CHAPTER 1

Chapter Summary

WHAT did you learn?	WHY did you learn it?
Find and describe patterns. **(1.1)**	Use a pattern to predict a figure or number in a sequence. **(p. 3)**
Use inductive reasoning. **(1.1)**	Make and verify conjectures such as a conjecture about the frequency of full moons. **(p. 5)**
Use defined and undefined terms. **(1.2)**	Understand the basic elements of geometry.
Sketch intersections of lines and planes. **(1.2)**	Visualize the basic elements of geometry and the ways they can intersect.
Use segment postulates and the Distance Formula. **(1.3)**	Solve real-life problems, such as finding the distance between two points on a map. **(p. 20)**
Use angle postulates and classify angles. **(1.4)**	Solve problems in geometry and in real life, such as finding the measure of the angle of vision for a horse wearing blinkers. **(p. 27)**
Bisect a segment and bisect an angle. **(1.5)**	Solve problems in geometry and in real life, such as finding an angle measure of a kite. **(p. 37)**
Identify vertical angles, linear pairs, complementary angles, and supplementary angles. **(1.6)**	Find the angle measures of geometric figures and real-life structures, such as intersecting metal supports of a stair railing. **(p. 45)**
Find the perimeter, circumference, and area of common plane figures. **(1.7)**	To solve problems related to measurement, such as finding the area of a deck for a pool. **(p. 54)**
Use a general problem-solving plan. **(1.7)**	To solve problems related to mathematics and real life, such as finding the number of bags of grass seed you need for a soccer field. **(p. 53)**

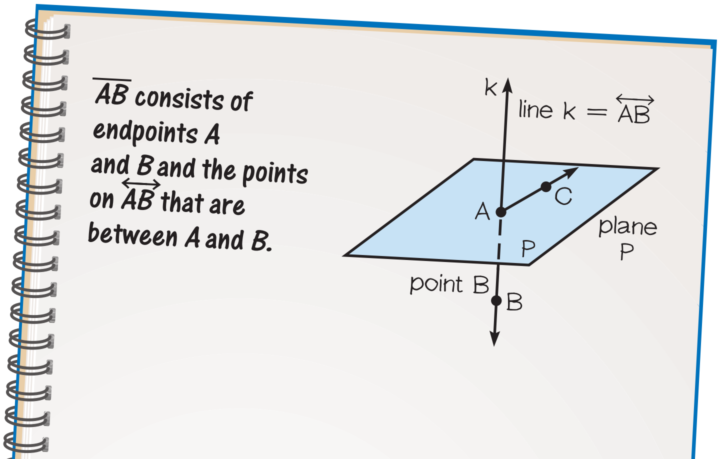
How does Chapter 1 fit into the BIGGER PICTURE of geometry?

In this chapter, you learned a basic reasoning skill—inductive reasoning. You also learned many fundamental terms—*point*, *line*, *plane*, *segment*, and *angle*, to name a few. Added to this were four basic postulates. These building blocks will be used throughout the remainder of this book to develop new terms, postulates, and theorems to explain the geometry of the world around you.

STUDY STRATEGY

How did you use your vocabulary pages?

The definitions of vocabulary terms you made, using the **Study Strategy** on page 2, may resemble this one.



CHAPTER 1

Chapter Review

VOCABULARY

- conjecture, p. 4
- inductive reasoning, p. 4
- counterexample, p. 4
- definition, undefined, p. 10
- point, line, plane, p. 10
- collinear, coplanar, p. 10
- line segment, p. 11
- endpoints, p. 11
- ray, p. 11
- initial point, p. 11
- opposite rays, p. 11
- intersect, intersection, p. 12
- postulates, or axioms, p. 17
- coordinate, p. 17
- distance, length, p. 17
- between, p. 18
- Distance Formula, p. 19
- congruent segments, p. 19
- angle, p. 26
- sides, vertex of an angle, p. 26
- congruent angles, p. 26
- measure of an angle, p. 27
- interior of an angle, p. 27
- exterior of an angle, p. 27
- acute, obtuse angles, p. 28
- right, straight angles, p. 28
- adjacent angles, p. 28
- midpoint, p. 34
- bisect, p. 34
- segment bisector, p. 34
- compass, straightedge, p. 34
- construct, construction, p. 34
- Midpoint Formula, p. 35
- angle bisector, p. 36
- vertical angles, p. 44
- linear pair, p. 44
- complementary angles, p. 46
- complement of an angle, p. 46
- supplementary angles, p. 46
- supplement of an angle, p. 46

1.1 PATTERNS AND INDUCTIVE REASONING

Examples on pp. 3–5

EXAMPLE Make a conjecture based on the results shown.

Conjecture: Given a 3-digit number, form a 6-digit number by repeating the digits. Divide the number by 7, then 11, then 13. The result is the original number.

$456{,}456 \div 7 \div 11 \div 13 = 456$

$562{,}562 \div 7 \div 11 \div 13 = 562$

$109{,}109 \div 7 \div 11 \div 13 = 109$

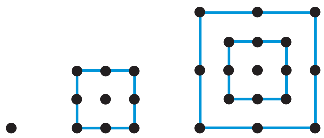
In Exercises 1–3, describe a pattern in the sequence of numbers.

1. 5, 12, 19, 26, 33, . . .

2. 0, 2, 6, 14, 30, . . .

3. 4, 12, 36, 108, 324, . . .

4. Sketch the next figure in the pattern.



5. Make a conjecture based on the results.

$4 \cdot 5 \cdot 6 \cdot 7 + 1 = 29 \cdot 29$

$5 \cdot 6 \cdot 7 \cdot 8 + 1 = 41 \cdot 41$

$6 \cdot 7 \cdot 8 \cdot 9 + 1 = 55 \cdot 55$

6. Show the conjecture is false by finding a counterexample:

Conjecture: *The cube of a number is always greater than the number.*

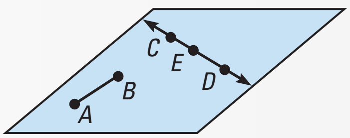
1.2 POINTS, LINES, AND PLANES

Examples on pp. 10–12

EXAMPLE

C, E, and D are collinear. $\overleftrightarrow{CD}$ is a line. $\overline{AB}$ is a segment.

A, B, C, D, and E are coplanar. $\overrightarrow{EC}$ and $\overrightarrow{ED}$ are opposite rays.



7. Draw five coplanar points, A, B, C, D, and E so that $\overrightarrow{BA}$ and $\overrightarrow{BC}$ are opposite rays, and $\overline{DE}$ intersects $\overleftrightarrow{AC}$ at B.

8. Sketch three planes that do not intersect.

9. Sketch two lines that are not coplanar and do not intersect.

1.3 SEGMENTS AND THEIR MEASURES

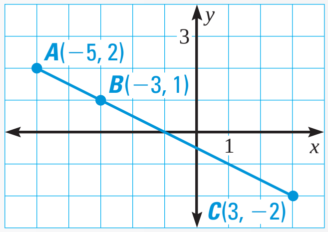
Examples on pp. 17–20

EXAMPLE B is between A and C, so $AB + BC = AC$.
Use the Distance Formula to find AB and BC.

$$AB = \sqrt{[-3 - (-5)]^2 + (1 - 2)^2} = \sqrt{2^2 + (-1)^2} = \sqrt{5}$$

$$BC = \sqrt{[3 - (-3)]^2 + (-2 - 1)^2} = \sqrt{6^2 + (-3)^2} = \sqrt{45}$$

Because $AB \neq BC$, $\overline{AB}$ and $\overline{BC}$ are *not* congruent segments.



10. Q is between P and S. R is between Q and S. S is between Q and T. $PT = 30$, $QS = 16$, and $PQ = QR = RS$. Find PQ, ST, and RP.

Use the Distance Formula to decide whether $\overline{PQ} \cong \overline{QR}$.

11. $P(-4, 3)$
$Q(-2, 1)$
$R(0, -1)$

12. $P(-3, 5)$
$Q(1, 3)$
$R(4, 1)$

13. $P(-2, -2)$
$Q(0, 1)$
$R(1, 4)$

1.4 ANGLES AND THEIR MEASURES

Examples on pp. 26–28

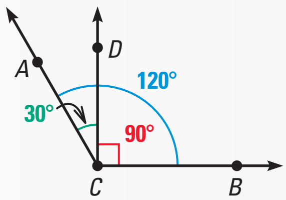
EXAMPLE

$m\angle ACD + m\angle DCB = m\angle ACB$

$\angle ACD$ is an acute angle: $m\angle ACD < 90°$.

$\angle DCB$ is a right angle: $m\angle DCB = 90°$.

$\angle ACB$ is an obtuse angle: $m\angle ACB > 90°$.



Classify the angle as *acute, right, obtuse,* or *straight*. Sketch the angle. Then use a protractor to check your results.

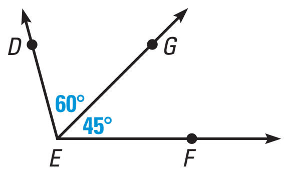
14. $m\angle KLM = 180°$

15. $m\angle A = 150°$

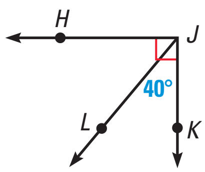
16. $m\angle Y = 45°$

Use the Angle Addition Postulate to find the measure of the unknown angle.

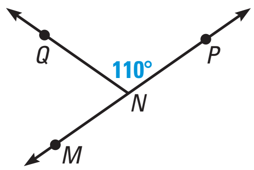
17. $m\angle DEF$



18. $m\angle HJL$



19. $m\angle QNM$

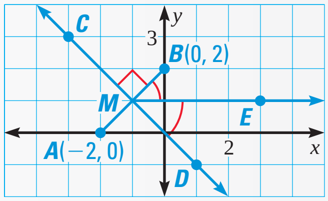


1.5 SEGMENT AND ANGLE BISECTORS

Examples on pp. 35–37

EXAMPLE If $\overleftrightarrow{CD}$ is a bisector of $\overline{AB}$, then $\overleftrightarrow{CD}$ intersects $\overline{AB}$ at its midpoint M: $M = \left(\frac{-2+0}{2}, \frac{0+2}{2}\right) = (-1, 1)$.

$\overrightarrow{ME}$ bisects $\angle BMD$, so $m\angle BME = m\angle EMD = 45°$.



Find the coordinates of the midpoint of a segment with the given endpoints.

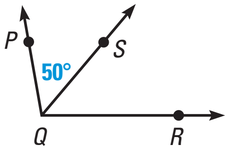
20. $A(0, 0)$, $B(-8, 6)$

21. $J(-1, 7)$, $K(3, -3)$

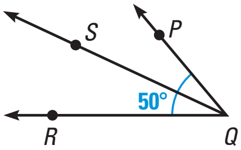
22. $P(-12, -9)$, $Q(2, 10)$

$\overrightarrow{QS}$ is the bisector of $\angle PQR$. Find any angle measures not given in the diagram.

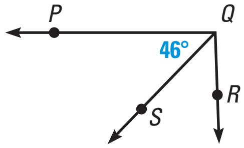
23.



24.



25.



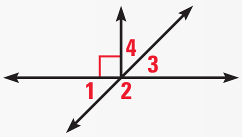
1.6 ANGLE PAIR RELATIONSHIPS

Examples on pp. 44–46

EXAMPLE $\angle 1$ and $\angle 3$ are vertical angles.

$\angle 1$ and $\angle 2$ are a linear pair and are supplementary angles.

$\angle 3$ and $\angle 4$ are complementary angles.



Use the diagram above to decide whether the statement is *always*, *sometimes*, or *never* true.

26. If $m\angle 2 = 115°$, then $m\angle 3 = 65°$.

27. $\angle 3$ and $\angle 4$ are congruent.

28. If $m\angle 1 = 40°$, then $m\angle 3 = 50°$.

29. $\angle 1$ and $\angle 4$ are complements.

1.7 INTRODUCTION TO PERIMETER, CIRCUMFERENCE, AND AREA

Examples on pp. 51–54

EXAMPLES A circle has diameter 24 ft.
Its circumference is $C = 2\pi r \approx 2(3.14)(12) = 75.36$ feet.
Its area is $A = \pi r^2 \approx 3.14(12^2) = 452.16$ square feet.

Find the perimeter (or circumference) and area of the figure described.

30. Rectangle with length 10 cm and width 4.5 cm

31. Circle with radius 9 in. (Use $\pi \approx 3.14$.)

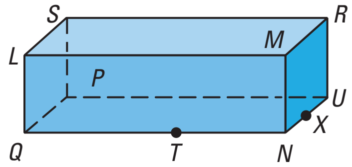
32. Triangle defined by $A(-6, 0)$, $B(2, 0)$, and $C(-2, -3)$

33. A square garden has sides of length 14 ft. What is its perimeter?

CHAPTER 1

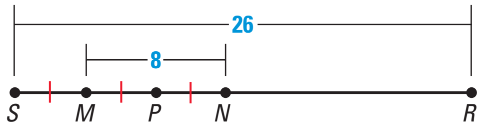
Chapter Test

Use the diagram to name the figures.



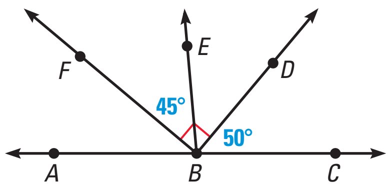
1. Three collinear points
2. Four noncoplanar points
3. Two opposite rays
4. Two intersecting lines
5. The intersection of plane LMN and plane QLS

Find the length of the segment.

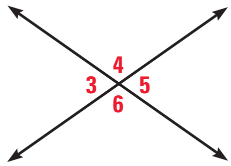


6. $\overline{MP}$
7. $\overline{SM}$
8. $\overline{NR}$
9. $\overline{MR}$

Find the measure of the angle.

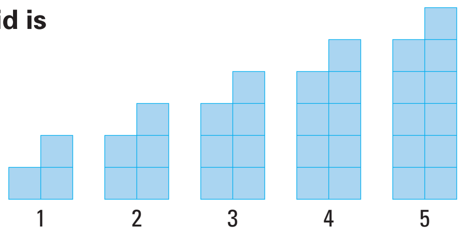


10. $\angle DBE$
11. $\angle FBC$
12. $\angle ABF$
13. $\angle DBA$



14. Refer to the diagram for Exercises 10–13. Name an obtuse angle, an acute angle, a right angle, and two complementary angles.
15. Q is between P and R. $PQ = 2w - 3$, $QR = 4 + w$, and $PR = 34$. Find the value of w. Then find the lengths of $\overline{PQ}$ and $\overline{QR}$.
16. $\overline{RT}$ has endpoints $R(-3, 8)$ and $T(3, 6)$. Find the coordinates of the midpoint, S, of $\overline{RT}$. Then use the Distance Formula to verify that $RS = ST$.
17. Use the diagram. If $m\angle 3 = 68°$, find the measures of $\angle 5$ and $\angle 4$.
18. Suppose $m\angle PQR = 130°$. If $\overrightarrow{QT}$ bisects $\angle PQR$, what is the measure of $\angle PQT$?

The first five figures in a pattern are shown. Each square in the grid is 1 unit × 1 unit.



19. Make a table that shows the distance around each figure at each stage.
20. Describe the pattern of the distances and use it to predict the distance around the figure at stage 20.

A center pivot irrigation system uses a fixed water supply to water a circular region of a field. The radius of the watering system is 560 feet long. (Use $\pi \approx 3.14$.)

21. If some workers walked around the circumference of the watered region, how far would they have to walk? Round to the nearest foot.
22. Find the area of the region watered. Round to the nearest square foot.