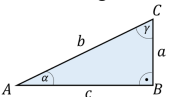
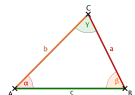


Grundlagen	
Mengen:	
$\mathbb{N} = \{1, 2, 3, \dots\}$	Natürliche Zahlen
$\mathbb{N}_0 = \{0, 1, 2, \dots\}$	Natürliche Zahlen (+0)
$\mathbb{Z} = \{\dots, -1, 0, 1, \dots\}$	Ganze Zahlen
$\mathbb{Q} = \{\frac{p}{q}\}$	Rationale Zahlen
$\mathbb{R} = \{\dots, \sqrt{3}, \pi, \dots\}$	Reelle Zahlen

Trigonometrie	
Rechtwinkliges Dreieck:	
	
$\sin(\alpha) = \frac{a}{c}$	$\cos(\alpha) = \frac{b}{c}$
$\tan(\alpha) = \frac{a}{b}$	
$\tan(\alpha) = \frac{\sin(\alpha)}{\cos(\alpha)}$	$\cos(\alpha) = \frac{\sin(\alpha)}{\tan(\alpha)}$
$\sin(\alpha) = \tan(\alpha) \cdot \cos(\alpha)$	

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

Logarithmen $a^y = x \rightarrow \log_a x = y$	
$\log_a(u \cdot v) = \log_a u + \log_a v$	$\log_{10} x = \log x$
$\log_a \frac{u}{v} = \log_a u - \log_a v$	$\log_e x = \ln x$
$\log_a u^x = x \cdot \log_a u$	
$\log_a(x) = \frac{\log(x)}{\log(a)} = \frac{\ln(x)}{\ln(a)} = \frac{\log_e(x)}{\log_e(a)}$	Basiswechsel
$\log_a(a^x) = x$	$\log_a(1) = 0$
$a^n = x \rightarrow n = \frac{\log(x)}{\log(a)}$	

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

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

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

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

Potenzen $a^n = a \cdot a \cdot \dots \cdot a$	
$a^m \cdot a^n = a^{m+n}$	$\frac{a^m}{a^n} = a^{m-n}$
$a^n \cdot b^n = (a \cdot b)^n$	$\frac{a^n}{b^n} = \left(\frac{a}{b}\right)^n$
$(a^n)^m = a^{m \cdot n} = (a^m)^n$	
$a^0 = 1$	$a^{-n} = \frac{1}{a^n}$

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

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

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

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

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