

Write the converse, inverse, and contrapositive of each conditional. Determine if the converse, inverse, and contrapositive are true or false. If false, give a counterexample.

36. All squares are quadrilaterals.

38. If a ray bisects an angle, then the two angles formed are congruent.

40. Vertical angles are congruent.

36. Every square is a quadrilateral.

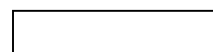
If it is a square, then it is a quadrilateral.

$p \rightarrow q$ (Original)

If it is a quadrilateral, then it is a square.

$q \rightarrow p$ (Converse)

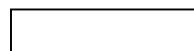
False, a rectangle with length is longer than width.



If it is not a square, then it is not a quadrilateral.

$\sim p \rightarrow \sim q$ (Inverse)

False, counterexample is same as above.



If it is not a quadrilateral, then it is not a square

$\sim q \rightarrow \sim p$ (Contrapositive)

True.

38. If two angles formed by a cutting ray into an angle are congruent, then that ray bisects the original angle.

True (Converse)

If a ray does not bisect an angle, then the two angles formed are not congruent.

True (Inverse)

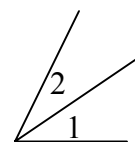
If the two angles formed are not congruent, then a ray does not bisect an angle.

True (Contrapositive)

40. If two angles are vertical angles, then they are congruent. (Original)

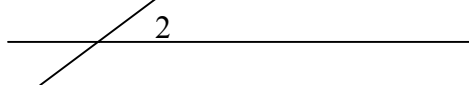
If two angles are congruent, then they are vertical angles. (Converse)

False, these two angles could be adjacent and congruent.



If two angles are not vertical angles, then they are not congruent.

False, _____ 1 (Inverse)



If two angles are not congruent, then they are not vertical angles.

True (Contrapositive)