

CHAPTER

9

Geometry

- 9.1 Angle Relationships**
- 9.2 Parallel and Perpendicular Lines**
- 9.3 Lines of Symmetry**
- 9.4 Triangles and Angles**
- 9.5 Polygons**
- 9.6 Using Angle Relationships**
- 9.7 Solids, Shells, and Skeletons**
- 9.8 Nets of Three-Dimensional Shapes**

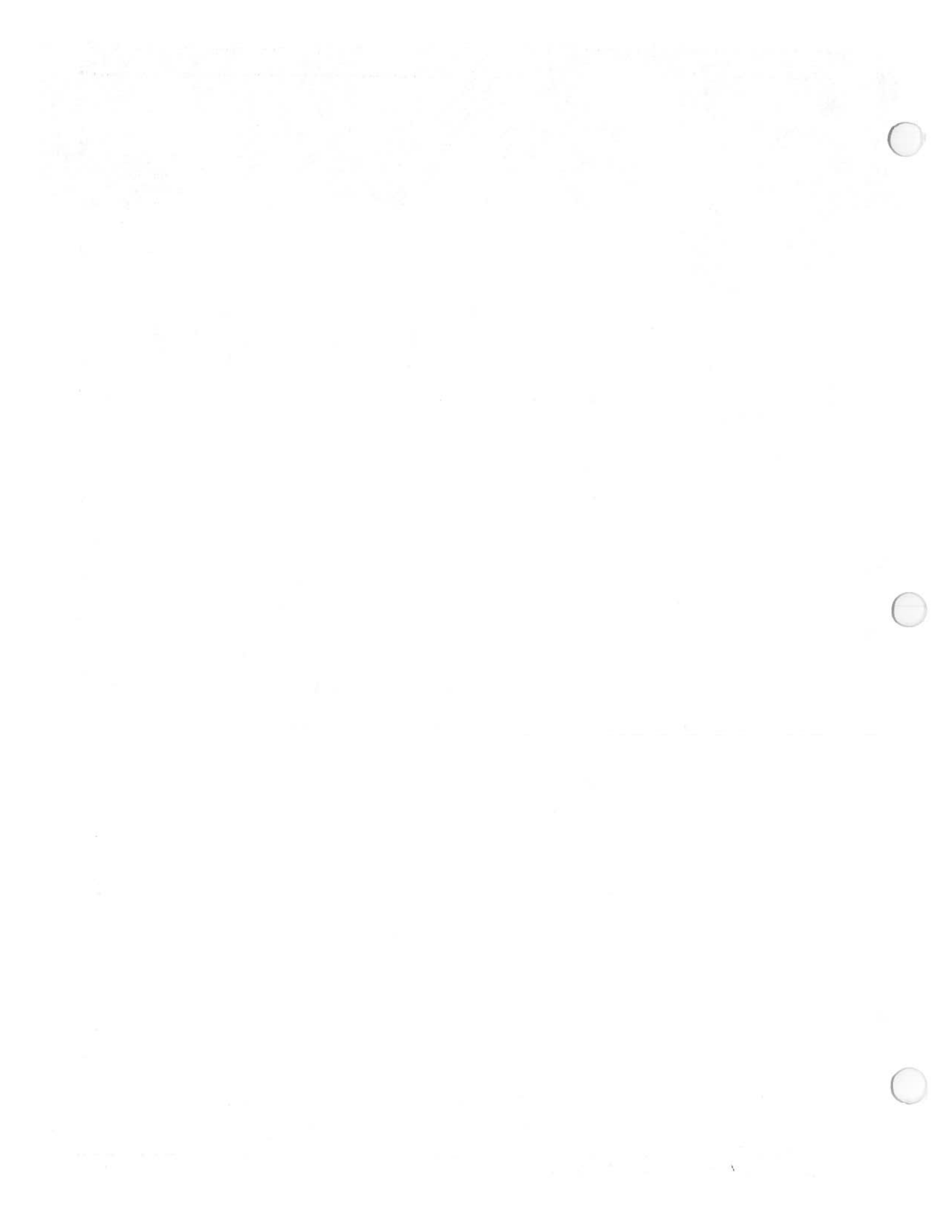
Review

Chapter Check

Problem Solving: Using the Strategies

Answers CHAPTER 9 Geometry





Skill Builder

1. Multiply.

Move the decimal to the right when multiplying by 10, 100, 1000,....

a) $56 \times 10 =$ _____

c) $56 \times 100 =$ _____

e) $56 \times 1000 =$ _____



NO CALCULATOR

b) $56 \times 0.1 =$ _____

d) $56 \times 0.01 =$ _____

f) $56 \times 0.001 =$ _____

Move the decimal to the left when multiplying by 0.1, 0.01, 0.001,....

2. Divide.

Move the decimal to the left when dividing by 10, 100, 1000,....

a) $56 \div 10 =$ _____

c) $56 \div 100 =$ _____

e) $56 \div 1000 =$ _____

b) $56 \div 0.1 =$ _____

d) $56 \div 0.01 =$ _____

f) $56 \div 0.001 =$ _____

Move the decimal to the right when dividing by 0.1, 0.01, 0.001,....

GETTING STARTED



Work together with your classmates, using your **MATHPOWER™** student text, pages 272 and 273.

MATHPOWER™
Pages
272 to 273

Mental Math



NO CALCULATOR

1. Add.

a) $50 + 25 =$ _____

c) $50 + 25 + 25 =$ _____

e) $150 + 25 =$ _____

b) $100 + 25 + 25 =$ _____

d) $50 + 25 + 50 =$ _____

f) $125 + 25 + 50 =$ _____

2. Subtract.

a) $100 - 50 =$ _____

c) $150 - 50 =$ _____

e) $100 - 50 - 25 =$ _____

b) $75 - 25 =$ _____

d) $100 - 25 =$ _____

f) $75 - 50 - 25 =$ _____

3. Multiply.

a) $25 \times 2 =$ _____

c) $25 \times 4 =$ _____

e) $50 \times 3 =$ _____

b) $25 \times 3 =$ _____

d) $50 \times 2 =$ _____

f) $50 \times 4 =$ _____

Rough Work:

Continues on next page. →

4. Divide.

a) $3\overline{)75}$

b) $5\overline{)125}$

c) $8\overline{)200}$

d) $7\overline{)175}$

e) $4\overline{)200}$

f) $10\overline{)250}$

g) $9\overline{)225}$

h) $6\overline{)150}$

Skill Builder

1. Round each number as indicated. Circle the correct answer.

a) 2059 (nearest hundred)

2000 2100

b) 765.39 (nearest tenth)

765.4 765.3

c) 94.1 (nearest ten)

94 90

d) 44.026 (nearest hundredth)

44.03 44.02

e) 98 099 (nearest thousand)

98 000 99 000

f) 0.084 6 (nearest thousandth)

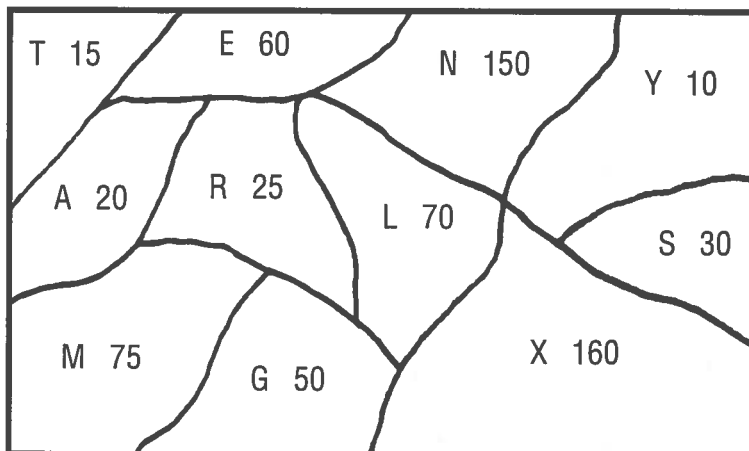
0.084 0.085

2. "What are formed when two lines cross?"

First: Find the missing value () in questions a – f.

Second: Shade in the region that contains the answer to each question.

Third: What word do these letters spell?



a) $70 + \square = 90$

b) $30 + \square = 180$

c) $25 + \square = 75$

d) $15 + \square = 85$

e) $135 + \square = 195$

f) $65 + \square = 95$

Answer: _____

9.1 Angle Relationships

Practice

1. Write the measure of the angle that is **complementary** to each of the following.

Complementary angles add up to 90° .

- a) 30° _____
- b) 80° _____
- c) 50° _____
- d) 35° _____
- e) 25° _____
- f) 70° _____
- g) 56° _____
- h) 8° _____

Rough Work:

a)
$$\begin{array}{r} 90 \\ - 30 \\ \hline \end{array}$$

2. Write the measure of the angle that is **supplementary** to each of the following.

Supplementary angles add up to 180° .

- a) 100° _____
- b) 50° _____
- c) 120° _____
- d) 90° _____
- e) 60° _____
- f) 110° _____
- g) 106° _____
- h) 157° _____

Rough Work:

a)
$$\begin{array}{r} 180 \\ - 100 \\ \hline \end{array}$$

3. Tell whether each pair of angles is **complementary** or **supplementary**.

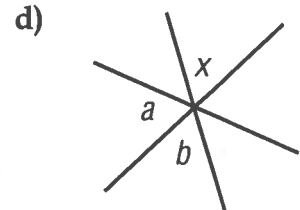
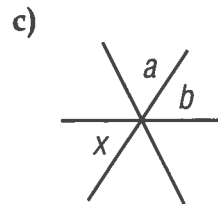
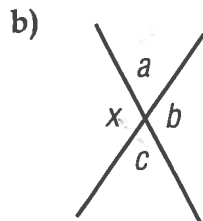
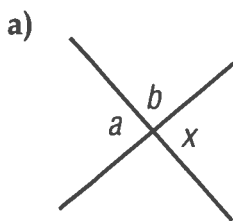
- a) $50^\circ, 40^\circ$ **complementary**
- b) $20^\circ, 160^\circ$ _____
- c) $130^\circ, 50^\circ$ _____
- d) $45^\circ, 45^\circ$ _____
- e) $110^\circ, 70^\circ$ _____
- f) $30^\circ, 60^\circ$ _____

Hint: Do they total 90° or 180° ?

Rough Work:

a)
$$\begin{array}{r} 50 \\ + 40 \\ \hline 90 \end{array}$$

4. Tell which angle is **opposite** to angle x in each diagram.



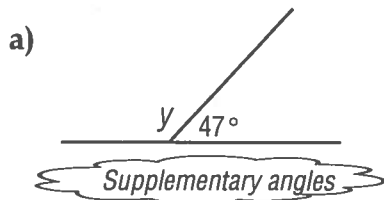
$\angle \square$ is opposite $\angle x$.

5. Find the measure of each unknown angle.

Supplementary angles form a straight line.

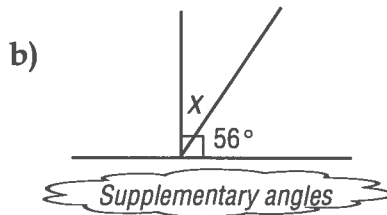
Complementary angles form a right angle.

Opposite angles have equal measures.



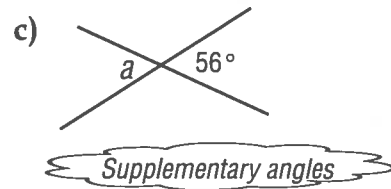
$\angle y = 180^\circ - \square$

$\angle y = \square^\circ$

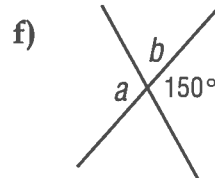
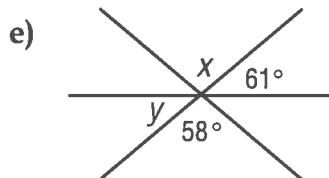
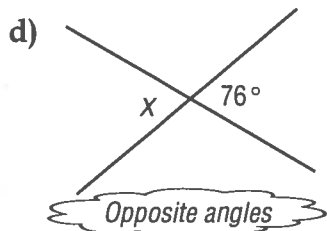


$\angle x = 90^\circ - \square$

$\angle x = \square^\circ$



$\angle a = \square^\circ$

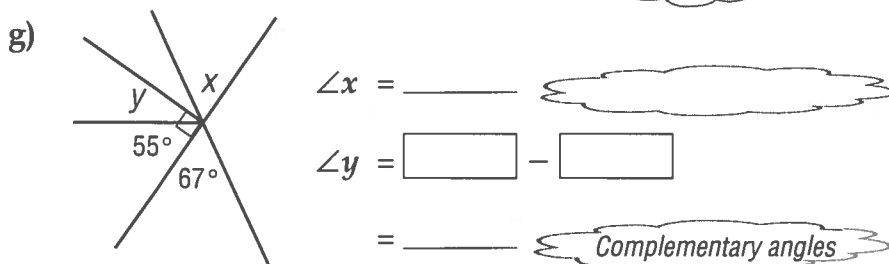


$\angle a = \square$

$\angle b = \square - \square$

$= \square^\circ$

Supplementary angles



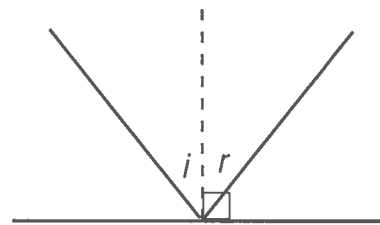
Problems and Applications

6. In the diagram $\angle i = \angle r$. If $i = 35^\circ$, what is the **measure** of

a) r ? _____

b) the complement of i ? _____

$90^\circ - 35^\circ = \square$



7. Use the figure below to name the following angles.

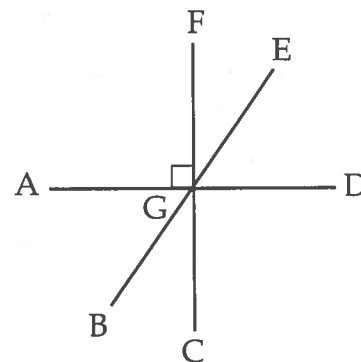
a) four right angles. _____, _____, _____, _____

b) two pairs of complementary angles.

$\angle AGB$ and , _____

c) four pairs of supplementary angles

$\angle AGF$ and , _____, _____



Multiply all the integers from -10 to $+10$.
What is the answer?

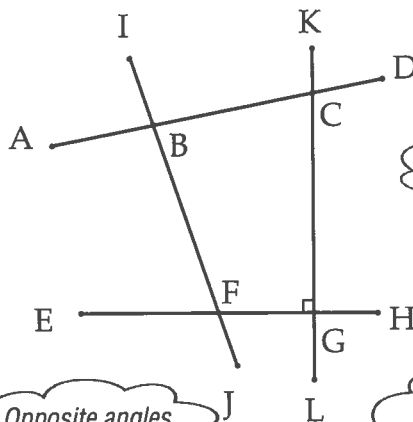
What is the answer when you multiply by zero?

$-10, -9, -8, \dots, +8, +9, +10$

Skill Builder

1. Use the diagram to name the following.

- a) an acute angle _____
- b) an obtuse angle _____
- c) a right angle _____
- d) One pair of supplementary angles.
_____ and _____
- e) One pair of opposite angles.
_____ and _____



Right angle measures 90° .

Acute angle measures less than 90° .

Obtuse angle measures more than 90° .

Opposite angles are across from each other.

Supplementary angles form a straight line.

2. Calculate.

"of" means to multiply.

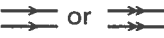

- a) $\frac{1}{2}$ of $200 =$ _____
- b) $\frac{1}{3}$ of $90 =$ _____
- c) $\frac{1}{2}$ of $80 =$ _____
- d) $90 - 10 =$ _____
- e) $180 - 10 =$ _____
- f) $90 - 80 =$ _____

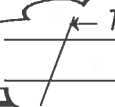


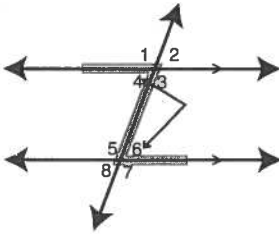
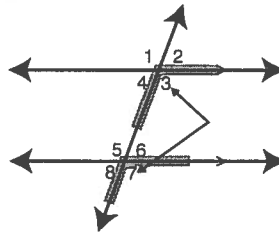
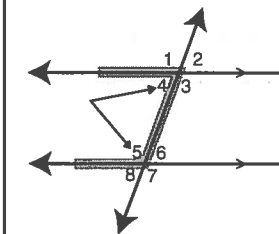
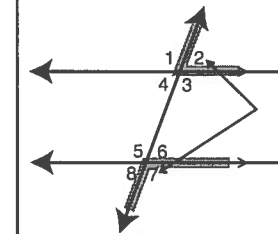
NO CALCULATOR

9.2 Parallel and Perpendicular Lines

Practice

 or 
means parallel.

 Transversal

Alternate Angles	Corresponding Angles	Co-interior Angles or Interior Angles	Exterior Angles
			
<p>Alternate angles are equal.</p> <p>$\angle 4 = \angle 2$</p> <p>$\angle 3 = \underline{\hspace{2cm}}$</p>	<p>Corresponding angles are equal.</p> <p>$\angle 3 = \angle 7$</p> <p>$\angle 2 = \underline{\hspace{2cm}}$</p> <p>$\angle 4 = \underline{\hspace{2cm}}$</p> <p>$\angle 1 = \underline{\hspace{2cm}}$</p>	<p>Co-interior angles are supplementary.</p> <p>$\angle 4 + \angle 5 = 180^\circ$</p> <p>$\angle 3 + \underline{\hspace{1cm}} = 180^\circ$</p>	<p>Exterior angles are supplementary.</p> <p>$\angle 2 + \angle 7 = 180^\circ$</p> <p>$\angle 1 + \underline{\hspace{1cm}} = 180^\circ$</p>

1. Identify each pair of angles as alternate angles, corresponding angles, opposite angles, co-interior angles, or exterior angles.

a) $\angle a$ and $\angle e$ _____

b) $\angle c$ and $\angle f$ _____

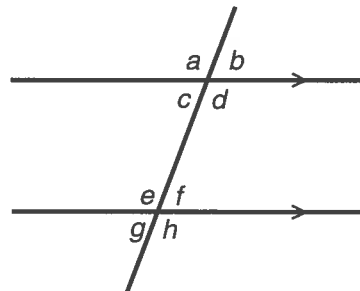
c) $\angle c$ and $\angle e$ _____

d) $\angle e$ and $\angle h$ _____

e) $\angle b$ and $\angle h$ _____

g) $\angle d$ and $\angle e$ _____

i) $\angle b$ and $\angle c$ _____

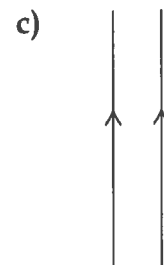
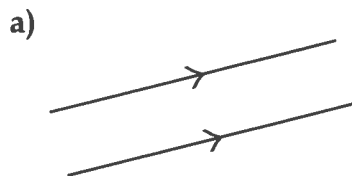


f) $\angle a$ and $\angle g$ _____

h) $\angle c$ and $\angle g$ _____

j) $\angle d$ and $\angle f$ _____

2. Draw a transversal on the following diagrams.



Problems and Applications

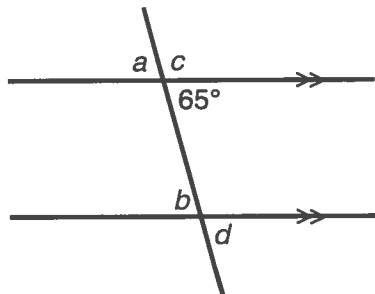
Opposite angles have the same measure.

Corresponding angles have the same measure.

Co-interior angles add up to 180°.

3. Find the missing angle measures. Give a reason for each answer.

a)



$\angle b =$ _____

Why? _____

$\angle c =$ _____

$180^\circ - 65^\circ =$ _____

Why? _____

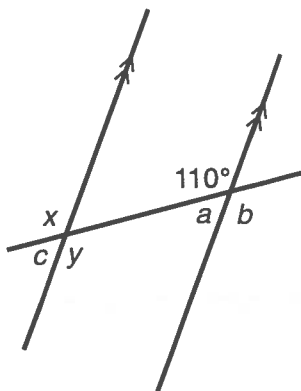
$\angle a =$ _____

Why? Opposite angles are equal.

$\angle d =$ _____

Why? _____

b)



$\angle a =$ _____

Why? _____

$\angle x =$ _____

Why? _____

$\angle b =$ _____

Why? _____

$\angle y =$ _____

Why? _____

$\angle c =$ _____

Why? _____

4. Work with a partner and make a list of sports playing surfaces that have parallel and perpendicular lines on them.

Skill Builder

1. Name each type of angle.

Acute angles are less than 90° .

Right angles are 90° .

a) $47^\circ \rightarrow$ _____

b) $180^\circ \rightarrow$ _____

c) $167^\circ \rightarrow$ _____

d) $231^\circ \rightarrow$ _____

e) $90^\circ \rightarrow$ _____

f) $99^\circ \rightarrow$ _____

g) $356^\circ \rightarrow$ _____

h) $8^\circ \rightarrow$ _____

Straight angles are 180° .

Obtuse angles are more than 90° but less than 180° .

Reflex angles are more than 180° but less than 360° .

2. Find the sum.

Remember to write equivalent fractions with the same denominator.

a) $\frac{1}{2} + \frac{1}{4}$

b) $\frac{1}{4} + \frac{1}{8}$

c) $\frac{1}{3} + \frac{1}{6}$

d) $\frac{2}{3} + \frac{1}{9}$

= $\frac{\square}{4} + \frac{1}{4}$

= $\frac{\square}{8} + \frac{1}{8}$

= _____

= _____



9.3 Lines of Symmetry

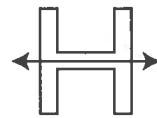
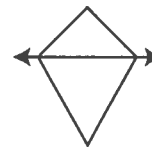
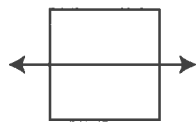
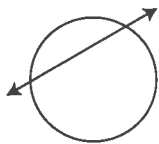
A *line of symmetry* divides the figure into 2 congruent parts.

Congruent Figures — Figures with the same size and shape.



Practice

1. Is the line (\longleftrightarrow) a line of symmetry for each diagram? "Yes" or "No."



a) _____

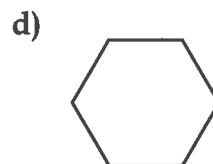
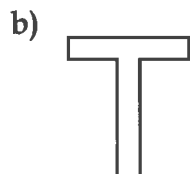
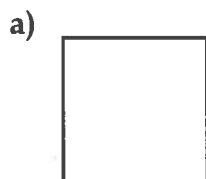
b) _____

c) _____

d) _____

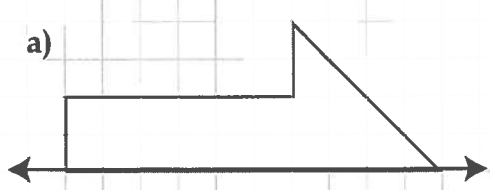
e) _____


2. For each figure draw all the lines of symmetry.

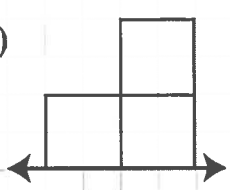


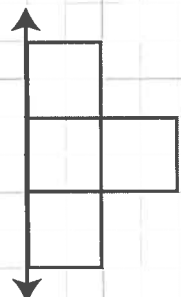
Problems and Applications


3. On the grid below, complete each diagram so that the straight line (\longleftrightarrow) is a line of symmetry.


a) 

b) 

c) 

d) 

e) 

f) 

4. The following symbols are used by meteorologists. Draw the lines of symmetry for each symbol.

a) Snow



b) Fog



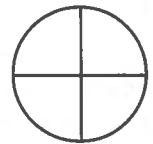
c) Hail/Showers



d) Haze



e) Overcast



Skill Builder

1. Calculate.

a) $2 \times 9 \times 5 = \underline{\hspace{2cm}}$

$2 \times 5 \times 9 = \boxed{\hspace{1cm}} \times 9$

c) $5 \times 8 \times 2 = \underline{\hspace{2cm}}$

e) $2 + 7 + 8 + 3 = \underline{\hspace{2cm}}$

Regroup to find 10s.

b) $5 \times 7 \times 2 = \underline{\hspace{2cm}}$

d) $8 + 4 + 2 = \underline{\hspace{2cm}}$

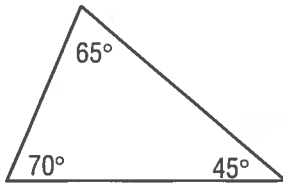
$8 + 2 + 4 = \boxed{\hspace{1cm}} + 4$

f) $22 - 8 - 2 = \underline{\hspace{2cm}}$

Continues on next page. \rightarrow

2. Classify each angle of the triangles below as *acute*, *right*, or *obtuse*.

a)



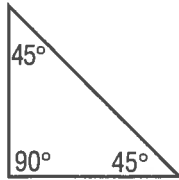
65° → acute

70° → _____

45° → _____

Acute angles are less than 90°.

b)



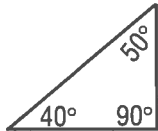
Right angles are 90°.

c)

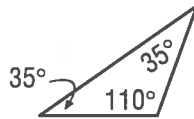


Obtuse angles are more than 90° but less than 180°.

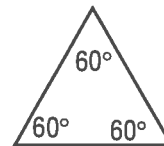
d)



e)



f)

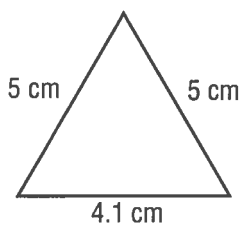


9.4 Triangles and Angles Practice

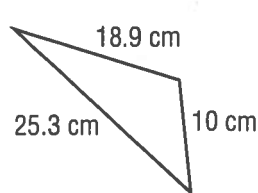
1. Classify each triangle by its sides. Use *scalene*, *isosceles*, or *equilateral*.

<i>scalene triangle</i>	<i>isosceles triangle</i>	<i>equilateral triangle</i>
no equal sides	2 equal sides	3 equal sides

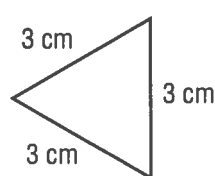
a)



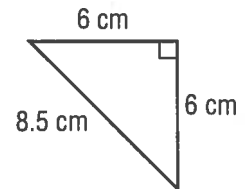
b)






c)

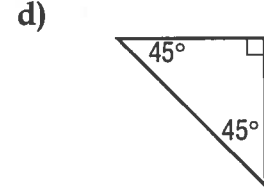
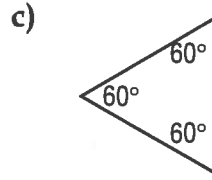
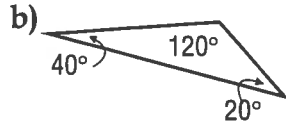
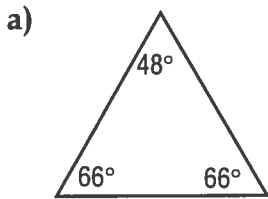


d)



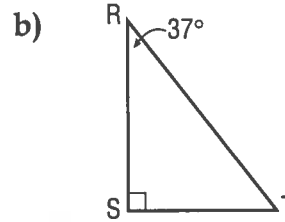
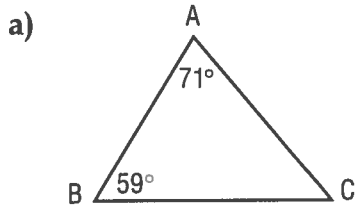
2. Classify each triangle by its angles.
Use *acute*, *obtuse*, or *right*.

<i>acute triangle</i>	<i>right triangle</i>	<i>obtuse triangle</i>
		
3 acute angles	1 right angle	1 obtuse angle



3. Find the measure of the unknown angle.

The three angles of a triangle add up to 180°.



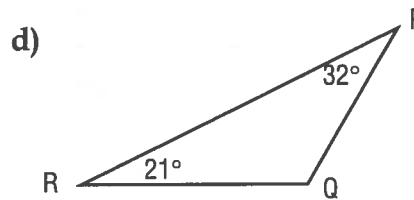
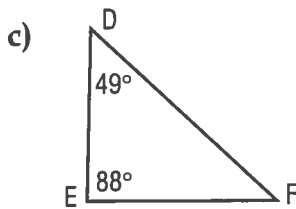
Press \boxed{C} $\boxed{180}$ $\boxed{-}$ $\boxed{71}$
 $\boxed{-}$ $\boxed{59}$ $\boxed{=}$

$$\angle ACB = 180^\circ - 71^\circ - 59^\circ$$

$$= \underline{\hspace{2cm}}$$

$$\angle RTS = \underline{\hspace{2cm}}$$

$$= \underline{\hspace{2cm}}$$



4. Two angles of a triangle are given. Find the third angle.

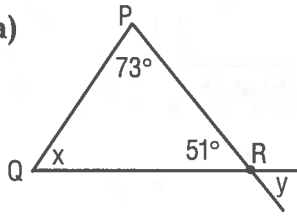
a) $\angle A = 80^\circ, \angle B = 50^\circ, \angle C = \underline{\hspace{2cm}}$

b) $\angle A = 100^\circ, \angle B = 40^\circ, \angle C = \underline{\hspace{2cm}}$

Problems and Applications

5. Calculate the measure of each missing angle.

a)



$$\angle x = 180^\circ - \square - \square$$

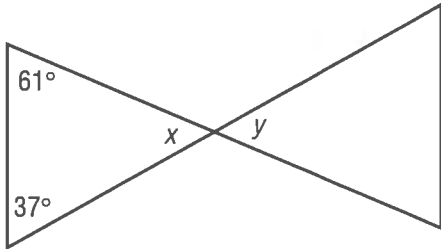
Sum of angles of a $\Delta = 180^\circ$.

$$= \underline{\hspace{2cm}}$$

$$\angle y = \underline{\hspace{2cm}}$$

Opposite angles are equal.

b)



$$\angle x = \underline{\hspace{2cm}}$$

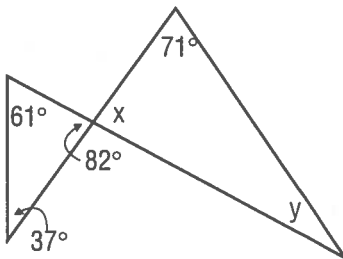
Sum of angles of a $\Delta = 180^\circ$.

$$= \underline{\hspace{2cm}}$$

$$\angle y = \underline{\hspace{2cm}}$$

Opposite angles

c)



$$\angle x = \underline{\hspace{2cm}}$$

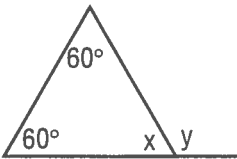
Opposite angles

$$\angle y = \underline{\hspace{2cm}}$$

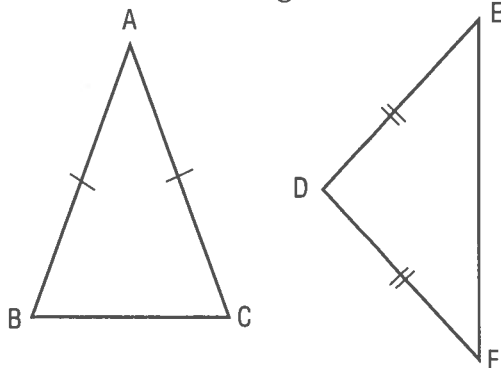
Sum of angles of a $\Delta = 180^\circ$.

$$= \underline{\hspace{2cm}}$$

d.



6. Two isosceles triangles are drawn below.



Use a protractor.



a) Measure the angles.

$$\angle A = \underline{\hspace{2cm}}$$

$$\angle D = \underline{\hspace{2cm}}$$

$$\angle B = \underline{\hspace{2cm}}$$

$$\angle E = \underline{\hspace{2cm}}$$

$$\angle C = \underline{\hspace{2cm}}$$

$$\angle F = \underline{\hspace{2cm}}$$

b) Which angles are equal in each triangle? _____

c) Write a definition of an isosceles triangle. _____

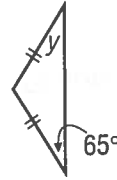
7. Find the missing measures.

a)



$\angle x = \underline{\hspace{2cm}}$

b)



$\angle y = \underline{\hspace{2cm}}$

Skill Builder

Hint: Move the decimal to the left.

1. Calculate.

a) $26 \div 10 = \underline{\hspace{2cm}}$

b) $26 \div 100 = \underline{\hspace{2cm}}$

c) $26 \div 1000 = \underline{\hspace{2cm}}$

d) $3.5 \div 10 = \underline{\hspace{2cm}}$

e) $3.5 \div 100 = \underline{\hspace{2cm}}$

f) $3.5 \div 1000 = \underline{\hspace{2cm}}$

g) $56 \div 1000 = \underline{\hspace{2cm}}$

h) $59.3 \div 100 = \underline{\hspace{2cm}}$

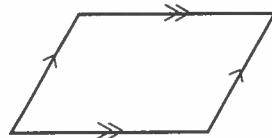
i) $0.5 \div 10 = \underline{\hspace{2cm}}$

2. Match the shape in Column A with the best name in Column B.

Column A

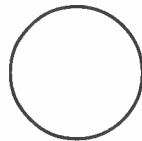
Column B

a)



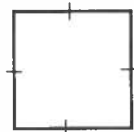
 circle

b)



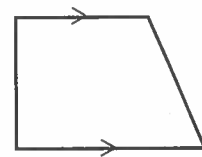
 trapezoid

c)



 triangle

d)



 rhombus

e)



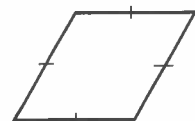
 parallelogram

f)



 square

g)



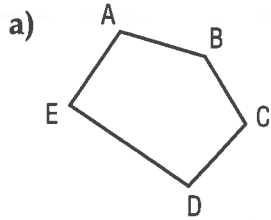
 rectangle

9.5 Polygons

Practice

1. Name each shape and find the sum of the interior angles in each of the following.

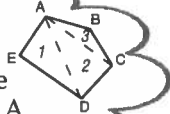
Polygon	Sides
Triangle (\triangle)	3
Quadrilateral (\square)	4
Pentagon (\pentagon)	5
Hexagon (\hexagon)	6
Heptagon (\heptagon)	7
Octagon	8
Nonagon	9
Decagon	10
Dodecagon	12



Name: _____

First:

From point A draw line segments joining point A to all the points.



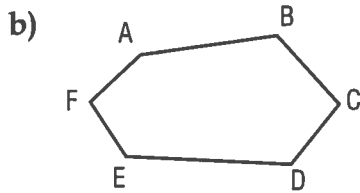
Second: Multiply.

$180^\circ \times$ number of Δ s
= sum of interior angles.

$180^\circ \times \square = \underline{\hspace{2cm}}$



Sentence: *The sum of the interior angles is* $^\circ$.



Name: _____

First:

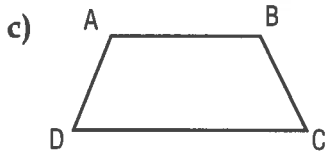
Draw all line segments from point A.

Second:

$180^\circ \times$ number of Δ s
= sum of interior angles.

$180^\circ \times \square = \underline{\hspace{2cm}}$

Sentence: _____

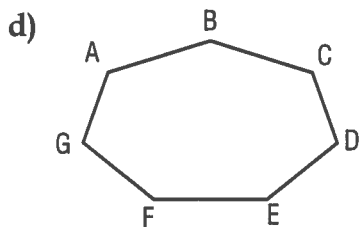


Name: _____

First:

Second:

Sentence: _____



Name: _____

Sentence: _____

2. Use the formula to find the sum of the interior angles of each of the following.

Sum of interior angles of a polygon: $S = 180^\circ \times (n - 2)$

number of sides

a) Quadrilateral

A quadrilateral has 4 sides.

$$\begin{aligned}
 S &= 180 \times (n - 2) \\
 &= 180 \times (4 - 2) \\
 &= 180 \times \underline{\hspace{2cm}} \\
 &= \boxed{\hspace{1cm}}^\circ
 \end{aligned}$$

Formula

Substitute

Do brackets

Multiply

b) Pentagon

$$\begin{aligned}
 S &= 180 \times (n - 2) \\
 &= 180 \times (\square - 2) \\
 &= 180 \times \underline{\hspace{2cm}} \\
 &= \boxed{\hspace{1cm}}^\circ
 \end{aligned}$$

Pentagon has 5 sides.

c) Hexagon

Formula

Substitute

Do brackets

Multiply

d) Heptagon

e) Octagon

Formula

Substitute

Do brackets

Multiply

f) Nonagon

g) Decagon

Formula

Substitute

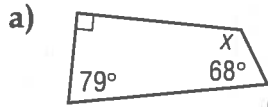
Do brackets

Multiply

Polygon	Sum of the Interior Angles
Triangle	
Quadrilateral	
Pentagon	
Hexagon	720°
Heptagon	
Octagon	
Nonagon	
Decagon	

Complete the chart.

3. Find the measure of the unknown angle in each polygon.



See chart below.

$$\angle x = \boxed{\text{Total number of degrees in the polygon.}} - \boxed{\text{Total of given angles.}}$$

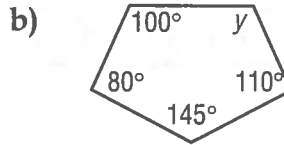
$$= \boxed{}^\circ - (79^\circ + 68^\circ + 90^\circ)$$

$$= \boxed{}^\circ - \boxed{}^\circ$$

$$= \underline{}^\circ$$

Do brackets

Subtract

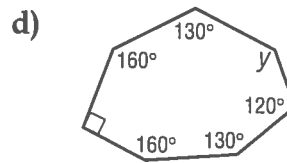
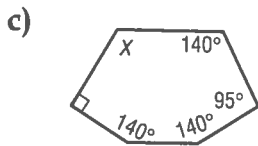


$$\angle y = \boxed{\text{Total number of degrees in the polygon.}} - \boxed{\text{Total of given angles.}}$$

$$= \boxed{} - (\underline{} + \underline{} + \underline{})$$

$$= \boxed{} - \boxed{}$$

$$= \underline{}$$



4. Find the measure of each angle in the following.

Regular Polygon → all the sides are the same length
and
all the angles have the same measure.

Polygon	Sum of the Interior Angles
Triangle	180°
Quadrilateral	360°
Pentagon	540°
Hexagon	720°
Heptagon	900°
Octagon	1080°
Nonagon	1260°
Decagon	1440°

a) regular triangle

$$\text{measure of each angle} = \frac{\text{Sum of interior angles}}{\text{Number of sides}}$$

$$= \frac{180^\circ}{\boxed{}} \quad \text{Substitute}$$

$$= \underline{} \quad \text{Divide}$$

Each angle is $\boxed{}$.

b) regular pentagon

$$\text{measure of each angle} = \frac{\text{Sum of interior angles}}{\text{Number of sides}}$$

$$= \frac{\boxed{}}{\boxed{}}$$

$$= \underline{}$$

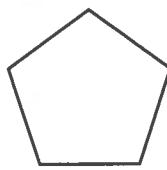
c) regular hexagon

d) regular decagon

Problems and Applications

5. What is the common name for a regular quadrilateral? _____
6. How many lines of symmetry are there in
- a) a regular hexagon? _____ b) a regular pentagon? _____

Hint:
All 4 sides
are equal.



Skill Builder

1. Write each ratio 3 ways.

Example:
\$3 spent to \$10 saved → 3 to 10, 3:10 or $\frac{3}{10}$

- a) \$1 spent to \$4 saved b) \$5 spent to \$7 saved c) \$6 spent to \$5 saved

_____, _____ or _____

2. Evaluate for $t = -3$.

BEDMAS

a) $-5t$

$= -5 \times \boxed{-3}$

Substitute

$=$ _____

Calculate

b) $-t + 3$

c) $4t$

d) $6t + 2$

$=$

Substitute

$=$

Multiply

$=$

Calculate

e) $-2t - 5$

f) $-t + 3$

$= -1() + 3$

$=$ _____ $+ 3$

$=$ _____

g) $2t^2$

Substitute

Exponents

Multiply

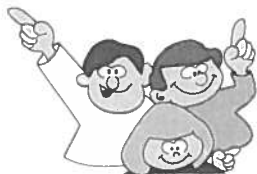
h) $t^2 + 4$

Substitute

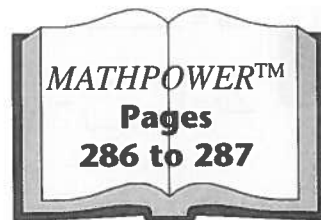
Exponents

Add

LEARNING TOGETHER The Golden Ratio

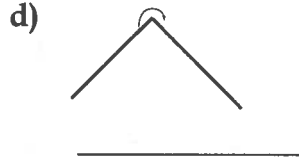
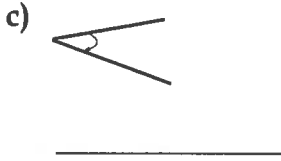
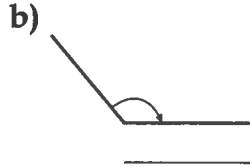
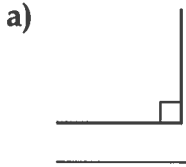
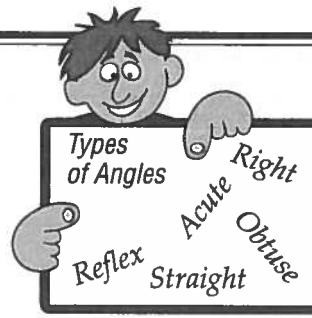


Work together with your classmates, using your MATHPOWER™ student text, pages 286 and 287.



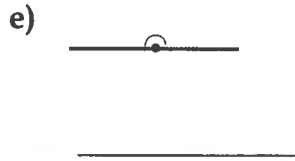
Skill Builder

1. Classify each angle.

Types of Angles

- Right
- Acute
- Obtuse
- Straight
- Reflex



2. Subtract.

a)
$$\begin{array}{r} 180 \\ - 25 \\ \hline \end{array}$$

b)
$$\begin{array}{r} 180 \\ - 62 \\ \hline \end{array}$$

c)
$$\begin{array}{r} 90 \\ - 46 \\ \hline \end{array}$$

d)
$$\begin{array}{r} 90 \\ - 71 \\ \hline \end{array}$$

e)
$$\begin{array}{r} 180 \\ - 110 \\ \hline \end{array}$$

f)
$$\begin{array}{r} 90 \\ - 23 \\ \hline \end{array}$$

g)
$$\begin{array}{r} 180 \\ - 135 \\ \hline \end{array}$$

h)
$$\begin{array}{r} 90 \\ - 34 \\ \hline \end{array}$$

i)
$$\begin{array}{r} 180 \\ - 87 \\ \hline \end{array}$$

j)
$$\begin{array}{r} 90 \\ - 7 \\ \hline \end{array}$$



9.6 Using Angle Relationships

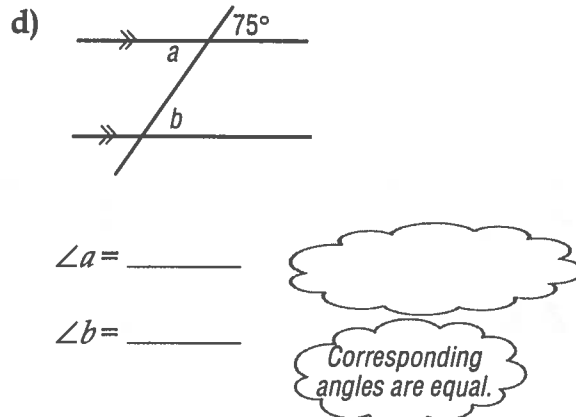
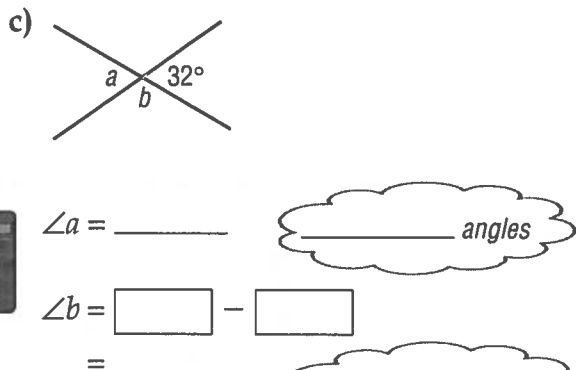
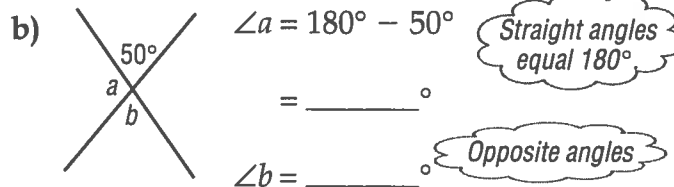
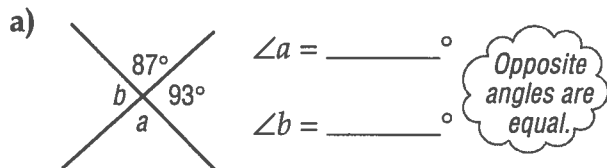
Practice

1. Find the unknown angle measures.

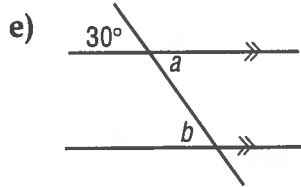
Equal angles

- opposite angles
- corresponding angles
- alternate angles

The 3 angles in a triangle add up to 180°.

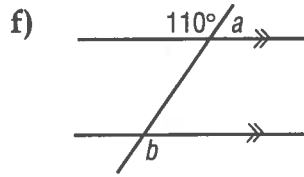


Find the unknown angle measures.



$\angle a =$ _____

$\angle b =$ _____



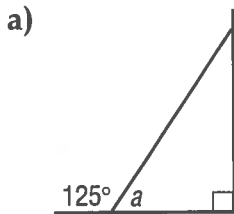
$\angle a =$ _____

$=$ _____

$\angle b =$ _____

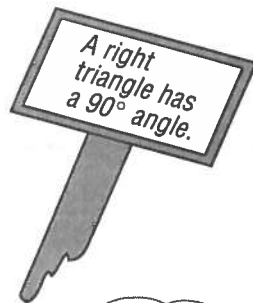
Exterior angles are equal.

2. Find the measures of the missing angles in the triangles below.

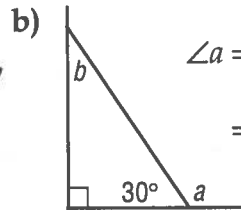


$\angle a =$ _____

$=$ _____



Straight angles are 180°.



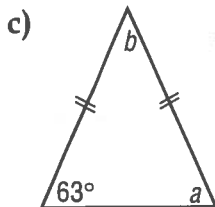
$\angle a =$ _____

$=$ _____

$\angle b = 180^\circ - \square - \square$

$=$ _____

Sum of angles of a $\Delta = \square$

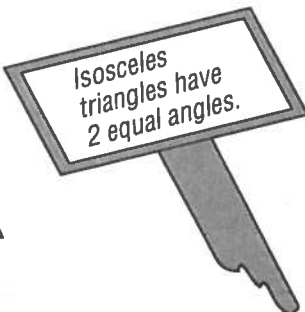


$\angle a =$ _____

$\angle a =$ _____

$\angle b =$ _____

$=$ _____

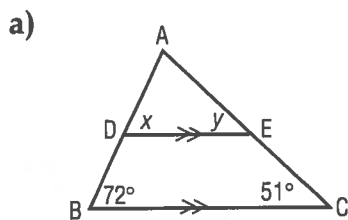


Isosceles triangles have 2 equal angles.

Sum of angles of a $\Delta = 180^\circ$.

Problems and Applications

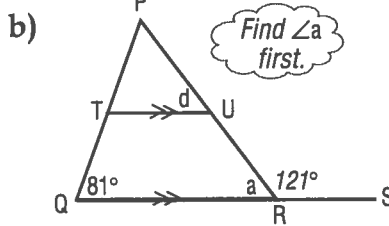
3. Find the unknown angle measures.



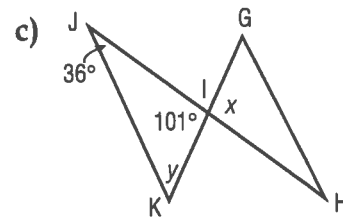
$\angle x =$ _____

$\angle y =$ _____

Corresponding angles



Find $\angle a$ first.





1. Use a calculator to complete the following calculations.

$$19^2 = \underline{\hspace{2cm}}$$

$$199^2 = \underline{\hspace{2cm}}$$

$$1999^2 = \underline{\hspace{2cm}}$$

$$19\,999^2 = \underline{\hspace{2cm}}$$



Press \boxed{C} $\boxed{19}$ $\boxed{\times^2}$ $\boxed{=}$



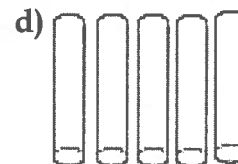
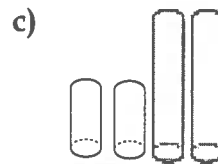
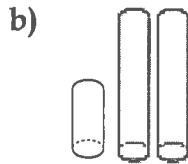
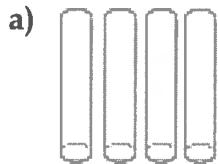
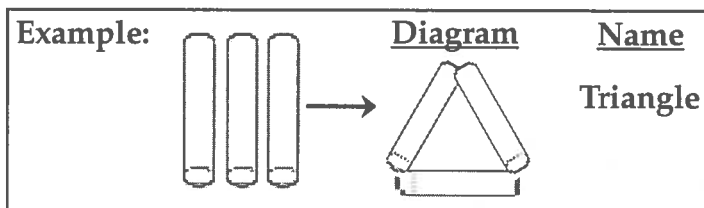
NO CALCULATOR

2. Calculate. *Use the above pattern.*

$$199\,999^2 = \underline{\hspace{2cm}}$$

Skill Builder

1. What polygon can be made with these straws? Use each straw only once.



2. Calculate.

a)
$$\begin{array}{r} 25 \\ \times 3 \\ \hline \end{array}$$

b)
$$\begin{array}{r} 14 \\ + 8 \\ \hline \end{array}$$

c)
$$\begin{array}{r} 23 \\ - 9 \\ \hline \end{array}$$

d)
$$\begin{array}{r} 100 \\ \times 10 \\ \hline \end{array}$$

e)
$$\begin{array}{r} 29 \\ + 11 \\ \hline \end{array}$$

f)
$$2 \overline{)26}$$

g)
$$7 \overline{)70}$$

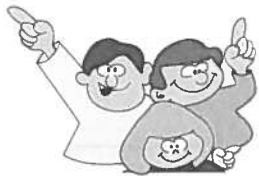
h)
$$\begin{array}{r} 56 \\ - 16 \\ \hline \end{array}$$

i)
$$\begin{array}{r} 1000 \\ - 10 \\ \hline \end{array}$$

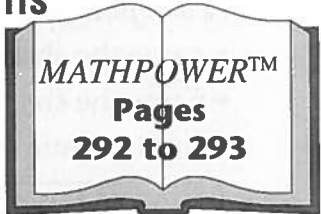
j)
$$\begin{array}{r} 1000 \\ - 100 \\ \hline \end{array}$$



NO CALCULATOR

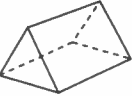

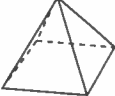
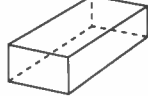



Work together with your classmates, using your *MATHPOWER™* student text, pages 292 and 293.



Skill Builder

1. Match each shape with its name.

Shape →	a) 	b) 	c) 	d) 	e) 
Name →	<u> </u> square pyramid	<u> </u> rectangular prism	<u> </u> triangular pyramid	<u> </u> cube	<u> </u> triangular prism

2. Estimate.

First, round each number.

a) $423 \div 42$

b) $282 \div 74$

c) $523 \div 49$

d) $829 \div 233$

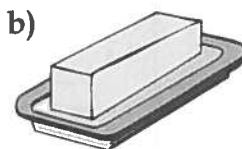
e) $371 \div 7$

f) $630 \div 8$

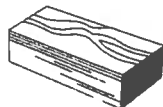

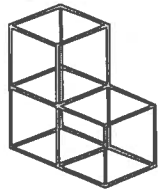
9.7 Solids, Shells, and Skeletons

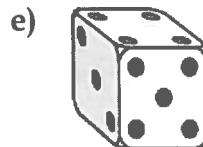
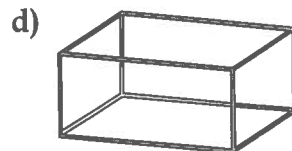
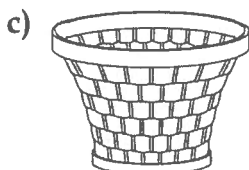
Practice

1. Classify each object as a solid, a shell, or a skeleton.









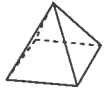

Examples:

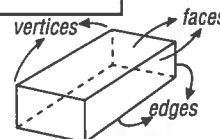
		
Solid	Shell	Skeleton



2. For each polyhedron,


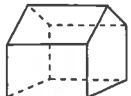

- name the shape of each base,
- name the shape of each face, and
- state the number of each shape of face.

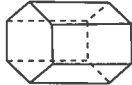


Polyhedron	Base	Faces	
		Diagram	Number of each shape
a)  <i>hexagonal prism</i>	hexagon	 →  →	2 hexagons 6 rectangles
b)  <i>cube</i>			
c)  <i>triangular prism</i>			
d)  <i>pentagonal pyramid</i>			
e)  <i>square pyramid</i>			
f)  <i>triangular pyramid</i>			



Problems and Applications

3. Complete the chart for each polyhedron.

Polyhedron	Number of Faces <i>Face - a plane surface.</i>	Number of Edges <i>Edge - where 2 faces meet.</i>	Number of Vertices <i>Vertices - a point where edges meet.</i>
a)  <i>cube</i>			
b)  <i>pentagonal prism</i>			
c)  <i>triangular prism</i>			

Polyhedron	Number of Faces <i>Face - a plane surface.</i>	Number of Edges <i>Edge - where 2 faces meet.</i>	Number of Vertices <i>Vertices - a point where edges meet.</i>
d)  <i>hexagonal prism</i>			
e)  <i>square pyramid</i>			
f)  <i>triangular pyramid</i>			

4. Write a short paragraph about Leonhard Euler.

Use the Internet or an encyclopedia.

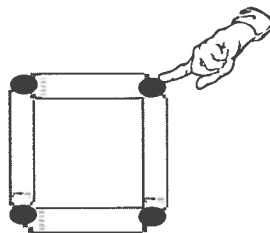
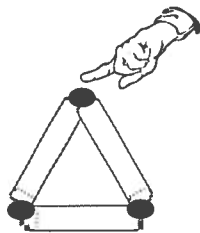


5. Work in a group to do the following questions.



a) Form a **triangle** and a **square** using straws and pipe cleaners.

Using your finger, push down gently on a vertex of the triangle and a vertex of the square.

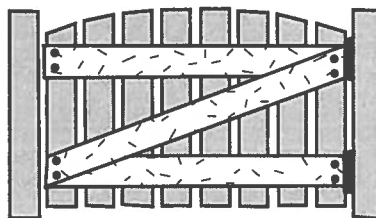


What happens to the shape of each polygon?

triangle → _____

square → _____

b) The triangle is a rigid figure that is used to help make objects strong. Describe how it is used in each of the following.



c) Name 2 other situations where the triangle is used to make an object strong.

d) Use straws and pipe cleaners to construct each polyhedron.

- pentagonal prism
- cube
- rectangular prism
- triangular prism
- square pyramid
- hexagonal prism

Which polyhedra above are rigid (firm)?

Test each one by pressing gently on a vertex.

Skill Builder

1. Complete the chart.

Polyhedron	Name of Face Shape(s)	Number of Each Shape
a) triangular prism	_____	→ <input type="text"/>
	_____	→ <input type="text"/>
b) cube	_____	→ <input type="text"/>
c) triangular pyramid	_____	→ <input type="text"/>
d) pentagonal prism	_____	→ <input type="text"/>
	_____	→ <input type="text"/>

Hint:
Look on page 408 for diagrams.

2. Calculate.

- a) $120 - 100 =$ _____ b) $90 + 10 =$ _____ c) $945 + 1000 =$ _____
 d) $90 - 10 =$ _____ e) $200 - 1 =$ _____ f) $1000 - 1000 =$ _____
 g) $89 + 1 =$ _____ h) $493 + 100 =$ _____ i) $250 - 100 =$ _____



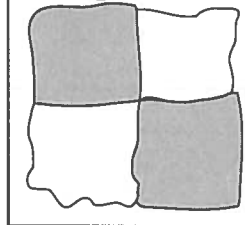
NO CALCULATOR

Math



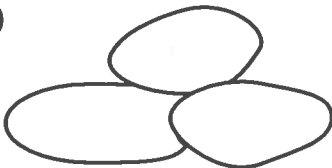
To colour a map correctly, you must use different colours for any two countries that share a border.

Example:

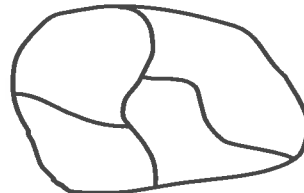


1. Colour each map.

a)

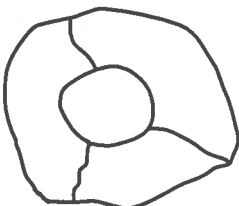


b)

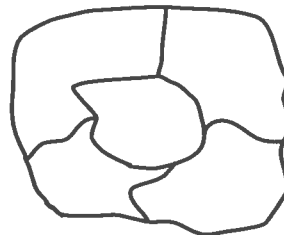


2. Use 4 colours to colour each map.

a)

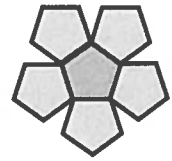


b)


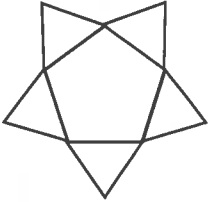
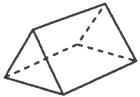
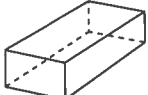
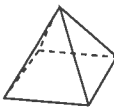


9.8 Nets of Three-Dimensional Shapes

Practice



1. Working with a partner, use a building set whose pieces hinge together, or cut shapes from heavy cardboard to help you complete the chart.

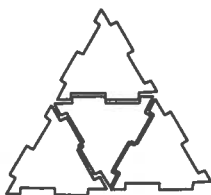
Polyhedron	Shape of Base	Number and Shape of Faces	Draw a Net.
a)  <i>pentagonal pyramid</i>	pentagon	pentagon → 1 triangle → 5	
b)  <i>triangular prism</i>	_____		
c)  <i>rectangular prism</i>	_____		
d)  <i>square pyramid</i>	_____		

Problems and Applications

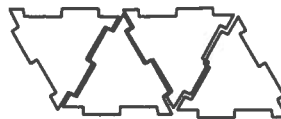
2. If you cut out and folded your nets in question 1, is the result a solid, a shell, or a skeleton? Explain.

3. What polyhedron can be formed from each net?

a)



b)



4. The juice container is a **cylinder**. Draw a net of the juice container.

Hint:
Cut a juice can apart.

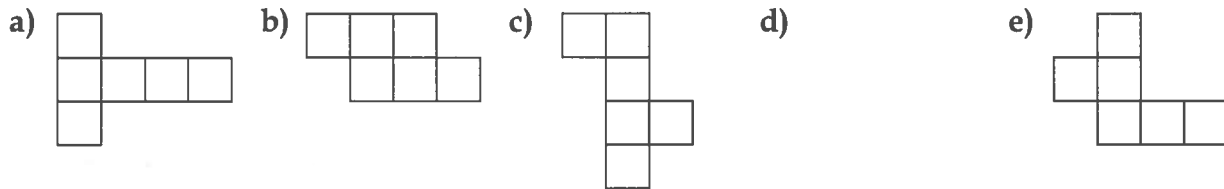


5. The gift box is in the shape of a **cone**. The cone is cut open and laid flat. Draw the net.

First:
Make a cone.

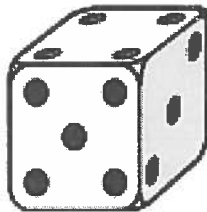
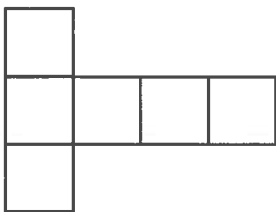


6. Below are patterns made from 6 squares. Tell which ones show a pattern for a net of a **cube**.

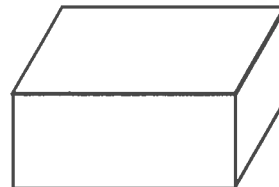
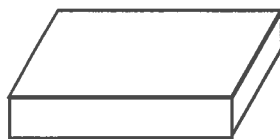
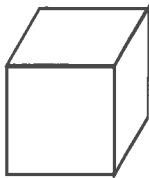


7. Look at a die to check the numbers on opposite faces.

- a) Mark the dots on the net below, so that you could make the net form the die. b) Draw a different net for the die. Mark the dots on the new net.



8. Tissue boxes come in the shapes of many different rectangular prisms.



Work with a classmate and collect several different tissue boxes.

First: Label your boxes **A, B, C**, and so on.

Second: Draw a sketch to predict the net for each box.

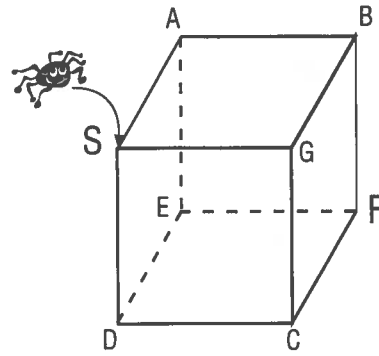
Third: Carefully cut each tissue box and open it to display the net.

Fourth: Compare each of your net drawings with the actual net.

Show your work on looseleaf!



A spider is at the vertex S on this wire cube.



The spider wants to get to vertex F. It must follow these rules.

1. The spider can walk only along the edges.
2. The spider can walk on an edge only **once**.
3. The spider can only go down the vertical edges, never up.

One way for the spider to make the trip is to go from S to A to B to F. Name 2 other ways for the spider to get to F.

Skill Builder

1. How many equal sides does each of these polygons have?

a) regular pentagon → _____

b) square → _____

c) equilateral triangle → _____

d) regular hexagon → _____

2. Add.

a) $7 + 3 + 7 + 3 + 4 =$ _____

b) $6 + 1 + 1 + 4 =$ _____

c) $2 + 2 + 2 + 2 + 2 + 2 + 2 =$ _____

d) $8 + 9 + 3 + 8 =$ _____

e) $4 + 3 + 8 + 5 + 10 =$ _____

f) $6 + 9 + 2 + 1 + 1 + 1 =$ _____

3. Subtract.

a) $99 - 1 - 1 - 1 - 1 =$ _____

b) $102 - 2 - 2 - 2 - 2 =$ _____

c) $103 - 3 - 3 =$ _____

d) $98 - 7 =$ _____

e) $97 - 3 =$ _____

f) $99 - 9 =$ _____

4. Complete the table.

×	6	10	70
2	12		
4		40	
9			630

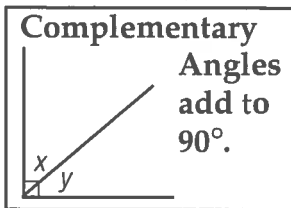
Rough Work:

NO CALCULATOR

Review



1. Write the measure of each complementary angle.



Complementary \angle .

a) $35^\circ \rightarrow$ _____

$90^\circ - 35^\circ =$ _____

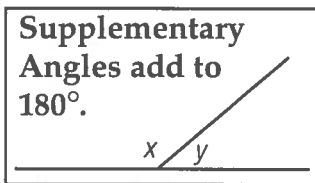
b) $66^\circ \rightarrow$ _____

$90^\circ - \square =$ _____

c) $89^\circ \rightarrow$ _____



2. Write the measure of each supplementary angle.



Supplementary \angle .

a) $47^\circ \rightarrow$ _____

$180^\circ - 47^\circ =$ _____

b) $102^\circ \rightarrow$ _____

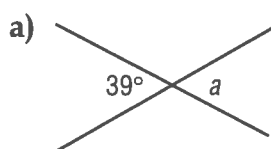
$180^\circ - \square =$ _____

c) $156^\circ \rightarrow$ _____

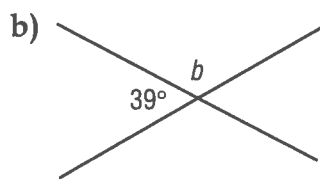


3. Find the measure of each unknown angle.

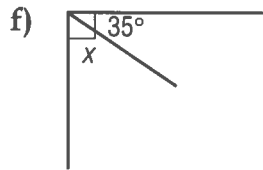
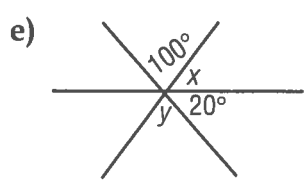
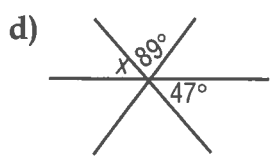
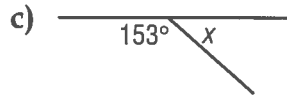
Complementary angles add up to 90° .	Supplementary angles add up to 180° .	Opposite angles are equal.
$\angle x + \angle y = 90^\circ$	$\angle x + \angle y = 180^\circ$	$\angle x = \angle y$



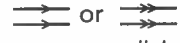

$\angle a =$ _____




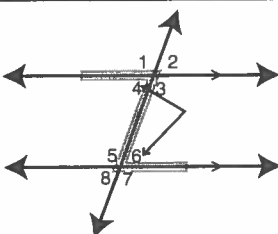
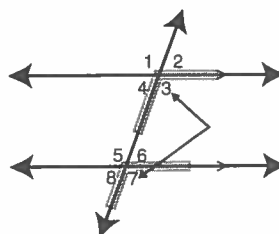
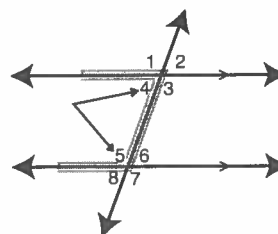
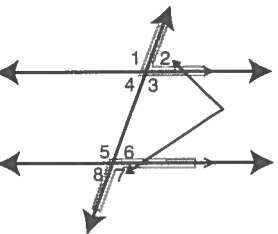
$\angle b = 180^\circ - \square$
 $=$ _____



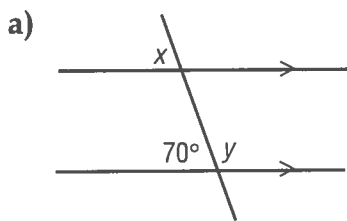
4.

 or 
means parallel.

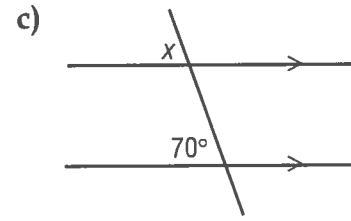
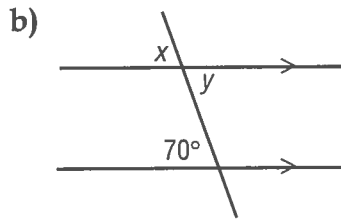
 Transversal

Alternate Angles	Corresponding Angles	Co-interior Angles or Interior Angles	Exterior Angles
			
Alternate angles are equal. $\angle 4 = \angle 6$ $\angle 3 = \underline{\hspace{2cm}}$	Corresponding angles are equal. $\angle 3 = \angle 7$ $\angle 2 = \underline{\hspace{2cm}}$ $\angle 4 = \underline{\hspace{2cm}}$ $\angle 1 = \underline{\hspace{2cm}}$	Co-interior angles are supplementary. $\angle 4 + \angle 5 = 180^\circ$ $\angle 3 + \underline{\hspace{1cm}} = 180^\circ$	Exterior angles are supplementary. $\angle 2 + \angle 7 = 180^\circ$ $\angle 1 + \underline{\hspace{1cm}} = 180^\circ$

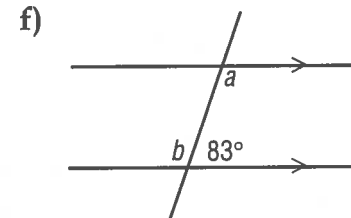
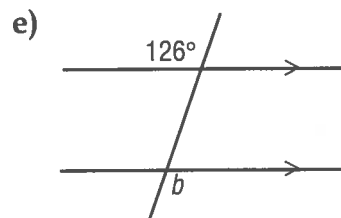
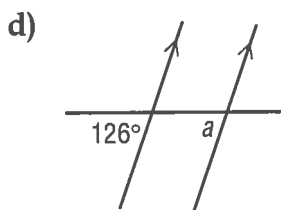
4. Find the measure of each unknown angle.



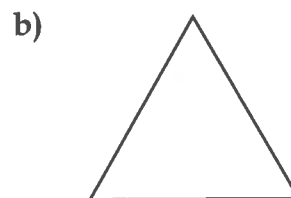
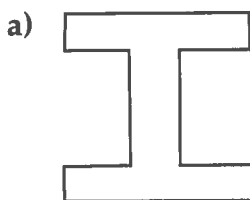
$\angle x = \underline{\hspace{2cm}}$
 $\angle y = 180^\circ - \square$
 $= \underline{\hspace{2cm}}$



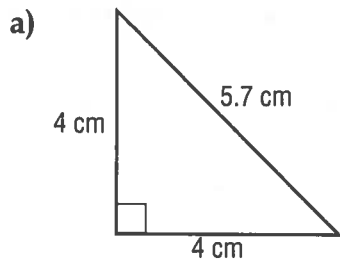
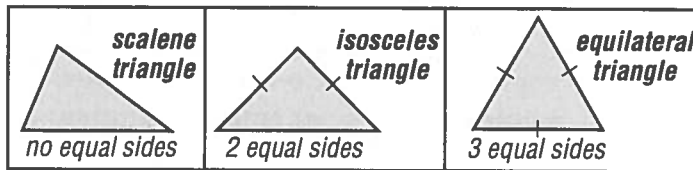
$\angle x = \underline{\hspace{2cm}}$

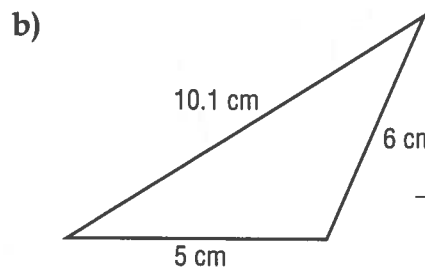


5. Draw the lines of symmetry for each figure.

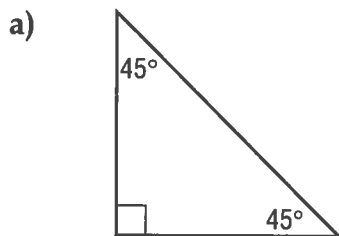
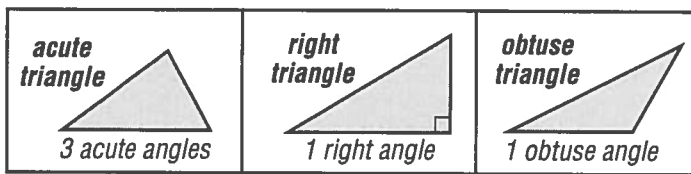


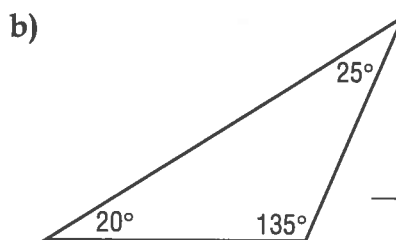
6. Classify each triangle by sides.



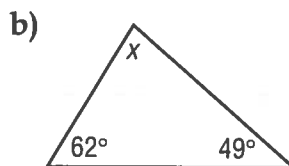
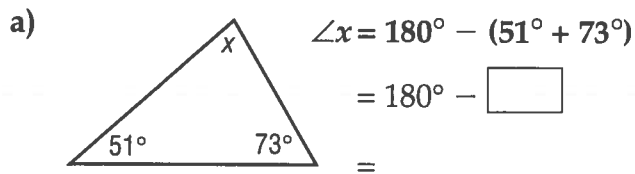


7. Classify each triangle by angles.



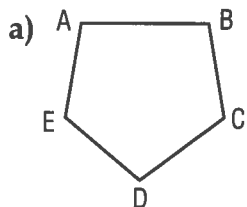


8. Calculate the missing measures.

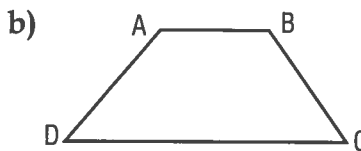
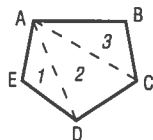


Hint:
 The three angles in a triangle add up to 180°.

9. Find the sum of the interior angles in each of the following.



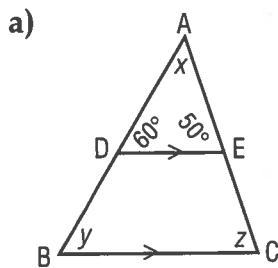
Step 1: From Point A draw line segments to the other points.



Step 2: Multiply.

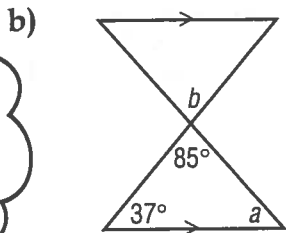
Sum of interior \angle 's = $180^\circ \times$ Number of Δ s
 $= 180 \times 3$
 $= \square$

10. Find the measure of the unknown angle.



Hints:

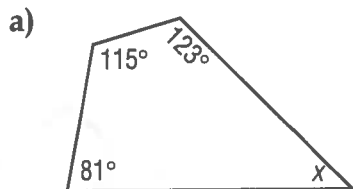
- Sum of interior \angle s of $\Delta = 180^\circ$.
- Opposite \angle s are equal.
- Corresponding \angle s are equal.



$$\begin{aligned} \angle x &= 180^\circ - (\text{ } + \text{ }) \\ &= 180^\circ - \text{ } \\ &= \text{ } \\ \angle y &= \text{ } \\ \angle z &= \text{ } \end{aligned}$$

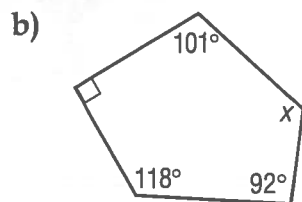
Corresponding \angle s

11. Find the measure of the unknown angle in each polygon.



Hint: Sum of the interior \angle s of a quadrilateral = 360° .

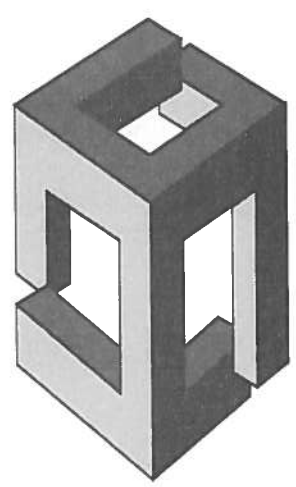
$$\begin{aligned} \angle x &= 360^\circ - (\text{ } + \text{ } + \text{ }) \\ &= 360^\circ - \text{ } \\ &= \text{ } \end{aligned}$$




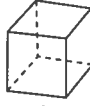
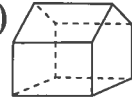

Hint: Sum of the interior \angle s of a pentagon = 540° .

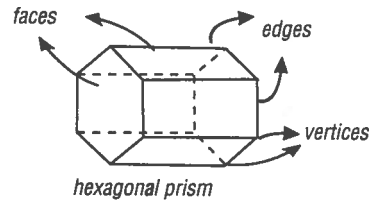
12. Match each three-dimensional figure with its name.

- | Figure | Name |
|--------|-------------------------|
| a) | _____ pentagonal prism |
| b) | _____ square pyramid |
| c) | _____ triangular prism |
| d) | _____ cube |
| e) | _____ rectangular prism |
| f) | _____ hexagonal prism |



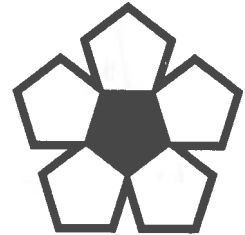
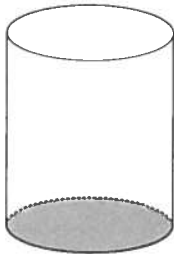
13. Complete the chart.

Polyhedron	Number of Faces	Number of Edges	Number of Vertices
a)  square pyramid			
b)  cube			
c)  pentagonal prism			
d)  triangular prism			

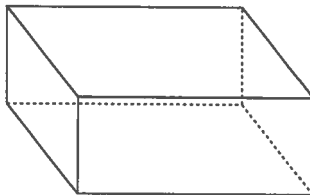


14. Draw a net for each of the following containers.

a)



b)



15. A cylinder contains 1 L of water. Is the cylinder a solid, a shell, or a skeleton?

Chapter Check

1. Write the measure of the complementary angle.

a) $44^\circ \rightarrow$ _____

$90^\circ - 44^\circ =$ _____

b) $7^\circ \rightarrow$ _____



Complementary angles add to 90° .



c) $66^\circ \rightarrow$ _____



2. Write the measure of the supplementary angle.

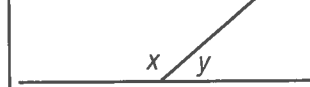
a) $57^\circ \rightarrow$ _____

$180^\circ - 57^\circ =$ _____

b) $101^\circ \rightarrow$ _____



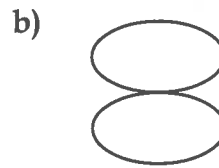
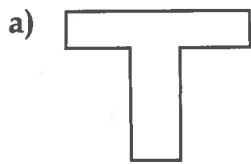
Supplementary angles add to 180° .



c) $165^\circ \rightarrow$ _____

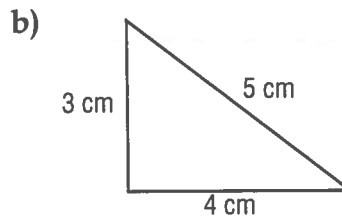
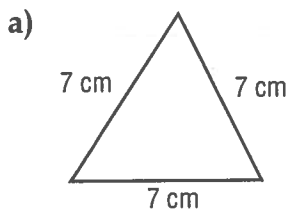


3. Draw the lines of symmetry for each figure.



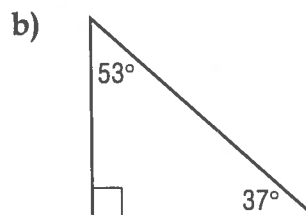
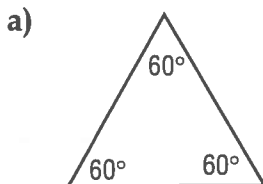
4. Classify each triangle by sides.

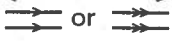
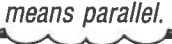
Hint: Isosceles Δ , Equilateral Δ , Scalene Δ

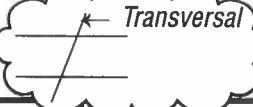


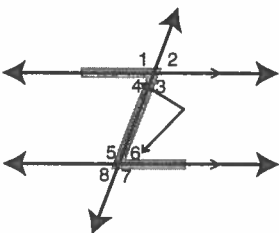
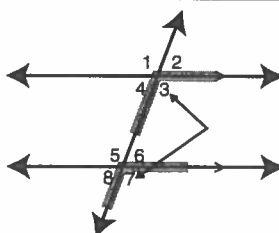
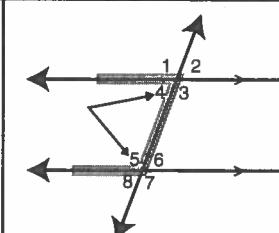
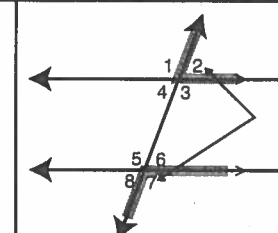
5. Classify each triangle by angles.

Hint: Acute Δ , Obtuse Δ , Right Δ

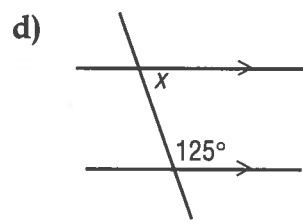
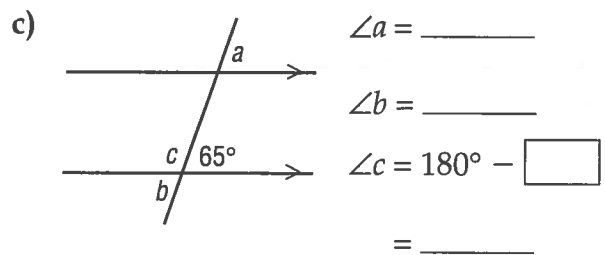
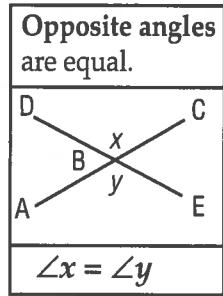
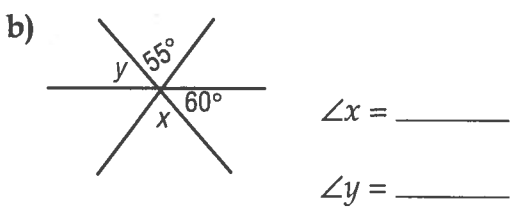
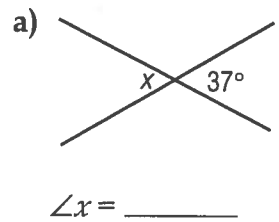


 or 
 means parallel.

 Transversal

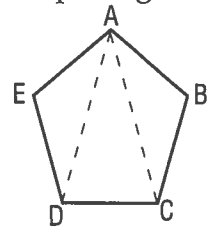
Alternate Angles	Corresponding Angles	Co-interior Angles or Interior Angles	Exterior Angles
			
Alternate angles are equal. $\angle 4 = \angle 6$ $\angle 3 = \underline{\hspace{2cm}}$	Corresponding angles are equal. $\angle 3 = \angle 7$ $\angle 2 = \underline{\hspace{2cm}}$ $\angle 4 = \underline{\hspace{2cm}}$ $\angle 1 = \underline{\hspace{2cm}}$	Co-interior angles are supplementary. $\angle 4 + \angle 5 = 180^\circ$ $\angle 3 + \underline{\hspace{1cm}} = 180^\circ$	Exterior angles are supplementary. $\angle 2 + \angle 7 = 180^\circ$ $\angle 1 + \underline{\hspace{1cm}} = 180^\circ$

6. Find the measure of the unknown angles.



7. Find the sum of the interior angles in

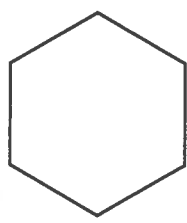
a) a pentagon



First: Draw diagonals from point A.
Second: Multiply number of Δ s $\times 180^\circ$.

Sum of interior \angle s $= 180^\circ \times \text{No. of } \Delta$ s
 $= 180 \times \square$
 $= \underline{\hspace{2cm}}$

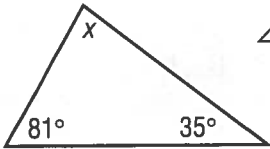
b) a hexagon



8. Find the measure of the unknown angles.

Figure	Sum of interior angles
Triangle	180°
Quadrilateral	360°

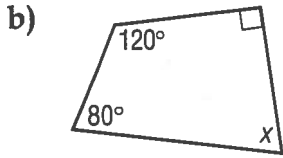
a)



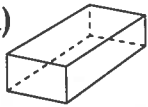

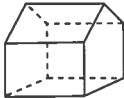
$$\angle x = 180^\circ - (\text{---} + \text{---})$$

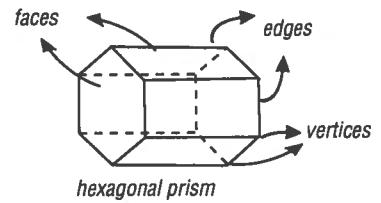
$$= 180^\circ - \square$$

$$= \text{---}$$

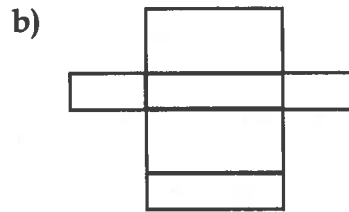
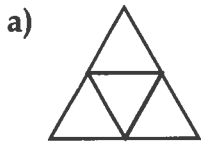


9. Complete the chart.

Polyhedron	Number of Faces	Number of Edges	Number of Vertices
a)  rectangular prism			
b)  square pyramid			
c)  pentagonal prism			



10. Name the polyhedron made from each net.



Hint: • cube • triangular prism • triangular pyramid
• rectangular prism • square pyramid
• hexagonal prism • pentagonal prism

Problem Solving: Using the Strategies

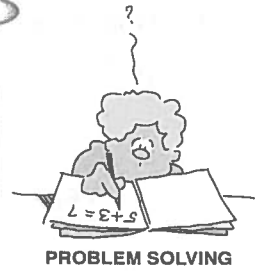
Show all your work on looseleaf!

Understand the Problem

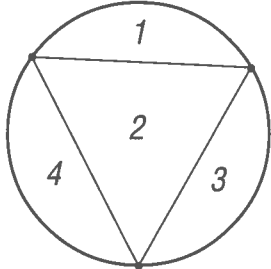
Think of a Plan

Carry Out the Plan

Look Back



1. Three points are marked on a circle. If you join each point to every other point, the circle is divided into 4 regions.



If you put 4 points on the circle and join every point to every other point, how many regions do you have?

Draw a diagram.

2. Ashir works in the Cookie Loft. A package of oatmeal cookies sells for \$1.50, and a package of chocolate chip cookies sells for \$1.70. One day, Ashir sold 7 packages of cookies for \$11.30. How many packages of each kind of cookie did he sell?

Use Guess and Check.

Copy and complete the chart.

Oatmeal cookies	Chocolate chip cookies	Total = \$11.30
1 package \times 1.50 = 1.50	6 packages \times 1.70 = 10.20	1.50 + 10.20 = <input type="text"/> No!

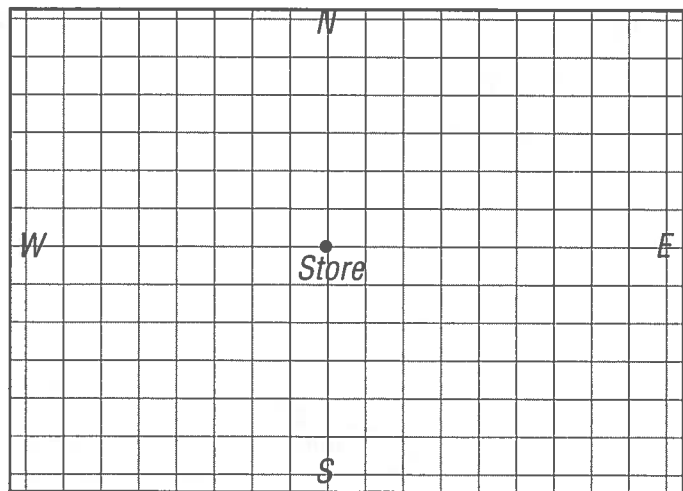
Remember # of packages = 7.
So, 1 + 6 = 7.

3. If you have 6 coins that total 38¢, what coins do you have?

Use Guess and Check.

4. Use grid paper to help you answer the following question.

Maria left the corner grocery store and rode her bicycle 4 blocks north, 3 blocks west, 1 block south, 6 blocks east, 5 blocks south, then 3 blocks east. What is the smallest number of blocks she can ride to get back to the grocery store?



5. Three students, Tanya, Darrell, and Susan, play in the school band. They play the trumpet, drums, and saxophone. What instrument does each person play?

To find the answer use the following clues and fill in the chart below.

- a) No person's name begins with the same letter as the instrument he or she plays.
 b) Susan does not play the trumpet.

	Tanya	Darrell	Susan
Trumpet			
Drums			
Saxophone			

6. One month, John did the following transactions with his bank account.



- a) He wrote cheques for \$14.95, \$67.80, and \$114.60.
 b) He withdrew \$80.00 from the automatic teller machine.
 c) He deposited 2 cheques for \$60.00 and \$156.80.

At the end of the month, he had \$87.88 in his account. How much money was in his account at the beginning of the month?



DATA BANK

Use your **MATHPOWER™** student text pages 362, 363, and 365.

1. What is
- a) the driving distance from Edmonton to Victoria? _____
- b) the length of the South Saskatchewan River? _____
- c) the flying distance from Toronto to Charlottetown? _____

2. Arrange the distances in **question 1** from shortest to longest.

3. What percent of Canada's fresh water is in Quebec?

4. What percent of Canada's fresh water is in Alberta?

5. Name the world's largest island.

