3.4 Start Thinking

A construction worker building a house uses many tools to ensure the foundation, walls, floors, and ceilings are all "square."

One tool frequently used is a level. A level indicates whether a surface is horizontal (parallel) or vertical (perpendicular) to another surface. Research two more tools a construction worker uses related to perpendicular lines and explain how the tools are used.

3.4 Warm Up

Find the indicated measurement.

1. the height of a triangle with base 30 centimeters and area 375 square centimeters
2. the base of a triangle with height 3 centimeters and area 49.5 square centimeters
3. the area of a triangle with base 33 centimeters and height 29 centimeters
4. the length of a rectangle with width 24 centimeters and area 1104 square centimeters
5. the width of a rectangle with length 7 centimeters and area 49 square centimeters

3.4 Cumulative Review Warm Up

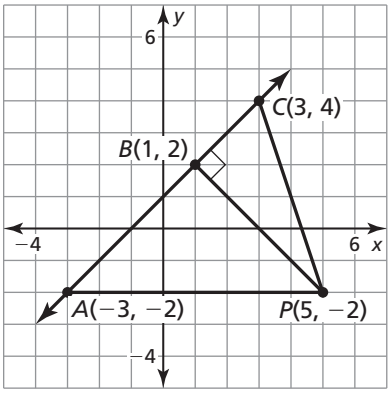
Write a two-column proof for the property.

1. Symmetric Property of Segment Congruence
2. Reflexive Property of Angle Congruence

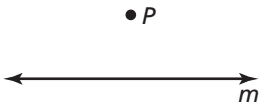
Name _____ Date _____

3.4 Practice A

1. Find the distance from point P to $\overleftrightarrow{AB}$.

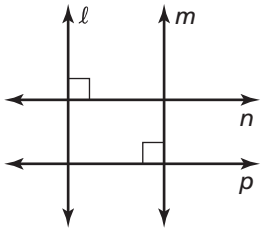


2. Trace line m and point P. Then use a compass and a straightedge to construct a line perpendicular to line m through point P.

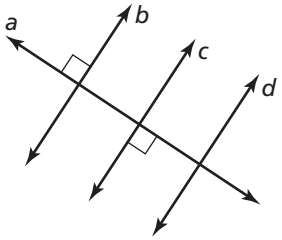


In Exercises 3 and 4, determine which lines, if any, must be parallel. Explain your reasoning.

3.

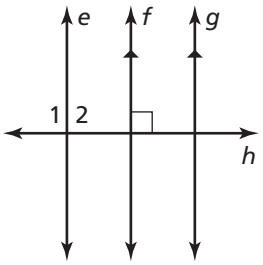


4.

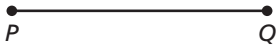


5. **Given:** $\angle 1 \cong \angle 2$, $f \perp h$ and $f \parallel g$

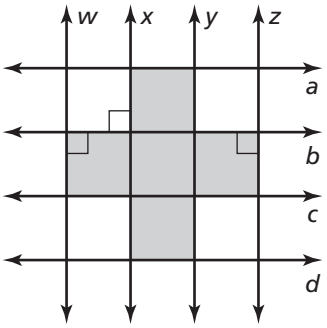
Prove: $e \parallel g$



6. Your friend claims that there is only one line that can be drawn perpendicular to $\overline{PQ}$. Is your friend correct? Explain your reasoning.



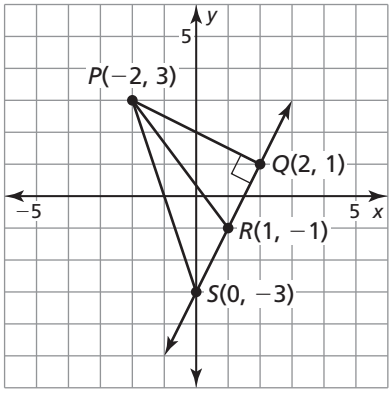
7. Determine which lines must be parallel. Explain your reasoning.



Name_____ Date _____

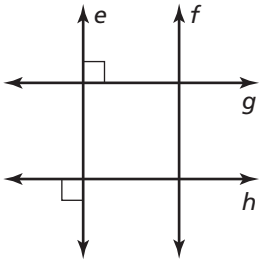
3.4 Practice B

1. Find the distance from point P to $\overleftrightarrow{QS}$.

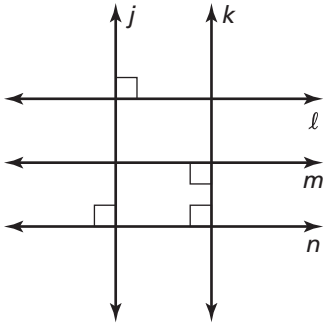


In Exercises 2 and 3, determine which lines, if any, must be parallel. Explain your reasoning.

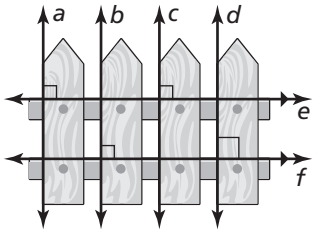
2.



3.

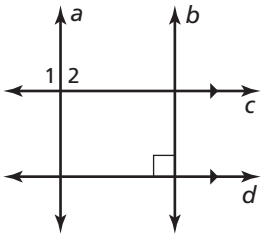


4. Your friend claims that you have enough information to determine that all of the vertical panels are parallel to each other. Is your friend correct? Explain your reasoning.

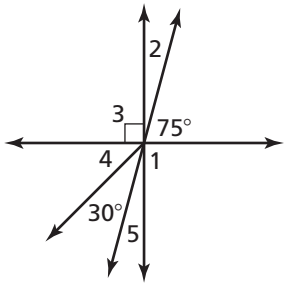


5. **Given:** $\angle 1 \cong \angle 2$, $c \parallel d$, and $b \perp d$

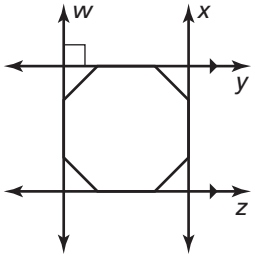
Prove: $a \parallel b$



6. Find all the unknown angle measures in the diagram. Justify your answer for each angle measure.



7. You extend the sides of a regular octagon as shown in the figure. You are given that $w \perp y$ and $y \parallel z$. Do you have enough information to conclude that $x \perp z$? Explain.



Name _____ Date _____

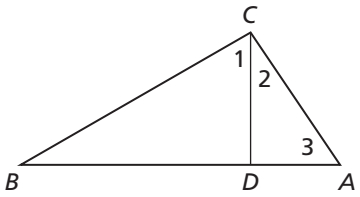
3.4 Enrichment and Extension

Proofs with Perpendicular Lines

In Exercises 1–4, refer to the diagram to write a two-column proof.

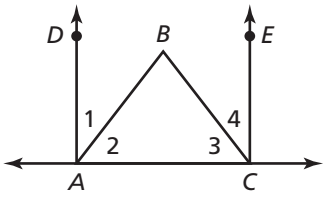
1. Given: $\overline{AC} \perp \overline{BC}$; $\angle 3$ is complementary to $\angle 1$.

Prove: $\angle 3 \cong \angle 2$



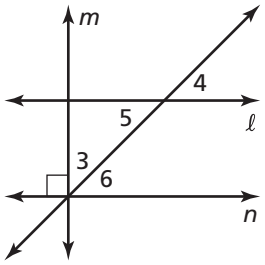
2. Given: $\overline{AB}$ bisects $\angle DAC$; $\overline{CB}$ bisects $\angle ECA$; $m\angle 2 = 45°$; $m\angle 3 = 45°$

Prove: $\overrightarrow{AD}$ is parallel to $\overrightarrow{CE}$.



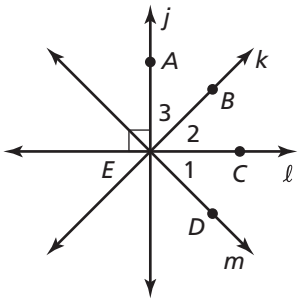
3. Given: $m \perp n$; $\angle 3$ and $\angle 4$ are complementary.

Prove: $\angle 5 \cong \angle 6$



4. Given: $j \perp \ell$; $\angle 1 \cong \angle 3$

Prove: $k \perp m$



In Exercises 5–8, use the following information to find the distance between the point and the line.

The distance d between the point (x_1, y_1) and the line $Ax + By = C$ is

$$d = \frac{|Ax_1 + By_1 - C|}{\sqrt{A^2 + B^2}}.$$

5. $(3, 6)$; $3x + 4y = -2$

6. $(-2, 1)$; $x - y = 2$

7. $(8, 6)$; $-3x + 5y = -2$

8. $(5, -2)$; $2x + 3y = 1$

Name_____ Date _____

3.4 Puzzle Time

What Snake Is The Best Mathematician?

Write the letter of each answer in the box containing the exercise number.

Complete the sentence.

1. The distance from a point to a line is the length of the _____ segment from the point to the line.
2. If two lines intersect to form a(n) _____ of congruent angles, then the lines are perpendicular.
3. In a plane, if a transversal is perpendicular to one of two _____ lines, then it is perpendicular to the other line.
4. In a(n) _____ , if two lines are perpendicular to the same line, then they are parallel to each other.

Indicate the distance of the segment using the given information. Round to the nearest tenth.

5. Find AX. $A(-4, 5), X(1, -2)$
6. Find CX. $C(6, -4), X(1, -2)$
7. Find DX. $D(-7, 3), X(3, 4)$
8. *F*ind BX. $B(5, 2), X(3, 4)$

Answers

R. 5.4

D. perpendicular

I. vertical pair

P. longest segment

A. plane

A. 9.8

M. straight

D. 11.6

E. linear pair

A. graph

E. 1.9

H. 8.6

V. 5.3

D. 10.0

A. 3.6

T. parallel

M. 4.5

E. 2.8

3	5	8		4	1	7	2	6