

Hulkliikmete korrutamine

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

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

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

$$(a+b)(c+d) = ac + ad + bc + bd$$

$$(a+b)(x+y+z) = ax + ay + az + bx + by + bz$$

$$(a-b)^3 = a^3 - 3a^2b + 3ab^2 - b^3$$

$$(a+b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$$

$$(a+b)(a^2 - ab + b^2) = a^3 + b^3$$

$$(a-b)(a^2 + ab + b^2) = a^3 - b^3$$

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

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

$$a - b = -(b-a)$$

$$\frac{a-b}{b-a} = \frac{-(b-a)}{b-a} = -1$$

Tehted astmetega

$$(a : b)^n = a^n : b^n$$

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

$$a^n a^m = a^{n+m}$$

$$a^n : a^m = a^{n-m}$$

$$(a^n)^m = a^{nm}$$

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

$$a^0 = 1$$

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

$$\left(\frac{1}{a}\right)^{-n} = a^n$$

Arvu ruutjuur

$$\sqrt{a^2} = |a| = \begin{cases} a, & \text{kui } a > 0 \\ -a, & \text{kui } a < 0 \\ 0, & \text{kui } a = 0 \end{cases}$$

$$\sqrt{a \cdot b} = \sqrt{a} \cdot \sqrt{b}$$

$$\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}} \quad \sqrt{k^2 a} = k\sqrt{a}$$

$$(\sqrt{a})^2 = a$$

Aritmeetiline keskmine
 $(a_1 + a_2) : 2; (a_1 + a_2 + \dots + a_n) : n$

Geomeetriline keskmine
 $\sqrt{a_1 a_2}$

Ruutvõrrand

$$ax^2 + bx = 0 \Rightarrow x(ax+b) = 0 \Rightarrow x_1 = 0, x_2 = -\frac{b}{a}$$

$$ax^2 + b = 0 \Rightarrow x_{1,2} = \pm \sqrt{-\frac{b}{a}}$$

$$ax^2 + bx + c = 0; \quad x_{1,2} = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x^2 + px + q = 0; \quad x_{1,2} = -\frac{p}{2} \pm \sqrt{\left(\frac{p}{2}\right)^2 - q}$$

Ruutkolmliikme tegurdamine

$$ax^2 + bx + c = a(x-x_1)(x-x_2)$$

$$x^2 + px + q = (x-x_1)(x-x_2)$$

Tehted ratsionaalarvudega

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

$$a + (-b) = \begin{cases} a - b, & \text{kui } a \geq b \\ -(b - a), & \text{kui } a < b \end{cases}$$

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

$$-a \cdot b = a \cdot (-b) = -a \cdot b$$

$$-a \cdot (-b) = a \cdot b$$

$$-a : b = a : (-b) = -a : b$$

$$-a : (-b) = a : b$$

Võrre

$$\frac{a}{-} = \frac{c}{-}$$

$$\frac{b}{-} = \frac{d}{-}$$

$$ad = bc$$

Viete'i teoreem

$$x^2 + px + q = 0; \quad x_1 + x_2 = -p; \quad x_1 x_2 = q$$

Trigonomeetria

α	30°	45°	60°
$\sin \alpha$	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$
$\cos \alpha$	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$
$\tan \alpha$	$\frac{\sqrt{3}}{3}$	1	$\sqrt{3}$

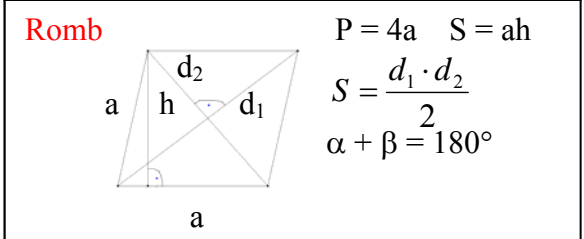
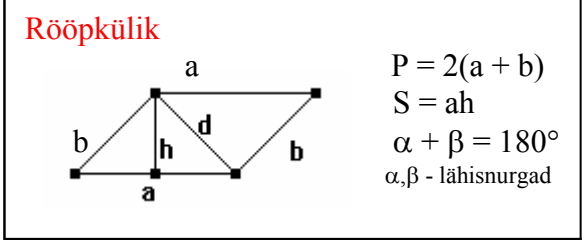
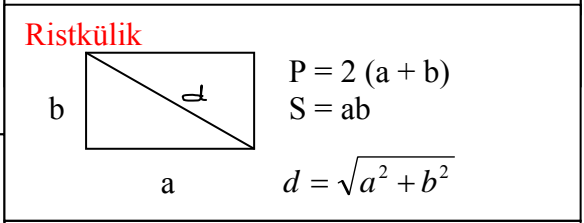
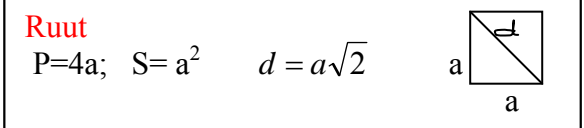
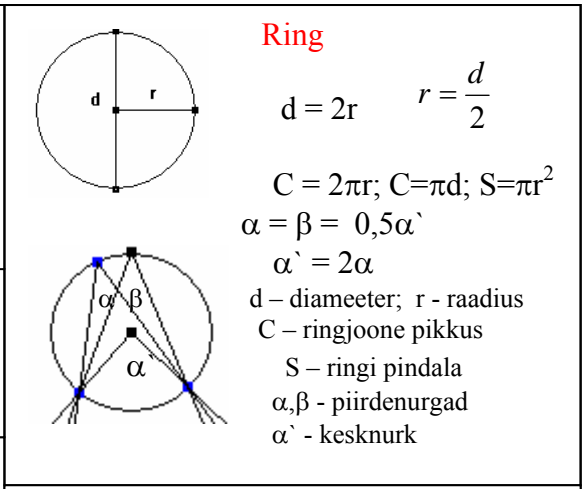
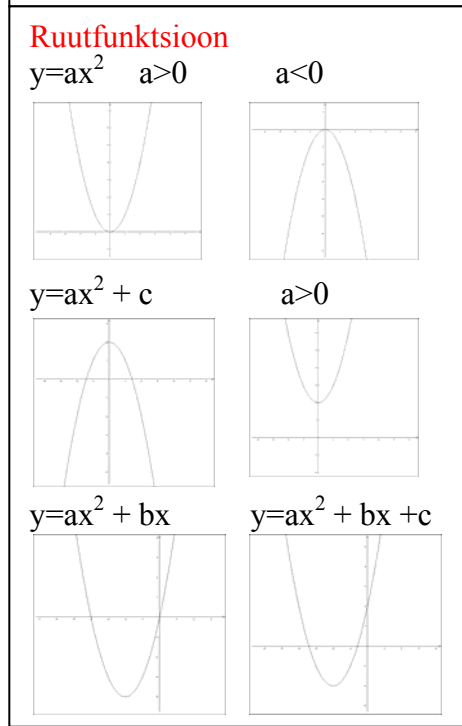
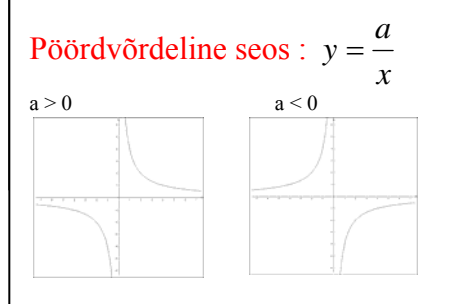
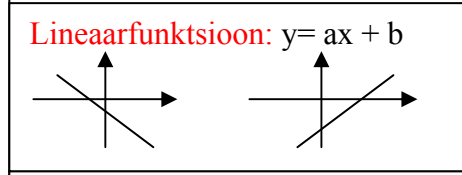
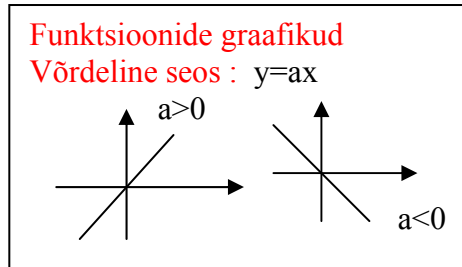
$$\sin \alpha = \cos \beta = \cos(90^\circ - \alpha)$$

$$\cos \alpha = \sin \beta = \sin(90^\circ - \alpha)$$

$$\tan \alpha = \frac{1}{\tan \beta} = \frac{1}{\tan(90^\circ - \alpha)}$$

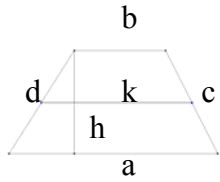
$$\sin^2 \alpha + \cos^2 \alpha = 1$$

$$1 + \tan^2 \alpha = \frac{1}{\cos^2 \alpha} \quad \tan \alpha = \frac{\sin \alpha}{\cos \alpha}$$



P – ümbermõõt, S – pindala, a, b, c, d – küljed, d – diagonaal
 h – kõrgus, k – kesklõik
 P- põhja ümbermõõt, H – ruumilise kujundi kõrgus
 Sp- põhja pindala, Sk – külgpindala, S_t-täispindala
 V-ruumala, n-külgede arv, H-kõrgus, h- põhitahu kõrgus
 m-külgtahu kõrgus, moodustaja

Trapets



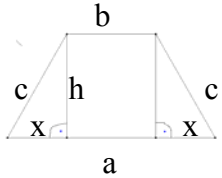
$$P = a + b + c + d$$

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

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

$$S = kh$$

Võrdhaarne trapets

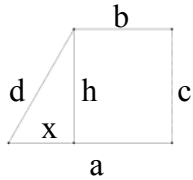


$$x = \frac{a-b}{2}$$

$$c^2 = x^2 + h^2$$

$$c = \sqrt{x^2 + h^2}$$

Täisnurkne trapets

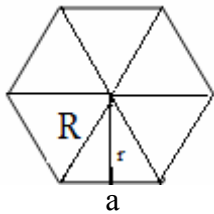


$$x = a - b$$

$$d^2 = x^2 + h^2$$

$$d = \sqrt{x^2 + h^2}$$

Korrapärane hulknurk



$$P = na$$

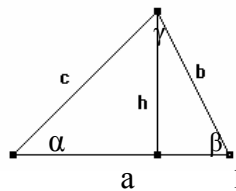
$$S = \frac{Pr}{2}$$

$$s = (n-2)180^\circ$$

P - ümarmõõt
S - pindala

r – apoteem, siseringjoone raadius
R - välisringjoone raadius
s – sisenurkade summa
n - nurkade, külgede arv

Kolmnurk



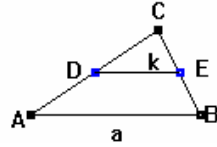
$$\alpha + \beta + \gamma = 180^\circ$$

$$P = a + b + c$$

$$S = \frac{ah}{2}$$

α, β, γ - kolmnurga sisenurgad

Kolmnurga kesklõik

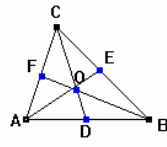


$$k = \frac{a}{2}$$

AB || DE
AD = DC
BE = EC

k - kesklõik

Kolmnurga mediaanid



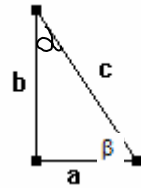
$$CO = 2OD, CD = 3OD$$

$$AO = 2OE, AE = 3OE$$

$$BO = 2OF, BF = 3OF$$

$$AF = FC, BE = EC, AD = DB$$

Täisnurkne kolmnurk



(Pythagorase teoreem)

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

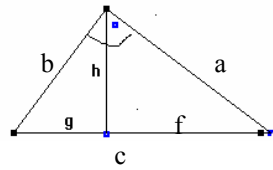
(täisnurkse kolmnurga pindala)

$$S = \frac{ab}{2}$$

$$\alpha + \beta = 90^\circ$$

$$\sin \alpha = \frac{a}{c}, \cos \alpha = \frac{b}{c}, \tan \alpha = \frac{a}{b}$$

$$\sin \beta = \frac{b}{c}, \cos \beta = \frac{a}{c}, \tan \beta = \frac{b}{a}$$



f, g - kaatetite a, b projektsioonid hüpotenuusil

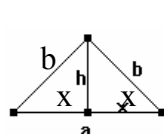
Eukleidese teoreem

$$a^2 = fc$$

$$b^2 = gc$$

hüpotenuusile joonestatud kõrgus $h^2 = fg$

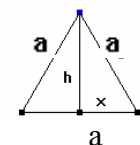
Võrdhaarne kolmnurk



$$h^2 + x^2 = b^2, x = \frac{a}{2}$$

$$h^2 = b^2 - x^2$$

$$h = \sqrt{b^2 - x^2}$$



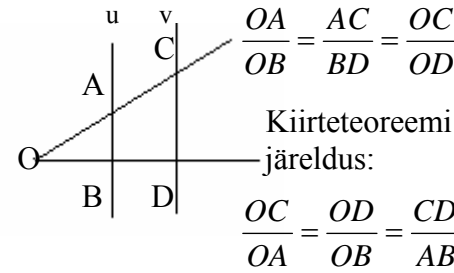
Võrdkülgne kolmnurk

$$x = \frac{a}{2}$$

$$h^2 = a^2 - x^2$$

$$h = \frac{a\sqrt{3}}{2}$$

Kiirteteoreem

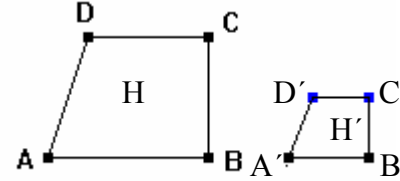


$$\frac{OA}{OB} = \frac{AC}{BD} = \frac{OC}{OD}$$

Kiirteteoreemi järelendus:

$$\frac{OC}{OA} = \frac{OD}{OB} = \frac{CD}{AB}$$

Sarnased hulknurgad

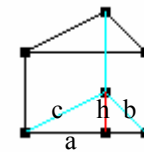


$$\angle A = \angle A', \angle B = \angle B', \angle C = \angle C', \angle D = \angle D'$$

$$\frac{AB}{A'B'} = \frac{BC}{B'C'} = \frac{CD}{C'D'} = \frac{DA}{D'A'} = k$$

$$\frac{P}{P'} = k, \frac{S}{S'} = k^2$$

Kolmnurkne püstprisma



$$S_p = \frac{ah}{2}$$

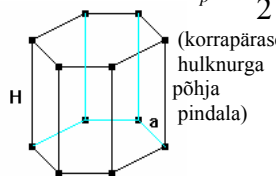
$$S_k = PH$$

$$P = a + b + c$$

$$S_t = 2S_p + S_k$$

$$V = S_p H$$

Korrapärane püstprisma



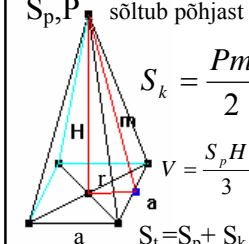
$$S_t = 2S_p + S_k$$

$$S_k = PH$$

$$P = na$$

$$V = S_p H$$

Korrapärane püramiid



S_p, P sõltub põhjast

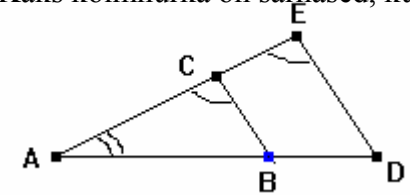
$$S_k = \frac{Pm}{2}$$

$$V = \frac{S_p H}{3}$$

$$S_t = S_p + S_k$$

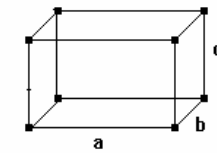
Kolmnurkade sarnasustunnused:

Kaks kolmnurka on sarnased, kui...



- NN $\angle BAC = \angle DAE, \angle ACB = \angle AED$
- KNK $\angle C = \angle E, \frac{AE}{AC} = \frac{ED}{CB}$
- KKK $\frac{AE}{AC} = \frac{ED}{CB} = \frac{AD}{AB} = k$

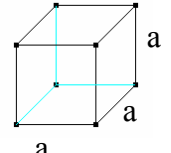
Risttahukas



$$S_t = 2(ab + bc + ca)$$

$$V = abc, V = S_p h$$

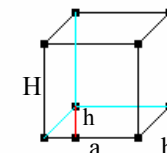
Kuup



$$S_t = 6a^2$$

$$V = a^3$$

Püströöptahukas



$$S_p = ah$$

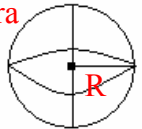
$$P = 2(a+b)$$

$$S_k = PH$$

$$S_t = 2S_p + S_k$$

$$V = S_p H$$

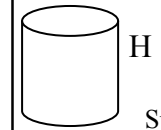
Kera



$$S = 4\pi R^2$$

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

Silinder



$$S_p = \pi r^2$$

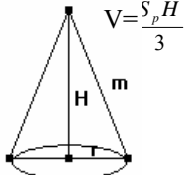
$$S_k = PH$$

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

$$S_t = 2S_p + S_k$$

$$V = S_p H$$

Koonus



$$V = \frac{S_p H}{3}$$

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

$$S_p = \pi r^2, S_k = \pi r m$$

$$S_t = S_p + S_k$$

m-moodustaja