# Transformations

*Short-answer problems about transformations.*

**Question 1** *Use adjacent angles to prove that vertical angles are equal.*

**Question 2** *Now use rotations to prove that vertical angles are equal.*

**Question 3** *Prove that alternate interior angles and corresponding angles of a transversal with respect to a pair of parallel lines are equal.*

**Question 4** *Prove that the sum of the interior angles of a triangle is* $180^\circ$.

**Question 5** *Prove: If a pair of alternate interior angles or a pair of corresponding angles of a transversal with respect to two lines are equal, then the lines are parallel.*

***Free Response:*** ***Hint:***

**Question 6** *Prove: If two parallel lines are cut by a transversal, then alternate interior angles are congruent.*

***Free Response:*** ***Hint:*** *Let the two parallel lines be* $\ell$ *and* $k$. *And let* $P$ *and* $Q$ *be the intersections between the transversal and* $\ell$ *and* $k$, *respectively. Let* $M$ *be the midpoint of* $\overline{PQ}$. *Rotate* $\ell$ *and the transversal* $180^\circ$ *about* $M$. $R(Q) = P$. *We proved previously that such a rotation will map* $\ell$ *onto a parallel line. That lines contains* $P$. *And because the parallel to* $k$ *through* $P$ *is unique,* $R(k) = \ell$.

Learning outcomes:
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