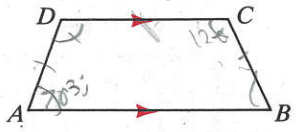
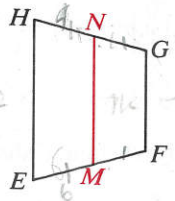
Classroom Exercises

1. In trapezoid $ABCD$, $m\angle A = 70$ and $m\angle C = 120$. Then $m\angle B =$ __?__ and $m\angle D =$ __?__.
2. Suppose trapezoid $ABCD$ is isosceles and that $m\angle A = 3j$. Find the measures of $\angle B$, $\angle C$, and $\angle D$ in terms of j.



$\overline{MN}$ is the median of trapezoid $EFGH$.

3. If $HN = 4$ and $EM = 6$, $NG =$ __?__ and $EF =$ __?__.
4. If $HE = 16$ and $GF = 10$, $MN =$ __?__.
5. If $GF = 5$ and $NM = 7$, $HE =$ __?__.
6. If $HE = 12k$ and $NM = 9k$, $GF =$ __?__.



M, N, and T are the midpoints of the sides of $\triangle XYZ$.

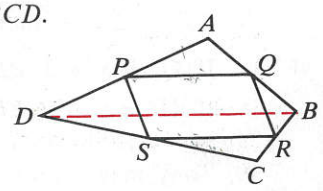
7. If $XZ = 10$, $MN =$ __?__.
8. If $TN = 7$, $XY =$ __?__.
9. If $ZN = 8$, $TM =$ __?__.
10. If $XY = k$, $TN =$ __?__.
11. Suppose $XY = 10$, $YZ = 14$, and $XZ = 8$. What are the lengths of the three sides of
    a. $\triangle TNZ$? **b.** $\triangle MYN$? **c.** $\triangle XMT$? **d.** $\triangle NTM$?
12. State a theorem suggested by Exercise 11.

Exs. 7–12

Draw the trapezoid described. If a trapezoid can't be drawn, explain why not.

13. With two right angles
14. With bases shorter than the legs
15. With congruent bases
16. With three acute angles

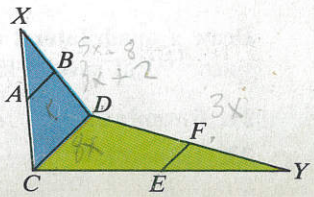
17. P, Q, R, and S are the midpoints of the sides of quad. $ABCD$.
    a. Explain how diagonal $\overline{BD}$ helps you prove that $\overline{PQ} \cong \overline{SR}$.
    b. How could you prove that $\overline{PQ} \parallel \overline{SR}$?
    c. State the theorem that tells you quad. $PQRS$ is a parallelogram.



Written Exercises

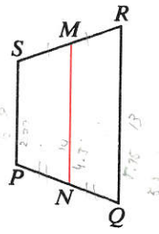
Points A, B, E, and F are the midpoints of $\overline{XC}$, $\overline{XD}$, $\overline{YC}$, and $\overline{YD}$. Complete.

A
1. If $CD = 24$, $AB =$ __?__ and $EF =$ __?__.
2. If $AB = k$, $CD =$ __?__ and $EF =$ __?__.
3. If $AB = 5x - 8$ and $EF = 3x$, $x =$ __?__.
4. If $CD = 8x$ and $AB = 3x + 2$, $x =$ __?__.



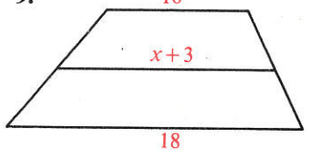
$\overline{MN}$ is the median of trap. $PQRS$. Complete the table.

	SP	MN	RQ
5.	9	?	13
6.	12	14	?
7.	3.4	?	5.2
8.	?	$4\frac{1}{2}$	$5\frac{3}{4}$

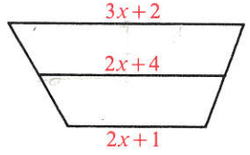


Each figure shows a trapezoid and its median. Find the value of x.

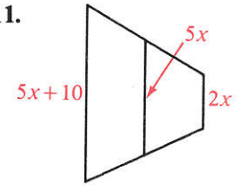
9.



10.

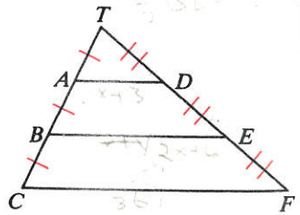


11.



In Exercises 12–16: $TA = AB = BC$ and $TD = DE = EF$.

12. Compare lengths AD and BE. (*Hint:* Think of $\triangle TBE$.)
13. Compare the lengths AD, BE, and CF. (*Hint:* Think of trap. $CFDA$.)
14. If $AD = 7$, then $BE =$? and $CF =$?.
15. If $BE = 26$, then $AD =$? and $CF =$?.
16. If $AD = x$ and $BE = x + 6$, then $x =$? and $CF =$? (numerical answers).



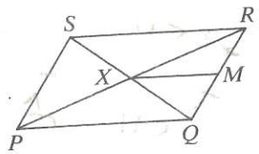
Exs. 12–20

B 17. If $AD = x + 3$, $BE = x + y$, and $CF = 36$, then $x =$? and $y =$?.
18. If $AD = x + y$, $BE = 20$, and $CF = 4x - y$, then $CF =$? (numerical answer).
19. Tony makes up a problem for the figure, setting $AD = 5$ and $CF = 17$. Katie says, "You can't do that." Explain.
20. Mike makes up a problem for the figure, setting $AD = 2x + 1$, $BE = 4x + 2$, and $CF = 6x + 3$ and asking for the value of x. This time Katie says, "Anybody can do that problem." Explain.

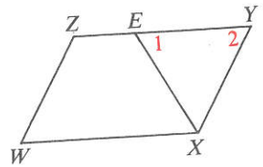
Draw a quadrilateral of the type named. Join, in order, the midpoints of the sides. What special kind of quadrilateral do you get?

21. Rhombus
22. Rectangle
23. Trapezoid
24. Isosceles trapezoid

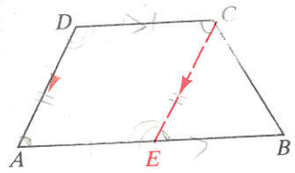
25. Given: $\square PQRS$; M is the midpoint of $\overline{QR}$.
Prove: $MX = \frac{1}{2}PQ$



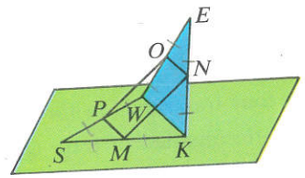
26. Given: $\square WXYZ$; $\angle 1 \cong \angle 2$
Prove: $WXEZ$ is an isos. trap.



27. Write a proof of Theorem 4–15, following the plan on page 173.
28. Write a proof of Theorem 4–15, using the method suggested by the diagram shown below.

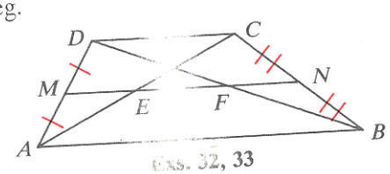


Ex. 28



Ex. 29

29. A *skew quadrilateral* $SKEW$ is shown. M, N, O, and P are the midpoints of $\overline{SK}$, $\overline{KE}$, $\overline{WE}$, and $\overline{SW}$. Explain why $PMNO$ is a parallelogram.
30. Discover, state, and prove a theorem about the diagonals of an isosceles trapezoid.
31. Prove that a line drawn through the midpoint of one leg of a trapezoid and parallel to the bases bisects the other leg.
32. $DC = 6$ and $AB = 16$. Find ME, FN, and EF.



Exs. 32, 33

C 33. $DC = 3x$, $AB = 2x^2$, and $EF = 7$. Find the value of x.

34. Prove that the perpendicular bisector of one base of an isosceles trapezoid is also the perpendicular bisector of the other base of the trapezoid.
35. State and prove the converse of the theorem you discovered in Exercise 30. (*Hint:* Draw auxiliary lines as in the Plan for Proof for Theorem 4–15 on page 173.)

★36. $\overline{VE}$, $\overline{VF}$, $\overline{VG}$, $\overline{EF}$, $\overline{FG}$, and $\overline{GE}$ are congruent. J, K, L, and M are the midpoints of $\overline{EF}$, $\overline{VF}$, $\overline{VG}$, and $\overline{EG}$. What name best describes $JKLM$? Explain.