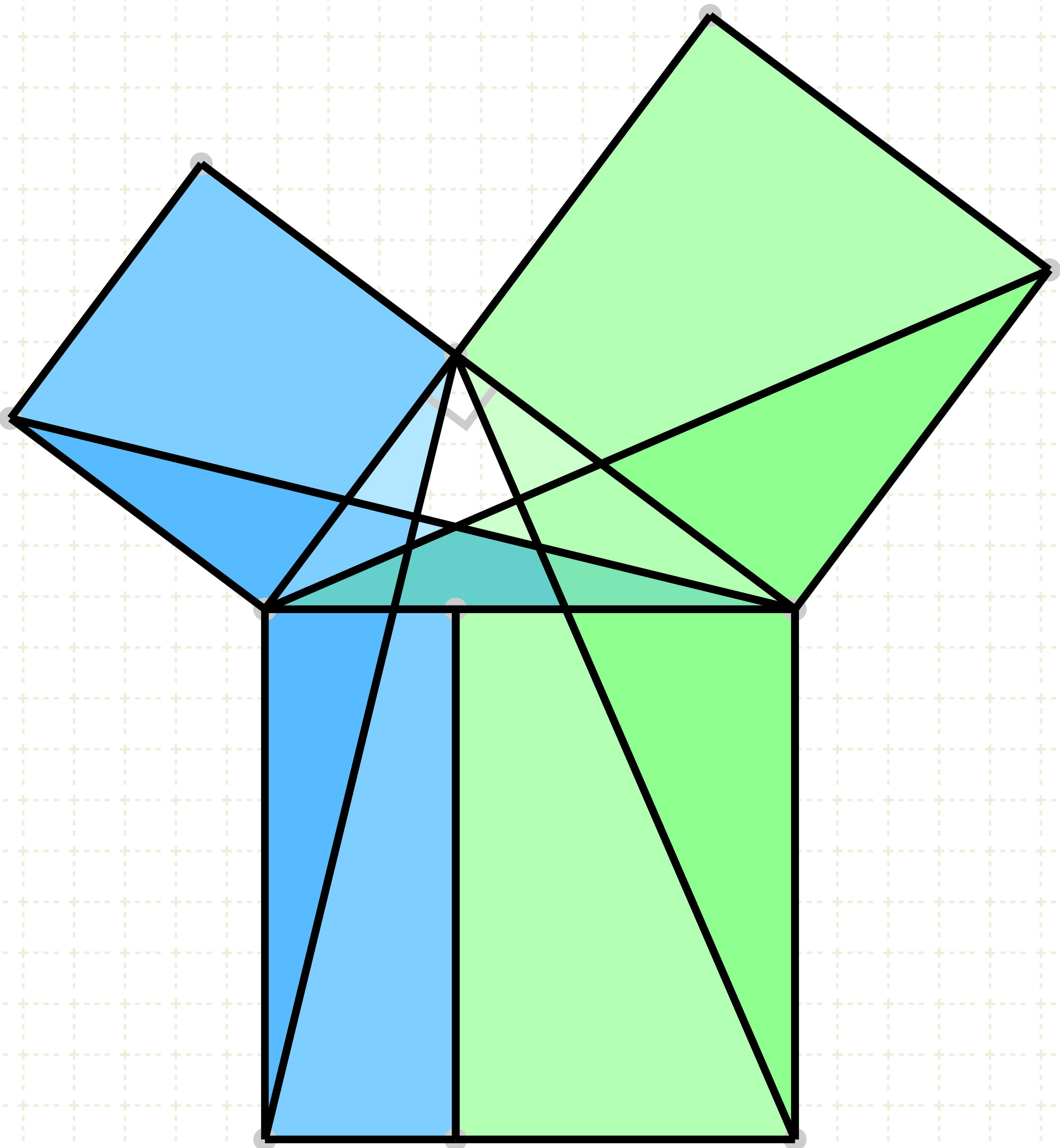
Euclid's Elements

Book I



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

Albert Einstein

Table of Contents, Chapter 1

1 Construct an equilateral triangle

2 Copy a line

3 Subtract one line from another

4 Equal triangles if equal side-angle-side

5 Isosceles triangle gives equal base angles

6 Equal base angles gives isosceles triangle

7 Two sides of triangle meet at unique point

8 Equal triangles if equal side-side-side

9 How to bisect an angle

10 Bisect a line

11 Construct right angle, point on line

12 Construct perpendicular, point to line

13 Sum of angles on straight line = 180

14 Two lines form a single line if angle = 180

15 Vertical angles equal one another

16 Exterior angle larger than interior angle

17 Sum of two interior angles less than 180

18 Greater side opposite of greater angle

19 Greater angle opposite of greater side

20 Sum of two angles greater than third

21 Triangle within triangle has smaller sides

22 Construct triangle from given lines

23 Copy an angle

24 Larger angle gives larger base

25 Larger base gives larger angle

26 Equal triangles if equal angle-side-angle

27 Alternate angles equal then lines parallel

28 Sum of interior angles = 180 , lines parallel

29 Lines parallel, alternate angles are equal

30 Lines parallel to same line are parallel to themselves

31 Construct one line parallel to another

32 Sum of interior angles of a triangle = 180

33 Lines joining ends of equal parallels are parallel

34 Opposite sides-angles equal in parallelogram

35 Parallelograms, same base-height have equal area

36 Parallelograms, equal base-height have equal area

37 Triangles, same base-height have equal area

38 Triangles, equal base-height have equal area

Table of Contents, Chapter 1

39 Equal triangles on same base, have equal height

40 Equal triangles on equal base, have equal height

41 Triangle is half parallelogram with same base and height

42 Construct parallelogram with equal area as triangle

43 Parallelogram complements are equal

44 Construct parallelogram on line, equal to triangle

45 Construct parallelogram equal to polygon

46 Construct a square

47 Pythagoras' theorem

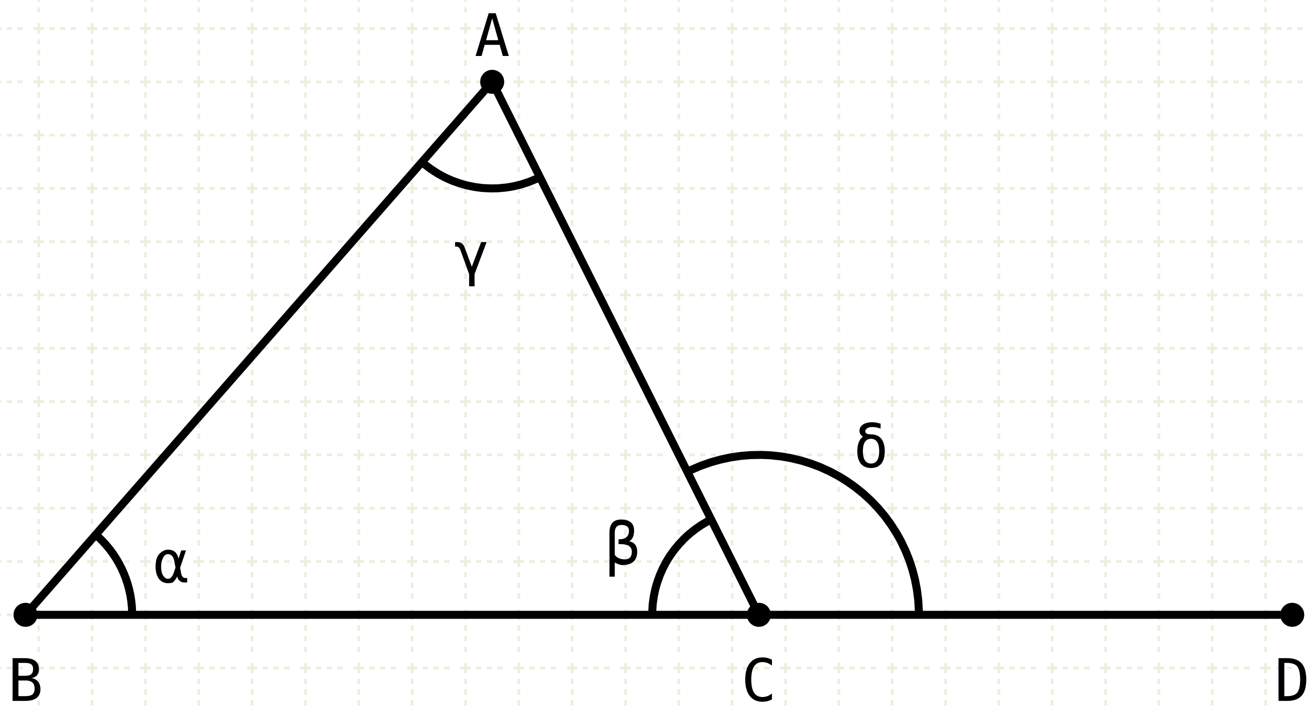
48 Inverse Pythagoras' theorem

Proposition 32 of Book I

In any triangle, if one of the sides is produced, then the exterior angle equals the sum of the two interior and opposite angles, and the sum of the three interior angles of the triangle equals two right angles.

Proposition 32 of Book I

In any triangle, if one of the sides is produced, then the exterior angle equals the sum of the two interior and opposite angles, and the sum of the three interior angles of the triangle equals two right angles.

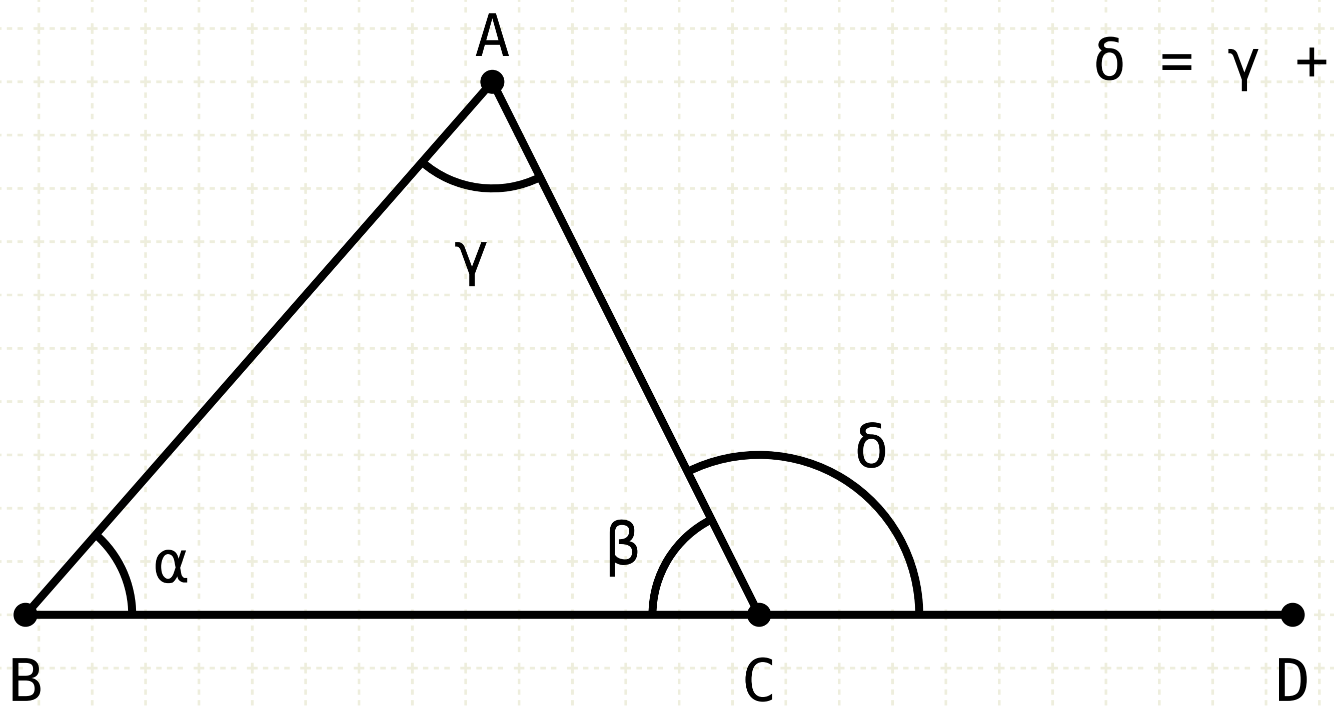


In other words

Given a triangle ABC, and line BC extended to point D

Proposition 32 of Book I

In any triangle, if one of the sides is produced, then the exterior angle equals the sum of the two interior and opposite angles, and the sum of the three interior angles of the triangle equals two right angles.



$$\delta = \gamma + \alpha$$

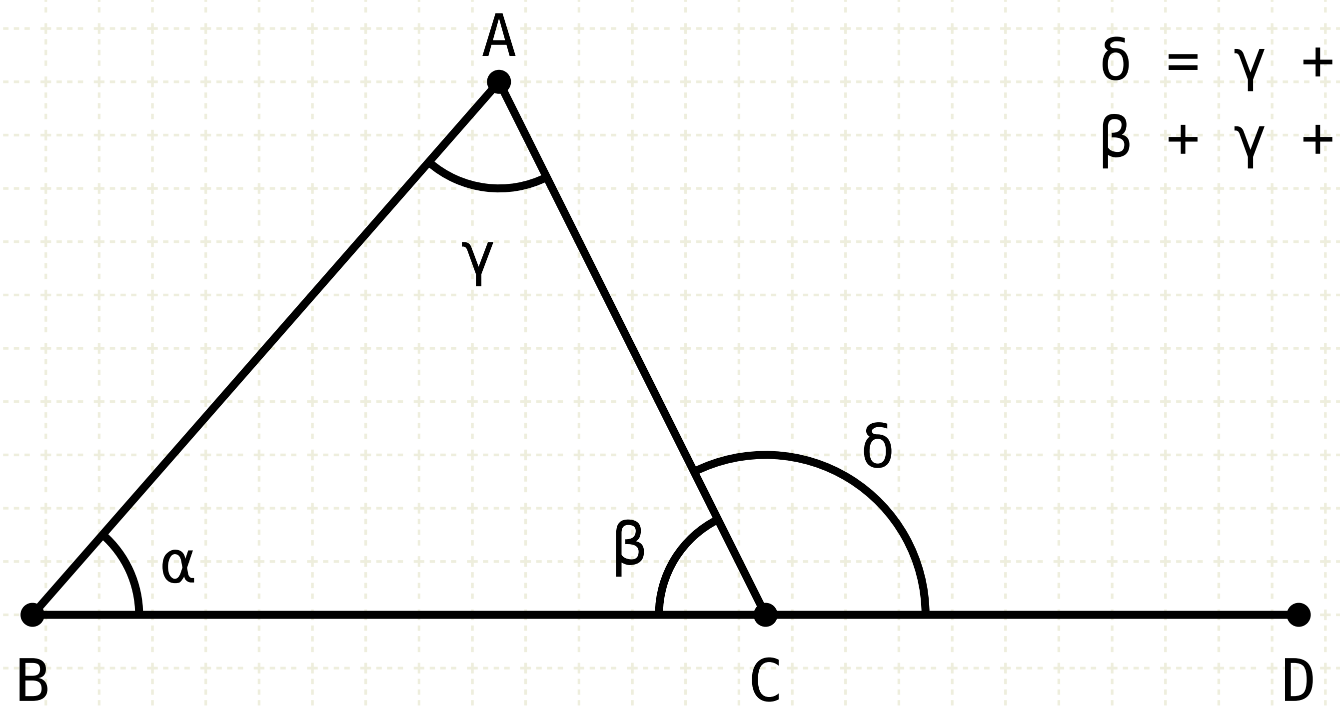
In other words

Given a triangle ABC, and line BC extended to point D

Angle DCA is equal to the sum of ABC and CAB

Proposition 32 of Book I

In any triangle, if one of the sides is produced, then the exterior angle equals the sum of the two interior and opposite angles, and the sum of the three interior angles of the triangle equals two right angles.



$\delta = \gamma + \alpha$

$\beta + \gamma + \alpha = \llcorner + \llcorner$

In other words

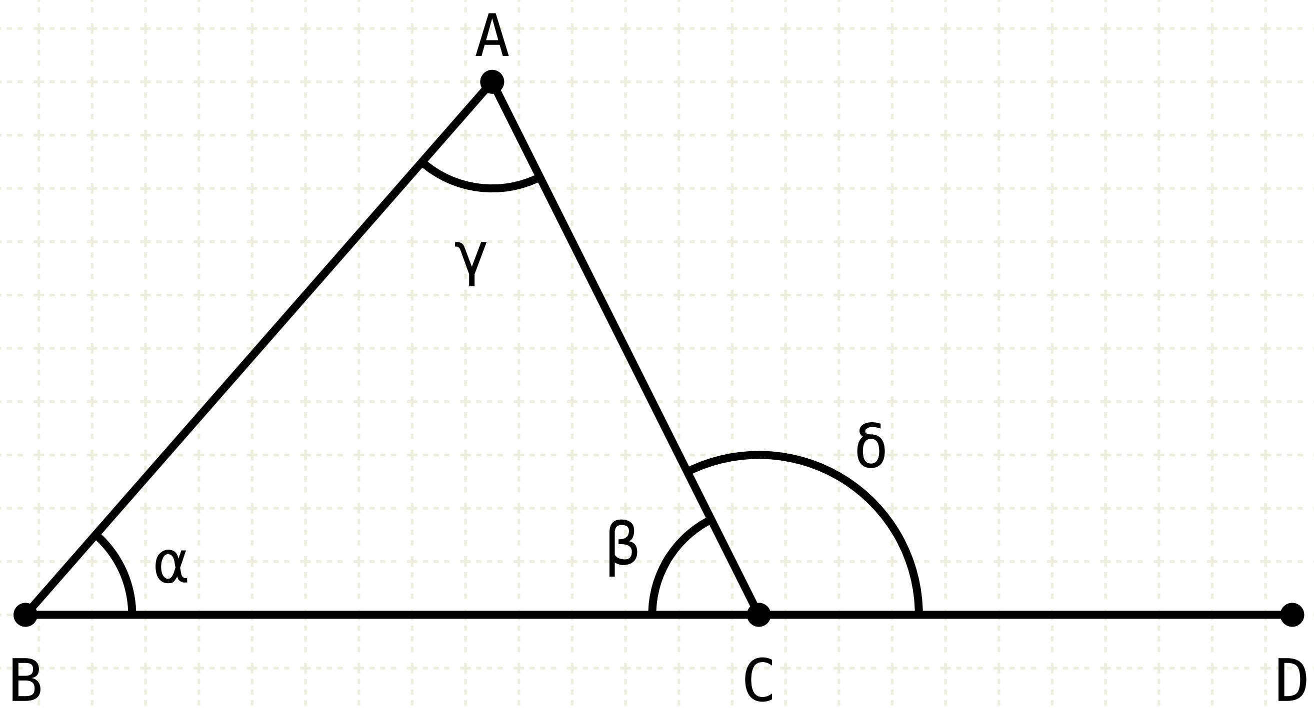
Given a triangle ABC, and line BC extended to point D

Angle DCA is equal to the sum of ABC and CAB

The sum of the angles BCA, ABC and CAB is two right angles

Proposition 32 of Book I

In any triangle, if one of the sides is produced, then the exterior angle equals the sum of the two interior and opposite angles, and the sum of the three interior angles of the triangle equals two right angles.



In other words

Given a triangle ABC, and line BC extended to point D

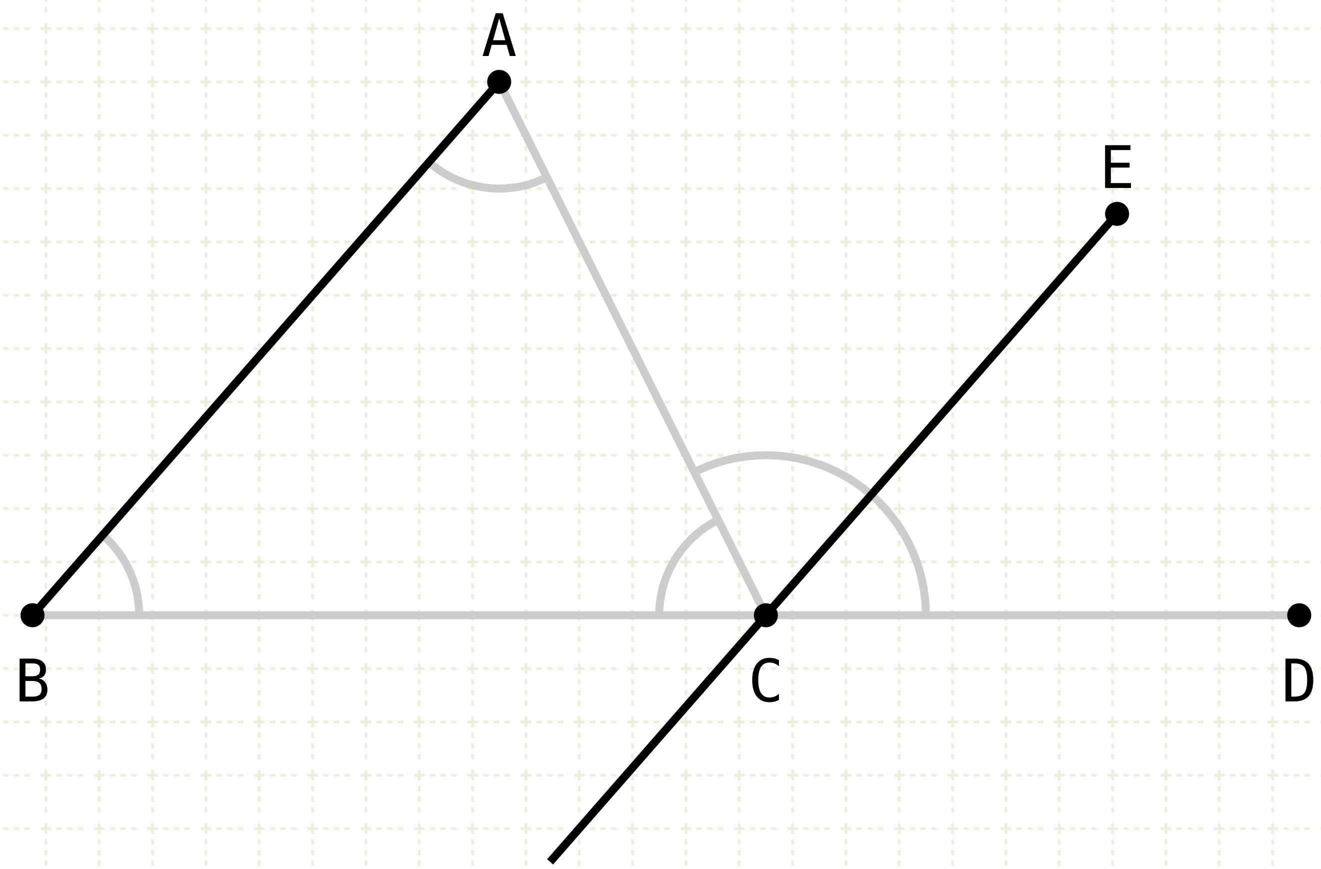
Angle DCA is equal to the sum of ABC and CAB

The sum of the angles BCA, ABC and CAB is two right angles

Proof

Proposition 32 of Book I

In any triangle, if one of the sides is produced, then the exterior angle equals the sum of the two interior and opposite angles, and the sum of the three interior angles of the triangle equals two right angles.



In other words

Given a triangle ABC, and line BC extended to point D

Angle DCA is equal to the sum of ABC and CAB

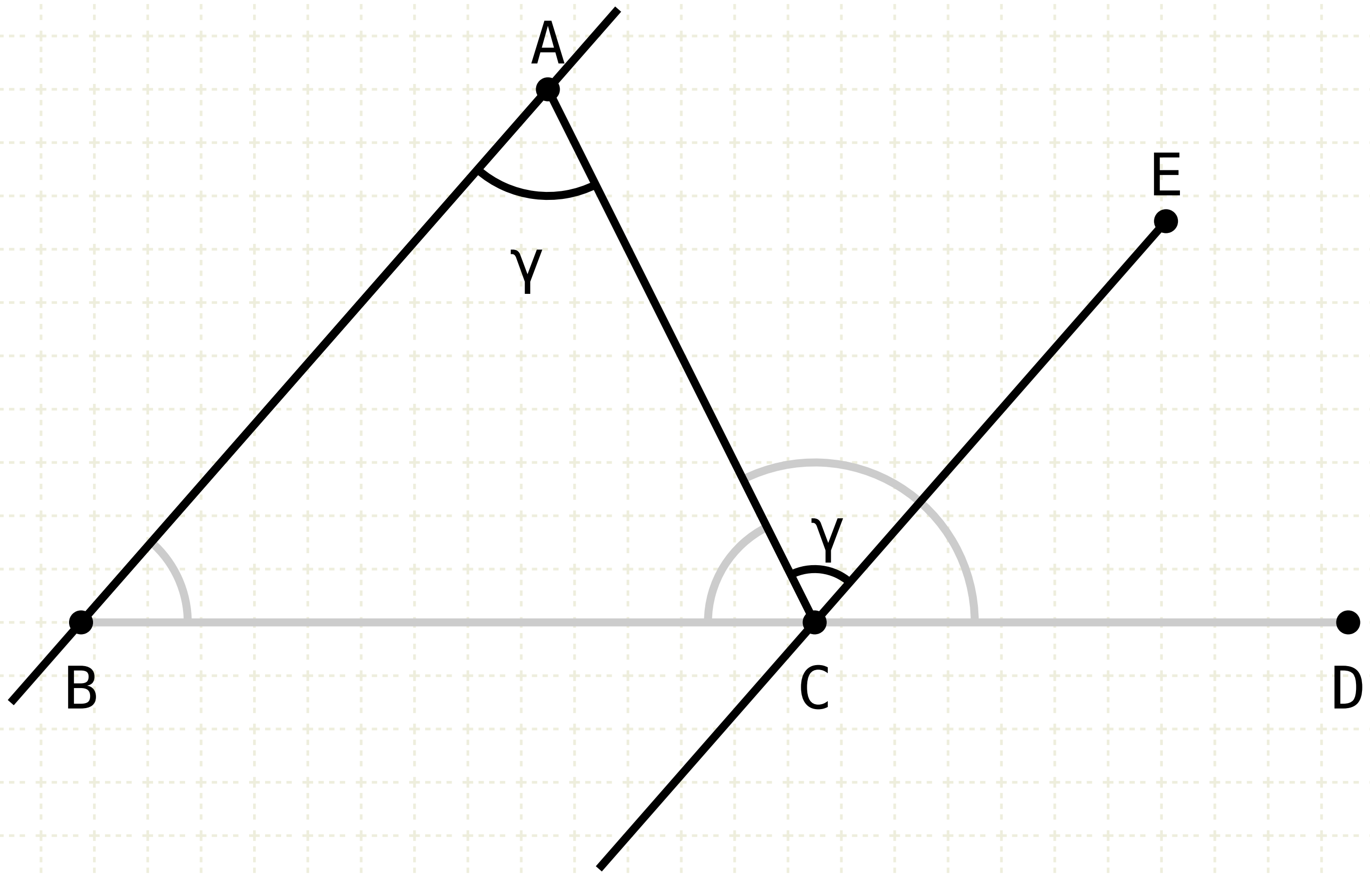
The sum of the angles BCA, ABC and CAB is two right angles

Proof

Create a line parallel to AB, at point C (I·31)

Proposition 32 of Book I

In any triangle, if one of the sides is produced, then the exterior angle equals the sum of the two interior and opposite angles, and the sum of the three interior angles of the triangle equals two right angles.



$\angle BAC = \angle ACE = \gamma$

In other words

Given a triangle ABC, and line BC extended to point D

Angle DCA is equal to the sum of ABC and CAB

The sum of the angles BCA, ABC and CAB is two right angles

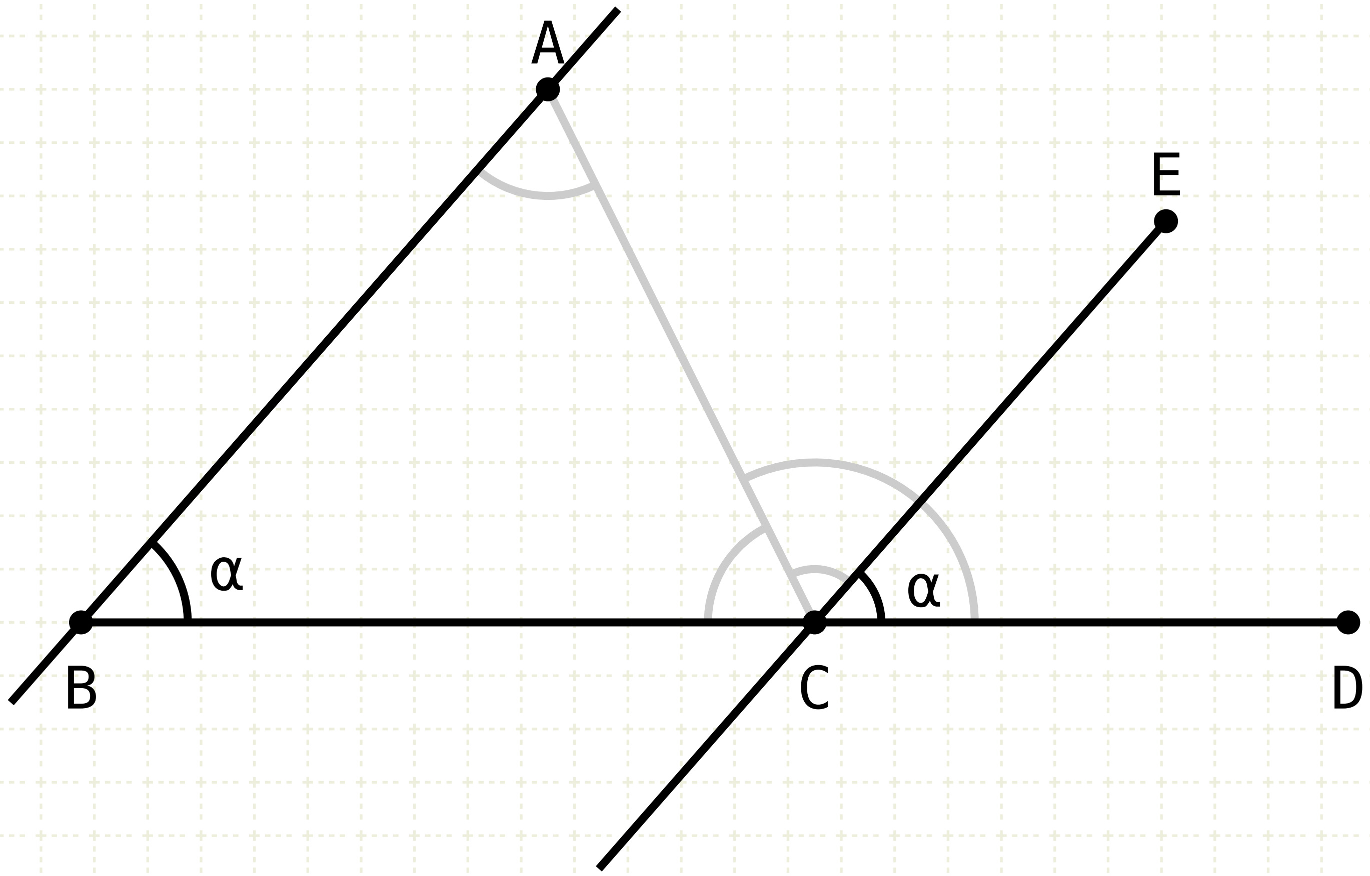
Proof

Create a line parallel to AB, at point C (I·31)

Since lines AB and CE are parallel, and line AC crosses them, then angles BAC and ACE are equal (I·29)

Proposition 32 of Book I

In any triangle, if one of the sides is produced, then the exterior angle equals the sum of the two interior and opposite angles, and the sum of the three interior angles of the triangle equals two right angles.



$$\angle BAC = \angle ACE = \gamma$$
$$\angle ABC = \angle ECD = \alpha$$

In other words

Given a triangle ABC, and line BC extended to point D

Angle DCA is equal to the sum of ABC and CAB

The sum of the angles BCA, ABC and CAB is two right angles

Proof

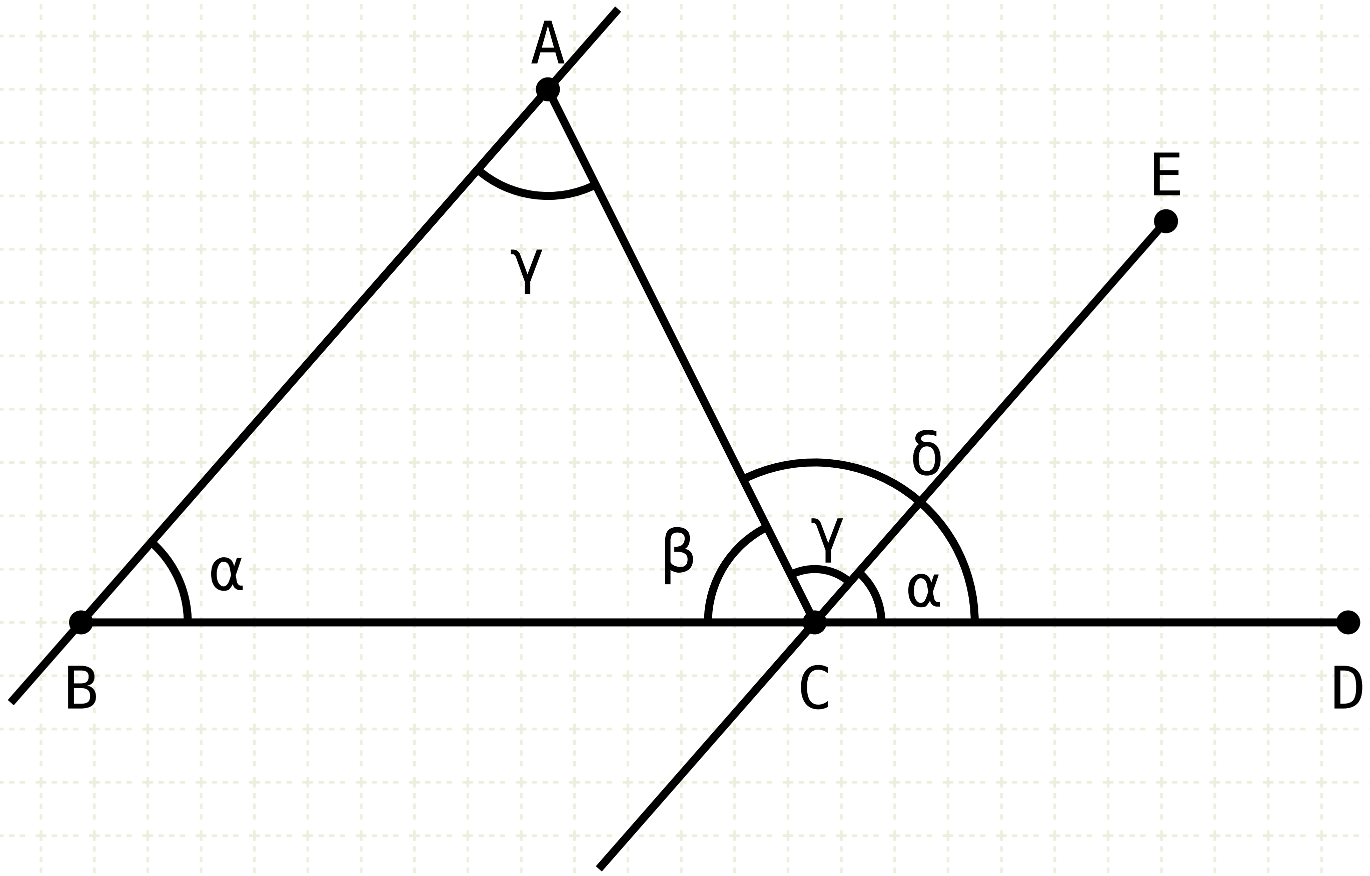
Create a line parallel to AB, at point C (I·31)

Since lines AB and CE are parallel, and line AC crosses them, then angles BAC and ACE are equal (I·29)

Since lines AB and CE are parallel, and line BC crosses them, then angles ABC and ECD are equal (I·29)

Proposition 32 of Book I

In any triangle, if one of the sides is produced, then the exterior angle equals the sum of the two interior and opposite angles, and the sum of the three interior angles of the triangle equals two right angles.



$\angle BAC = \angle ACE = \gamma$
$\angle ABC = \angle ECD = \alpha$
$\delta = \gamma + \alpha$

In other words

Given a triangle ABC, and line BC extended to point D

Angle DCA is equal to the sum of ABC and CAB

The sum of the angles BCA, ABC and CAB is two right angles

Proof

Create a line parallel to AB, at point C (I·31)

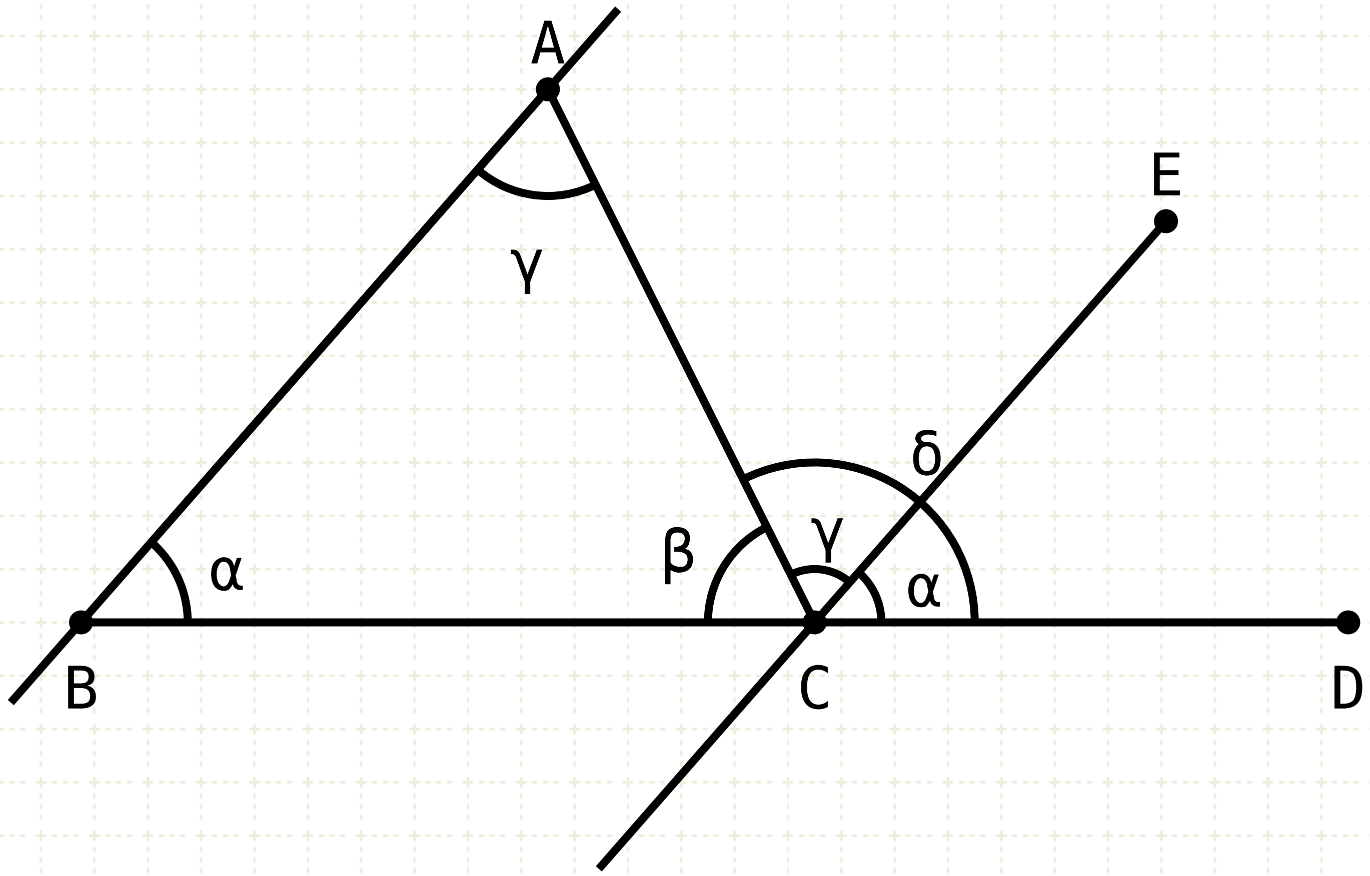
Since lines AB and CE are parallel, and line AC crosses them, then angles BAC and ACE are equal (I·29)

Since lines AB and CE are parallel, and line BC crosses them, then angles ABC and ECD are equal (I·29)

Angle ACD equals the sum of angles ACE and ECD

Proposition 32 of Book I

In any triangle, if one of the sides is produced, then the exterior angle equals the sum of the two interior and opposite angles, and the sum of the three interior angles of the triangle equals two right angles.



$$\angle BAC = \angle ACE = \gamma$$
$$\angle ABC = \angle ECD = \alpha$$
$$\delta = \gamma + \alpha$$
$$\beta + \delta = \llcorner + \llcorner$$

In other words

Given a triangle ABC, and line BC extended to point D

Angle DCA is equal to the sum of ABC and CAB

The sum of the angles BCA, ABC and CAB is two right angles

Proof

Create a line parallel to AB, at point C (I·31)

Since lines AB and CE are parallel, and line AC crosses them, then angles BAC and ACE are equal (I·29)

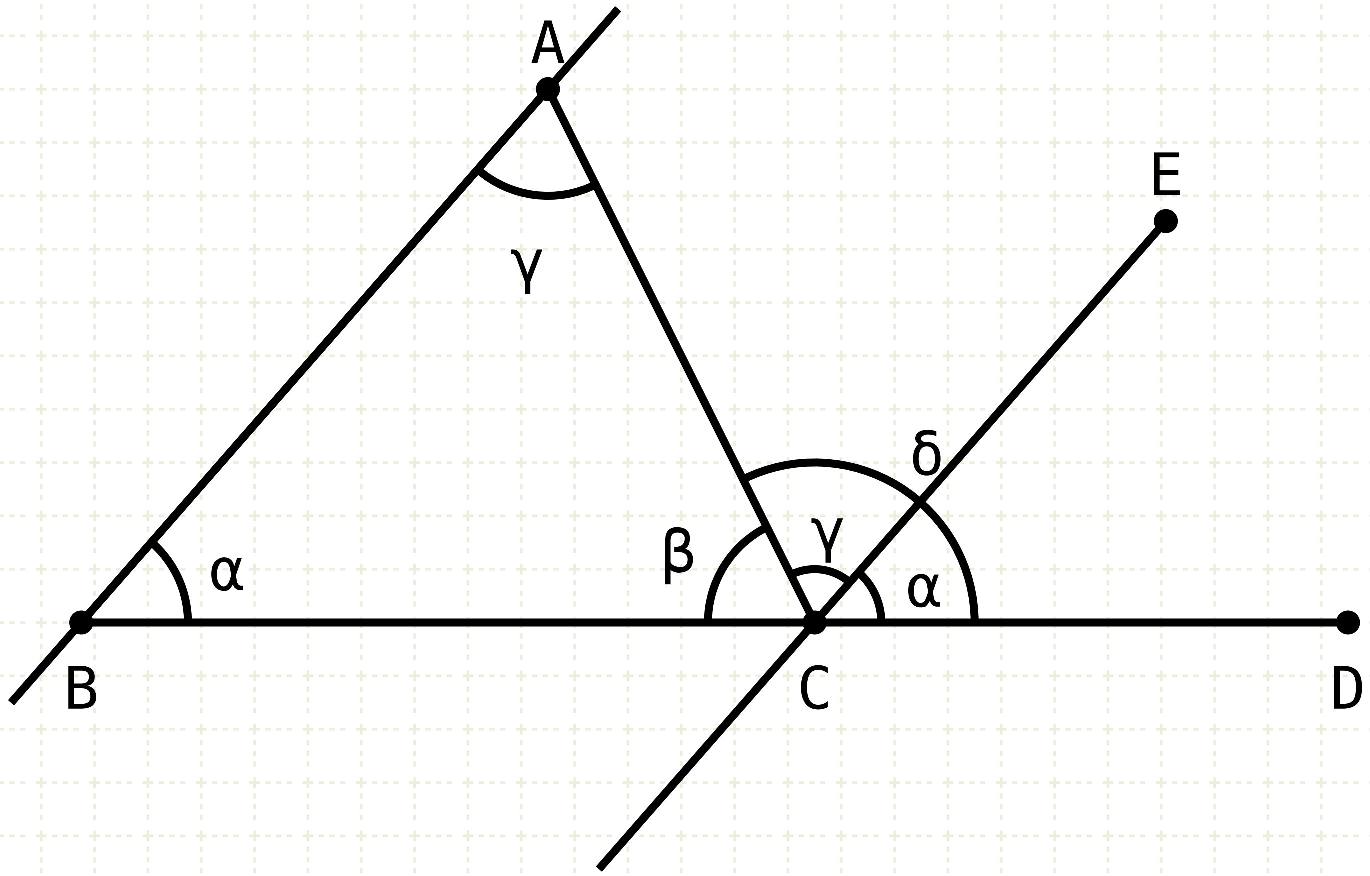
Since lines AB and CE are parallel, and line BC crosses them, then angles ABC and ECD are equal (I·29)

Angle ACD equals the sum of angles ACE and ECD

The sum of angles ACD and ACB is two right angles (I·13)

Proposition 32 of Book I

In any triangle, if one of the sides is produced, then the exterior angle equals the sum of the two interior and opposite angles, and the sum of the three interior angles of the triangle equals two right angles.



$$\angle BAC = \angle ACE = \gamma$$
$$\angle ABC = \angle ECD = \alpha$$
$$\delta = \gamma + \alpha$$
$$\beta + \delta = \llcorner + \llcorner$$
$$\beta + \gamma + \alpha = \llcorner + \llcorner$$

In other words

Given a triangle ABC, and line BC extended to point D

Angle DCA is equal to the sum of ABC and CAB

The sum of the angles BCA, ABC and CAB is two right angles

Proof

Create a line parallel to AB, at point C (I·31)

Since lines AB and CE are parallel, and line AC crosses them, then angles BAC and ACE are equal (I·29)

Since lines AB and CE are parallel, and line BC crosses them, then angles ABC and ECD are equal (I·29)

Angle ACD equals the sum of angles ACE and ECD

The sum of angles ACD and ACB is two right angles (I·13)

Therefore sum of angles ACE, ECD, and ACB is two right angles

Youtube Videos

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