

Formulas for mathematics 2

Algebra

Rules

$$(a + b)^2 = a^2 + 2ab + b^2$$

$$(a - b)^2 = a^2 - 2ab + b^2$$

$$(a + b)(a - b) = a^2 - b^2$$

Quadratic equations

$$x^2 + px + q = 0$$

$$ax^2 + bx + c = 0$$

$$x = -\frac{p}{2} \pm \sqrt{\left(\frac{p}{2}\right)^2 - q}$$

$$x = -\frac{b}{2a} \pm \frac{\sqrt{b^2 - 4ac}}{2a}$$

Arithmetic

Prefixes

T	G	M	k	h	d	c	m	μ	n	p
tera	giga	mega	kilo	hecto	deci	centi	milli	micro	nano	pico
10^{12}	10^9	10^6	10^3	10^2	10^{-1}	10^{-2}	10^{-3}	10^{-6}	10^{-9}	10^{-12}

Powers

$$a^x a^y = a^{x+y}$$

$$\frac{a^x}{a^y} = a^{x-y}$$

$$(a^x)^y = a^{xy}$$

$$a^{-x} = \frac{1}{a^x}$$

$$a^x b^x = (ab)^x$$

$$\frac{a^x}{b^x} = \left(\frac{a}{b}\right)^x$$

$$a^{\frac{1}{n}} = \sqrt[n]{a}$$

$$a^0 = 1$$

Logarithms

$$y = 10^x \Leftrightarrow x = \lg y$$

$$\lg x + \lg y = \lg xy$$

$$\lg x - \lg y = \lg \frac{x}{y}$$

$$\lg x^p = p \cdot \lg x$$

Functions and relations

Linear function

$$y = kx + m \quad k = \frac{y_2 - y_1}{x_2 - x_1}$$

$ax + by + c = 0$, where a and b are not both zero

Power function

$$y = C \cdot x^a$$

Quadratic function

$$y = ax^2 + bx + c \quad a \neq 0$$

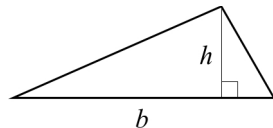
Exponential function

$$y = C \cdot a^x \quad a > 0 \text{ och } a \neq 1$$

Geometry

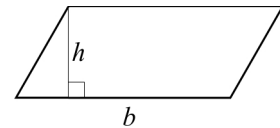
Triangle

$$A = \frac{bh}{2}$$



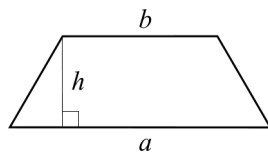
Parallelogram

$$A = bh$$



Trapezium

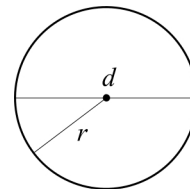
$$A = \frac{h(a+b)}{2}$$



Circle

$$A = \pi r^2 = \frac{\pi d^2}{4}$$

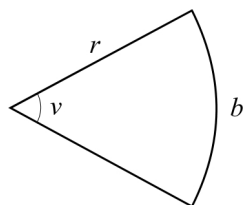
$$O = 2\pi r = \pi d$$



Circle sector

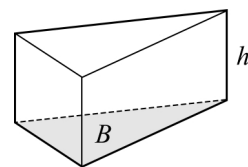
$$b = \frac{v}{360^\circ} \cdot 2\pi r$$

$$A = \frac{v}{360^\circ} \cdot \pi r^2 = \frac{br}{2}$$



Prism

$$V = Bh$$

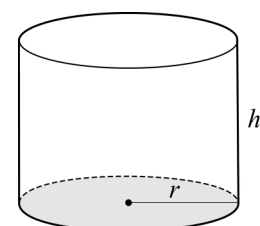


Cylinder

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

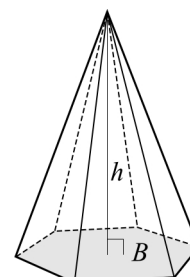
Lateral surface area

$$A = 2\pi r h$$



Pyramid

$$V = \frac{Bh}{3}$$

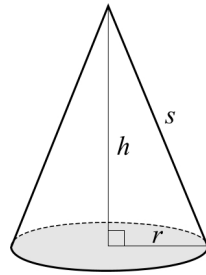


Cone

$$V = \frac{\pi r^2 h}{3}$$

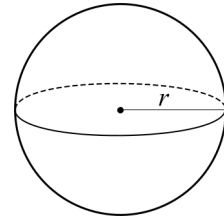
Lateral surface area

$$A = \pi r s$$

**Sphere**

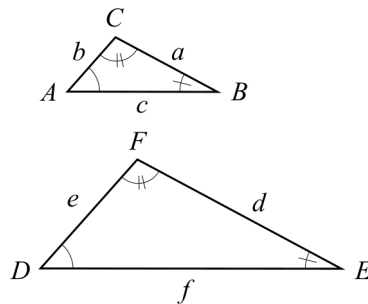
$$V = \frac{4\pi r^3}{3}$$

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

**Similarity**

The triangles ABC and DEF are similar.

$$\frac{a}{d} = \frac{b}{e} = \frac{c}{f}$$

**Scale**

Area scale factor = (Length scale factor)²

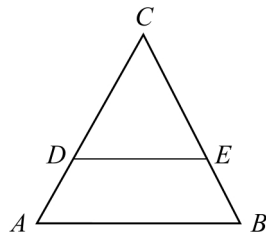
Volume scale factor = (Length scale factor)³

Triangle with a transversal line

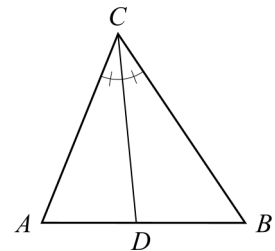
If DE is parallel to AB then

$$\frac{DE}{AB} = \frac{CD}{AC} = \frac{CE}{BC} \text{ and}$$

$$\frac{CD}{AD} = \frac{CE}{BE}$$

**Angle bisector theorem**

$$\frac{AD}{BD} = \frac{AC}{BC}$$

**Angles**

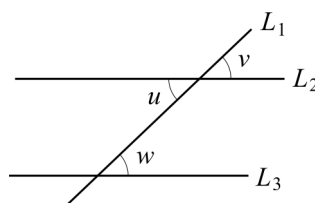
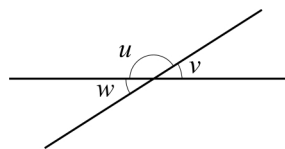
$u + v = 180^\circ$ Supplementary angles

$w = v$ Vertical angles

L_1 cuts two parallel lines L_2 and L_3

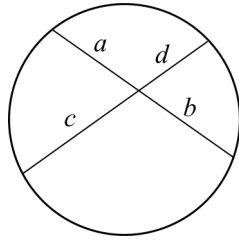
$v = w$ Corresponding angles

$u = w$ Alternate angles

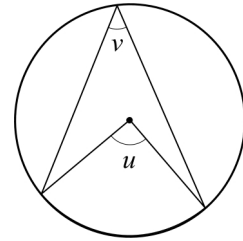


Chord theorem

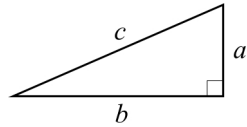
$$ab = cd$$

**Angles subtended by the same arc**

$$u = 2v$$

**Pythagoras' theorem**

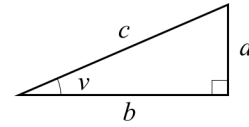
$$a^2 + b^2 = c^2$$

**Trigonometry**

$$\sin v = \frac{a}{c}$$

$$\cos v = \frac{b}{c}$$

$$\tan v = \frac{a}{b}$$

**Distance formula**

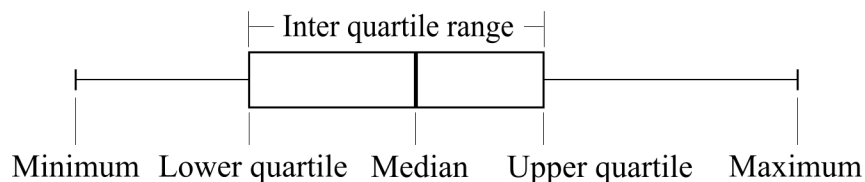
$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Midpoint formula

$$x_m = \frac{x_1 + x_2}{2} \quad \text{and} \quad y_m = \frac{y_1 + y_2}{2}$$

Statistics and probability**Standard deviation of a sample**

$$s = \sqrt{\frac{(x_1 - \bar{x})^2 + (x_2 - \bar{x})^2 + \dots + (x_n - \bar{x})^2}{n-1}}$$

Box plot**Normal distribution**