

CUT & GLUE SORT



TRAPEZOIDS, ISOSCELES TRAPEZOIDS AND MIDSEGMENTS

True for Every Trapezoid, or Only Some?

Every trapezoid · every isosceles trapezoid · not every one

FREE

1	2	3	4
Both pairs of base angles are congruent.	The two angles on each leg add to 180° .	The diagonals bisect each other.	The midsegment is parallel to both bases.

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:** *“Test each sentence on the drawings. If it is true for the trapezoid that is not isosceles, it goes in the first row. A rectangle is an isosceles trapezoid too.”*
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 trapezoid that is not isosceles, an isosceles trapezoid and a rectangle as small drawings.
Answers	page 5.

Why this sort. Most students picture every trapezoid as an isosceles one, sitting on its longer base. So they believe that every trapezoid has congruent legs, congruent base angles and congruent diagonals. The first two rows pull apart the facts about all trapezoids (the angles on a leg, the midsegment) from the facts that belong only to isosceles trapezoids.

The last row is the hardest. Its main sentence is “The diagonals bisect each other.” Students often think that congruent diagonals and diagonals that bisect each other always go together. The isosceles trapezoid is where they come apart: its diagonals are congruent, but they do not cut each other in half. The last row also holds the triangle midsegment rule used on a trapezoid, and two sentences that are true only for a rectangle.

The definitions matter. This sheet uses these: a trapezoid has at least one pair of parallel sides, and an isosceles trapezoid has a pair of congruent base angles. Then a rectangle is an isosceles trapezoid too. Some textbooks use other definitions, so tell the class which ones this sheet uses.



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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Which trapezoids is it true for?

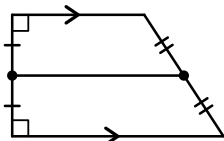
Three rows

Name _____

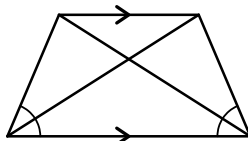
Period _____

Date _____

Cut out the twelve sentences on the next page. **Decide which row each sentence belongs in, and glue it there.** Test each sentence on the drawings below.



Not isosceles: one leg upright, one slanted. The **midsegment** joins the midpoints of the **legs**.



An **isosceles trapezoid**: a pair of congruent **base angles**, and its two **diagonals**.



A **rectangle** is an isosceles trapezoid too.

A trapezoid has at least one pair of parallel sides. An isosceles trapezoid has a pair of congruent base angles. A rectangle is an isosceles trapezoid too. A sentence that is true only for some isosceles trapezoids goes in the last row.

True for every trapezoid.

True for every isosceles trapezoid, but not for every trapezoid.

Not true for every isosceles trapezoid.

The twelve sentences

Cut along the dotted lines

1 Both pairs of base angles are congruent.	2 The two angles on each leg add to 180° .	3 The diagonals bisect each other.	4 The midsegment is parallel to both bases.
5 The two bases are congruent.	6 The two legs are congruent.	7 The midsegment is the average of the two bases.	8 The two diagonals are congruent.
9 The midsegment is half as long as the longer base.	10 A line through the midpoints of the two bases is a line of symmetry.	11 The two angles on each leg are congruent.	12 A diagonal makes congruent alternate interior angles with the two bases.



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Cut & Glue Sort — answers

For the teacher

True for every trapezoid.	2 “The two angles on each leg add to 180°.” Each leg crosses the two parallel bases, so its two angles are same-side interior angles. They add to 180° in every trapezoid.	4 “The midsegment is parallel to both bases.” The midsegment theorem says so for every trapezoid, not only the isosceles ones.	7 “The midsegment is the average of the two bases.” The midsegment theorem: its length is half the sum of the bases in every trapezoid.	12 “A diagonal makes congruent alternate interior angles with the two bases.” The bases are parallel and the diagonal crosses both, so the alternate interior angles are congruent in every trapezoid.
True for every isosceles trapezoid, but not for every trapezoid.	1 “Both pairs of base angles are congruent.” An isosceles trapezoid has one pair of congruent base angles, and then the other pair is congruent too. A trapezoid with legs of different lengths has neither pair.	6 “The two legs are congruent.” The legs of an isosceles trapezoid are congruent. In a trapezoid with a slanted leg and an upright leg, they are not.	8 “The two diagonals are congruent.” The diagonals of an isosceles trapezoid are congruent. In a trapezoid that is not isosceles, they are not.	10 “A line through the midpoints of the two bases is a line of symmetry.” Folding an isosceles trapezoid along this line matches the two halves. A trapezoid that is not isosceles does not fold onto itself.
Not true for every isosceles trapezoid.	3 “The diagonals bisect each other.” The diagonals of an isosceles trapezoid are congruent, but they do not cut each other in half. Only a rectangle has both.	5 “The two bases are congruent.” In most isosceles trapezoids one base is longer than the other. Only a rectangle has congruent bases.	9 “The midsegment is half as long as the longer base.” That is the triangle midsegment rule. A trapezoid’s midsegment is the average of both bases, so it is longer than half the longer base.	11 “The two angles on each leg are congruent.” The two angles on a leg add to 180°. They are congruent only if both are 90°, which happens only in a rectangle.

Every row holds four pieces. To check a piece with a student, ask first: “Is it true for a trapezoid with one upright leg and one slanted leg?” If yes, it goes in the first row. If no, ask: “Is it true for every isosceles trapezoid, even one with a short top base?” If yes, it goes in the second row. If no, it goes in the last row.