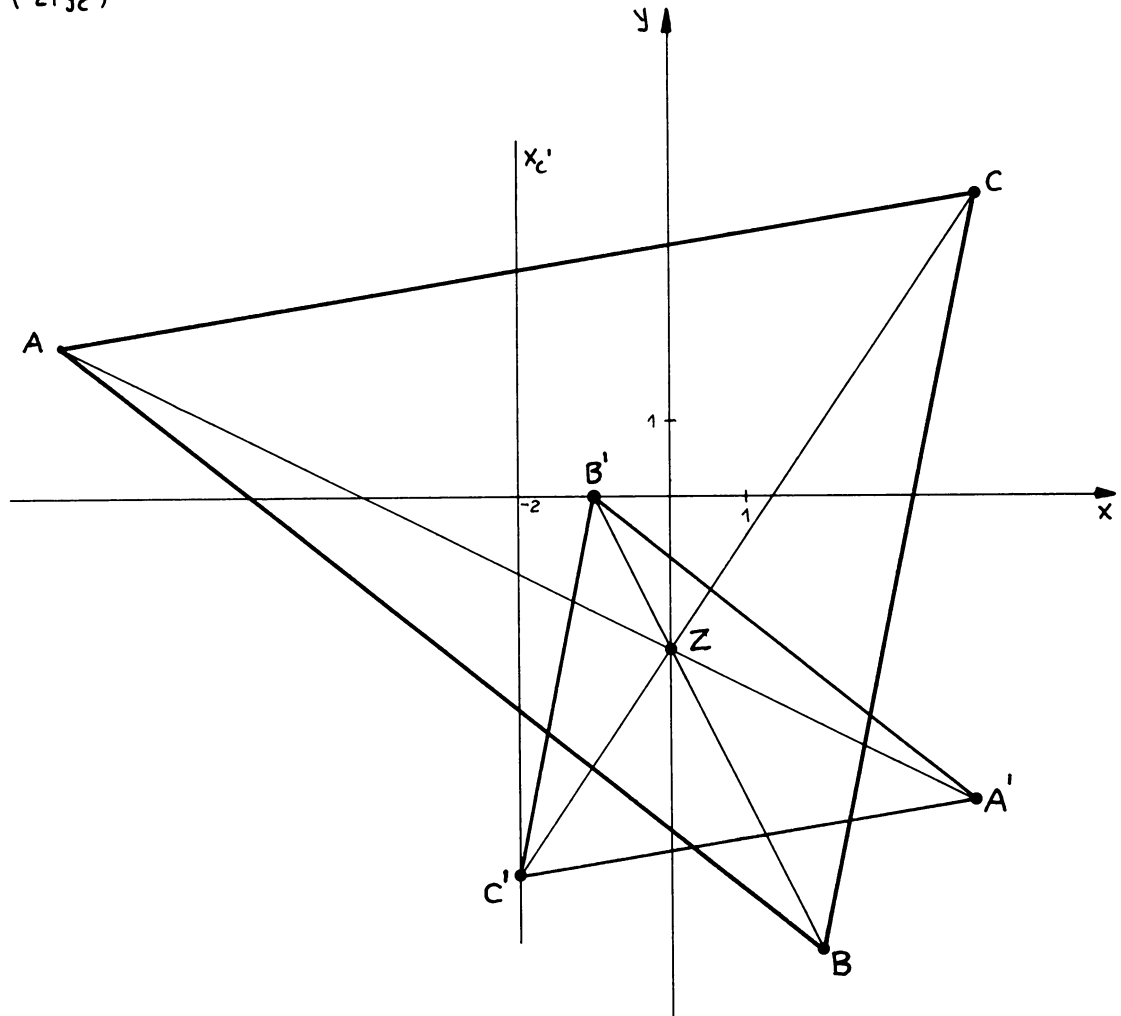


3. Mathematikschulaufgabe

Klasse 9 / I

- Lösungen -

- 1.0 $A(-8|2)$
 $B(2|-6)$
 $C(4|4)$
 $A'(4|-4)$
 $C'(-2|4)$



- 1.1 Konstruktionsbeschreibung C' :

$\overline{AC} \parallel$ durch A' schneidet $x = -2$ in C'

- Lösungen -

Berechnung von k und $y_{c'}$:

$$\vec{A'C'} = k \cdot \vec{AC}$$

$$\begin{pmatrix} -2-4 \\ y_{c'}+4 \end{pmatrix} = k \cdot \begin{pmatrix} 4+8 \\ 4-2 \end{pmatrix}$$

$$\begin{cases} -6 = k \cdot 12 \\ \wedge y_{c'}+4 = k \cdot 2 \end{cases}$$

$$\underline{\underline{k = -0,5}}$$

$$y_{c'} = -0,5 \cdot 2 - 4$$

$$\underline{\underline{y_{c'} = -5}}$$

1.2

$$\vec{ZA'} = k \cdot \vec{ZA}$$

$$\begin{pmatrix} 4-x \\ -4-y \end{pmatrix} = -0,5 \cdot \begin{pmatrix} -8-x \\ 2-y \end{pmatrix}$$

$$\begin{aligned} 4-x &= 4+0,5x \\ 1,5x &= 0 \\ \underline{\underline{x &= 0}} \end{aligned}$$

$$\begin{aligned} -4-y &= -1+0,5y \\ -1,5y &= 3 \\ \underline{\underline{y &= -2}} \end{aligned}$$

$$\underline{\underline{Z(0|-2)}}$$

1.3

$$\vec{ZB'} = k \cdot \vec{ZB}$$

$$\begin{pmatrix} x-0 \\ y+2 \end{pmatrix} = -0,5 \begin{pmatrix} 2-0 \\ -6+2 \end{pmatrix}$$

$$\underline{\underline{\begin{aligned} x &= -1 \\ y &= 0 \end{aligned}}}$$

$$\underline{\underline{B'(-1|0)}}$$

1.4

$$A_{ABC} = \frac{1}{2} | \vec{AB} \quad \vec{AC} |$$

$$A_{ABC} = \frac{1}{2} \begin{vmatrix} 2+8 & 4+8 \\ -6-2 & 4-2 \end{vmatrix}$$

$$A_{ABC} = \frac{1}{2} (10 \cdot 2 - 12 \cdot (-8))$$

$$\underline{\underline{A_{ABC} = 58 \text{ cm}^2}}$$

1.5

$$A_{A'B'C'} = k^2 \cdot A_{ABC}$$

$$A_{A'B'C'} = 0,25 \cdot 58 \text{ cm}^2$$

$$\underline{\underline{A_{A'B'C'} = 14,5 \text{ cm}^2}}$$

- Lösungen -

2.0

$p: y = x^2 + 4x + 4$ $Z(2|-3)$

$g: y = 0,5x$

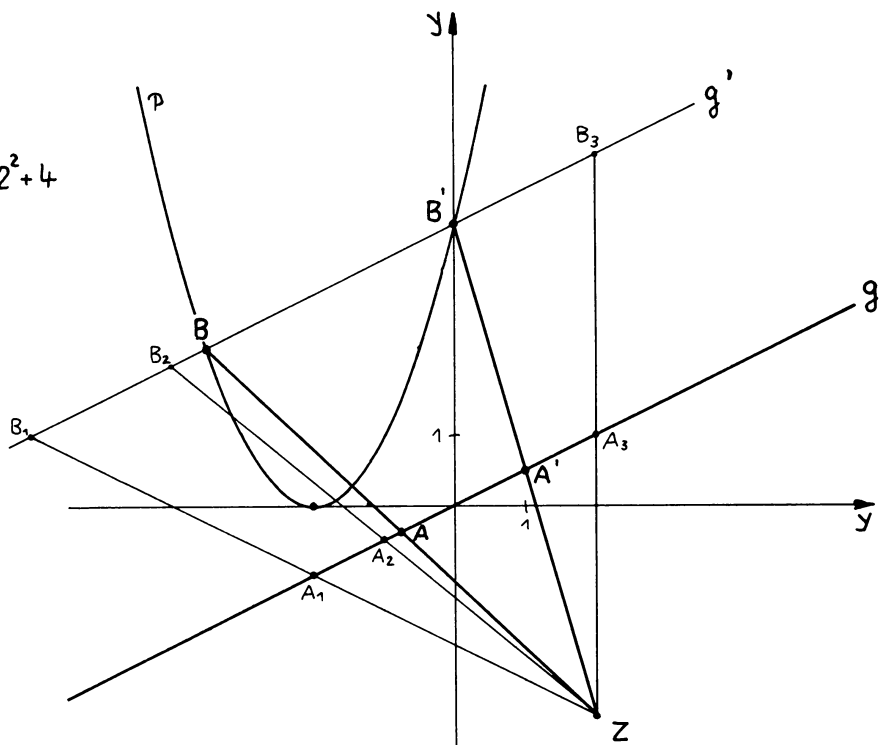
2.1

$y = x^2 + 4x + 4$

$y = x^2 + 4x + 2^2 - 2^2 + 4$

$y = (x+2)^2$

$S(-2|0)$



2.2

$\vec{ZB} = k \cdot \vec{ZA}$

$\begin{pmatrix} x' - 2 \\ y' + 3 \end{pmatrix} = 2 \cdot \begin{pmatrix} x - 2 \\ 0,5x + 3 \end{pmatrix}$

$\begin{cases} x' - 2 = 2x - 4 \\ \wedge y' + 3 = x + 6 \end{cases}$

$\begin{cases} x = 0,5x' + 1 \\ \wedge y' = x + 3 \end{cases}$

$y' = 0,5x' + 1 + 3$

$g': y = 0,5x + 4$

$g' \cap p = \{B\}$

$0,5x + 4 = x^2 + 4x + 4$

$x^2 + 3,5x = 0$

$x(x + 3,5) = 0$

$\begin{matrix} x_1 = 0 \\ x_2 = -3,5 \end{matrix}$

x_1/x_2 in p einsetzen:

$y_1 = 0^2 + 4 \cdot 0 + 4$
 $y_1 = 4$

$y_2 = -3,5^2 + 4 \cdot (-3,5) + 4$
 $y_2 = 2,25$

$B(-3,5 | 2,25)$

$B'(0 | 4)$

$\vec{ZB} = k \cdot \vec{ZA}$

$\begin{pmatrix} -3,5 - 2 \\ 2,25 + 3 \end{pmatrix} = 2 \cdot \begin{pmatrix} x - 2 \\ y + 3 \end{pmatrix}$

$\begin{matrix} x = 0,75 \\ y = -0,375 \end{matrix}$ $A(0,75 | -0,375)$

$\vec{ZB}' = k \cdot \vec{ZA}'$

$\begin{pmatrix} 0 - 2 \\ 4 + 3 \end{pmatrix} = 2 \cdot \begin{pmatrix} x - 2 \\ y + 3 \end{pmatrix}$

$\begin{matrix} x = 1 \\ y = 0,5 \end{matrix}$ $A'(1 | 0,5)$

- Lösungen -

3.

$$h^2 = p \cdot q$$

$$p = \frac{(4,8 \text{ cm})^2}{3,2 \text{ cm}}$$

$$\underline{p = 7,2 \text{ cm}}$$

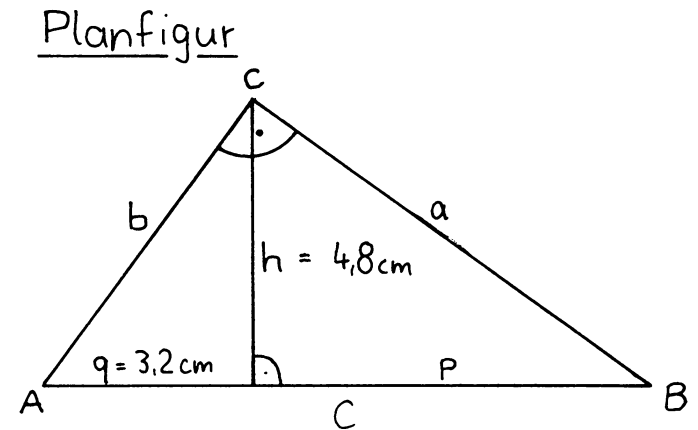
$$c = p + q$$

$$\underline{c = 10,5 \text{ cm}}$$

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

$$b^2 = 10,5 \text{ cm} \cdot 3,2 \text{ cm}$$

$$\underline{b = 5,8 \text{ cm}}$$



$$a^2 = c \cdot p$$

$$a^2 = 10,5 \text{ cm} \cdot 7,2 \text{ cm}$$

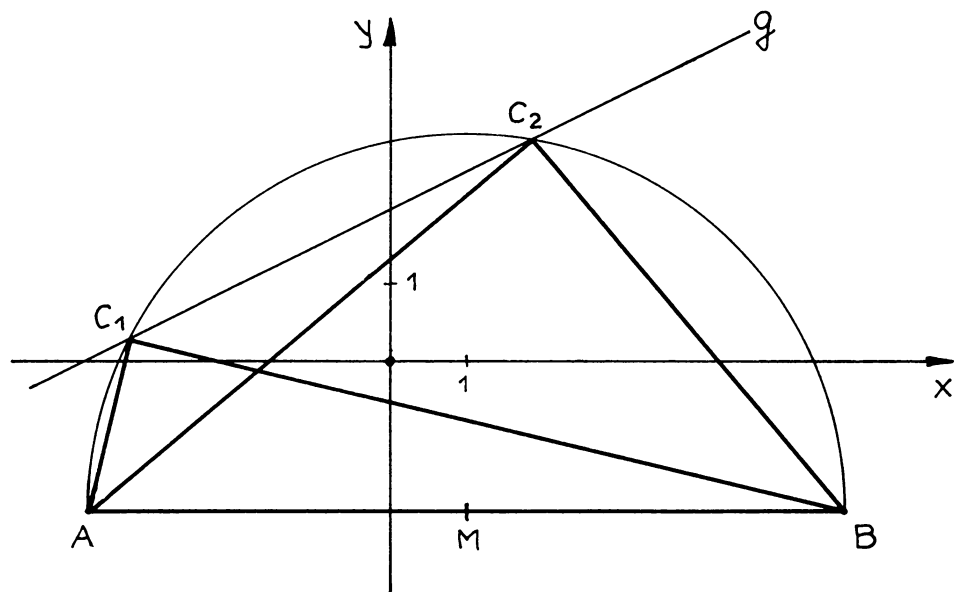
$$\underline{a = 8,69 \text{ cm}}$$

4.0

$$A(-4| -2); \quad B(6| -2); \quad g: y = 0,5x + 2$$

$$C_n(x | 0,5x + 2)$$

4.1



- Lösungen -

4.2

1. Möglichkeit

$$\begin{aligned} |\vec{MB}| &= |\vec{MC}| \\ \sqrt{5^2 + 0} &= \sqrt{(x-1)^2 + (0,5x+4)^2} \\ 25 &= x^2 - 2x + 1 + 0,25x^2 + 4x + 16 \\ 25 &= 1,25x^2 + 2x + 17 \\ \underline{1,25x^2 + 2x - 8 = 0} \end{aligned}$$

$$x_{1/2} = \frac{-2 \pm \sqrt{4 - 4 \cdot 1,25 \cdot (-8)}}{2 \cdot 1,25}$$

$$\underline{x_1 = 1,85} \quad \underline{x_2 = -3,45}$$

$$y_1 = 0,5 \cdot 1,85 + 2 \quad y_2 = 0,5 \cdot (-3,45) + 2$$

$$\underline{y_1 = 2,93} \quad \underline{y_2 = 0,28}$$

$$\underline{\underline{C_1(1,85 | 2,93)}} \quad \underline{\underline{C_2(-3,45 | 0,28)}}$$

$$\underline{M(1 | -2)}$$

$$\underline{\vec{MB} = \begin{pmatrix} 6-1 \\ -2+2 \end{pmatrix} = \begin{pmatrix} 5 \\ 0 \end{pmatrix}}$$

$$\underline{\vec{MC} = \begin{pmatrix} x \\ 0,5x+2 \end{pmatrix} = \begin{pmatrix} x \\ 2 \end{pmatrix}}$$

$$\underline{\vec{MC} = \begin{pmatrix} x-1 \\ 0,5x+4 \end{pmatrix}}$$

2. Möglichkeit

$$\begin{aligned} |\vec{AB}|^2 &= |\vec{AC}|^2 + |\vec{BC}|^2 \\ (\sqrt{10^2+0})^2 &= (\sqrt{(x+4)^2 + (0,5x+4)^2})^2 + (\sqrt{(x-6)^2 + (0,5x+4)^2})^2 \\ 100 &= x^2 + 8x + 16 + 0,25x^2 + 4x + 16 + x^2 - 12x + 36 + 0,25x^2 + 4x + 16 \\ 100 &= 2,5x^2 + 4x + 84 \quad | : 2 \\ \underline{1,25x^2 + 2x - 8 = 0} \end{aligned}$$

Rest siehe oben.

$$\vec{AB} = \begin{pmatrix} 6+4 \\ -2+2 \end{pmatrix} = \begin{pmatrix} 10 \\ 0 \end{pmatrix}$$

$$\vec{AC} = \begin{pmatrix} x+4 \\ 0,5x+2 \end{pmatrix} = \begin{pmatrix} x+4 \\ 0,5x+4 \end{pmatrix}$$

$$\vec{BC} = \begin{pmatrix} x-6 \\ 0,5x+2 \end{pmatrix} = \begin{pmatrix} x-6 \\ 0,5x+4 \end{pmatrix}$$