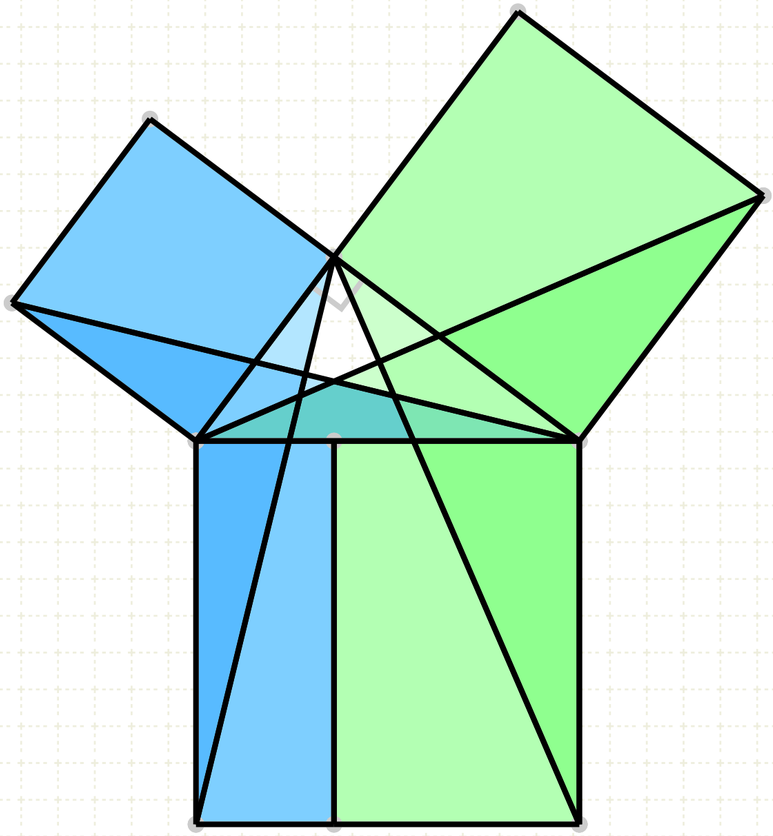
Euclid's Elements

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 44 of Book I

To a given straight line in a given rectilinear angle, to apply a parallelogram equal to a given triangle.

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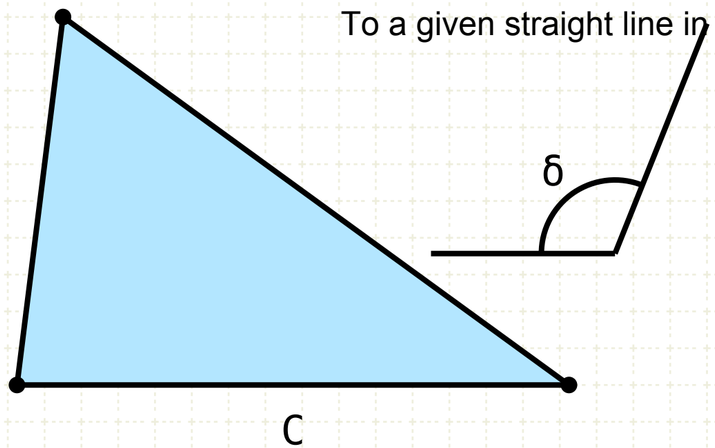
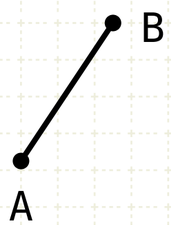


In other words

Start with a given triangle C, a straight line AB and an angle δ



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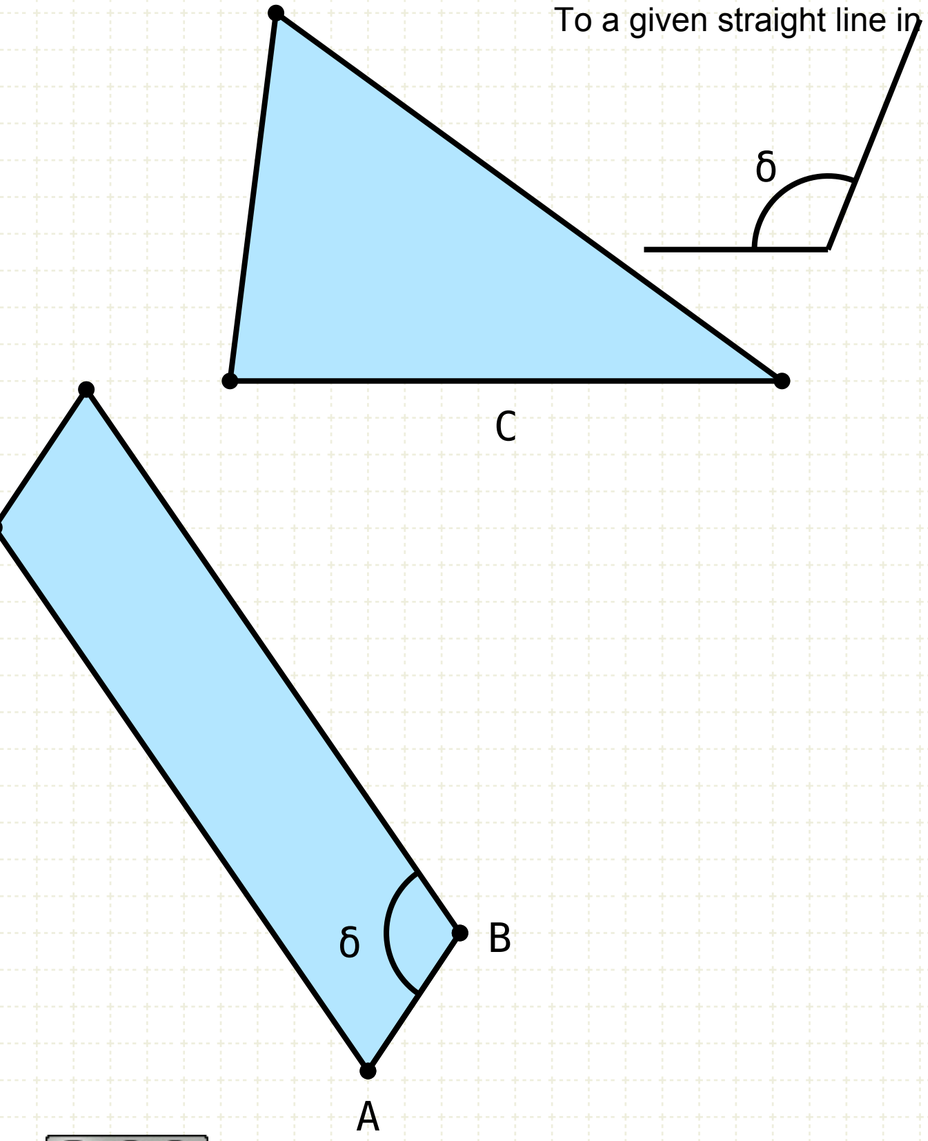
To a given straight line in a given rectilinear angle, to apply a parallelogram equal to a given triangle.



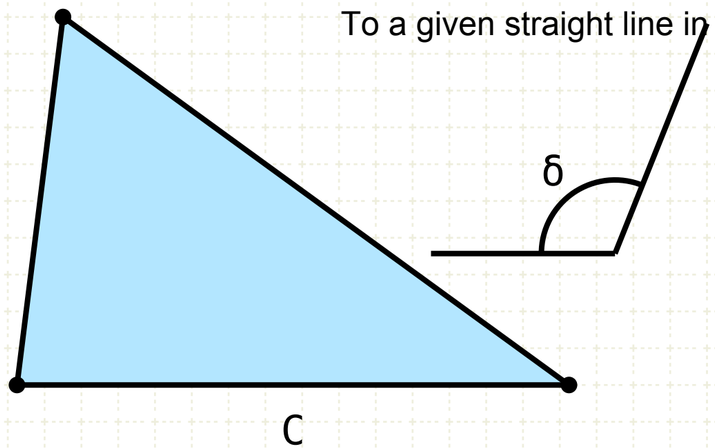
In other words

Start with a given triangle C, a straight line AB and an angle δ

Create a parallelogram, on the line AB, with an angle δ, such that it is equal in area to the triangle C

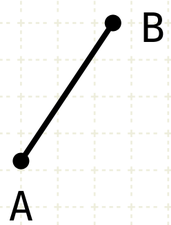
Proposition 44 of Book I

To a given straight line in a given rectilinear angle, to apply a parallelogram equal to a given triangle.



Construction

Start with a given triangle C, a straight line AB and an angle δ



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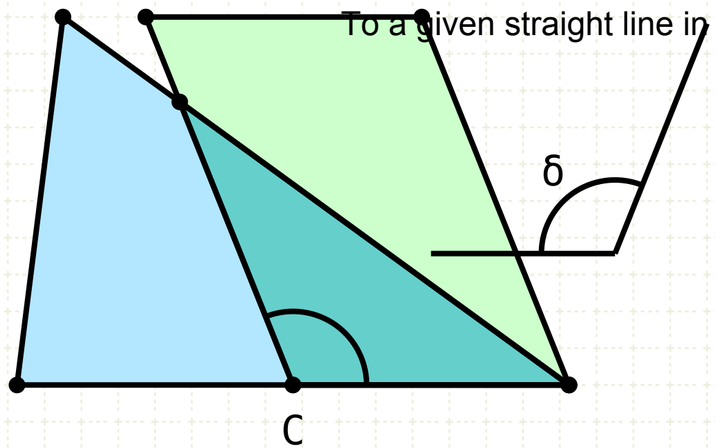
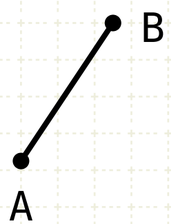


Construction

Start with a given triangle C, a straight line AB and an angle δ

Create a parallelogram equal to triangle C, with angle δ
(I·42)



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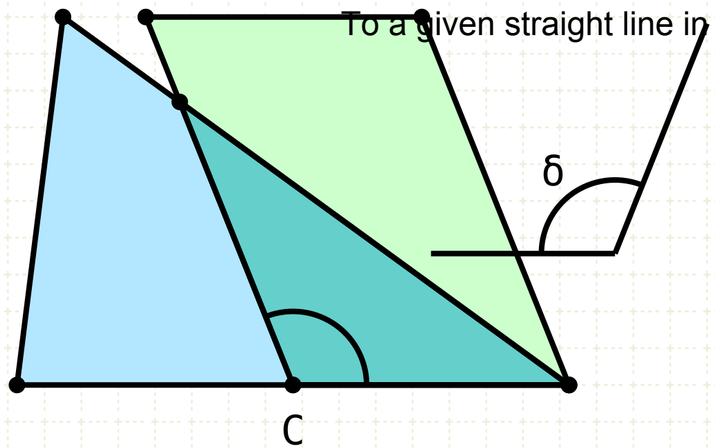
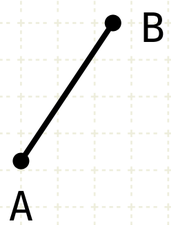


Construction

Start with a given triangle C, a straight line AB and an angle δ

Create a parallelogram equal to triangle C, with angle δ (I·42)

Copy the parallelogram so that one side is in a straight line with AB



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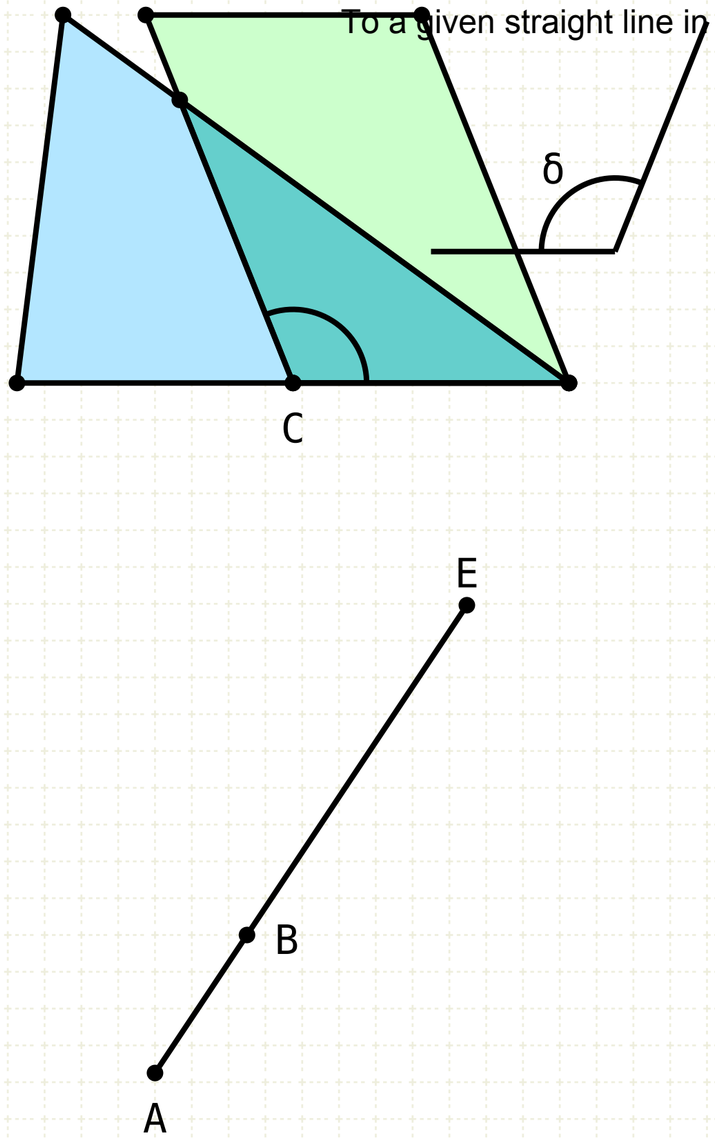

Construction

Start with a given triangle C, a straight line AB and an angle δ

Create a parallelogram equal to triangle C, with angle δ (I·42)

Copy the parallelogram so that one side is in a straight line with AB

copy one side of parallelogram to AB

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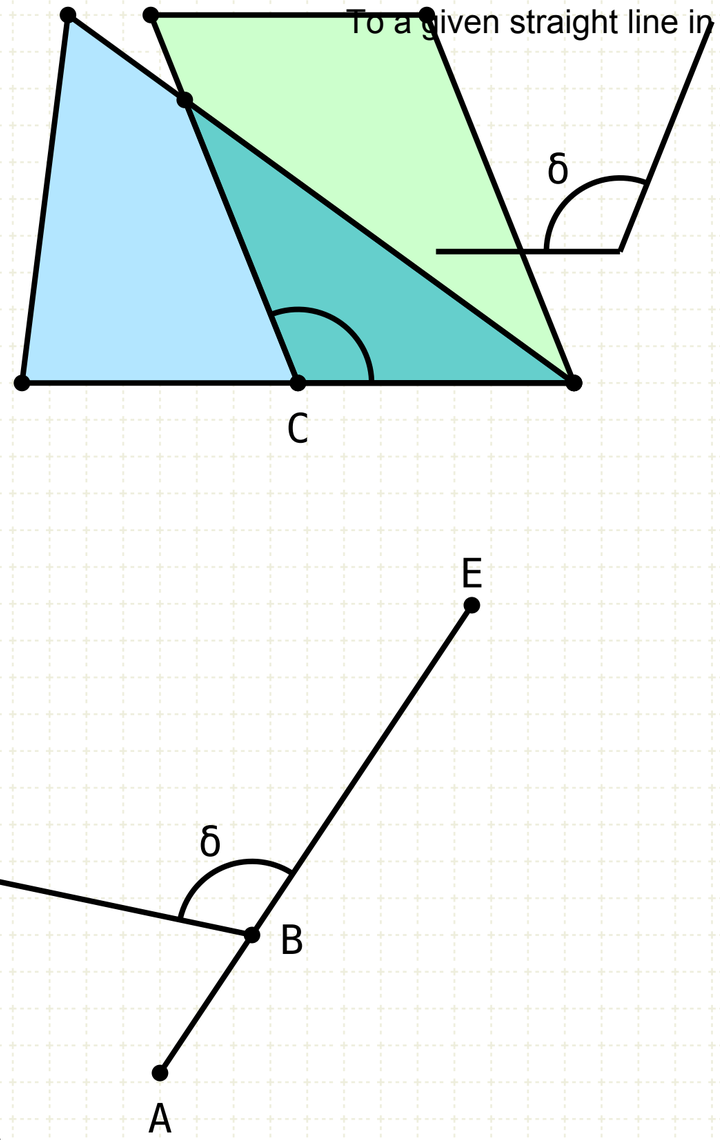

Construction

Start with a given triangle C, a straight line AB and an angle δ

Create a parallelogram equal to triangle C, with angle δ (I·42)

Copy the parallelogram so that one side is in a straight line with AB

copy one side of parallelogram to AB

copy angle δ to BE

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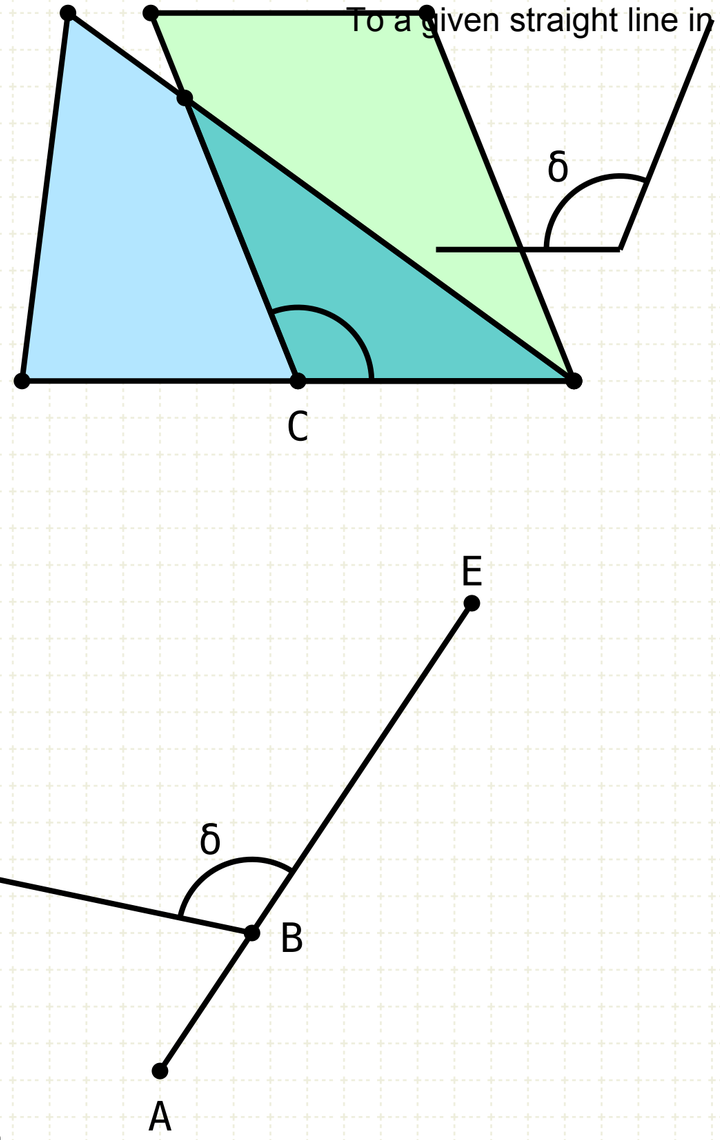

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Start with a given triangle C, a straight line AB and an angle δ

Create a parallelogram equal to triangle C, with angle δ (I·42)

Copy the parallelogram so that one side is in a straight line with AB

- copy one side of parallelogram to AB
- copy angle δ to BE
- copy the other side of parallelogram to BG

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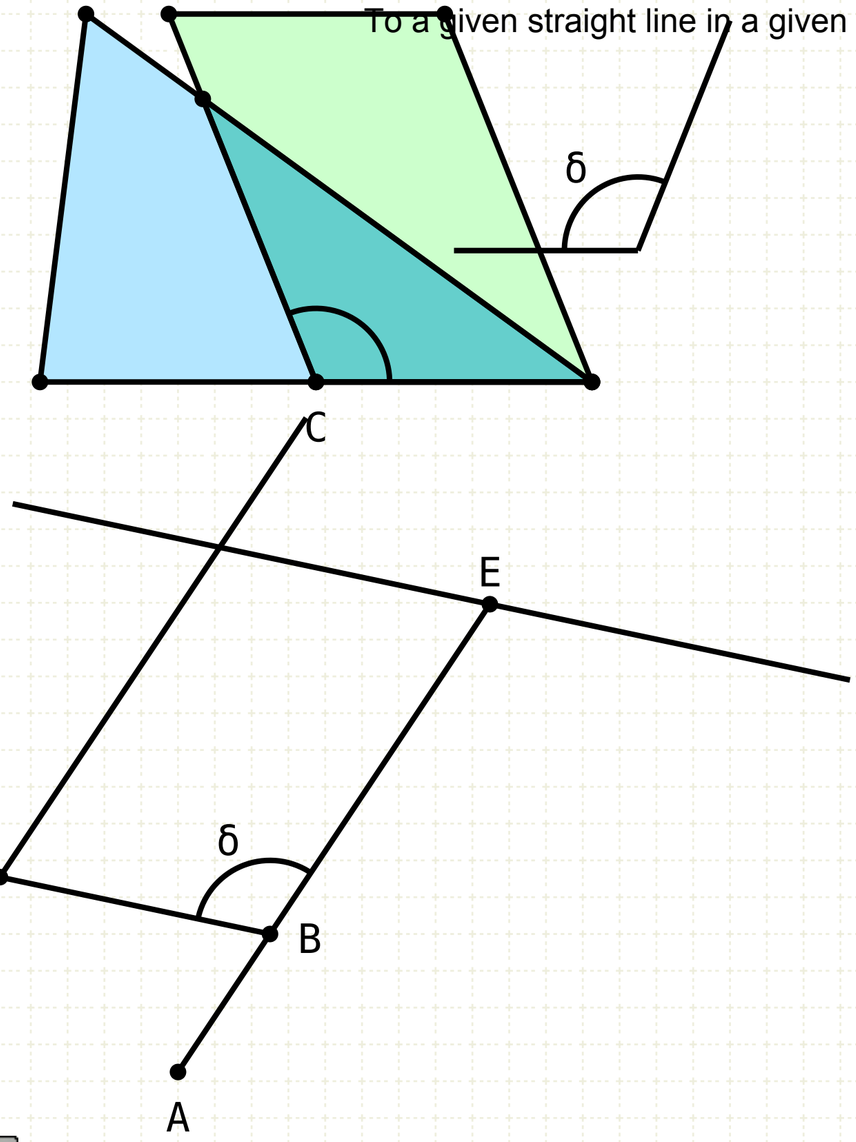

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Create a parallelogram equal to triangle C, with angle δ (I·42)

Copy the parallelogram so that one side is in a straight line with AB

- copy one side of parallelogram to AB
- copy angle δ to BE
- copy the other side of parallelogram to BG
- create parallel lines to existing lines

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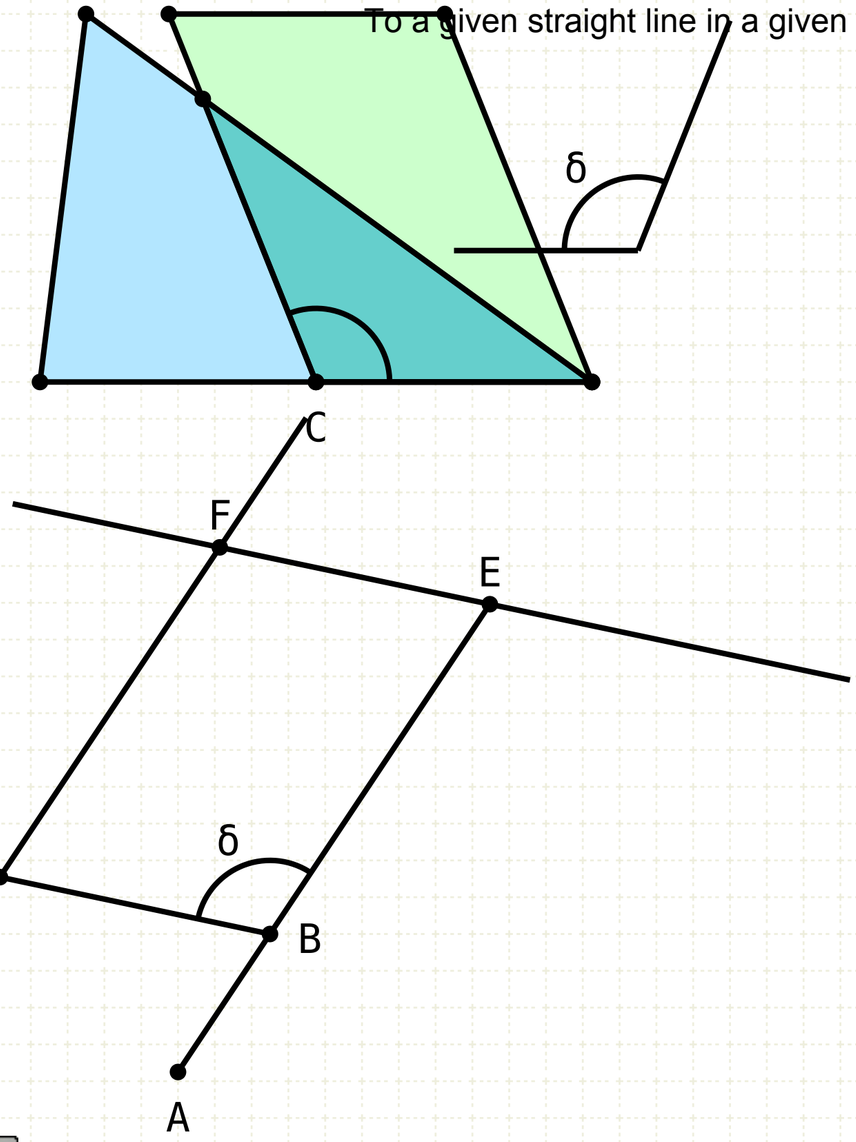

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- copy one side of parallelogram to AB
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- create parallel lines to existing lines
- get last and final point

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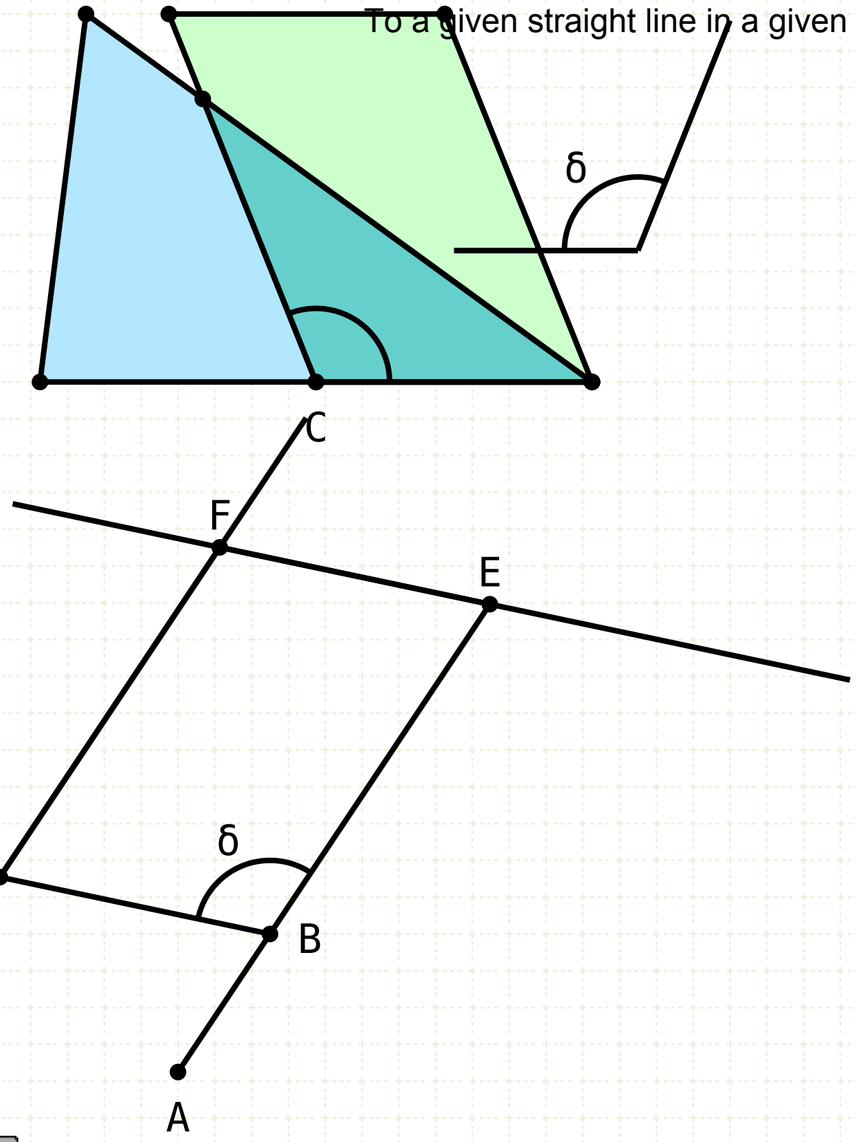

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- copy one side of parallelogram to AB
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- copy the other side of parallelogram to BG
- create parallel lines to existing lines
- get last and final point
- construct the last two lines of the polygon

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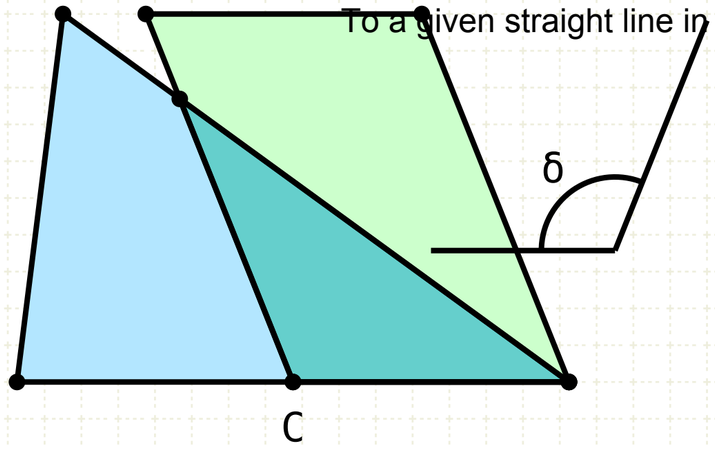
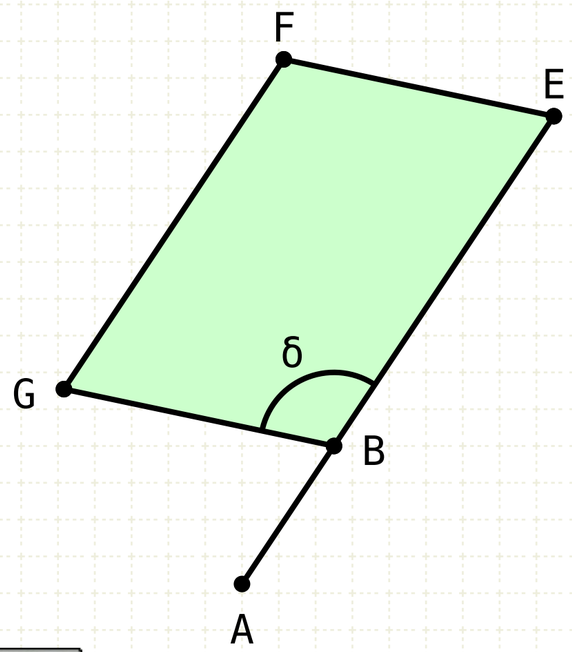


EFGB = ΔC



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Create a parallelogram equal to triangle C, with angle δ (I·42)

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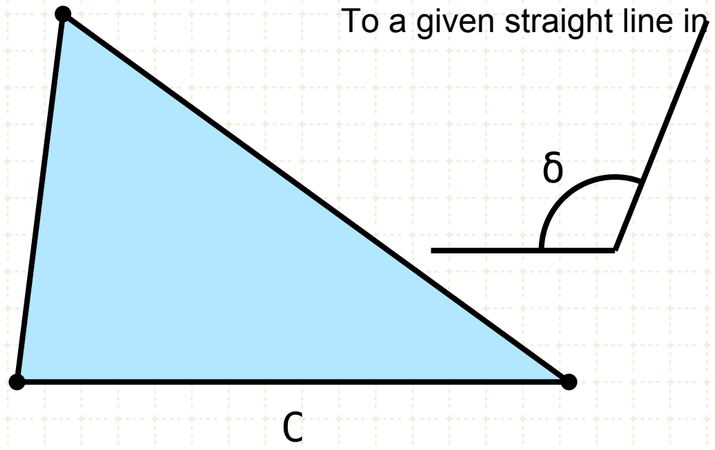

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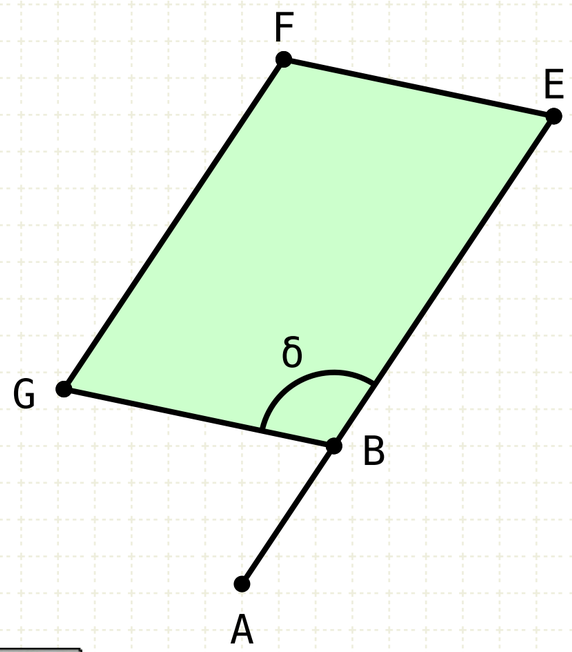

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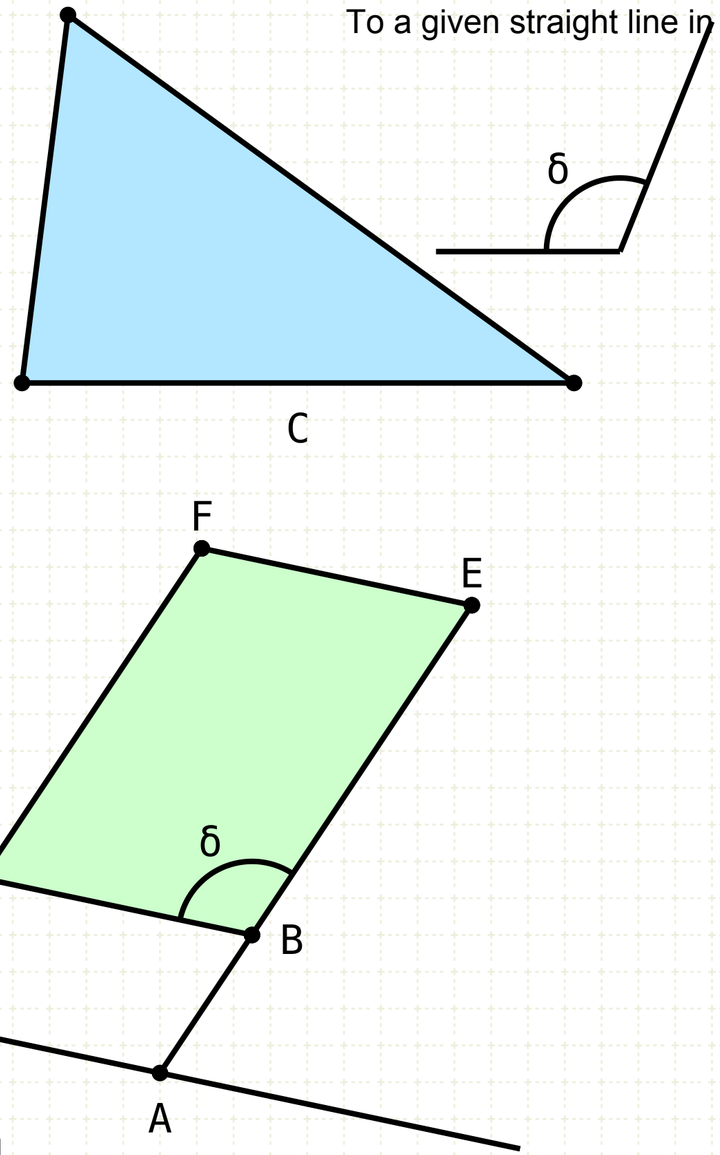

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Construction

Start with a given triangle C, a straight line AB and an angle δ

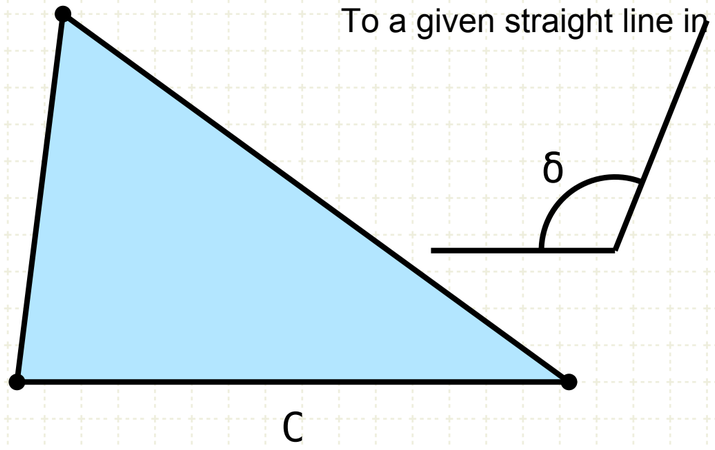
Create a parallelogram equal to triangle C, with angle δ (I·42)

Copy the parallelogram so that one side is in a straight line with AB

Draw a line parallel to GB, through A (I·31)

Proposition 44 of Book I

To a given straight line in a given rectilinear angle, to apply a parallelogram equal to a given triangle.



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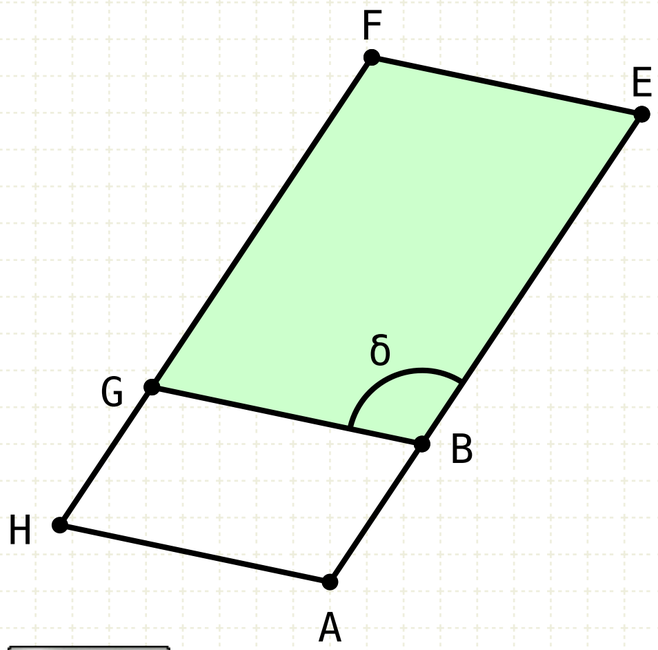

Construction

Start with a given triangle C, a straight line AB and an angle δ

Create a parallelogram equal to triangle C, with angle δ (I·42)

Copy the parallelogram so that one side is in a straight line with AB

Draw a line parallel to GB, through A (I·31)

Extend line FG so that it intersects with the previously drawn line, at point H

Proposition 44 of Book I

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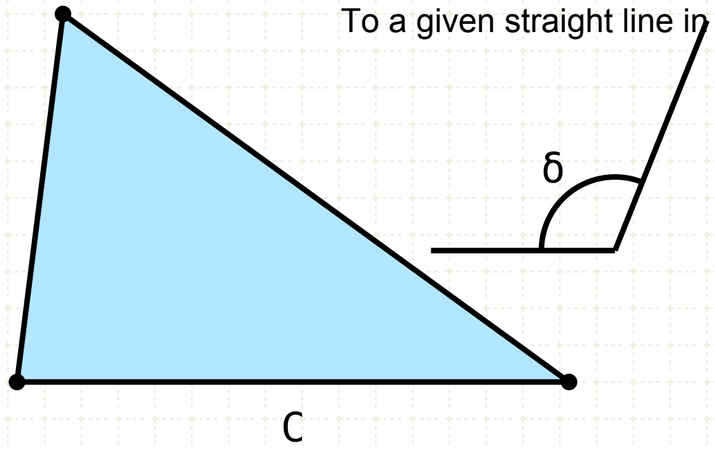

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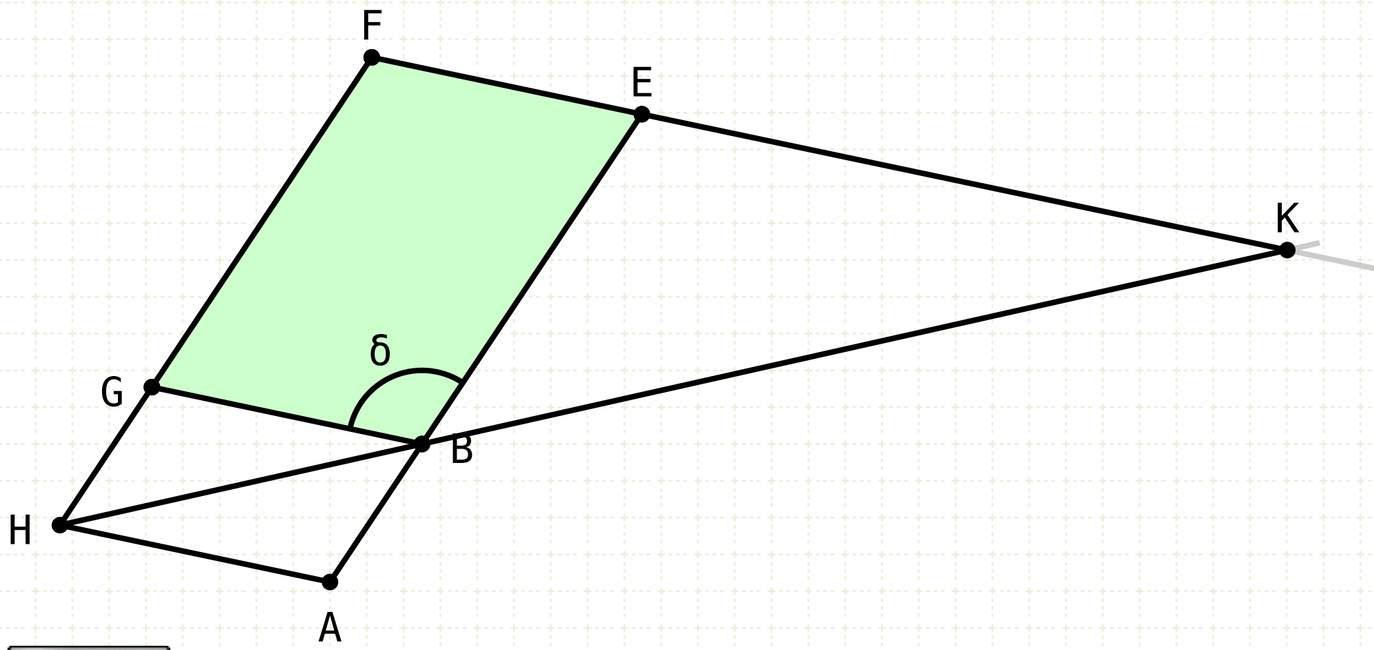

Construction

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Create a parallelogram equal to triangle C, with angle δ (I·42)

Copy the parallelogram so that one side is in a straight line with AB

Draw a line parallel to GB, through A (I·31)

Extend line FG so that it intersects with the previously drawn line, at point H

Draw line HB, extending the line so that it intersects the extension of line FE at point K

Proposition 44 of Book I

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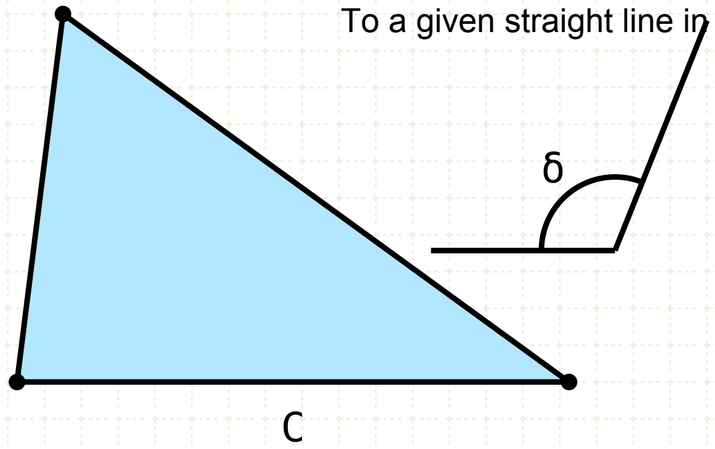

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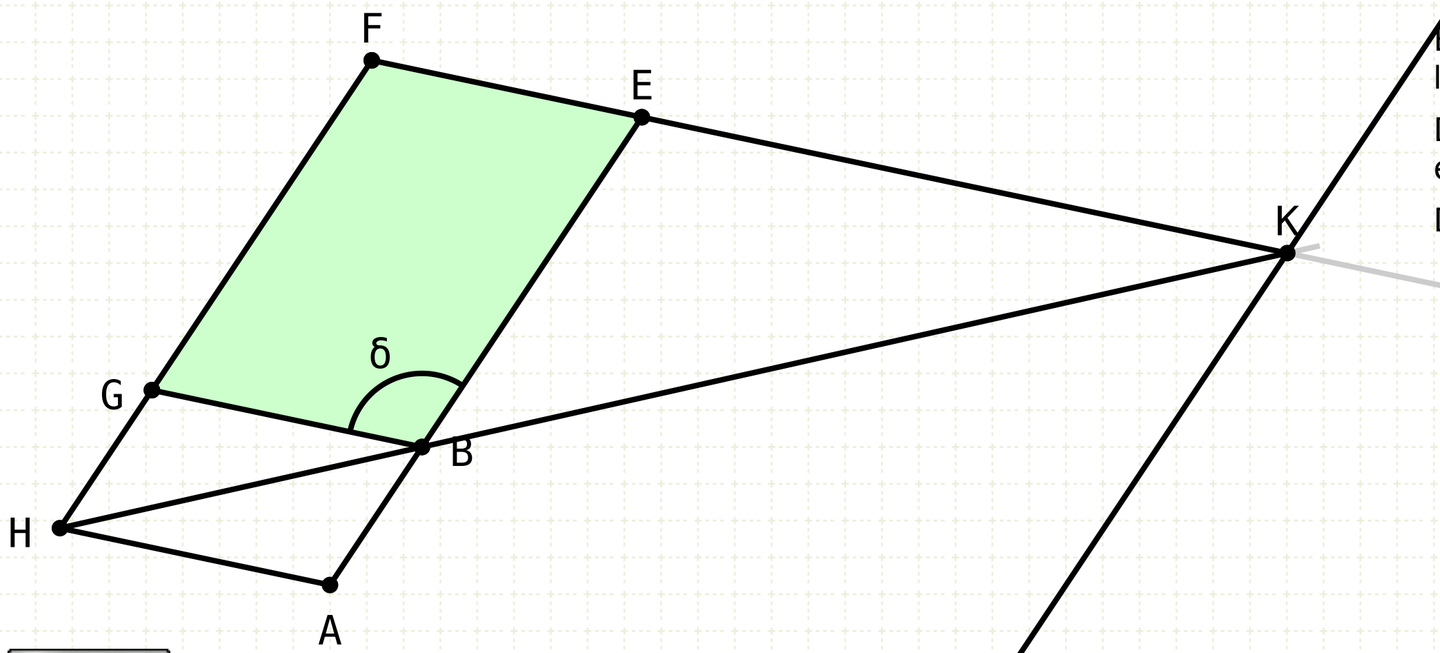


Construction

Start with a given triangle C, a straight line AB and an angle δ

Create a parallelogram equal to triangle C, with angle δ (I·42)

Copy the parallelogram so that one side is in a straight line with AB

Draw a line parallel to GB, through A (I·31)

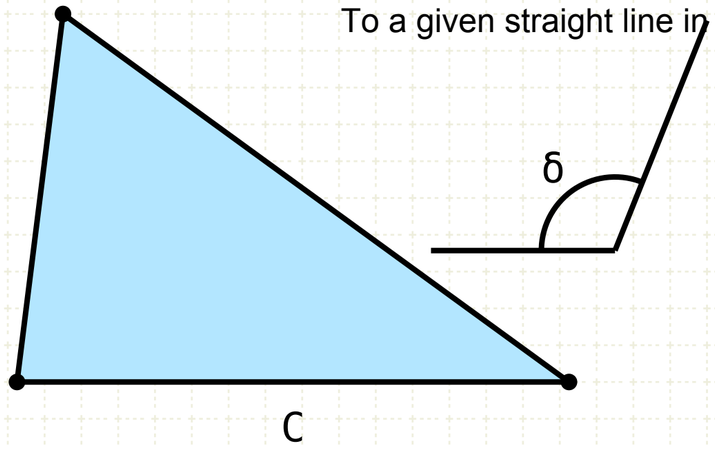
Extend line FG so that it intersects with the previously drawn line, at point H

Draw line HB, extending the line so that it intersects the extension of line FE at point K

Draw a line parallel to BE, through K (I·31)

Proposition 44 of Book I

To a given straight line in a given rectilinear angle, to apply a parallelogram equal to a given triangle.



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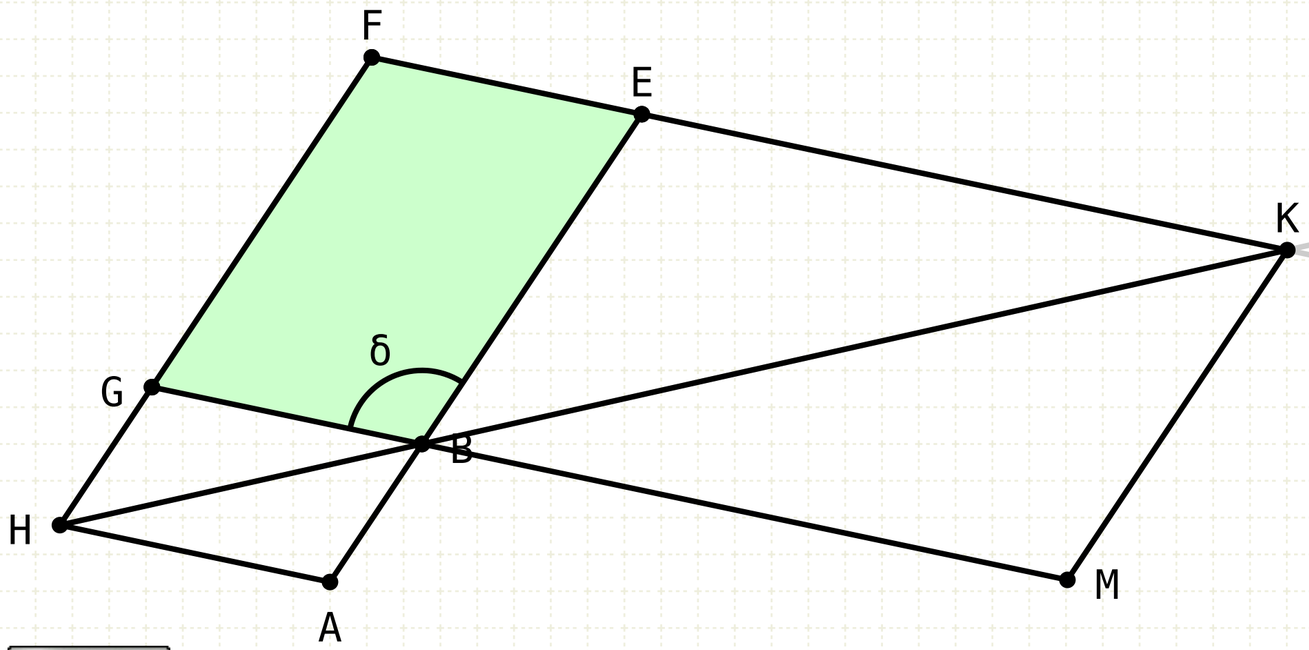


Construction

Start with a given triangle C, a straight line AB and an angle δ

Create a parallelogram equal to triangle C, with angle δ (I·42)

Copy the parallelogram so that one side is in a straight line with AB

Draw a line parallel to GB, through A (I·31)

Extend line FG so that it intersects with the previously drawn line, at point H

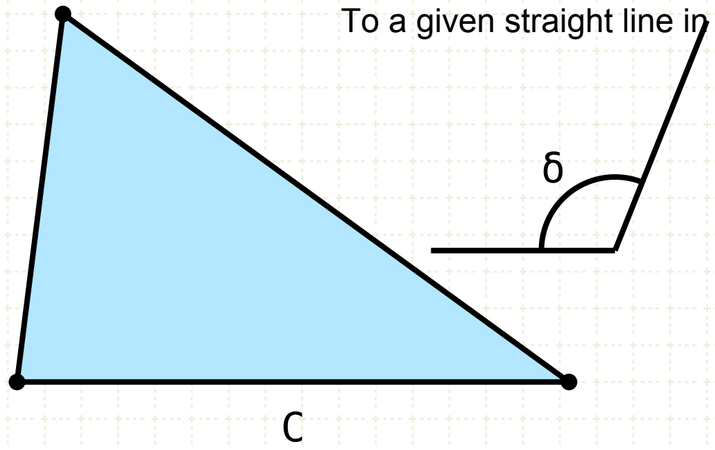
Draw line HB, extending the line so that it intersects the extension of line FE at point K

Draw a line parallel to BE, through K (I·31)

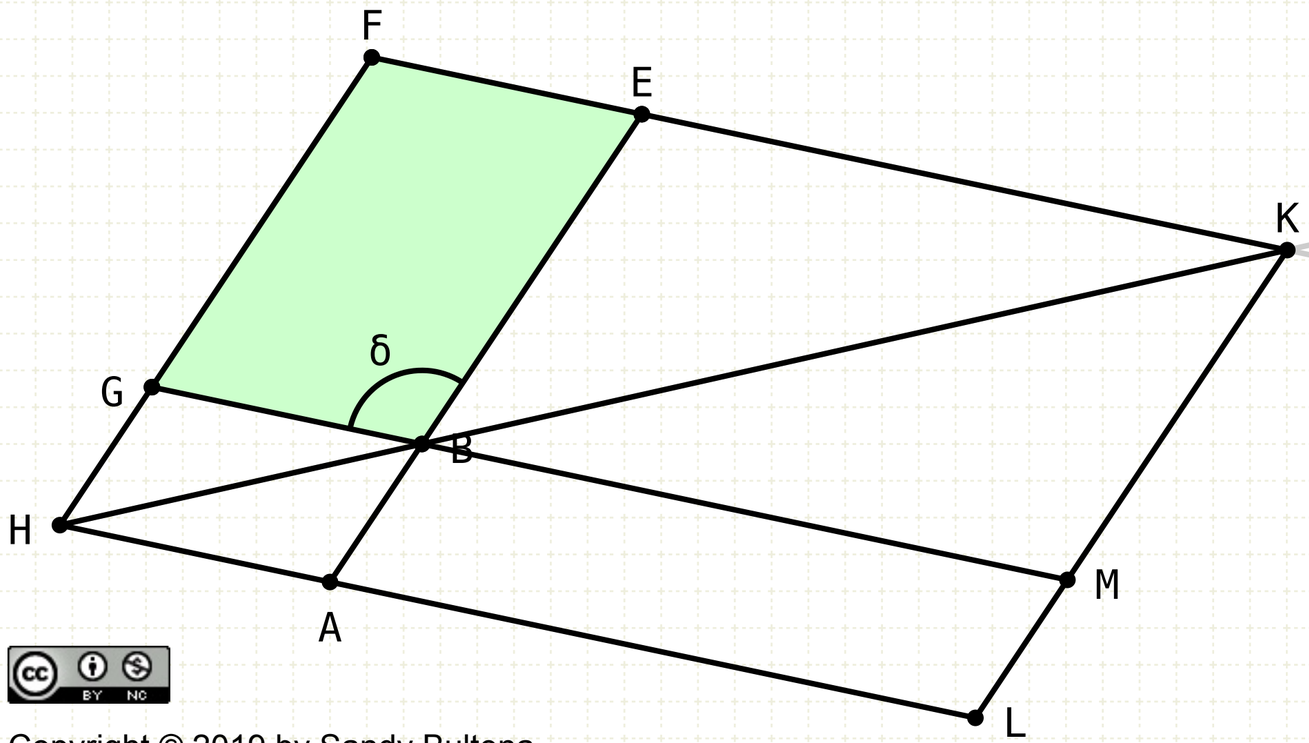
Extend GB so that it intersects with the previously drawn line, at point M

Proposition 44 of Book I

To a given straight line in a given rectilinear angle, to apply a parallelogram equal to a given triangle.



EFGB = ΔC



Construction

Start with a given triangle C, a straight line AB and an angle δ

Create a parallelogram equal to triangle C, with angle δ (I·42)

Copy the parallelogram so that one side is in a straight line with AB

Draw a line parallel to GB, through A (I·31)

Extend line FG so that it intersects with the previously drawn line, at point H

Draw line HB, extending the line so that it intersects the extension of line FE at point K

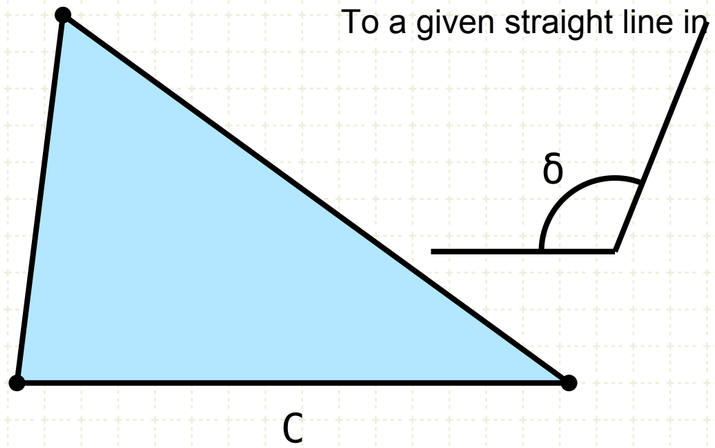
Draw a line parallel to BE, through K (I·31)

Extend GB so that it intersects with the previously drawn line, at point M

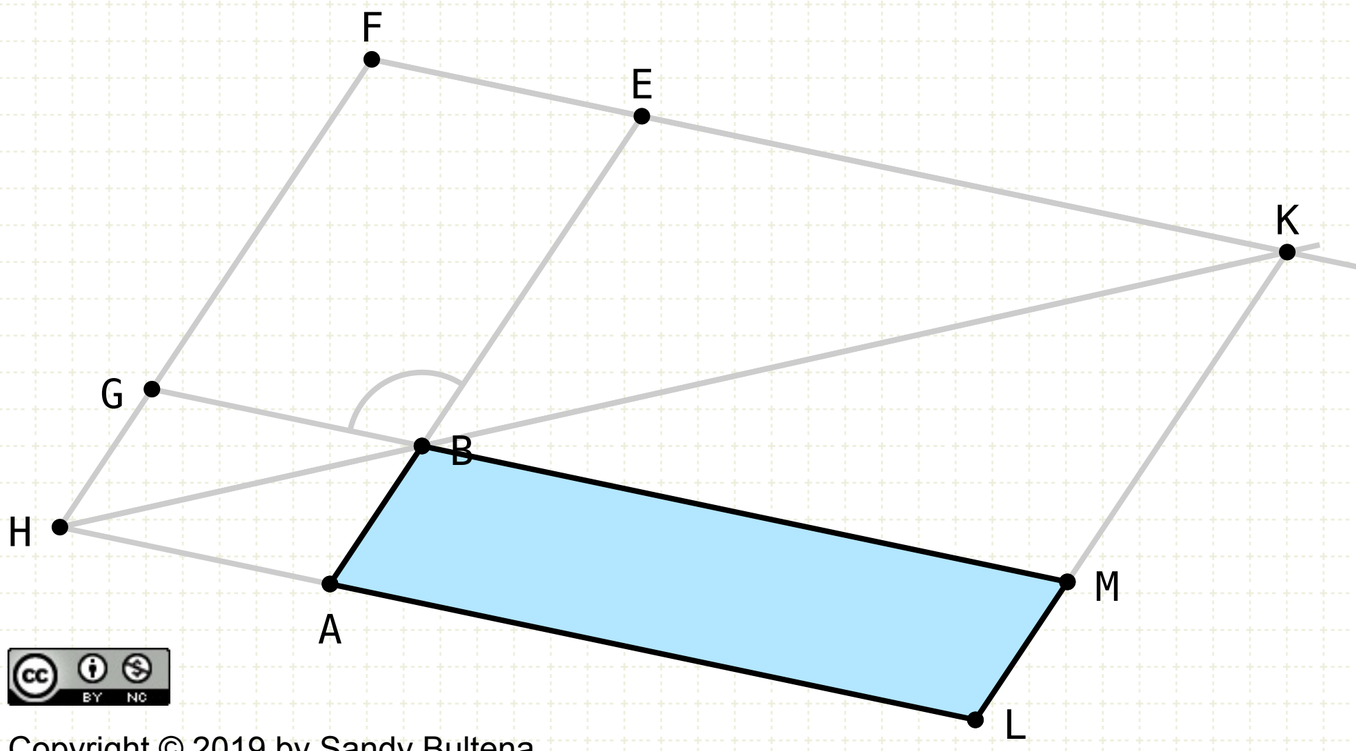
Extend HA and KM so that they intersects at point L

Proposition 44 of Book I

To a given straight line in a given rectilinear angle, to apply a parallelogram equal to a given triangle.



EFGB = ΔC
BALM = ΔC



Construction

Start with a given triangle C, a straight line AB and an angle δ

Create a parallelogram equal to triangle C, with angle δ (I·42)

Copy the parallelogram so that one side is in a straight line with AB

Draw a line parallel to GB, through A (I·31)

Extend line FG so that it intersects with the previously drawn line, at point H

Draw line HB, extending the line so that it intersects the extension of line FE at point K

Draw a line parallel to BE, through K (I·31)

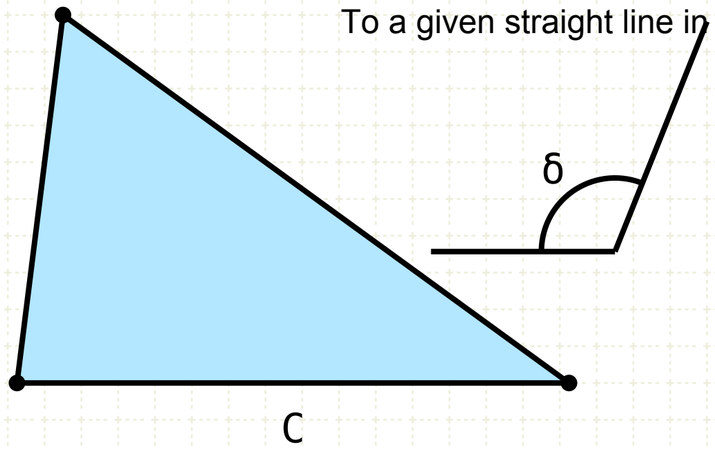
Extend GB so that it intersects with the previously drawn line, at point M

Extend HA and KM so that they intersects at point L

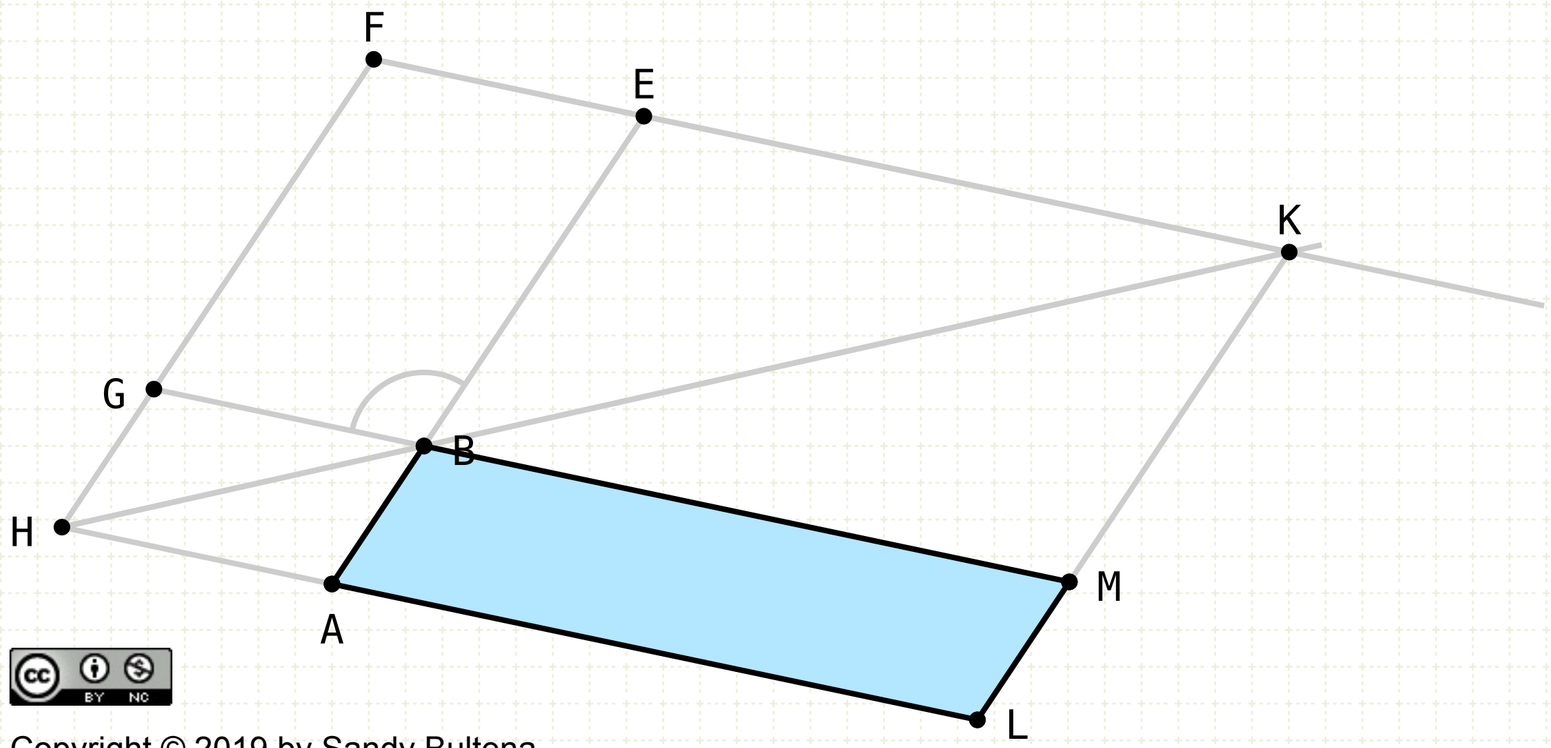
Parallelogram BALM is equal in area to triangle C, and it contains the angle δ and one of it's sides is the given line AB

Proposition 44 of Book I

To a given straight line in a given rectilinear angle, to apply a parallelogram equal to a given triangle.



Proof:



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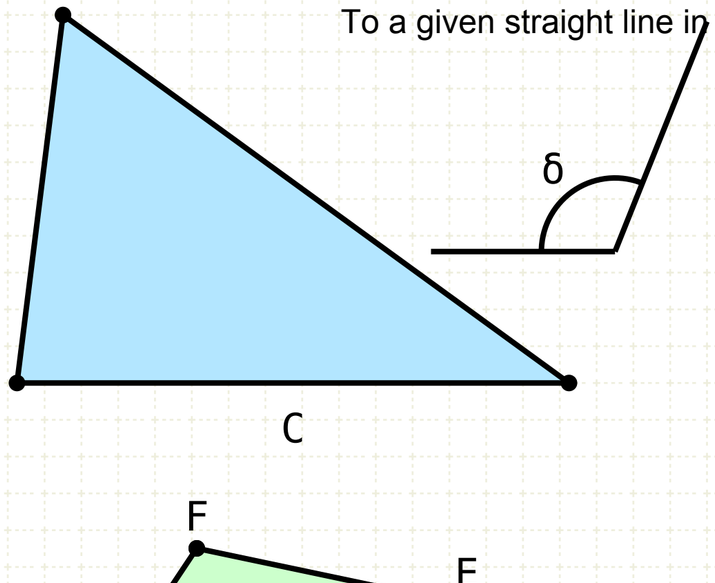
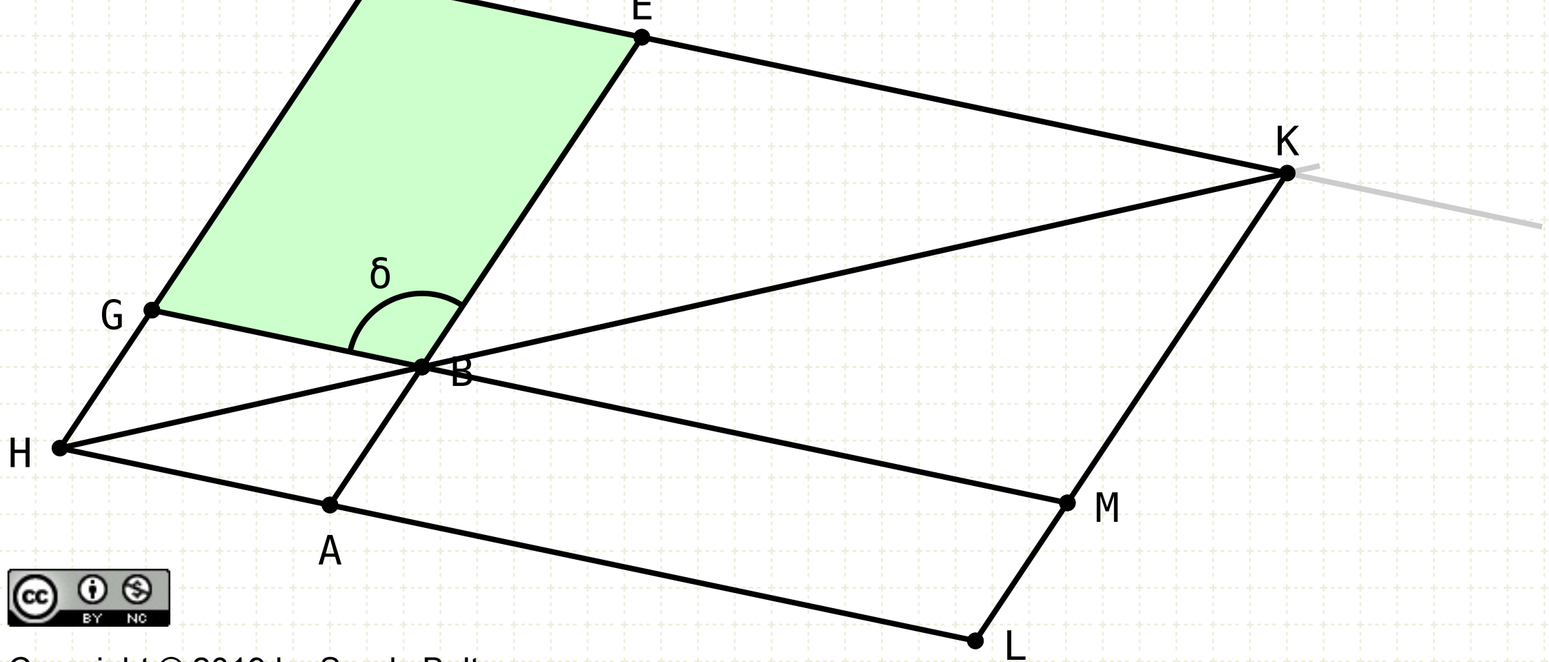


EFGB = ΔC

Proof:

By definition of the construction techniques EFGB is equal to the given triangle C (I·42)



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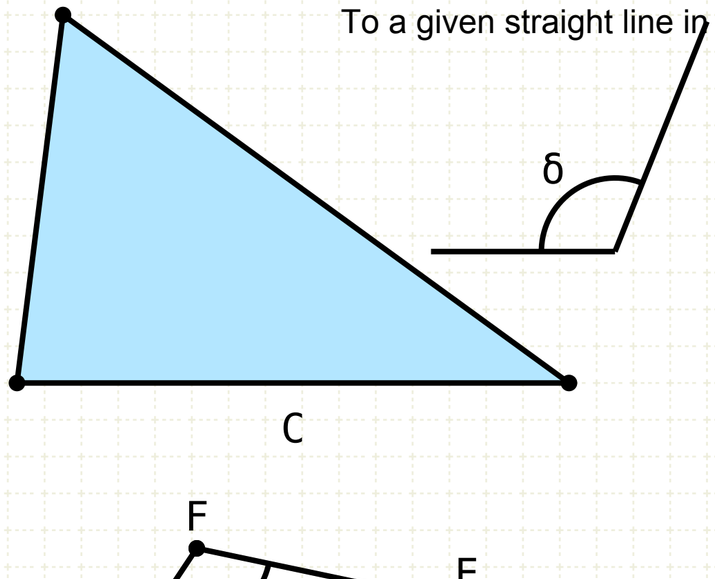
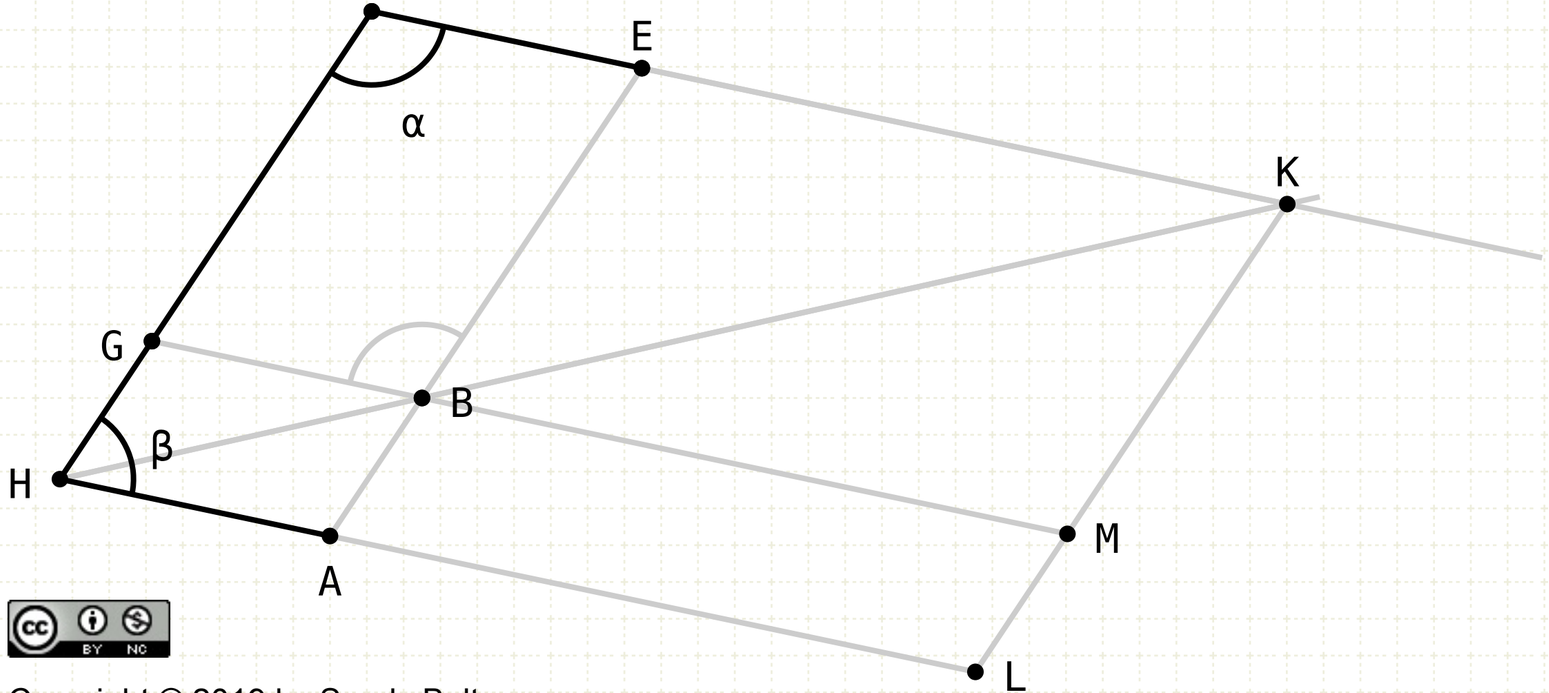




EFGB = ΔC

FE ‖ HA

α + β = ∟ + ∟

Proof:

By definition of the construction techniques EFGB is equal to the given triangle C (I·42)

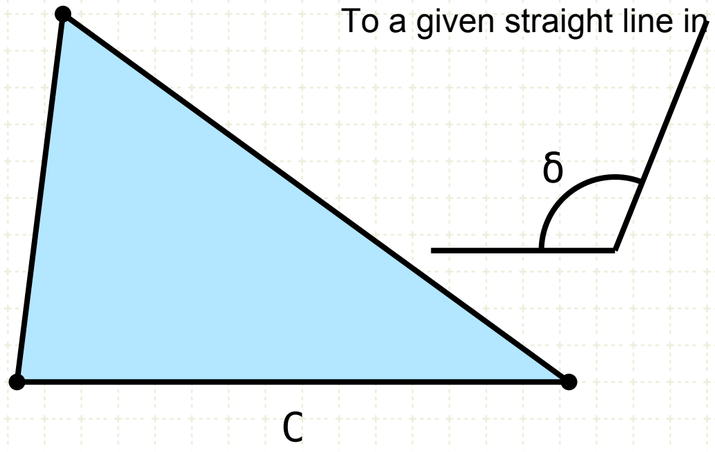
The extension of HB will intersect the extension of line FK because…

Lines FE and HA are parallel,

therefore the sum of the angles EFG and GHA is equal the sum of two right angles (I·42)

Proposition 44 of Book I

To a given straight line in a given rectilinear angle, to apply a parallelogram equal to a given triangle.



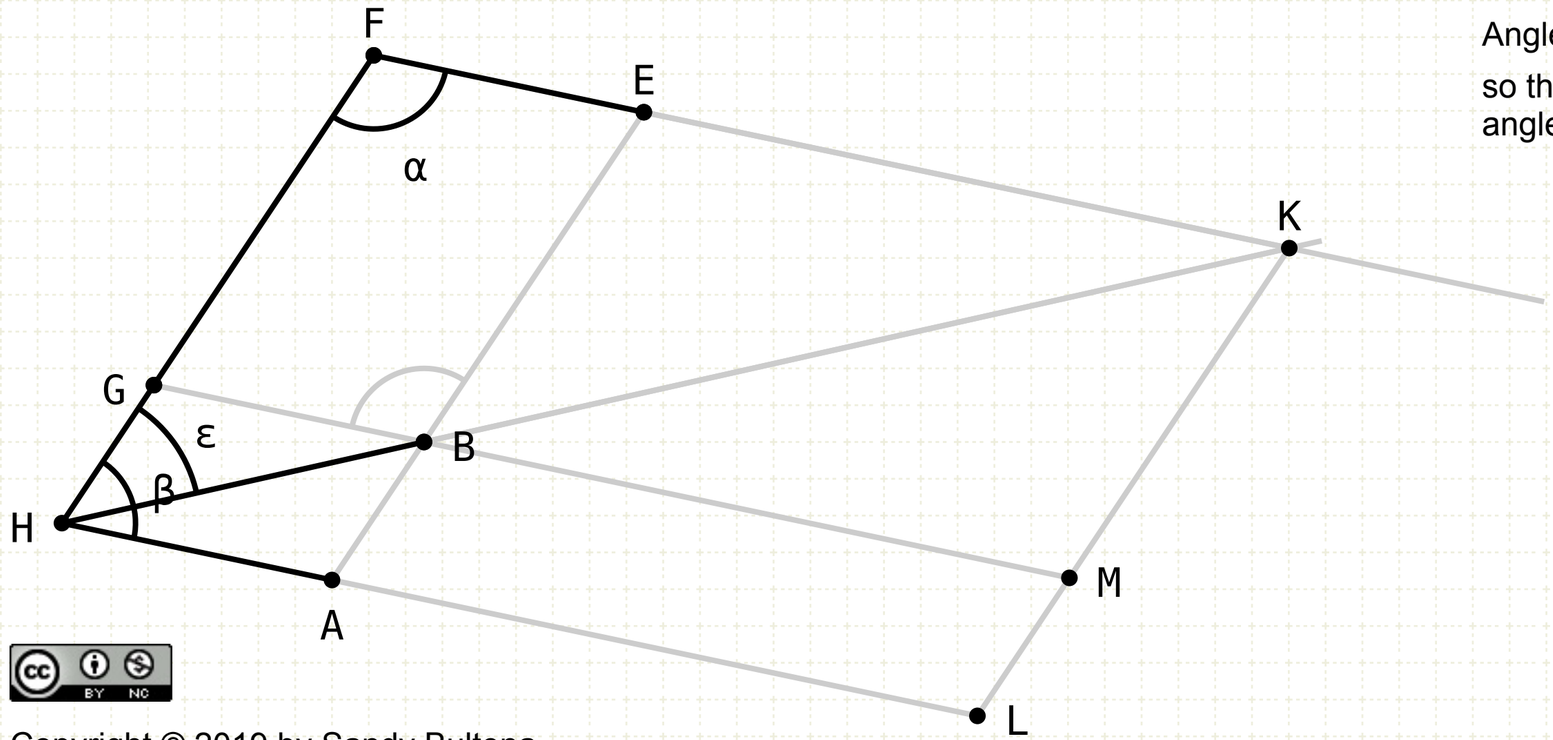
EFGB = ΔC

FE ‖ HA

α + β = ∟ + ∟

ε < β

ε + α < ∟ + ∟



Proof:

By definition of the construction techniques EFGB is equal to the given triangle C (I·42)

The extension of HB will intersect the extension of line FK because…

Lines FE and HA are parallel,

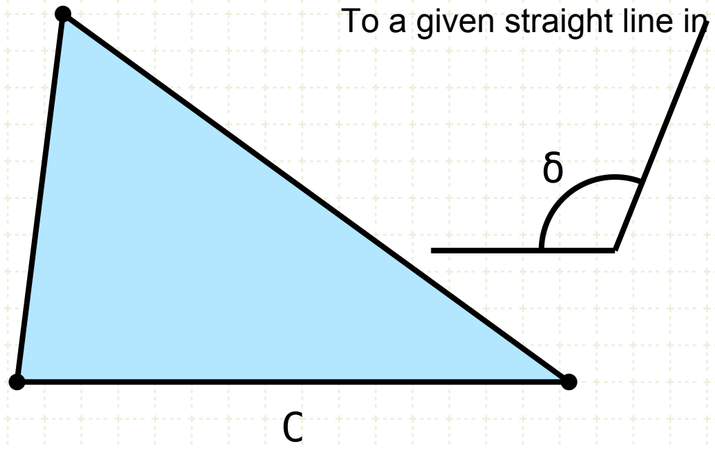
therefore the sum of the angles EFG and GHA is equal the sum of two right angles (I·42)

Angle BHG is less than GHA,

so the sum of angles EFG and GHA is less than two right angles

Proposition 44 of Book I

To a given straight line in a given rectilinear angle, to apply a parallelogram equal to a given triangle.



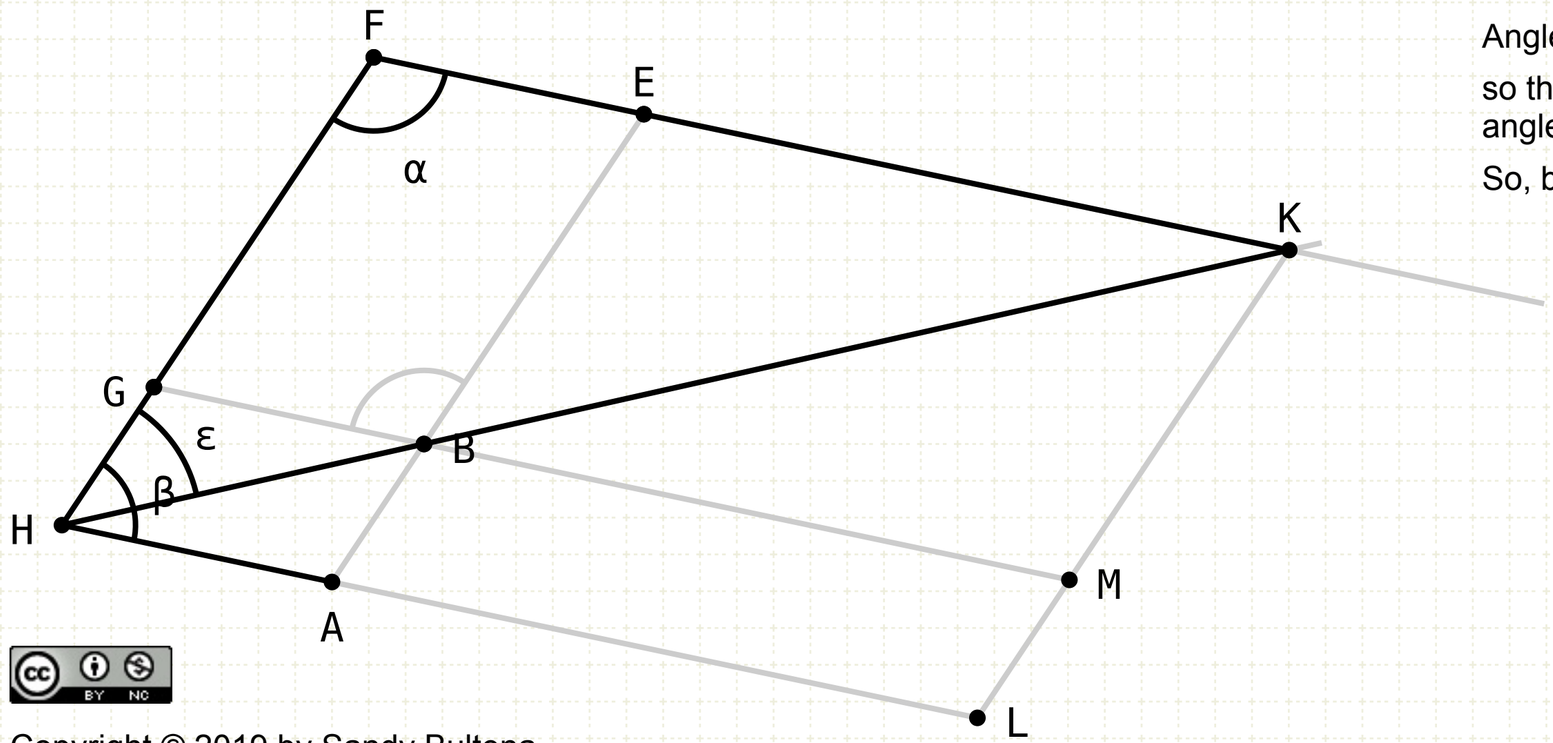
EFGB = ΔC

FE ∥ HA

α + β = ∟ + ∟

ε < β

ε + α < ∟ + ∟



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So, by Postulate 5, HB and FE will intersect

Proposition 44 of Book I

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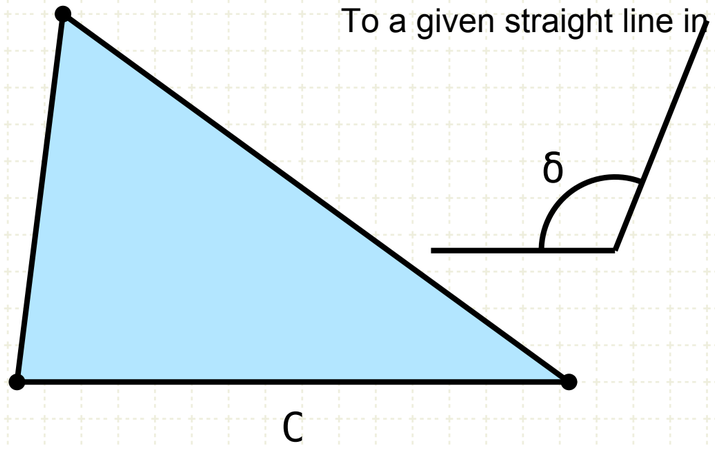

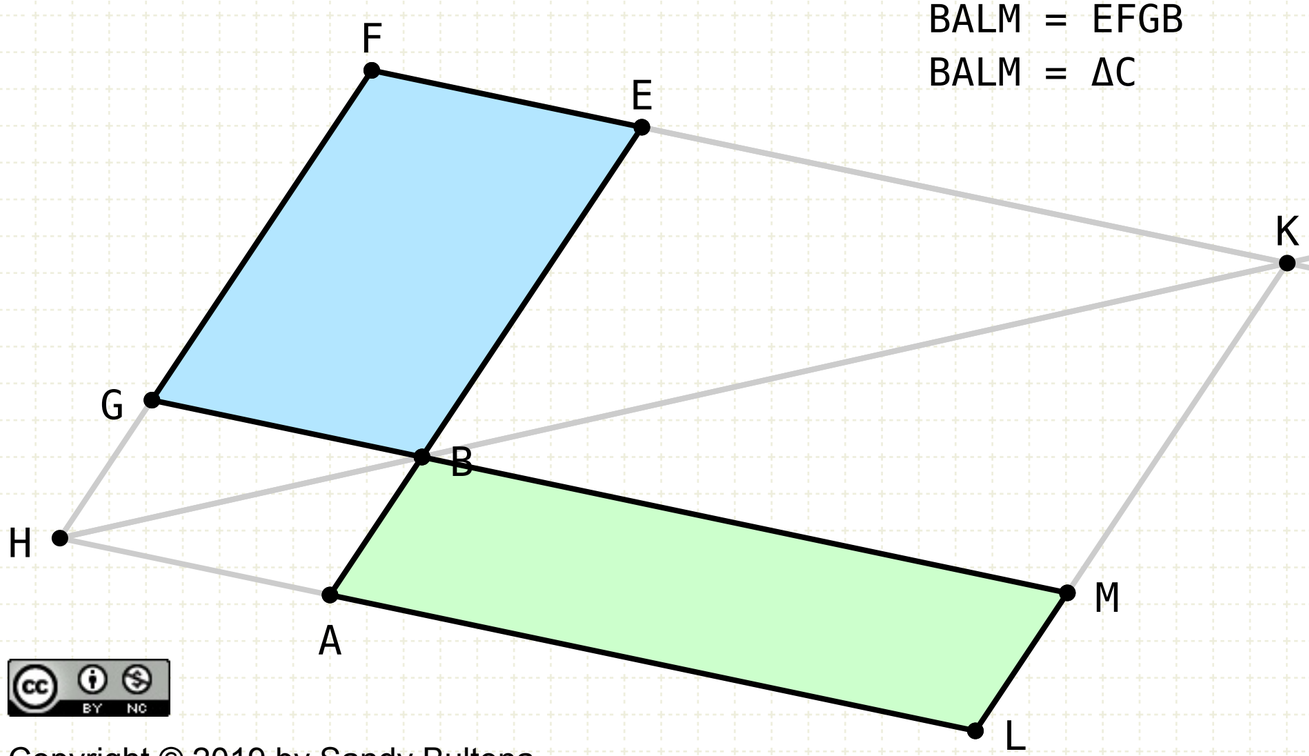

EFGB = ΔC

FE ‖ HA

α + β = ∟ + ∟

ε < β

ε + α < ∟ + ∟

BALM = EFGB

BALM = ΔC

Proof:

By definition of the construction techniques EFGB is equal to the given triangle C (I·42)

The extension of HB will intersect the extension of line FK because…

Lines FE and HA are parallel,

therefore the sum of the angles EFG and GHA is equal the sum of two right angles (I·42)

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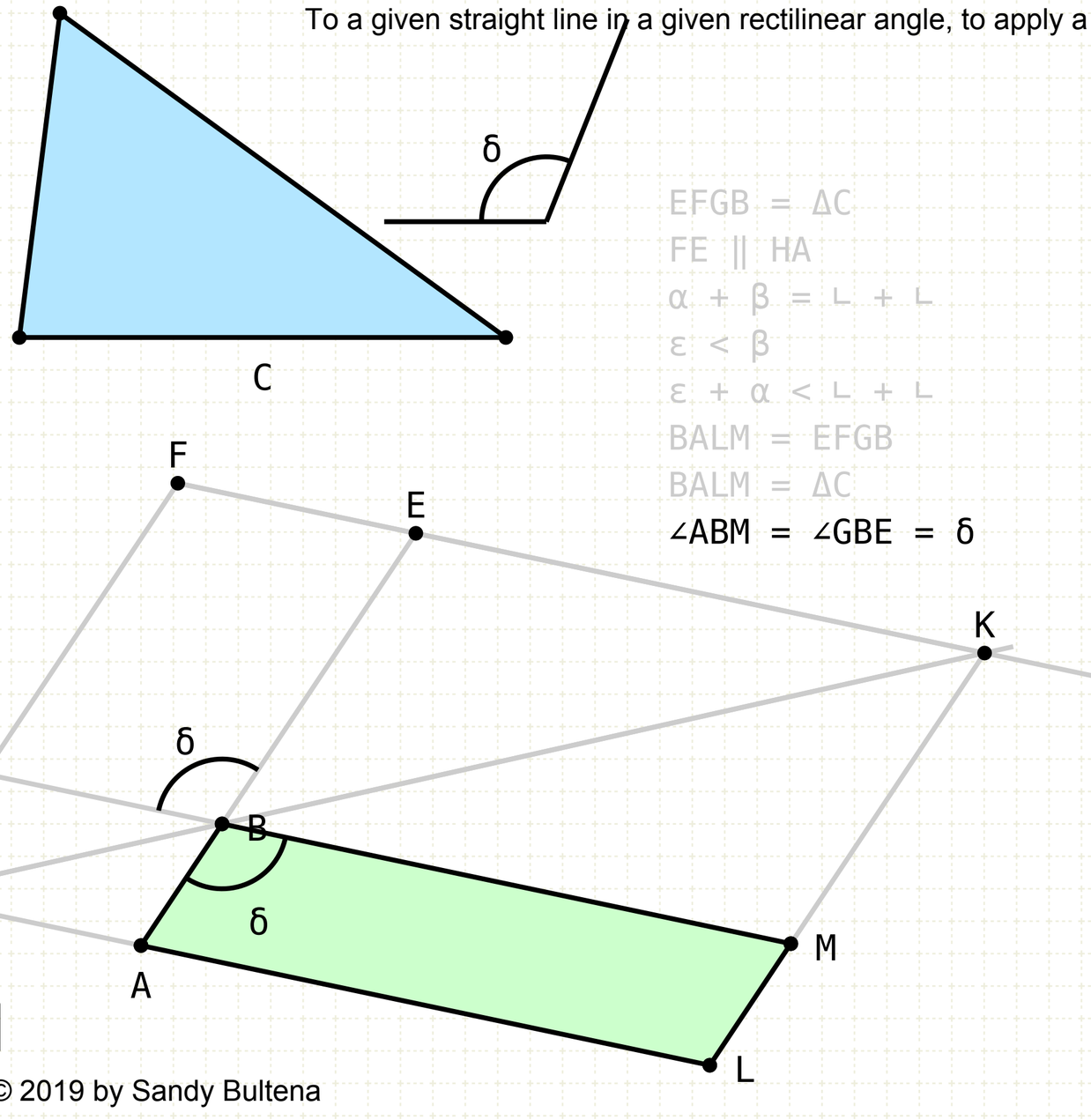
so the sum of angles EFG and GHA is less than two right angles

So, by Postulate 5, HB and FE will intersect

The two parallelograms FGBE and BALM are complements of the parallelogram FHLK, thus they are equal in area (I·43)

Proposition 44 of Book I

To a given straight line in a given rectilinear angle, to apply a parallelogram equal to a given triangle.



EFGB = ΔC
FE ∥ HA
α + β = ∟ + ∟
ε < β
ε + α < ∟ + ∟
BALM = EFGB
BALM = ΔC
∠ABM = ∠GBE = δ

Proof:

By definition of the construction techniques EFGB is equal to the given triangle C (I·42)

The extension of HB will intersect the extension of line FK because…

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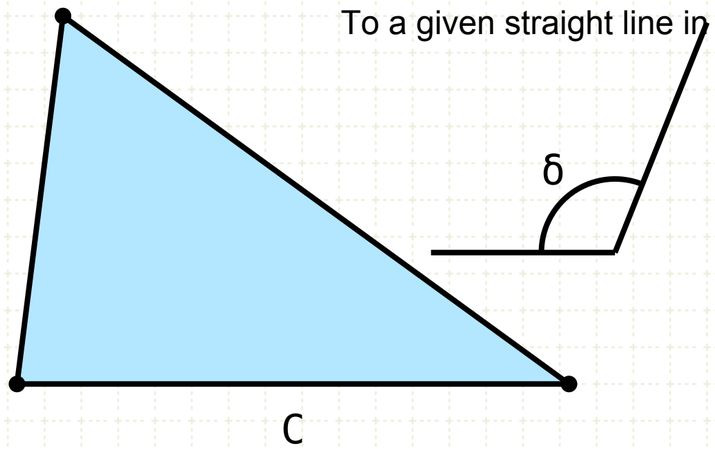
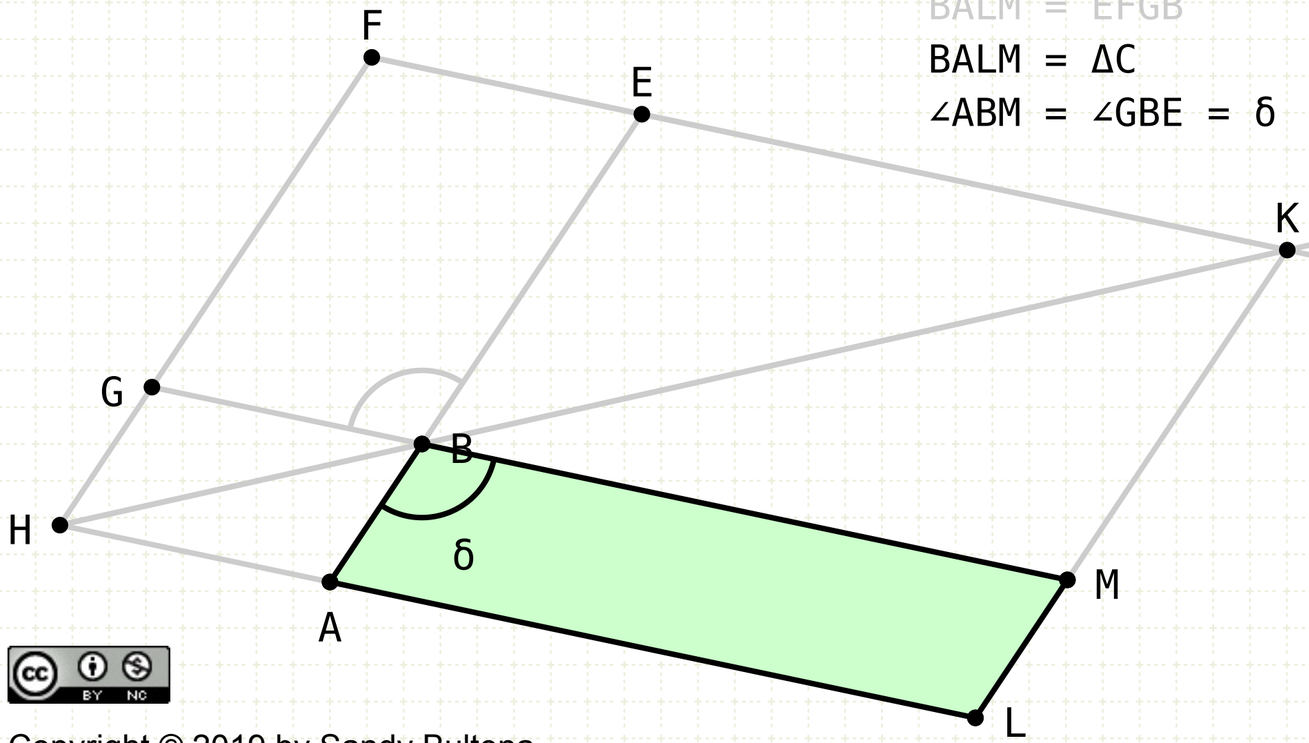
The angle ABM is the vertical angle of GBE, so they are equal (I·15)

Proposition 44 of Book I

To a given straight line in a given rectilinear angle, to apply a parallelogram equal to a given triangle.





EFGB = ΔC
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