

# MATEMATIKAI KÉPLETTÁR

## Hatványok

$$a^n - b^n = (a-b)(a^{n-1} + a^{n-2}b + a^{n-3}b^2 + \dots + ab^{n-2} + b^{n-1})$$

$$a^{2k+1} + b^{2k+1} = (a+b)(a^{2k} - a^{2k-1}b + a^{2k-2}b^2 - \dots - ab^{2k-1} + b^{2k})$$

$$a^{2k} - b^{2k} = (a+b)(a^{2k-1} - a^{2k-2}b + a^{2k-3}b^2 - \dots + ab^{2k-2} - b^{2k-1})$$

## Binomiális együtthatók

$$\binom{n}{k} = \binom{n}{n-k}$$

$$\binom{n}{k} + \binom{n}{k+1} = \binom{n+1}{k+1}$$

## Közep

Súlyozott számtani közép:  $A = \frac{g_1 a_1 + g_2 a_2 + \dots + g_n a_n}{g_1 + g_2 + \dots + g_n}$

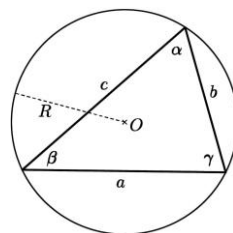
Harmonikus közép:  $H = \frac{n}{\frac{1}{a_1} + \frac{1}{a_2} + \dots + \frac{1}{a_n}}$

Négyzetes közép:  $Q = \sqrt{\frac{a_1^2 + a_2^2 + \dots + a_n^2}{n}}$

## Háromszögek

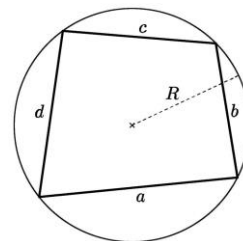
$$K = 2s$$

$$T = \frac{abc}{4R} = \sqrt{s(s-a)(s-b)(s-c)} = \frac{a^2 \sin \beta \sin \gamma}{2 \sin \alpha}$$



## Négyszögek

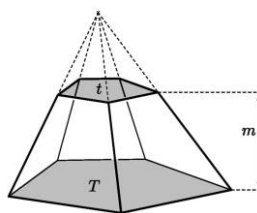
Húrnégyszög:  $T = \sqrt{(s-a)(s-b)(s-c)(s-d)}$ , ahol  $K = 2s$



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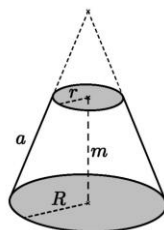
## Felszín és térfogat

Csonkagúla:  $V = \frac{m}{3}(T + \sqrt{Tt} + t)$



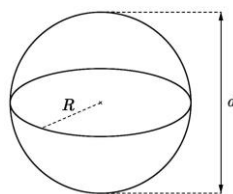
Csonkakúp:  $A = \pi[R^2 + r^2 + (R+r)a]$

$$V = \frac{\pi m}{3}(R^2 + Rr + r^2)$$



Gömb:  $A = 4R^2\pi = d^2\pi$

$$V = \frac{4R^3\pi}{3} = \frac{d^3\pi}{6}$$



## Trigonometriai összefüggések

$$\sin(\alpha \pm \beta) = \sin \alpha \cos \beta \pm \cos \alpha \sin \beta$$

$$\cos(\alpha \pm \beta) = \cos \alpha \cos \beta \mp \sin \alpha \sin \beta$$

$$\operatorname{tg}(\alpha \pm \beta) = \frac{\operatorname{tg} \alpha \pm \operatorname{tg} \beta}{1 \mp \operatorname{tg} \alpha \operatorname{tg} \beta}$$

$$\sin \alpha + \sin \beta = 2 \sin \frac{\alpha + \beta}{2} \cdot \cos \frac{\alpha - \beta}{2}$$

$$\sin \alpha - \sin \beta = 2 \cos \frac{\alpha + \beta}{2} \cdot \sin \frac{\alpha - \beta}{2}$$

$$\cos \alpha + \cos \beta = 2 \cos \frac{\alpha + \beta}{2} \cdot \cos \frac{\alpha - \beta}{2}$$

$$\cos \alpha - \cos \beta = -2 \sin \frac{\alpha + \beta}{2} \cdot \sin \frac{\alpha - \beta}{2}$$

$$\sin \frac{\alpha}{2} = \pm \sqrt{\frac{1 - \cos \alpha}{2}}$$

$$\sin^2 \alpha = \frac{1 - \cos 2\alpha}{2}$$

$$\cos \frac{\alpha}{2} = \pm \sqrt{\frac{1 + \cos \alpha}{2}}$$

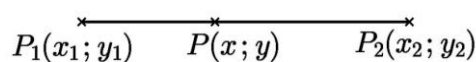
$$\cos^2 \alpha = \frac{1 + \cos 2\alpha}{2}$$

$$\operatorname{tg} \frac{\alpha}{2} = \pm \sqrt{\frac{1 - \cos \alpha}{1 + \cos \alpha}} = \frac{1 - \cos \alpha}{\sin \alpha} = \frac{\sin \alpha}{1 + \cos \alpha}$$

## Koordináta-geometria

Szakaszt adott arányban osztó pont koordinátái:

$$x = \frac{nx_1 + mx_2}{m+n}, \quad y = \frac{ny_1 + my_2}{m+n},$$



ahol  $P_1P : PP_2 = m : n$

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## Differenciálszámítás

$$(c \cdot f)' = c \cdot f'$$

$$(f \pm g)' = f' \pm g'$$

$$(f \cdot g)' = f' \cdot g + f \cdot g'$$

$$\left(\frac{f}{g}\right)' = \frac{f' \cdot g - f \cdot g'}{g^2}$$

$$(f(g))' = f'(g) \cdot g'$$

$$(\sin x)' = \cos x$$

$$(\cos x)' = -\sin x$$

$$(\operatorname{tg} x)' = \frac{1}{\cos^2 x}$$

$$(\operatorname{ctg} x)' = -\frac{1}{\sin^2 x}$$

## Integrálszámítás

$$\int (c \cdot f) = c \cdot \int f$$

$$\int (f \pm g) = \int f \pm \int g$$

$$\int \sin x \, dx = -\cos x + C$$

$$\int \cos x \, dx = \sin x + C$$

$$\int_a^b f = -\int_b^a f$$

$$\int_a^b f = \int_a^c f + \int_c^b f$$

$$\int_a^b (c \cdot f) = c \cdot \int_a^b f$$

$$\int_a^b (f \pm g) = \int_a^b f \pm \int_a^b g$$

## Statisztika

$$\text{Szórásnégyzet: } D^2 = \frac{\sum x_i^2}{n} - \left(\frac{\sum x_i}{n}\right)^2$$

## Valószínűségszámítás

$$P(A) + P(\bar{A}) = 1$$

$$P(A + B) = P(A) + P(B) - P(A \cdot B)$$

$$P(A|B) = \frac{P(A \cdot B)}{P(B)}$$

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