

CUT & GLUE SORT

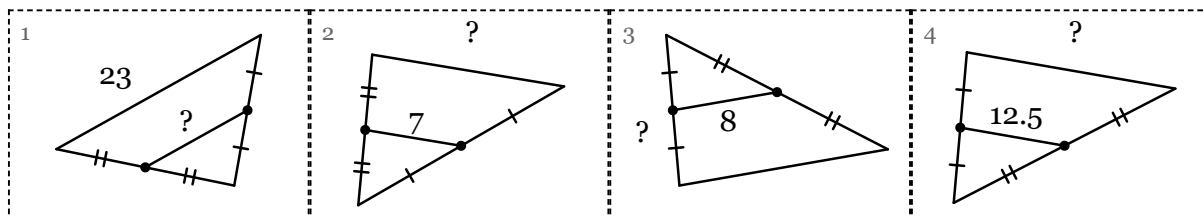


THE TRIANGLE MIDSEGMENT THEOREM

Halve It, Double It, or Can You Not Tell?

Decide before any arithmetic

FREE



Cut & Glue Sort — how to run it

25 minutes, including the cutting

1. **Hand out pages 3 and 4**, one of each per student, with scissors and glue. Nothing else is needed.
2. **Say this once:** *“Do not work out any numbers. For each piece, decide: to find the question mark, do you halve the number, double it, or can you not tell?”*
3. **Check a sheet in ten seconds:** every row gets four pieces.

Student sheets	pages 3 and 4, one of each per student. Page 3 shows a midsegment and the midsegment theorem as two small drawings.
Answers	page 5.

The sheet practices one decision, made before any arithmetic. A midsegment joins the midpoints of two sides. It is half as long as the one side it does not touch. So if the known number is on that side (the long one), the student halves it. If the known number is on the midsegment (the short one), the student doubles it. The most common mistake on this topic is to halve when the answer needs doubling.

The last row is the most important. In two of its pieces the segment inside really is a midsegment, but the number or the question mark is on a side that the midsegment touches. The theorem says nothing about those two lengths. In the other two, the segment looks parallel to a side, but no ticks mark its ends as midpoints, so it may not be half of anything.

How to see the mistake. A student who always halves a number on a side and doubles a number on the segment inside gets eight of the twelve pieces right. Then the last row stays empty and the first two rows hold six each. Ask that student to put a finger on each end of the segment inside and say which sides it touches. Other guessing rules place at most six pieces correctly.



This is the free lesson this activity came from. The worksheet, the full answers and the lesson plan are on it, at three levels of difficulty.
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Halve, double, or cannot tell?

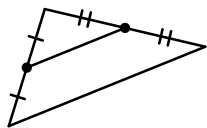
The midsegment theorem

Name _____

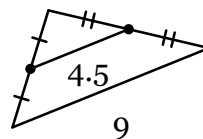
Period _____

Date _____

Cut out the twelve pieces on the next page. Each piece shows a triangle with a number on one segment and a ? on another. **Do not work out the ?**. Decide how you would find it: **halve the number, double it, or you cannot tell**. Glue the piece in that row.



A **midsegment** joins the midpoints of two sides.



It is parallel to the side it does not touch, and **half** as long.

First ask: is the segment inside a midsegment? Both of its ends must have ticks on the two halves of their side. Then ask: is the other segment the side that the midsegment does not touch?

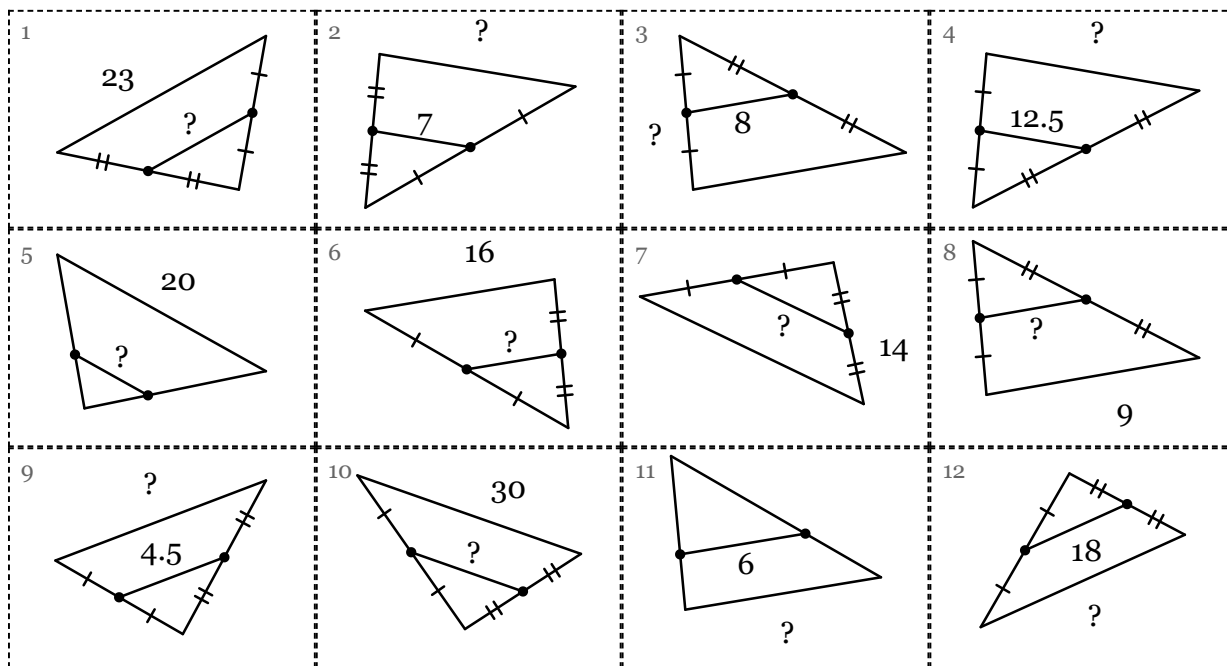
Halve the number. The number is on a side. The ? is on the midsegment that does not touch that side.

Double the number. The number is on a midsegment. The ? is on the side that this midsegment does not touch.

Cannot tell. The segment inside is not marked as a midsegment, or the ? and the number are on a midsegment and a side it touches.

The twelve pieces

Cut along the dotted lines



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Cut & Glue Sort — answers

For the teacher

Halve the number	1 — The number is on the side DE does not touch, so the ? is half of it.	6 — The ? is on the midsegment. The number is on the side it runs beside and does not touch. Halve.	8 — The long one, the side, is known. The short one, the midsegment, is asked. Halve.	10 — Both ends of the segment are ticked midpoints, and the number is on the side it does not touch. Halve.
Double the number	2 — The number is on the midsegment, and the ? is on the side it does not touch. Double.	4 — The short one, the midsegment, is known. The long one, the side, is asked. Double.	9 — Both ends are ticked midpoints. The side the midsegment does not touch is twice as long. Double.	12 — The ? is on the side across from the midsegment, so it is twice the number. Double.
Cannot tell	3 — The ? is on a side the midsegment touches. The theorem pairs a midsegment only with the side it does not touch.	5 — The segment looks parallel, but no ticks mark its ends as midpoints. So it may not be half.	7 — The number is on a side the midsegment touches. The midsegment is half of the other side, not of this one.	11 — Nothing marks the ends of the segment as midpoints. Looking parallel does not make it a midsegment.

Every row holds four pieces. A piece goes in the first row when the number is on a side and the question mark is on the midsegment that does not touch that side: the midsegment is half of it. It goes in the second row when the number is on the midsegment and the question mark is on the side it does not touch: the side is twice as long. It goes in the last row when the segment inside is not marked as a midsegment, or when the other segment is a side the midsegment touches.

To check a piece with a student, ask two questions. “Do both ends of the segment inside have ticks on the two halves of their side?” and “Does the midsegment touch the side with the number or the question mark?”