△ congruency shortcuts

SAS ASA

SSS AAS

HL
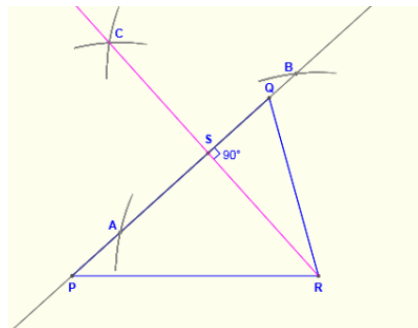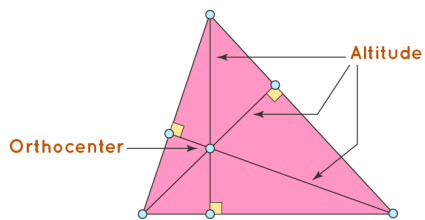
Triangle centers

Altitudes & orthocenter
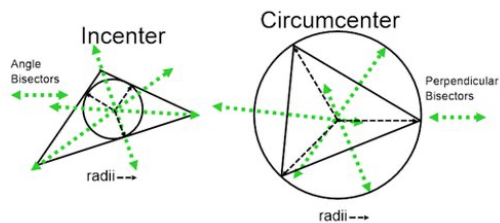
Altitude and Orthocenter of a Triangle

Altitude

Orthocenter

Circumcenter (where perpendicular bisectors of sides meet)

Incenter (where angle bisectors meet)

Incenter

Angle Bisectors

radii→

Circumcenter

Perpendicular Bisectors

radii→

From a vertex to the midpoint of its opposite side

Centroid
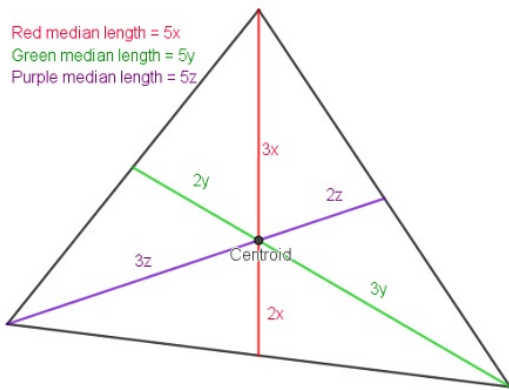Where medians meet
Center of mass
Average of all vertices

Centroid to side = ⅖ entire median length
Centroid to vertex = 3/5 entire median length

Red median length = 5x
Green median length = 5y
Purple median length = 5z

CPCTC
- Corresponding points of congruent triangles are congruent.

N-gon formulas:

Sum of interior angles

$$(n-2)180$$

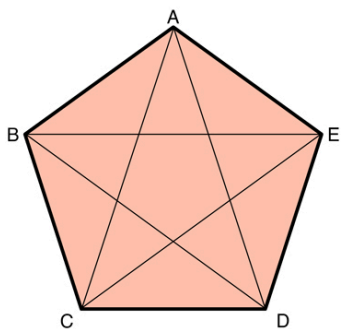Interior angle measure of equiangular n-gon

$$\frac{(n-2)180}{n}$$

Diagonals

Diagonals of a Polygon

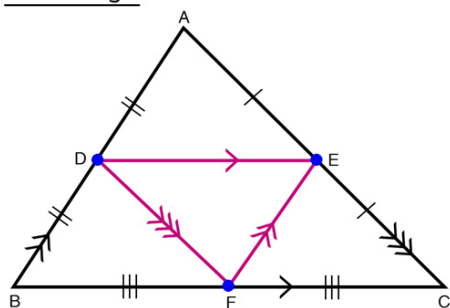Formula: Number of diagonals = $\frac{n(n-3)}{2}$

here, n = number of sides

In ⌂ABCDE, n = 5

Sum of n triangle numbers (1,2,3,4,5)

$$\frac{n(n+1)}{2}$$

Diagonals and midsegments

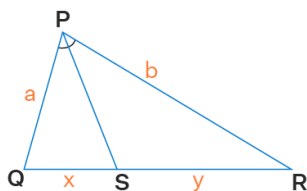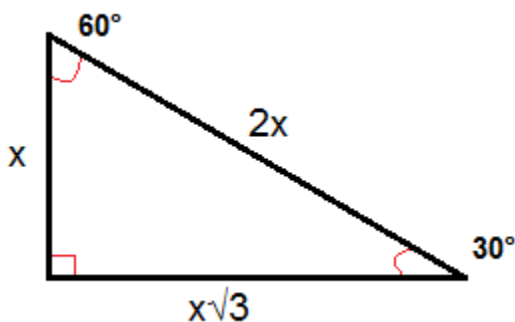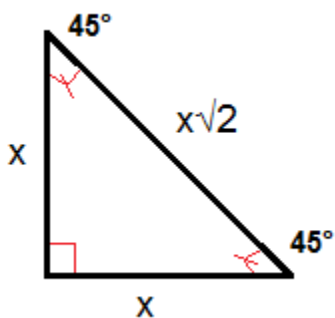## Properties of Midsegments of a Triangle

① Joins the midpoints of 2 sides of a triangle
② A triangle has 3 midsegments
③ It is always parallel to the third side
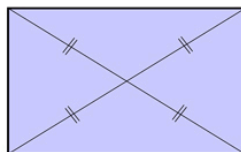④ It is $\frac{1}{2}$ the length of the third side

Proportions

Angle Bisector Theorem

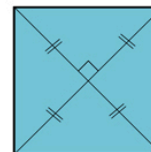cuemath
THE MATH EXPERT

$$\frac{a}{b} = \frac{x}{y}$$

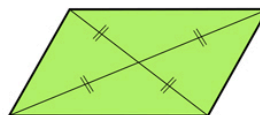## Diagonal of Quadrilaterals

Rectangle
• Has two diagonals
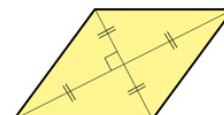• Diagonals are equal
• Diagonals bisect each other

Square
• Has two diagonals
• Diagonals are perpendicular
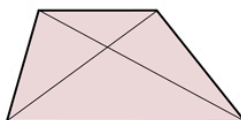• Diagonals bisect each other

Parallelogram
• Has two diagonals
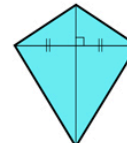• Diagonals bisect each other

Rhombus
• Has two diagonals
• Diagonals are perpendicular
• Diagonals bisect each other

Trapezoid
• Has two diagonals
• Diagonals are not equal
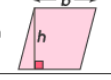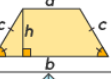 (exception: isosceles trapezoid)
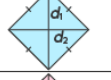
Kite
• Has two diagonals
• Diagonals are perpendicular
• Longer diagonal bisects the shorter one

Quadrilateral Area Formulas

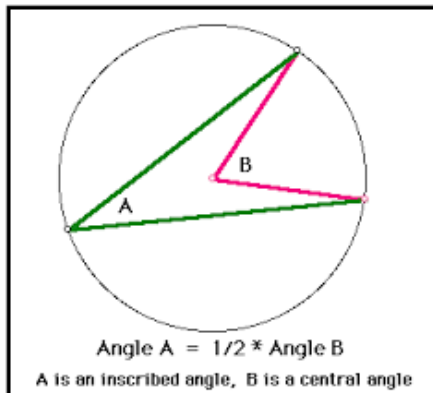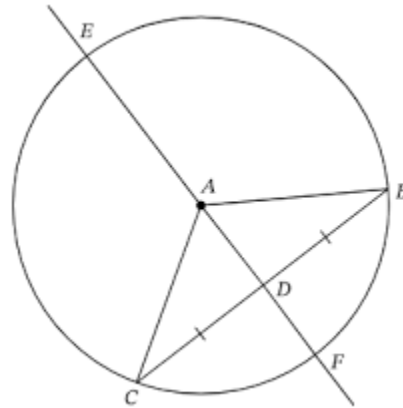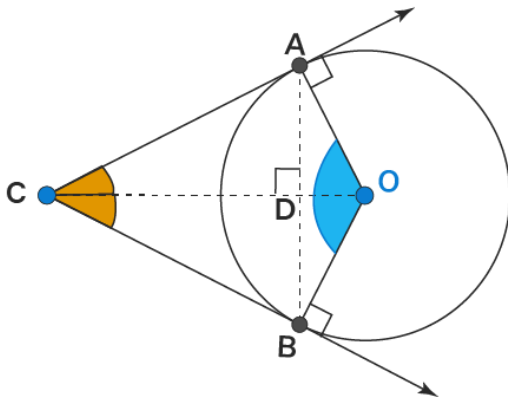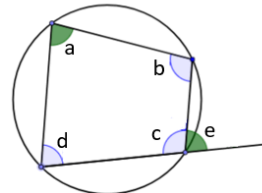| Quadrilateral		Area Formula
Square	x x x x	x^2
Rectangle	l b b l	$l \times b$
Parallelogram	b h	$b \times h$
Trapezoid	a c h c b	$\dfrac{1}{2}(a + b)h$
Rhombus	d_1 d_2	$\dfrac{1}{2} \times d_1 \times d_2$
Kite	d_1 d_2	$\dfrac{1}{2} \times d_1 \times d_2$

Two Tangents Theorem

Angle A = 1/2 * Angle B

A is an inscribed angle, B is a central angle

Cyclic Quadrilateral

A cyclic quadrilateral has all its vertices on the circumference of the circle.

Opposite angles add up to 180°
∠a + ∠c = 180°
∠b + ∠d = 180°

Exterior angle is equal to the interior opposite angle
∠a = ∠e

Similar Figures		
Similarity ratio	Area Ratio	Volume Ratio
$\dfrac{a}{b}$	$\dfrac{a^2}{b^2}$	$\dfrac{a^3}{b^3}$