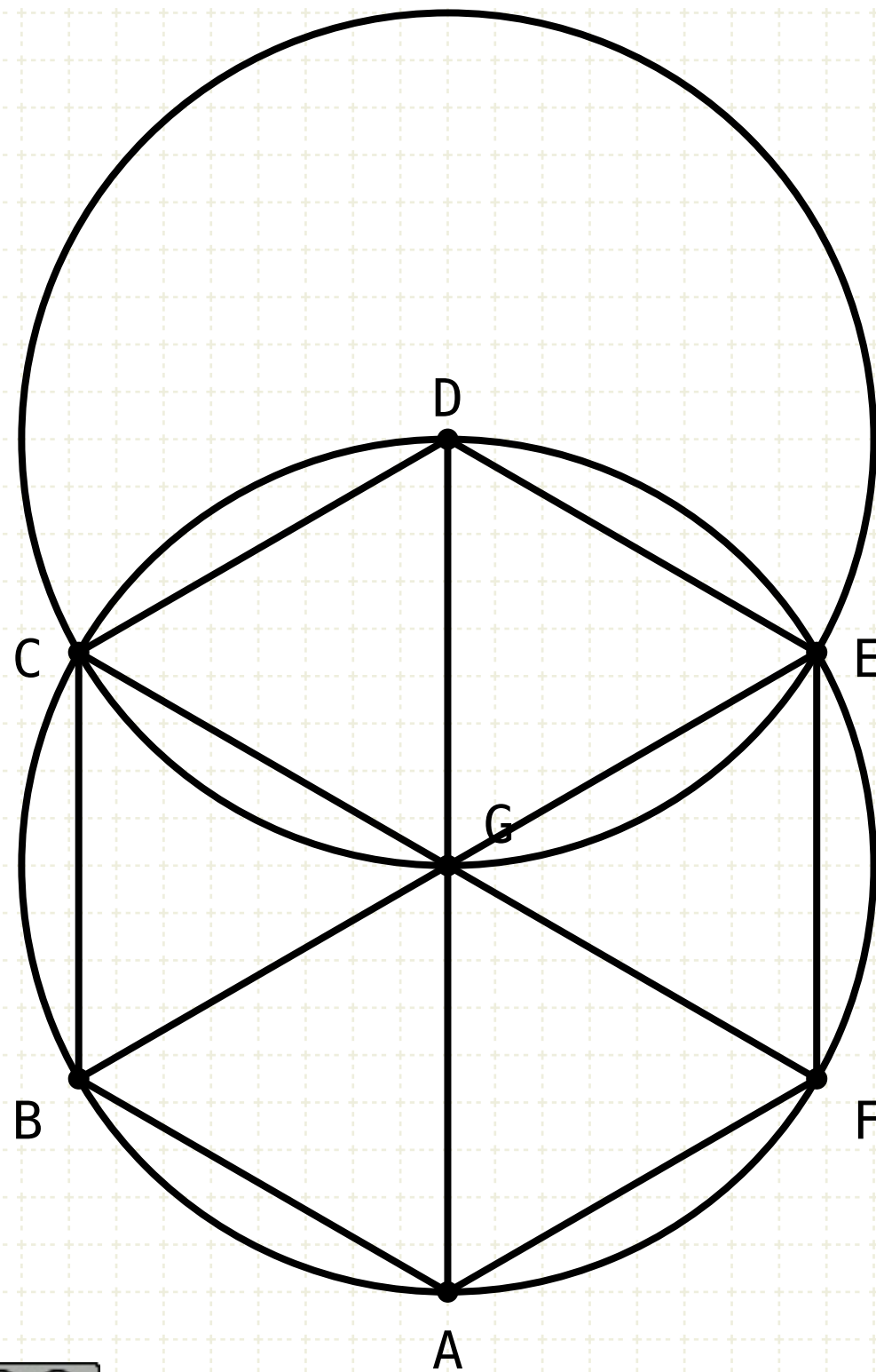


Euclid's Elements

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 6 of Book IV

In a given circle to inscribe a square.



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3	About a given circle to circumscribe a triangle equiangular with a given triangle	13	In a given pentagon, which is equilateral and equiangular, to inscribe a circle
4	In a given triangle, to inscribe a circle	14	About a given pentagon, which is equilateral and equiangular, to circumscribe a circle
5	About a given triangle to circumscribe a circle	15	In a given circle to inscribe an equilateral and equiangular hexagon
6	In a given circle to inscribe a square	16	In a given circle to inscribe a fifteen angled figure which shall be both equilateral and equiangular
7	About a given circle to circumscribe a square		
8	In a given square, to inscribe a circle		
9	About a given square, to circumscribe a circle		
10	To construct an isosceles triangle having each of the angles at the base double of the remaining one		



Proposition 6 of Book IV

In a given circle to inscribe a square.

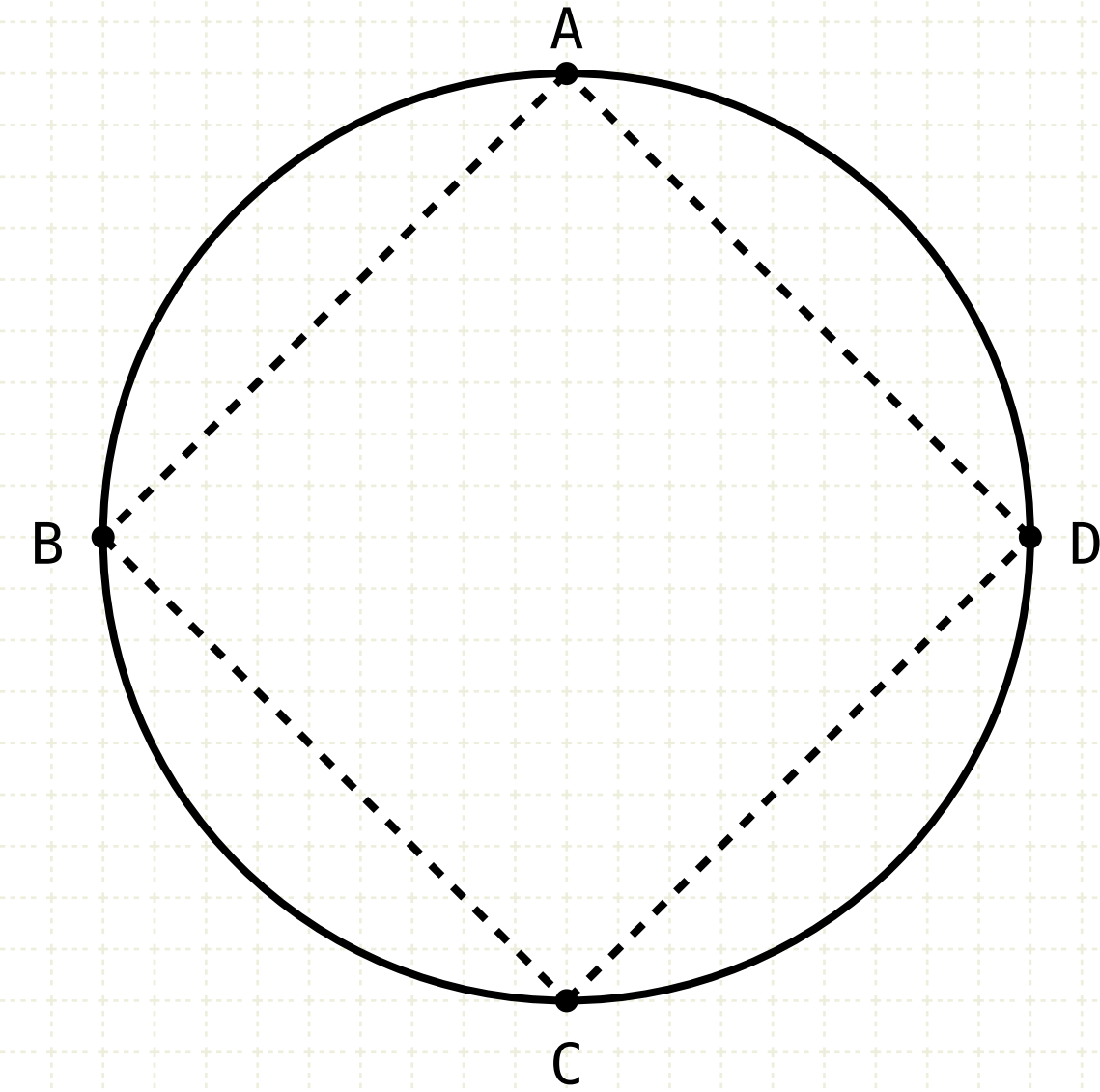


Proposition 6 of Book IV

In a given circle to inscribe a square.

In other words

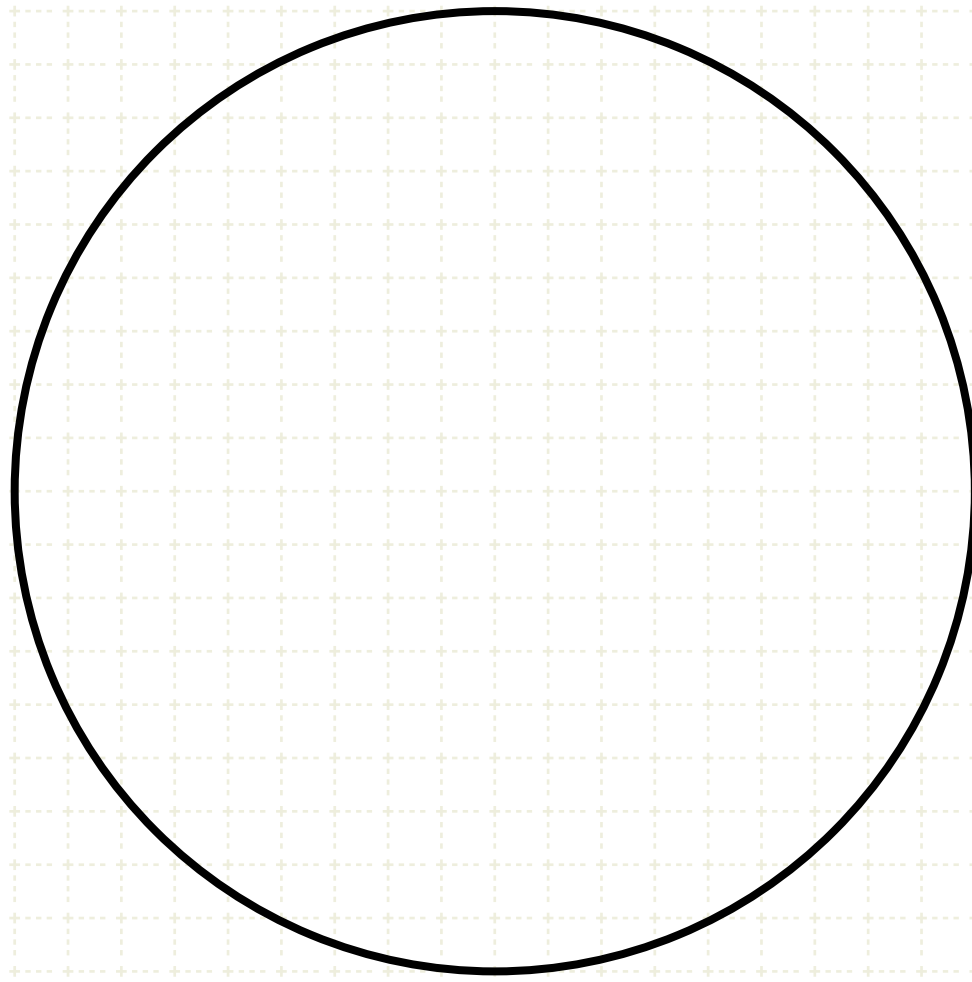
Given a circle, draw a square ABCD within the circle



Proposition 6 of Book IV

In a given circle to inscribe a square.

Construction

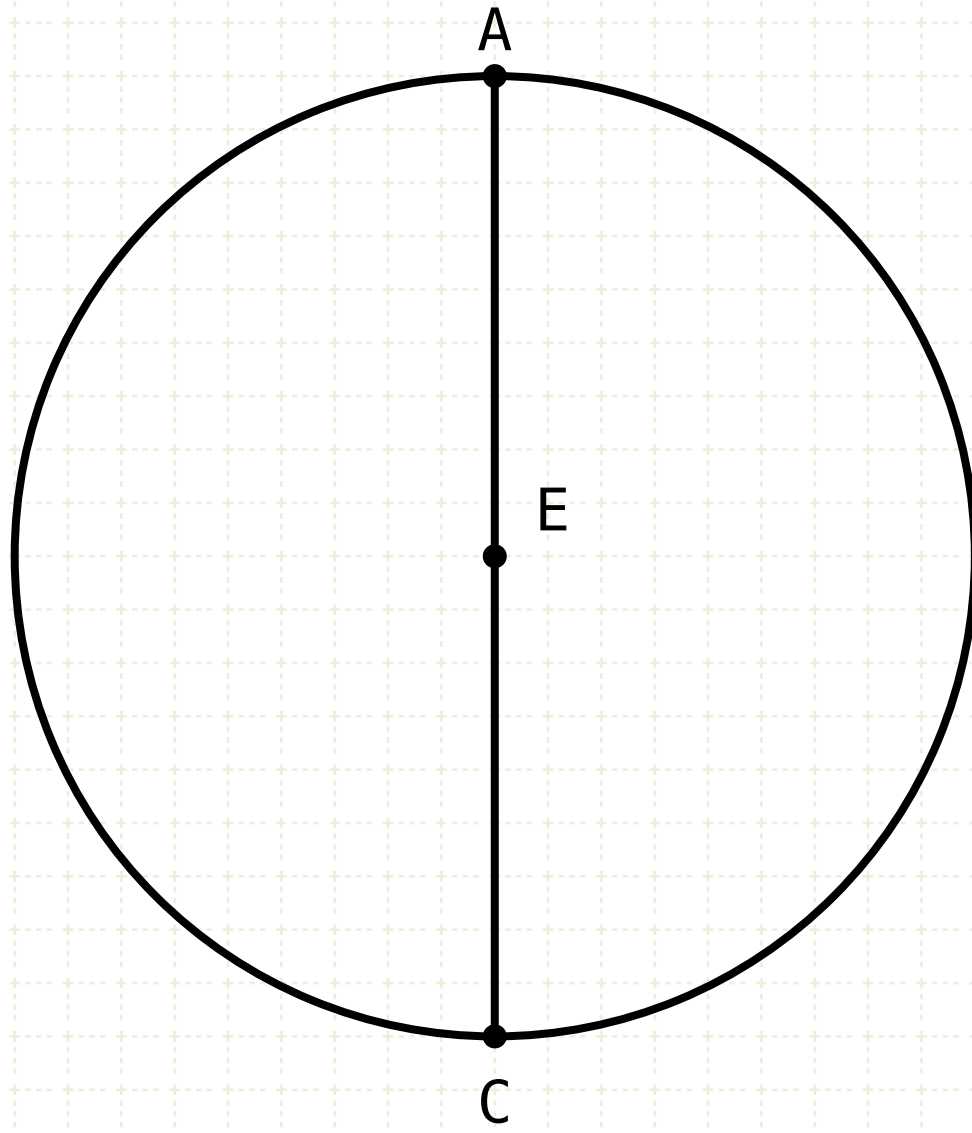


Proposition 6 of Book IV

In a given circle to inscribe a square.

Construction

Draw a diameter AC through the centre of the circle E



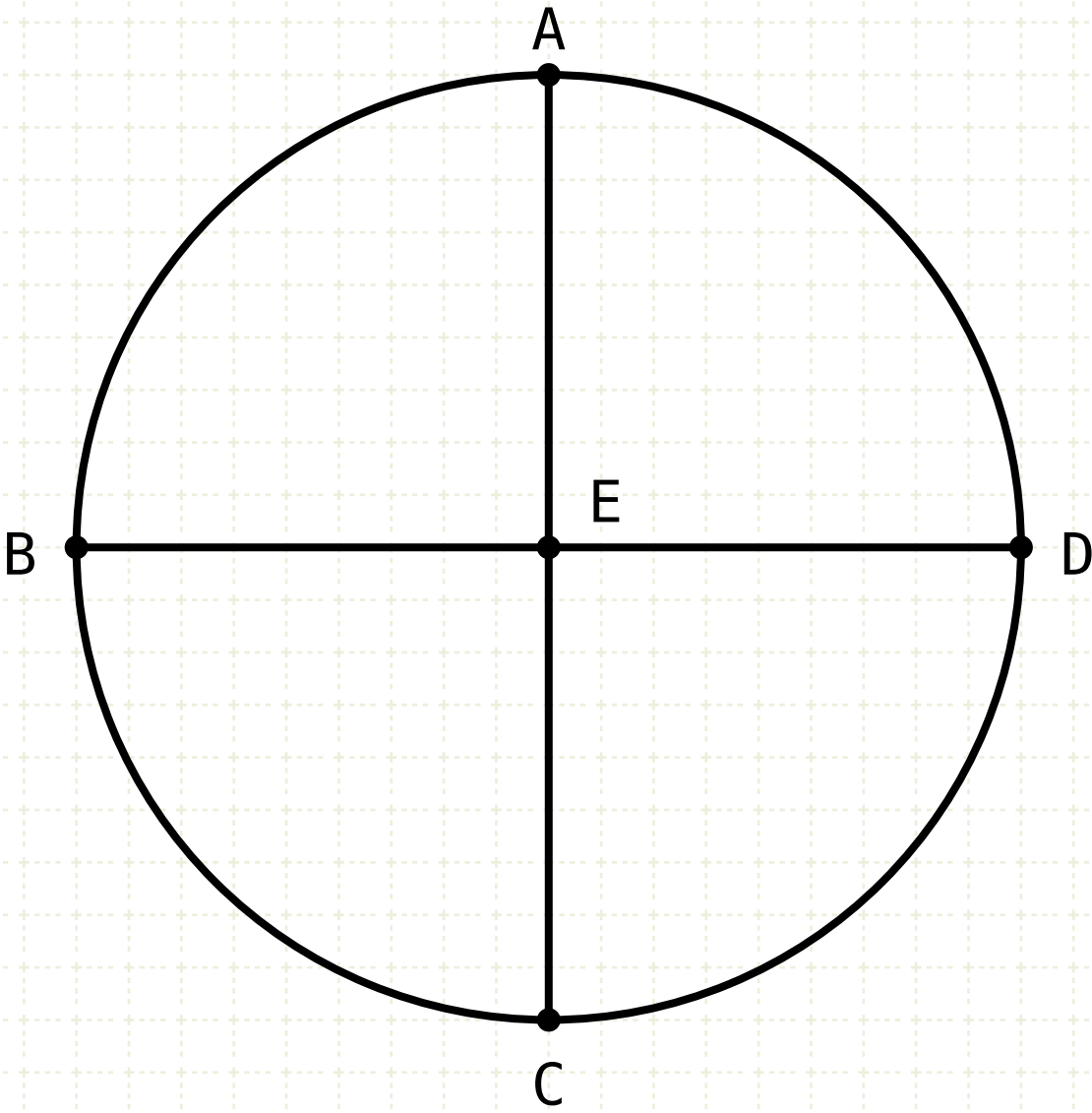
Proposition 6 of Book IV

In a given circle to inscribe a square.

Construction

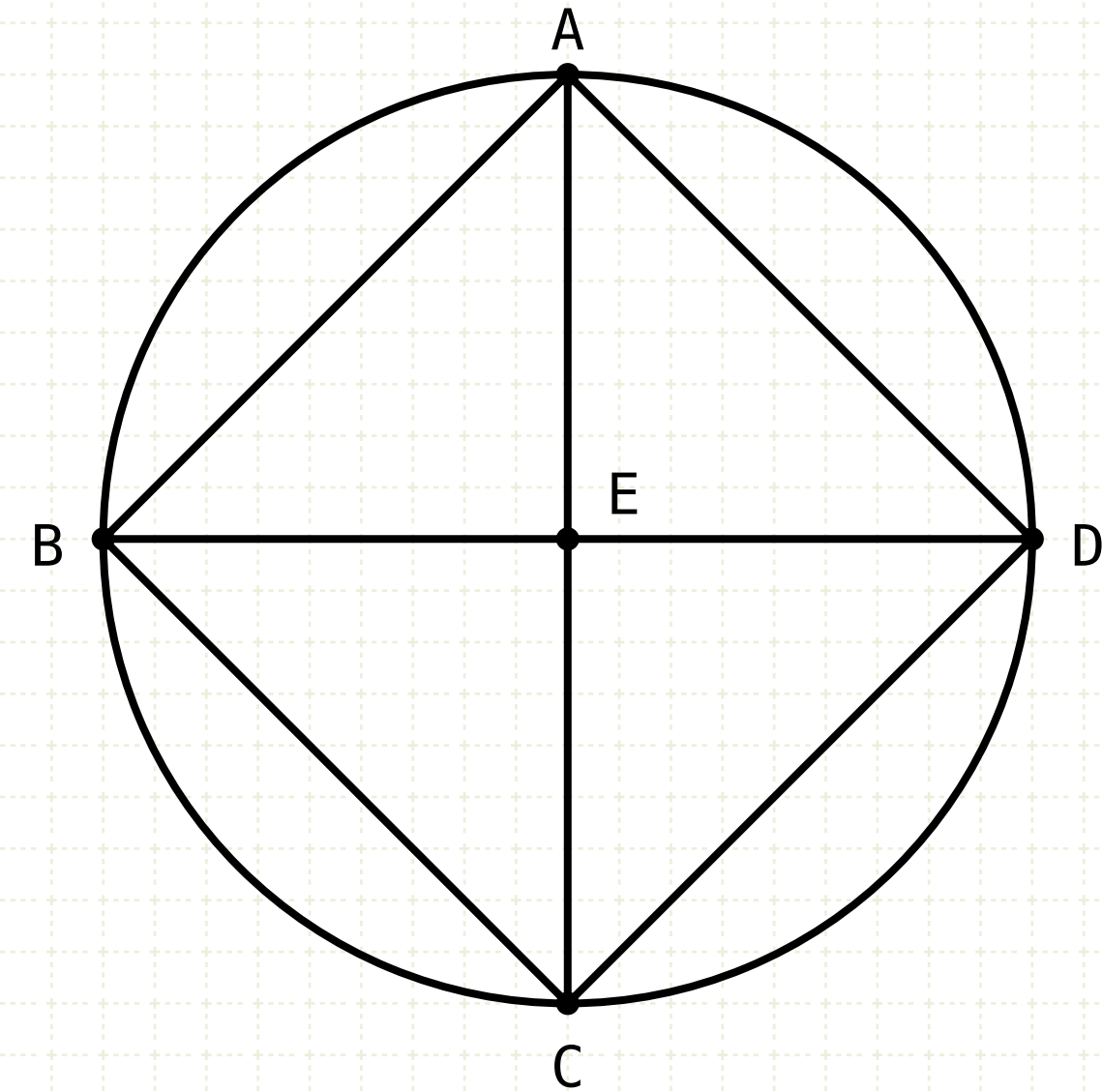
Draw a diameter AC through the centre of the circle E

Draw a diameter BD, perpendicular to AC, through the centre of the circle E



Proposition 6 of Book IV

In a given circle to inscribe a square.



Construction

Draw a diameter AC through the centre of the circle E

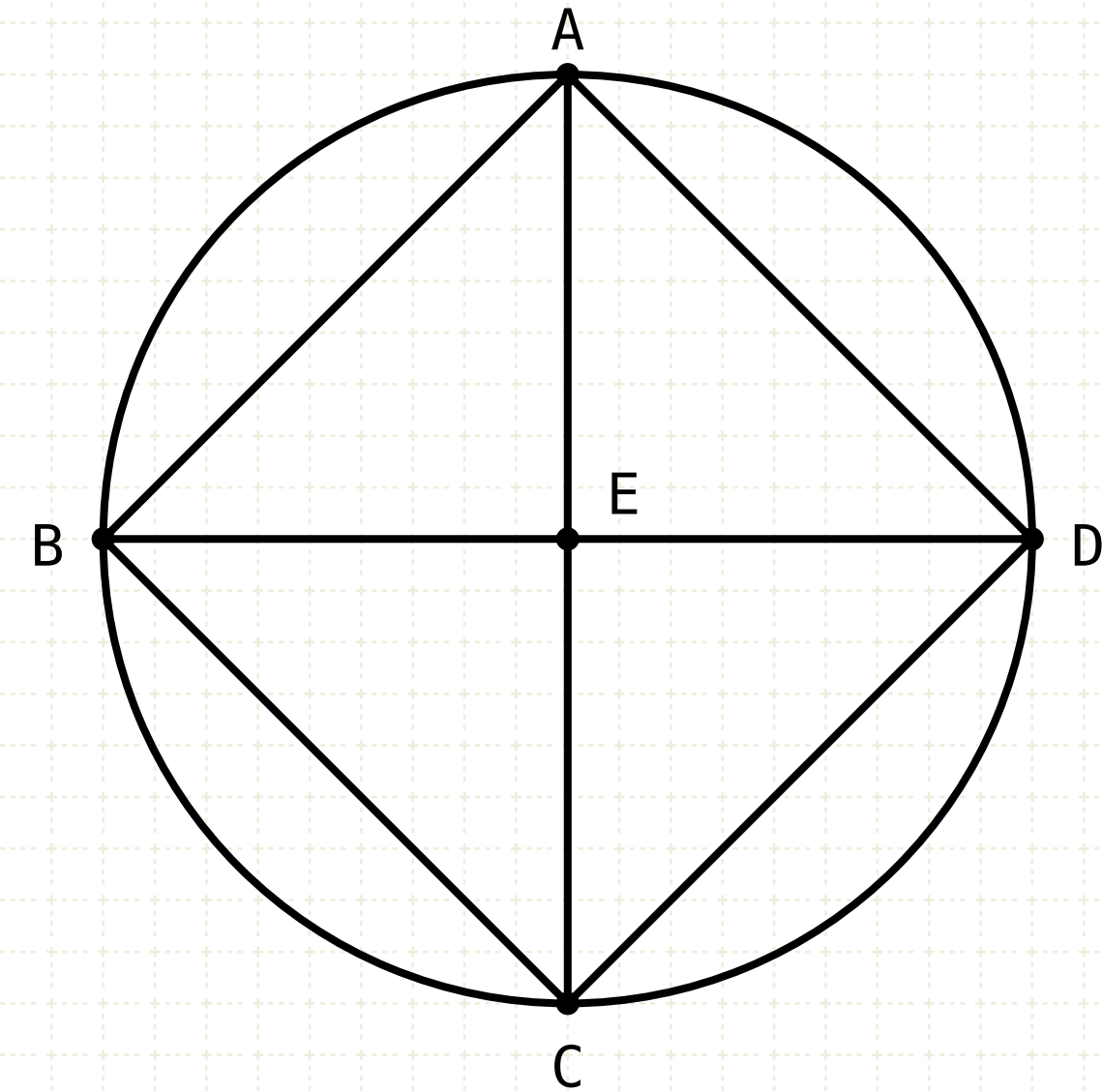
Draw a diameter BD, perpendicular to AC, through the centre of the circle E

Draw lines AB, BC, CD, DA

ABCD is a square

Proposition 6 of Book IV

In a given circle to inscribe a square.



Construction

Draw a diameter AC through the centre of the circle E

Draw a diameter BD, perpendicular to AC, through the centre of the circle E

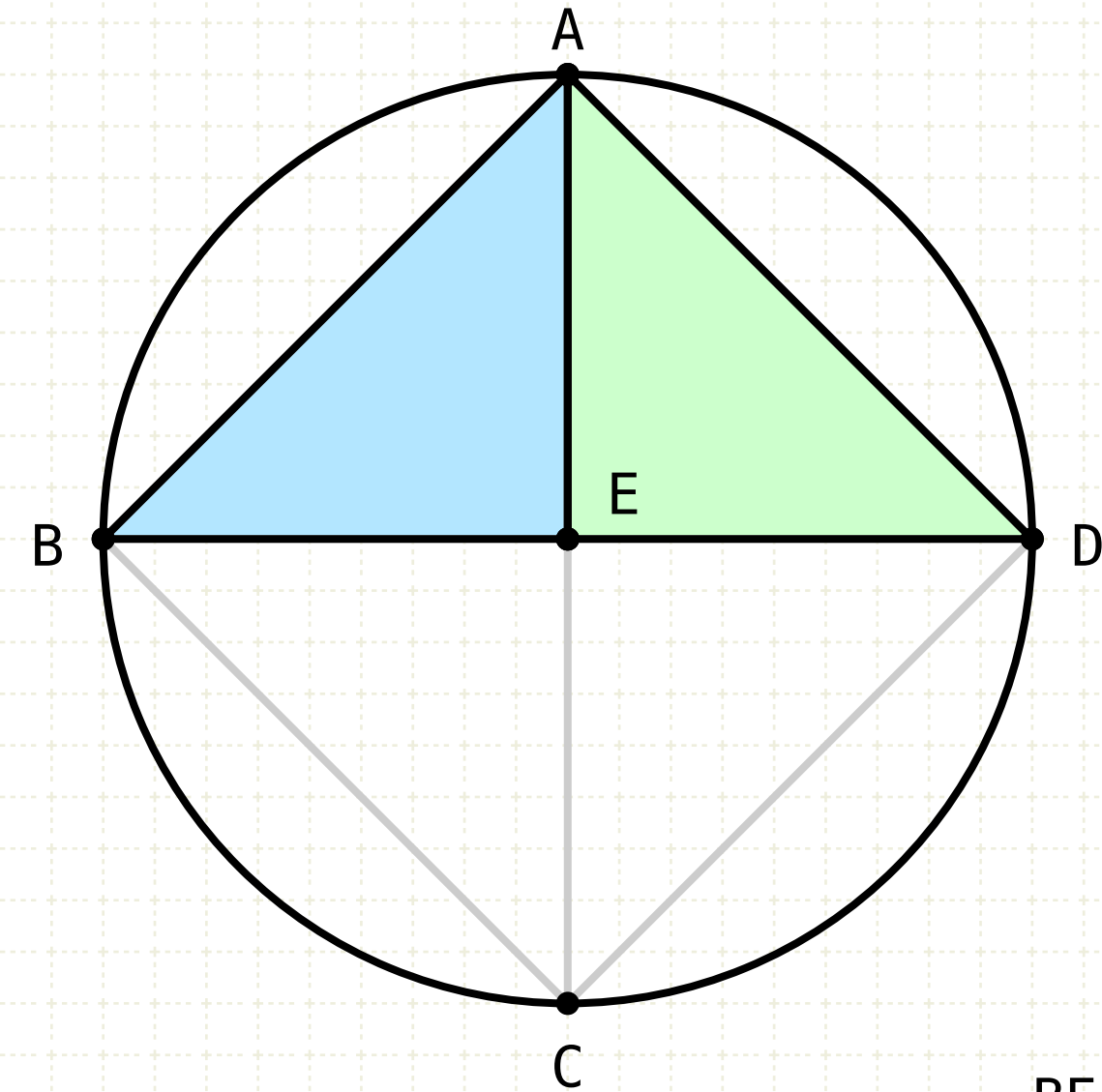
Draw lines AB, BC, CD, DA

ABCD is a square

Proof

Proposition 6 of Book IV

In a given circle to inscribe a square.



$$BE = ED$$

$$\angle AEB = \angle AED = \angle$$

AE is common

Construction

Draw a diameter AC through the centre of the circle E

Draw a diameter BD, perpendicular to AC, through the centre of the circle E

Draw lines AB, BC, CD, DA

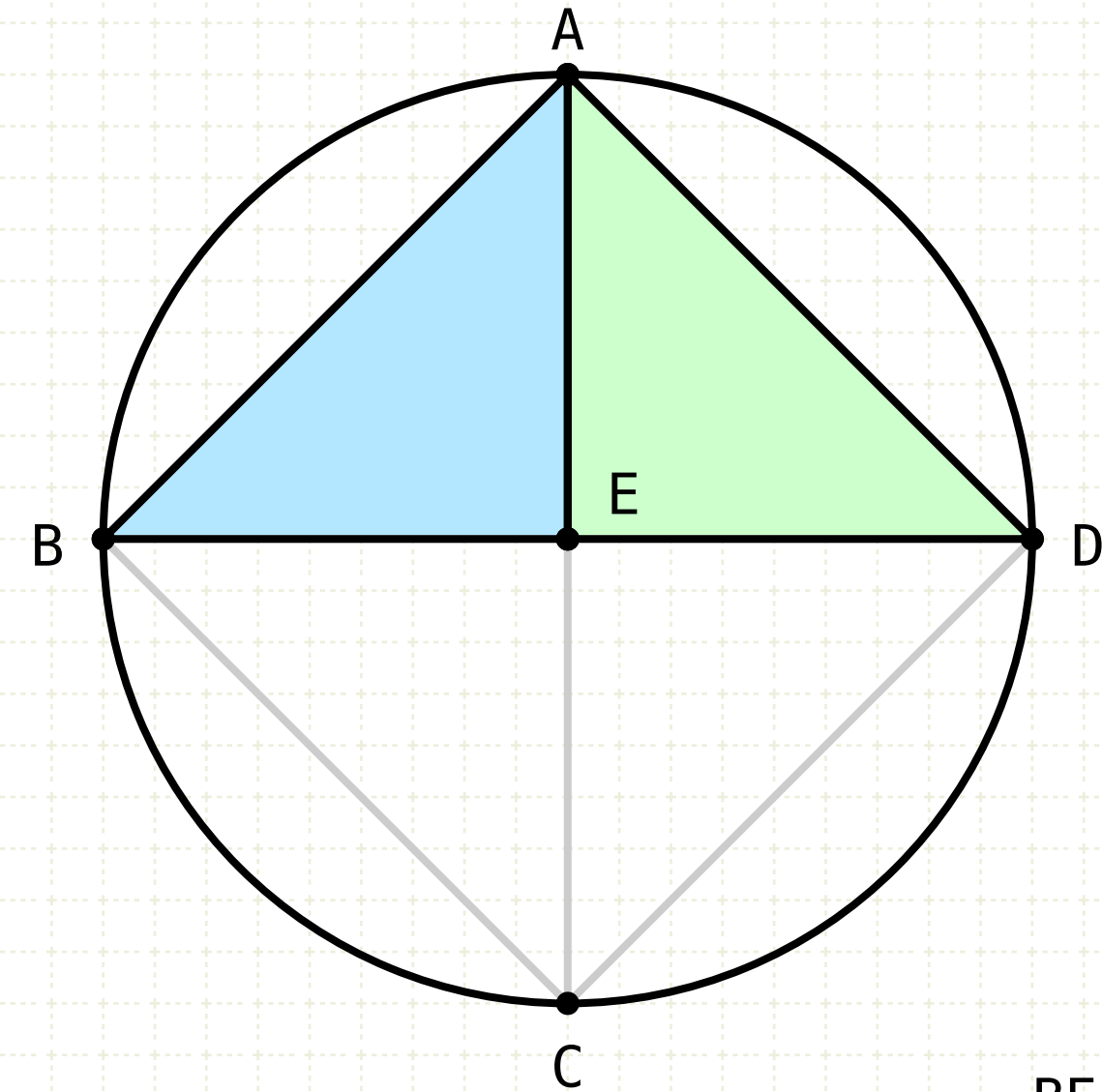
ABCD is a square

Proof

The two triangles ABE and AED are equal, since they have a side (BE, ED), angle ($\angle AEB = \angle AED = \angle$), side (AE) equal (I.4)

Proposition 6 of Book IV

In a given circle to inscribe a square.



$$BE = ED$$

$$\angle AEB = \angle AED = \angle$$

AE is common

$$\therefore AB = AD$$

Construction

Draw a diameter AC through the centre of the circle E

Draw a diameter BD, perpendicular to AC, through the centre of the circle E

Draw lines AB, BC, BC, DA

ABCD is a square

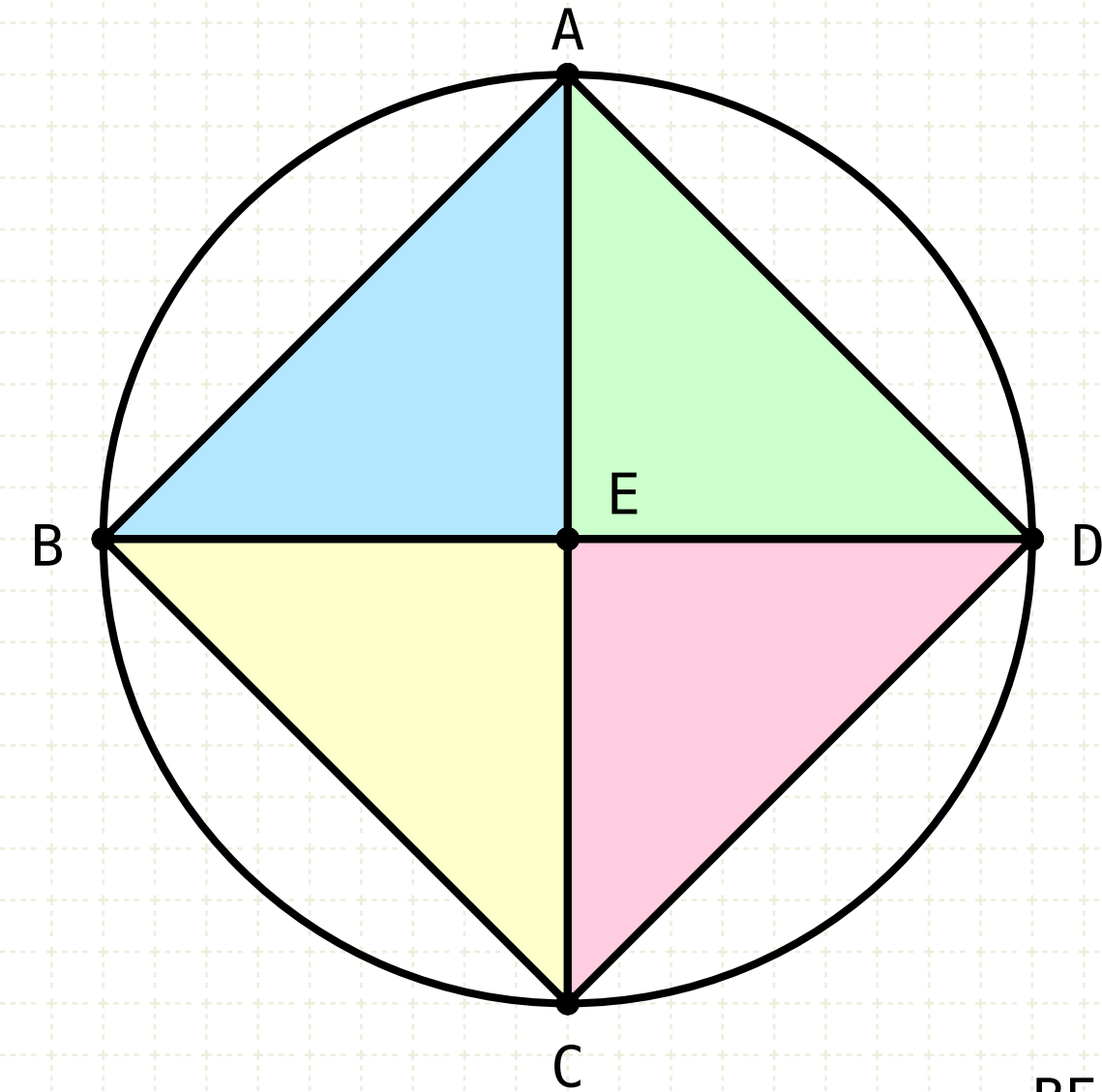
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Hence AB equals AD

Proposition 6 of Book IV

In a given circle to inscribe a square.



$$BE = ED$$

$$\angle AEB = \angle AED = \angle$$

AE is common

$$\therefore AB = AD$$

$$AB = AD = CD = CB$$

Construction

Draw a diameter AC through the centre of the circle E

Draw a diameter BD, perpendicular to AC, through the centre of the circle E

Draw lines AB, BC, CD, DA

ABCD is a square

Proof

The two triangles ABE and AED are equal, since they have a side (BE, ED), angle ($\angle AEB = \angle AED = \angle$), side (AE) equal (I.4)

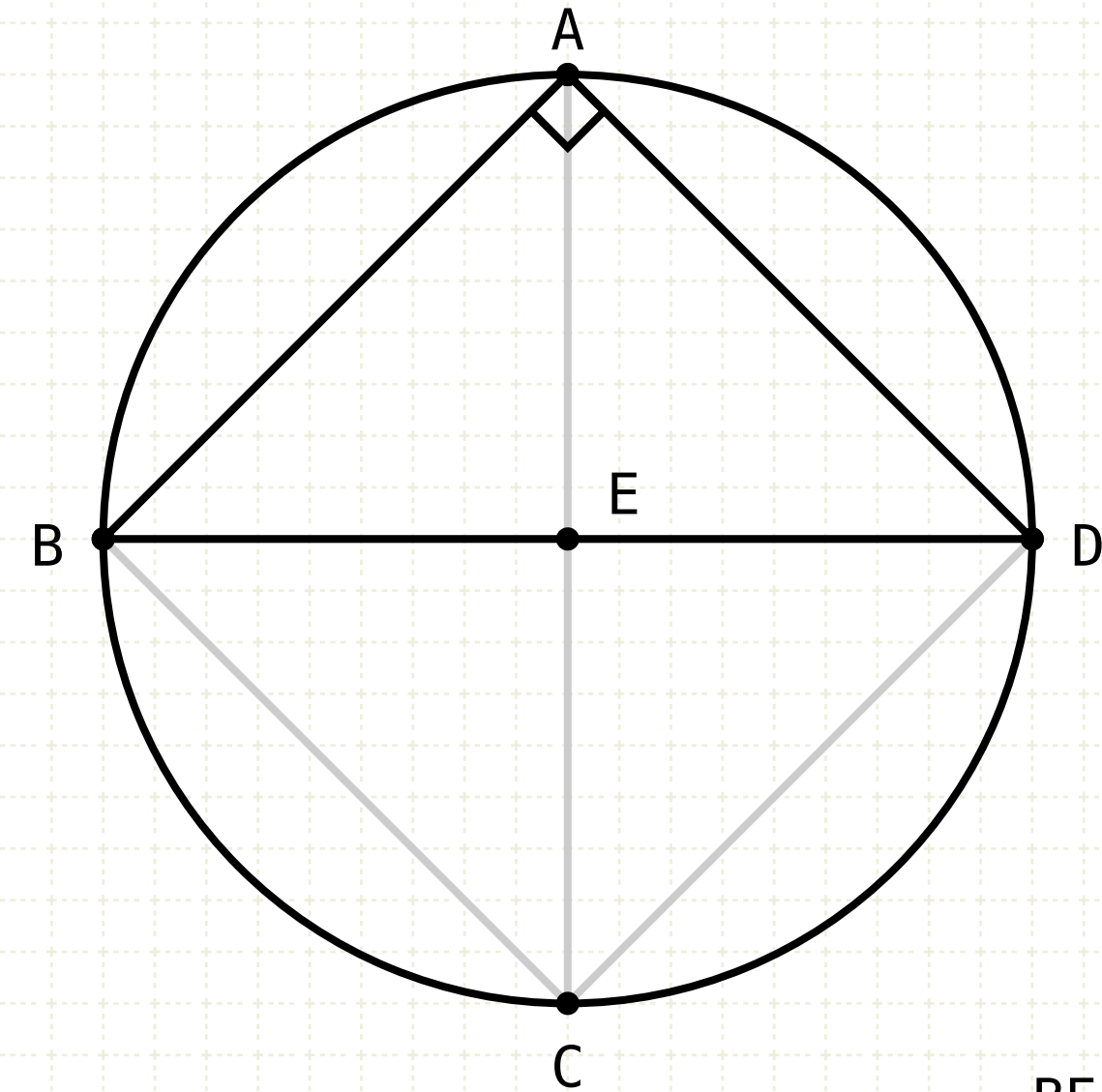
Hence AB equals AD

Similarly, it can be shown that AD is equal to CD, and CD equals CB, hence ABCD is an equilateral



Proposition 6 of Book IV

In a given circle to inscribe a square.



$$BE = ED$$

$$\angle AEB = \angle AED = \angle$$

AE is common

$$\therefore AB = AD$$

$$AB = AD = CD = CB$$

$$\angle BAD = \angle$$

Construction

Draw a diameter AC through the centre of the circle E

Draw a diameter BD, perpendicular to AC, through the centre of the circle E

Draw lines AB, BC, BC, DA

ABCD is a square

Proof

The two triangles ABE and AED are equal, since they have a side (BE,ED), angle ($\angle AEB = \angle AED = \angle$), side (AE) equal (I·4)

Hence AB equals AD

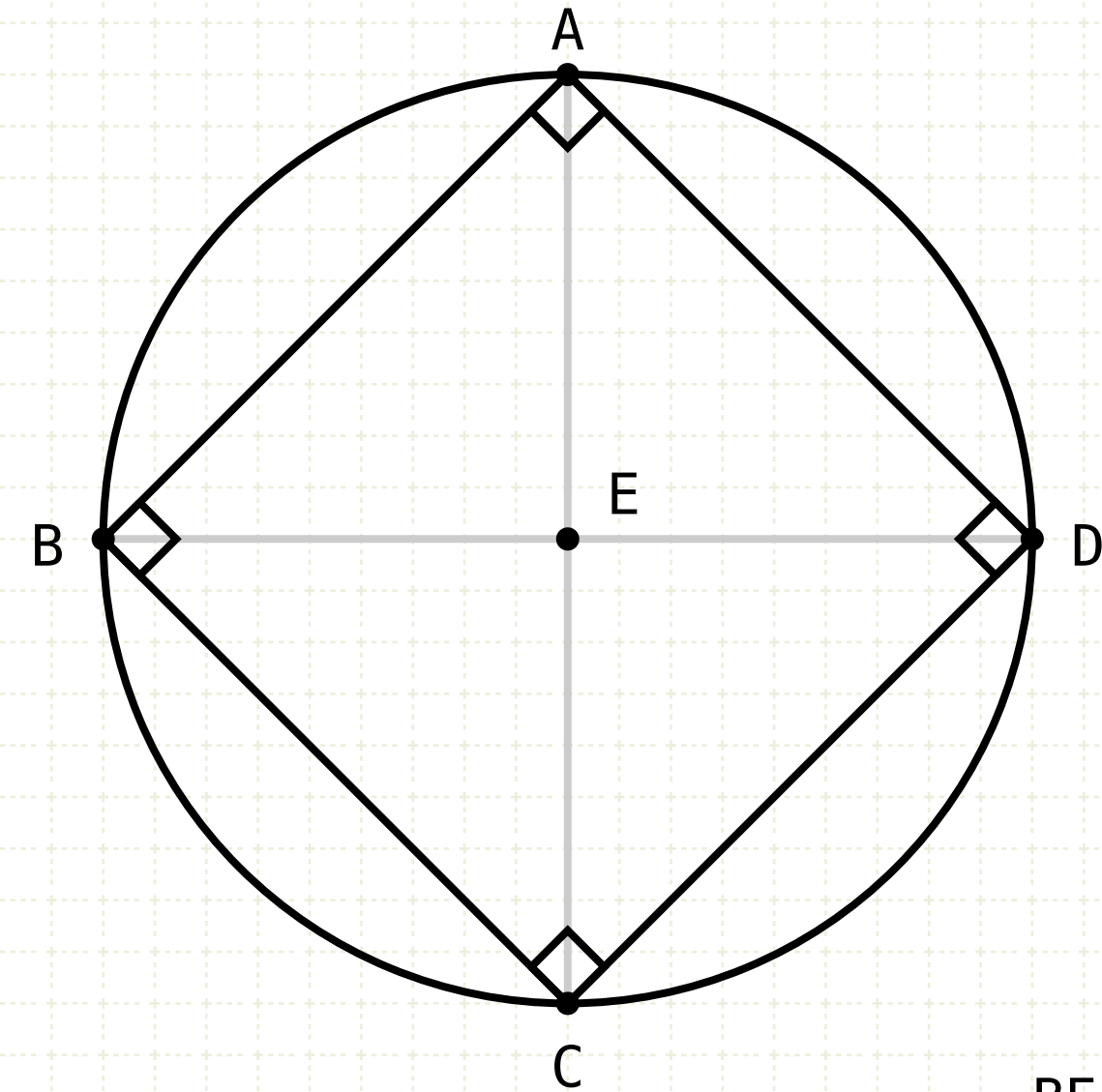
Similarly, it can be shown that AD is equal to CD, and CD equals CB, hence ABCD is an equilateral

BD is the diameter of the circle, and the angle of a semi-circle is a right angle (III·31), therefore the angle BAD is right



Proposition 6 of Book IV

In a given circle to inscribe a square.



$$BE = ED$$

$$\angle AEB = \angle AED = \angle$$

AE is common

$$\therefore AB = AD$$

$$AB = AD = CD = CB$$

$$\angle BAD = \angle$$

$$\angle ADC = \angle DCB = \angle CBA = \angle$$

Construction

Draw a diameter AC through the centre of the circle E

Draw a diameter BD, perpendicular to AC, through the centre of the circle E

Draw lines AB, BC, CD, DA

ABCD is a square

Proof

The two triangles ABE and AED are equal, since they have a side (BE, ED), angle ($\angle AEB = \angle AED = \angle$), side (AE) equal (I·4)

Hence AB equals AD

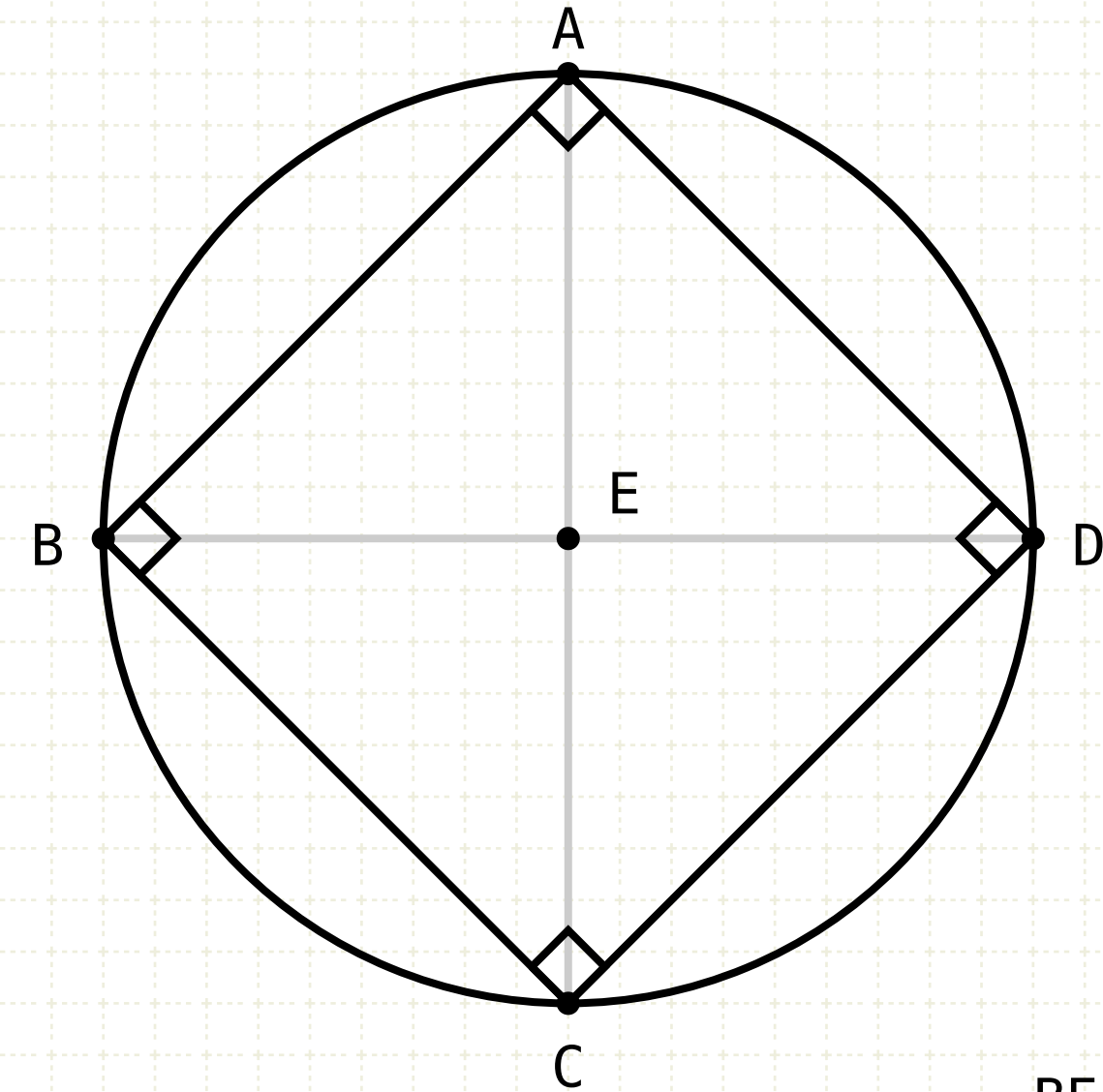
Similarly, it can be shown that AD is equal to CD, and CD equals CB, hence ABCD is an equilateral

BD is the diameter of the circle, and the angle of a semi-circle is a right angle (III·31), therefore the angle BAD is right

Similarly, it can be shown that all the angles touching the circle are right

Proposition 6 of Book IV

In a given circle to inscribe a square.



$$BE = ED$$

$$\angle AEB = \angle AED = \angle$$

AE is common

$$\therefore AB = AD$$

$$AB = AD = CD = CB$$

$$\angle BAD = \angle$$

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Draw a diameter AC through the centre of the circle E

Draw a diameter BD, perpendicular to AC, through the centre of the circle E

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Hence AB equals AD

Similarly, it can be shown that AD is equal to CD, and CD equals CB, hence ABCD is an equilateral

BD is the diameter of the circle, and the angle of a semi-circle is a right angle (III.31), therefore the angle BAD is right

Similarly, it can be shown that all the angles touching the circle are right

A quadrilateral with all angles right angles is, by definition, a square



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