

REVIEW GUIDE  
FOR  
MATHEMATICS PLACEMENT

Topics included for MAT 097 – Geometry

DEPARTMENT OF MATHEMATICS  
Parkland College  
Office M120  
Phone: 217-351-2225  
[www.parkland.edu/math](http://www.parkland.edu/math)

PLACEMENT PRACTICE FOR MAT 097 (GEOMETRY)

Note: Some of the symbols used in this practice set of questions are:

$\overline{AB}$  for line segment AB; this is a geometric figure

$AB$  for the length of line segment  $\overline{AB}$ ;  $AB$  is a number

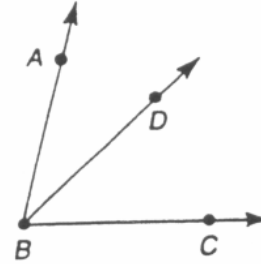
$\angle ABC$  for angle ABC; this is a geometric figure

$m\angle ABC$  for the degree measure of  $\angle ABC$ ;  $m\angle ABC$  is a number

**A. Angle Relationships**

1. If  $m\angle ABD = 26^\circ$  and  $m\angle CBD = 48^\circ$ , find  $m\angle ABC$ .

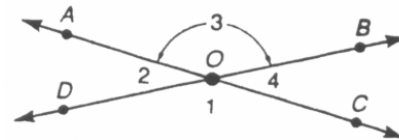
2. If  $m\angle ABD = x$ ,  $m\angle CBD = 2x - 12$ , and  $m\angle ABC = 72$ , find the value of  $x$ .



Exs 1,2

3. Two angles are complementary. If the measure of the larger angle is four times that of its complement, find the measure of the smaller angle.

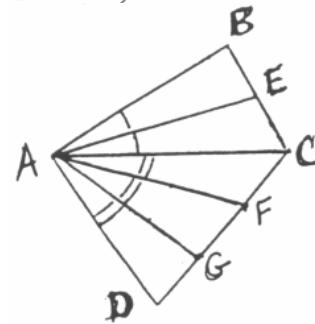
4. In the figure, lines  $\overline{AC}$  and  $\overline{DB}$  intersect at point O. If  $m\angle 2 = y$ , find an expression (containing  $y$ ) that represents  $m\angle 3$ .



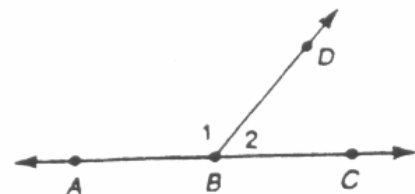
5. Using the same figure as Exercise 4, find the value of  $x$  if  $m\angle 1 = 3x + 20$  and  $m\angle 3 = 5(x - 8)$ .

Exs 4,5

6. In the figure,  $m\angle BAC = 32^\circ$  and  $m\angle CAD = 57^\circ$ . If  $\overline{AE}$  bisects  $\angle BAC$  while  $\overline{AF}$  and  $\overline{AG}$  trisect  $\angle CAD$ , find  $m\angle EAG$ .



7. In the figure,  $\overline{AC}$  is a straight line. What relationship must exist between  $\angle 1$  and  $\angle 2$ ?

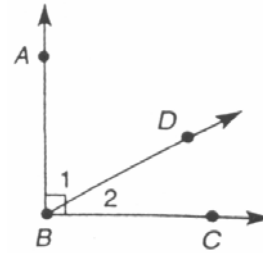


Note: Some of the symbols used in this practice set of questions are:

$\parallel$ , which represents *parallel* and  $\perp$ , which means *perpendicular*

## B. Parallel and Perpendicular Lines

1. In the figure,  $\overline{BA} \perp \overline{BC}$ . What relationship must exist between  $\angle 1$  and  $\angle 2$ ?

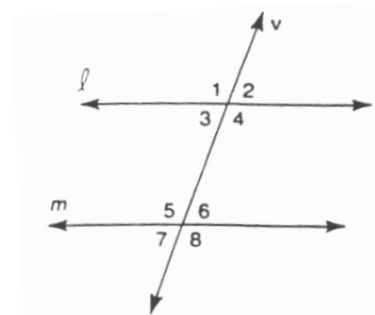


2. In the figure, which angle is the alternate interior angle for  $\angle 4$ ?

3. If  $\ell \parallel m$  with transversal  $v$  and  $m \angle 1 = 114^\circ$ ,  
Find: (a)  $m \angle 5$  (b)  $m \angle 7$

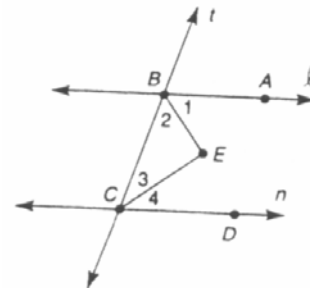
4. Suppose that  $m \angle 2 = 6x + 10$  and  $m \angle 6 = 8(x - 1)$ .  
What value of  $x$  is necessary to guarantee that lines  $\ell$  and  $m$  will be parallel?

5. Suppose that lines  $r$ ,  $s$ , and  $t$  are coplanar. If  $r \perp s$   
and  $s \perp t$ , then how are lines  $r$  and  $t$  related?

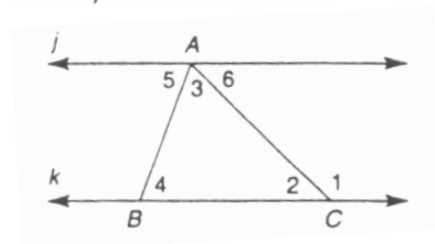


Exs 2-4

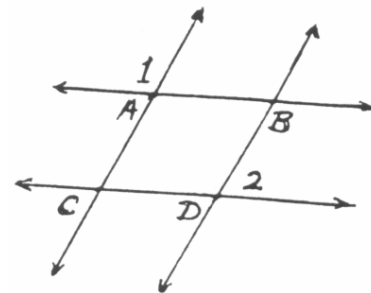
6. It is given that lines  $\ell$  and  $n$  are parallel. Find  $m \angle E$ , the  
angle formed by the bisectors of the indicated interior angles.



7. Lines  $j$  and  $k$  are parallel. Knowing that  
 $m \angle 4 = 64^\circ$  and  $m \angle 1 = 132^\circ$ , find  $m \angle 3$ .



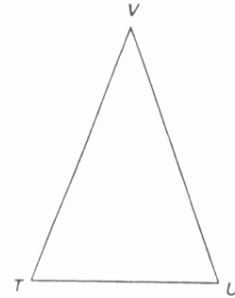
8. Knowing that  $\overline{AB} \parallel \overline{CD}$  and  $\overline{AC} \parallel \overline{BD}$ , what relationship  
exists between  $\angle 1$  and  $\angle 2$ ?



**Note: Some symbols used in this practice set of questions are:**  
 $\Delta$ , which means *triangle* and  $\cong$ , which means *congruent*

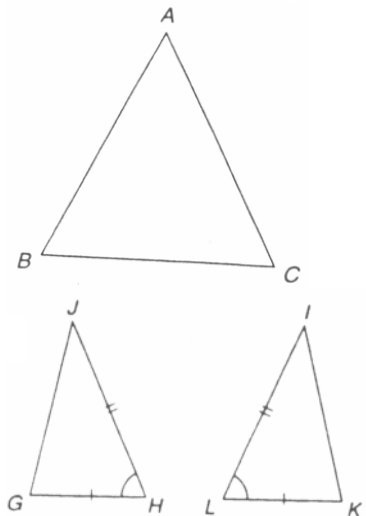
### C. Triangles and Congruent Triangles

- In  $\Delta ABC$ ,  $m\angle A = 47^\circ$  and  $m\angle B = 69^\circ$ . Find  $m\angle C$ .
- The degree measures of the angles of a triangle are  $x$ ,  $x + 20$ , and  $3x$ . What *type* of triangle (acute, right, or obtuse) is this triangle?
- In the figure,  $\overline{VT} \cong \overline{VU}$ . If  $m\angle T = 73^\circ$ , find  $m\angle V$ .
- In the figure,  $\overline{VT} \cong \overline{VU}$ . If  $TV = 13$  and  $TU = 10$ , find the length of the altitude of  $\Delta VTU$  from  $V$  to the base  $\overline{TU}$ .
- In the figure,  $\angle T \cong \angle U$ . If  $TV = 13$  and  $TU = 10$ , find the perimeter of  $\Delta VTU$ .



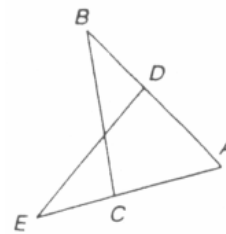
Exs 3 - 5

- In  $\Delta ABC$ ,  $m\angle A = 59^\circ$  and  $m\angle B = 63^\circ$ . Which side of  $\Delta ABC$  has the greatest length?
- With congruent parts marked, which method (SSS, SAS, ASA, or AAS) is used to establish that  $\Delta GHJ$  is congruent to  $\Delta KLI$ ?
- After proving that  $\Delta GHJ \cong \Delta KLI$  in Exercise 7, can you conclude that  $\angle G$  is congruent to  $\angle K$ ?



Exs 7,8

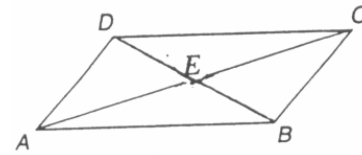
- With  $\overline{BA} \cong \overline{EA}$  and  $\angle B \cong \angle E$ , which method (SSS, SAS, ASA, or AAS) is used to establish that  $\Delta ABC$  is congruent to  $\Delta AED$ ?



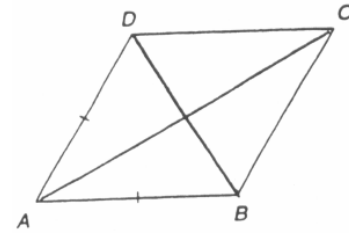
Note: The symbol  $\square$  represents the word *parallelogram*.

### D. Quadrilaterals and Polygons

- In  $\square ABCD$ ,  $m\angle ADC = 114^\circ$ .  
Find: (a)  $m\angle DCB$       (b)  $m\angle CBA$
- In  $\square ABCD$ , the lengths of the diagonals are  $\overline{AC} = 12$  and  $\overline{DB} = 8$ . Find the length of  $\overline{EC}$ .

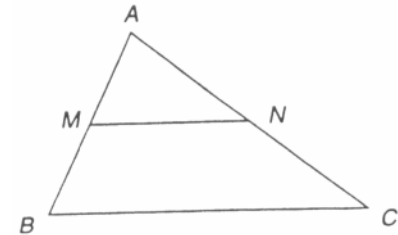


Exs 1,2



- The diagonals of rhombus  $ABCD$  have lengths  $\overline{AC} = 8$  and  $\overline{DB} = 6$ . Find the length of each side of the rhombus.

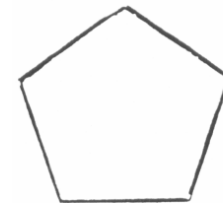
- In  $\triangle ABC$ ,  $M$  is the midpoint of  $\overline{AB}$  and  $N$  is the midpoint of  $\overline{AC}$ . Being as specific as possible, what *type* of quadrilateral is  $NCBM$ ?



Exs 4,5

- In  $\triangle ABC$ ,  $M$  is the midpoint of  $\overline{AB}$  and  $N$  is the midpoint of  $\overline{AC}$ . If  $AB = 12$ ,  $BC = 16$ , and  $AC = 14$ , find the length of  $\overline{MN}$ ?

- Use the following formula that provides the sum  $S$  of all interior angles of a polygon with  $n$  sides to do the following problems:  
 $S = (n - 2) \cdot 180^\circ$ 
  - Find the sum of all the interior angles of the pentagon shown.
  - Assuming that the pentagon shown is a regular polygon, find the measure of one of its interior angles.



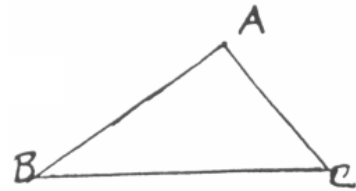
Exs 6,7

- For the pentagon shown, find the total number of diagonals.

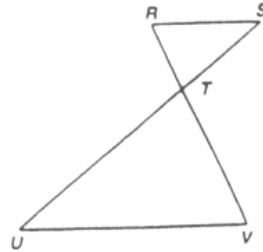
Note: The symbol  $\sim$  represents the phrase *is similar to*.

### E. Proportions and Similarity

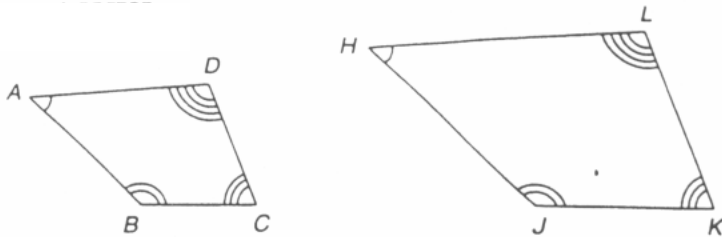
1. The measures of the angles of  $\triangle ABC$  are in the ratio 5:2:3; that is,  $m\angle A = 5x$ ,  $m\angle B = 2x$ , and  $m\angle C = 3x$ . Find  $m\angle C$ .



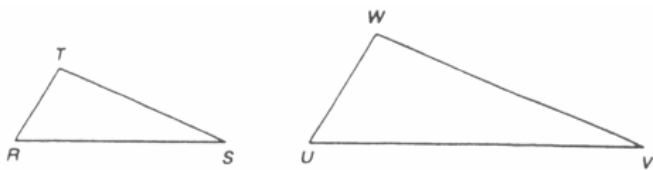
2. With  $\overline{RS} \parallel \overline{UV}$ , it can be shown that  $\triangle RST \sim \triangle VUT$ . If  $RT = 5$ ,  $RS = 6$ , and  $TV = 8$ , find  $UV$ .



3. Suppose that quadrilateral  $ABCD \sim$  quadrilateral  $HJKL$ , with corresponding angles as indicated. If  $m\angle A = 2x - 17$ ,  $m\angle C = 3x - 25$ , and  $m\angle H = x + 20$ , find  $m\angle K$ .



4. Suppose that  $\angle T \cong \angle W$  and  $\angle R \cong \angle U$ . Name the reason (AA, SAS  $\sim$ , or SSS  $\sim$ ) why  $\triangle RST$  is similar to  $\triangle UVW$ .
5. Suppose that  $\frac{TR}{WU} = \frac{TS}{WV} = \frac{RS}{UV}$ . Name the reason (AA, SAS  $\sim$ , or SSS  $\sim$ ) why  $\triangle RST$  is similar to  $\triangle UVW$ .

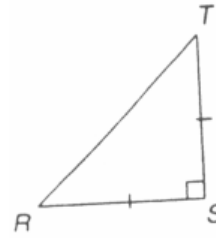


Exs 4,5

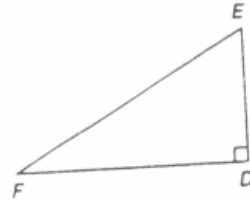
Note: The symbol  $\sim$  represents the phrase *is similar to*.

## E. Proportions and Similarity (cont.)

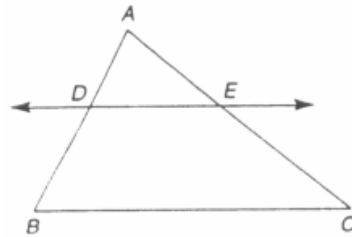
6. In the right triangle RST,  $\overline{RS} \cong \overline{ST}$  and  $RS = 8$ . Find: (a)  $m\angle R$  (b)  $RT$



7. In the right triangle DEF,  $m\angle F = 30^\circ$  and  $DE = 5$ . Find: (a)  $DF$  (b)  $FE$



8. In  $\triangle ABC$ ,  $\overline{DE} \parallel \overline{BC}$ . If  $AD = 6$ ,  $DB = 10$ , and  $AE = 8$ , find  $EC$ .

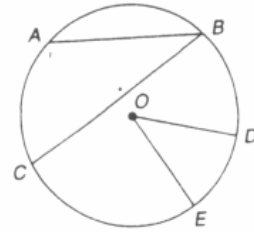


Note: In this practice set of problems, some of the symbols used are:

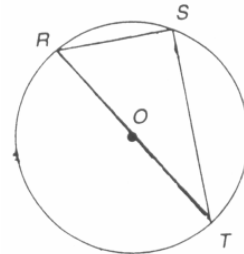
$\odot$  to mean *circle* and  $m\widehat{AC}$  to mean the degree measure of arc AC.

### F. Circles

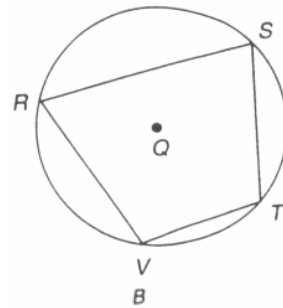
1. In  $\odot O$ ,  $m\widehat{AC} = 62^\circ$  and  $m\widehat{DE} = 47^\circ$ .  
Find: (a)  $m\angle B$  (b)  $m\angle O$



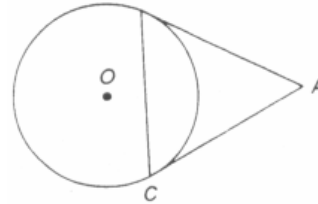
2.  $\triangle RST$  is inscribed in  $\odot O$  so that  $\overline{RT}$  is a diameter. If  $OT = 5$  and  $RS = 6$ , find: (a)  $m\angle S$  (b)  $ST$



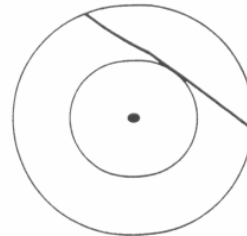
3. Quadrilateral RSTV is inscribed in the circle.  
How are  $\angle R$  and  $\angle T$  related?



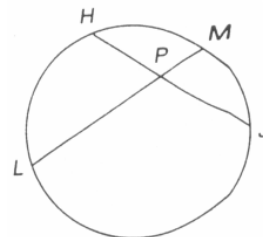
4. If  $\overline{AB}$  and  $\overline{AC}$  are tangent segments from external point A, then what *type* of triangle is  $\triangle ABC$ ?



5. For the concentric circles shown, the length of the radius of the inner circle is 3. If the chord shown for the outer circle is tangent to the inner circle and has length 8, what is the length of the radius of the outer circle?



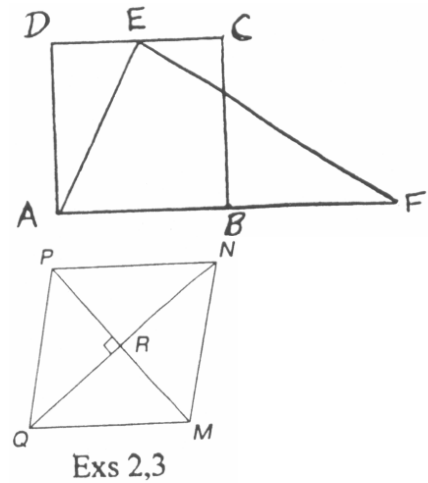
6. For the chords shown,  $HP \cdot PJ = LP \cdot PM$ . If  $HP = 6$ ,  $PJ = 4$ , and  $LM = 11$ , find the two possible lengths of  $\overline{LP}$ .



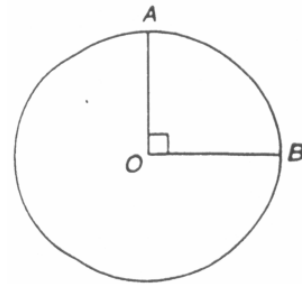


## G. Area, Circumference, and Perimeter

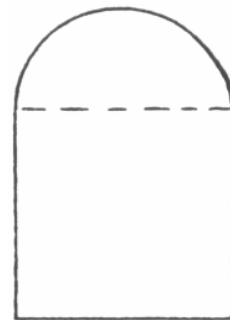
- In the figure, the area of square  $ABCD$  is equal to that of  $\triangle AFE$ . If  $AB = 6$  inches, what is the length of side  $\overline{AF}$  of  $\triangle AFE$ ?
- For rhombus  $MNPQ$ , the lengths of the diagonals are  $QN = 8$  and  $PM = 6$ . What is the *perimeter* of rhombus  $MNPQ$ ?
- For rhombus  $MNPQ$ , the lengths of the diagonals are  $QN = 8$  and  $PM = 6$ . What is the *area* of rhombus  $MNPQ$ ?
- For a given rectangle, both the length and width are tripled in order to determine a larger rectangle. By what number must we multiply the area of the first rectangle in order to provide the area of the larger rectangle?
- For a given circle, the length of the diameter is 10 inches. By leaving  $\pi$  in the answer, find an expression for the exact *circumference* of the circle.
- For a given circle, the length of the diameter is 10 inches. By leaving  $\pi$  in the answer, find an expression for the exact *area* of the circle.



- If the area of the circle shown is 60 square inches, what is the area of the  $90^\circ$  sector of the circle?

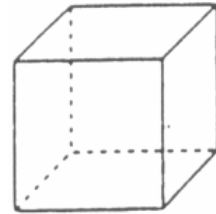


- The Norman style window shown has the shape of a square surmounted by a semicircle. If each side of the square is 4 feet long, what amount of area is created by the window opening? Leave  $\pi$  in the answer.



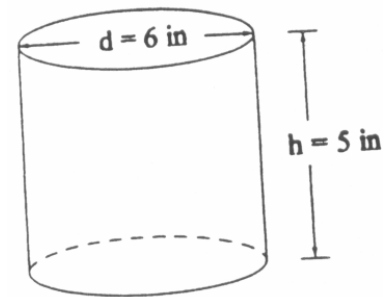
## H. Surface Area and Volume

1. Each edge of a cube has length  $s$ . In terms of  $s$ , what expression represents the total surface area of all six faces?

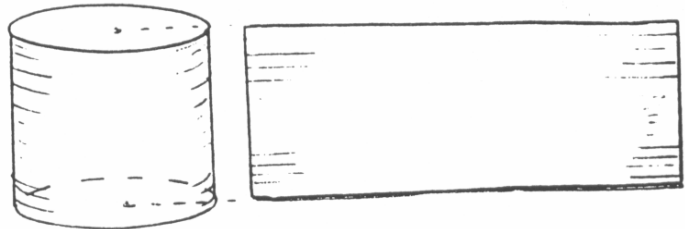


2. A rectangular prism (box) has these dimensions: length = 1 foot, width = 5 inches, and height = 8 inches. Determine the volume of the box in *cubic inches*.

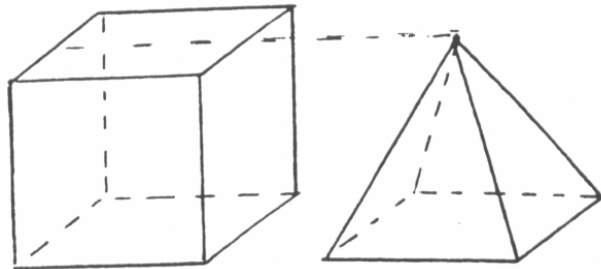
3. The volume of a right circular cylinder is the product of the area of its base and the length of its altitude. Find the volume of the right circular cylinder shown.



4. The lateral area of a cylindrical container is the same as the area of the label of the container. In terms of the radius  $r$  of the circular base and the length of altitude  $h$ , find an expression for the lateral area of the cylinder.



5. The prism and pyramid shown have congruent bases and the same length of altitude. If the volume of the prism is 75 cubic centimeters, find the volume of the pyramid.



Mat 097 Review Answers:

A. Angle Relationships

1.  $74^\circ$
2.  $x = 28$
3.  $18^\circ$
4.  $180 - y$
5.  $x = 30$
6.  $54^\circ$
7. supplementary

B. Parallel and Perpendicular Lines

1. complementary
2.  $\angle 5$
3. (a)  $114^\circ$  (b)  $66^\circ$
4.  $x = 9$
5. parallel
6.  $90^\circ$
7.  $68^\circ$
8. supplementary

C. Triangles and Congruent Triangles

1.  $64^\circ$
2. obtuse
3.  $34^\circ$
4. 12
5. 36
6.  $\overline{AC}$
7. SAS
8. Yes
9. ASA

D. Quadrilaterals and Polygons

1. (a)  $66^\circ$  (b)  $114^\circ$
2. 6
3. 5
4. trapezoid
5. 8
6. (a)  $540^\circ$  (b)  $108^\circ$
7. 5

E. Proportions and Similarity

1.  $54^\circ$
2. 9.6 or  $9\frac{3}{5}$
3.  $86^\circ$
4. AA
5. SSS ~
6. (a)  $45^\circ$  (b)  $8\sqrt{2}$
7. (a)  $5\sqrt{3}$  (b) 10
8.  $13\frac{1}{3}$

F. Circles

1. (a)  $31^\circ$  (b)  $47^\circ$
2. (a)  $90^\circ$  (b) 8
3. supplementary
4. isosceles
5. 5
6.  $LP = 3$  or  $LP = 8$

G. Area, Circumference, and Perimeter

1.  $AF = 12$  inches
2. 20
3. 24
4. 9
5.  $10\pi$  inches
6.  $25\pi$  square inches
7. 15 square inches
8.  $(16 + 2\pi)$  square feet

H. Surface Area and Volume

1.  $6s^2$
2. 480 cubic inches
3.  $45\pi$  cubic inches
4.  $2\pi rh$
5. 25 cubic centimeters