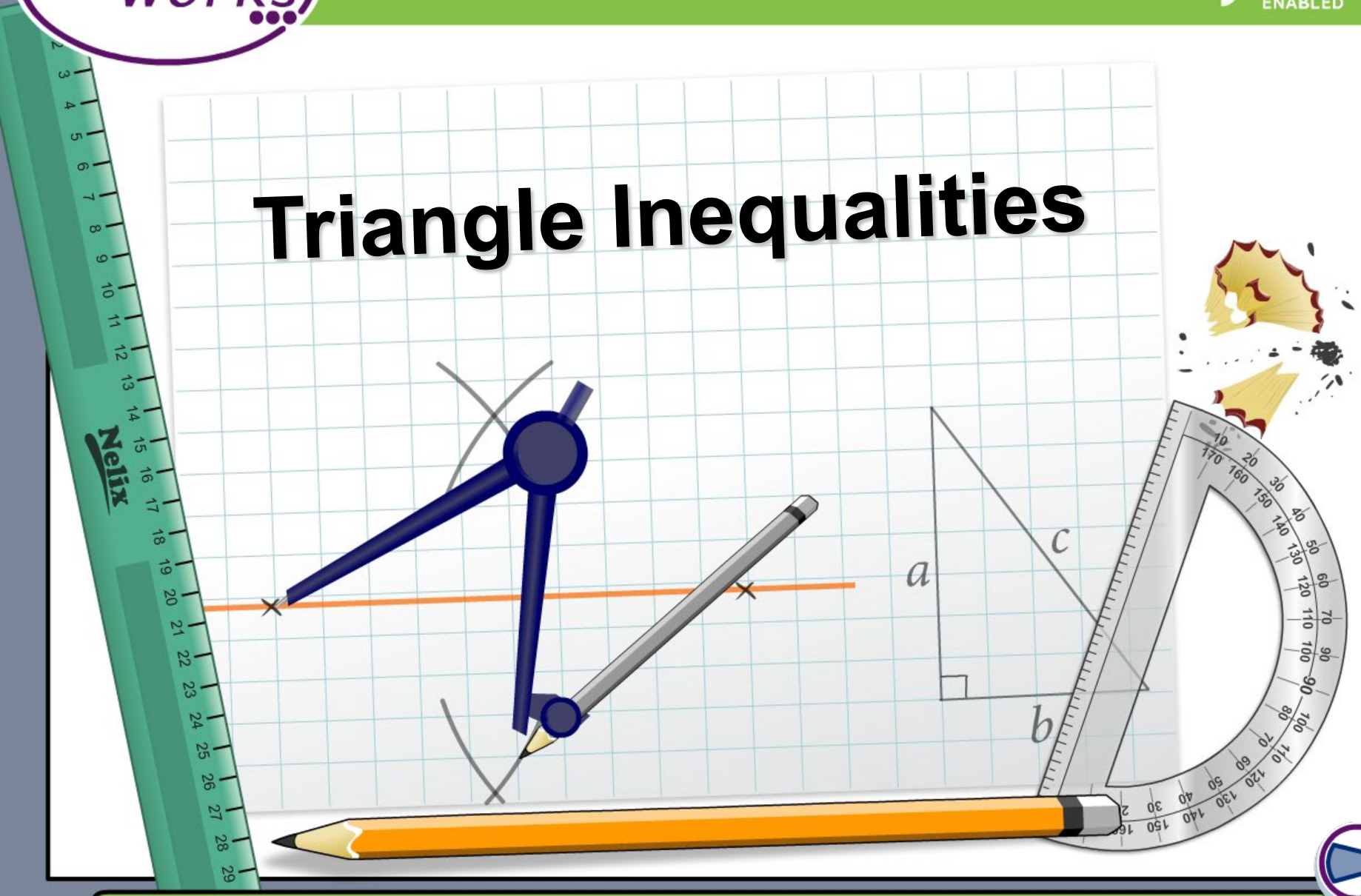
# Triangle Inequalities



# Information

## Common core icons

This icon indicates a slide where the Standards for Mathematical Practice are being developed. Details of these are given in the Notes field.


Slides containing examples of mathematical modeling are marked with this stamp.

This icon indicates an opportunity for discussion or group work.

The **Standards for Mathematical Practice** outlined in the Common Core State Standards for Mathematics describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

These are:

**1) Make sense of problems and persevere in solving them.**

**2) Reason abstractly and quantitatively.**

**3) Construct viable arguments and critique the reasoning of others.**

**4) Model with mathematics.**

**5) Use appropriate tools strategically.**

**6) Attend to precision.**

**7) Look for and make use of structure.**

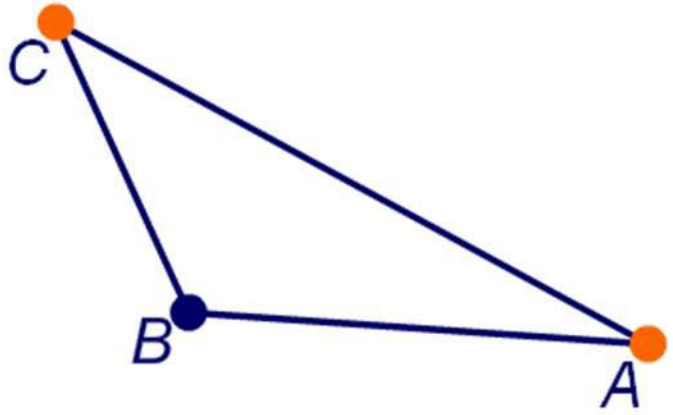
**8) Look for and express regularity in repeated reasoning.**

This icon indicates that the slide contains activities created in Flash. These activities are not editable.

This icon indicates teacher's notes in the Notes field.

# Exploring triangle side lengths

## The triangle inequality




*Drag the vertices of the triangle to explore the relationship between side lengths.*

show lengths

show relation

# Triangle inequality theorem

***Triangle inequality theorem***: The sum of any two sides of a triangle is greater than the third side.

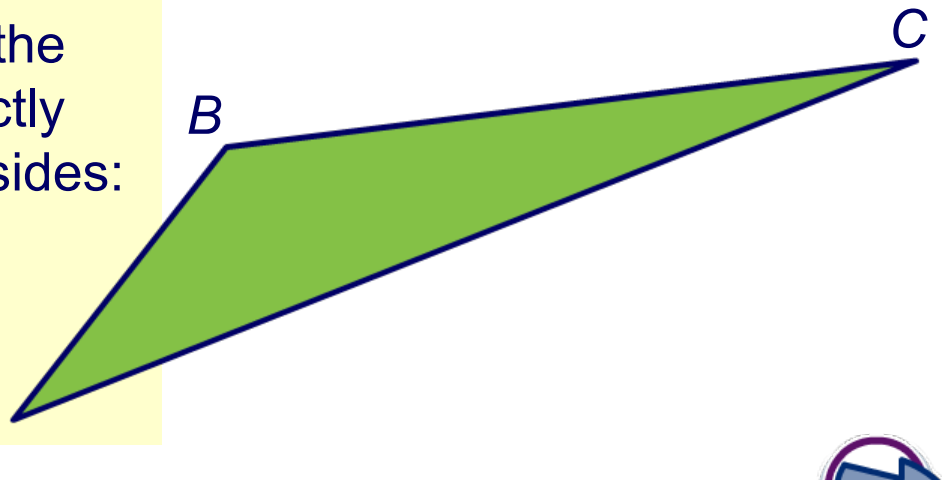
$$AB + BC > AC \qquad AB + AC > BC \qquad BC + AC > AB$$

**Two sides of a triangle have length $AB = 4$ and $AC = 8$. What can you say about the length of the third side, $BC$?**

By the triangle inequality theorem, the length of the third side must be strictly less than the sum of the two other sides:

$$BC < AB + AC = 4 + 8 = 12$$

$$\boldsymbol{BC < 12}$$

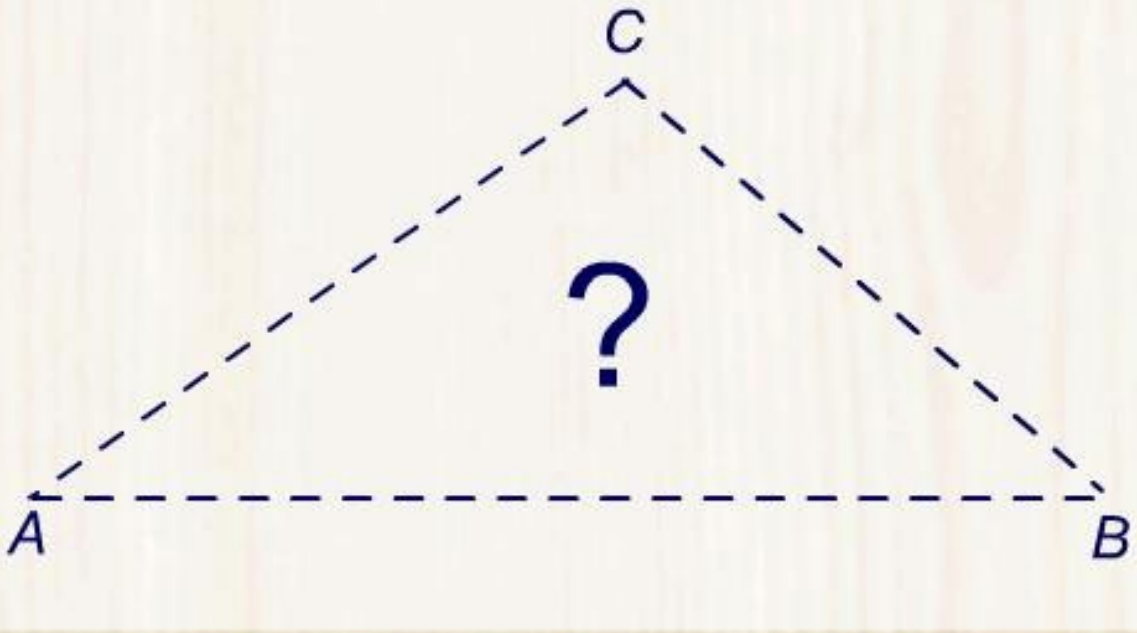


# Testing the inequality theorem (1)

## Testing the triangle inequality theorem

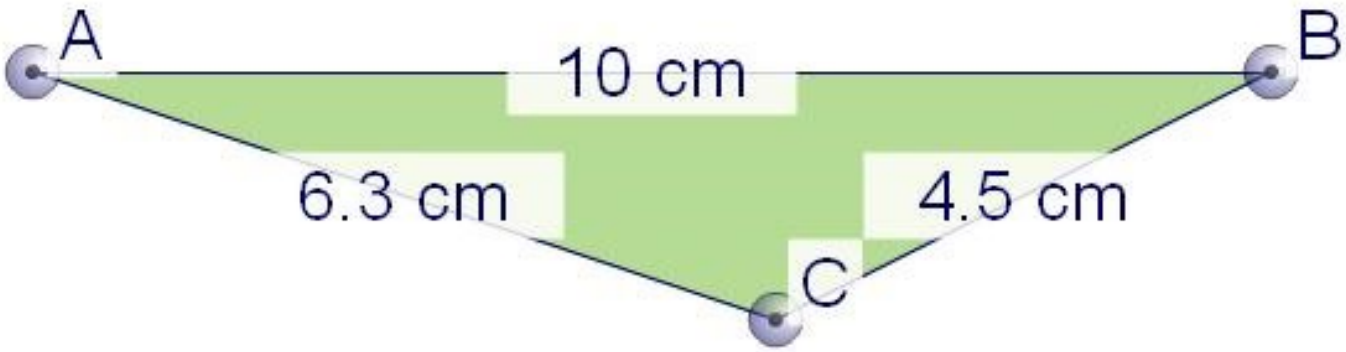
Press **play** to attempt to construct $\triangle ABC$, where:

$AB = 8\,\text{cm}$
$BC = 3\,\text{cm}$
$AC = 4\,\text{cm}$



# Testing the inequality theorem (2)

**Adjust the size of the triangle, then press the green panels to test the triangle inequality theorem.**




$AB + BC > AC$ | $BC + AC > AB$ | $AC + AB > BC$

# Finding possible lengths

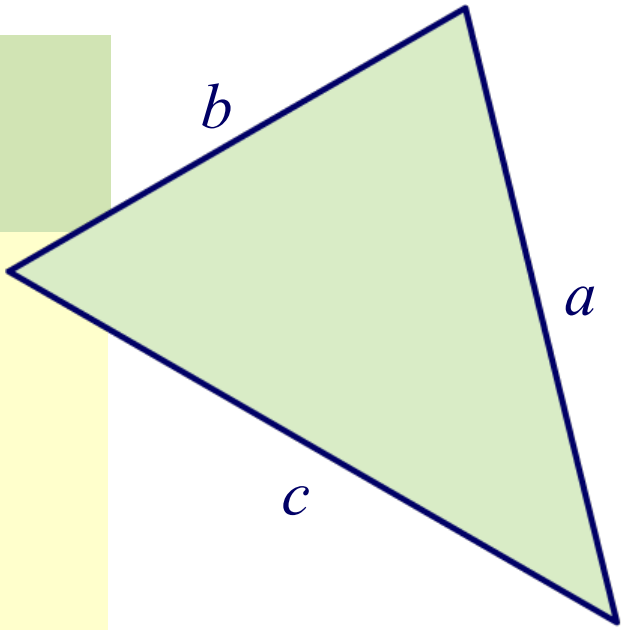
**The length of one side can be any value greater than the difference and less than the sum of the other sides:**

triangle inequality: $a < b + c$

a different triangle inequality: $b < a + c \Rightarrow b - c < a$ for $b > c$

combining inequalities: $b - c < a < b + c$

**If $b$ = 8 cm and $c$ = 6 cm, what is the range of possible lengths for $a$?**




$b - c < a < b + c$

substituting: $8 - 6 < a < 8 + 6$

$2 < a < 14$

$a$ must measure **between 2 cm and 14 cm.**