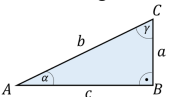
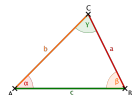


Grundlagen	
<b>Mengen:</b>	
$\mathbb{N} = \{1, 2, 3, \dots\}$	Natürliche Zahlen
$\mathbb{N}_0 = \{0, 1, 2, \dots\}$	Natürliche Zahlen (+0)
$\mathbb{Z} = \{\dots, -1, 0, 1, \dots\}$	Ganze Zahlen
$\mathbb{Q} = \{\frac{p}{q}\}$	Rationale Zahlen
$\mathbb{R} = \{\dots, \sqrt{3}, \pi, \dots\}$	Reelle Zahlen

Trigometrie	
<b>Rechtwinkliges Dreieck:</b>	
	
$\sin(\alpha) = \frac{a}{c}$	$\cos(\alpha) = \frac{b}{c}$
$\tan(\alpha) = \frac{a}{b}$	
$\tan(\alpha) = \frac{\sin(\alpha)}{\cos(\alpha)}$	$\cos(\alpha) = \frac{\sin(\alpha)}{\tan(\alpha)}$
$\sin(\alpha) = \tan(\alpha) \cdot \cos(\alpha)$	

<b>Allgemeines Dreieck:</b>	
	
<b>Sinussatz:</b>	
$\frac{a}{\sin(\alpha)} = \frac{b}{\sin(\beta)} = \frac{c}{\sin(\gamma)}$	
<b>Kosinussatz:</b>	
$a^2 = b^2 + c^2 - 2bc \cos(\alpha)$	
$b^2 = a^2 + c^2 - 2ac \cos(\beta)$	
$c^2 = a^2 + b^2 - 2ab \cdot \cos(\gamma)$	
<b>Umrechnung Gradmass/Bogenmass:</b>	
$x_{\text{Bogenmass}} = \frac{\alpha}{180^\circ} \cdot \pi$	$x_{\text{Gradmass}} = \frac{\alpha}{\pi} \cdot 180^\circ$

Binomische Formeln	
$(a + b)^2 = a^2 + 2ab + b^2$	
$(a - b)^2 = a^2 - 2ab + b^2$	
$(a + b) \cdot (a - b) = a^2 - b^2$	

Brüche	
$\frac{\frac{a}{b}}{\frac{c}{d}} = \frac{a}{b} \cdot \frac{d}{c} = \frac{a \cdot d}{b \cdot c} = \frac{ad}{bc}$	

Summenzeichen	
$\sum_i^n a = a_i + a_{i+1} + \dots + a_n$	
<b>Gaussche Summenformel:</b>	
$\sum_{k=1}^n k = \frac{n(n+1)}{2}$	
Für $k^2$ :	
$\sum_{k=1}^n k^2 = \frac{n(n+1)(2n+1)}{6}$	

<b>Rechenregeln:</b>	
$\sum_{k=s}^n (c \cdot a_k) = c \cdot \sum_{k=s}^n a_k$	
$\sum_{k=s}^n (a_k + b_k) = \sum_{k=s}^n a_k + \sum_{k=s}^n b_k$	
$\sum_{k=s}^n (a_k \cdot b_k) = \sum_{k=s}^n a_k \cdot \sum_{k=s}^n b_k$	
$\sum_{k=s}^n a_k + \sum_{k=n+1}^m a_k = \sum_{k=s}^m a_k$	
$\sum_{k,l=s}^n a_{kl} = \sum_{k=s}^n \sum_{l=s}^n a_{kl}$	
<b>Indexttransformation:</b>	
$\sum_{k=s}^n a_k = \sum_{k=s-k_0}^{n-k_0} a_k + k_0 \rightarrow$	

Produktzeichen	
$\prod_i^n a = a_i \cdot a_{i+1} \cdot \dots \cdot a_n$	

<b>Logarithmen</b> $a^y = x \rightarrow \log_a x = y$	
$\log_a(u \cdot v) = \log_a u + \log_a v$	$\log_{10} x = \log x$
$\log_a \frac{u}{v} = \log_a u - \log_a v$	$\log_e x = \ln x$
$\log_a u^x = x \cdot \log_a u$	
$\log_a(x) = \frac{\log(x)}{\log(a)} = \frac{\ln(x)}{\ln(a)} = \frac{\log_c(x)}{\log_c(a)}$	<b>Basiswechsel</b>
$\log_a(a^x) = x$	$\log_a(1) = 0$
$a^n = x \rightarrow n = \frac{\log(x)}{\log(a)}$	
$\ln(x) = y \quad ( e^{\dots}  \rightarrow x = e^y$	

<b>Potenzen</b> $a^n = a \cdot a \cdot \dots \cdot a$	
$a^m \cdot a^n = a^{m+n}$	$\frac{a^m}{a^n} = a^{m-n}$
$a^n \cdot b^n = (a \cdot b)^n$	$\frac{a^n}{b^n} = (\frac{a}{b})^n$
$(a^n)^m = a^{m \cdot n} = (a^m)^n$	
$a^0 = 1$	$a^{-n} = \frac{1}{a^n}$
<b>Tricks:</b>	
$x^{1+a} = y \cdot (a+2) \rightarrow x = (y \cdot (a+2))^{\frac{1}{1+a}}$	

<b>Wurzel</b>	
<b>Quadratwurzel:</b>	
$\sqrt{a} = b \rightarrow b^2 = a$	
$\sqrt{a} \cdot \sqrt{a} = a$	$\frac{\sqrt{a}}{\sqrt{a}} = 1$
$\sqrt{a} \cdot \sqrt{b} = \sqrt{ab}$	$\frac{\sqrt{a}}{\sqrt{b}} = \sqrt{\frac{a}{b}}$
$\sqrt{a^2} =  a  \rightarrow a \in \mathbb{R}$	
<b>Wurzel Tricks:</b>	
$\frac{\sqrt{x}}{x} = \frac{1}{\sqrt{x}}$	
$2\sqrt{x} \cdot \sqrt{1 + \frac{1}{x}} = 2\sqrt{x \cdot (1 + \frac{1}{x})} = 2\sqrt{x+1}$	

<b>Algem. Wurzel:</b>	
$\sqrt[n]{a} = b \rightarrow b^n = a$	
$\sqrt[n]{a} \cdot \sqrt[n]{a} = a^{\frac{1}{n}} \cdot a^{\frac{1}{n}} = a^{\frac{m+n}{m \cdot n}}$	
$\sqrt[n]{a} : \sqrt[m]{a} = a^{\frac{1}{n}} : a^{\frac{1}{m}} = a^{\frac{m-n}{m \cdot n}}$	
$\sqrt[n]{a} \cdot \sqrt[m]{b} = \sqrt[n]{a \cdot b}$	$\sqrt[n]{a^m} = a^{\frac{m}{n}} = (\sqrt[n]{a})^m$
$\frac{\sqrt[n]{a}}{\sqrt[m]{b}} = \sqrt[n]{\frac{a}{b}}$	$\sqrt[n]{\sqrt[m]{a}} = \sqrt[n \cdot m]{a} = \sqrt[m]{\sqrt[n]{a}}$
$\sqrt[n]{a} \rightarrow$ nicht definiert	$\sqrt[n]{-1} \rightarrow$ nicht definiert
$2^n + \sqrt[n]{-1} = 1$	

Exponentialfunktion	
$f(x) = a \cdot b^x$	
$a \rightarrow$ Anfangswert	
$b \rightarrow$ Wachstumsfaktor	
$\rightarrow b > 1$ Wachstum	
$\rightarrow b < 1$ Abnahme	
<b>Prozentuale Zu- oder Abnahme (p%)</b>	
$b = 1 \pm \frac{p}{100}$	

Volumen und Flächen	
<b>Quadrat:</b>	
$A = a^2$	$U = 4 \cdot a$
$d = \sqrt{2} \cdot a$	
<b>Rechteck:</b>	
$A = a \cdot b$	$U = 2a + 2b$
$d = \sqrt{a^2 + b^2}$	
<b>Dreieck:</b>	
$A = \frac{1}{2} \cdot a \cdot h$	$U = a + b + c$
<b>Kreis:</b>	
$A = \pi \cdot r^2$	$U = 2\pi \cdot r$
$A = \frac{d^2 \cdot \pi}{4}$	
<b>Zylinder:</b>	
$V = \pi \cdot r^2 \cdot h$	$A = 2 \cdot \pi(r^2 + r \cdot h)$
<b>Pyramide:</b>	
$G \rightarrow$ Grundfläche (Quadrat, Rechteck, Dreieck)	
$V = \frac{1}{3} \cdot G \cdot h$	$A = G + S_1, S_2, \dots$
<b>Kugel:</b>	
$V = \frac{4}{3} \cdot \pi \cdot r^3$	$A = 4 \cdot \pi \cdot r^2$

Nullstellen von Gleichungen	
<b>Grad 1</b>	
$x_0 = -\frac{b}{a}$	
<b>Grad 2</b>	
$x_{1,2} = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$	
<b>Weitere Methoden:</b>	
<ul style="list-style-type: none"> <li>Polynomdivision</li> <li>Faktorisierung</li> <li>Binomisierung</li> </ul>	

Tricks mit lim	
$\lim_{n \rightarrow \infty} (1 + \frac{2}{5n})^{-\frac{2n}{5}} = \lim_{n \rightarrow \infty} (1 + \frac{1}{\frac{5n}{2}})^{-\frac{2n}{5}} =$	
$\lim_{n \rightarrow \infty} (1 + \frac{1}{\frac{5n}{2}})^{\frac{5n}{2} \cdot \frac{-4}{25}} = e^{-\frac{4}{25}}$	
$\lim_{n \rightarrow \infty} (\sqrt{n^2 + n} - \sqrt{n^2 - 2n}) = \lim_{n \rightarrow \infty} (\sqrt{n^2 + n} - \sqrt{n^2 - 2n}) \cdot \frac{\sqrt{n^2 + n} + \sqrt{n^2 - 2n}}{\sqrt{n^2 + n} + \sqrt{n^2 - 2n}} =$	
$= \lim_{n \rightarrow \infty} \frac{n^2 + n - (n^2 - 2n)}{\sqrt{n^2 + n} + \sqrt{n^2 - 2n}} = \lim_{n \rightarrow \infty} \frac{3n}{\sqrt{n^2 + n} + \sqrt{n^2 - 2n}} \cdot \frac{1}{\frac{1}{n}} =$	
$= \lim_{n \rightarrow \infty} \frac{3}{\sqrt{1 + \frac{1}{n}} + \sqrt{1 - \frac{2}{n}}} = \lim_{n \rightarrow \infty} \frac{3}{\sqrt{1 + \frac{1}{n}} + \sqrt{1 - \frac{2}{n}}} = \frac{3}{\sqrt{1} + \sqrt{1}} = \frac{3}{2}$	