Geometri

cytopyge

1. General nomenclature

A = area
P = perimeter
The inner angle in point A is called α, B β and so on.
AB is the line between point A and B
c is the length of the line between A and B
V is the volume of a body

2. Triangle ABC

2.1. Area, perimeter and sum of all angles

$$A = \frac{b \times h}{2}$$

$$P = a + b + c$$

$$A = \sqrt{s(s-a)(s-b)(s-c)};$$

$$s = \frac{a+b+c}{2} = \frac{P}{2}$$

$$\alpha + \beta + \gamma = 180°$$

2.2. Median

line m goes through B and divides AC in point N

$$CA = b = CN + NA$$

$$CN = NA = \frac{b}{2} = \frac{CA}{2}$$

$$m = \frac{1}{2}\sqrt{2a^2 + ac^2 - b^2}$$

2.3. Angle bisector

line g goes through B and divides β into same angles
line g divides AC in point I

$$\angle CBI = \angle IBA = \frac{\beta}{2}$$

$$g = \frac{2}{a+c}\sqrt{acs(s-b)}$$

$$\frac{\overline{CI}}{\overline{CB}} = \frac{\overline{AI}}{\overline{AB}}$$

2.4. Right triangle

triangle abc has a right angle (90°) in γ
line h goes from C and makes a right angle (90°) with AB

$$h = CH$$

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

$$A = \frac{1}{2}\,ab = \frac{1}{2}\,ch$$

$$\frac{1}{h^2} = \frac{1}{a^2} = \frac{1}{b^2}$$

$$a^2 = BH \cdot c$$

$$b^2 = AH \cdot c$$

$$h^2 = AH \cdot BH$$

3. Rectangle ABCD

all the angles in ABCD are right (90°) angles

$$AB = a \wedge BC = b$$

$$P = (a + b) \times 2$$

$$A = a \times b$$

d is the diagonal from A to C or from B to D

$$d = \sqrt{a^2 + b^2}$$

4. Square

a square is a rectangle with equal sides

$$a = b$$

$$AB = BC = CD = AD$$

$$P = 4 \times a$$

$$A = a^2$$

5. Parallellogram ABCD

a parallellogram is a skewed rectangle
opposite sides are parallel

$$AB//CD \wedge AD//BC$$

opposite angles are similar

$$\alpha = \gamma \wedge \beta = \delta$$

adjacent angles are complementary

$$\alpha + \beta = \beta + \gamma = \gamma + \delta = \alpha + \delta = 180°$$

opposite sides are of equal length

$$a = AD = BC \wedge b = AB = CD$$

m is the diagonal from A to C
n is the diagonal from B to D

$$m^2 + n^2 = 2(a^2 + b^2)$$

m and n bisect each other in point K

$$AK = KC \wedge BK = KD$$

h is the line from D that makes a right angle with AB

$$h = a \sin \alpha = a \sin \beta$$

5.1. Perimeter

$$P = (a + b) \times 2$$

5.2. Area

$$A = bh = ab \sin \alpha$$

6. Rhombus ABCD (diamond or lozenge)

All sides have equal length a

6.1. Perimeter

$$P = a \times 4$$

$$\alpha + \beta = 180°$$

m is the diagonal from A to C
n is the diagonal from B to D
m and m cross each other in K with a right angle

$$m^2 + n^2 = 4a^2$$

h is the line that comes from D and crosses AB in a right angle

$$h = \frac{mn}{2a} = a \sin \alpha$$

6.2. Area

$$A = \frac{m \times n}{2} = a \times h$$

7. Trapezoid ABCD (trapezium)

One pair of opposite sides parallel

$$AB//CD$$

$$AB = a \wedge CD = b$$

7.1. Area

$$q//a//b$$

$$q = \frac{a+b}{2}$$

h is the lenght of a perpendicular line from CD to AB

$$h \perp q$$

$$A = h \times \frac{(a+b)}{2} = hq$$

8. Convex quadrilateral ABCD

8.1. Area

α is the angle between the diagonals a and b

$$A = \frac{1}{2}\, ab \sin \alpha$$

9. Circle

A circle describes all points that have a (2D) distance r from point M
r is the radius of the circle

9.1. Unit circle

$$r = 1$$

9.1.1. Perimeter

The perimeter of the unit circle defines the value of π.

$$\pi = \frac{1}{2} \times P \approx \frac{22}{7} \approx 3,14$$

9.2. Perimeter

$$d = 2r$$

$$P = 2\pi r = \pi d$$

9.3. Area

$$A = \pi r^2$$

10. Radians and degrees

$$2\pi\, rad \;=\; 360°$$

$$\pi\, rad \;=\; 180°$$

rad to deg

$$n\ rad = n \times \frac{180°}{\pi}$$

deg to rad

$$n° = n \times \frac{\pi}{180°}$$

11. Circle segment

$$A = \frac{r^2}{2}\left(\frac{\pi\alpha_{deg}}{180} - \sin\alpha_{deg}\right)$$

12. Circle sector

Arclength b

$$b = 2\pi r\,\frac{\alpha}{360}$$

12.1. Area

$$A = \pi r^2\,\frac{\alpha}{360} = \frac{br}{2}$$

13. Regular polygon of N sides

length of each side is a
distance from each side to center M is r
distance from each corner point to M is R

$$r = \frac{a}{2}\,cot\,\frac{180°}{N}$$

$$R = \frac{a}{2\sin(\frac{180°}{N})}$$

13.1. Perimeter

$$P = a \times N$$

13.2. Area

$$A = \frac{a^2 N}{4\tan(\frac{180}{N})} = \frac{a^2}{4\tan(\frac{\pi}{N})}$$

$$A = \frac{R^2 N \sin(\frac{360°}{N})}{2} = \frac{R^2 N \sin(\frac{2\pi}{N})}{2}$$

14. Hexagon

length of each of the six sides is a
distance from each corner point to M is a

14.1. Area

$$A = \frac{3\sqrt{3}}{2} a^2$$

15. Sphere

15.1. Volume

$$V = \frac{4}{3} \pi r^3$$

15.2. Surface area

$$A = 4\pi r^2$$