15. Given: $\overrightarrow{BD}$ bis. $\angle ABC$; $\overrightarrow{BD} \perp \overline{AC}$
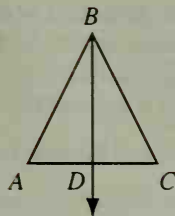Prove: $\triangle ABC$ is isos.
Key steps of proof: 1. $\triangle ABD \cong \triangle CBD$ (ASA)
                                  2. $\overline{AB} \cong \overline{CB}$ (CPCT)
17. Plan for proof: Show that the slopes of the bases $= 0$, and that the slope of the median $= 0$.
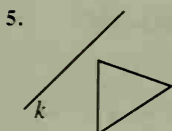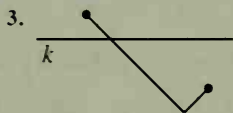
Chapter 14

Written Exercises, Pages 574–576
1. 33, 4   **3.** 10, 10; no   **5. a.** $A'(4, 2)$, $B'(8, 4)$, $C'(6, -2)$ **b.** Yes   **c.** $(8, 8)$ **7. a.** $A'(0, 12)$, $B'(12, 18)$, $C'(6, 0)$ **b.** No   **c.** $(4, 2)$ **9. a.** $A'(12, 4)$, $B'(8, 6)$, $C'(10, 0)$ **b.** Yes   **c.** $(0, 6)$
11. a. Yes   **b.** preserves   **c.** No   **13.** Let X be int. of $\overline{AC}$ and $\overline{DB}$. P on $\overline{DC}$ maps to pt. P', where $\overrightarrow{PX}$ int. $\overline{AB}$. Not an isom.   **15.** $A'(5, 3)$, $B'(7, 3)$, $C'(9, 5)$, $D'(7, 5)$. Area $ABCD = 4$, perimeter $ABCD = 8$; Area $A'B'C'D' = 4$, perimeter $A'B'C'D' = 4 + 4\sqrt{2}$ **17.** Yes   **19.** No   **21.** If A and B are diff. pts., $AB > 0$. But $A'B' = 0$.   **23. a.** $A'(-6, 1)$, $B'(-3, 4)$, $C'(-1, -3)$

Written Exercises, Pages 580–582
1.   **3.**   **5.**   **7. a.** $(2, -4)$ **b.** $(-2, 4)$ **c.** $(4, 2)$ **9. a.** $(0, 2)$ **b.** $(0, -2)$ **c.** $(-2, 0)$ **11. a.** $(-3, 2)$ **b.** $(3, -2)$ **c.** $(-2, -3)$
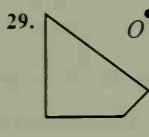**13.** Examples: WOW, AHA.   **15.** An isos. $\triangle$ with m the $\perp$ bis. of the base.   **17.** If P is not on plane X, then X is $\perp$ to and bis. $\overline{PP'}$. If P is on plane X, $P' = P$.   **19.** Let X and Y be the pts. where $\overline{PP'}$ and $\overline{QQ'}$ int. m, resp. $\triangle XYQ \cong \triangle XYQ'$, so $XQ = XQ'$ and $\angle QXY \cong \angle Q'XY$. Then $\angle PXQ \cong \angle P'XQ'$ and since $XP = XP'$, $\triangle XPQ \cong \triangle XP'Q'$ by SAS. Then $PQ = P'Q'$.   **21.** Const. k, the $\perp$ to t through A, int. t at P; const. $\overline{PA'}$ on k so that $AP = PA'$; $A' = R_t(A)$.   **23.** Yes   **25.** Path from B to H hits walls first at X, then at Y. Because reflect. is isom., $YH = YH'$, $XH' = XH''$. Thus $BX + XY + YH = BX + XY + YH' = BX + XH' = BX + XH'' = BH''$.   **27.** Aim for image of hole under reflect. in two walls, as in Ex. 25.   **29.** Yes
31. $y = -x - 5$ **33.** $x = 2$ **35.** $y = x$ **37.** $y = -\dfrac{5}{3}x + 6$ **39. a.** $(6, 3)$ **b.** $(10, -2)$ **c.** $(13, 1)$ **d.** $(10 - x, y)$

Written Exercises, Pages 586–587
1. a. $A'(-4, 6)$, $B'(-2, 10)$, $C'(1, 5)$; yes   **c.** Yes; yes   **3.** $(8, 4)$ **5.** $(-4, -3)$ **7.** $A'(1, 4)$, $B'(4, 6)$, $C'(5, 10)$; $A''(-1, 4)$, $B''(-4, 6)$, $C''(-5, 10)$ **9.** $(-x, y + 4)$ **11.** a, b, c, d
13. $(x - 4, y + 9)$ **15. a.** $A'(2, -2)$, $B'(3, 2)$ **b.** $\square$; $10 + 2\sqrt{17}$ **17.** The midpts. of $\overline{AA'}$, $\overline{BB'}$, and $\overline{CC'}$ lie on the reflecting line.   **19.** Let translation T map P to P' and Q to Q'. Let reflection R_k map P' to P'' and Q' to Q''. Since T and R_k are isom., $PQ = P'Q'$ and $P'Q' = P''Q''$. By trans. $PQ = P''Q''$, so the glide reflection is also an isom.

Written Exercises, Pages 590–592
Answers may vary in Exs. 1–5.   **1.** $\mathcal{R}_{O,\,440}$ **3.** $\mathcal{R}_{A,\,90}$ **5.** $\mathcal{R}_{O,\,180}$ **7.** C   **9.** E   **11.** D   **13.** D
15. rotation   **17.** half-turn   **19.** rotation   **21.** reflection   **23.** 6   **25.** a, b, c, d
27.   **29.**   **31.** Const. the $\perp$ bis. of $\overline{AA'}$ and $\overline{BB'}$. They int. at O.
33. b. $A'(3, 0)$, $B'(1, -4)$ **c.** slope of $\overrightarrow{AB} = -\dfrac{1}{2}$, slope of $\overrightarrow{A'B'} = 2$; the lines are $\perp$ **d.** A rotation is an isom.   **e.** An isom. maps any $\triangle$ to a $\cong \triangle$.   **f.** $(y, -x)$