

MYSTERY PICTURE

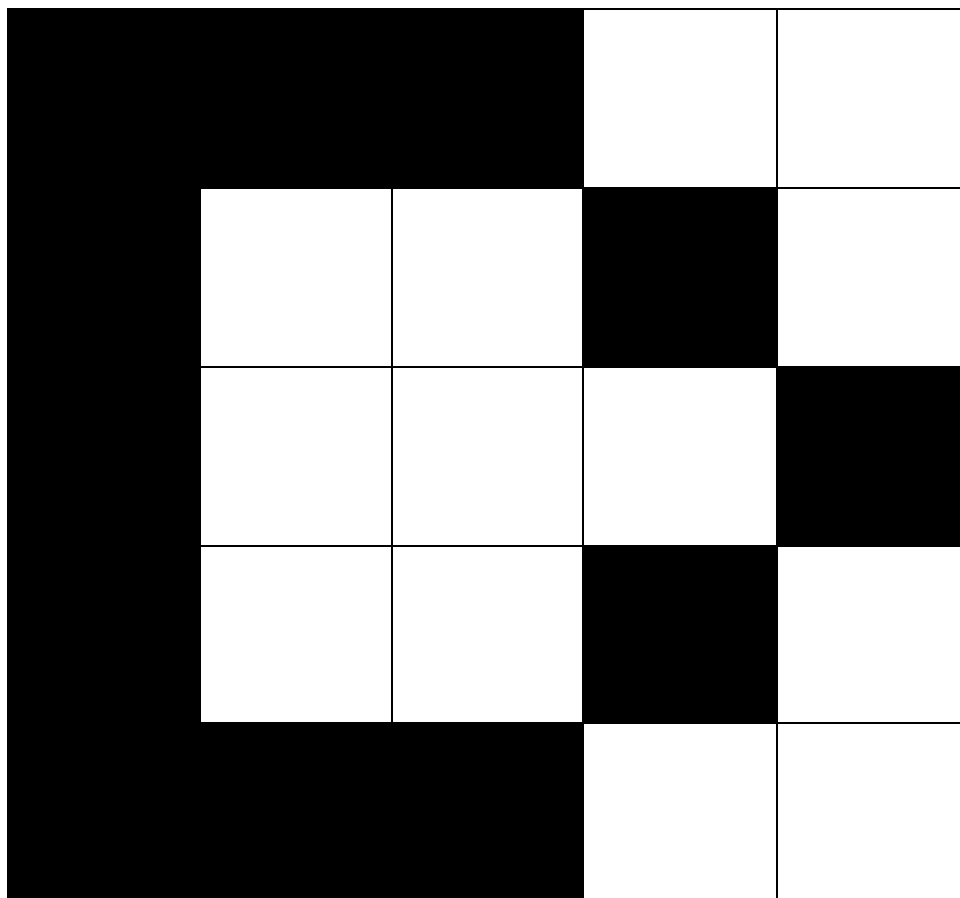


TRAPEZOIDS, ISOSCELES TRAPEZOIDS AND MIDSEGMENTS

Is It Really an Isosceles Trapezoid?

25 marked figures · read the marks, not the look

FREE



1. **Hand out page 3**, one per student. Pencils. Nothing else is needed.
2. **Say this once:** *“Fill a square only when the marks prove it is an isosceles trapezoid. That means parallel bases and either two equal angles that share a base, or two equal diagonals. Looking isosceles is not enough.”*
3. **When a student finishes, look at the picture.** If it is not the letter D, a square is wrong. The student finds it and checks it again.

Student sheet	page 3, one per student. It shows an isosceles trapezoid, two angles on one leg, and a rectangle as small drawings.
Answers	page 4: the finished picture and the reason for every square.

The lesson's definitions decide every square. A trapezoid has at least one pair of parallel sides, the bases. An isosceles trapezoid is a trapezoid with a pair of congruent base angles, which are two angles that share a base. So a rectangle is an isosceles trapezoid too. Congruent legs are not the definition: a parallelogram also has them. Some textbooks use other definitions, and then a few answers change. Tell the class which ones this sheet uses.

The figures are turned every way. Many students think the base angles are the two angles at the bottom of the page. On this sheet the equal pair is often at the top or at the side. A square is filled when a pair of base angles is marked equal, or when the diagonals are said to be congruent, or when the shape is a rectangle.

Two kinds of square stay white. In nine squares the marks are not enough, and these are drawn to look isosceles on purpose. For example, only the bases are marked, or the legs are congruent (a parallelogram also has that), or the two marked angles are on one leg. In four squares the marks rule it out: two angles that share a base are different, or the two legs are printed with different lengths.

A student who fills every square that looks isosceles gets ten squares wrong. Guessing does not work: every simple guessing rule gets at least nine squares wrong.



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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Mystery Picture

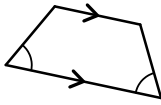
Read the marks

Name _____

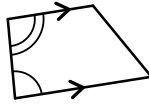
Period _____

Date _____

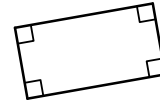
Each square shows a figure with marks. Do the marks prove it is an isosceles trapezoid? If yes, fill the square with slanted lines. If no, leave it white. A trapezoid has at least one pair of parallel sides (arrowheads). These are the bases.



An **isosceles trapezoid** has a pair of congruent **base angles**: two angles that share a base.



Two angles on one **leg** do not share a base. They add to 180° .



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

Leave a square white when the marks are not enough, and also when a number shows it cannot be an isosceles trapezoid. Do not measure. When you finish, look at the picture. If part of it is missing, or one square does not fit, check that square again.

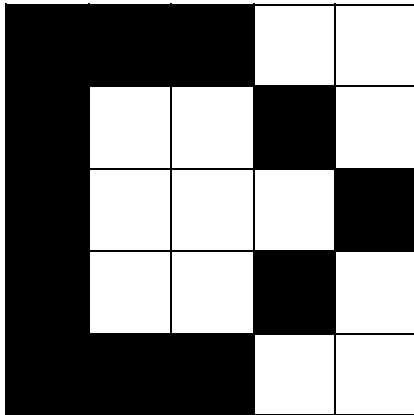
1 The diagonals are congruent.	2 75° 75°	3 Right angles	4 Congruent base angles	5 All angles congruent
6 Congruent adjacent angles	7 Congruent opposite sides	8 6 7	9 The diagonals are congruent.	10 Congruent opposite angles
11 All angles congruent	12 65° 72°	13 80° 100°	14 The diagonals are congruent.	15 Congruent adjacent angles
16 The diagonals are congruent.	17 The diagonals bisect each other.	18 70° 70°	19 Congruent adjacent angles	20 6 6
21 All angles congruent	22 Congruent adjacent angles	23 78° 78°	24 60° 60°	25 Congruent adjacent angles



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Mystery Picture — answers

For the teacher



The finished picture is **the letter D**: a straight line down the left side, with a top and a bottom that come to a point on the right.

A square is filled when its marks prove an isosceles trapezoid: parallel bases with a pair of equal base angles, or parallel bases with congruent diagonals, or a rectangle.

To check a square with a student, ask: “Which sides are the bases? Do the two equal angles share one of them?”

Squares	Answer	Why
6, 15, 22	FILL	The arcs mark two angles that share a base as equal. A trapezoid with a pair of congruent base angles is isosceles.
2, 23	FILL	The two equal printed angles share a base. That is a pair of congruent base angles.
3	FILL	The two right angles share a base, so they are a pair of congruent base angles. The shape is a rectangle, and a rectangle is an isosceles trapezoid.
11	FILL	Both pairs of sides are parallel and one angle is a right angle, so all four angles are right angles. A rectangle is an isosceles trapezoid.
21	FILL	Four right angles make a rectangle. Its base angles are congruent, so a rectangle is an isosceles trapezoid.
1, 9, 16	FILL	The bases are parallel and the diagonals are congruent. A trapezoid with congruent diagonals is isosceles.
19	FILL	Both pairs of base angles are marked equal. One pair would already be enough.
4	white	Only the bases are marked. It looks isosceles, but a trapezoid with legs of different lengths has the same marks.
7, 20	white	One pair of sides is parallel and the legs are congruent. A parallelogram has these marks too, and it is not isosceles unless it is a rectangle.
13	white	The 80° and the 100° are on one leg, so they do not share a base. In every trapezoid the two angles on a leg add to 180° .
5	white	The two right angles are on one leg, so they do not share a base. Every right trapezoid has these marks, and most are not isosceles.
18	white	The two 70° angles are opposite each other, so they do not share a base. The angle next to each one is 110° , so no two angles that share a base are equal. It is a parallelogram.
14	white	Nothing is marked on the diagonals. The diagonals of every quadrilateral cross, so the crossing proves nothing.
10, 25	white	No arrowheads show a pair of parallel sides, so there are no bases. Two equal angles alone do not make a trapezoid.
17	white	Diagonals that bisect each other make a parallelogram. A parallelogram is an isosceles trapezoid only if it is a rectangle, and nothing marks a right angle.
12	white	Two angles that share a base are printed with different numbers. In an isosceles trapezoid they are equal.
8	white	The legs are printed with different lengths. The legs of an isosceles trapezoid are congruent.
24	white	The right angle and the 60° angle share a base, and they are different. So no pair of base angles is equal.