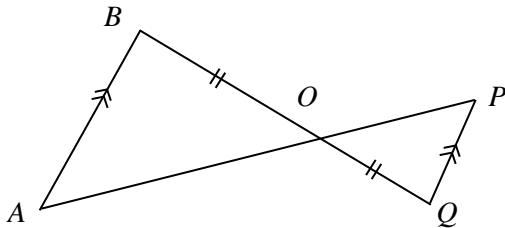


# Geometric Proof Assignment

Complete Chapter 11 of *Proof: Interesting activities in conjecture and mathematical proof* before attempting this assignment.

1. Triangle  $OAB$  and triangle  $OPQ$  are shown on the diagram below. The diagram includes symbols indicating that two lines are parallel and that two line segments are of the same length. The diagram is not drawn to scale.



Required to prove:

$$\triangle OAB \cong \triangle OPQ$$

*Diagram is not to scale.*

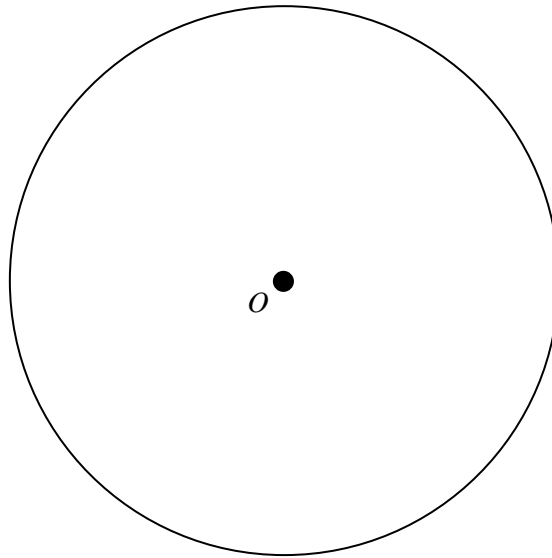
The Explanation column has been left blank in the “two column” proof given below. Complete it from the List of Possible Explanations given below (just fill in the letter of the best Explanation).

Statement	Explanation
$\angle BOA \cong \angle QOP$	
$\angle ABO \cong \angle PQO$	
$\overline{OB} \cong \overline{OQ}$	
$\triangle OAB \cong \triangle OPQ$	

List of Some Possible Explanations. (May be used once, more than once, or not at all.)
A. Vertically opposite angles are equal.
B. A fact given in the statement of the situation.
C. Parallel lines are the same length.
D. Alternate angles on parallel lines.
E. Programmatic specificity.
F. Pythagoras' Theorem.
G. Corresponding angles on similar shapes are equal.
H. Corresponding line segments on congruent shapes are equal.
I. Lightning never strikes twice in the same place.
J. Symmetry.
K. SSS
L. RHS
M. ASA
N. SAS

2. Required to prove: A diameter perpendicular to a chord bisects the chord.

- (a) The circle given below has centre  $O$  and radius  $r$ . On the circle draw and label a chord  $AC$ , and the diameter  $DE$  which is perpendicular to  $AC$  and intersects it at  $B$ . Also draw and label radius  $OA$  and radius  $OC$ .



- (b) Complete the Explanation column in the proof below.

Required to prove: A diameter perpendicular to a chord bisects the chord.

Statement	Explanation
$\angle ABO = 90^\circ$	
$\overline{AO} \cong \overline{CO}$	
$\triangle AOB \cong \triangle COB$	
$\overline{AB} \cong \overline{BC}$	

3. An isosceles trapezium has one pair of parallel sides and one pair of congruent sides. It has a single axis of symmetry. Prove that opposite angles are supplementary.

(a) Draw a suitable diagram and use conventional mathematical notation to indicate the given facts.

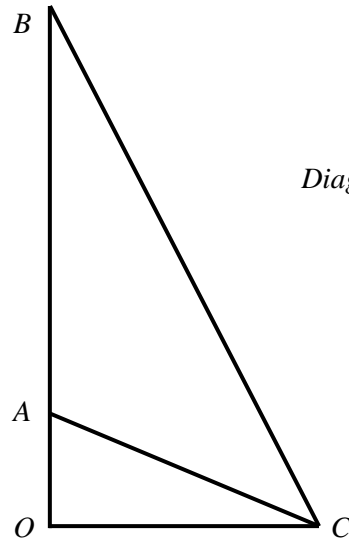
(b) Complete a proof in the table below. There may be more rows than needed. The “Possible Explanations” from Question 1 may be used.

**Required to prove: Opposite angles in an isosceles trapezium are supplementary.**

Statement	Explanation

4. Prove that the exterior angle of a cyclic quadrilateral is equal to the opposite interior angle.

5.



Given  $\overline{OB} \perp \overline{OC}$  and  $\angle OBC \cong \angle OCA$  and  $\overline{OA} : \overline{OC} = 1 : 2$

- (a) Use conventional mathematical symbols to mark the given information on the diagram.
- (b) Prove that  $\overline{OA} : \overline{AB} = 1 : 3$

Statement	Explanation