Aufgabe 1993 3a: **4 P**

Das Grundstück ABCD hat folgende Maße:

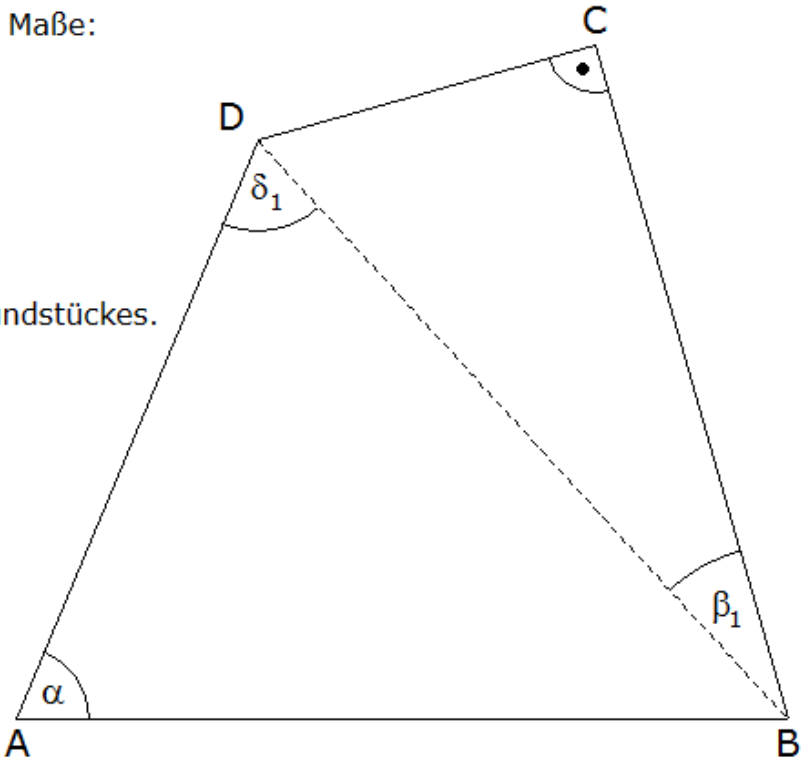
$\overline{BC} = 785\,m$

$\beta_1 = 32,0°$

$\delta_1 = 63,0°$

$\alpha = 72,5°$

Berechnen Sie den Umfang des Grundstückes.



Strategie 1993 3a:

Gegeben:

$\overline{BC} = 785\,m$

$\beta_1 = 32,0°$

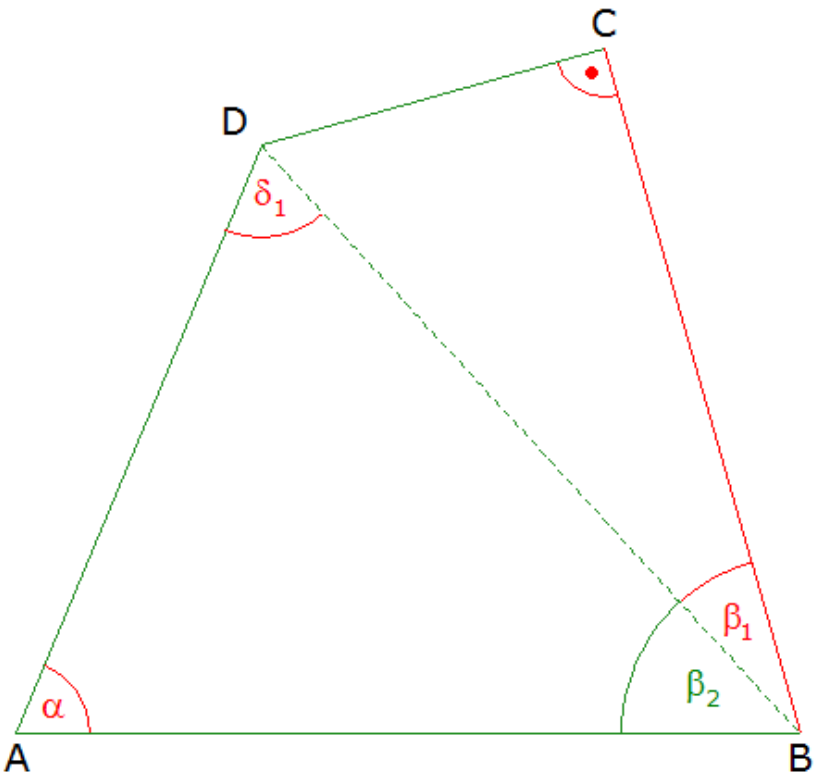
$\delta_1 = 63,0°$

$\alpha = 72,5°$

Gesucht:

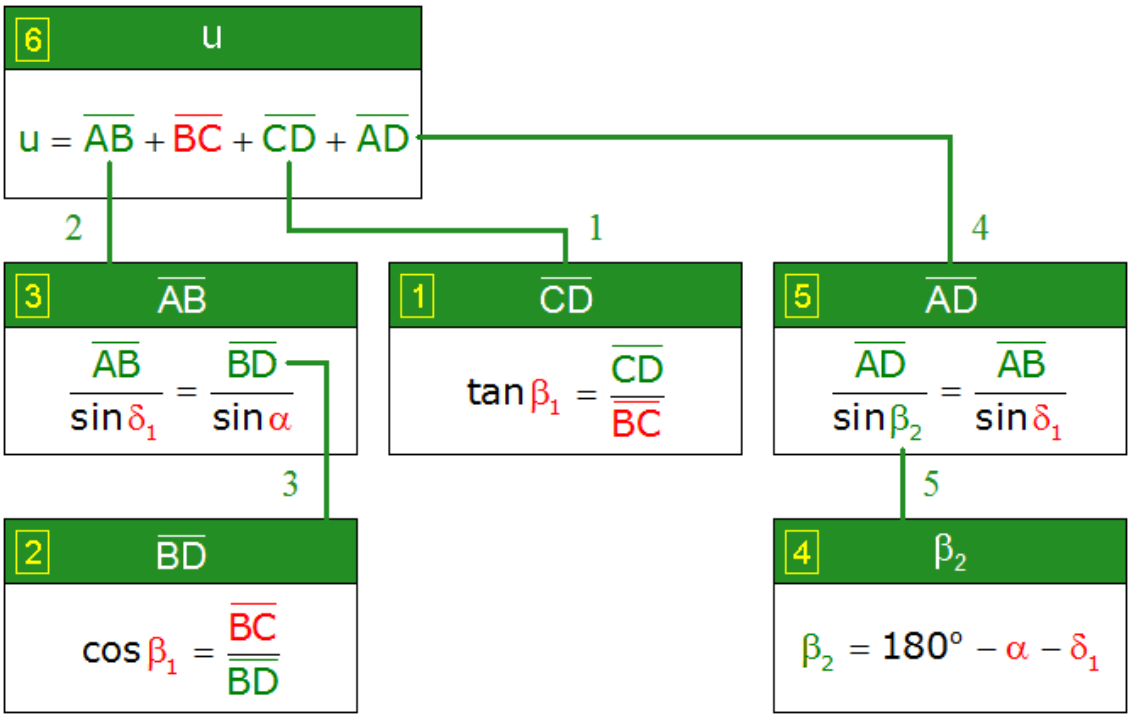
u

Skizze:



Strategie 1993 3a:

Struktogramm:



Lösung 1993 3a:

1. Berechnung der Strecke $\overline{CD}$:

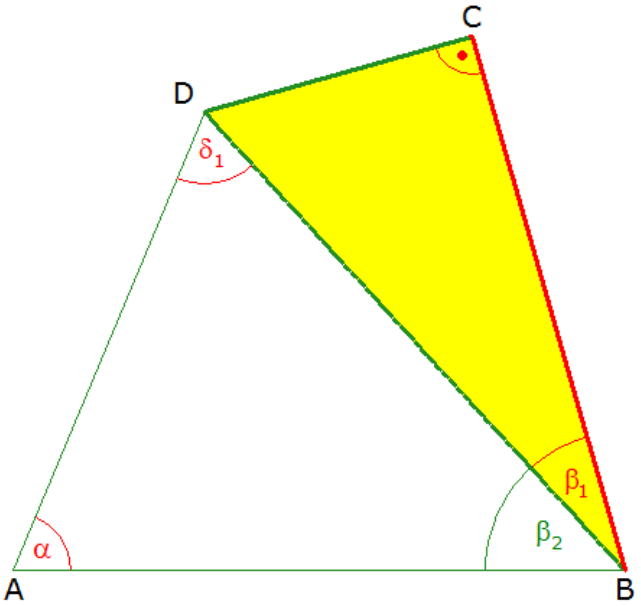
$$\tan\beta_1 = \frac{\text{Gegenkathete}}{\text{Ankathete}} = \frac{\overline{CD}}{\overline{BC}}$$ Tangensfunktion im rechtwinkligen gelben Teildreieck BCD

$$\tan 32° = \frac{\overline{CD}}{785}$$

$$0,6249 = \frac{\overline{CD}}{785}$$ Seiten tauschen

$$\frac{\overline{CD}}{785} = 0,6249 \quad | \cdot 785$$

$$\overline{CD} = 491\,\text{m}$$



Lösung 1993 3a:

2. Berechnung der Strecke $\overline{BD}$:

Pythagoras im rechtwinkligen gelben Teildreieck

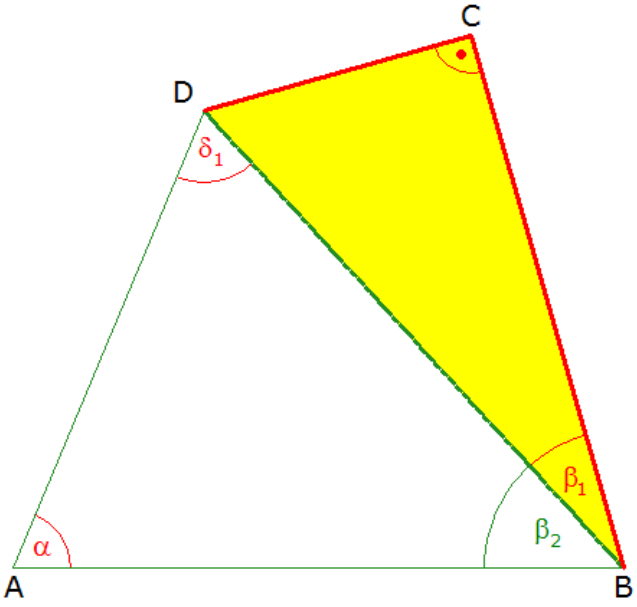
$$\overline{BD}^2 = \overline{BC}^2 + \overline{CD}^2$$

$$\overline{BD}^2 = 785^2 + 491^2$$

$$\overline{BD}^2 = 616225 + 241081$$

$$\overline{BD}^2 = 857306 \quad |\sqrt{\ }$$

$$\overline{BD} = 926\,\text{m}$$



3. Berechnung der Strecke $\overline{AB}$:

Sinussatz im allgemeinen hellblauen Teildreieck

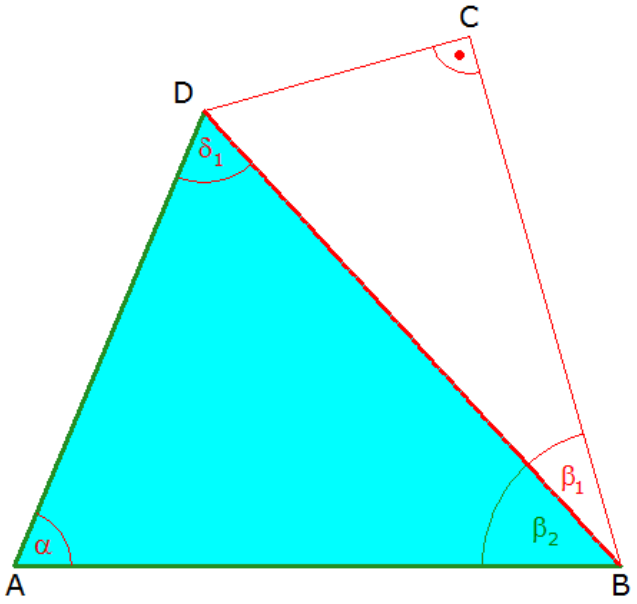
$$\frac{\overline{AB}}{\sin\delta_1} = \frac{\overline{BD}}{\sin\alpha}$$

$$\frac{\overline{AB}}{\sin 63^\circ} = \frac{926}{\sin 72{,}5^\circ}$$

$$\frac{\overline{AB}}{0{,}8910} = \frac{926}{0{,}9537}$$

$$\frac{\overline{AB}}{0{,}8910} = 970{,}94 \quad |\cdot 0{,}8910$$

$$\overline{AB} = 865\text{m}$$



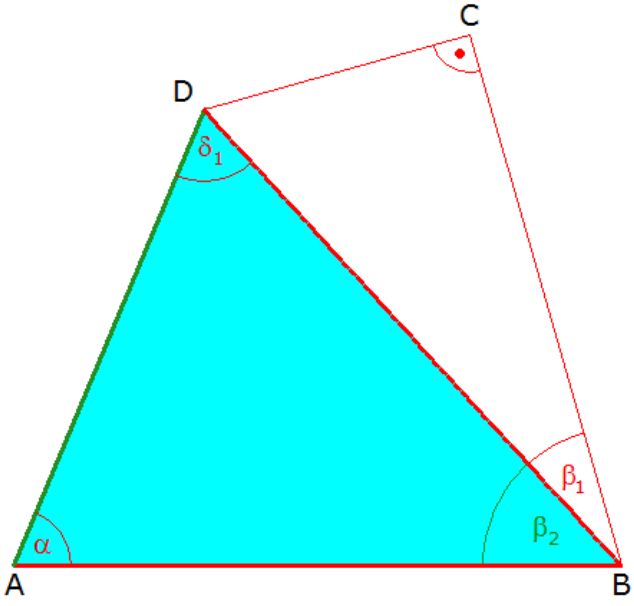
4. Berechnung des Winkels β_2:

Winkelsumme im allgemeinen hellblauen Teildreieck ABD

$$\beta_2 = 180^\circ - \alpha - \delta_1$$

$$\beta_2 = 180^\circ - 72{,}5^\circ - 63^\circ$$

$$\beta_2 = 44{,}5^\circ$$



Lösung 1993 3a:

5. Berechnung der Strecke $\overline{AD}$:

$$\frac{\overline{AD}}{\sin\beta_2} = \frac{\overline{AB}}{\sin\delta_1}$$

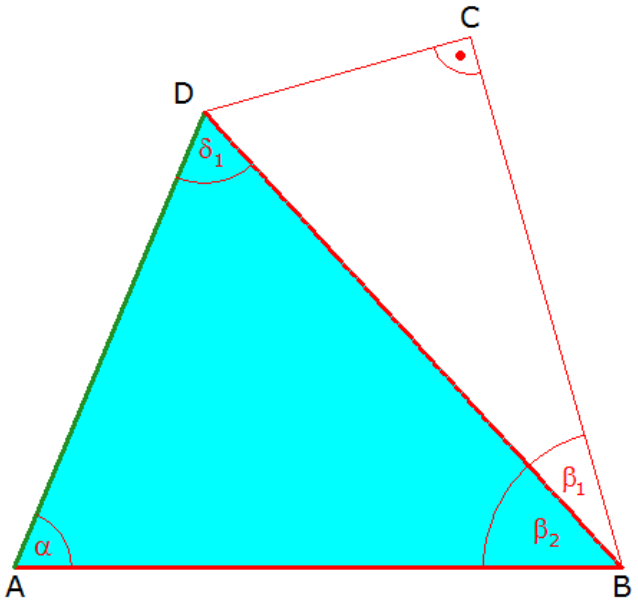
Sinussatz im allgemeinen hellblauen Teildreieck

$$\frac{\overline{AD}}{\sin 44{,}5^\circ} = \frac{865}{\sin 63^\circ}$$

$$\frac{\overline{AD}}{0{,}7009} = \frac{865}{0{,}8910}$$

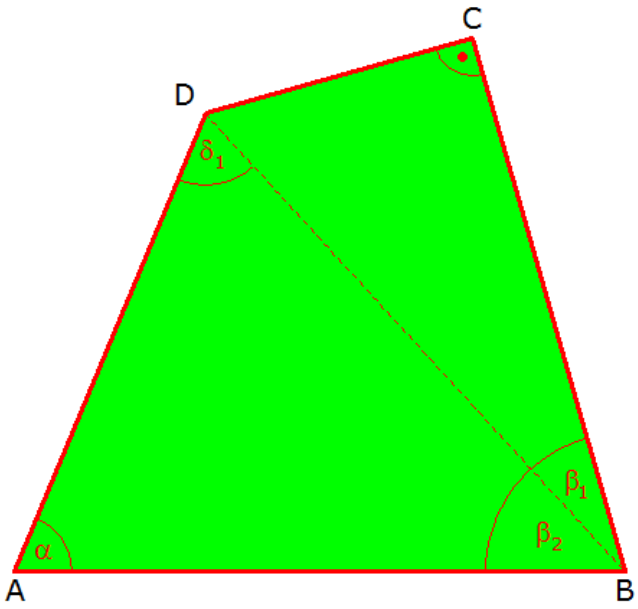
$$\frac{\overline{AD}}{0{,}7009} = 970{,}82 \quad |\cdot 0{,}7009$$

$$\overline{AD} = 680\,\text{m}$$



6. Berechnung des Umfangs u:

$$u = \overline{AB} + \overline{BC} + \overline{CD} + \overline{AD}$$

$$u = 865 + 785 + 491 + 680$$

$$u = 2821\,\text{m}$$