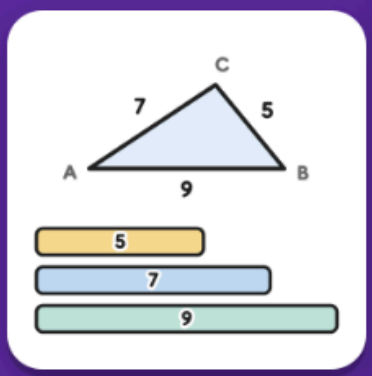
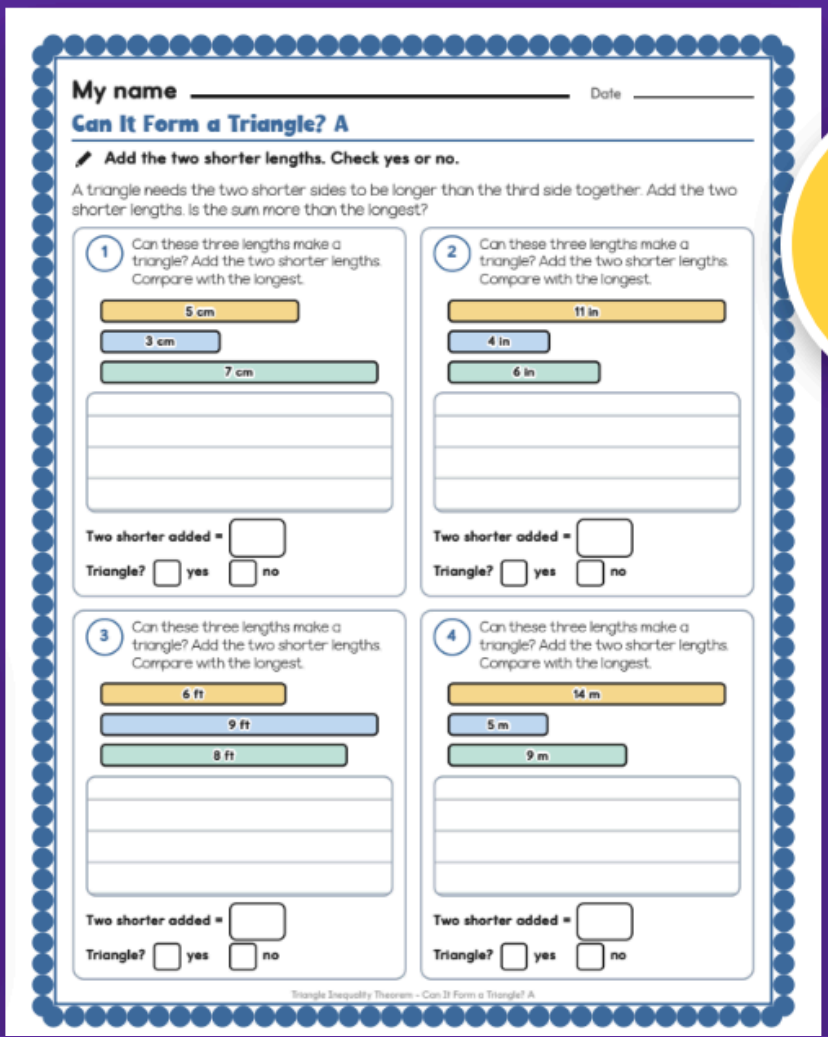
TRIANGLE INEQUALITY

THEOREM WORKSHEETS · GRADES 7-9





My name _____ Date _____

Can It Form a Triangle? A

Add the two shorter lengths. Check yes or no.

A triangle needs the two shorter sides to be longer than the third side together. Add the two shorter lengths. Is the sum more than the longest?

1. Can these three lengths make a triangle? Add the two shorter lengths. Compare with the longest.
   5 cm, 3 cm, 7 cm
   Two shorter added = ☐
   Triangle? ☐ yes ☐ no

2. Can these three lengths make a triangle? Add the two shorter lengths. Compare with the longest.
   11 in, 4 in, 6 in
   Two shorter added = ☐
   Triangle? ☐ yes ☐ no

3. Can these three lengths make a triangle? Add the two shorter lengths. Compare with the longest.
   6 ft, 9 ft, 8 ft
   Two shorter added = ☐
   Triangle? ☐ yes ☐ no

4. Can these three lengths make a triangle? Add the two shorter lengths. Compare with the longest.
   14 m, 5 m, 9 m
   Two shorter added = ☐
   Triangle? ☐ yes ☐ no

Triangle Inequality Theorem - Can It Form a Triangle? A

24 PAGES

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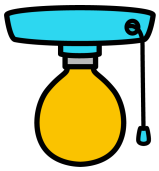


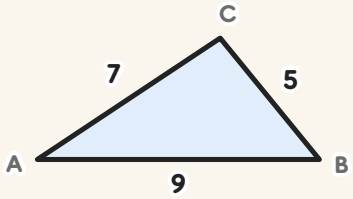
Triangle Inequality: The Words

Read about each word. Fill in the blanks.

The Triangle Inequality Theorem tells you if three lengths can be the sides of a triangle. These six words come up on every page.

Triangle

A shape with three straight sides and three corners.



A triangle has ___ sides: ☐

Sum

The answer when you add. Add the two shorter sides.



5 + 7 = ☐

Longest side

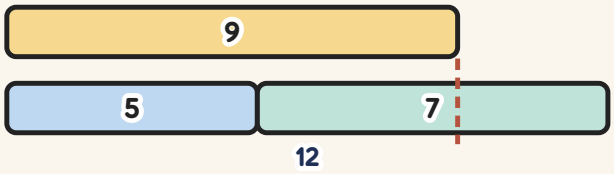
The biggest of the three lengths. The sum of the other two is checked against it.



The longest of 5, 7 and 9 is ☐

Triangle Inequality Theorem

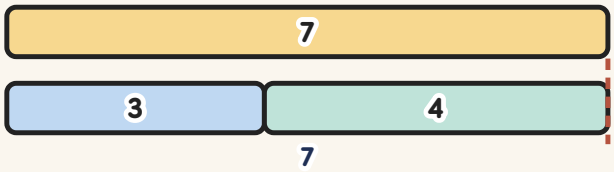
Any two sides added together must be MORE than the third side. Here 12 is more than 9.



12 is more than ☐

Flat, not a triangle

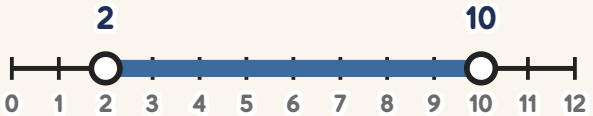
If two sides add to exactly the third side, the strips lie flat in one line.



3 + 4 = ☐

Range of the third side

Sides 4 and 6: the third side is more than 6 - 4 and less than 6 + 4.



More than 2 and less than ☐

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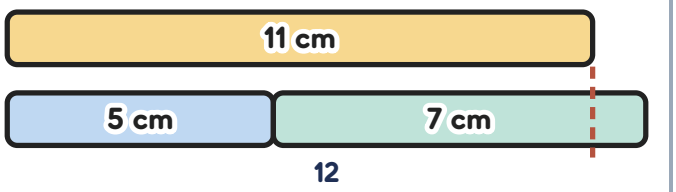
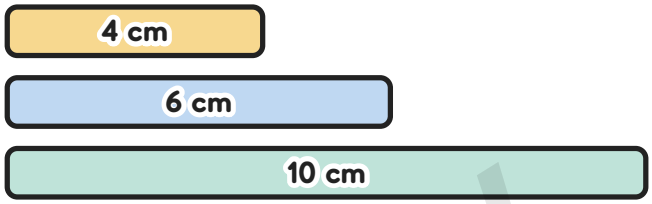
Worked Example 1: Test Three Lengths

Read the example. Then fill in the blanks.



Example



Your turn

Example. Can sticks that are 5 cm, 7 cm and 11 cm long make a triangle? The numbers are made up for practice.

Order	5, 7, 11 Put the lengths in order, smallest first.
Add	5 + 7 = 12 Add the two shorter lengths.
Compare	12 is more than 11 Is the sum more than the longest length?
Answer	Yes, a triangle More than means they can make a triangle.

Your turn. Can sticks that are 4 cm, 6 cm and 10 cm make a triangle? Do the same steps.

Order	Write the lengths in order, smallest first.	
Add	Add the two shorter lengths. 4 + 6 =	
Compare	Is the sum more than 10? Write more, equal or less.	
Answer	Can they make a triangle? Write yes or no.	

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Can It Form a Triangle? A

Add the two shorter lengths. Check yes or no.

A triangle needs the two shorter sides to be longer than the third side together. Add the two shorter lengths. Is the sum more than the longest?

1 Can these three lengths make a triangle? Add the two shorter lengths. Compare with the longest.

5 cm

3 cm

7 cm

Two shorter added = ☐

Triangle? ☐ yes ☐ no

2 Can these three lengths make a triangle? Add the two shorter lengths. Compare with the longest.

11 in

4 in

6 in

Two shorter added = ☐

Triangle? ☐ yes ☐ no

3 Can these three lengths make a triangle? Add the two shorter lengths. Compare with the longest.

6 ft

9 ft

8 ft

Two shorter added = ☐

Triangle? ☐ yes ☐ no

4 Can these three lengths make a triangle? Add the two shorter lengths. Compare with the longest.

14 m

5 m

9 m

Two shorter added = ☐

Triangle? ☐ yes ☐ no

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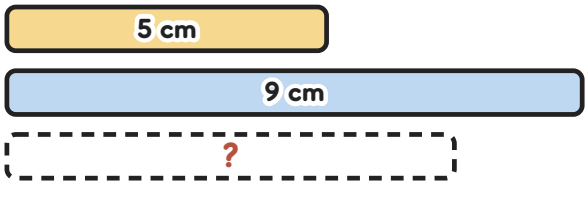
Range of the Third Side

Find the lowest and highest third side.

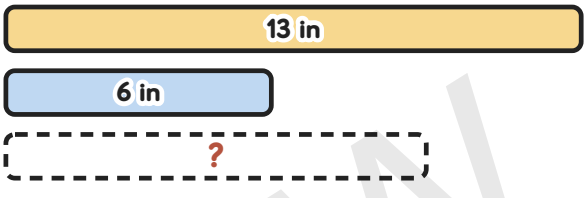
Subtract to find the lowest. Add to find the highest. The third side is between them, never exactly on them.

1 Two sides of a triangle are 5 cm and 9 cm long. What can the third side be?



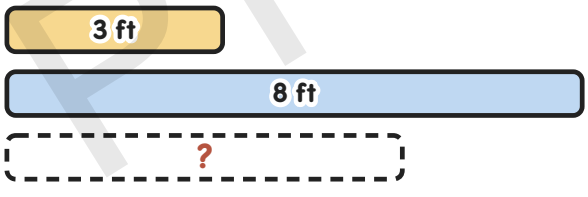
More than ____ Less than ____

2 Two sides of a triangle are 13 in and 6 in long. What can the third side be?



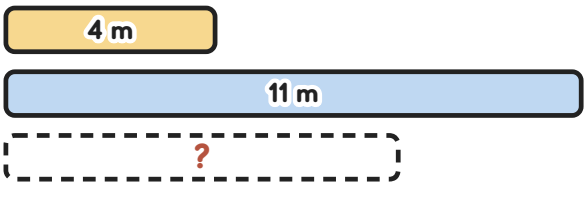
More than ____ Less than ____

3 Two sides of a triangle are 3 ft and 8 ft long. What can the third side be?



More than ____ Less than ____

4 Two sides of a triangle are 4 m and 11 m long. What can the third side be?



More than ____ Less than ____

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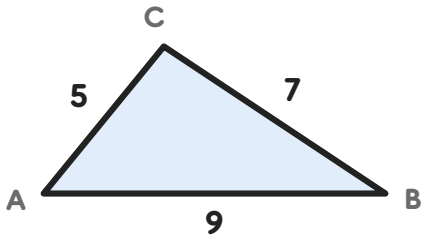
My name _____ Date _____

Order the Angles by the Sides

Write the smallest and largest angle.

The longest side sits across from the largest angle. The shortest side sits across from the smallest angle. Side a is across from angle A.

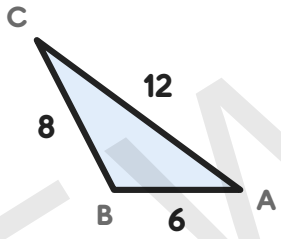
1 Look at the three sides. Which angle is the smallest? Which angle is the largest?



Smallest angle: ☐

Largest angle: ☐

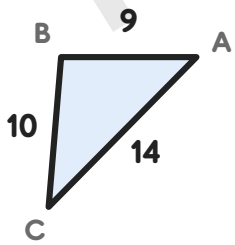
2 Look at the three sides. Which angle is the smallest? Which angle is the largest?



Smallest angle: ☐

Largest angle: ☐

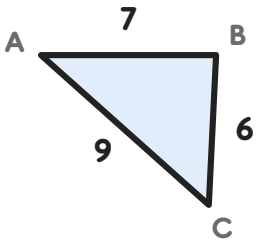
3 Look at the three sides. Which angle is the smallest? Which angle is the largest?



Smallest angle: ☐

Largest angle: ☐

4 Look at the three sides. Which angle is the smallest? Which angle is the largest?



Smallest angle: ☐

Largest angle: ☐

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My name _____ Date _____

Quiz

Solve each one. Show your work.

Take your time. Show your work in the box.

1 Can these three lengths make a triangle? Add the two shorter lengths. Compare with the longest.

4 cm

9 cm

7 cm

Two shorter added = ☐

Triangle? ☐ yes ☐ no

2 Can these three lengths make a triangle? Add the two shorter lengths. Compare with the longest.

15 in

6 in

9 in

Two shorter added = ☐

Triangle? ☐ yes ☐ no

3 Two sides of a triangle are 4 ft and 9 ft long. What can the third side be?

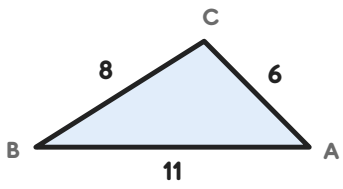
4 ft

9 ft

?

More than ☐ **Less than** ☐

4 Look at the three sides. Which angle is the smallest? Which angle is the largest?



Smallest angle: ☐

Largest angle: ☐

PREVIEW

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My name _____ Date _____

Cut and Paste: Sort the Sets

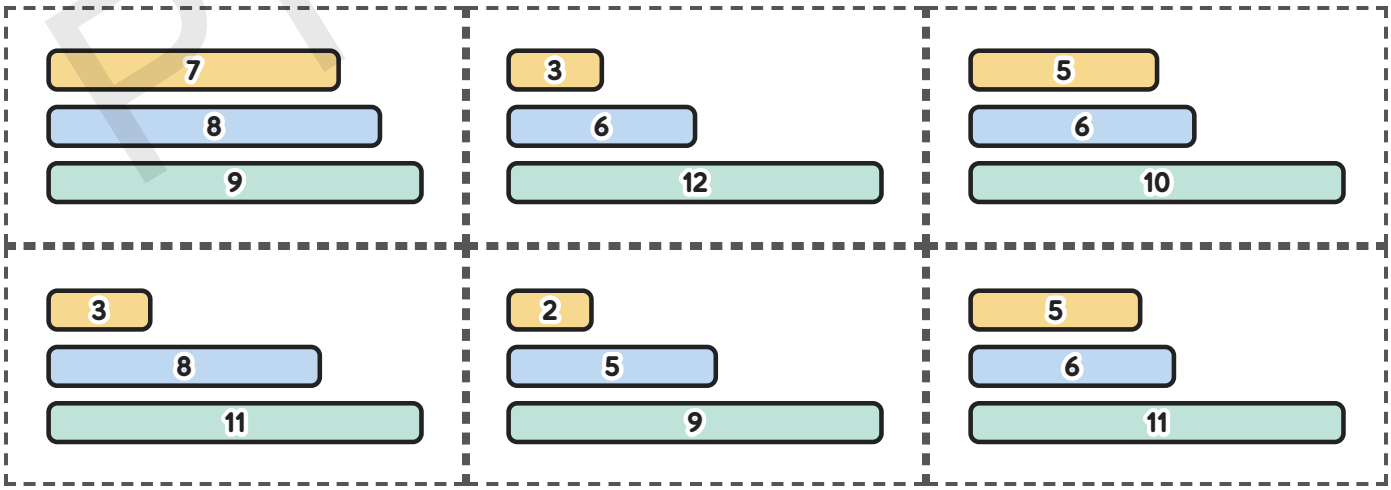
Cut out the six cards. Paste each one in the right box.

Add the two shorter bars. If the sum is more than the longest, paste it in the triangle box. If it is less, or exactly equal, paste it in the matching No box.

Makes a triangle	No: the sum is less	No: the sum is equal

PREVIEW

Cut on the dashed lines: six cards, one cut across and two cuts down.



How can you tell when three lengths cannot make a triangle?

Answer Key: Angles, Stories, Mistakes, Quiz, Cuts

Sam, in the Find the Mistake problems, is invented. Cards are named by row and column in the cutting grid, left to right and top to bottom. Angle A is across from side a.

Item	Mistake	What went wrong	Right answer
13.1	Line 1	Add the two SHORTER lengths: 5 + 6 = 11. 11 is less than 12, so the sticks cannot meet. The answer is No.	No
13.2	Line 2	The sum has to be MORE than the longest side. When it is equal the pieces lie flat in one line. The answer is No.	No
13.3	Line 3	The third side must be MORE than 3 and LESS than 17, so 3 and 17 do not work. The shortest whole number is 4 and the longest is 16.	4 and 16
13.4	Line 2	That checks only one end. Also try 3 + 6 = 9. 9 is less than 10, so the 3 cm side is too short. The third side must be more than 10 - 6 = 4. The answer is No.	No

Order the Angles page 11

Item	Sides	Answer
11.1	A opposite 7, B opposite 5, C opposite 9	smallest B (opposite 5), largest C (opposite 9)
11.2	A opposite 8, B opposite 12, C opposite 6	smallest C (opposite 6), largest B (opposite 12)
11.3	A opposite 10, B opposite 14, C opposite 9	smallest C (opposite 9), largest B (opposite 14)
11.4	A opposite 6, B opposite 9, C opposite 7	smallest A (opposite 6), largest B (opposite 9)

Triangle Stories page 12

Item	Lengths	Answer
12.1	12, 9, 15 in	9 + 12 = 21; 21 is more than 15: Yes
12.2	14, 5, 8 cm	5 + 8 = 13; 13 is less than 14: No
12.3	12 and 7 m: more than 5, less than 19	shortest 6 m, longest 18 m
12.4	15 and 10 ft: more than 5, less than 25	shortest 6 ft, longest 24 ft

Strip Tries page 15

Try	Strips	Answer
Try 1	4, 5, 8	4 + 5 = 9; more than 8: Yes
Try 2	3, 4, 9	3 + 4 = 7; less than 9: No

Quiz page 14

Item	Lengths	Answer
14.1	4, 9, 7 cm	4 + 7 = 11; 11 is more than 9: Yes
14.2	15, 6, 9 in	6 + 9 = 15; equal to 15, not more: No
14.3	4 and 9 ft: 9 - 4 = 5; 4 + 9 = 13	more than 5, less than 13
14.4	A opposite 8, B opposite 6, C opposite 11	smallest B (opposite 6), largest C (opposite 11)

Cut and Paste Sort page 16

Card	Work	Box
r1 c1	7, 8, 9: 7 + 8 = 15	Makes a triangle
r1 c2	3, 6, 12: 3 + 6 = 9	No: the sum is less
r1 c3	5, 6, 10: 5 + 6 = 11	Makes a triangle
r2 c1	3, 8, 11: 3 + 8 = 11	No: the sum is equal
r2 c2	2, 5, 9: 2 + 5 = 7	No: the sum is less
r2 c3	5, 6, 11: 5 + 6 = 11	No: the sum is equal

PREVIEW

Class Progress Grid

Every student on one grid: items right by page type.

Class or group _____ Month _____

Student	Test three lengths (of 8)	Range of the third side (of 8)	Order angles (of 4)	Stories (of 4)	Mistakes (of 4)	Quiz (of 4)	Strips and sort (of 8)

PREVIEW

How to fill this in

For each column, add up how many items that student has right with no prompt (the tracker rows). One glance across a row shows which skill is easiest and which is next.

Grouping for small-group time

Students low in Test three lengths need the words and the worked examples (pages 4 to 6). Students low in Range need the second worked example and the pick page (6 and 10). Students near full marks can move to the mistakes and the quiz (pages 13 and 14).

Maya's Tracker (Invented Student)

Maya R. is invented; nothing on this page describes a real student. The blank tracker is on page 19.

Student	Teacher	Month
Maya R. (an invented student)	Mr. Okafor (invented)	October

Page	Page type and set	Items	Right	Date	Notes
7	Can It Form a Triangle? A	4	3	10/6	Added the two longer lengths once
8	Can It Form a Triangle? B	4	4	10/8	-
9	Range of the Third Side	4	2	10/13	Forgot to subtract for the lowest side
10	Which Length Works?	4	3	10/15	Counted an end number once
11	Order the Angles by the Sides	4	4	10/17	-
12	Triangle Stories	4	3	10/20	Said yes when the sum was equal
13	Find the Mistake	4	3	10/22	Found the line, one fix not finished
14	Quiz	4	-	-	-
15	Cut and Paste: Strip Tries	2	-	-	-
16	Cut and Paste: Sort the Sets	6	-	-	-

How to read it

Maya R. has done **7 of 10** scored pages and got **22 of 28** items right with no prompt. **2** pages were all right and **5** carry a note. Every number comes from the table.

What the table points to

The lowest pages are Range of the Third Side (2 of 4). Those are where the next practice goes. The 3 pages left blank are not tried yet, never wrong.

PREVIEW