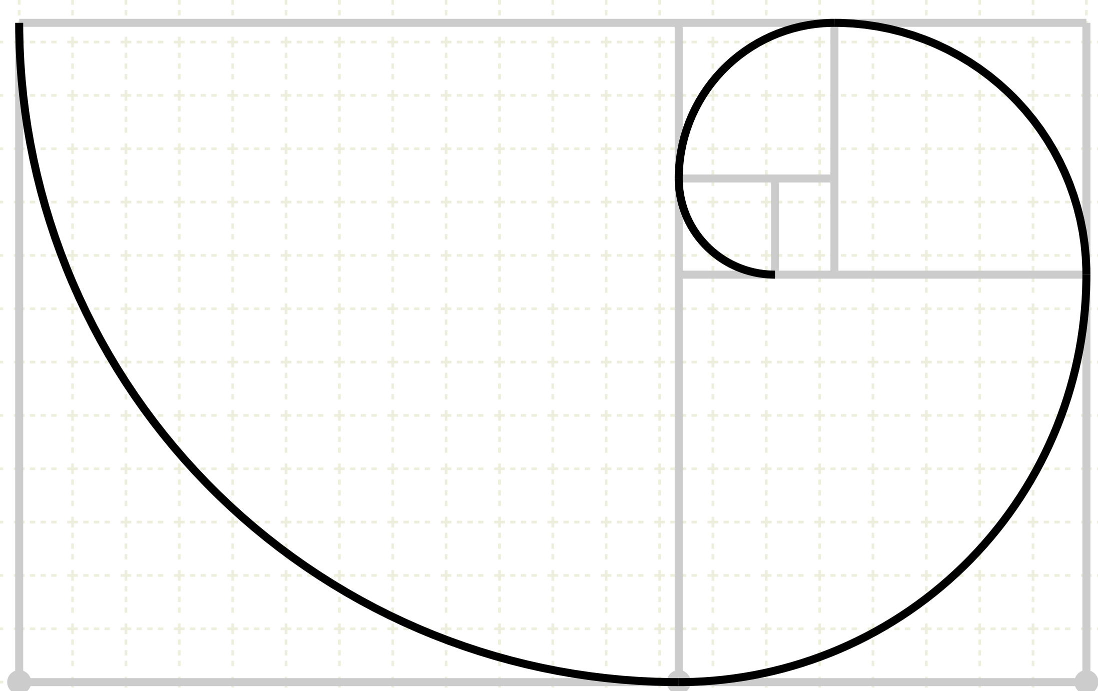
Euclid's Elements

Book VI



One can state, without exaggeration, that the observation of and the search for similarities and differences are the basis of all human knowledge.

Alfred Nobel

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Proposition 27 of Book VI

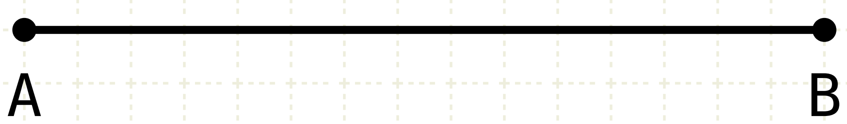
Of all the parallelograms applied to the same straight line and deficient by parallelogrammic figures similar and similarly situated to that described on the half of the straight line, that parallelogram is greatest which is applied to the half of the straight line and is similar to the defect

Proposition 27 of Book VI

Of all the parallelograms applied to the same straight line and deficient by parallelogrammic figures similar and similarly situated to that described on the half of the straight line, that parallelogram is greatest which is applied to the half of the straight line and is similar to the defect

In other words

Given a straight line AB



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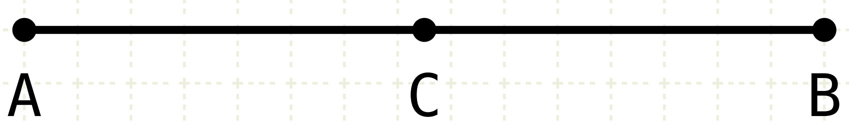
In other words

Given a straight line AB

and a midpoint C



$AC = \frac{1}{2} AB$

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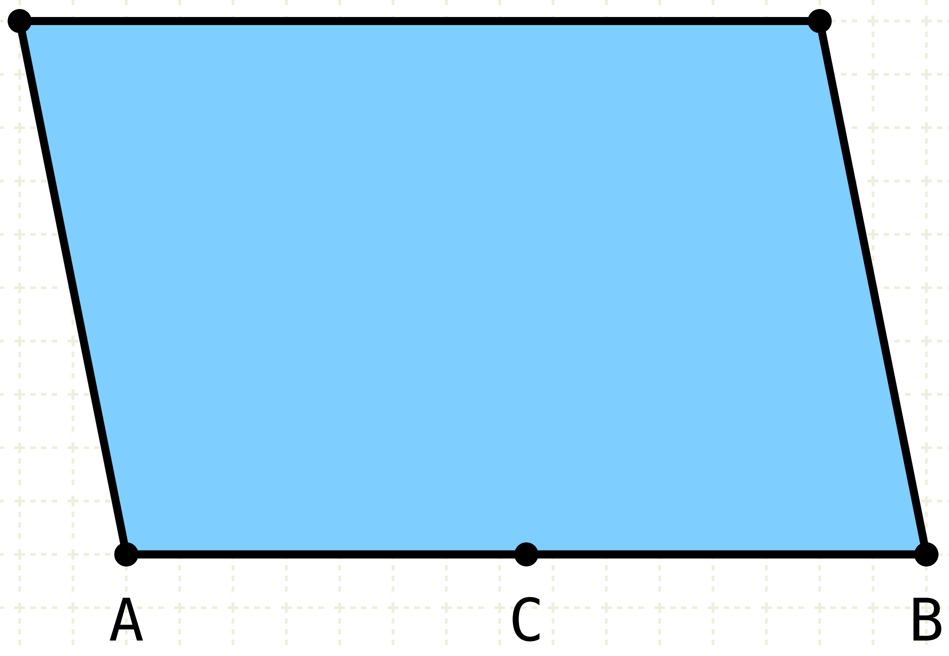

$AC = \frac{1}{2} AB$

In other words

Given a straight line AB

and a midpoint C

Draw a parallelogram on AB

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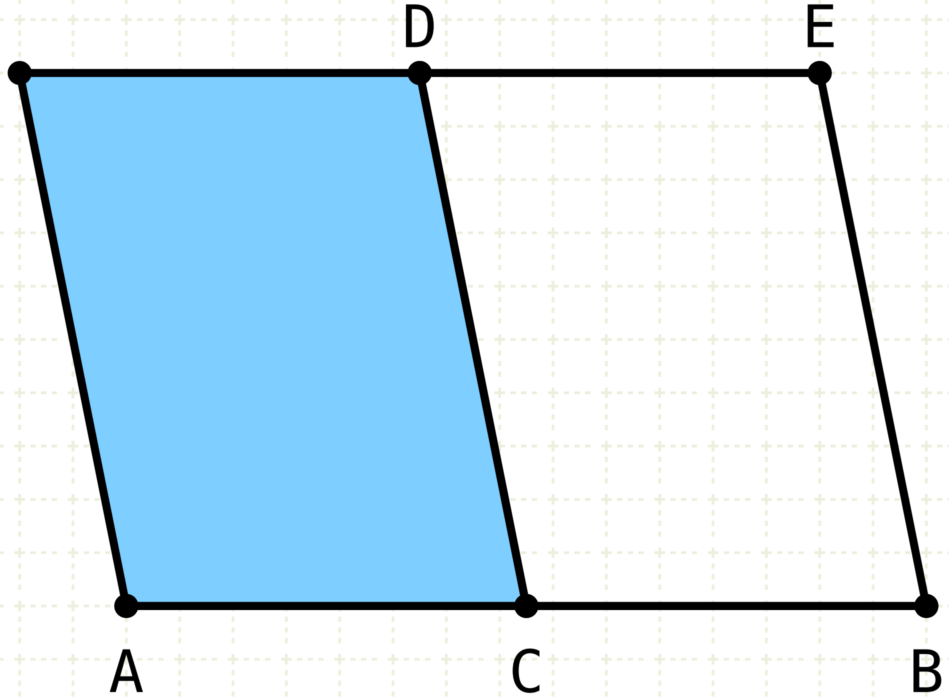

AC = ½ AB

□AD = □DB

In other words

Given a straight line AB

and a midpoint C

Draw a parallelogram on AB

Remove the section described by the parallelogram CE

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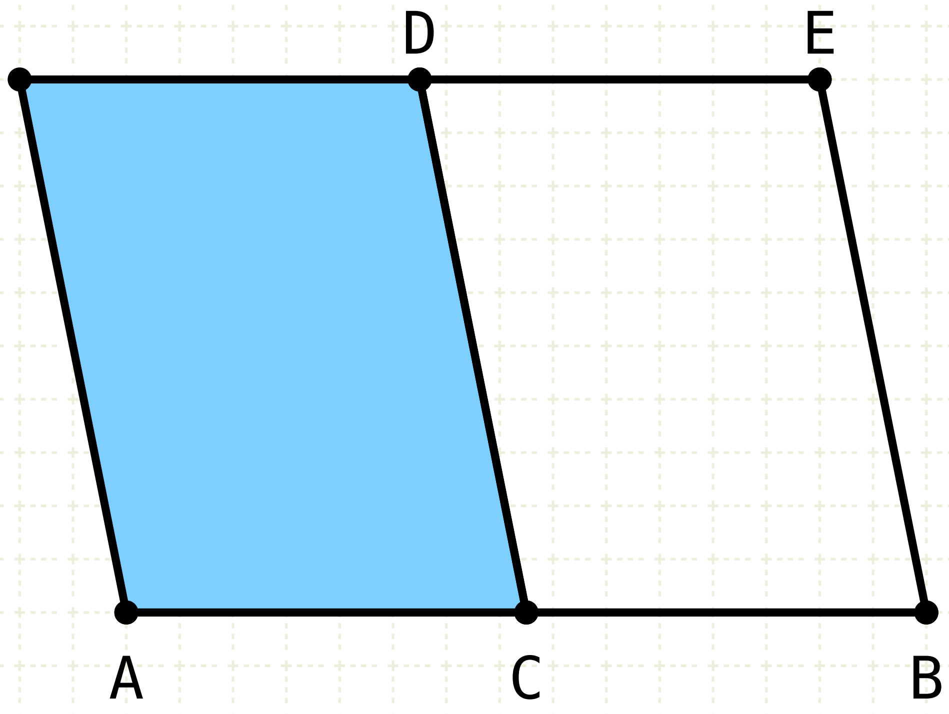
Of all the parallelograms applied to the same straight line and deficient by parallelogrammic figures similar and similarly situated to that described on the half of the straight line, that parallelogram is greatest which is applied to the half of the straight line and is similar to the defect



$AC = \frac{1}{2} AB$

$\square AD = \square DB$

In other words

Given a straight line AB

and a midpoint C

Draw a parallelogram on AB

Remove the section described by the parallelogram CE

Then the parallelogram AD is the largest of all parallelograms drawn on AB, where another parallelogram similar to CE (and similarly situated) is removed

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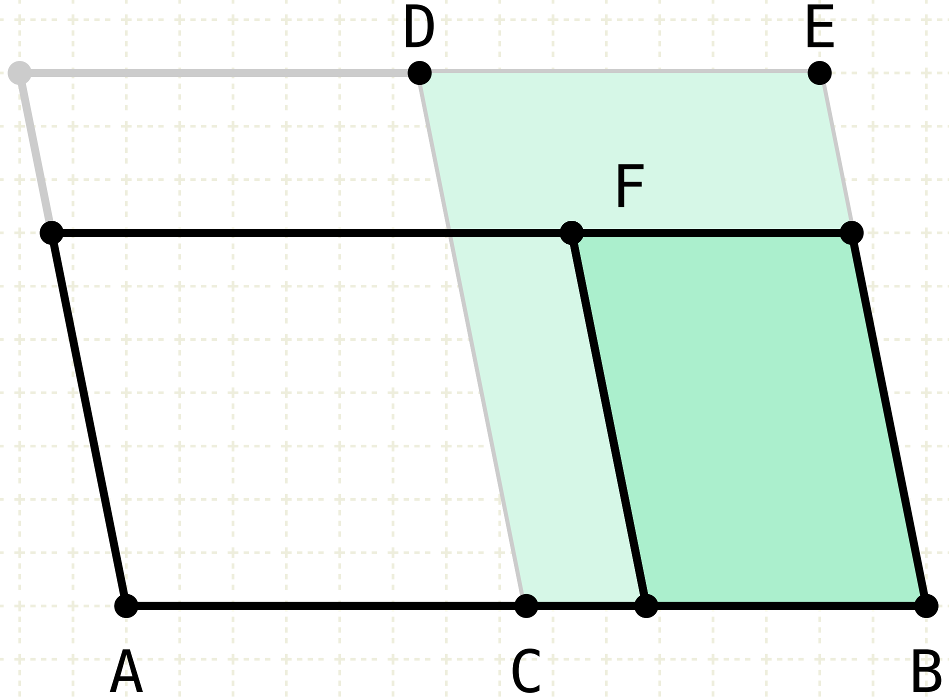

AC = ½ AB

□AD = □DB

□DB ~ □FB

In other words

Given a straight line AB

and a midpoint C

Draw a parallelogram on AB

Remove the section described by the parallelogram CE

Then the parallelogram AD is the largest of all parallelograms drawn on AB, where another parallelogram similar to CE (and similarly situated) is removed

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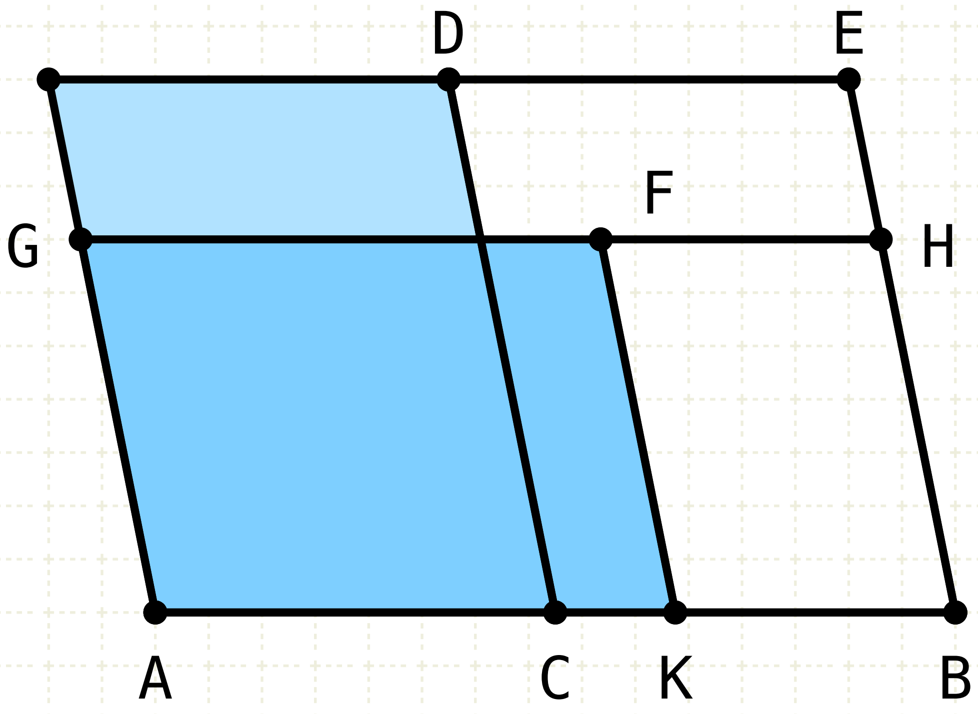

In other words

Given a straight line AB

and a midpoint C

Draw a parallelogram on AB

Remove the section described by the parallelogram CE

Then the parallelogram AD is the largest of all parallelograms drawn on AB, where another parallelogram similar to CE (and similarly situated) is removed

$AC = \frac{1}{2} AB$

$\square AD = \square DB$

$\square DB \sim \square FB$

$\square AD > \square AF$

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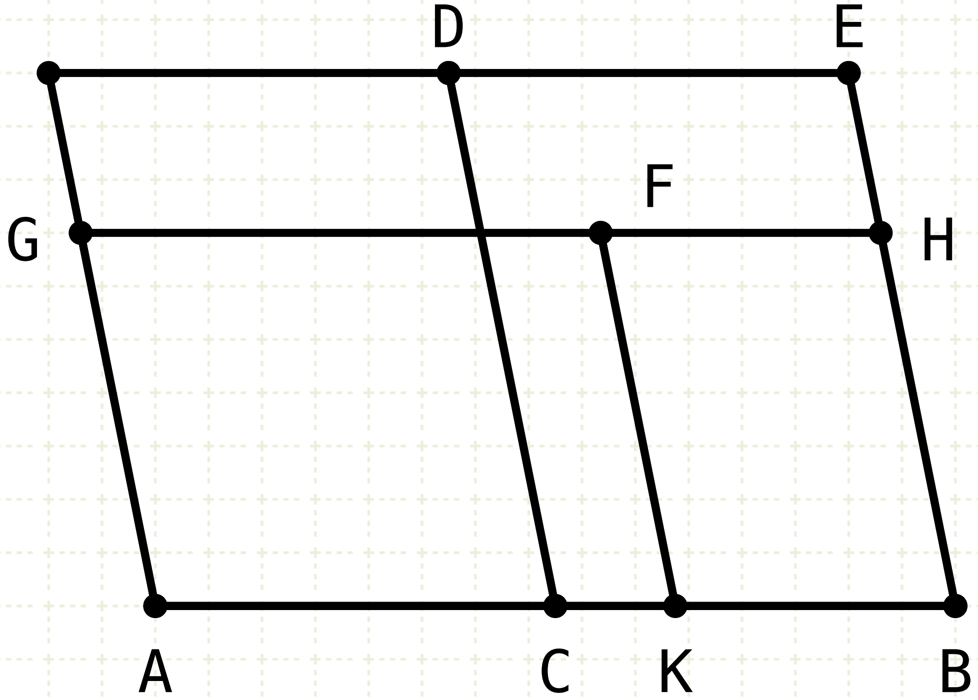
Of all the parallelograms applied to the same straight line and deficient by parallelogrammic figures similar and similarly situated to that described on the half of the straight line, that parallelogram is greatest which is applied to the half of the straight line and is similar to the defect



Proof

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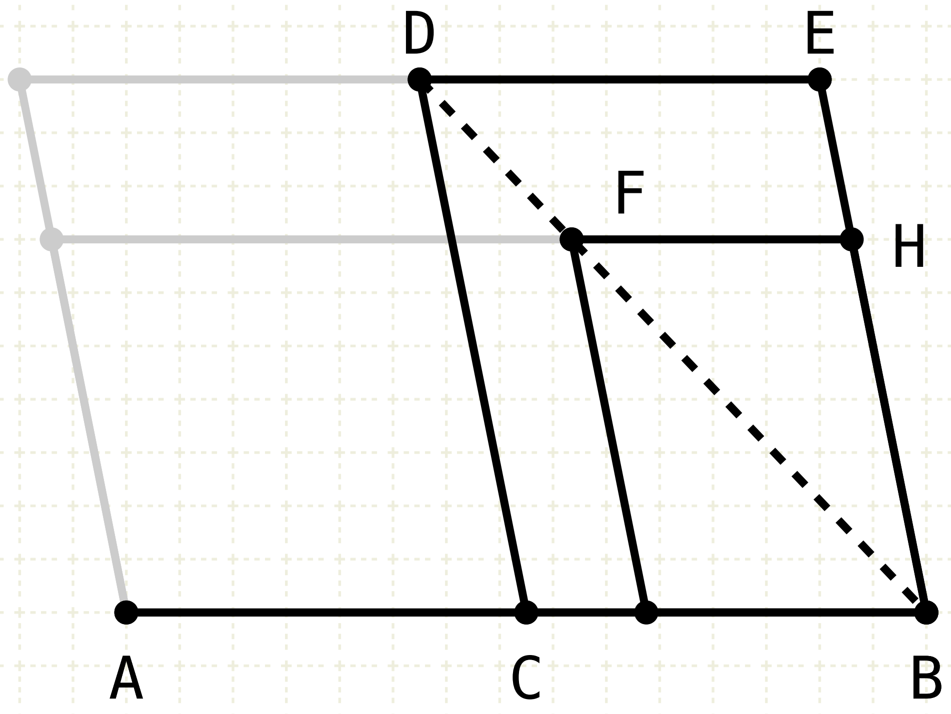

$AC = \frac{1}{2} AB$

$\square AD = \square DB$

$\square DB \sim \square FB$

Proof

Since the parallelograms DB and FB are similar, they are both on the same diameter (VI·26)

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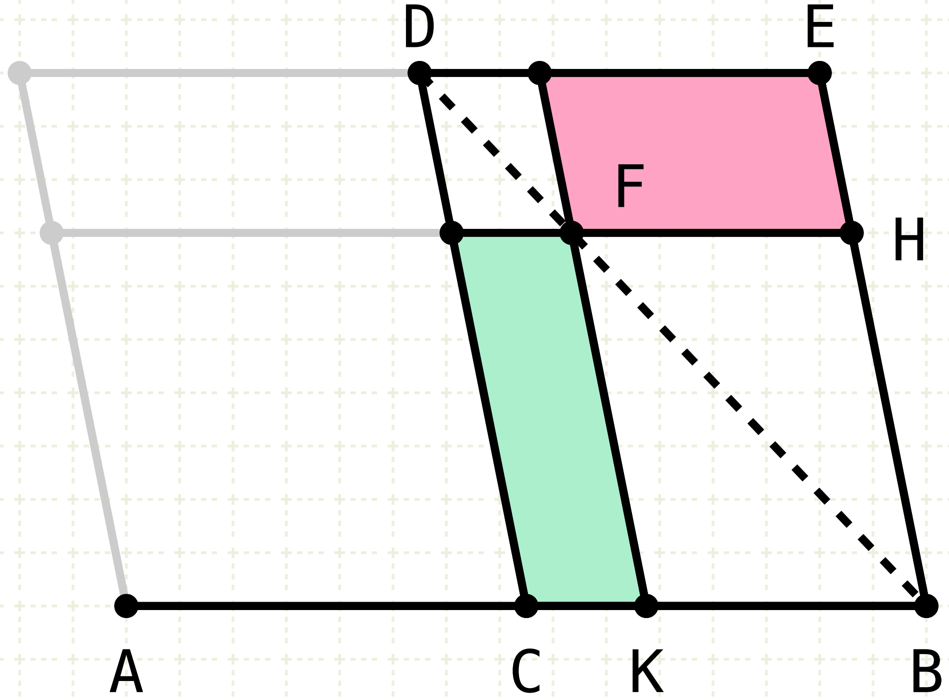

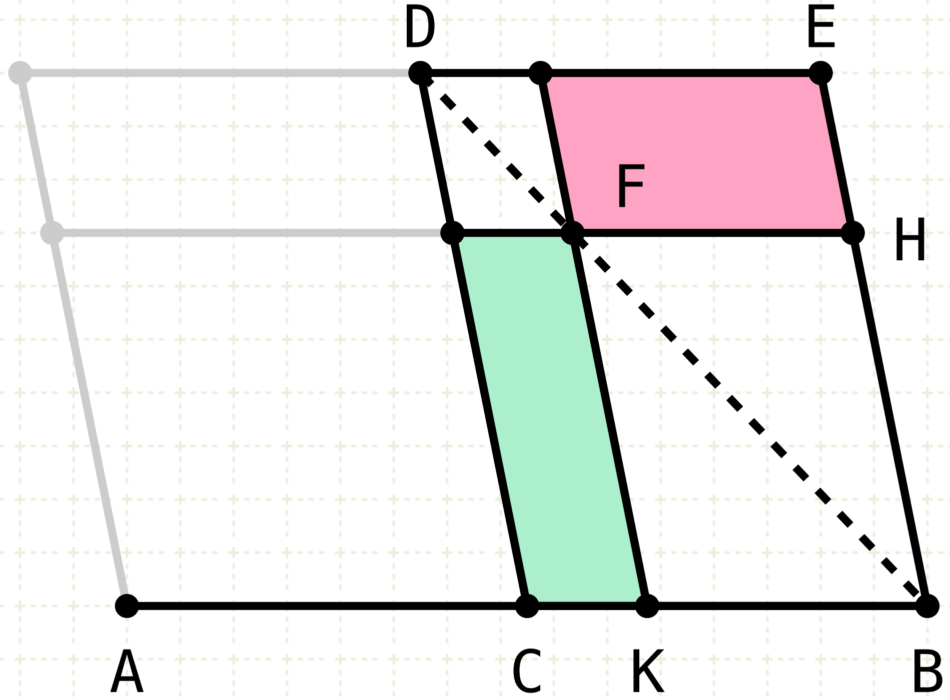

Proof

Since the parallelograms DB and FB are similar, they are both on the same diameter (VI·26)

Parallelograms CF and FE are equal (I·43)

$AC = \frac{1}{2} AB$

$\square AD = \square DB$

$\square DB \sim \square FB$

$\square CF = \square FE$

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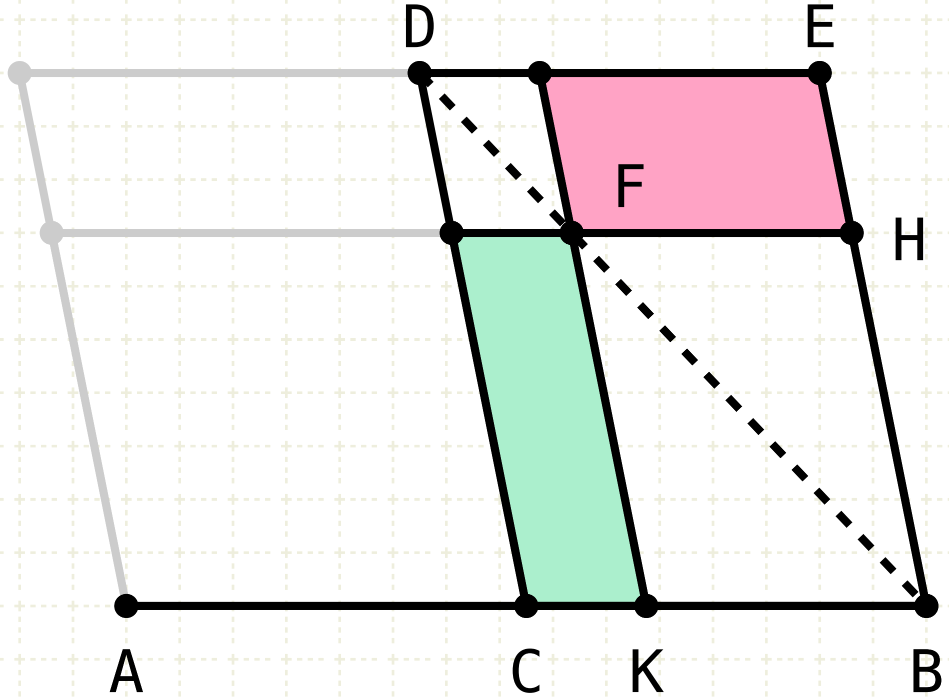

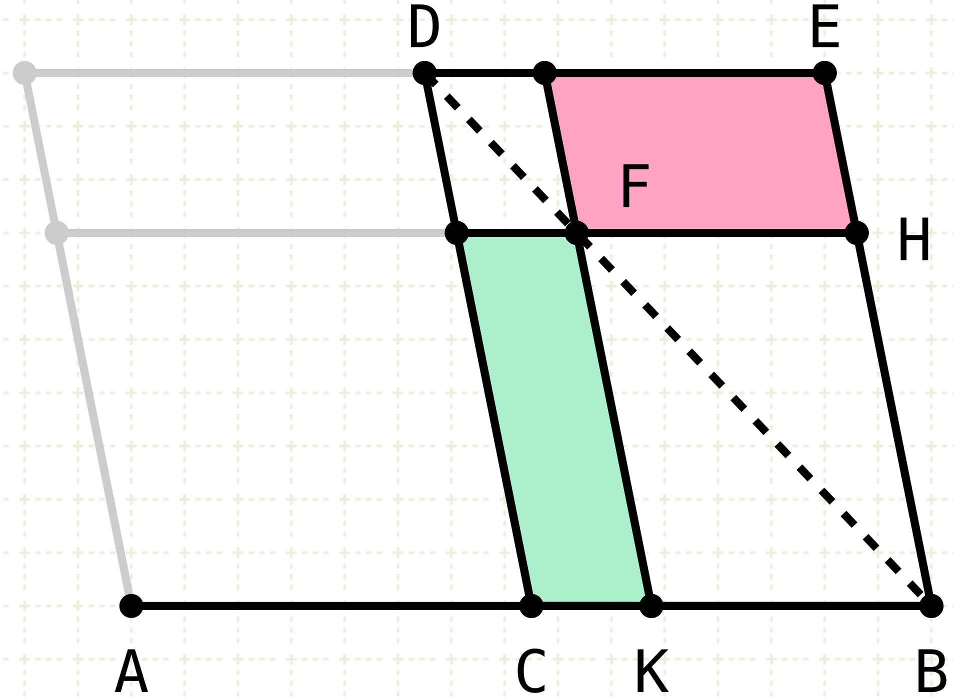

Proof

Since the parallelograms DB and FB are similar, they are both on the same diameter (VI·26)

Parallelograms CF and FE are equal (I·43)

Since the parallelogram FB is common, the whole of CH is equal to the whole KE

AC = ½ AB

□AD = □DB

□DB ~ □FB

□CF = □FE

□CF+□FB = □FE+□FB

□CH = □KE

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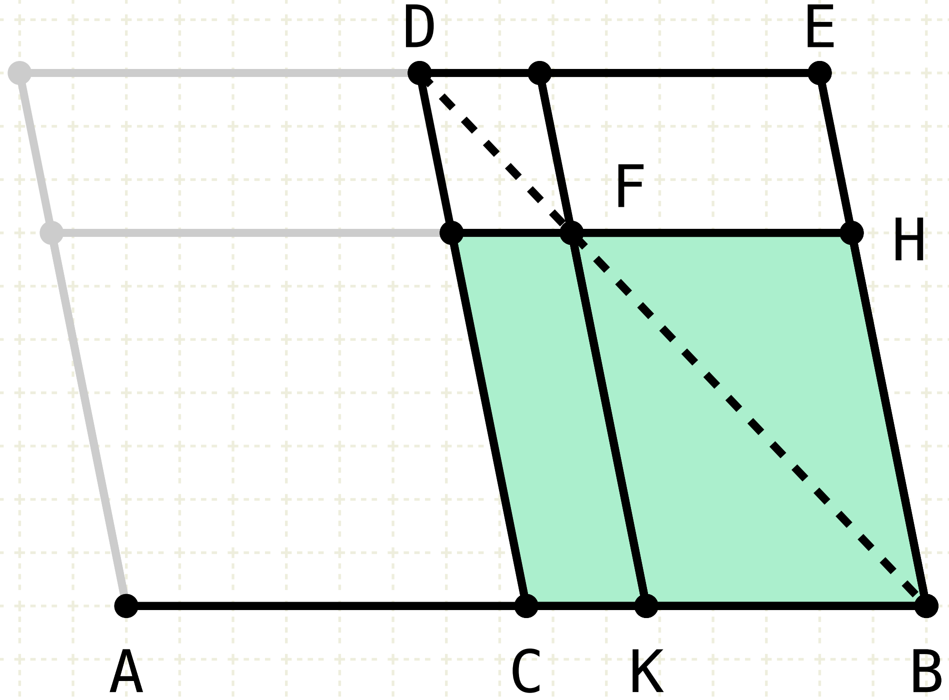

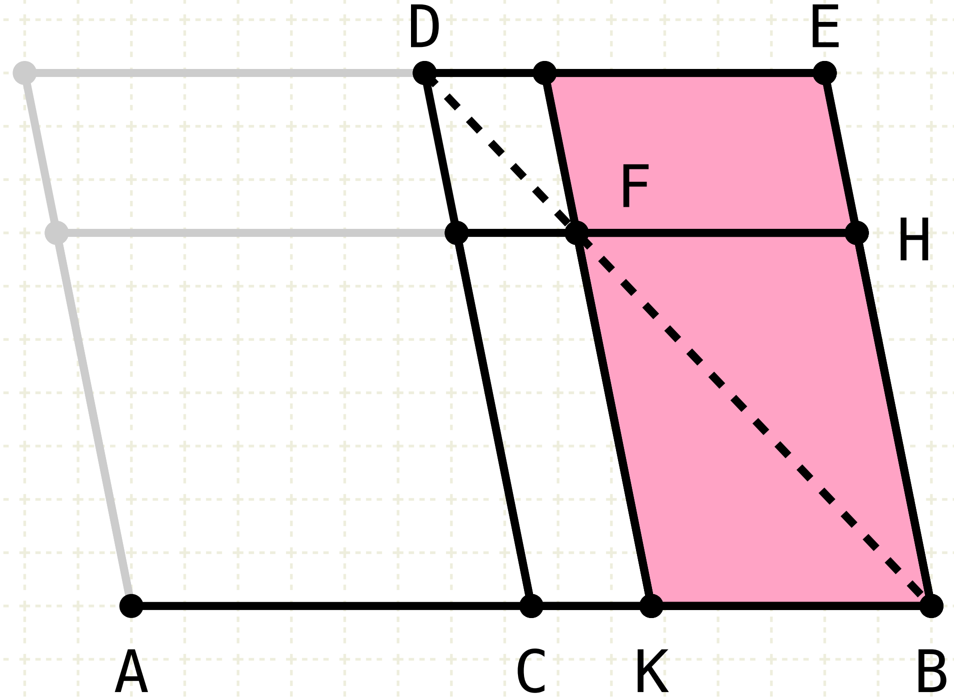

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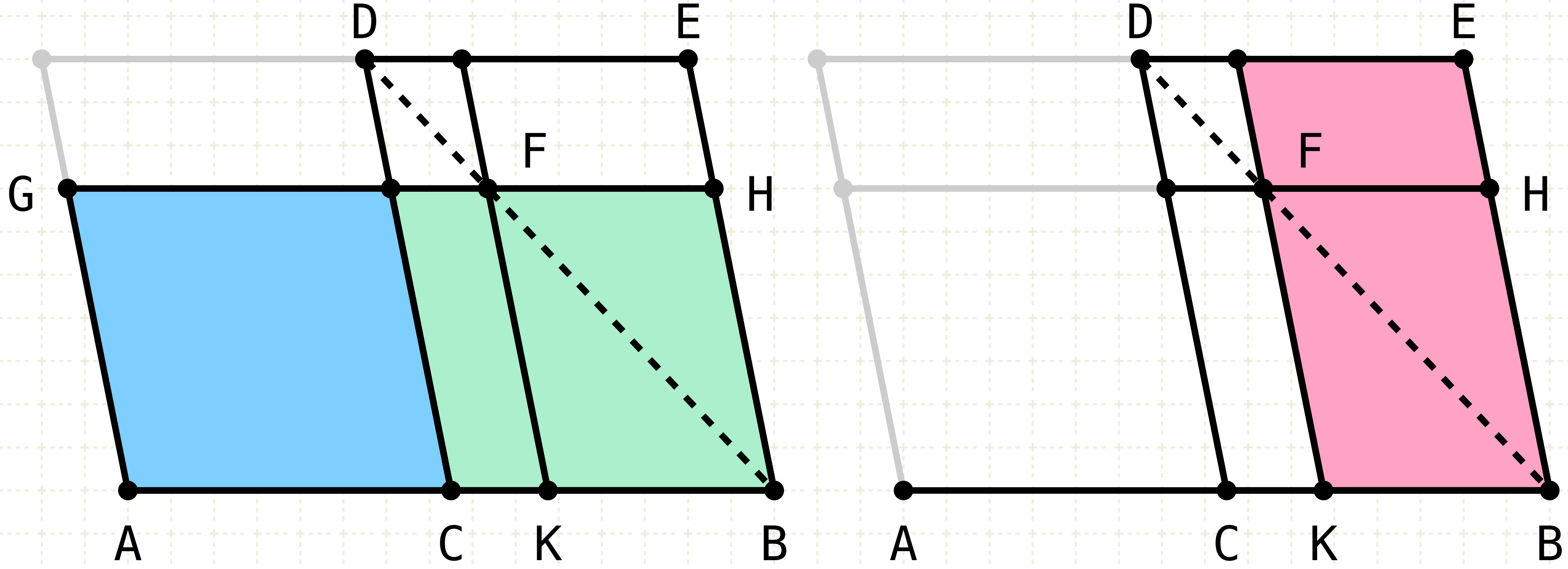

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Since the parallelogram FB is common, the whole of CH is equal to the whole KE

But CH is equal to CG, since AC is also equal to CB (I·36)

$AC = \frac{1}{2} AB$

$\square AD = \square DB$

$\square DB \sim \square FB$

$\square CF = \square FE$

$\square CF + \square FB = \square FE + \square FB$

$\square CH = \square KE$

$\square CH = \square CG$

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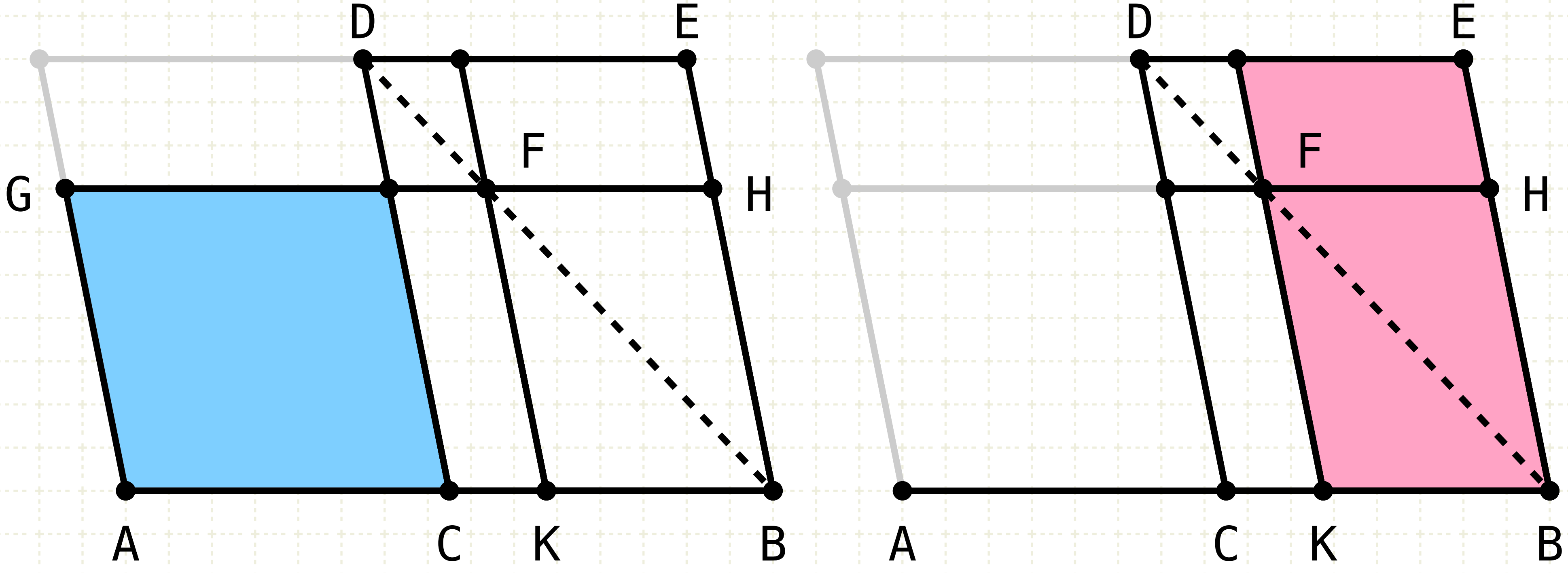

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But CH is equal to CG, since AC is also equal to CB (I·36)

Therefore CG is also equal to KE

AC = ½ AB

□AD = □DB

□DB ~ □FB

□CF = □FE

□CF+□FB = □FE+□FB

□CH = □KE

□CH = □CG

□CG = □KE

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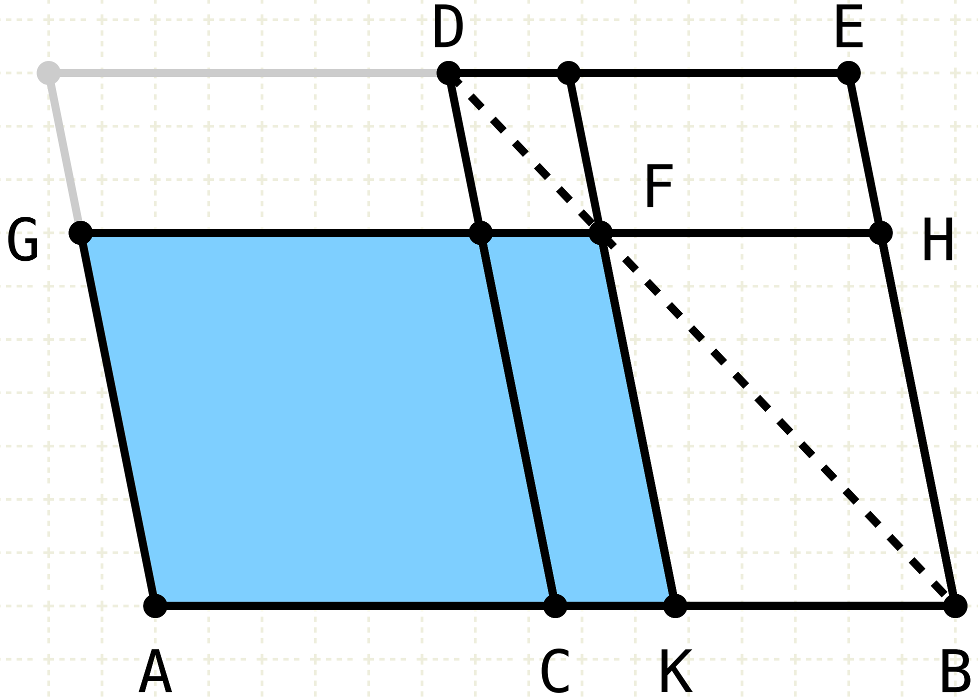

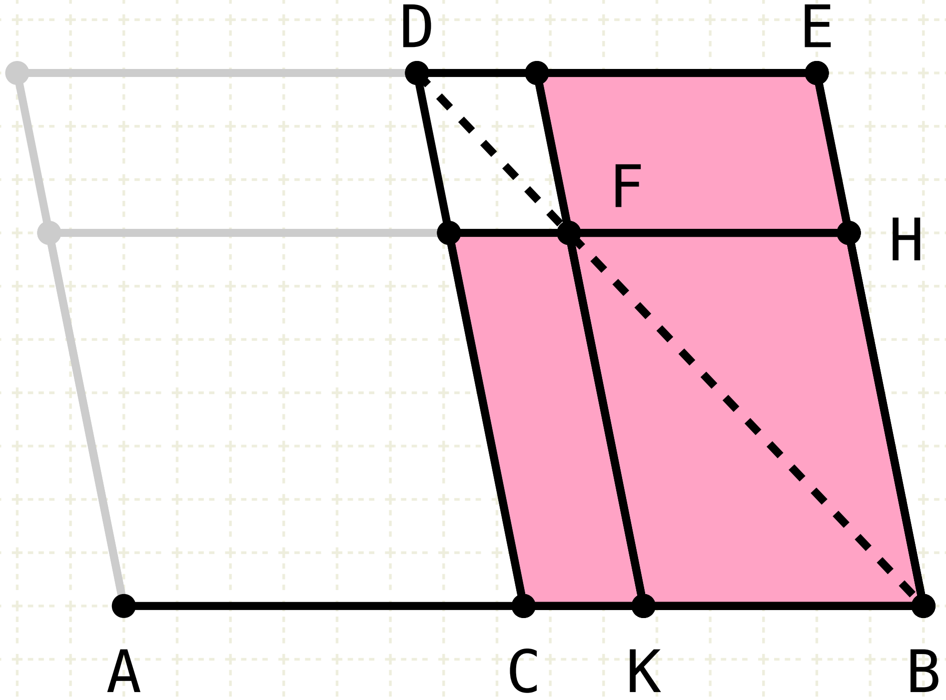

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Since the parallelogram FB is common, the whole of CH is equal to the whole KE

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Therefore CG is also equal to KE

Add the parallelogram CF to each, therefore the gnomon CBEF is equal to the parallelogram AF

AC = $\frac{1}{2}$ AB
□AD = □DB
□DB ~ □FB
□CF = □FE
□CF+□FB = □FE+□FB
□CH = □KE
□CH = □CG
□CG = □KE
□AF = CBEF

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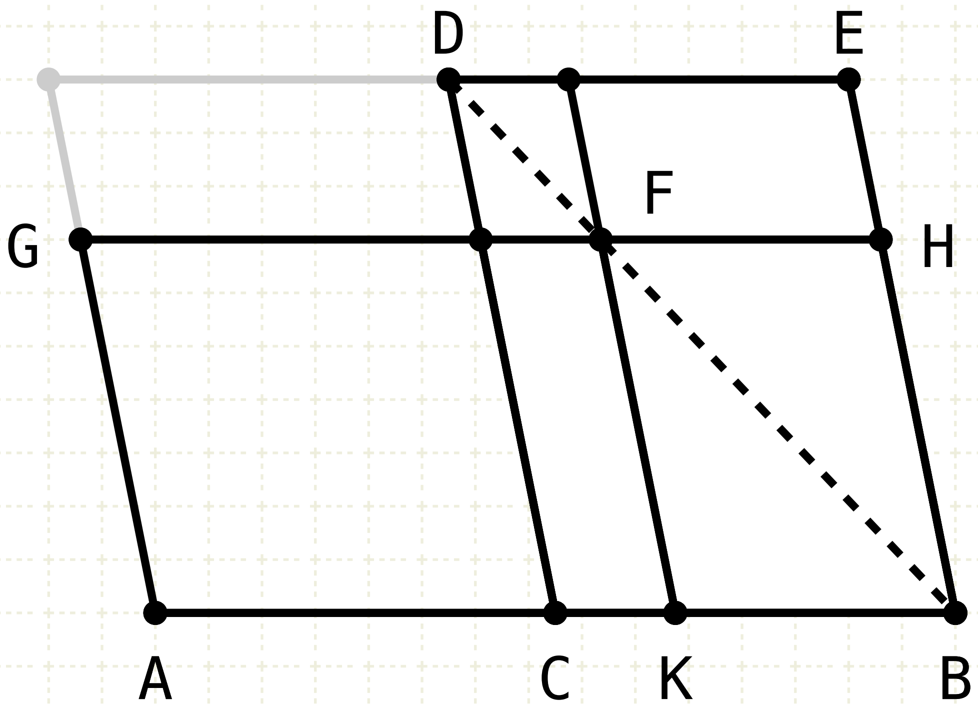

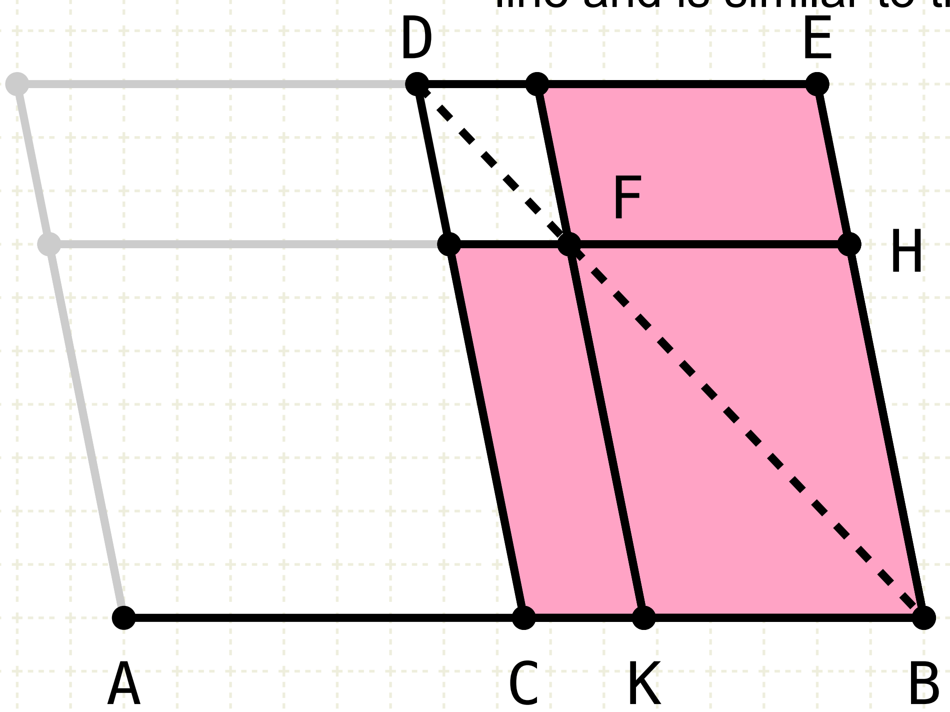

AC = ½ AB
□AD = □DB
□DB ~ □FB
□CF = □FE
□CF+□FB = □FE+□FB
□CH = □KE
□CH = □CG
□CG = □KE
□AF = CBEF

CBEF < □DB

Proof

Since the parallelograms DB and FB are similar, they are both on the same diameter (VI·26)

Parallelograms CF and FE are equal (I·43)

Since the parallelogram FB is common, the whole of CH is equal to the whole KE

But CH is equal to CG, since AC is also equal to CB (I·36)

Therefore CG is also equal to KE

Add the parallelogram CF to each, therefore the gnomon CBEF is equal to the parallelogram AF

The gnomon CBEF is less than the parallelogram DB

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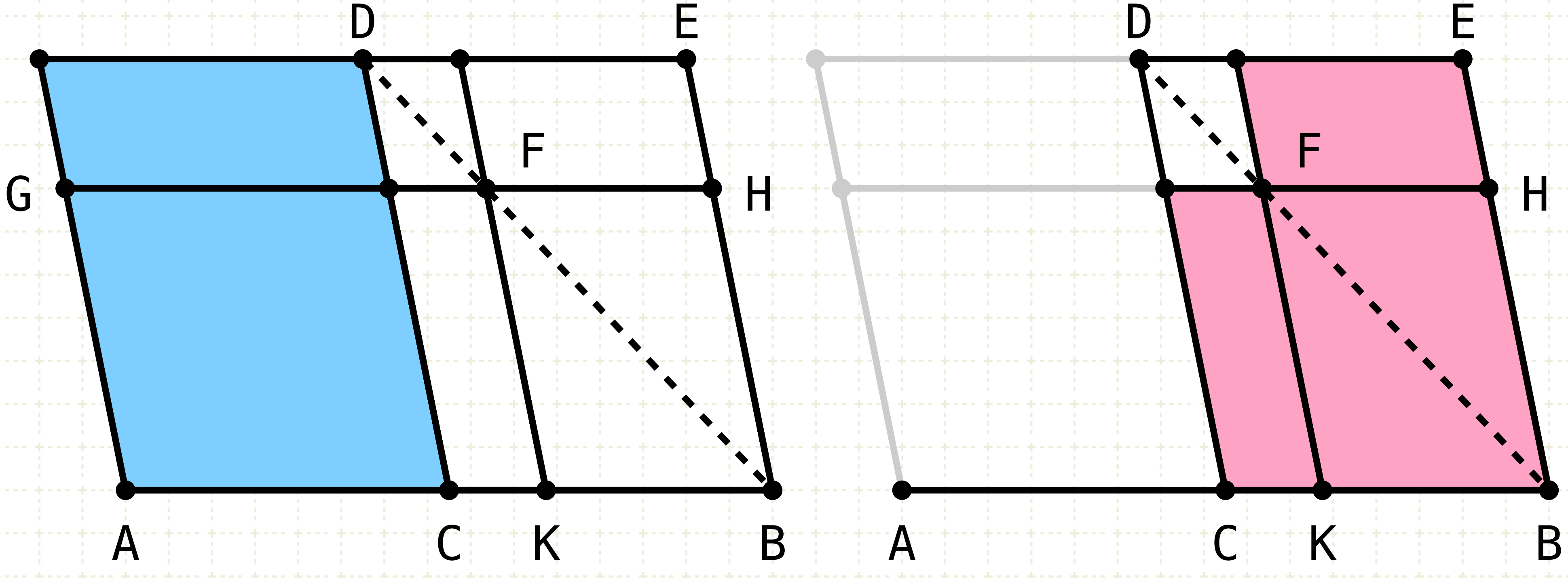

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□CF = □FE
□CF+□FB = □FE+□FB
□CH = □KE
□CH = □CG
□CG = □KE
□AF = CBEF

CBEF < □DB
CBEF < □AD

Proof

Since the parallelograms DB and FB are similar, they are both on the same diameter (VI·26)

Parallelograms CF and FE are equal (I·43)

Since the parallelogram FB is common, the whole of CH is equal to the whole KE

But CH is equal to CG, since AC is also equal to CB (I·36)

Therefore CG is also equal to KE

Add the parallelogram CF to each, therefore the gnomon CBEF is equal to the parallelogram AF

The gnomon CBEF is less than the parallelogram DB

And thus, the gnomon is also less than AD

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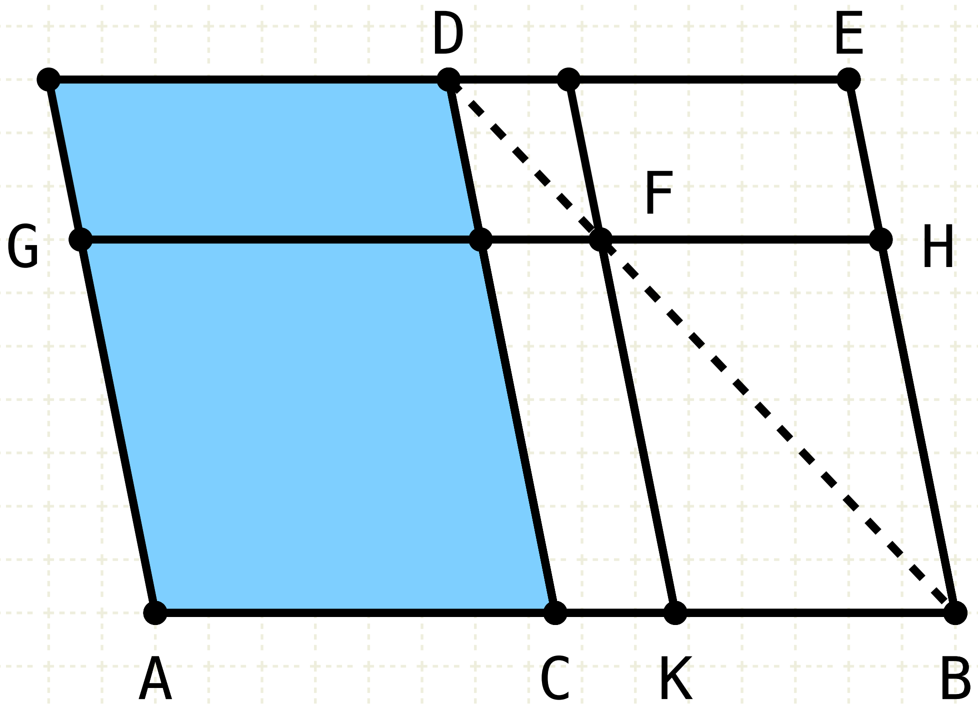
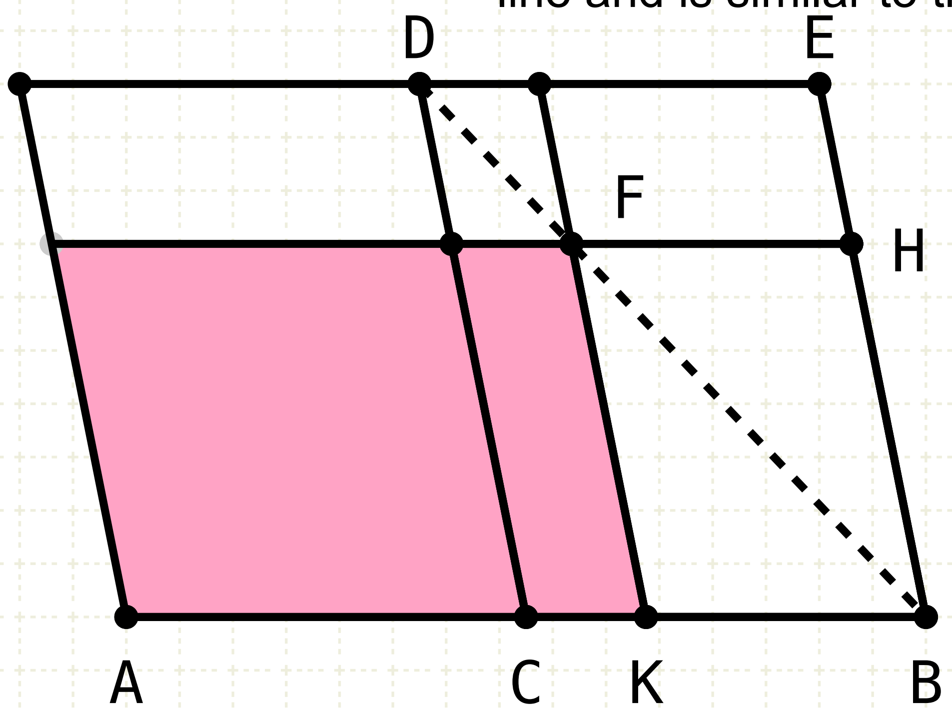
Of all the parallelograms applied to the same straight line and deficient by parallelogrammic figures similar and similarly situated to that described on the half of the straight line, that parallelogram is greatest which is applied to the half of the straight line and is similar to the defect





$AC = \frac{1}{2}\ AB$

$\square AD = \square DB$

$\square DB \sim \square FB$

$\square CF = \square FE$

$\square CF + \square FB = \square FE + \square FB$

$\square CH = \square KE$

$\square CH = \square CG$

$\square CG = \square KE$

$\square AF = CBEF$

$CBEF < \square DB$

$CBEF < \square AD$

$\square AF < \square AD$

Proof

Since the parallelograms DB and FB are similar, they are both on the same diameter (VI·26)

Parallelograms CF and FE are equal (I·43)

Since the parallelogram FB is common, the whole of CH is equal to the whole KE

But CH is equal to CG, since AC is also equal to CB (I·36)

Therefore CG is also equal to KE

Add the parallelogram CF to each, therefore the gnomon CBEF is equal to the parallelogram AF

The gnomon CBEF is less than the parallelogram DB

And thus, the gnomon is also less than AD

Finally, since CBEF is equal to AF, AF is less than the AD

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