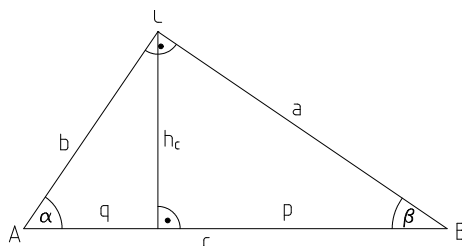


## 9.3 Satz von Pythagoras, Höhen- und Kathetensatz

### 9.3.1



a)  $c^2 = a^2 + b^2$  (Pythagoras)

$$c = \sqrt{4^2 + 2^2} = \sqrt{20} = 2\sqrt{5}$$

$$b^2 = c \cdot q \text{ (Kathetensatz)}$$

$$q = \frac{b^2}{c} = \frac{2^2}{2\sqrt{5}} = \frac{2}{\sqrt{5}} = \frac{2}{5}\sqrt{5}$$

$$p = c - q = 2\sqrt{5} - \frac{2}{5}\sqrt{5} = 1,6 \cdot \sqrt{5}$$

$$h^2 = p \cdot q \text{ (Höhensatz)}$$

$$h = \sqrt{1,6 \cdot \sqrt{5} \cdot 0,4 \cdot \sqrt{5}} = 0,8 \cdot \sqrt{5}$$

$$A = \frac{1}{2}a \cdot b = \frac{1}{2} \cdot 4 \cdot 2 = 4$$

b)  $c = 2\sqrt{5}, q = \frac{2}{5}\sqrt{5}, p = 1,6 \cdot \sqrt{5}, h = \frac{4}{5}\sqrt{5}, A = 4$

c)  $b = \sqrt{39}, q = 4,875, p = 3,125, h = 0,625\sqrt{39}, A = \frac{5}{2}\sqrt{39}$

d)  $b^2 = c \cdot q$

$$a^2 + b^2 = c^2, \text{ also } a^2 + cq = c^2$$

Mit  $a = 2$  und  $q = 3$  erhält man folgende quadratische Gleichung:  $4 + 3c = c^2$

Auflösen nach  $c$  liefert  $c = 4$  (bzw.  $c = -1$ , was jedoch nicht sinnvoll ist!)

$$b = 2\sqrt{3}, p = 1, h = \sqrt{3}, A = 2\sqrt{3}$$

e)  $b = 3, c = 5, q = 1,8, p = 3,2, h = 2,4$

9.3.2 a)  $u^2 = c^2 - x^2$

b)  $r^2 = s^2 + t^2$

c)  $t = \sqrt{r^2 - s^2}$

d)  $r^2 = (x + y)^2 - c^2$

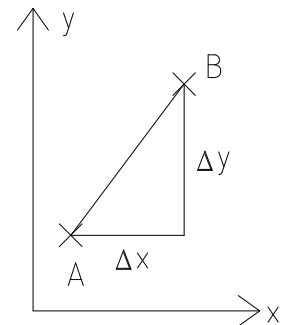
e)  $(x + y)^2 = r^2 + c^2$

$\Rightarrow x = \sqrt{r^2 + c^2} - y$

9.3.3 Beachte:  $Abstand = \sqrt{(\Delta x)^2 + (\Delta y)^2}$

a)  $\overline{AB} = \sqrt{(4-1)^2 + (6-2)^2} = \sqrt{9+16} = 5$

b)  $\overline{AB} = \sqrt{5}$



9.3.4  $\overline{BL} = \sqrt{(5cm)^2 + (2cm)^2} = \sqrt{29cm}$

Länge einer Raumdiagonale:  $\sqrt{(\Delta x)^2 + (\Delta y)^2 + (\Delta z)^2}$

$\overline{BK} = \sqrt{(3cm)^2 + (8cm)^2 + (3cm)^2} = \sqrt{82cm}$  (Raumdiagonale!)

$\overline{LK} = \sqrt{(8cm - 2cm)^2 + (3cm)^2 + (5cm - 3cm)^2} = \sqrt{6^2 + 3^2 + 2^2}cm = 7cm$

9.3.5 Berechnung der Höhe:

$a^2 = \left(\frac{a}{2}\right)^2 + h^2$  (Pythagoras)

$h = \sqrt{a^2 - \frac{a^2}{4}} = \sqrt{\frac{3}{4}a^2} = \frac{a}{2}\sqrt{3}$

Berechnung der Fläche:

$A = \frac{1}{2} \cdot a \cdot h = \frac{1}{2} \cdot a \cdot \frac{a}{2}\sqrt{3} = \frac{a^2}{4}\sqrt{3}$

