

CUT & GLUE SORT



BICONDITIONALS AND DEFINITIONS

Join It with If and Only If, or Refuse?

12 statements · check the statement and its converse · say which one fails

FREE

A If an angle is a straight angle, then it measures 180° .	B If two angles are congruent, then they are vertical angles.	C If two angles form a linear pair, then they are supplementary.	D If an angle is a right angle, then it is not obtuse.
E If two angles are complementary, then their measures add to 90° .	F If two angles are adjacent, then they form a linear pair.	G If two angles are complementary, then they are adjacent.	H If two angles are complementary, then both of them are acute.

Cut & Glue Sort — how to run it

25 minutes, the cutting included

1. **Hand out pages 3 and 4, one of each per student.** Students need scissors and glue. Nothing else is needed.
2. **Say this once:** *“Check the statement. Then swap its two parts and check that too. Join them only if both are true.”*
3. **Every row gets 4 pieces.** Check the letters against page 5.

Student sheets pages 3 (the rows) and 4 (the pieces), one of each per student.

Answers page 5: the letters in each row, and a case that breaks each false sentence.

Two rows say no, and each one gives the reason. So a student who does not join the two parts must also decide which one is false: the statement or its converse. Row 2 holds the most common mistake in this lesson: a true statement joined to a false converse. In row 3, the statement itself is false.

Row 3 is for the student who checks only the converse. This lesson spends most of its time on converses, so some students stop checking the statement. Three of the four statements in row 3 have a true converse. A student who checks only the converse gets 8 of the 12 pieces right, and so does a student who checks only the statement. No simple guessing rule gets more than 8.

An idea for a later discussion. The same sentences can also be sorted into three other groups: a good definition, true but not a definition, and not even true. A good definition also needs a group that the thing belongs to, a property that separates it from the rest of that group, and only words the class already knows. Many students cannot check these alone, so this sort checks only the two directions.



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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Cut & Glue Sort

Join them or not?

Name _____

Period _____

Date _____

Each piece has one if-then statement. Its converse swaps the two parts. Can the statement and its converse be joined with if and only if? Glue the piece in the row that says why.

Check the statement first. Then swap its two parts and check the new sentence too.

1. Join them.

The statement is true. Its converse is true too.

2. Do not join them.

The statement is true, but its converse is false.

3. Do not join them.

The statement itself is false.

Cut & Glue Sort — the pieces

Cut along the dashed lines

Cut out the 12 pieces. Read each statement. Then glue the piece in a row on the other sheet.

A If an angle is a straight angle, then it measures 180° .	B If two angles are congruent, then they are vertical angles.	C If two angles form a linear pair, then they are supplementary.	D If an angle is a right angle, then it is not obtuse.
E If two angles are complementary, then their measures add to 90° .	F If two angles are adjacent, then they form a linear pair.	G If two angles are complementary, then they are adjacent.	H If two angles are complementary, then both of them are acute.
I If two segments have the same length, then they are congruent.	J If two lines meet to form a right angle, then they are perpendicular.	K If $AM = MB$, then M is the midpoint of segment AB.	L If two lines are perpendicular, then they intersect.



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Cut & Glue Sort — answers

For the teacher

Row	Pieces
1	Join them. The statement is true. Its converse is true too. A: statement true, converse true. E: statement true, converse true. I: statement true, converse true. J: statement true, converse true.
2	Do not join them. The statement is true, but its converse is false. C: statement true, converse false . A case that breaks the converse: angles of 60° and 120° , at two different vertices. D: statement true, converse false . A case that breaks the converse: an angle of 45° . H: statement true, converse false . A case that breaks the converse: angles of 60° and 60° , at two different vertices. L: statement true, converse false . A case that breaks the converse: two lines that meet at 60° .
3	Do not join them. The statement itself is false. B: statement false , converse true. A case that breaks the statement: angles of 60° and 60° , at two different vertices. F: statement false , converse true. A case that breaks the statement: angles of 60° and 150° , adjacent angles. G: statement false , converse false . A case that breaks the statement: angles of 60° and 30° , at two different vertices. K: statement false , converse true. A case that breaks the statement: M at (4, 3) with A at (0, 0) and B at (8, 0): AM = 5, MB = 5, not on segment AB.