Aufgabe 1994 3a: **4 P**

Vom Viereck ABCD sind bekannt:

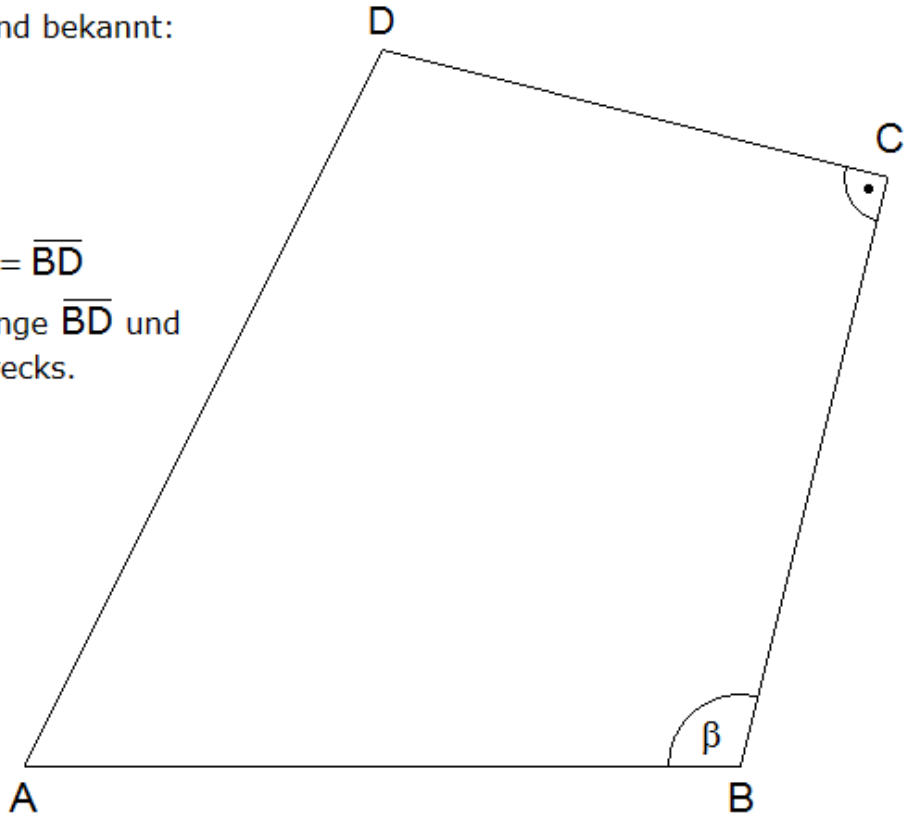
$\overline{BC} = 8,4\,cm$

$\overline{CD} = 7,7\,cm$

$\beta = 104,0°$

Ferner gilt : $\overline{AD} = \overline{BD}$

Berechnen Sie die Länge $\overline{BD}$ und den Umfang des Vierecks.



Strategie 1994 3a:

Gegeben:

$\overline{CD} = 7,7\,cm$

$\beta = 104,0°$

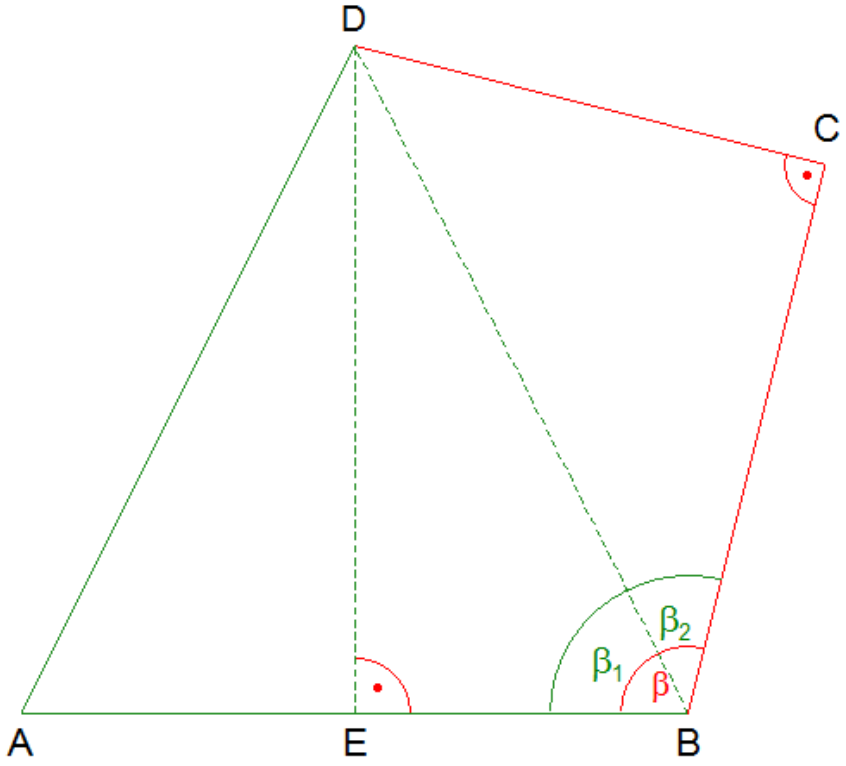
Ferner gilt : $\overline{AD} = \overline{BD}$

Gesucht:

$\overline{BD}$

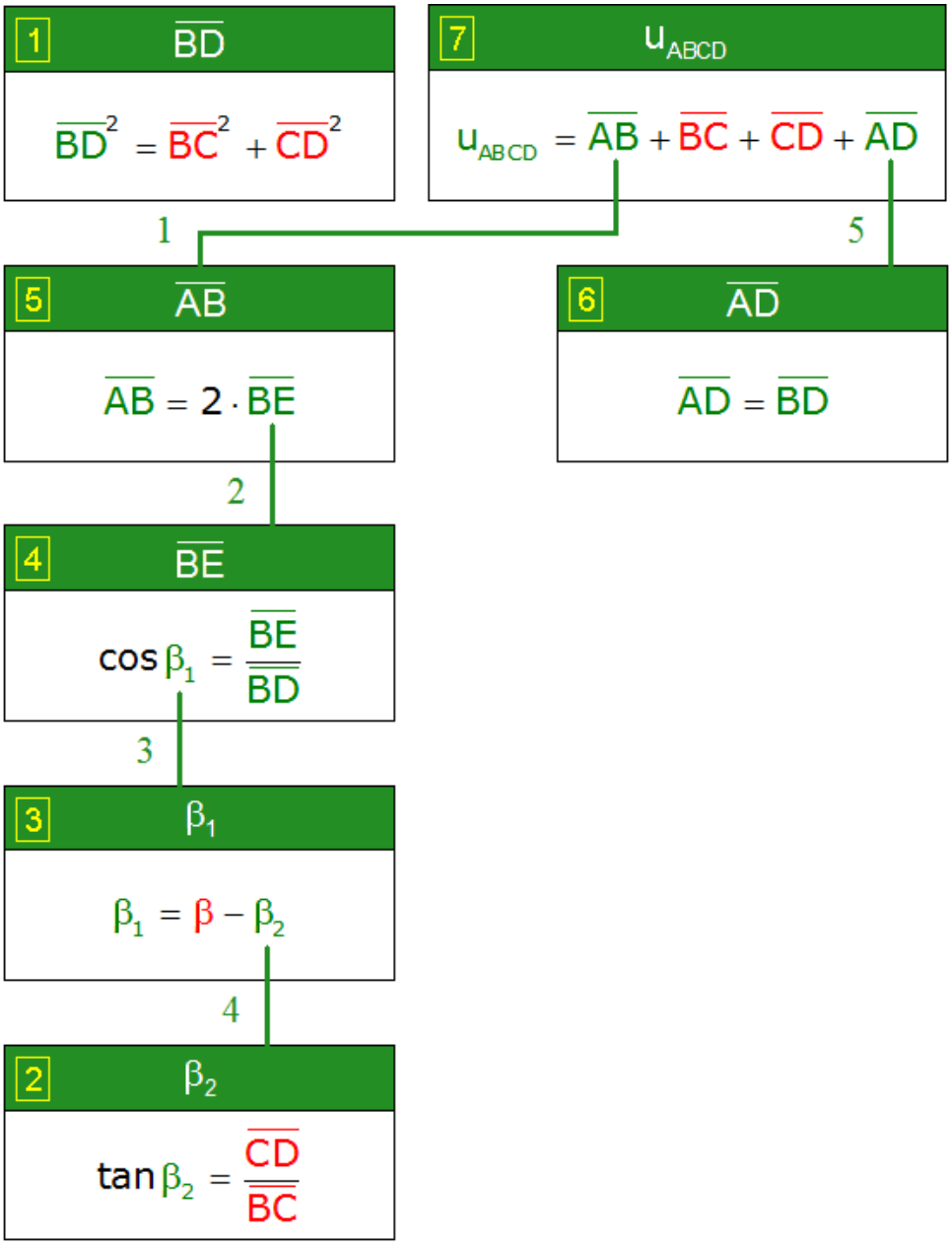
u_{ABCD}

Skizze:



Strategie 1994 3a:

Struktogramm:



Lösung 1994 3a:

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

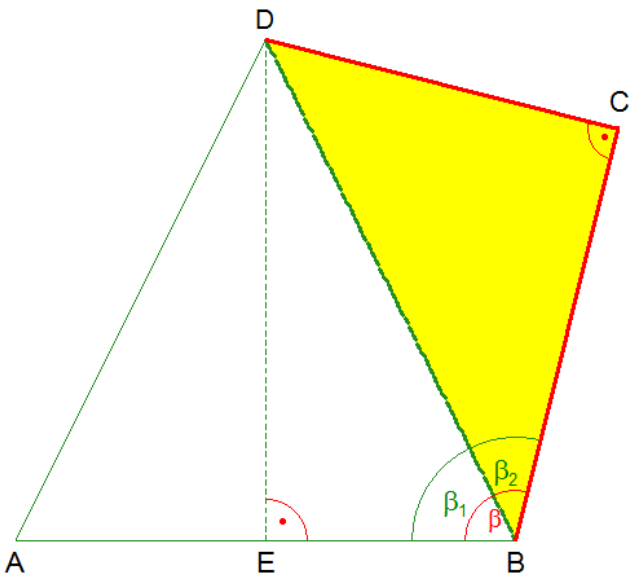
$\overline{BD}^2 = \overline{BC}^2 + \overline{CD}^2$ Pythagoras im rechtwinkligen gelben Teildreieck BCD

$\overline{BD}^2 = 8,4^2 + 7,7^2$

$\overline{BD}^2 = 70,56 + 59,29$

$\overline{BD}^2 = 129,85 \quad | \sqrt{\ }$

$\overline{BD} = 11,4\,cm$



Lösung 1994 3a:

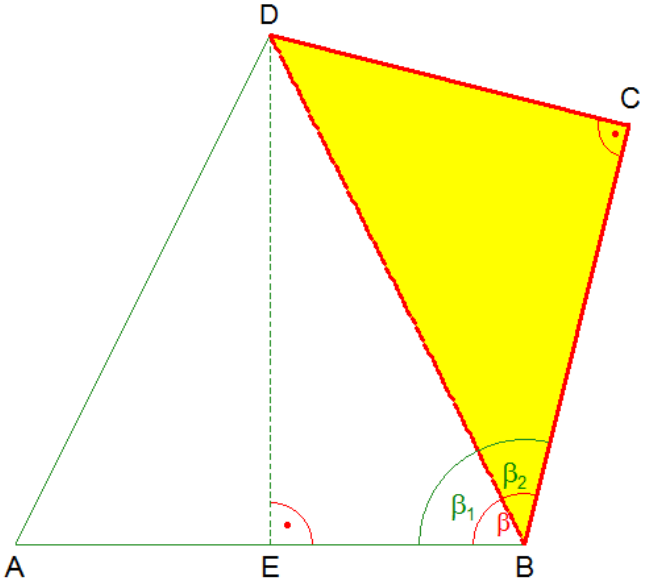
2. Berechnung des Winkels β_2:

$$\tan\beta_2 = \frac{\text{Gegenkathete}}{\text{Ankathete}} = \frac{\overline{CD}}{\overline{BC}}$$ Tangensfunktion im rechtwinkligen gelben Teildreieck

$$\tan\beta_2 = \frac{7,7}{8,4}$$

$$\tan\beta_2 = 0,9167$$

$$\underline{\beta_2 = 42,5^\circ}$$

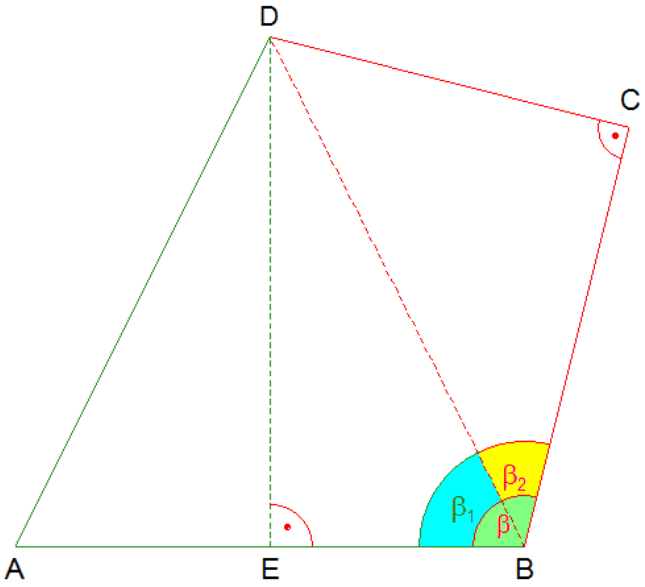


3. Berechnung des Winkels β_1:

$$\beta_1 = \beta - \beta_2$$

$$\beta_1 = 104^\circ - 42,5^\circ$$

$$\underline{\beta_1 = 61,5^\circ}$$



4. Berechnung der Strecke $\overline{BE}$:

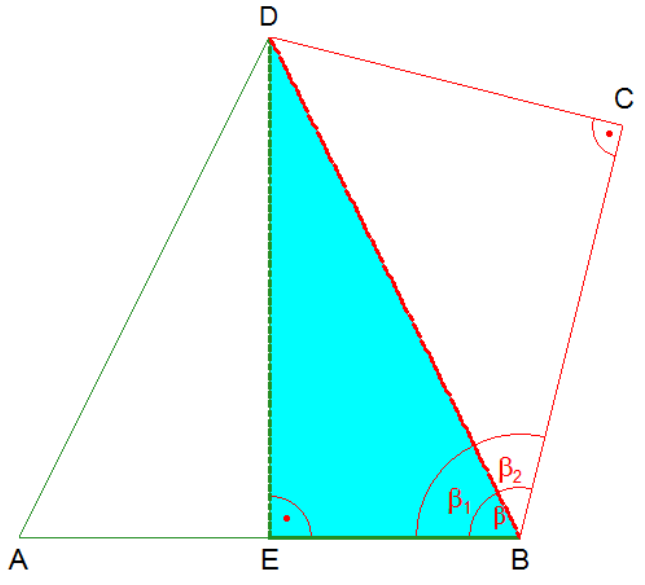
$$\cos\beta_1 = \frac{\text{Ankathete}}{\text{Hypotenuse}} = \frac{\overline{BE}}{\overline{BD}}$$ Kosinusfunktion im rechtwinkligen hellblauen Teildreieck BDE

$$\cos 61,5^\circ = \frac{\overline{BE}}{11,4}$$

$$0,4772 = \frac{\overline{BE}}{11,4}$$ Seiten tauschen

$$\frac{\overline{BE}}{11,4} = 0,4772 \quad |\cdot 11,4$$

$$\underline{\overline{BE} = 5,44\,\text{cm}}$$



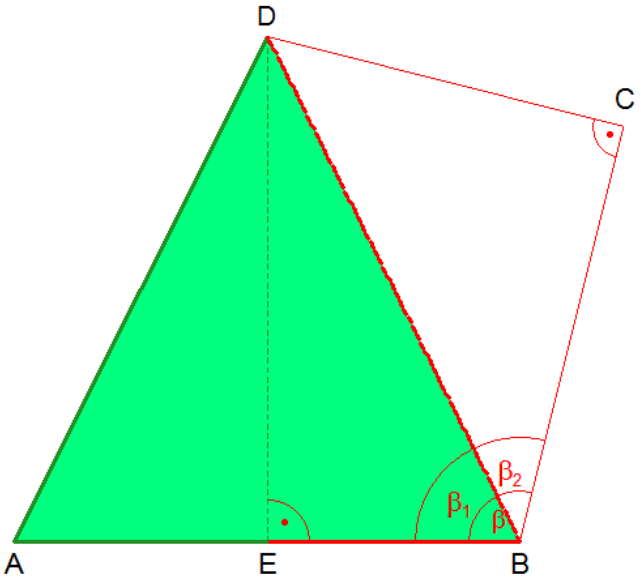
Lösung 1994 3a:

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

$\overline{AB} = 2 \cdot \overline{BE}$ Δ_{ABD} ist gleichschenklig

$\overline{AB} = 2 \cdot 5,44$

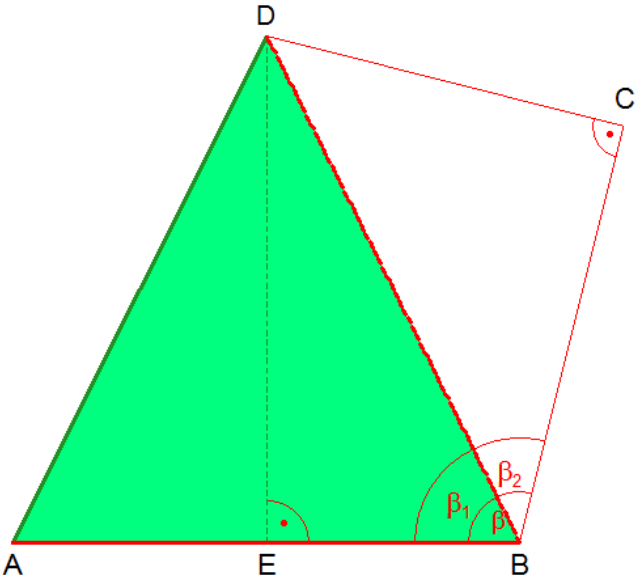
$\overline{AB} = 10,9\,cm$



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

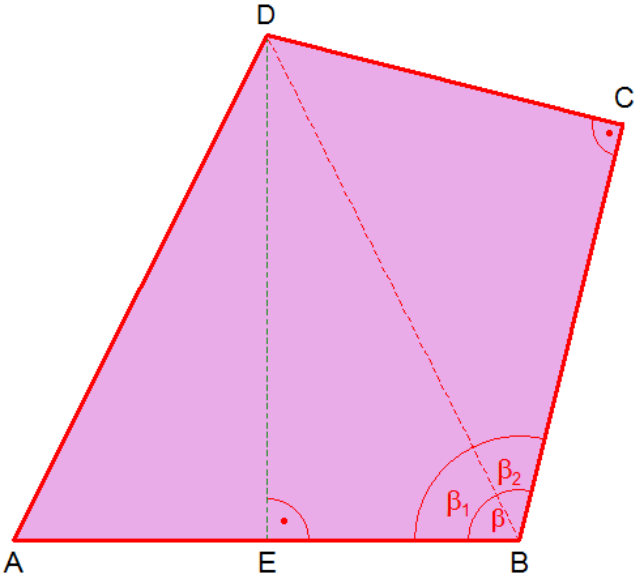
$\overline{AD} = \overline{BD}$ Δ_{ABD} ist gleichschenklig

$\overline{AD} = 11,4\,cm$



7. Berechnung des Umfangs u_{ABCD}:

$u_{ABCD} = \overline{AB} + \overline{BC} + \overline{CD} + \overline{AD}$

$u_{ABCD} = 10,9 + 8,4 + 7,7 + 11,4$

$u_{ABCD} = 38,4\,cm$