

# Aufgabe 1

$$|7 - 2 \cdot |x - 8|| = 3$$

$$\text{I) } x - 8 \geq 0 \rightarrow x \geq 8$$

$$\rightarrow |7 - 2 \cdot (x - 8)| = 3$$

$$|7 - 2x + 16| = 3$$

$$|23 - 2x| = 3$$

$$\text{a) } 23 - 2x \geq 0 \rightarrow x \leq 11,5$$

$$\rightarrow 23 - 2x = 3$$

$$-2x = -20$$

$$\underline{x = 10}$$

$$\text{b) } 23 - 2x < 0 \rightarrow x > 11,5$$

$$\rightarrow -(23 - 2x) = 3$$

$$-23 + 2x = 3$$

$$2x = 26$$

$$\underline{x = 13}$$

$\frac{1}{2}$

$$\text{II) } x - 8 < 0 \rightarrow x < 8$$

$$\rightarrow |7 - 2 \cdot (-(x - 8))| = 3$$

$$|7 + 2x - 16| = 3$$

$$|2x - 9| = 3$$

$$\text{a) } 2x - 9 \geq 0 \rightarrow x \geq 4,5$$

$$\rightarrow 2x - 9 = 3$$

$$2x = 12$$

$$\underline{x = 6}$$

$$\text{b) } 2x - 9 < 0 \rightarrow x < 4,5$$

$$\rightarrow -(2x - 9) = 3$$

$$-2x + 9 = 3$$

$$-2x = -6$$

$$\underline{x = 3}$$

$\frac{1}{2}$

$$\underline{\underline{L = \{3; 6; 10; 13\}}}$$

$\frac{1}{2}$

## Aufgabe 2

x: % Spiritus der Sorte A

y: % Spiritus der Sorte B

$$\textcircled{1} \quad 10 \cdot \frac{x}{100} + 6 \cdot \frac{y}{100} = 16 \cdot \frac{65}{100}$$

$$\textcircled{2} \quad 8 \cdot \frac{x}{100} + 10 \cdot \frac{y}{100} + 2 \cdot \frac{0}{100} = 20 \cdot \frac{65}{100} \quad \frac{1}{2}$$

$$1: \quad 5x + 3y = 520 \quad \downarrow -1 \cdot 11$$

$$2: \quad 4x + 5y = 650$$

$$-20x - 12y = -2080$$

$$20x + 25y = 3250$$

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$$13y = 1170$$

$$\underline{\underline{y = 90}} \quad 0,7308 \quad 1$$

$$\text{in 1:} \quad 5x + 270 = 520$$

$$5x = 250$$

$$\underline{\underline{x = 50}} \quad 0,5154 \quad \frac{1}{2}$$

### Aufgabe 3

$$5^{z+1} = 2^z \cdot 7^{2z}$$

$$\lg 5^{z+1} = \lg 2^z \cdot 7^{2z}$$

$$\lg 5^{z+1} = \lg 2^z + \lg 7^{2z}$$

$$(z+1) \cdot \lg 5 = z \cdot \lg 2 + 2z \cdot \lg 7$$

$$z \cdot \lg 5 + \lg 5 = z \cdot \lg 2 + 2z \cdot \lg 7$$

$$\lg 5 = z \cdot \lg 2 + 2z \cdot \lg 7 - z \cdot \lg 5$$

$$\lg 5 = z \cdot (\lg 2 + 2 \lg 7 - \lg 5)$$

$$z = \frac{\lg 5}{\lg 2 + 2 \cdot \lg 7 - \lg 5}$$

$$z = 0,5409$$

$$\underline{\underline{L = \{0,54\}}}$$

$\frac{1}{2}$

$\frac{1}{2}$

$\frac{1}{2}$

$\frac{1}{2}$

## Aufgabe 4

	Füllzeit alleine (Std)	Füllmenge pro Std
Zuleitung	x	$\frac{1}{x}$
Abfluss	x + 4	$\frac{1}{x+4}$

$$\frac{1}{3} = 13 \cdot \frac{1}{x+4} - 6 \cdot \frac{1}{x}$$

$\frac{1}{2}$

$$x \cdot (x+4) = 13 \cdot 3 \cdot x - 6 \cdot 3 \cdot (x+4)$$

$$x^2 + 4x = 39x - 18x - 72$$

$$x^2 - 17x + 72 = 0$$

1

$$x_{1/2} = \frac{-(-17) \pm \sqrt{(-17)^2 - 4 \cdot 1 \cdot 72}}{2 \cdot 1}$$

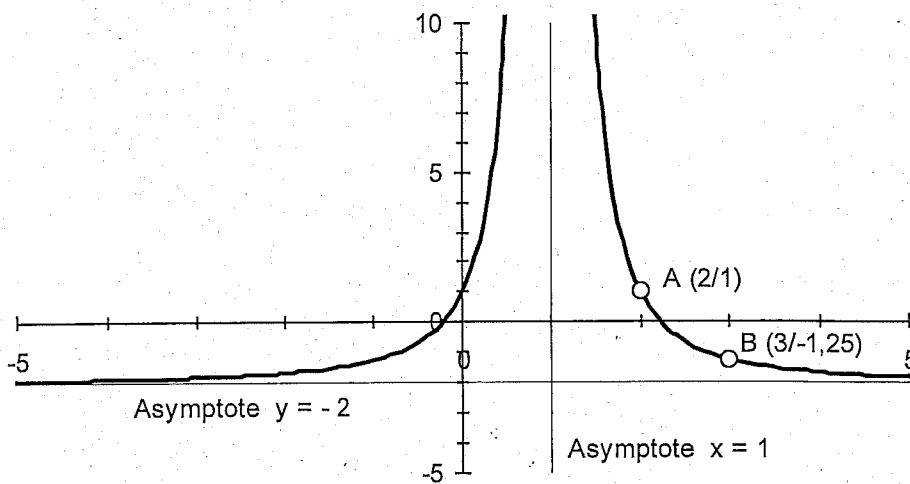
$$= \frac{17 \pm 1}{2}$$

$$x_1 = \frac{18}{2} = \underline{\underline{9}} \quad \checkmark$$

$$x_2 = \frac{16}{2} = \underline{\underline{8}} \quad \checkmark$$

$\frac{1}{2}$

## Aufgabe 5



$$y = a(x+b)^c + d$$

Asymptote  $x = 1$ :  $\rightarrow b = -1$

Asymptote  $y = -2$ :  $\rightarrow d = -2$

$$y = a \cdot (x-1)^c - 2$$

A:  $1 = a \cdot (2-1)^c - 2$

$$3 = a \cdot 1^c$$

$$\underline{3 = a}$$

B:  $-1,25 = a \cdot (3-1)^c - 2$

$$0,75 = a \cdot 2^c$$

$$0,75 = 3 \cdot 2^c$$

$$0,25 = 2^c$$

$$\lg 0,25 = \lg 2^c$$

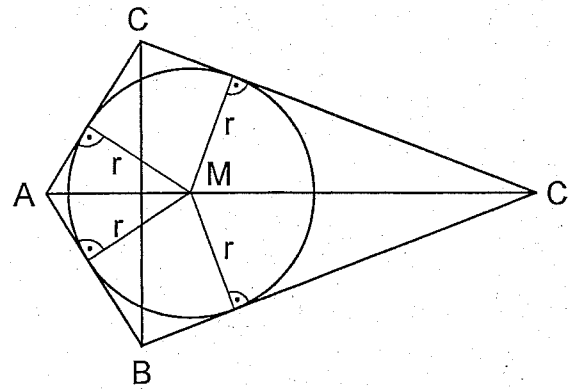
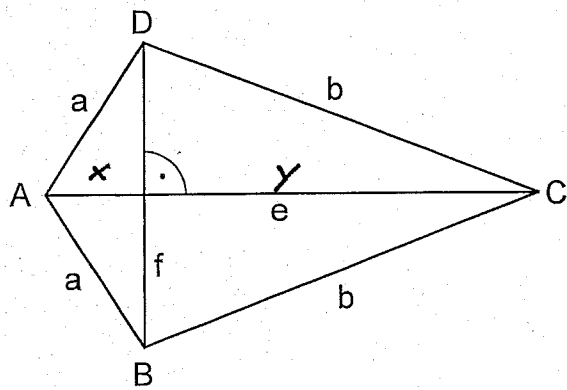
$$\lg 0,25 = c \cdot \lg 2$$

$$c = \frac{\lg 0,25}{\lg 2}$$

$$\underline{c = -2}$$

$$\underline{\underline{y = 3 \cdot (x-1)^{-2} - 2}}$$

# Aufgabe 6



$$a) \quad A = \frac{e \cdot f}{2} = \frac{616 \cdot 420}{2} = \underline{\underline{129'360 \text{ m}^2}} \quad \frac{1}{2}$$

$$b) \quad x = \sqrt{a^2 - \left(\frac{f}{2}\right)^2} \\ = \sqrt{238^2 - 210^2} = \underline{112 \text{ m}} \quad \frac{1}{2}$$

$$y = e - x = 616 - 112 = \underline{504 \text{ m}} \quad \frac{1}{2}$$

$$b = \sqrt{y^2 + \left(\frac{f}{2}\right)^2} \\ = \sqrt{504^2 + 210^2} = \underline{\underline{546 \text{ m}}} \quad \frac{1}{2}$$

$$c) \quad 2 \cdot \frac{ar}{2} + 2 \cdot \frac{br}{2} = 129'360 \text{ m}^2 \quad \frac{1}{2}$$

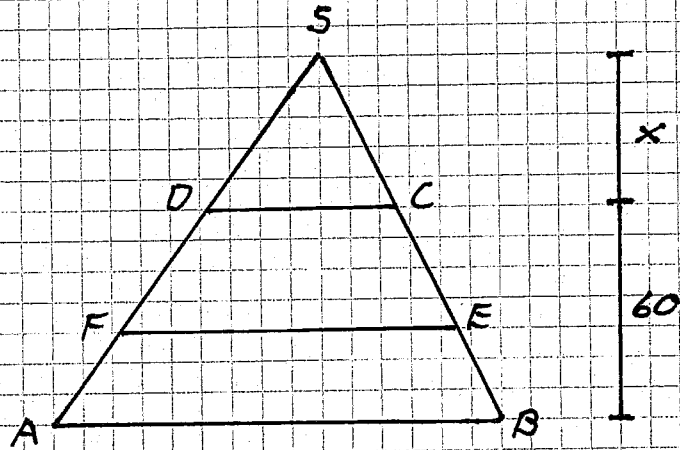
$$ar + br = 129'360$$

$$238r + 546r = 129'360$$

$$784r = 129'360$$

$$\underline{\underline{r = 165 \text{ m}}} \quad \frac{1}{2}$$

# Aufgabe 7



$$\begin{aligned} \alpha) \quad 20 : \overline{EF} &= \overline{EF} : 140 \\ \overline{EF}^2 &= 20 \cdot 140 \\ \overline{EF} &= \sqrt{2800} \\ \overline{EF} &= \underline{\underline{52,915 \text{ cm}}} \end{aligned}$$

$\frac{1}{2}$

$\frac{1}{2}$

$$\begin{aligned} \text{b)} \quad x : 20 &= (x + 60) : 140 \\ 140x &= 20 \cdot (x + 60) \\ 140x &= 20x + 1200 \\ 120x &= 1200 \\ \underline{x} &= \underline{10} \end{aligned}$$

$\frac{1}{2}$

$$A_{ABCD} = \frac{140 + 20}{2} \cdot 60 = 4800 \text{ cm}^2$$

$$A_{CDS} = \frac{20 \cdot 10}{2} = 100 \text{ cm}^2$$

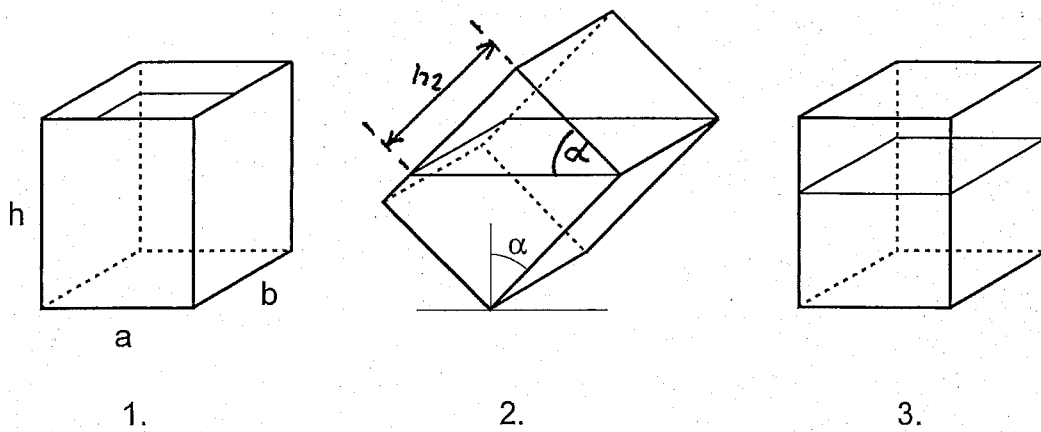
$$A_{EFS} = \frac{4800}{2} + 100 = 2500 \text{ cm}^2$$

$$\frac{A_{EFS}}{A_{CDS}} = \frac{2500}{100} = 25 = k^2 \longrightarrow k = 5$$

$$\overline{EF} = 5 \cdot 20 = \underline{\underline{100 \text{ cm}}}$$

$\frac{1}{2}$

# Aufgabe 8



$$\begin{aligned} \text{a) } V_{\text{abflans}} &= a \cdot b \cdot h_1 + 100 \\ &= 8 \cdot 5 \cdot 1 + 100 = 140 \text{ dm}^3 \end{aligned}$$

$\frac{1}{2}$

$$V_{\text{abflans}} = V_{\text{keil}}$$

$$V_{\text{keil}} = \frac{a \cdot b \cdot h_2}{2}$$

$$140 = \frac{8 \cdot 5 \cdot h_2}{2}$$

$\frac{1}{2}$

$$h_2 = \frac{140 \cdot 2}{8 \cdot 5} = 7 \text{ dm}$$

$\frac{1}{2}$

$$\tan \alpha = \frac{h_2}{a} = \frac{7}{8} = 0,875$$

$$\rightarrow \underline{\underline{\alpha = 41,19^\circ}}$$

$\frac{1}{2}$

$$\text{b) } h' \cdot a \cdot b = a \cdot b \cdot h_1 - 100$$

$$h' \cdot 8 \cdot 5 = 8 \cdot 5 \cdot 9 - 100$$

$\frac{1}{2}$

$$h' \cdot 40 = 360 - 100$$

$$h' \cdot 40 = 260$$

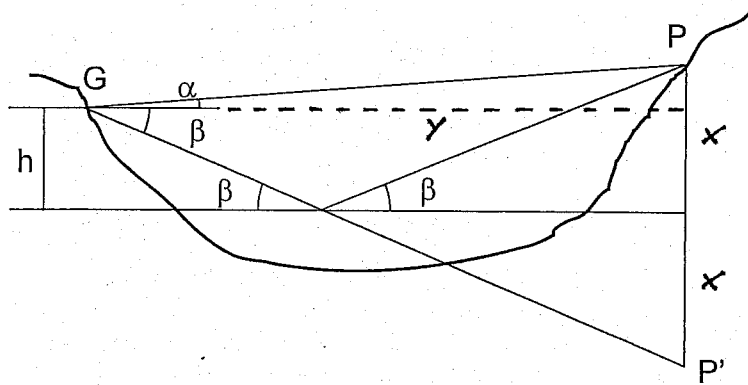
$$\underline{\underline{h' = 6,5 \text{ dm}}}$$

$\frac{1}{2}$



# Aufgabe 9

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$$\textcircled{1} \tan \alpha = \frac{x-h}{y}$$

$$\textcircled{2} \tan \beta = \frac{x+h}{y}$$

$\frac{1}{2}$

$$1: \quad y = \frac{x-h}{\tan \alpha}$$

$$2: \quad y = \frac{x+h}{\tan \beta}$$

$$\frac{x-h}{\tan \alpha} = \frac{x+h}{\tan \beta}$$

$$\tan \beta \cdot (x-h) = \tan \alpha \cdot (x+h)$$

$$\tan \beta \cdot x - \tan \beta \cdot h = \tan \alpha \cdot x + \tan \alpha \cdot h$$

$$\tan \beta \cdot x - \tan \alpha \cdot x = \tan \alpha \cdot h + \tan \beta \cdot h$$

$$x \cdot (\tan \beta - \tan \alpha) = h \cdot (\tan \alpha + \tan \beta)$$

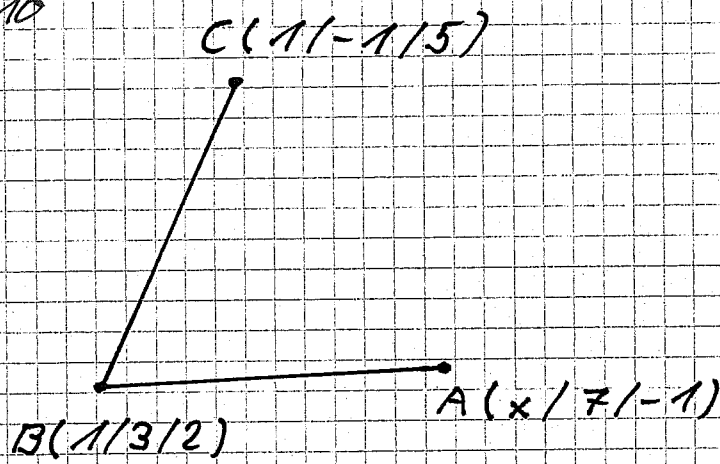
$$x = \frac{h \cdot (\tan \alpha + \tan \beta)}{\tan \beta - \tan \alpha}$$

$$= \frac{14 \cdot (\tan 20^\circ + \tan 32^\circ)}{\tan 32^\circ - \tan 20^\circ}$$

$$= \underline{\underline{53,06 \text{ m}}}$$

$\frac{1}{2}$

# Aufgabe 10



$$\vec{BC} = \begin{pmatrix} 1-1 \\ -1-3 \\ 5-2 \end{pmatrix} = \begin{pmatrix} 0 \\ -4 \\ 3 \end{pmatrix}$$

$$|\vec{BC}| = \sqrt{0^2 + (-4)^2 + 3^2} = 5$$

$\frac{1}{2}$

$$\vec{BA} = \begin{pmatrix} x-1 \\ 7-3 \\ -1-2 \end{pmatrix} = \begin{pmatrix} x-1 \\ 4 \\ -3 \end{pmatrix}$$

$$|\vec{BA}| = \sqrt{(x-1)^2 + 4^2 + 3^2} = \sqrt{x^2 - 2x + 1 + 16 + 9}$$
$$= \sqrt{x^2 - 2x + 26}$$

$\frac{1}{2}$

$$\cos 45^\circ = \frac{\vec{BC} \cdot \vec{BA}}{|\vec{BC}| \cdot |\vec{BA}|}$$

$$\frac{1}{\sqrt{2}} = \frac{\begin{pmatrix} 0 \\ -4 \\ 3 \end{pmatrix} \cdot \begin{pmatrix} x-1 \\ 4 \\ -3 \end{pmatrix}}{5 \cdot \sqrt{x^2 - 2x + 26}} = \frac{0 \cdot (x-1) + (-4) \cdot 4 + 3 \cdot (-3)}{5 \cdot \sqrt{x^2 - 2x + 26}} = \frac{-25}{5 \cdot \sqrt{x^2 - 2x + 26}}$$

$\frac{1}{2}$

$$\sqrt{x^2 - 2x + 26} = -5 \cdot \sqrt{2}$$

$$x^2 - 2x + 26 = 50$$

$$x^2 - 2x - 24 = 0$$

$$x_{1/2} = \frac{-(-2) \pm \sqrt{(-2)^2 - 4 \cdot 1 \cdot (-24)}}{2 \cdot 1} = \frac{2 \pm 10}{2}$$

$\nearrow$

$$x_1 = \frac{12}{2} = \underline{\underline{6}}$$

$$x_2 = \frac{-8}{2} = \underline{\underline{-4}}$$

$\frac{1}{2}$