

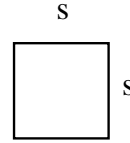
BASIC GEOMETRIC FORMULAS AND PROPERTIES

This handout is intended as a review of **basic geometric formulas and properties**. For further or more advanced geometric formulas and properties, consult with a SLAC counselor.

Square:

Perimeter: $P = 4s$ or $2s + 2s$

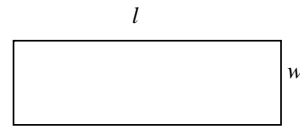
Area: $A = s^2$



Rectangle:

Perimeter: $P = 2w + 2l$

Area: $A = l \times w$



Triangles:

Perimeter: $P = a + b + c$

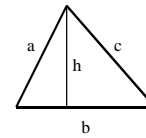
Area: $A = (1/2) \times b \times h$

Types of Triangles:

Isosceles (two equal sides)

Equilateral (all sides equal)

Right (one 90° or right angle)

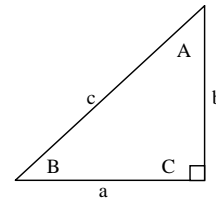


Pythagorean Theorem (for right triangles only):

$$a^2 + b^2 = c^2$$

Sum of the Angles (all triangles):

$$A + B + C = 180^\circ$$

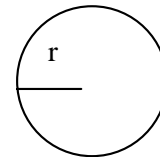


Circle:

Diameter: $d = 2r$

Circumference: $C = 2 \pi r = \pi d$

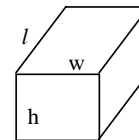
Area: $A = \pi r^2$



Rectangular Solid:

Volume: $V = l \times w \times h$

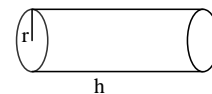
Surface Area: $S = (2 \times h \times w) + (2 \times l \times h) + (2 \times l \times w)$



Right Circular Cylinder:

Volume: $V = \pi r^2 h$

Surface Area: $S = 2 \pi r h + 2 \pi r^2$



Complementary Angles:

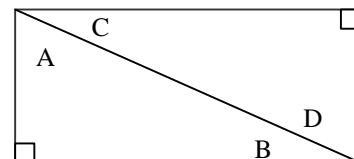
Two angles are complementary

if the sum of their measures

is 90° . Angles A and B are

complementary angles. Angles A

and C are complementary angles.



Supplementary Angles:

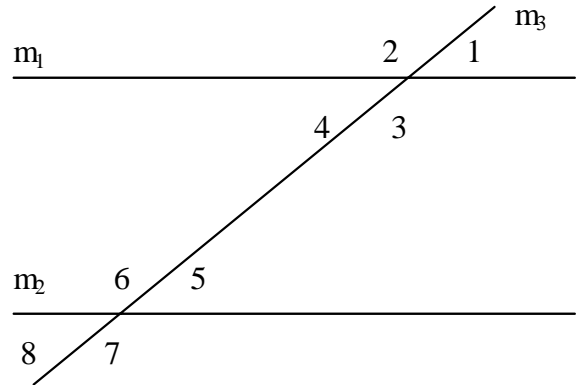
Two angles are supplementary if the sum of their measures is 180° .

Angles 1 and 2 are supplementary angles. Angles 2 and 4 are supplementary angles.

Opposite/Vertical Angles:

The intersection of two lines, m_1 and m_3 , form four angles. Opposite (vertical) angles are congruent (have equal measures).

Angles 1 and 4 are congruent.
Angles 2 and 3 are congruent.



Alternate Interior and Exterior Angles:

Lines m_1 and m_2 are parallel. Angles 4 and 5 are called alternate interior angles. Alternate interior angles are congruent.

Angles 3 and 6 are also alternate interior angles.
Angles 2 and 7 are called alternate exterior angles.

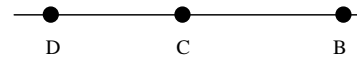
Alternate exterior angles are congruent.

Angles 1 and 8 are also alternative exterior angles.

Note: Angles 1 and 4 are congruent. (opposite/vertical angles)
Angles 4 and 5 are congruent. (alternate interior angles)
Angles 5 and 8 are congruent. (opposite/vertical angles)
Angles 1 and 8 are congruent. (alternate exterior angles)
Angles 2 and 6 are congruent. (corresponding angles)
Angles 3 and 7 are congruent. (corresponding angles)
etc.

Straight Lines:

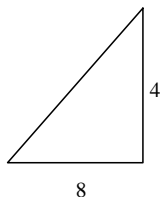
Straight lines have degrees measuring 180° . If D to B is a straight line, then angle DCB is 180° .



BASIC PROBLEMS OF GEOMETRY

1. Two sides of a triangle are 7 and 13 centimeters. The perimeter is 27 centimeters. Find the third side.

2. Find the area of the triangle:

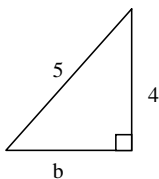


3. If a square has an area of 49 ft^2 , what is the length of one of its sides? The perimeter?

4. If a rectangle has a width of 4, how long must its length be so that the area is 36?

5. If one angle of a right triangle is 70° , what are the other 2 angles?

6. Find b:

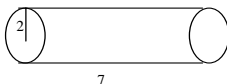


7. What is the diameter of a circle with an area of 16π ?

8. What is the circumference of the circle in problem 7? (allow $\pi = 3.14$)

9. If a box has a height of 4 in., a length of 12 in., and a volume 240 in.^3 , what is the box's width?

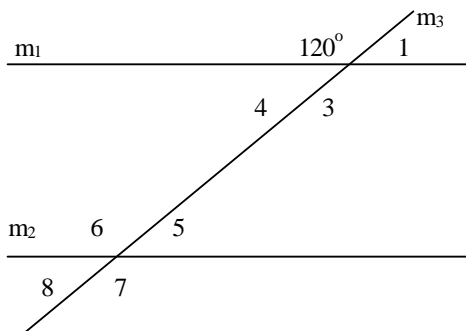
10. Find the volume: (allow $\pi = 3.14$)



11. Lines m_1 and m_2 are parallel, what is the measure of angle 1?

12. What is the measure of angle 5?

13. What is the measure of angle 4?



SOLUTIONS/ANSWERS

- $P = a + b + c$
 $27 = 7 + 13 + c$
 $7 = c$ (c = 7 centimeters)
- $A = (1/2) \times b \times h$
 $A = (1/2) \times 8 \times 4$
 $A = 16$ (A = 16)units²
- $A = s^2$
 $A = 49$
 $A = 7^2$
 $s = 7$ (s = 7 ft.)

 $P = 4(7)$
 $P = 28$ (P = 28 ft.)
- $A = l \times w$
 $36 = l \times 4$
 $9 = l$ (l = 9 units)
- Right triangle has one 90° angle
Problem tells us another angle is 70°
Sum of Angles: $A + B + C = 180^\circ$
 $90^\circ + 70^\circ + C = 180^\circ$
 $C = 20^\circ$ (C = 20°)
- Right Triangles
 $a^2 + b^2 = c^2$
 $4^2 + b^2 = 5^2$
 $16 + b^2 = 25$
 $b^2 = 9$
 $b = 3$ (b = 3 units)
- $A = \pi r^2$
 $16\pi = \pi r^2$
 $\frac{16}{\pi} = \frac{\pi r^2}{\pi}$
 $16 = r^2$
 $r = 4$
 $d = 2r = 2(4) = 8$ (d = 8 units)
- $C = 2\pi r$
 $C = 2\pi(4)$
 $C = 8\pi$ ($\pi = 3.14$)
 $C = 8(3.14)$
 $C = 25.13$ (C = 25.13 units)
- $V = l \times w \times h$
 $240 = 12 \times w \times 4$
 $5 = w$ (w = 5 in.)
- $V = \pi \times r^2 \times h$
 $V = \pi \times 2^2 \times 7$
 $V = \pi \times 4 \times 7$
 $V = 28(3.14)$ ($\pi = 3.14$)
 $V = 87.92$ (V = 87.92 unit³)

11. Straight lines have a degree measure of 180°
 $180^\circ - 120^\circ = 60^\circ$ (Angle 1 = 60°)

12. Angle 1 = 60° (above)
Angle 8 = 60° (alternate exterior of angle 1)
Angle 5 = 60° (opposite/vertical of angle 8) (Angle 5 = 60°)

13. Angle 4 = 60° (opposite interior of angle 5 above)

OR

(straight lines [the diagonal of m_2]
have a degree measure of 180°)

OR

(opposite vertical with angle 1) (Angle 4 = 60°)

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