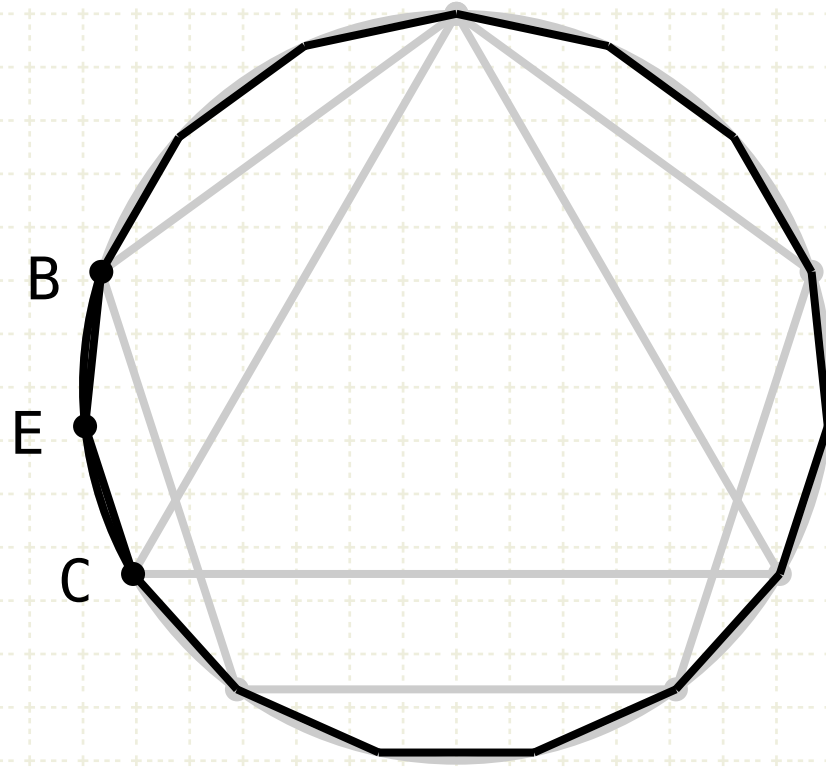
Bisect the arc BC at point E

Join the line CE, and copy this line into the circle, always contiguous to the previous line.



Proposition 16 of Book IV

In a given circle to inscribe a fifteen angled figure which shall be both equilateral and equiangular.



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Draw an equilateral triangle (I·1) and copy an equiangular version into the circle (IV·2)

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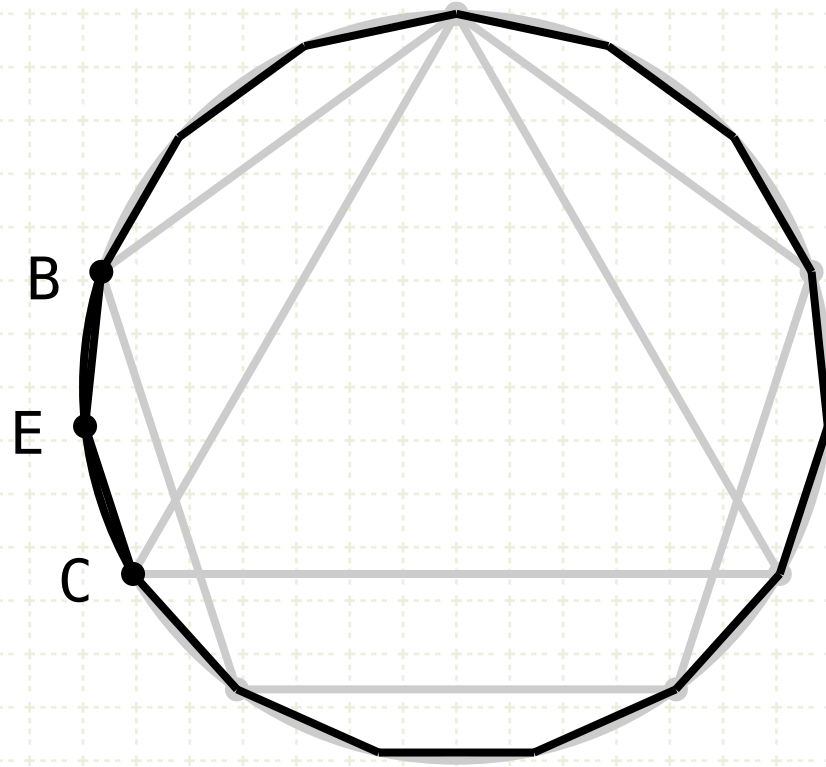
Join the line CE, and copy this line into the circle, always contiguous to the previous line.

The resulting figure is a 15 sided equiangular, equilateral polygon



Proposition 16 of Book IV

In a given circle to inscribe a fifteen angled figure which shall be both equilateral and equiangular.



Construction

Draw an equilateral triangle (I·1) and copy an equiangular version into the circle (IV·2)

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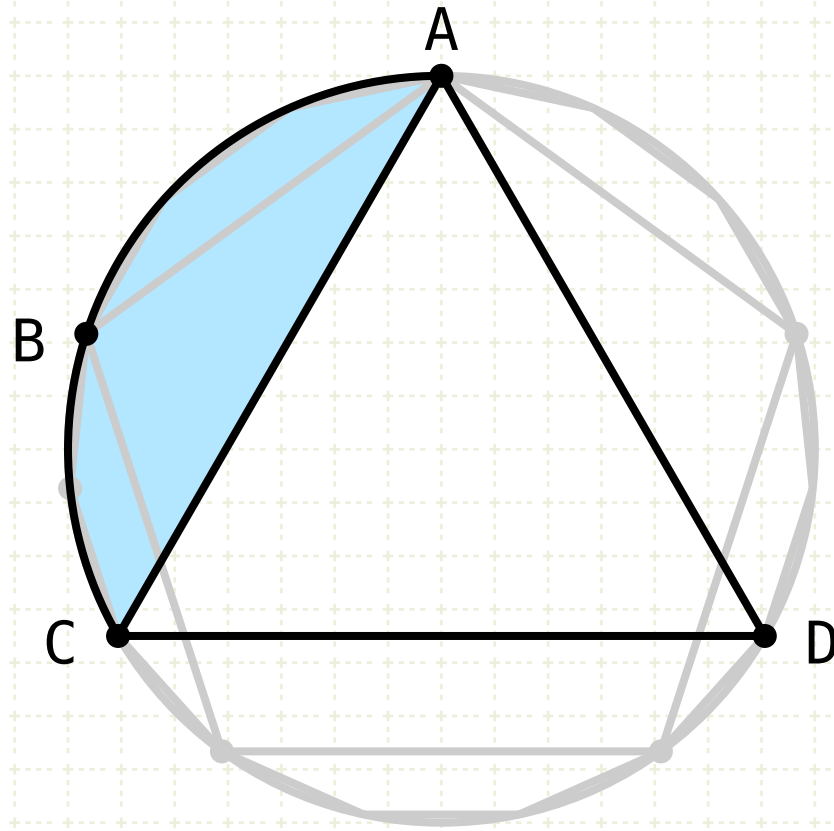
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Proof



Proposition 16 of Book IV

In a given circle to inscribe a fifteen angled figure which shall be both equilateral and equiangular.



$$AC = \frac{1}{3} \times 15 = 5/15$$

Construction

Draw an equilateral triangle (I·1) and copy an equiangular version into the circle (IV·2)

Inscribe a pentagon in the circle (IV·11)

Bisect the arc BC at point E

Join the line CE, and copy this line into the circle, always contiguous to the previous line.

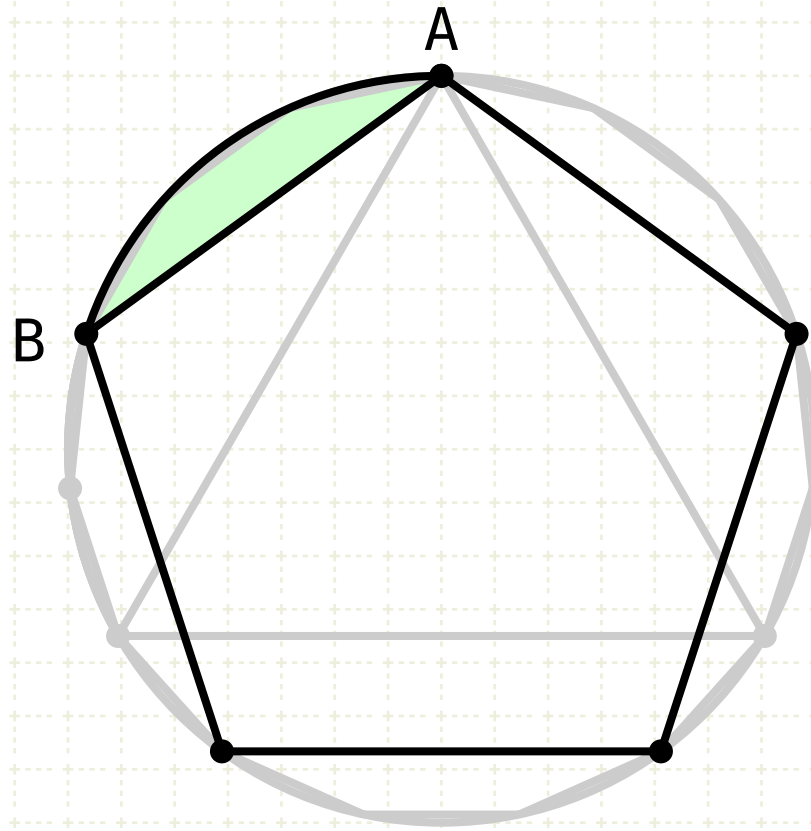
The resulting figure is a 15 sided equiangular, equilateral polygon

Proof

Circumference AC is one third of the circle, so it will contain five segments of a fifteen sided equilateral figure

Proposition 16 of Book IV

In a given circle to inscribe a fifteen angled figure which shall be both equilateral and equiangular.



$$AC = \frac{1}{3} \times 15 = 5/15$$

$$AB = \frac{1}{5} \times 15 = 3/15$$

Construction

Draw an equilateral triangle (I·1) and copy an equiangular version into the circle (IV·2)

Inscribe a pentagon in the circle (IV·11)

Bisect the arc BC at point E

Join the line CE, and copy this line into the circle, always contiguous to the previous line.

The resulting figure is a 15 sided equiangular, equilateral polygon

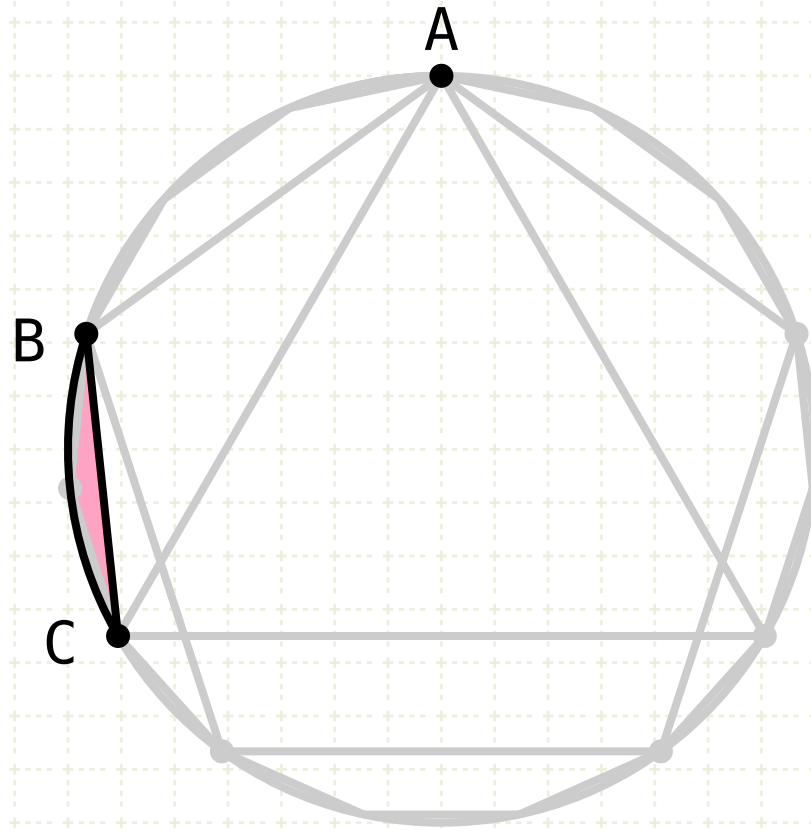
Proof

Circumference AC is one third of the circle, so it will contain five segments of a fifteen sided equilateral figure

Circumference AB is one fifth of the circle, so it will contain three segments of a fifteen sided equilateral figure

Proposition 16 of Book IV

In a given circle to inscribe a fifteen angled figure which shall be both equilateral and equiangular.



$$AC = \frac{1}{3} \times 15 = 5/15$$

$$AB = \frac{1}{5} \times 15 = 3/15$$

$$BC = AC - AB = 2/15$$

Construction

Draw an equilateral triangle (I·1) and copy an equiangular version into the circle (IV·2)

Inscribe a pentagon in the circle (IV·11)

Bisect the arc BC at point E

Join the line CE, and copy this line into the circle, always contiguous to the previous line.

The resulting figure is a 15 sided equiangular, equilateral polygon

Proof

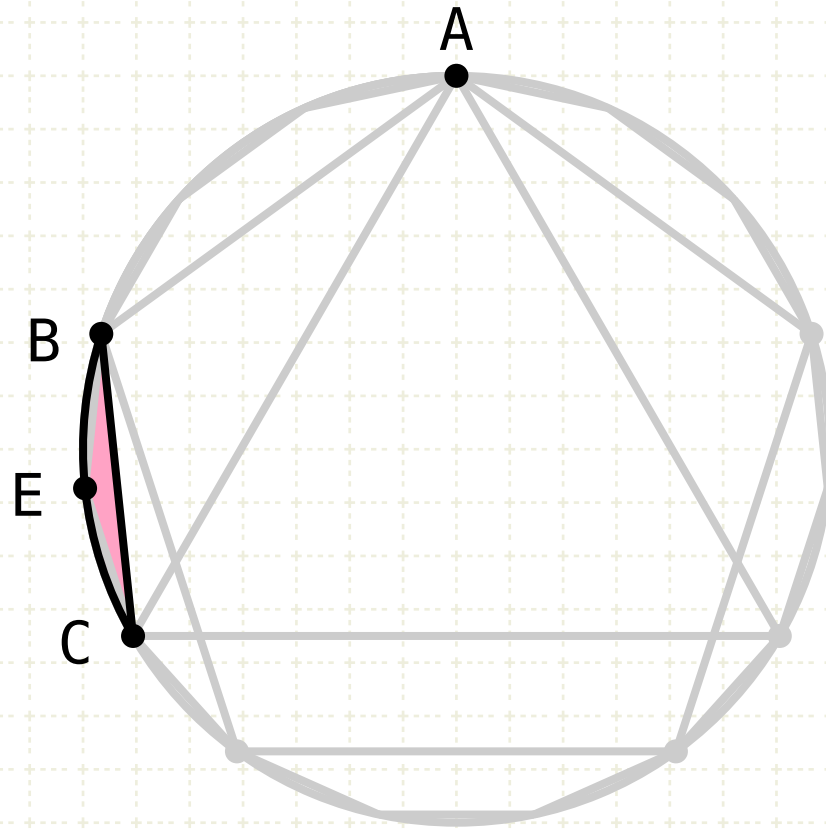
Circumference AC is one third of the circle, so it will contain five segments of a fifteen sided equilateral figure

Circumference AB is one fifth of the circle, so it will contain three segments of a fifteen sided equilateral figure

Therefore, the remainder of AB subtracted from AC (BC) will contain two segments of a fifteen sided equilateral figure

Proposition 16 of Book IV

In a given circle to inscribe a fifteen angled figure which shall be both equilateral and equiangular.



$$AC = \frac{1}{3} \times 15 = 5/15$$

$$AB = \frac{1}{5} \times 15 = 3/15$$

$$BC = AC - AB = 2/15$$

$$EC = 1/15$$

Construction

Draw an equilateral triangle (I·1) and copy an equiangular version into the circle (IV·2)

Inscribe a pentagon in the circle (IV·11)

Bisect the arc BC at point E

Join the line CE, and copy this line into the circle, always contiguous to the previous line.

The resulting figure is a 15 sided equiangular, equilateral polygon

Proof

Circumference AC is one third of the circle, so it will contain five segments of a fifteen sided equilateral figure

Circumference AB is one fifth of the circle, so it will contain three segments of a fifteen sided equilateral figure

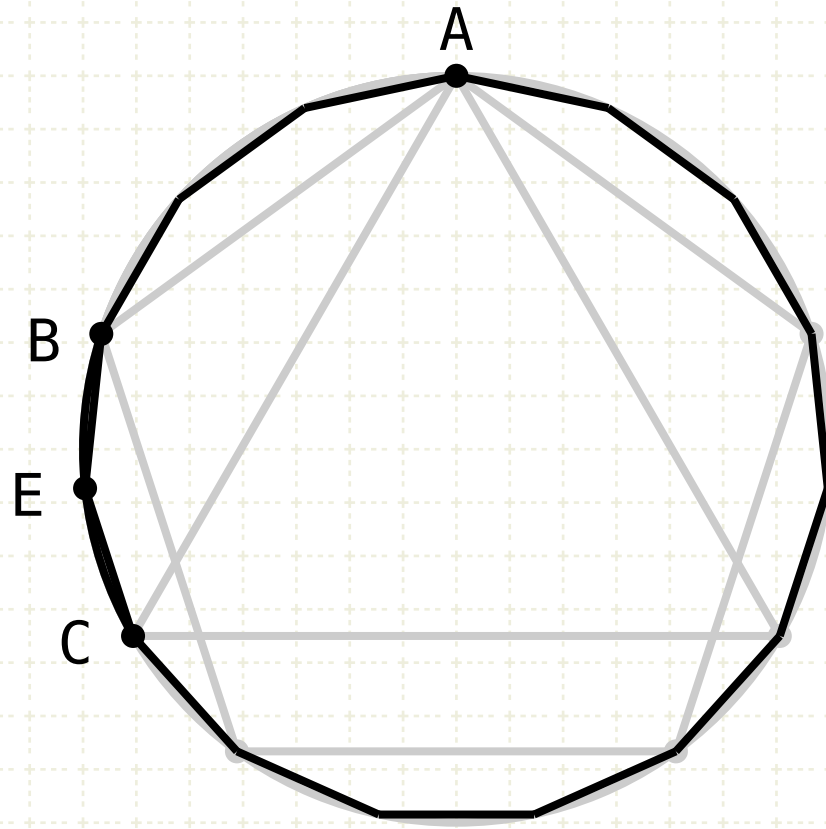
Therefore, the remainder of AB subtracted from AC (BC) will contain two segments of a fifteen sided equilateral figure

Therefore, since E bisects BC, EC is one-fifteenth of a circle



Proposition 16 of Book IV

In a given circle to inscribe a fifteen angled figure which shall be both equilateral and equiangular.



$$AC = \frac{1}{3} \times 15 = 5/15$$

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$$BC = AC - AB = 2/15$$

$$EC = 1/15$$

Construction

Draw an equilateral triangle (I·1) and copy an equiangular version into the circle (IV·2)

Inscribe a pentagon in the circle (IV·11)

Bisect the arc BC at point E

Join the line CE, and copy this line into the circle, always contiguous to the previous line.

The resulting figure is a 15 sided equiangular, equilateral polygon

Proof

Circumference AC is one third of the circle, so it will contain five segments of a fifteen sided equilateral figure

Circumference AB is one fifth of the circle, so it will contain three segments of a fifteen sided equilateral figure

Therefore, the remainder of AB subtracted from AC (BC) will contain two segments of a fifteen sided equilateral figure

Therefore, since E bisects BC, EC is one-fifteenth of a circle

Using the same arguments as for pentagons and hexagons, the points used to divide a circle into equal segments will create an equiangular, equilateral polygon

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