

3.4 Exercises

Vocabulary and Core Concept Check

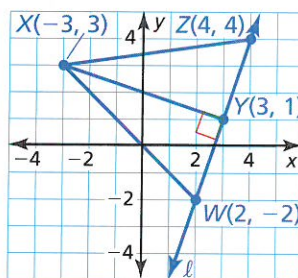
- COMPLETE THE SENTENCE** The perpendicular bisector of a segment is the line that passes through the _____ of the segment at a _____ angle.
- DIFFERENT WORDS, SAME QUESTION** Which is different? Find “both” answers.

Find the distance from point X to line \overleftrightarrow{WZ} .

Find XZ .

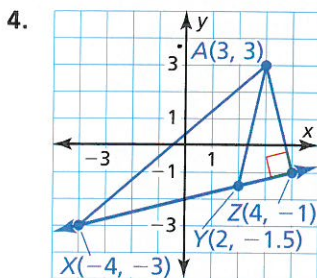
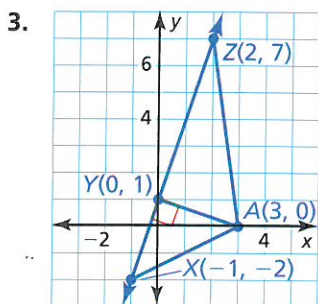
Find the length of \overline{XY} .

Find the distance from line ℓ to point X .

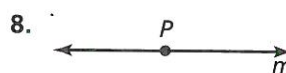
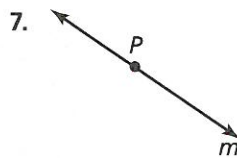
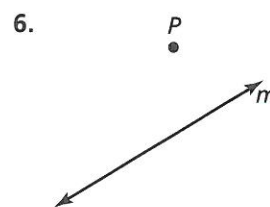
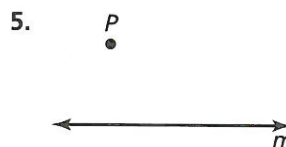


Monitoring Progress and Modeling with Mathematics

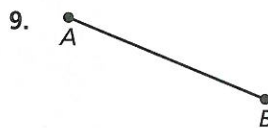
In Exercises 3 and 4, find the distance from point A to \overleftrightarrow{XZ} . (See Example 1.)



CONSTRUCTION In Exercises 5–8, trace line m and point P . Then use a compass and straightedge to construct a line perpendicular to line m through point P .

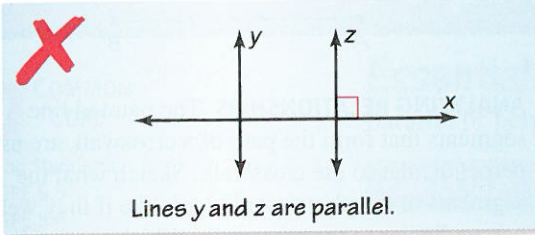


CONSTRUCTION In Exercises 9 and 10, trace \overline{AB} . Then use a compass and straightedge to construct the perpendicular bisector of \overline{AB} .

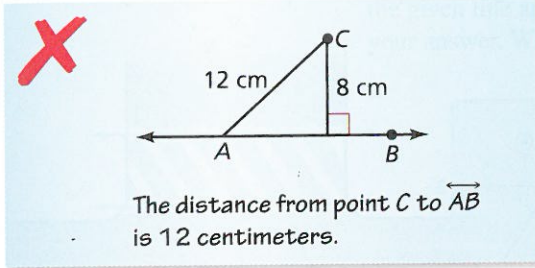


ERROR ANALYSIS In Exercises 11 and 12, describe and correct the error in the statement about the diagram.

11.



12.



PROVING A THEOREM In Exercises 13 and 14, prove the theorem. (See Example 2.)

13. Linear Pair Perpendicular Theorem (Thm. 3.10)

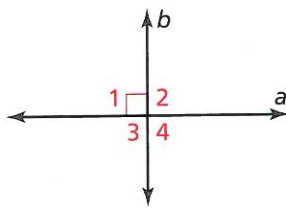
14. Lines Perpendicular to a Transversal Theorem (Thm. 3.12)

PROOF In Exercises 15 and 16, use the diagram to write a proof of the statement.

15. If two intersecting lines are perpendicular, then they intersect to form four right angles.

Given $a \perp b$

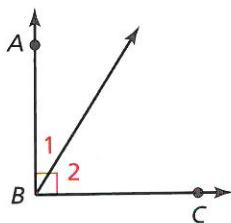
Prove $\angle 1, \angle 2, \angle 3,$ and $\angle 4$ are right angles.



16. If two sides of two adjacent acute angles are perpendicular, then the angles are complementary.

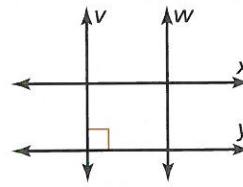
Given $\overrightarrow{BA} \perp \overrightarrow{BC}$

Prove $\angle 1$ and $\angle 2$ are complementary.

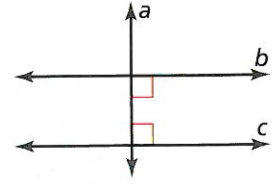


In Exercises 17–22, determine which lines, if any, must be parallel. Explain your reasoning. (See Example 3.)

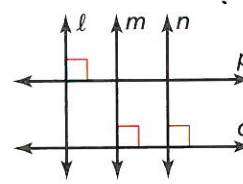
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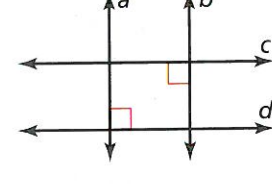
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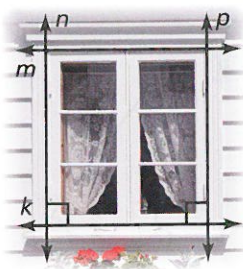
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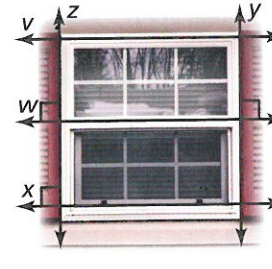
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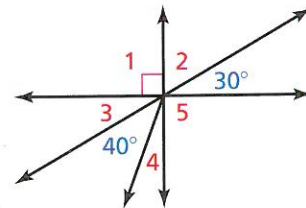
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22.

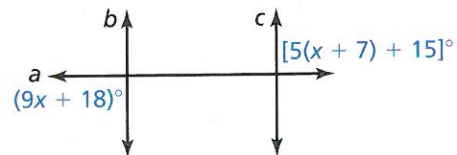


23. **USING STRUCTURE** Find all the unknown angle measures in the diagram. Justify your answer for each angle measure.

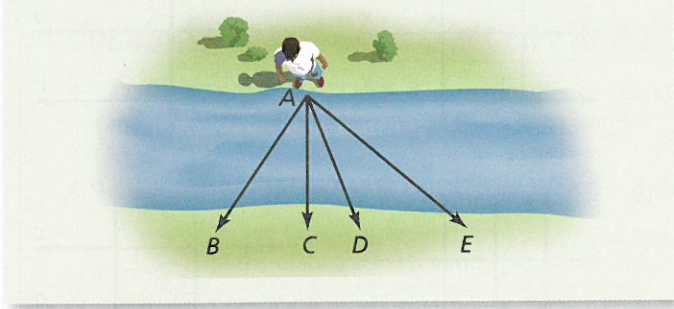


24. **MAKING AN ARGUMENT** Your friend claims that because you can find the distance from a point to a line, you should be able to find the distance between any two lines. Is your friend correct? Explain your reasoning.

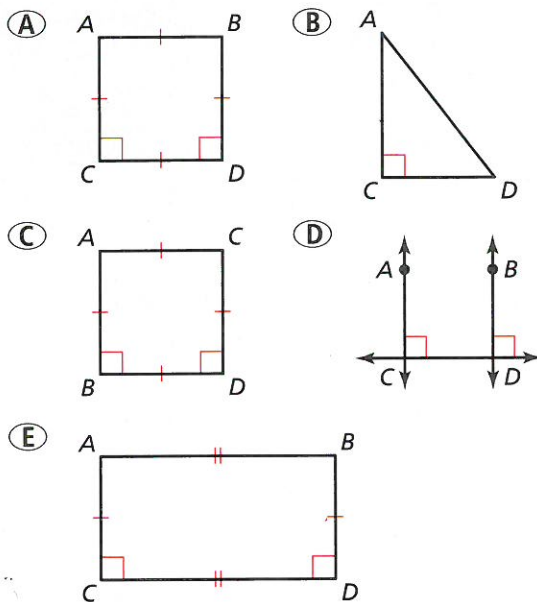
25. **MATHEMATICAL CONNECTIONS** Find the value of x when $a \perp b$ and $b \parallel c$.



26. **HOW DO YOU SEE IT?** You are trying to cross a stream from point A. Which point should you jump to in order to jump the shortest distance? Explain your reasoning.



27. **ATTENDING TO PRECISION** In which of the following diagrams is $\overline{AC} \parallel \overline{BD}$ and $\overline{AC} \perp \overline{CD}$? Select all that apply.

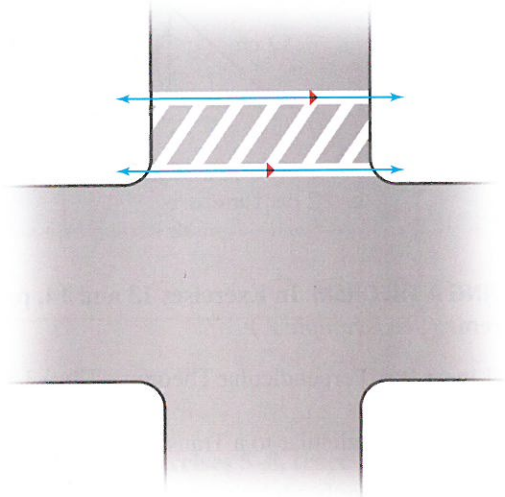


28. **THOUGHT PROVOKING** The postulates and theorems in this book represent Euclidean geometry. In spherical geometry, all points are points on the surface of a sphere. A line is a circle on the sphere whose diameter is equal to the diameter of the sphere. In spherical geometry, how many right angles are formed by two perpendicular lines? Justify your answer.

29. **CONSTRUCTION** Construct a square of side length AB .



30. **ANALYZING RELATIONSHIPS** The painted line segments that form the path of a crosswalk are usually perpendicular to the crosswalk. Sketch what the segments in the photo would look like if they were perpendicular to the crosswalk. Which type of line segment requires less paint? Explain your reasoning.



31. **ABSTRACT REASONING** Two lines, a and b , are perpendicular to line c . Line d is parallel to line c . The distance between lines a and b is x meters. The distance between lines c and d is y meters. What shape is formed by the intersections of the four lines?
32. **MATHEMATICAL CONNECTIONS** Find the distance between the lines with the equations $y = \frac{3}{2}x + 4$ and $-3x + 2y = -1$.
33. **WRITING** Describe how you would find the distance from a point to a plane. Can you find the distance from a line to a plane? Explain your reasoning.

Maintaining Mathematical Proficiency

Reviewing what you learned in previous grades and lessons

Simplify the ratio. (*Skills Review Handbook*)

34. $\frac{6 - (-4)}{8 - 3}$

35. $\frac{3 - 5}{4 - 1}$

36. $\frac{8 - (-3)}{7 - (-2)}$

37. $\frac{13 - 4}{2 - (-1)}$

Identify the slope and the y -intercept of the line. (*Skills Review Handbook*)

38. $y = 3x + 9$

39. $y = -\frac{1}{2}x + 7$

40. $y = \frac{1}{6}x - 8$

41. $y = -8x - 6$