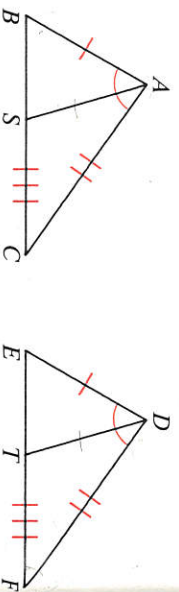## Classroom Exercises

In Exercises 1–3 you are given a diagram that is marked with given information. Give the reason for each key step of the proof.

1. Prove: $\overline{AS} \cong \overline{DT}$
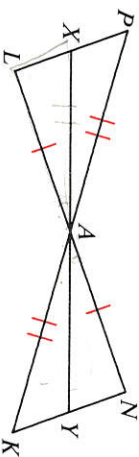   Key steps of proof:
   a. $\triangle ABC \cong \triangle DEF$
   b. $\angle C \cong \angle F$
   c. $\triangle ACS \cong \triangle DFT$
   d. $\overline{AS} \cong \overline{DT}$

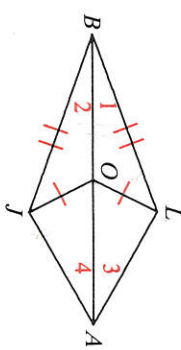2. Prove: $\overline{AX} \cong \overline{AY}$
   Key steps of proof:
   a. $\triangle PAL \cong \triangle KAN$
   b. $\angle L \cong \angle N$
   c. $\triangle LAX \cong \triangle NAY$
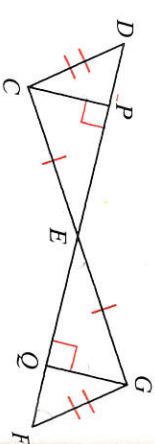   d. $\overline{AX} \cong \overline{AY}$

3. Prove: $\angle 3 \cong \angle 4$
   Key steps of proof:
   a. $\triangle LOB \cong \triangle JOB$
   b. $\angle 1 \cong \angle 2$
   c. $\triangle LBA \cong \triangle JBA$
   d. $\angle 3 \cong \angle 4$

4. State a plan for proving that $\angle D \cong \angle F$.
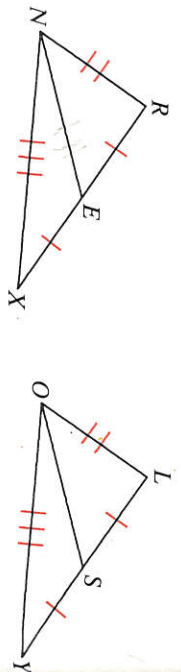
Written Exercises

In Exercises 1–5 you are given a diagram that is marked with given information. Give the reason for each key step of the proof.

A

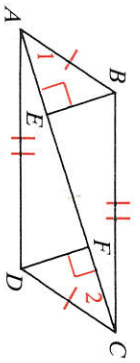1. Prove: $\overline{NE} \cong \overline{OS}$
   Key steps of proof:
   a. $\triangle RNX \cong \triangle LOY$
   b. $\angle X \cong \angle Y$
   c. $\triangle NEX \cong \triangle OSY$
   d. $\overline{NE} \cong \overline{OS}$

2. Prove: $\overline{BE} \cong \overline{DF}$
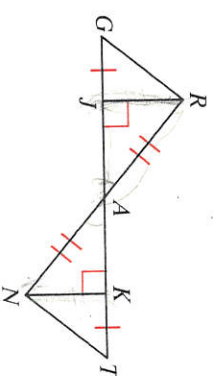   Key steps of proof:
   a. $\triangle ABC \cong \triangle CDA$
   b. $\angle 1 \cong \angle 2$
   c. $\triangle ABE \cong \triangle CDF$
   d. $\overline{BE} \cong \overline{DF}$

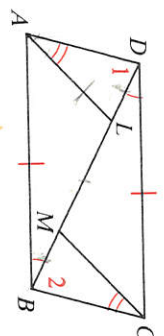3. Prove: $\angle G \cong \angle T$
   Key steps of proof:
   a. $\triangle RAJ \cong \triangle NAK$
   b. $\overline{RJ} \cong \overline{NK}$
   c. $\triangle GRJ \cong \triangle TNK$
   d. $\angle G \cong \angle T$

4. Prove: $\overline{AL} \cong \overline{CM}$
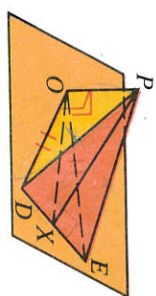   Key steps of proof:
   a. $\triangle ABD \cong \triangle CDB$
   b. $\overline{AD} \cong \overline{CB}$; $\angle 1 \cong \angle 2$
   c. $\triangle ADL \cong \triangle CBM$
   d. $\overline{AL} \cong \overline{CM}$

5. Prove: $\overline{DX} \cong \overline{EX}$
   Key steps of proof:
   a. $\triangle POD \cong \triangle POE$
   b. $\overline{PD} \cong \overline{PE}$
   c. $\triangle PDX \cong \triangle PEX$
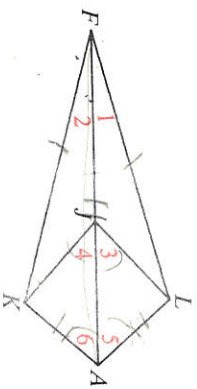   d. $\overline{DX} \cong \overline{EX}$

6. Plane M is the *perpendicular bisecting plane* of $\overline{AB}$ at O (that is, the plane that is perpendicular to $\overline{AB}$ at its midpoint, O). Points C and D also lie in plane M. List three pairs of congruent triangles and tell which congruence method can be used to prove each pair congruent.

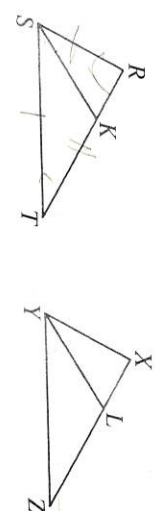Write proofs in two-column form or paragraph form, as directed by your teacher.
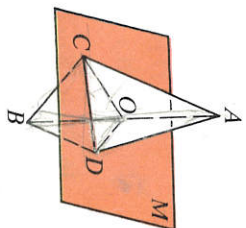
B

7. Given: $\overline{FL} \cong \overline{FK}$; $\overline{LA} \cong \overline{KA}$
   Prove: $\overline{LJ} \cong \overline{KJ}$

8. Given: $\overrightarrow{FA}$ bisects $\angle LFK$ and $\angle LAK$.
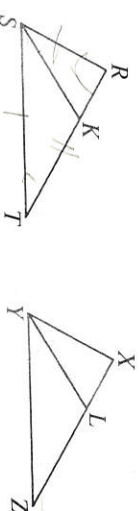   Prove: $\overrightarrow{FA}$ bisects $\angle LJK$.

9. Given: $\triangle RST \cong \triangle XYZ$; $\overrightarrow{SK}$ bisects $\angle RST$; $\overrightarrow{YL}$ bisects $\angle XYZ$.
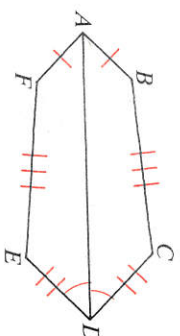   Prove: $\overline{SK} \cong \overline{YL}$

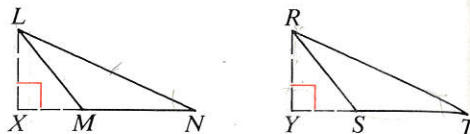10. Given: Congruent parts as marked in the diagram.
    Prove: $\angle B \cong \angle F$
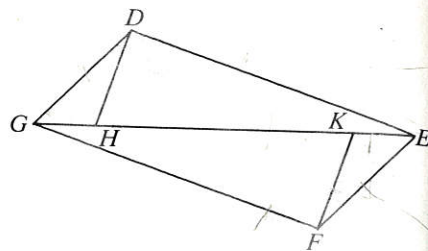   (Hint: First draw two auxiliary lines.)

11. Draw two congruent acute triangles, $\triangle PAY$ and $\triangle NOW$. Draw the altitudes $\overline{PE}$ and $\overline{NF}$ and prove that they are congruent. (First state what is given and what is to be proved.)

12. Given: $\triangle LMN \cong \triangle RST$;
    $\overline{LX}$ and $\overline{RY}$ are altitudes.
    Prove: $\overline{LX} \cong \overline{RY}$

13. Given: $\overline{DE} \cong \overline{FG}$; $\overline{GD} \cong \overline{EF}$;
    $\angle HDE$ and $\angle KFG$ are right angles.
    Prove: $\overline{DH} \cong \overline{FK}$

14. Given: $\overline{GD} \parallel \overline{EF}$; $\angle GDE \cong \angle GFE$;
    $\overline{GH} \cong \overline{EK}$
   Prove: $\overline{DH} \parallel \overline{FK}$

15. Draw two line segments, $\overline{SX}$ and $\overline{TY}$, that bisect each other at O. Choose any point P on $\overline{ST}$ and let Q be the point where $\overrightarrow{PO}$ intersects $\overline{XY}$. Prove that O is the midpoint of $\overline{PQ}$. (First state what is given and what is to be proved.)

16. This figure is like the one that Euclid used to prove that the base angles of an isosceles triangle are congruent (our Theorem 3–1). Write a paragraph proof following his key steps shown below.
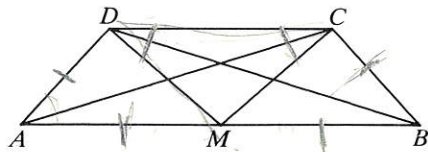   Given: $\overline{AB} \cong \overline{AC}$;
    $\overline{AB}$ and $\overline{AC}$ are extended so $\overline{BD} \cong \overline{CE}$.
    Prove: $\angle ABC \cong \angle ACB$
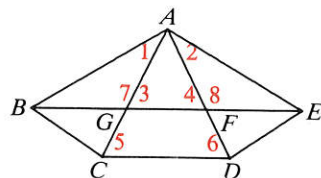
    Euclid's Key Steps
    1. Prove $\triangle DAC \cong \triangle EAB$.
    2. Prove $\triangle DBC \cong \triangle ECB$.
    3. Prove $\angle DBC \cong \angle ECB$ and then $\angle ABC \cong \angle ACB$.
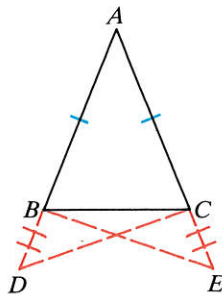
C 17. Given: $\overline{AM} \cong \overline{MB}$; $\overline{AD} \cong \overline{BC}$;
    $\angle MDC \cong \angle MCD$
    Prove: $\overline{AC} \cong \overline{BD}$

18. Given: $\angle 1 \cong \angle 2$;
    $\angle 3 \cong \angle 4$;
    $\angle 5 \cong \angle 6$
   Prove: $\overline{BC} \cong \overline{ED}$

19. A, B, C, and D are noncoplanar. $\triangle ABC$, are equilateral. X and Y are midpoints of point on $\overline{AB}$. What kind of triangle is $\triangle$

20. Given: $\overline{SN}$ and $\overline{TM}$ are medians of scale
    P is on $\overrightarrow{SN}$ such that $\overline{SN} \cong \overline{NP}$;
    Q is on $\overrightarrow{TM}$ such that $\overline{TM} \cong \overline{MQ}$.
    Prove: a. $\overline{RQ} \cong \overline{RP}$
    b. $\overline{RQ}$ and $\overline{RP}$ are both parallel t
    c. P, R, and Q are collinear.

For Exercises 21–23, write paragraph proofs. (l exercise that is unusually difficult.)

★21. Given: $\overline{AE} \parallel \overline{BD}$; $\overline{BC} \parallel \overline{AD}$;
    $\overline{AE} \cong \overline{BC}$; $\overline{AD} \cong \overline{BD}$;
    Prove: a. $\overline{AC} \cong \overline{BE}$
    b. $\overline{EC} \parallel \overline{AB}$
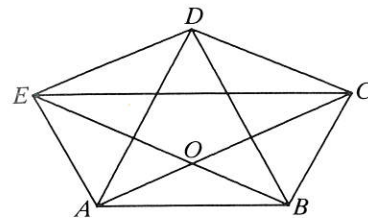
★23. Given: X, R, S, and T are coplanar;
    X is the midpoint of $\overline{AB}$;
    $\overline{AB} \perp \overline{RX}$; $\overline{AB} \perp \overline{TX}$
    Prove: $\overline{AB} \perp \overline{SX}$
    Note: This exercise proves that if a line ($\overleftrightarrow{A}$ each of two intersecting lines at their point the line is perpendicular to every line of through that point. Thus the line is perpe

3-8 Inductive Reasoning

Throughout these first three chapters, we have Now we'll consider **inductive reasoning**, a kind in science and in everyday life.

Example 1 After picking marigolds for th
sneeze. She also began sneezi
near marigolds. Based on this
inductively that she is allergic