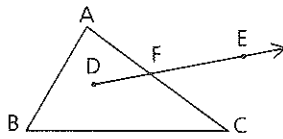**Problem 4**   *Draw a diagram in which* $\triangle ABC \cap \overrightarrow{DE} = F.$
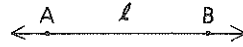
Solution

There are other correct answers, and a lot of wrong ones.
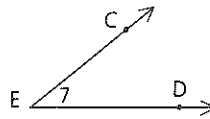
Part Three: Problem Sets

Problem Set A

In the back of the book, you will find answers to many of the problems. It will help you learn to check your answer in the back after you solve a problem. Then rethink your work if necessary.
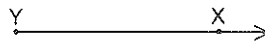
1 What are three possible names for the line shown? $\overleftrightarrow{AB}$, $\overleftrightarrow{BA}$, line ℓ
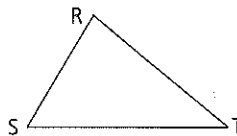
2 What are four possible names for the angle shown? $\angle CED$, $\angle DEC$, $\angle E$, $\angle 7$

3 Can the ray shown be called $\overrightarrow{XY}$? No

4 Name the sides of $\triangle RST$. $\overline{RS}$, $\overline{ST}$, $\overline{RT}$

5 a $\overline{AB} \cap \overline{BC} = \underline{}$ B
  b $\overrightarrow{EC} \cup \overrightarrow{EA} = \underline{}$ $\overleftrightarrow{AC}$ or $\angle CEA$
  c $\overleftrightarrow{AC} \cap \overleftrightarrow{DB} = \underline{}$ E
  d $\overline{DC} \cap \overline{AB} = \underline{}$ $\emptyset$
  e $\overrightarrow{AC} \cap \overrightarrow{EC} = \underline{}$ $\overrightarrow{EC}$
  f $\overrightarrow{BA} \cup \overrightarrow{BC} = \underline{}$ $\angle ABC$
  g $\overline{EC} \cup \overline{CB} \cup \overline{BE} = \underline{}$ $\triangle BEC$
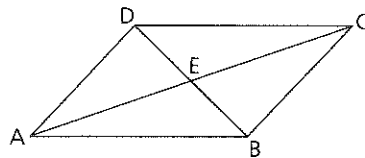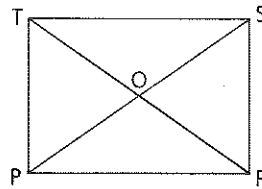
6 a Name $\angle OPR$ in all other possible ways. $\angle RPO$, $\angle RPS$, $\angle SPR$
  b What is the vertex of $\angle TOS$? O
  c How many angles have vertex R? 3
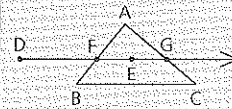 **d** Name $\angle TSP$ in all other possible ways.
  e How many triangles are there in the figure? 8

Problem-Set Notes and Additional Answers, continued

- From the outset, students should be instructed to show clear, organized work. A labeled diagram will also be helpful for many problems.
- Note that problem 7 introduces the idea of a reflection. Remind students that a reflection of a figure is a "mirror image" of the figure. Transformation topics are treated formally in Chapter 13.
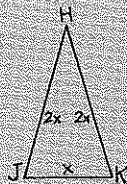
7

9

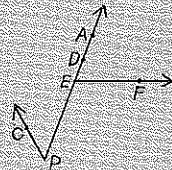**11a** $2x = 15$
$x = 7\frac{1}{2}$
$5x = 37\frac{1}{2}$

b $9x = 63$
$x = 7$
$\overline{HJ} = 4x = 28$

12

13

14 8 △s: △EXA, △EXC, △AXC, △TXC, △TAC, △XET, △EAT, △CTE
**a** △TAC, △TCX, △CTE; $\frac{3}{8} = 37\frac{1}{2}\%$
b △AXC, △TAC; $\frac{2}{8} = 25\%$

T 8

Problem Set A, continued

7 Figure 1 shows the reflection of the letter F over a line. Copy Figure 2 and draw the reflections of the letters P, A, and J over the given line.

Figure 1   Figure 2

8 a A line is made up of __?__. Points
b An angle is the union of two __?__ with a common __?__. Rays; endpoint
9 Draw a number line and label points F, G, H, and J with the coordinates $-4\frac{2}{3}$, 2, 5, and 3.5 respectively. One of these points is the *midpoint* (the halfway point) between two others. Which is it? J

10 Given a rectangle with sides 2.5 cm and 8.6 cm long, find

8.6 cm

2.5 cm
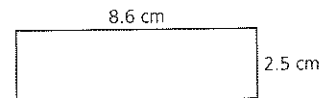
a The rectangle's area 21.5 sq cm
b The rectangle's perimeter (the distance around it) 22.2 cm

Problem Set B

11 a In △HJK, $\overline{HJ}$ is twice as long as $\overline{JK}$ and exactly as long as $\overline{HK}$. If the length of $\overline{HJ}$ is 15, find the perimeter of (the distance around) △HJK. $37\frac{1}{2}$

b If the length of $\overline{HJ}$ were 4x, the length of $\overline{HK}$ were 3x, the length of $\overline{JK}$ were 2x, and the perimeter of △HJK were 63, what would the length of $\overline{HJ}$ be? 28
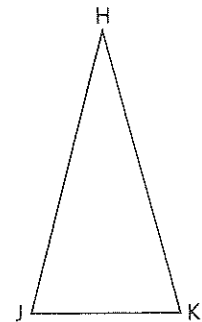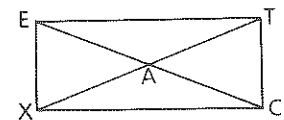
12 Draw a diagram in which $\overline{AB} \cap \overline{CD} = \overline{CB}$.

Problem Set C

13 Draw a diagram in which the intersection of ∠AEF and ∠DPC is $\overrightarrow{ED}$.

14 a What percentage of the triangles in the diagram have $\overline{CT}$ as a side? 37.5%
b What percentage have $\overline{AC}$ as a side? 25%

- There are several problems like Sample Problem 5 in the text. Some are quite difficult, but most are appropriate for all students. The solutions can be approximated with a clock and a protractor, or they can be arrived at algebraically.

Assignment Guide

Basic
1–3, 5–8, 9b, c, 10, 11, 13, 16, 18

Average
1, 2, 4–8, 9b, d, 10, 11, 13–18

Advanced
8, 9b, d, 10, 11, 15–20

Problem-Set Notes and Additional Answers

- The sample problems are similar to the problems in the problem sets. Students should study the sample problems before starting their problem-set assignments.

Solution

a Since $\angle B$ is acute, $m\angle B > 0$ and $m\angle B < 90$ $(0 < m\angle B < 90)$.

b $2x + 14 > 0$ and $2x + 14 < 90$
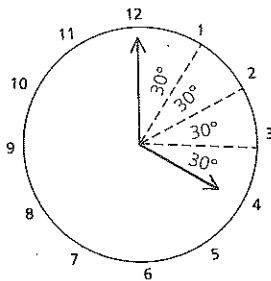$2x > -14$ and $2x < 76$
$x > -7$ and $x < 38$

Thus, $-7 < x < 38$.

Problem 5 Find the angle formed by the hands of a clock at each time.
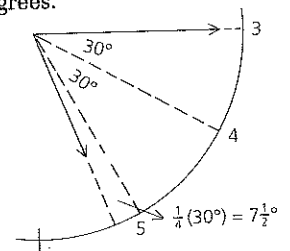
a 4:00

b 5:15

Solution

a Since $360°$ is divided into 12 intervals on a clock, each interval is $30°$. From 12 to 4 there are 4 intervals, so the angle is $4(30°)$, or $120°$.

b Remember that the hour hand is on 5 only when the minute hand is on 12. At 5:15 the hour hand is one fourth of the way from 5 to 6. Since $\frac{1}{4}(30°) = 7\frac{1}{2}°$, the hands form an angle of $60 + 7\frac{1}{2}$, or $67\frac{1}{2}$ degrees.

$\frac{1}{4}(30°) = 7\frac{1}{2}°$
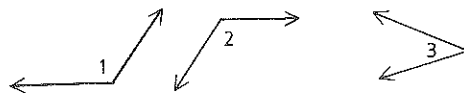
Part Three: Problem Sets

Problem Set A

1 Change each of the following to degrees and minutes.
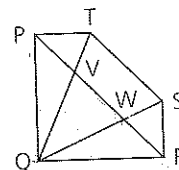**a** $61\frac{2}{3}°$ $61°40'$
b $71.7°$ $71°42'$

2 Change each of the following to degrees.
a $132°30'$ $132\frac{1}{2}°$
b $19°45'$ $19\frac{3}{4}°$

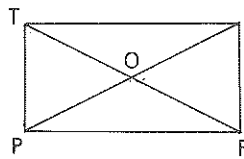**3** Which two of the angles below *appear* to be congruent? $\angle 1$ and $\angle 2$

4 a $\overrightarrow{QV} \cap \overleftrightarrow{TS} = \underline{\ ?\ }$ T
b $\overline{WP} \cap \overline{VR} = \underline{\ ?\ }$ $\overline{VW}$
c $\overrightarrow{WP} \cup \overrightarrow{VR} = \underline{\ ?\ }$ $\overleftrightarrow{PR}$
d $\overrightarrow{SQ} \cup \overrightarrow{SR} = \underline{\ ?\ }$ $\angle QSR$
e How many angles have vertex Q? 6

14 Chapter 1 Introduction to Geometry

5 a Evaluate 49°32'55" + 37°27'15". 87°10"

b Evaluate 123°15' − 40°26'. 82°49'

**6** There is a right angle at each corner of PRST. (Later in the course you will learn that PRST is a rectangle.)

a If ∠TPO = 60°, how large is ∠RPO? 30°

b If ∠PTO = 70°, how large is ∠STO? 20°

c If ∠TOP = 50°, how large is ∠POR? 130°

d Classify ∠TOS as acute, right, or obtuse. Obtuse

7 a Which angle *appears* to have the same measure as ∠1? ∠5

b Which angle *appears* larger, ∠2 or ∠3?   **b** Same size

c Does ∠3 *appear* to be congruent to ∠4 or to ∠5? ∠4
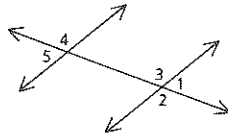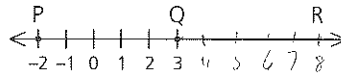
8 If ∠CBD ≅ ∠DBE, find m∠A. 55
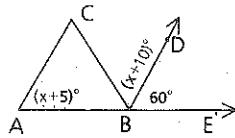
9 Find the measure of the angle formed by the hands of a clock at each time.

a 3:00 90   **b** 4:30 45   **c** 7:20 100   **d** 1:45 $142\frac{1}{2}$
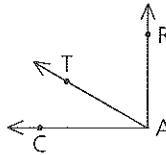
10 a Find PQ.

b If R's coordinate is 7, why is $\overline{PQ} \neq \overline{QR}$?

c What must the coordinate of R be in order for Q to be the midpoint of $\overline{PR}$?
a 5; b PQ ≠ QR; c 8

11 Given: ∠CAR is a right angle.
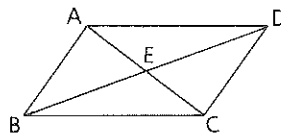m∠CAT = 37°66'10"

Find: m∠RAT
51°53'50"

Problem Set B

12 a How many triangles (△) are in the diagram? 8

b How many angles (∠s) in the figure *appear* to be right? 2

c How many angles in the figure *appear* to be acute? 10

d How many angles in the figure *appear* to be obtuse? 4

e Name the straight angles in the figure. ∠AEC, ∠BED
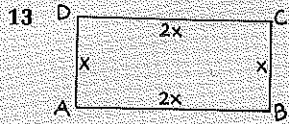
Problem-Set Notes and Additional Answers, continued

◼ The text frequently previews material that students will study later in the course. In problem **8** and throughout the text, students are required to use algebraic skills to solve geometric problems.

12a △ABC, △ADE, △ABD, △BCD, △ABE, △BCE, △ACD, △CDE

b ∠BAE, ∠DCE

c ∠EBA, ∠DCE, ∠EBC, ∠AEB, ∠ECB, ∠EDA, ∠EDC, ∠EAD, ∠ABC, ∠ADC
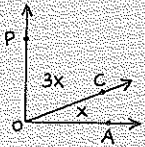
d ∠BCD, ∠BEC, ∠AED, ∠BAD

13

$6x = 66$
$x = 11$
$AB = 2x = 22$

14 $XT = YS$
$\therefore 2r + 5 = 3\frac{1}{2}r + 2$
$3 = 1\frac{1}{2}r$
$2 = r$
$XS = YT$
$\therefore 3m + 7 = 4.2m + 5$
$2 = 1.2m$
$m = 1\frac{2}{3}$

15 $y - 3 = x + 14$
$y = x + 17$

16 $4x = 90$
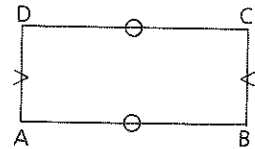$x = 22\frac{1}{2}$
$m\angle POC = 3x = 67\frac{1}{2}$

■ Notice that problem **18** introduces the idea of a rotation. Define rotation informally at this time, by examples. Transformation terms are defined in Section **3.1**.
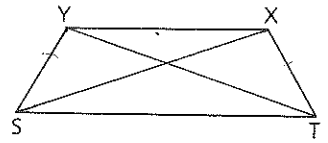
19 $\frac{3x}{2} + 2 = 2x - 29\frac{1}{4}$
$x = 62\frac{1}{2}$
$m\angle ABC = m\angle CBD = 95\frac{3}{4}$
Thus, $\angle ABD$ is not a straight angle.

Problem Set B, *continued*

13 The perimeter of (the distance around) ABCD is 66, and $\overline{DC}$ is twice as long as $\overline{CB}$. How long is $\overline{AB}$? 22
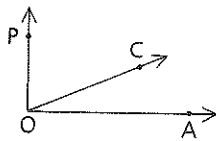

14 Given: $\overline{XS} \cong \overline{YT}$, $\overline{YS} \cong \overline{XT}$,
$XT = 2r + 5$,
$XS = 3m + 7$,
$YS = 3\frac{1}{2}r + 2$,
$YT = 4.2m + 5$
Solve for r and m. $2; \frac{5}{3}$

15 Given: $\angle 1 \cong \angle 2$,
$m\angle 1 = x + 14$,
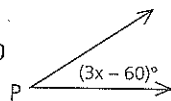$m\angle 2 = y - 3$
Solve for y in terms of x. $y = x + 17$

16 If $\angle POA$ is a right angle and if $\angle POC$ is three times as large as $\angle COA$, find $m\angle POC$. $67\frac{1}{2}$
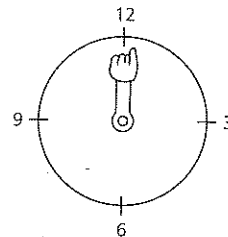

17 $\angle P$ is acute.

a What are the restrictions on $m\angle P$? $0 < m\angle P < 90$

b What are the restrictions on x? $20 < x < 50$
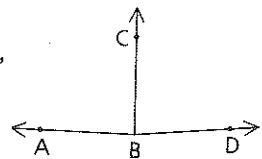

18 The hand is at 12 on the clock.

a If the hand were rotated 90° clockwise, at what number would it point? 3

b If the hand were rotated 150° clockwise and then 30° counterclockwise, at what number would it point? 4
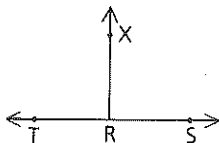

Problem Set C

19 $\angle ABC$ and $\angle CBD$ have the same measure.
If $\angle ABC = \left(\frac{3x}{2} + 2\right)°$ and $\angle CBD = \left(2x - 29\frac{1}{4}\right)°$,
is $\angle ABD$ a straight angle? No

20 Change $15\frac{2}{9}°$ to degrees, minutes, and seconds. $15°13'20''$

16 | Chapter 1   Introduction to Geometry

21 Given: ∠TRS is a straight angle.
∠TRX is a right angle.
m∠TRS = 2x + 5y,
m∠XRS = 3x + 3y

Solve for x and y. −10; 40

22 Maxie and Minnie were taking a stroll in the Arizona desert when a spaceship from Mars landed. A Martian walked up to them and pointed to Figure 1. "XLr8r, XLr8r, XLr8r plus YBcaws, YBcaws," she said. Pointing to Figure 2, she said, "YBcaws plus XLr8r, XLr8r, XLr8r." What might *XLr8r* mean? 10°

Figure 1   90°   Figure 2   60°
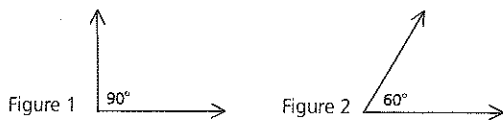
23 Change 72°22′30″ to degrees. $72\frac{3}{8}°$

21 $\begin{cases} 3x + 3y = 90 \\ 2x + 5y = 180 \end{cases}$

22 $\begin{cases} 3x + 2y = 90 \\ 3x + y = 60 \end{cases}$
$x = 10;\ y = 30$

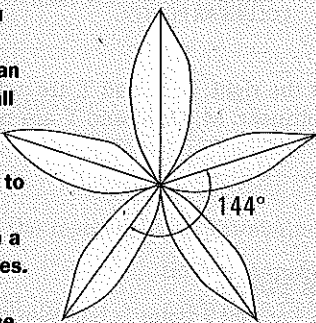## MATHEMATICAL EXCURSION

GEOMETRY IN NATURE
Orange sections and spiraling leaves

If you cut a cross section of an orange, you will see that it is divided into sections that together form a 360° angle. The mathematician Johannes Kepler (1571–1630) thought that all fruits and flowers that grew on trees had five sections or petals. You can see that this isn't true, but the sections of an orange do appear to be the same size and shape.

Flower petals, and leaves on stems grow in a spiral pattern and form angles of consistent sizes.

Phyllotaxis is the distribution of leaves around the stem of a plant. The measure of the angle formed by any two leaves in succession on a stem is equal to the measure of the angle between any two other leaves in succession.

The most common angles seem to be 144° and 135°. A 144° angle is characteristic

for rose leaves. Suppose you draw a series of 144° angles with a protractor, using one of the sides of the last angle you drew for each new angle and proceeding in a clockwise direction. You will see that the angles eventually divide a circle into five equal parts.
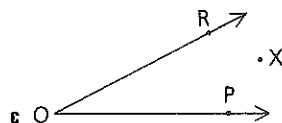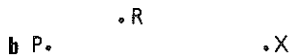
Botanists say that these angles exist because each bud grows where it will have the most room between the bud before it and the one that will come after it.

Section 1.2   Measurement of Segments and Angles | **17**

Part Two: Sample Problems

Problem 1 For each diagram, tell whether X is between P and R. (Answer Yes or No.)

a P ——— X ——————————— R

b P• • R • X

c O ——— R ↗ • X ——— P →

Answers   **a** Yes   **b** No   **c** No

Problem 2 Draw a diagram in which A, B, and C are collinear, A, D, and E are collinear, and B, C, and D are noncollinear.
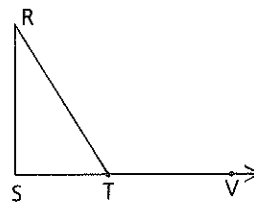
Solution   The diagram at the right shows one of the possible solutions.

Ans.

E ↗ D A —— B —— C →
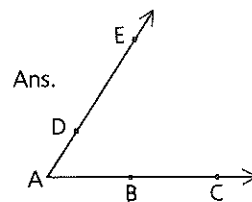
Problem 3   **a** Should we assume that S, T, and V are collinear in the diagram?

b Should we assume that ∠S = 90°?

Answers   **a** Yes

b No

R S —— T —— V →
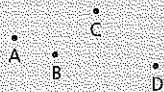
Part Three: Problem Sets

Problem Set A

1 Find m∠ABC (the measure of ∠ABC). 134

C ↗ (3x+8)° (x+4)° A —— B —— D →
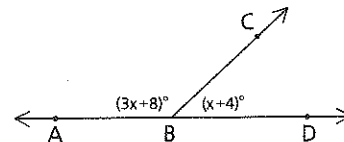
2 Draw a diagram showing four points, no three of which are collinear.
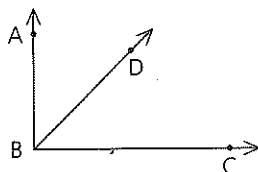

3
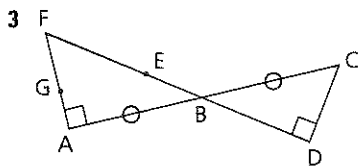
a Name all points collinear with E and F. B and D

b Are G, E, and D collinear? Are F and C collinear? No; yes

c Which two segments do the tick marks indicate are congruent? $\overline{AB}$ and $\overline{BC}$

d Is $\angle A \cong \angle D$? Yes

e Is $\angle F \cong \angle ABF$? Not necessarily

f Where do $\overleftrightarrow{AC}$ and $\overleftrightarrow{FE}$ intersect? B

g $\overline{AG} \cap \overline{GF} = \underline{\quad ? \quad}$ G

h $\overline{AG} \cup \overline{GF} = \underline{\quad ? \quad}$ $\overline{AF}$

i B lies on a ray whose endpoint is E. Name this ray in all possible ways. $\overrightarrow{EB}$, $\overrightarrow{ED}$

j Name all points between F and D. E and B

4
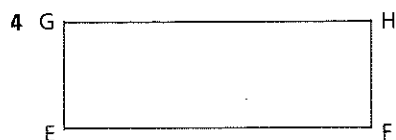
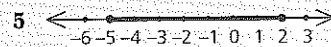**a** Should we assume that angles E, F, G, and H are right angles? Explain your answer. No; right angles cannot be assumed unless they are marked.

b Should we assume that points E, F, and G are noncollinear? Explain your answer. Yes; collinearity of points can be assumed from a diagram.

5 Draw a number line and shade all points that are at or between −5 and 2. Find the length of this shaded segment. 7

6 $\angle ABC$ is a right angle. The ratio of the measures of $\angle ABD$ and $\angle DBC$ is 3 to 2. Find $m\angle ABD$. (Hint: Let $m\angle ABD = 3x$ and $m\angle DBC = 2x$.) 54
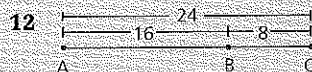

7 Explain how the sum of two acute angles could be

  a Acute   **b** Obtuse   **c** Right

    e.g., 33° and 40°   e.g., 60° and 70°   e.g., 45° and 45°

8 a Change $124\frac{3}{5}°$ to degrees and minutes. 124°36′

   b Change 84°50′ to degrees. $84\frac{5}{6}°$

Section 1.3   Collinearity, Betweenness, and Assumptions   **21**

5

Problem Set A, *continued*

9 $\angle ABD = (3x)°$
$\angle DBC = x°$
Find: $m\angle ABD$ 135
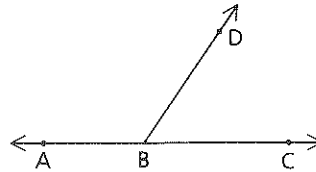
Problem Set B

10 A, K, O, and Y are collinear points. K is between O and A, the
length of $\overline{AO}$ added to the length of $\overline{AY}$ is equal to the length of
$\overline{OY}$ (OA + AY = OY), and A is to the right of O. Draw a diagram
that correctly represents this information.

11 Draw a diagram in which F is between A and E, F is also
between R and S, and A, E, R, and S are noncollinear.

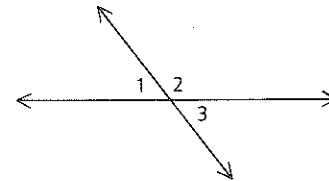**12** If AB = 16, BC = 8, and AC = 24, which point is between the
other two? B

13 a AC must be smaller than what
number? 15

b AC must be larger than what number? 3
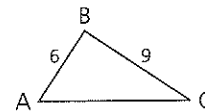
14 Q is between P and R on a number line. P = −8, and R = 4.
a What do we know about the coordinate of Q? −8 < Q < 4
b What do we know about the length PQ + QR? PQ + QR = PR = 12

Problem Set C

15 Given: $m\angle 1 = 2x + 40$,
$m\angle 2 = 2y + 40$,
$m\angle 3 = x + 2y$
Find: $m\angle 1$, $m\angle 2$, and $m\angle 3$
80; 100; 80

16 When Brock Clock was asked what time it was, he said, "Well,
the minute hand is pointing directly at one of the twelve num-
bers on the clock, the hour hand is pointing toward a spot whose
nearest number is at least five greater than the number the
minute hand is pointing toward, the angle formed by the hands
is acute, the sun is shining in the east, and it is not five minutes
past the hour." Wow! What time was it? 11:10 A.M.

17 To the nearest second, what is the first time after 12:00 that the
hour hand and the minute hand of a clock are together? ≈1:05:27

Problem-Set Notes and Additional Answers

- Students should always draw a complete and well-labeled diagram and copy the statement of the problem before starting a proof.
- See *Solution Manual* for answers to problems **1–6**.

Communicating Mathematics

Have students write a paragraph that explains the difference between a definition and a theorem.
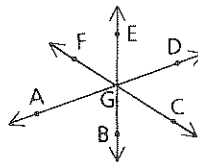
Part Three: Problem Sets

Problem Set A

In problems 1 and 2, copy the figure and the incomplete proof. Then complete the proof by filling in the missing reasons.

1 Given: $\angle 1$ is a right $\angle$.
  $\angle 2$ is a right $\angle$.

Prove: $\angle 1 \cong \angle 2$
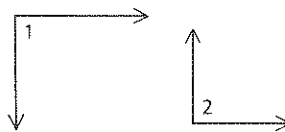
Statements	Reasons
1 $\angle 1$ is a right angle.	1 _____
2 $\angle 2$ is a right angle.	2 _____
3 $\angle 1 \cong \angle 2$	3 _____

2 Given: Diagram as shown
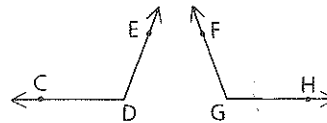
Prove: $\angle AGD \cong \angle EGB$

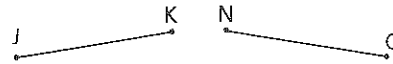| Statements	Reasons
1 Diagram as shown	1 _____
2 $\angle AGD$ is a straight angle.	2 _____
3 $\angle EGB$ is a straight angle.	3 _____
4 $\angle AGD \cong \angle EGB$	4 _____

In problems 3–7, use the two-column form of proof.

3 Given: $\angle A$ is a right angle.
  $\angle B$ is a right angle.

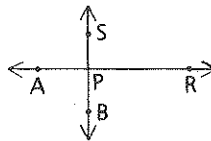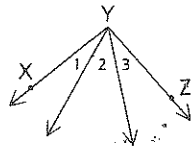Prove: $\angle A \cong \angle B$

4 Given: $\angle CDE = 110°$,
  $\angle FGH = 110°$

Conclusion: $\angle CDE \cong \angle FGH$

5 Given: $JK = 2.5$ cm, $NO = 2.5$ cm

Conclusion: $\overline{JK} \cong \overline{NO}$

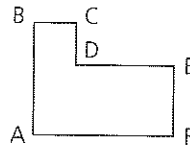**6** Given: Diagram as shown

Prove: $\angle APR \cong \angle SPB$

7 Given: $\angle 1 = 20°$,
$\angle 2 = 40°$,
$\angle 3 = 30°$
Prove: $\angle XYZ$ is a right angle.

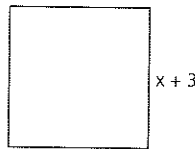**8** Draw the figure ABCDEF.
   a Draw its reflection over $\overleftrightarrow{AF}$.
   b Draw its reflection over $\overleftrightarrow{AB}$.
   c Draw a 90° clockwise rotation of the figure about B.

9 Find the angle formed by the hands of a clock at 11:40.   110°
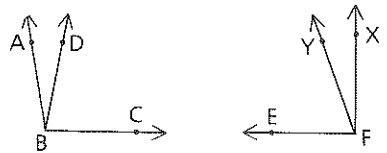
10 The square has a perimeter of 42.
   a Solve for x.   7.5
   b If the perimeter were greater than 42, what would we know about the value of x?
   $x > 7.5$

   $x + 3$

Problem Set B

11 Given: $\angle ABD = 10°$,
$\angle ABC = 100°$,
$\angle EFY = 70°20'$,
$\angle XFY = 19°40'$
Prove: $\angle DBC \cong \angle XFE$

12 Point P has a coordinate of 7 on a number line. If you "slide" P 15 units in the negative direction, what are the coordinates of the resulting point P'? -8
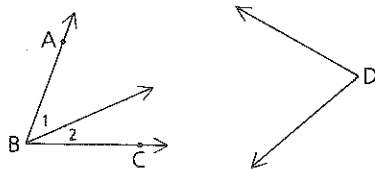
13 a Draw a number line, labeling points A = (−1) and B = (5). Then label point A′, the reflection of A over B.
   b Does AB = BA′?   Yes
   c What do we know about point B?   It is the midpt. of $\overline{AA'}$.

Problem Set C

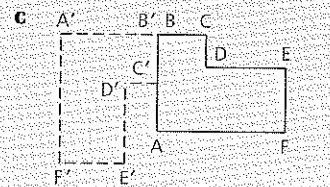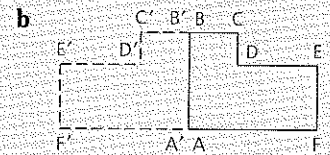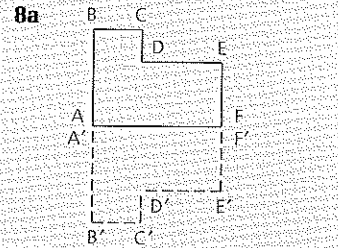**14** The measure of an obtuse angle is 5y + 45. What are the restrictions on y? $9 < y < 27$

15 Given: $\angle 1 = (x + 7)°$,
$\angle 2 = (2x - 3)°$,
$\angle ABC = (x^2)°$,
$\angle D = (5x - 4)°$
Show that $\angle ABC \cong \angle D$.

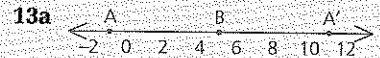*Problem-Set Notes and Additional Answers, continued*

■ See *Solution Manual* for answers to problems **7** and **11**.

8a

b

c

■ Notice that problem **12** introduces the idea of a slide. Remind students that a slide translates a given number of units in a given direction. Transformations are covered formally in Chapter **13**.
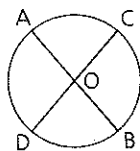
13a

15 $x^2 = x + 7 + 2x - 3$
$x^2 - 3x - 4 = 0$
$(x - 4)(x + 1) = 0$
$x = 4$ or $x = -1$
$m\angle D = 5(4) - 4 = 16$
$m\angle ABC = x^2 = 16$
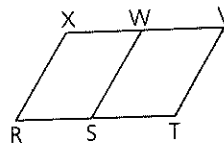$\therefore \angle ABC \cong \angle D$
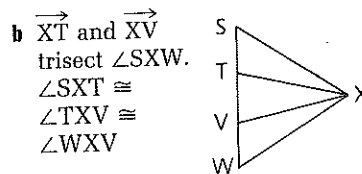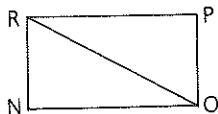
Part Three: Problem Sets

Problem Set A

1 Name the congruent segments.

a O is the midpoint of $\overline{CD}$. $\overline{CO} \cong \overline{DO}$
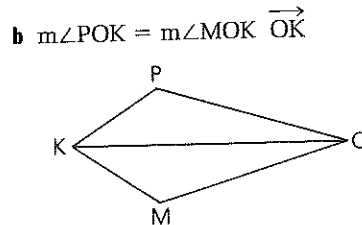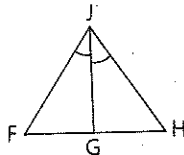
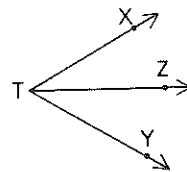**b** $\overline{SW}$ bisects $\overline{XV}$. $\overline{WX} \cong \overline{WV}$

2 Name the congruent angles.

a $\overrightarrow{RO}$ bisects $\angle NRP$. $\angle NRO \cong \angle PRO$

b $\overrightarrow{XT}$ and $\overrightarrow{XV}$ trisect $\angle SXW$.
$\angle SXT \cong$
$\angle TXV \cong$
$\angle WXV$

3 Name the angle bisector.

a $\overrightarrow{JG}$

b $m\angle POK = m\angle MOK$ $\overrightarrow{OK}$

4 Find $\angle XTZ$ if $\overrightarrow{TZ}$ bisects $\angle XTY$ and $\angle XTY$ equals

a 60° 30°

b 48°50′ 24°25′

c $36\frac{1}{2}°$ $18\frac{1}{4}°$

d 85°74′ 43°7′

5 B and C trisect $\overline{AD}$.

a Find the coordinates of B and C. 2; 9

b Find AC. 14

6 Given: OM = x + 8,
MP = 2x − 6,
OP = 44
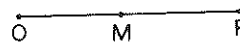
Is M the midpoint of $\overline{OP}$? Yes

7 Given: $m\angle FGJ = 3x − 5$,
$m\angle JGH = x + 27$;
$\overrightarrow{GJ}$ bisects $\angle FGH$.

Find: $m\angle FGJ$ 43

8 B and C are trisection points of $\overline{AD}$, and
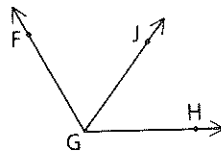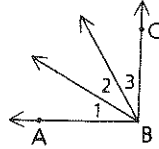AD = 12.

 a Find AB. 4

 b Find AC. 8

 c If AB = x + 3, solve for x. 1

 d If AB = x + 3 and AE = 3x + 6,
 find AE. 9

 e What segment is C the midpoint of? $\overline{BD}$

 f Do $\overrightarrow{EB}$ and $\overrightarrow{EC}$ trisect $\angle AED$? No
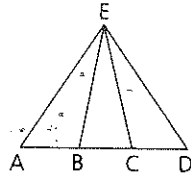
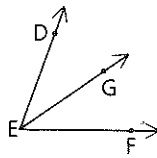**9** Given: $\angle ABC = 90°$,
 $\angle 1 = (2x + 10)°$,
 $\angle 2 = (x + 20)°$,
 $\angle 3 = (3x)°$

Has $\angle ABC$ been trisected? Yes

In problems 10 and 11, reason 2 in each proof is stated incorrectly.
Supply the correct final reason for each problem.

10 Given: $\angle DEG \cong \angle FEG$
 Prove: $\overrightarrow{EG}$ bisects $\angle DEF$.

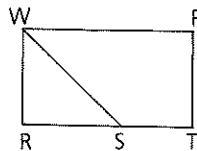| Statements	Reasons
1 $\angle DEG \cong \angle FEG$	1 Given
2 $\overrightarrow{EG}$ bisects $\angle DEF$.	2 If a ray divides an angle into two angles, the ray bisects the angle. *(What is the correct reason?)*

11 Given: $\overline{KJ} \cong \overline{HJ}$
 Prove: J is the midpoint of $\overline{HK}$.
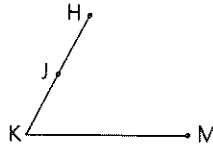
Statements	Reasons
1 $\overline{KJ} \cong \overline{HJ}$	1 Given
2 J is the midpoint of $\overline{HK}$.	2 If a point is the midpoint of a segment, it divides the segment into two congruent segments. *(What is the correct reason?)*

In problems 12–17, write a proof in two-column form.

12 Given: $\overrightarrow{WS}$ bisects $\angle RWP$.
 Prove: $\angle RWS \cong \angle PWS$

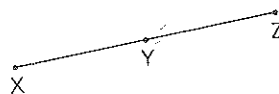**10** If a ray divides an $\angle$ into 2 $\cong \angle$s, the ray bisects the $\angle$.

11 If a point divides a segment into 2 $\cong$ segments, the point is the midpoint of the segment.
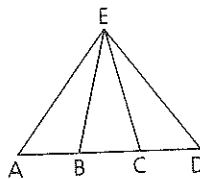
■ See *Solution Manual* for answer to problem **12**.
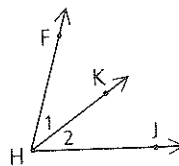
Problem Set A, *continued*

13 Given: $\overline{XY} \cong \overline{YZ}$
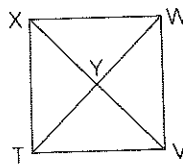Prove: Y is the midpoint of $\overline{XZ}$.

14 Given: $\angle AEB \cong \angle BEC \cong \angle CED$
Conclusion: $\overrightarrow{EB}$ and $\overrightarrow{EC}$ trisect $\angle AED$.

15 Given: $\angle 1 \cong \angle 2$
Conclusion: $\overrightarrow{HK}$ bisects $\angle FHJ$.

16 Given: $\angle TXW$ is a right angle.
$\angle TYV$ is a right angle.
Prove: $\angle TXW \cong \angle TYV$

17 Given: B is the midpoint of $\overline{AC}$.
Prove: $\overline{AB} \cong \overline{BC}$
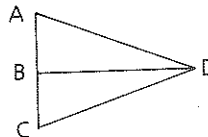
Problem Set B

18 $\overrightarrow{OG}$ and $\overrightarrow{OH}$ divide straight angle FOJ
into three angles whose measures are in
the ratio 4:3:2. Find m$\angle$FOG. 80
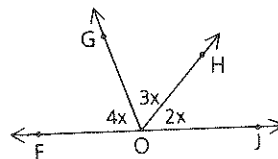
19 Given: $\overleftrightarrow{TP}$ bisects $\overline{VS}$ and $\overline{MR}$.
$\overline{VM} \cong \overline{SR}$,
MP = 9, VT = 6,
perimeter of MRSV = 62
Find: VM 16
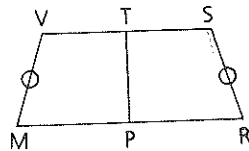
20 $\overrightarrow{PR}$ and $\overrightarrow{PS}$ trisect $\angle QPT$.
 a If m$\angle$RPS = 23°50',
find m$\angle$QPT. 71°30'
 b If m$\angle$QPT = 120°48'30",
find m$\angle$QPS. 80°32'20"

34 | Chapter 1 Introduction to Geometry
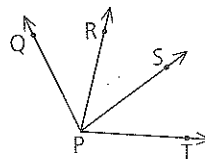
21 **a** Find the value of x. 2
b Is Q the midpoint of $\overline{PR}$? No

P   Q   R
$|\!-\!x^2+3\!-\!|\!-\!4+2x\!-\!|$
$|\!-\!-\!-\!-\!15\!-\!-\!-\!-\!|$

Problem Set C

22 Given: $\overrightarrow{OP}$ and $\overrightarrow{OR}$ trisect $\angle NOS$.

$m\angle NOP = 3x - 4y$,
$m\angle POR = x - y$,
$m\angle ROS = y - 10$
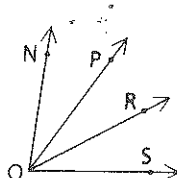
Find: $m\angle ROS$ 10

23 $\angle BAC = 120°$, and points D, E, and F are
in the interior of $\angle BAC$ as shown. $\overrightarrow{AD}$
bisects $\angle BAF$. $\overrightarrow{AE}$ bisects $\angle CAF$. Find
$m\angle DAE$. 60
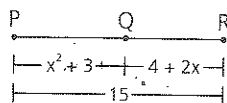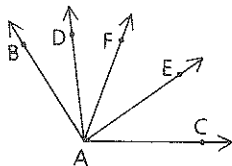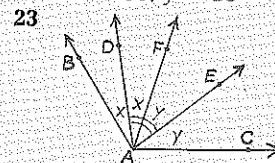
24 The measures of two angles are in the ratio 5:3. The measure of
the larger angle is 30 greater than half the difference of the
angles. Find the measure of each angle. 25 and 15 or 37.5 and 22.5

22 $\begin{cases} 3x - 4y = x - y \\ x - y = y - 10 \end{cases}$
$x = 30; \ y = 20$

23

$x + x + y + y = 120$
$2x + 2y = 120$
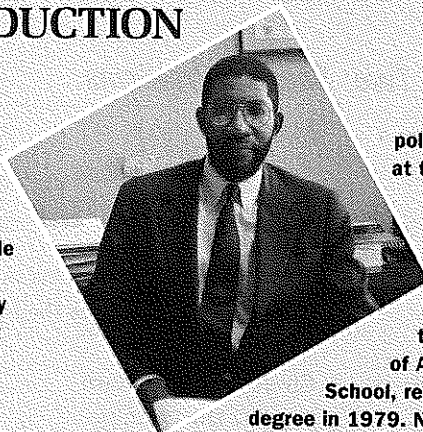$x + y = 60$

24 Let the angles measure 5x
and 3x.
Case 1:
$5x = \frac{1}{2}(5x - 3x) + 30$
$5x = x + 30$
$x = 7.5$
$\therefore m\angle s = 37.5$ and 22.5
Case 2:
$5x = \frac{1}{2}(3x - 5x) + 30$
$5x = -x + 30$
$x = 5$
$\therefore m\angle s = 25$ and 15

THE SCIENCE OF DEDUCTION
Wendell Griffen objects

Deductive reasoning, the cornerstone of
mathematical proof, is responsible for a
huge proportion of the scientific and techno-
logical achievements of the past three hun-
dred years, but it is equally important in a wide
variety of nonmathematical endeavors. Trial
lawyer Wendell Griffen believes that the ability
to use deductive reasoning is one of the most
useful tools a trial lawyer can possess. Why?
"Because a trial is an exercise in reason,"
he explains. Each side in a dispute has dif-
ferent pieces of the puzzle. "When we look
at the evidence we find riddles, and riddles
within those riddles," he says. "Who is at fault?
Which witness is more credible? A trial lawyer's
job is to construct a model of events so that the
judge and jury can reason their way through to
a logical conclusion."

Griffen attended high school in his hometown
of Delight, Arkansas, and earned a degree in
political science
at the University
of Arkansas.
After three
years in the
army he
entered
the University
of Arkansas Law
School, receiving a law
degree in 1979. Now a partner
in the general litigation depart-
ment of a Little Rock law firm, Griffen spends
most of his time defending employees in work-
ers' compensation cases. In his rare free mo-
ments he enjoys reading. Asked to name his
favorite fictional character, he answers without
hesitating, "Sherlock Holmes, naturally!"

Section 1.5   Division of Segments and Angles   **35**

Basic
1–5, 8–12, 14

Average
1–5, 8–12, 14

Advanced
($\frac{1}{2}$ day) Section **1.7** 5, 14
($\frac{1}{2}$ day) Section **1.8** 3–5, 7–10

Problem-Set Notes and Additional Answers

5a i If B, then A.
ii Wet $\Rightarrow$ rain
iii If an angle is acute, then it is a 45° angle.
iv If a point divides a segment into two congruent segments, it is the midpoint of the segment.

b i May be either true or false
ii False
iii False
iv True

6 Possible

7 Not true if it is a fair coin; past outcomes do not influence current outcomes.

8 Correct

9 Not correct, since we do not know that ∠C is acute

10 Not correct, since we were reasoning from the converse

Part Three: Problem Sets

Problem Set A

1 What four elements are found in any deductive structure?
Undefined terms, postulates, definitions, theorems

2 Which of the following kinds of statements are always reversible? a

a Definitions   **b** Theorems   **c** Postulates

3 Answer each question Yes or No.

a Do we prove theorems? Yes   **b** Do we prove definitions? No

4 Tell whether each of the following statements is a theorem or a definition.

a If two angles are right angles, then they are congruent. Theorem

b If a ray bisects an angle, it divides the angle into two congruent angles. Definition

5 a Write the converse of each of the following statements.

   i If A, then B.
   ii Rain $\Rightarrow$ wet
   iii If an angle is a 45° angle, then it is acute.
   iv If a point is the midpoint of a segment, it divides the segment into two congruent segments.

   b Discuss the truth of each of the converses in part **a**.

In problems 6 and 7, comment on the reasoning used.

6 The school colors are orange and black, so I'll wear my orange skirt to the game and everyone will notice me.

7 I've flipped this silver dollar five times and the toss has come up heads each time. Thus, the odds are greater than 50–50 that the toss will come up tails next time.

Problem Set B

In problems 8–12, study each of the arguments and state whether or not the conclusion is deducible. If it is not, comment on the error in the reasoning.

8 If a student at Niles High has room 303 as his or her homeroom, the student is a freshman. Joe Jacobs is a student at Niles High and has room 303 as his homeroom. Therefore, Joe Jacobs is a freshman.

9 If the three angles of a triangle are acute, then the triangle is acute. In triangle ABC, angle A and angle B are acute. Therefore, triangle ABC is acute.

10 All school buses stop at railroad crossings. A vehicle stopped at the Santa Fe railroad crossing. Therefore, that vehicle is a school bus.

11 All cloudy days are depressing. Therefore, since I was depressed on Thursday, Thursday was cloudy.

12 If two angles of a triangle are congruent, then the sides opposite them are congruent. In △ABC, ∠A ≅ ∠B. Therefore, in △ABC, $\overline{BC} \cong \overline{AC}$.

Problem Set C

13 Study the following five statements.

1 Spoof is the set of all purrs.
2 Spoof contains at least two distinct purrs.
3 Every lilt is a set of purrs and contains at least two distinct purrs.
4 If *A* and *B* are any two distinct purrs, there is one and only one lilt that contains them.
5 No lilt contains all the purrs.

a Show that each of the following statements is true.
  i There is at least one lilt.
  ii There are at least three purrs.
  iii There are at least three lilts.

b If the lilt "girt" contains the purr "pil" and the purr "til" and if the lilt "mirt" contains the purr "pil" and the purr "til" then the lilt "girt" is the same as the lilt "mirt" except in one case. What is this case?

14 The Bronx Zoo has a green lizard, a red crocodile, and a purple monkey. They are the only animals of their kind in existence. One violently windy Saturday, their name tags blew off, and their keeper's journal was torn to shreds. Inasmuch as they were to appear on television at 7:30 Sunday morning, the night watchman had to replace their name tags. He managed to piece together the following information from the mangled journal.

1 Wendy cannot get along with the lizard.
2 Katie playfully took a bite out of the monkey's ear one month ago.
3 Wendy never casts a red reflection in the mirror.
4 Jody has the personality of a crocodile, but she isn't one.

Match the animals with their names. Wendy—purple monkey; Katie—red crocodile; Jody—green lizard

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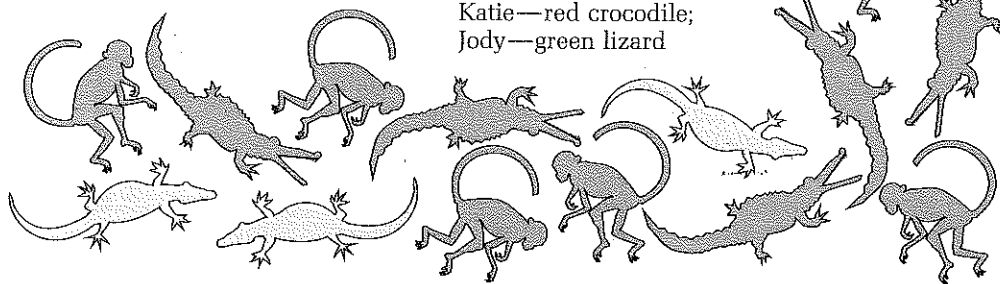
Problem-Set Notes and Additional Answers, continued

11 Not correct, since we were reasoning from the converse.
12 Correct

■ See *Solution Manual* for answer to problem **13a.**

13b If the two purrs "pil" and "til" are the same (not distinct), then more than one lilt could contain them.

14

	Wendy	Katie	Jody
green lizard	O	O	X
red crocodile	O	X	O
purple monkey	X	O	O

(1) $g \Rightarrow e$
(2) $\sim t \Rightarrow w$
(3) $t \Rightarrow \sim e$

To complete the chain of reasoning, we can rearrange the statements and use contrapositives as needed to match symbols. Thus,

(1) $g \Rightarrow e$
(3) $e \Rightarrow \sim t$ ($t \Rightarrow \sim e$ is equivalent to $e \Rightarrow \sim t$.)
(2) $\sim t \Rightarrow w$
$\therefore g \Rightarrow w$ (The symbol $\therefore$ means "therefore.")

Hence, if gremlins grow grapes, then wizards weave willows.

Part Three: Problem Sets

Problem Set A

1 Write each sentence in conditional ("If . . ., then . . .") form.

  a Eighteen-year-olds may vote in federal elections.

  b Opposite angles of a parallelogram are congruent.

2 Write the converse, the inverse, and the contrapositive of each statement. Determine the truth of each of the new statements.

  a If each side of a triangle has a length of 10, then the triangle's perimeter is 30.

  b If an angle is acute, then it has a measure greater than 0 and less than 90.

3 If a conditional statement and its converse are both true, the statement is said to be *biconditional*. Which of these statements is biconditional? a

  a If two angles are congruent, then they have the same measure.

  b If two angles are straight angles, then they are congruent.

4 Draw a Venn diagram for the true conditional statement "If a person lives in Chicago, then the person lives in Illinois." Assuming that each of the following "Given . . ." statements is true, determine the truth of the conclusion.

  a Given: Penny lives in Chicago.
  Conclusion: Penny lives in Illinois. True

  b Given: Benny lives in Illinois.
  Conclusion: Benny lives in Chicago. False

  c Given: Kenny does not live in Chicago.
  Conclusion: Kenny must live in Illinois. False

  d Given: Denny does not live in Illinois.
  Conclusion: Denny lives in Chicago. False

Problem-Set Notes and Additional Answers

1a If a person is 18 years old, then he or she may vote in a federal election.

  b If two angles are opposite angles of a parallelogram, then they are congruent.

2a Converse: If a triangle has a perimeter of 30, then each side has a length of 10; false.
Inverse: If each side length of a triangle is not 10, then the perimeter is not 30; false.
Contrapositive: If the perimeter of a triangle is not 30, then each side length is not 10; true.

  b Converse: If an angle has a measure greater than 0 and less than 90, then the angle is acute; true.
Inverse: If an angle is not acute, then it does not have a measure greater than 0 and less than 90; true.
Contrapositive: If an angle does not have a measure greater than 0 and less than 90, then it is not acute; true.

4
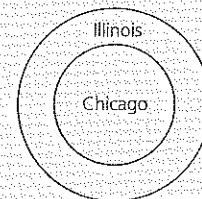
Problem Set A, *continued*

5 Write a concluding statement for each of the following chains of reasoning.

a
$a \Rightarrow b \quad d \Rightarrow f$
$d \Rightarrow \sim c$
$\sim c \Rightarrow a$
$b \Rightarrow f$

b
$p \Rightarrow \sim q \quad s \Rightarrow \sim p$
$r \Rightarrow q$
$s \Rightarrow r$

c If weasels walk wisely, then cougars call their cubs.
If goats go to graze, then horses head for home.
If cougars call their cubs, then goats go to graze.
If bobcats begin to browse, then weasels walk wisely.
If bobcats begin to browse, then horses head for home.

Problem Set B

6 Write the converse, the inverse, and the contrapositive of "If M is the midpoint of $\overline{AB}$, then M, A, and B are collinear." Are these statements true or false?

7 Rewrite the following sentence in conditional form and find its converse, inverse, and contrapositive: "A square is a quadrilateral with four congruent sides."

8 Write the converse, the inverse, and the contrapositive of each statement.

a If a ray bisects an angle, it divides the angle into two congruent angles.

b If two sides of a triangle are congruent, then the angles opposite those sides are congruent.

9 What conclusion can be drawn from the following?
$$\sim c \Rightarrow \sim f \quad g \Rightarrow b \quad p \Rightarrow f \quad c \Rightarrow \sim b \quad p \Rightarrow \sim g$$

Problem Set C

10 What conclusion can be drawn from the following?

If the line is long, then Quincy will go home.
If it is morning, then Quincy will not go home.
If the line is long, then it is morning.
At least one of the given statements is false.

PROBABILITY
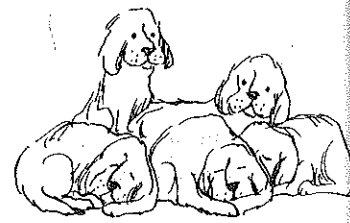
IF YOU HAVE 5 DOGS, 3 WILL BE ASLEEP
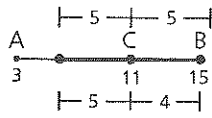
The "winning" region is 9 (not 10) units long. $\overline{AB}$ is 12 units long.

Probability $= \dfrac{9}{12} = \dfrac{3}{4}$

Part Three: Problem Sets

Problem Set A

In problems 1–4, refer to the following diagram.
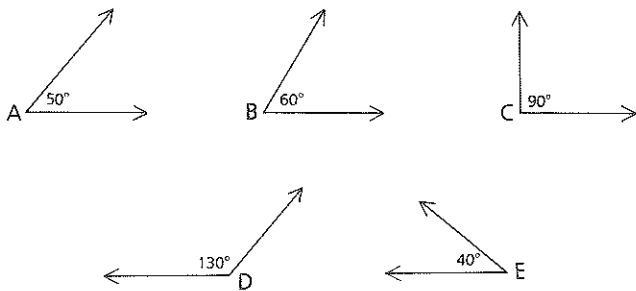
1 If one of the five angles is selected at random, what is the probability that the angle is acute? $\frac{3}{5}$

2 If one of the five angles is selected at random, what is the probability that the angle is right? $\frac{1}{5}$

3 If one of the five angles is selected at random, what is the probability that the angle is obtuse? $\frac{1}{5}$

4 If one of the five angles is selected at random, what is the probability that the angle is straight? 0

5 If a point is randomly chosen on $\overline{PR}$, what is the probability that it is within 2 units of R? $\frac{1}{3}$

Problem Set B

In problems 6–9, use the five angles shown at the beginning of Problem Set A.

6 If two of the five angles are selected at random, what is the probability that both are acute? $\frac{3}{10}$

7 If two of the five angles are selected at random, what is the probability that one of them is obtuse? $\frac{2}{5}$

8 If two of the five angles are selected at random, what is the probability that one is right and the other is obtuse? $\frac{1}{10}$

Assignment Guide

Basic
1–7, 10, 11
Average
1–11, 15
Advanced
1–11, 14, 15

Cooperative Learning

Have each student in a group of four students draw and label two angles. Then have each group pool its angles and write problems similar to those in Problem Set A, where the probabilities for the students' sets of angles will be 0, $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, and 1.

Answers will vary, depending on student drawings.

Problem Set B, *continued*

9 An angle is selected at random from the five angles and then
replaced. A second selection is then made at random. (Thus, the
same angle might be selected twice.) What is the probability that
an acute angle is selected both times? $\frac{9}{25}$

10 If a point B is chosen on $\overline{AC}$, what is the
probability that $-5 \leq B \leq 7$? $\frac{2}{5}$
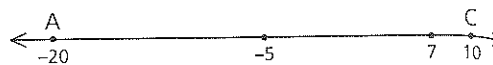
11 The second hand of a clock sweeps continuously around the face
of the clock. What is the probability that at any random moment
the second hand is between 7 and 12? $\frac{5}{12}$

Problem Set C

12 If two of the five angles shown in Problem Set A are selected at
random, what is the probability that neither angle is acute? $\frac{1}{10}$

13 If the four points shown are to be labeled
with the letters A, B, C, and D in such a
way that A and two of the other points
are collinear, in how many different
ways can the diagram be labeled? 18

14 Consider points A, B, C, D, and E as shown.

 a If two of these points are selected at random, what is the
 probability that they are collinear? 1
 b If three of these points are selected at random, what is the
 probability that they are collinear? $\frac{1}{10}$
 c If four of these points are selected at random, what is the
 probability that they are collinear? 0

15 If a point is chosen at random in rectan-
gle ABCD, what is the probability that
 a It is in square SQUA? $\frac{1}{5}$
 b It is not in square SQUA? $\frac{4}{5}$
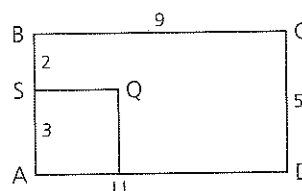
REVIEW PROBLEMS

Problem Set A

1 a Name in all possible ways, the line containing A, R, and D. $\overleftrightarrow{AR}$, $\overrightarrow{AD}$, $\overleftrightarrow{RA}$, $\overleftrightarrow{RD}$, $\overleftrightarrow{DA}$, $\overrightarrow{DR}$

  b Name the sides of ∠ABC. $\overrightarrow{BA}$, $\overrightarrow{BC}$

  c What side do ∠2 and ∠4 have in common? $\overrightarrow{DF}$

  d Name the horizontal ray with endpoint C. $\overrightarrow{CB}$

  e Estimate the sizes of ∠BAD, ∠2, and ∠ABC. 60°; 52°; 120°

  f Are angles FCD and DCE different angles? No

  g Which angle in the figure is ∠B? No angle can be called ∠B since 3 angles have B as a vertex.
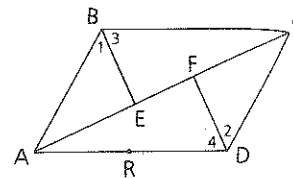
  h $\overrightarrow{EC} \cup \overrightarrow{FA} = \underline{\quad?\quad}$ $\overleftrightarrow{AC}$

  i $\overrightarrow{EC} \cap \overrightarrow{FA} = \underline{\quad?\quad}$ $\overline{EF}$

  j $\overrightarrow{BA} \cup \overrightarrow{BE} = \underline{\quad?\quad}$ ∠1

  k $\overleftrightarrow{AC} \cap \overleftrightarrow{DR} = \underline{\quad?\quad}$ A

  l ∠AFD $\cap \overleftrightarrow{CE} = \underline{\quad?\quad}$ $\overline{FE}$

2 Tell whether each of the following angles *appears* to be acute, right, obtuse, or straight. Which angle's classification can be assumed from the diagram? ∠DEF is straight.

  a ∠H Right

  b ∠G Obtuse

  c ∠GFE Acute

  d ∠DEF Straight

  e ∠HDF Right
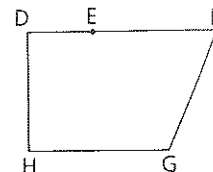
3. a 43°15′17″ + 25°49′18″ = $\underline{\quad?\quad}$ 69°4′35″

  b 90° − 39°17″ = $\underline{\quad?\quad}$ 50°59′43″

4 a Change $46\frac{7}{8}°$ to degrees, minutes, and seconds. 46°52′30″

  b Change 132°6′ to degrees. $132\frac{1}{10}°$

5 a According to the diagram, which two segments are congruent? $\overline{BC} \cong \overline{RT}$

b According to the diagram, which two angles are congruent? $\angle A \cong \angle S$
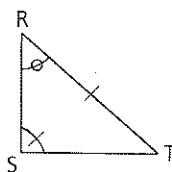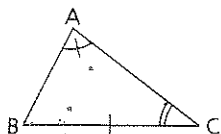
6 a If $\angle EFG$ is obtuse and $\angle HJK$ is right, is $\angle 1 \cong \angle 2$? No
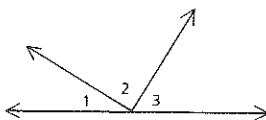
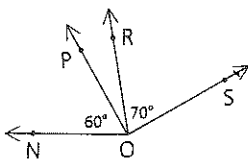**b** If $\angle EFG \cong \angle HJK$, is $\angle 1 \cong \angle 2$? Yes
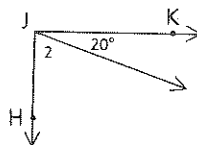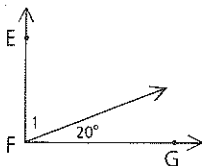
7 If $\angle A \cong \angle B$, find $m\angle A$. 20
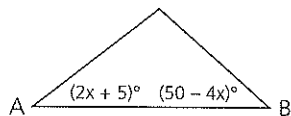
8 The measures of $\angle 1$, $\angle 2$, and $\angle 3$ are in the ratio 1:3:2. Find the measure of each angle. 30; 90; 60

9 Is it possible for both $\angle NOR$ and $\angle POS$ to be right angles? No

In problems 10 and 11, copy each figure and incomplete proof. Then complete the proof by filling in the missing reasons.

10 Given: Diagram as shown

Prove: $\angle EFG \cong \angle HJK$
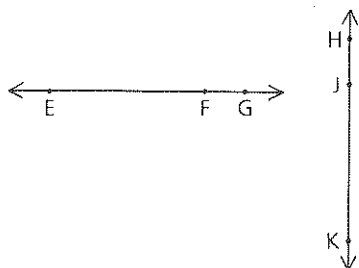
Statements	Reasons
1 Diagram as shown	1 _____
2 $\angle EFG$ is a straight angle	2 _____
3 HJK is a straight angle	3 _____
4 $\angle EFG \cong \angle HJK$	4 _____

Review Problems **55**

Review Problem Set A, *continued*

11 Given: ∠ABC = 130°,
         ∠ABD = 60°
    Prove: ∠DBC is acute.
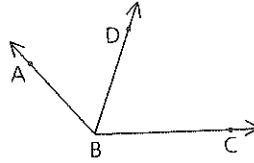
Statements	Reasons
1 ∠ABC = 130°	1 _____
2 ∠ABD = 60°	2 _____
3 ∠DBC = 70°	3 _____
4 ∠DBC is acute	4 _____

In problems 12–15, write each proof in two-column form.

12 Given: ∠X is a right angle.
         ∠Y is a right angle.
    Prove: ∠X ≅ ∠Y
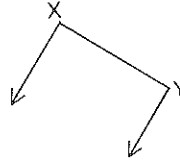
13 Given: $\overline{AB} \cong \overline{BC}$
    Prove: B is the midpoint of $\overline{AC}$.
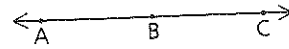
14 Given: $\overrightarrow{DF}$ and $\overrightarrow{DG}$ trisect ∠EDH.
    Conclusion: ∠EDF ≅ ∠FDG ≅ ∠GDH
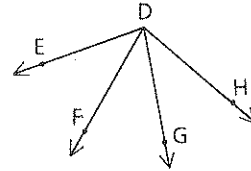
15 Given: $\overrightarrow{TW}$ bisects ∠VTX.
    Prove: ∠VTW ≅ ∠XTW
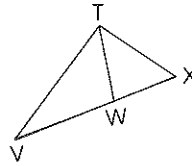
16 Given: ∠1 = 61.6°,
         ∠2 = $61\frac{3}{5}°$
    Prove: ∠1 ≅ ∠2 (Write a paragraph
         proof.)
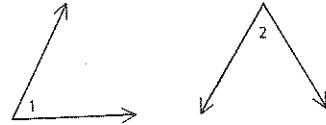
17 a Find coordinate of C (the midpoint
    of $\overline{BD}$). −3
    b If AD = 15, find the coordinate of A. −13

56 | Chapter 1   Introduction to Geometry
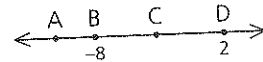
18 Copy the diagram and draw $\triangle A'B'C'$, the reflection of $\triangle ABC$, over ℓ_2. What is the length of A'B'? 5
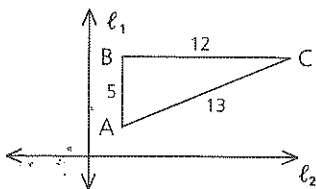
19 a If one of the five labeled points is selected at random, what is the probability that it is a midpoint? $\frac{2}{5}$

b If two of the five points are randomly chosen, what is the probability that both are midpoints? $\frac{1}{10}$
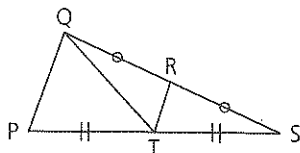
20 Given: $\overrightarrow{OR}$ and $\overrightarrow{OS}$ trisect $\angle TOP$.
$\angle TOP = 40.2°$

Find: $m\angle POR$ 13°24'
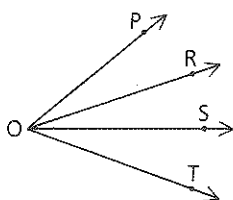
21 Find the angle formed by the hands of a clock at each time.
a 1:00 30°   **b** 11:20 140°   **c** 4:45 $127\frac{1}{2}°$

22 Write the converse, the inverse, and the contrapositive of the statement "If the time is 2:00, then the angle formed by the hands of a clock is acute." Are these statements true or false?

Problem Set B

23 The perimeter of PRST is 10 more than 5(RS). If PR = 26, find RS. 14
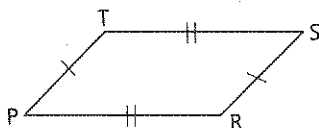
24 Given: $\angle DEG = (x + 3y)°$,
$\angle GEF = (2x + y)°$;
$\angle DEF$ is a right angle.
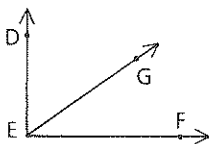
a Solve for y in terms of x. $y = -\frac{3}{4}x + 22\frac{1}{2}$
b If $\angle DEG \cong \angle GEF$, find the values of x and y. 18; 9

25 Given: WY = 25;
The ratio of WX to XY is 3:2.
Find: WX 15
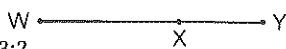
26 The measure of $\angle A$ is 6 greater than twice the measure of $\angle B$. If the angles' sum is 42°, find the measure of $\angle A$. 30

Review Problems | **57**

18
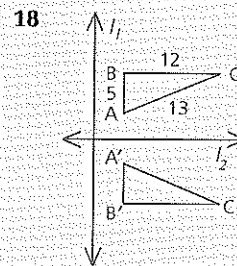
22 Converse: If the angle formed by the hands of a clock is acute, then the time is 2:00; false.
Inverse: If the time is not 2:00, then the angle formed by the hands is not acute; false.
Contrapositive: If the angle formed by the hands of the clock is not acute, then the time is not 2:00; true.

27 Given: ∠ABC is a right angle.
　　　∠DBC = 20°,
　　　∠FEG = 40°,
　　　∠GEH = 30°
Prove: ∠ABD ≅ ∠FEH
　　　(Write a two-column proof.)
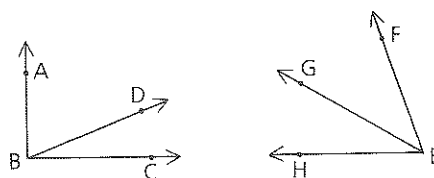
28 Given: ∠OMK = 50°,
　　　∠OKM = (2x)°,
　　　∠OKJ = (5x + 5)°
Conclusion: ∠OKJ ≅ ∠OMN
　　　　　(Write a paragraph proof.)
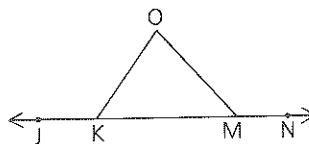
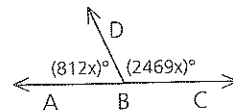**29** Find m∠1.　48°50′44″
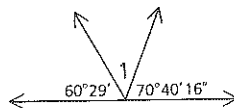
30 The diagram shows Kara's watch. If Kara cannot go home until 4:15, how many degrees must the hour hand travel before she can go home?　20°
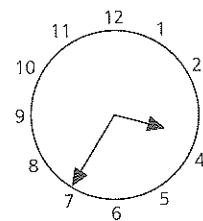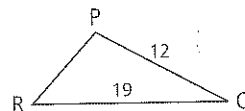
31 Find the measure of ∠ABD to
　a The nearest tenth of a degree　≈44.5°
　b The nearest minute　≈44°33′

32 If a point is chosen at random on $\overline{PR}$, what is the probability that it is within 6 units of Q?　$\frac{1}{3}$

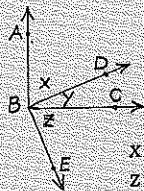**33** The characteristics of a triangle require that PR be between what two values?
7 < PR < 31

34 Given: $\overrightarrow{BD}$ bisects ∠ABC.
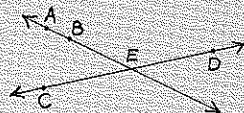　　　m∠ABC = 25
　Solve for x and y.　x = 10; y = $7\frac{1}{2}$
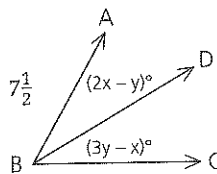
38
x + y = 90
z + y = 90
∴ x + y = z + y
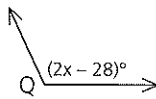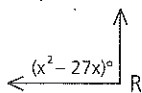x = z

39

35 $\angle Q$ is obtuse.

  a What are the limitations on $m\angle Q$?
  (Write two inequalities.) $90 < m\angle Q < 180$

  b What are the restrictions on x? $59 < x < 104$

  Q $(2x - 28)°$

36 Given that $\angle R$ is a right angle, solve for x.
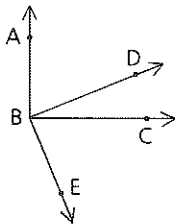 $x = 30$ or $x = -3$

  $(x^2 - 27x)°$ R

37 The perimeter of a rectangle is 20. If the rectangle's length is less than 4, what is the range of possible values of its width? $6 < w < 10$

Problem Set C

38 Given: $\angle ABC$ is a right angle.
  $\angle DBE$ is a right angle.

  Prove: $\angle ABD \cong \angle CBE$
  (Write a paragraph proof.)

39 Draw a diagram in which $\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$ intersect at E but in which $\angle AEC$ does not appear to be congruent to $\angle DEB$.

40 Jennie's teacher told her to select two problems from a list of two C-level problems, five B-level problems, and one A-level problem. If she selected at random, what is the probability that she selected two B-level problems? $\frac{5}{14}$

41 At 3:00 the hands of a clock form an angle of 90°. To the nearest second, at what time will the hands of the clock next form a 90° angle? $\approx$ 3:32:44

Problem Set D

42 If six points are represented on a sheet of paper in such a way that any four of them are noncollinear,

  a What is the maximum number of lines determined? 15

  b What is the minimum number of lines determined? 7

43 To the nearest second, what is the first time after 2:00 that the hands of a clock will form an angle $2\frac{1}{2}$ times as great as the angle formed at 2:00? $\approx$ 2:38:11
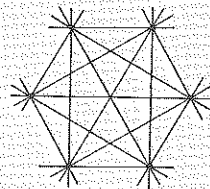
Review Problems | **59**