Subject: Geometry
Created by: Ariel Li
Revised: 03/29/2018

Basic Geometry Rules

Triangle

Definition: Triangles are closed geometrical figures that have three straight sides. Every triangle will, as a result, have three angles as well.

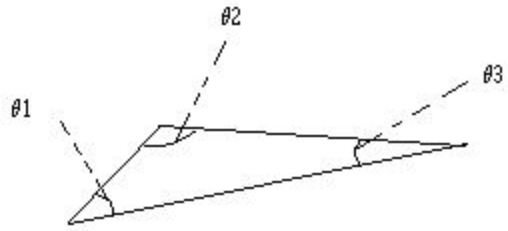


Figure 1: a triangle

$\theta 1 + \theta 2 + \theta 3 = 180$ degrees

The sum of the three angles in a triangle is always equal to 180 degrees (for definition of degree see subsection below on *angles*)

Special Triangles:

A.* The Right Triangle*: *The right triangle* is a triangle that has one 90° angle. Since the sum of the angles in a triangle must be 180°, this implies that the other two angles in a right triangle must add up to 90°. One of these relations is the so called *Pythagorean Theorem*. For the right triangle shown in figure 2, the relation is:

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

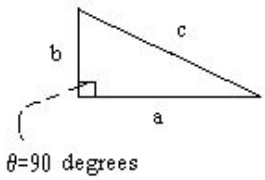


Figure 2: The Right Triangle

B. Isosceles Triangle: In this special type of triangle, *two* sides are equal to each other. One can prove that the angles *opposite* to these two equal sides are also equal to each other. Thus, let us say that we have a triangle in which two sides are 5.0 cm in length and the other side is - let's say -

Basic Geometry Rules

2.0 cm in length, as in the figure below. This means that the two angles indicated with an arrow in the figure are equal.

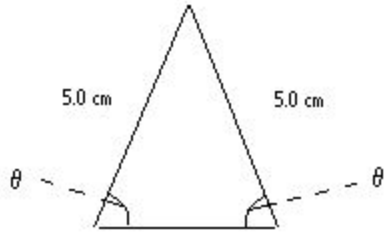


Figure 4: Isoceles Triangle, two sides equal.

B. <u>Equilateral Triangle:</u> This is a special type of isosceles triangle in which not just two, but all three sides, and as a result all three angles are equal. Since the sum of the angles in a triangle must be 180°, this means that for an equilateral triangle each angle is 60°.

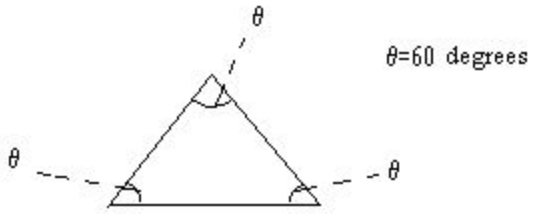
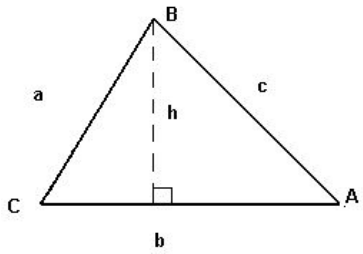


Figure 3: Equilateral Triangle, all sides equal

Perimeter: The *perimeter of a triangle* is equal to the sum of the length of its three sides.
Area: The *area of a triangle* is equal to half its base times its height**.**
The *height of a triangle* is each of the perpendicular lines drawn from one vertex to the opposite side (or its extension).



Basic Geometry Rules

Figure 5: Sample Triangle

Perimeter for Figure 5: P = a + b +c

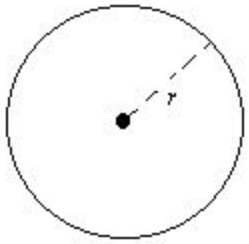
where: P = Perimeter, a, b, c = (length of) sides

Area for Figure 5: A= ½ (h*b)

where: A = Area, b = (length of) base, h = (length of) height

Circle

Definition: A circle is a closed geometric figure as shown in the following figure:



r=radius, a constant value

Figure 7: A Circle

It is defined such that all the points on the circle are at a constant distance from a *center*. This distance is called the *radius* of the circle, as indicated in the diagram above.

Circumference: The *circumference of a circle* depends very simply on the radius of the circle.

$$\mathbf{C = 2 \times p \times r}$$

where: C = Circumference, r = radius, and p = 3.1415 ....

Area: The *area of the circle* also depends on the radius of the circle. It is given by:

$$\mathbf{A = p \times r^2}$$

where: A = Area, r = radius, and p = 3.1415 ....

Parallelogram

Definition: a parallelogram is a quadrilateral with two pairs of parallel sides.

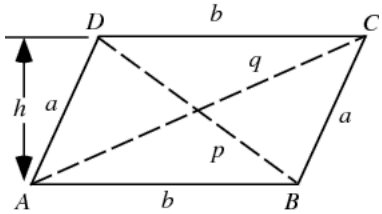


Figure 8: A Parallelogram

(510) 885-3674
www.csueastbay.edu/scaa
scaa@csueastbay.edu
CALIFORNIA STATE UNIVERSITY EAST BAY

Basic Geometry Rules

The opposite or facing sides of a parallelogram are of equal length and the opposite angles of a parallelogram are of equal measure.

Perimeter: The *perimeter of a parallelogram* equals the sum of the length of its four sides. In Figure 8,

P = a + b + a + b = 2a + 2b

where: a, b = length of sides

Area: The *area of a parallelogram* is equal to its base times its height. The *height of a triangle* is each of the perpendicular lines drawn from one vertex to the opposite side (or its extension). In Figure 8,

A = b*h

where: A= area, b = base, h = height

Trapezoid

Definition: A trapezoid is a 4-sided flat shape with straight sides that has a pair of opposite sides parallel.

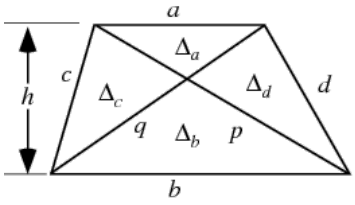


Figure 9: A Trapezoid

Isosceles trapezoid is a trapezoid when the sides that aren't parallel are equal in length and both angles coming from a parallel side are equal.

Perimeter: The *perimeter of a trapezoid* equals the sum of the length of all its four sides. In Figure 9,

P = a + b + c + d

where: a, b, c, d= length of sides

Area: The *area of a trapezoid* is equal half the sum of its base (or parallel sides) times height. In Figure 9,

A = ½ * (a + b) * h

where: a, b = bases, h = height

Rectangle

Definition: A rectangle is a special parallelogram with straight sides where all interior angles are right angles (90°).

(510) 885-3674
www.csueastbay.edu/scaa
scaa@csueastbay.edu
CALIFORNIA STATE UNIVERSITY EAST BAY

Basic Geometry Rules

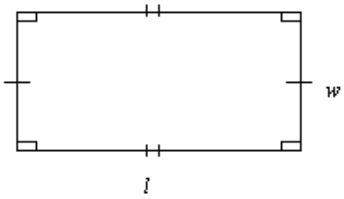


Figure 10: A Rectangle

The opposite sides of a rectangle are parallel and of equal length. The longer sides are called length and the shorter sides are called width.

Perimeter: The *perimeter of a rectangle* equals the sum of the length of all its four sides. In Figure 10,

$$\mathbf{P = l + w + l + w = 2l + 2w}$$

where: l, w = length and width (four sides)

Area: The *area of a rectangle* equals its length times its width. In Figure 10,

$$\mathbf{A = l * w}$$

where: l = length, w = width

Square

Definition: A square is a special rectangular that all its four sides equal.

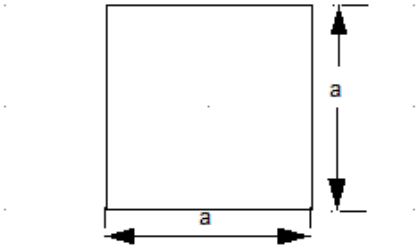


Figure 11: A Square

Perimeter: The *perimeter of a square* equals the sum of the length of all its four sides. In Figure 11,

$$\mathbf{P = a + a + a + a = 4a}$$

where: a = side

Area: The *area of a square* equals the length of the sides squared. In Figure 11,

$$\mathbf{A = a^2}$$

where: a = side

Subject: Geometry
Created by: Ariel Li
Revised: 03/29/2018

Basic Geometry Rules

--

References - The following work was referenced to during the creation of this handout: The University of Colorado Atlas Project, Analyze Math, Wolfram, Paul Bourke, and Trans4mind.

(510) 885-3674
www.csueastbay.edu/scaa
scaa@csueastbay.edu
CALIFORNIA STATE UNIVERSITY EAST BAY