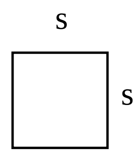
BASIC GEOMETRIC FORMULAS AND PROPERTIES

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:

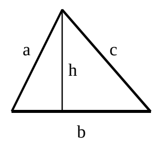
Perimeter: $P = 2w + 2l$

Area: $A = l \times w$

Triangles:

Perimeter: $P = a + b + c$

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

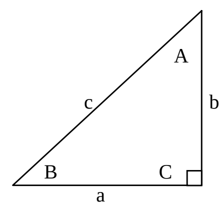


Types of Triangles:

Isosceles (two equal sides)
Equilateral (all sides equal)
Right (one 90^o or right angle)

Pythagorean Theorem (for right triangles only):

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



Sum of the Angles (all triangles):

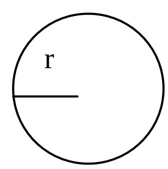
$A + B + C = 180^o$

Circle:

Diameter: $d = 2r$

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

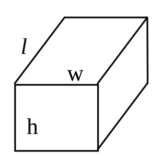
Area: $A = \pi r^2$



Rectangular Solid:

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

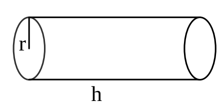
Surface Area: $S = (2 \times h \times w) + (2 \times l \times h) + (2 \times l \times w)$



Right Circular Cylinder:

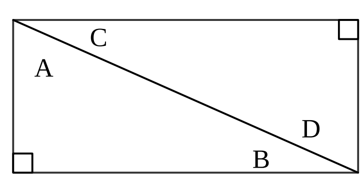
Volume: $V = \pi r^2 h$

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



Complementary Angles:

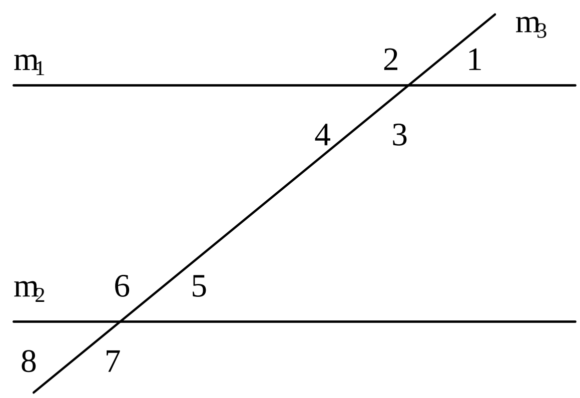
Two angles are complementary if the sum of their measures is 90^o. Angles A and B are complementary angles. Angles A and C are complementary angles.



Supplementary Angles:

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

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.

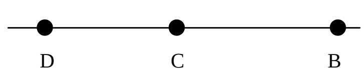
Alternate exterior angles are congruent.

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:

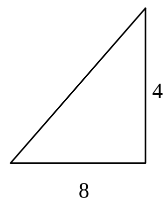
Straight lines have degrees measuring 180^o. If D to B is a straight line, then angle DCB is 180^o.



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:

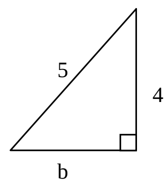


3. If a square has an area of 49 ft^2, what is the length of one of its sides? The perimeter?

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^o, what are the other 2 angles?

6. Find b:

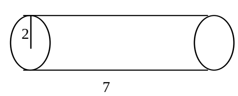


7. What is the diameter of a circle with an area of 16π ?

8. What is the circumference of the circle in problem 7? (allow π = 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?

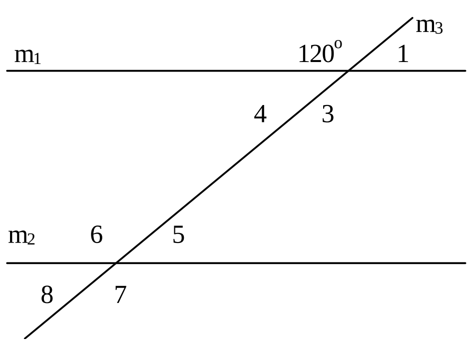
10. Find the volume: (allow π = 3.14)



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

1. $P = a + b + c$
   $27 = 7 + 13 + c$
   $7 = c$ (c = 7 centimeters)

2. $A = (1/2)\times b\times h$
   $A = (1/2)\times 8\times 4$
   $A = 16$ ($A = 16$)$units^2$

3. $A = s^2$
   $A = 49$
   $A = 7^2$
   $s = 7$ (s = 7 ft.)

   $P = 4(7)$
   $P = 28$ (P = 28 ft.)

4. $A = l\times w$
   $36 = l\times 4$
   $9 = l$ (l = 9 units)

5. Right triangle has one 90^o angle
   Problem tells us another angle is 70^o
   Sum of Angles: $A + B + C = 180^o$
   $90^o + 70^o + C = 180^o$
   $C = 20^o$ ($C = 20^o$)

6. 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)

7. $A = \pi r^2$
   $16\pi = \pi r^2$
   $$\frac{16}{\pi} = \frac{\pi r^2}{\pi}$$
   $16 = r^2$
   $r = 4$
   $d = 2r = 2(4) = 8$ (d = 8 units)

8. $C = 2\pi 4$
   $C = 2\pi(4)$
   $C = 8\pi$ (π =3.14)
   $C = 8(3.14)$
   $C = 25.13$ (C = 25.13 units)

9. $V = l\times w\times h$
   $240 = 12\times w\times 4$
   $5 = w$ (w = 5 in.)

10. $V = \pi\times r^2\times h$
    $V = \pi\times 2^2\times 7$
    $V = \pi\times 4\times 7$
    $V = 28(3.14)$ (π = 3.14)
    $V = 87.92$ ($V = 87.92\ unit^3$)

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

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

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

OR

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

OR

(opposite vertical with angle 1) (Angle 4 = 60^o)

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