Answers for Lesson 3-3, pp. 143–144 Exercises

1. a. $\angle 1 \cong \angle 2 \cong \angle 3$

b. Slat D is perp. to slats B and C. Explanations may vary. Sample: Slat D is perp. to slat A. Slats A, B, and C are parallel, so by Theorem 3-11, slat D is also perp. to B and C.

2. *a* is perp. to *b* and *c* is perp. to *b*, so *a* is parallel to *c* because two lines perp. to the same line are parallel. *d* is parallel to *c* and *a* is parallel to *c*, so by Thm. 3-9, *a* is parallel to *d*.

3. a. corr. $\measuredangle$s

b,c. $\angle 1$, $\angle 3$ (any order)

d. Converse of Corr.

4–11. Answers may vary. Samples are given.

4. The rungs are parallel to each other because they are all perpendicular to the same side.

5. All of the rungs are perpendicular to one side. The side is perp. to the top rung, and because all of the rungs are parallel to each other, the side is perp. to all of the rungs.

6. The rungs are perpendicular to both sides. The rungs are perp. to one of two parallel lines, so they are perp. to both lines.

7. The rungs are parallel to each other because they are all perpendicular to one side. The sides are parallel because they are both perpendicular to one rung.

8. The sides are parallel because they are both perpendicular to one rung.

9. All of the rungs are parallel. All of the rungs are parallel to one rung, so they are all parallel to each other.

10. The rungs are parallel because they are all perpendicular to one side.

11. In the diagram, $a \perp b$ means the marked $\angle$ is a rt. $\angle$. $b \parallel c$ means that the corres. $\angle$ formed by a and c is a rt. $\angle$, so $a \perp c$.

12. Thm. 3-10

13. Answers may vary. Sample: In the diagram, $\overline{AB} \perp \overline{BH}$ and $\overline{AB} \perp \overline{BD}$, but $\overline{BH} \nparallel \overline{BD}$. They intersect.

14. $a \parallel d$ **15.** $a \perp d$ **16.** $a \perp d$ **17.** $a \perp d$

18. $a \parallel d$ **19.** $a \parallel d$ **20.** $a \parallel d$ **21.** $a \perp d$

22. Reflexive: $a \parallel a$; false; any line intersects itself.
Symmetric: If $a \parallel b$, then $b \parallel a$; true; b and a are coplanar and do not intersect.
Transitive: In general, if $a \parallel b$, and $b \parallel c$, then $a \parallel c$; true; however, when $a \parallel b$, and $b \parallel a$, it does not follow that $a \parallel a$.

23. Reflexive: $a \perp a$; false; $\perp$ lines are two lines that intersect to form right $\measuredangle$s.
Symmetric: If $a \perp b$, then $b \perp a$; true; b and a intersect to form right $\measuredangle$s.
Transitive: If $a \perp b$, and $b \perp c$, then $a \perp c$; false; in a plane, two lines $\perp$ to the same line are $\parallel$.