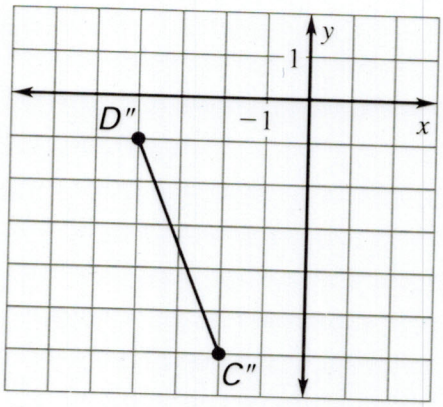
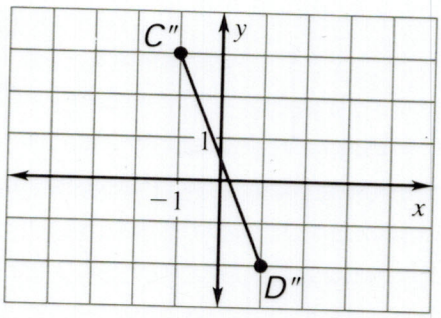
Answers for 9.5

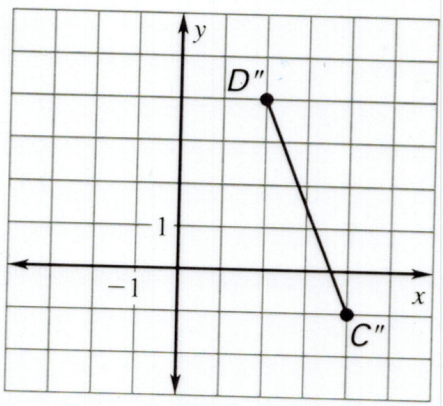
For use with pages 611–615

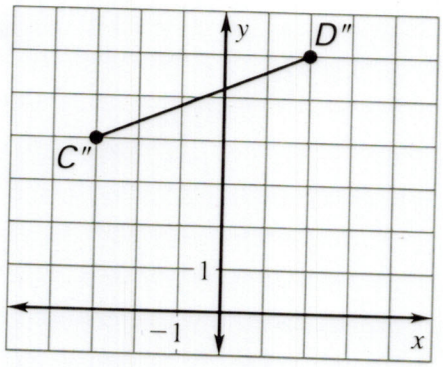
9.5 Skill Practice

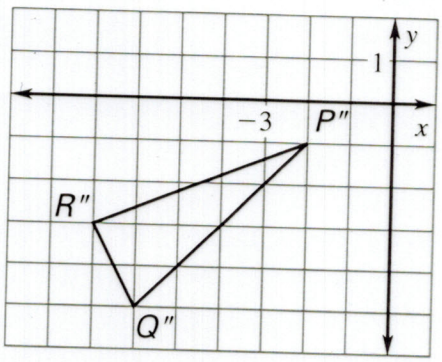
1. parallel
2. It preserves length and angle measure.

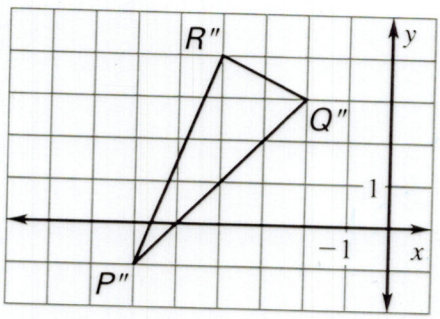
3. 

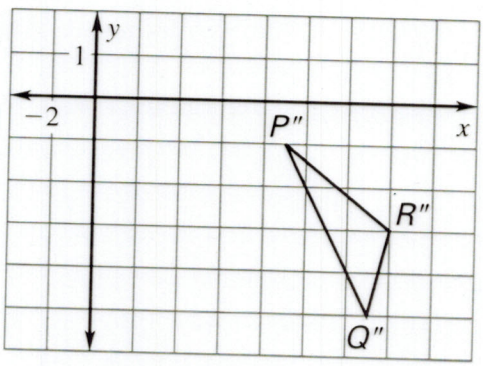
4. 

5. 

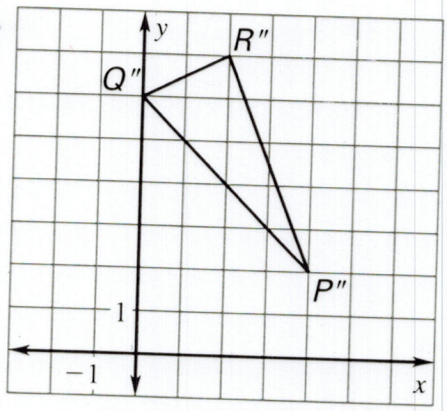
6. 

7. 

8. 

9. 

10.



11. yes **12.** yes

13. $(x, y) \rightarrow (x + 5, y + 1)$ followed by a rotation of 180° about the origin.

14. a reflection in the y-axis followed by a reflection in the x-axis

15. $\triangle A''B''C''$

16. line k and line m

17. *Sample answer:* $\overline{AA'}$, $\overline{AA''}$

18. 5.2 in.

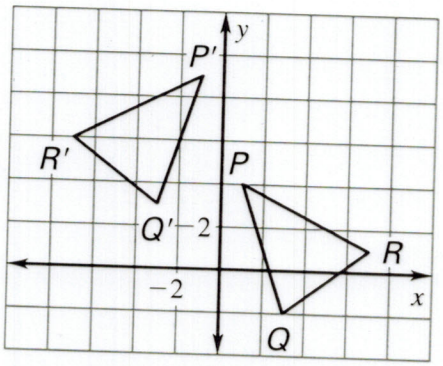
19. yes; definition of reflection of a point over a line

20. 110° **21.** 30°

22. The line of reflection is not parallel to the direction of the translation; this is not a glide reflection.

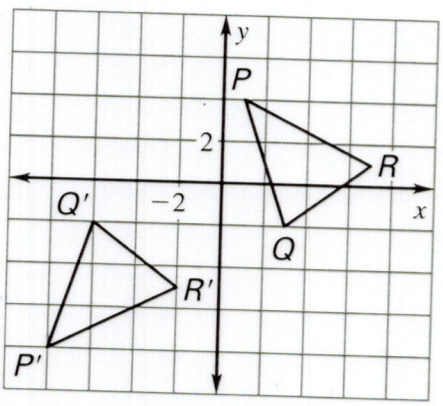
23.

$$\begin{matrix} P' & Q' & R' \end{matrix}$$
$$\begin{bmatrix} -1 & -3 & -7 \\ 9 & 3 & 6 \end{bmatrix}$$



24.

$$\begin{matrix} P' & Q' & R' \end{matrix}$$
$$\begin{bmatrix} -8 & -6 & -2 \\ -8 & -2 & -5 \end{bmatrix}$$



25. Check students' work. Since the three transformations are isometries, the preimage and the final image are congruent because an isometry preserves length and angle measure.

26. $J''(-7, 5)$, $K''(-2, 6)$, $L''(-4, 7)$

9.5 Problem Solving

27. *Sample answer:*
$(x, y) \rightarrow (x + 9, y)$, reflected over a horizontal line that separates the left and right prints

28. *Sample answer:*
$(x, y) \rightarrow (x + 7.5, y)$, reflected over a horizontal line that separates the left and right prints

29. C

30. glide reflection

31. reflection and translation

32. rotation and translation

33. translation and reflection

34. Reflect the object across two parallel lines, and then reflect it across a third line perpendicular to the first two lines.

35. Use the Rotation Theorem followed by the Reflection Theorem.

36. A reflection followed by a rotation, a reflection followed by a translation, a rotation followed by a translation, a rotation followed by a reflection, or a translation followed by a reflection. *Sample answer:* Given a reflection in m mapping P to P' and Q to Q' followed by a rotation about R mapping P' to P'' and Q' to Q''. Using the Reflection Theorem, $PQ = P'Q'$. Using the Rotation Theorem, $P'Q' = P''Q''$. Using the Transitive property of equality, $PQ = P''Q''$.

37. a. Given: A reflection in ℓ maps $\overline{JK}$ to $\overline{J'K'}$, a reflection in m maps $\overline{J'K'}$ to $\overline{J''K''}$, $\ell \parallel m$, and the distance between ℓ and m is d. Using the definition of reflection, ℓ is the perpendicular bisector of $\overline{KK'}$ and m is the perpendicular bisector of $\overline{K'K''}$. Using the Segment Addition Postulate, $KK' + K'K'' = KK''$. It follows that $\overline{KK'}$ is perpendicular to ℓ and m.

37. b. Using the definition of reflection, the distance from K to ℓ is the same as the distance from ℓ to K' and the distance from K' to m is the same as the distance from m to K''. Since the distance from ℓ to K' plus the distance from K' to m is d, it follows that $K'K'' = 2d$.

38. a–b. Given: k and m intersect at point P. Q is any point not on k or m. Reflect Q over k to Q' followed by Q' reflected over m to Q''. Using the definition of reflection, k is the perpendicular bisector of $\overline{QQ'}$ at A and m is the perpendicular bisector of $\overline{Q'Q''}$ at B. It follows that $\overline{QA} \cong \overline{Q'A}$, $\overline{Q'B} \cong \overline{Q''B}$, and $\triangle QAP$, $\triangle Q'AP$, $\triangle Q'BP$, and $\triangle Q''BP$ are right triangles. Using the Reflexive Property of Segment Congruence, $\overline{AP} \cong \overline{AP}$ and $\overline{BP} \cong \overline{BP}$. Using the SAS Congruence Postulate, $\triangle QAP \cong \triangle Q'AP$ and $\triangle Q'BP \cong \triangle Q''BP$. Using corresponding parts of congruent triangles are congruent, $\overline{QP} \cong \overline{Q'P}$ and $\overline{Q'P} \cong \overline{Q''P}$. Using the Transitive Property of Segment Congruence, $\overline{QP} \cong \overline{Q''P}$. Using corresponding parts of congruent triangles are congruent, $\angle QPA \cong \angle Q'PA$ and $\angle Q'PB \cong \angle Q''PB$. Using the Angle Addition Postulate, $m\angle QPA + m\angle Q'PA + m\angle Q'PB + m\angle Q''PB = m\angle QPQ''$ and $m\angle Q'PA + m\angle Q'PB = m\angle APB$. Using the definition of angle congruence and substitution, you get $m\angle Q'PA + m\angle Q'PA + m\angle Q'PB + m\angle Q'PB = m\angle QPQ''$ or $2(m\angle Q'PA + m\angle Q'PB) = m\angle QPQ''$. Using substitution it follows that $m\angle QPQ'' = 2m\angle APB$.

39. a. translation and a rotation

b. One transformation is not followed by the second. They are done simultaneously.

40. a. $A'(2, 0, 0)$, $B'(2, 0, 3)$

b. $A''(6, 0, -1)$, $B''(6, 0, 2)$

41. *Sample answer:* The conjecture is not always true. Consider a reflection of a point (a, b) in the x-axis followed by a reflection in the line $y = x$.

9.5 Mixed Review

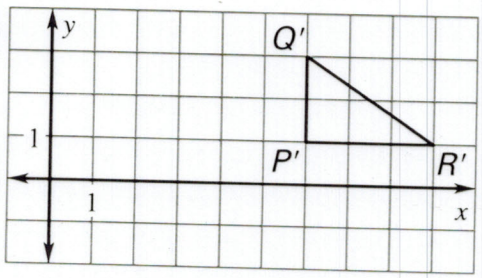
42. 34 **43.** $4\sqrt{5}$ **44.** $\sqrt{285}$

42. 34 43. $4\sqrt{5}$ 44. $\sqrt{285}$

Answers for 9.5 *continued*

For use with pages 611–615

45.



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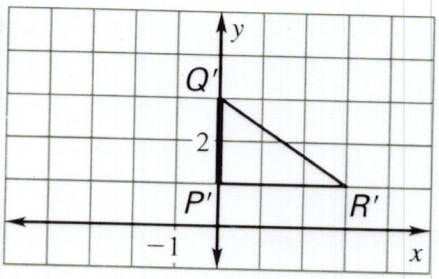
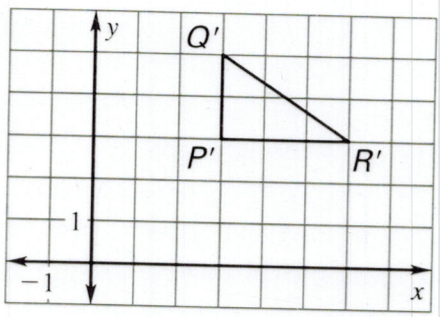
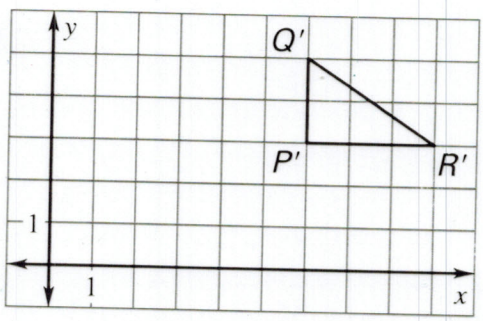


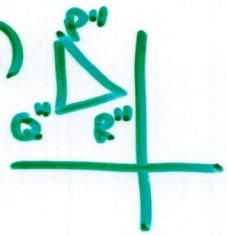
47.



48.

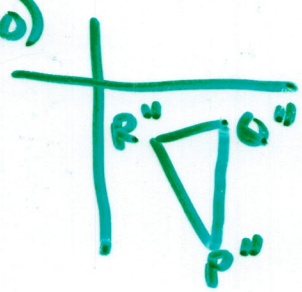


9)



Q"(−8, 7)
R"(−4, 10)
P"(−11, 15)

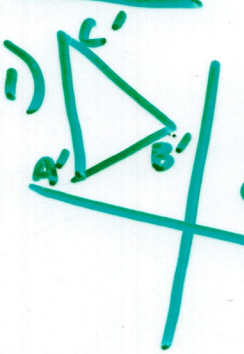
10)



Q"(9, −3)
R"(5, −6)
P"(12, −11)

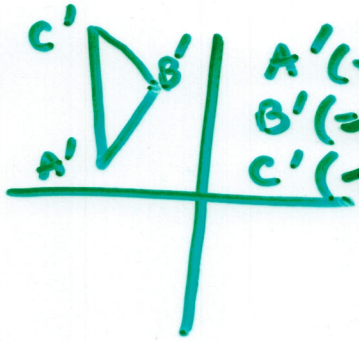
Quiz

1)



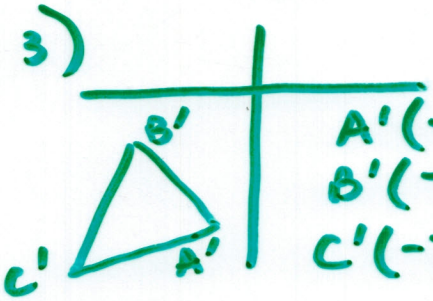
A'(−7, 1)
B'(−3, 5)
C'(−10, 7)

2)



A'(−15, 1)
B'(−11, 5)
C'(−18, 7)

3)



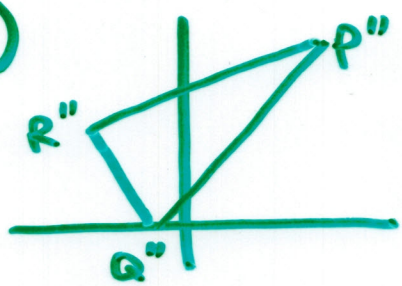
A'(−1, −7)
B'(−5, −3)
C'(−7, −10)

4) (−2, 3)

5) (3, 2)

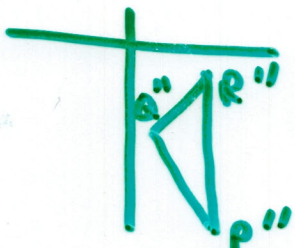
6) (−3, −2)

7)



Q"(−1, 0)
R"(−5, 3)
P"(2, 8)

8)



R"(7, −1)
Q"(4, 5)
P"(12, −8)