# Geometric Proofs

①

Given: N is the midpoint of $\overline{MP}$, Q is the midpoint of $\overline{RP}$, and $\overline{PQ} \cong \overline{NM}$.

Prove: $\overline{PN} \cong \overline{QR}$
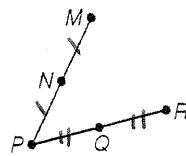
① N is the m.p. of $\overline{MP}$ — ① given
② $\overline{PN} \cong \overline{NM}$, $PN = NM$ — ② def. of midpoint → def. of $\cong$
③ Q is the m.p. of $\overline{RP}$ — ③ given
④ $\overline{PQ} \cong \overline{QR}$, $PQ = QR$ — ④ def. of midpoint → def of $\cong$
⑤ $\overline{PQ} \cong \overline{NM}$ — ⑤ given
⑥ $PQ = NM$ — ⑥ def of congruence
⑦ $QR = PN$ — ⑦ subst. prop. of $=$
⑧ $PN = QR$ — ⑧ symm. prop of $=$
⑨ $\overline{PN} \cong \overline{QR}$ — ⑨ def of congruence

②

Given: $\angle 1$ and $\angle 2$ form a linear pair, and $\angle 3$ and $\angle 4$ form a linear pair.

Prove: $m\angle 1 + m\angle 2 + m\angle 3 + m\angle 4 = 360°$
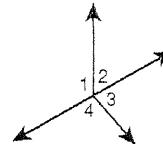
① $\angle 1$ and $\angle 2$ form linear pair — ① given
② $\angle 1$ and $\angle 2$ are supp. — ② Linear Pair Thm.
③ $m\angle 1 + m\angle 2 = 180°$ — ③ def. of supp. $\angle$'s
④ $\angle 3$ and $\angle 4$ form linear pair — ④ given
⑤ $\angle 3$ and $\angle 4$ are supp. — ⑤ Linear Pair Thm
⑥ $m\angle 3 + m\angle 4 = 180°$ — ⑥ def. of supp. $\angle$'s

⑦ $m\angle 1 + m\angle 2 + m\angle 3 + m\angle 4 = 180° + m\angle 3 + m\angle 4$ — ⑦ Addition Prop of $=$
⑧ $m\angle 1 + m\angle 2 + m\angle 3 + m\angle 4 = 180° + 180°$ — ⑧ subst. Prop of $=$
⑨ $m\angle 1 + m\angle 2 + m\angle 3 + m\angle 4 = 360°$ — ⑨ simplify

③ given: m∠ABC = 90°
and m∠1 = 4m∠2.   prove: m∠2 = 18°
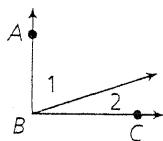
Statements	Reasons
① m∠ABC = 90°	① given
② m∠1 + m∠2 = m∠ABC	② Angle Add. Postulate
③ m∠1 + m∠2 = 90°	③ Subst. prop of =
④ m∠1 = 4m∠2	④ given
⑤ 4m∠2 + m∠2 = 90°	⑤ subst. prop of =
⑥ 5m∠2 = 90°	⑥ Simplify / Comb. Like terms
⑦ m∠2 = 18°	⑦ Div. Prop of =

④ Given: $\overline{HJ}$ is the bisector of ∠IHK and ∠1 ≅ ∠3.

Prove: ∠2 ≅ ∠3
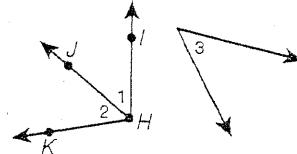
Statements	Reasons
① $\overline{HJ}$ bisects ∠IHK	① given
② ∠1 ≅ ∠2 m∠1 = m∠2	② def. of angle bisector def of ≅
③ ∠1 ≅ ∠3	③ given
④ m∠1 = m∠3	④ def. of congruence
⑤ m∠2 = m∠3	⑤ subst. prop. of =
⑥ ∠2 ≅ ∠3	⑥ def. of congruence

⑤ Given: ∠1 and ∠3 are complementary, and ∠2 and ∠4
     are complementary. ∠3 ≅ ∠4
Prove: ∠1 ≅ ∠2
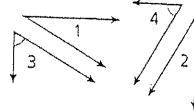
① ∠1 and ∠3 are comp.	① given
② $m\angle 1 + m\angle 3 = 90°$	② def of comp.
③ ∠2 and ∠4 are comp.	③ given
④ $m\angle 2 + m\angle 4 = 90°$	④ def of comp.
⑤ $m\angle 1 + m\angle 3 = m\angle 2 + m\angle 4$	⑤ subst. prop of =
⑥ ∠3 ≅ ∠4	⑥ given
⑦ $m\angle 3 = m\angle 4$	⑦ def of congruence
⑧ $m\angle 1 + m\angle 4 = m\angle 2 + m\angle 4$	⑧ subst. prop of =
⑨ $m\angle 1 = m\angle 2$	⑨ subtr. prop of =
⑩ ∠1 ≅ ∠2	⑩ def of congruence