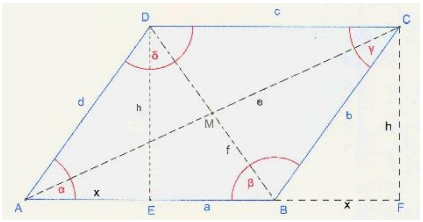
Trigonometrie – Berechnungen im Parallelogramm und Trapez

Lösungsblatt

Berechnen Sie in folgenden Beispielen die gesuchten Größen!



h² = e² - (a + x)² und h² = f² - (a - x)²
→ h² = h²
e² - (a + x)² = f² - (a - x)²

$e^2 - (a + x)^2 = f^2 - (a - x)^2$
$e^2 - a^2 - 2ax - x^2 = f^2 - a^2 + 2ax - x^2$
$e^2 - f^2 = 4ax$
$x = \frac{e^2 - f^2}{4a} \rightarrow x = \frac{123^2 - 71^2}{4 \cdot 80}$
x = 31,525 m

Parallelogramm ABCD: a = 80 m, e = 123 m, f = 71 m;
Zu berechnen sind: h, b, U, A, α = γ und β = δ!

$h^2 = e^2 - (a + x)^2$
$h^2 = 123^2 - 111{,}525^2$
$h = \sqrt{2691{,}174375}$
h = 51,876 m

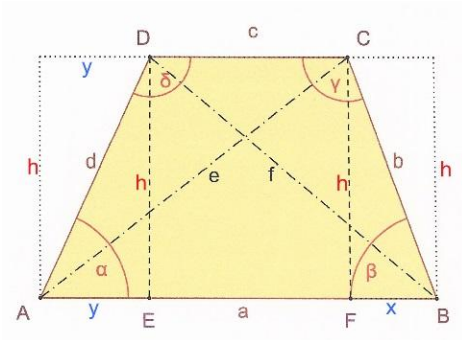
$b^2 = h^2 + x^2$
$b^2 = 51{,}876^2 + 31{,}525^2$
$b = \sqrt{3685}$
b = 60,704 m

U = 2 . (a + b)
U = 2 . (80 + 60.704)
U = 281,408 m

A = a . h
A = 80 . 51,876
A = 4150,08 m²

$\sin \alpha = \frac{h}{b}$
$\sin \alpha = \frac{51{,}876}{60{,}704}$
sin α = 0,8545…
α = 58,71° = γ

β = 180° – α
β = 180° – 58,71°
β = 121,29° = δ



h² = b² - x² und h² = e² - (a - x)²
→ h² = h²
b² - x² = e² - (a - x)²

$b^2 - x^2 = e^2 - (a - x)^2$
$b^2 - x^2 = e^2 - a^2 + 2ax - x^2$
$b^2 - e^2 + a^2 = 2ax$
$x = \frac{b^2 - e^2 + a^2}{2a} \rightarrow x = \frac{59^2 - 88^2 + 90^2}{2 \cdot 90}$
$x = \frac{3837}{180} \rightarrow$ x = 21,32 m

Trapez ABCD: a = 90 m, b = 59m, c = 45 m, e = 88 m;
Zu berechnen sind: h, d, α, β, γ, δ, U und A,!

$h^2 = b^2 - x^2$
$h^2 = 59^2 - 21{,}32^2$
$h = \sqrt{3026{,}59}$
h = (~) 55 m

y = a – x – c
y = 90 – 21,32 – 45
y = 23,68 m

$d^2 = h^2 + y^2$
$d^2 = 55^2 + 21{,}32^2$
$d = \sqrt{3585{,}742}$
d = 59,88 m

$\sin \alpha = \frac{h}{d}$
$\sin \alpha = \frac{55}{59{,}88}$
sin α = 0,9185…
α = 66,71°

δ = 180° – α
δ = 180° – 66,71°
δ = 113,29°

U = a + b + c + d
U = 90+59+45+59,88
U = 253,88 m

$\sin \beta = \frac{h}{b}$
$\sin \beta = \frac{55}{59}$
sin β = 0,9322…
β = 68,78°

δ = 180° – β
δ = 180° – 68,78°
δ = 111,22°

$A = \frac{1}{2} . (a + c) . h$
$A = \frac{1}{2} . (90+45).55$
A = 3712,5 m²

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