10. Imagine quad. $WXYZ$, with sides $\overline{WX}$ and $\overline{ZY}$ congruent and sides $\overline{WZ}$ and $\overline{XY}$ parallel. Must $WXYZ$ be a parallelogram? Explain.

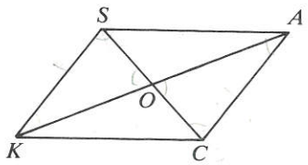
11. Imagine a quadrilateral with two pairs of sides congruent. Must the quadrilateral be a parallelogram? Explain.

Written Exercises

State the principal definition or theorem that enables you to deduce, from the information given, that quadrilateral *SACK* is a parallelogram.

A

1. $\overline{SA} \parallel \overline{KC}$; $\overline{SK} \parallel \overline{AC}$
2. $\overline{SA} \cong \overline{KC}$; $\overline{SK} \cong \overline{AC}$
3. $\overline{SA} \cong \overline{KC}$; $\overline{SA} \parallel \overline{KC}$
4. $SO = \frac{1}{2}SC$; $KO = \frac{1}{2}KA$
5. $\angle SKC \cong \angle CAS$; $\angle KCA \cong \angle ASK$



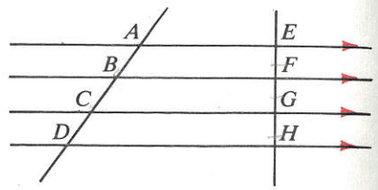
6. Suppose you know that $\triangle SOK \cong \triangle COA$. Explain how you could prove that quad. $SACK$ is a parallelogram.

$\overleftrightarrow{AE}$, $\overleftrightarrow{BF}$, $\overleftrightarrow{CG}$ and $\overleftrightarrow{DH}$ are parallel, with $EF = FG = GH$. Complete.

7. If $AB = 5$, $AD =$ ___?___.
8. If $AC = 12$, $CD =$ ___?___.
9. If $AB = 5x$ and $BC = 2x + 12$, $x =$ ___?___.
10. If $AC = 22 - x$ and $BD = 3x - 22$, $x =$ ___?___.

B

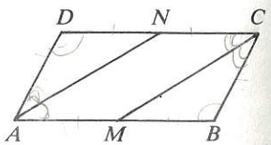
11. If $AB = 15$, $BC = 2x - y$, and $CD = x + y$, $x =$ ___?___ and $y =$ ___?___.
12. If $AB = 12$, $BC = 2x + 3y$, and $BD = 8x$, $x =$ ___?___ and $y =$ ___?___.



Exs. 7–12

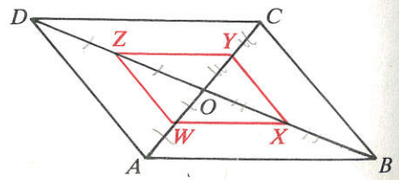
In Exercises 13–15 explain briefly how you would prove that the quadrilateral is a parallelogram.

13. Given: $\square ABCD$; M and N are the midpoints of $\overline{AB}$ and $\overline{DC}$.
Prove: $AMCN$ is a $\square$.



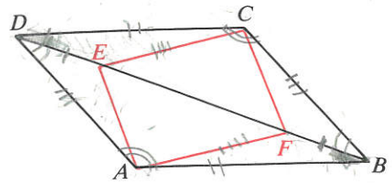
14. Given: $\square ABCD$; $\overline{AN}$ and $\overline{CM}$ bisect $\angle A$ and $\angle C$.
Prove: $AMCN$ is a $\square$.

15. Given: $\square ABCD$; W, X, Y, Z are midpoints of $\overline{AO}$, $\overline{BO}$, $\overline{CO}$, and $\overline{DO}$.
Prove: $WXYZ$ is a $\square$.

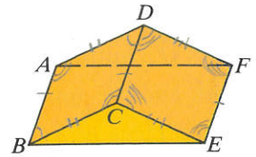


Explain briefly how you would prove that the quadrilateral is a parallelogram.

16. Given: $\square ABCD$; $DE = BF$
Prove: $AFCE$ is a $\square$.



17. Given: $\square ABCD$ and $\square CDFE$
Prove: $ABEF$ is a $\square$.



18. **a.** State Theorem 4–1 in if-then form.
b. Which theorem in this section is the converse of Theorem 4–1?

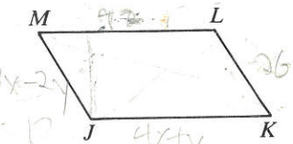
19. Prove Theorem 4–4.

20. Prove Theorem 4–5.

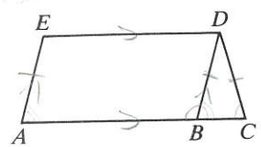
21. **a.** Prove Theorem 4–7.
b. Describe another way to prove Theorem 4–7.

What values must x and y have to make quad. *JKLM* a parallelogram?

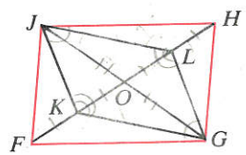
22. $ML = 42$, $LK = 26$, $KJ = 4x + y$, $JM = 3x - 2y$
23. $ML = 5x - 3y$, $LK = x + y$, $KJ = 3x + y$, $JM = 33$
24. $ML = 2y - x$, $LK = 5$, $KJ = 2x - y$, $JM = x - \frac{y}{2}$



25. Given: $\overline{AE} \cong \overline{CD}$;
$\angle DBC \cong \angle C$;
$\angle A \cong \angle DBC$
Prove: Quad. $ABDE$ is a $\square$.



26. Given: $\square KGLJ$;
$FK = LH$
Prove: Quad. $FGHJ$ is a $\square$.



27. Given: Plane $X \parallel$ plane Y;
$\overline{LM} \cong \overline{ON}$
Prove: Quad. $LMNO$ is a $\square$.