

Aufgabe 1993 4c:

3 P

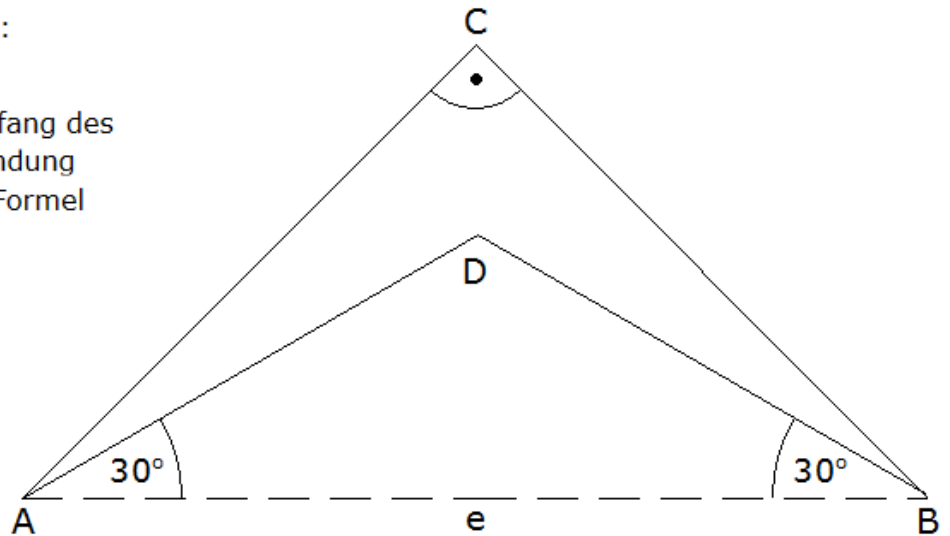
In nebenstehender Figur gilt:

$$\overline{AC} = \overline{BC}$$

Zeigen Sie, daß sich der Umfang des Vierecks ADBC ohne Verwendung gerundeter Werte nach der Formel

$$u = \frac{e}{3} (3\sqrt{2} + 2\sqrt{3})$$

berechnen läßt.



Strategie 1993 4c:

Gegeben:

$$\overline{AC} = \overline{BC}$$

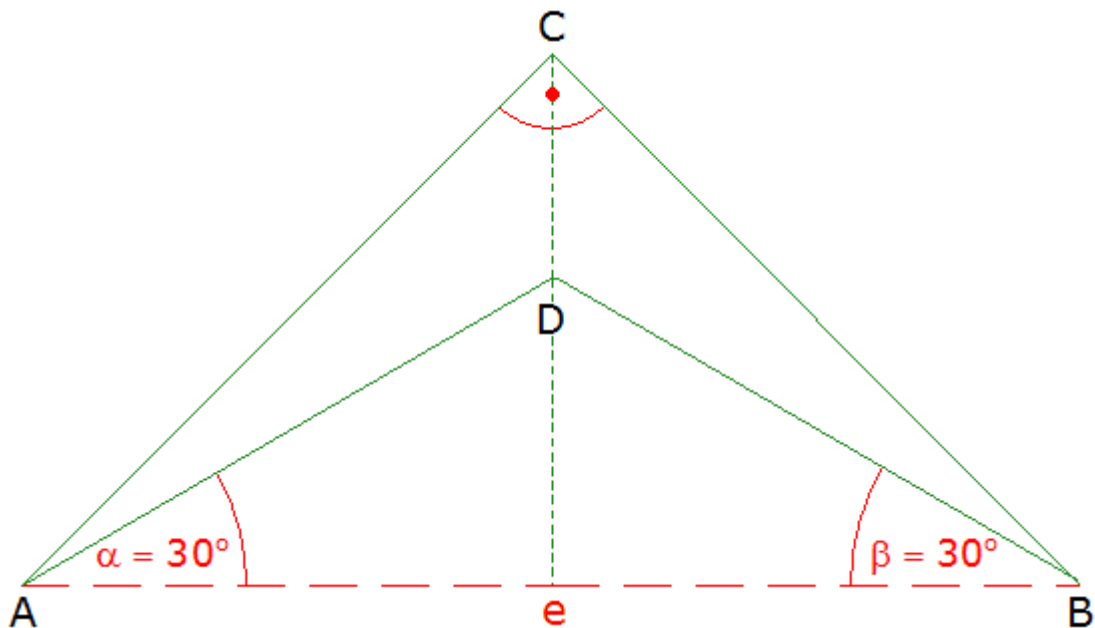
$$\overline{AB} = e$$

$$\alpha = \beta = 30^\circ$$

Gesucht:

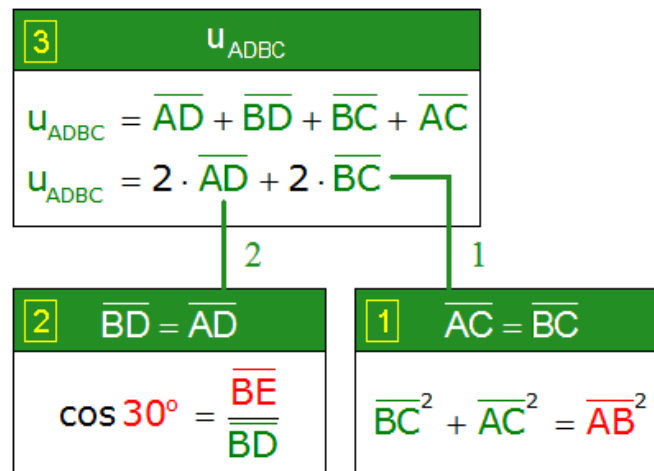
$$u = \frac{e}{3} (3\sqrt{2} + 2\sqrt{3})$$

Skizze:



Strategie 1993 4c:

Struktogramm:



Lösung 1993 4c:

1. Berechnung der Strecke $\overline{AC} = \overline{BC}$:

$\overline{AC}^2 + \overline{BC}^2 = \overline{AB}^2$ Pythagoras im
 rechtwinkligen gelben
 Dreieck ABC

$\overline{AC}^2 + \overline{AC}^2 = e^2$

$2 \cdot \overline{AC}^2 = e^2 \quad | : 2$

$\overline{AC}^2 = \frac{e^2}{2} \quad | \sqrt{}$

$\overline{AC} = \sqrt{\frac{e^2}{2}}$

$\overline{AC} = \sqrt{\frac{2e^2}{4}}$

$\overline{AC} = \sqrt{2 \cdot \frac{e^2}{4}}$

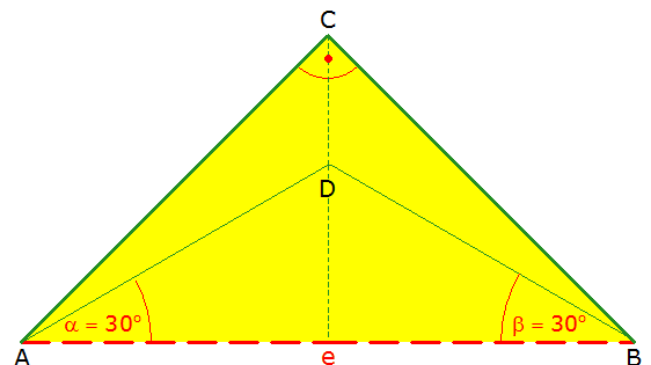
Wurzelgesetz:
 $\sqrt{a \cdot b} = \sqrt{a} \cdot \sqrt{b}$

$\overline{AC} = \sqrt{2} \cdot \sqrt{\frac{e^2}{4}}$

$\overline{AC} = \sqrt{2} \cdot \frac{e}{2}$

$\overline{AC} = \frac{e}{2} \sqrt{2}$

$\overline{BC} = \frac{e}{2} \sqrt{2}$



Lösung 1993 4c:

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

$$\cos \beta = \frac{\text{Ankathete}}{\text{Hypotenuse}} = \frac{\overline{BE}}{\overline{BD}}$$

Kosinusfunktion im rechtwinkligen hellblauen Teildreieck BDE

$$\cos 30^\circ = \frac{e}{\overline{BD}}$$

$$\frac{1}{2}\sqrt{3} = \frac{e}{\overline{BD}} \quad | \cdot \overline{BD}$$

$$\overline{BD} \cdot \frac{1}{2}\sqrt{3} = e \quad | \cdot 2$$

$$\overline{BD} \cdot \sqrt{3} = e \quad | : \sqrt{3}$$

$$\overline{BD} = \frac{e}{\sqrt{3}}$$

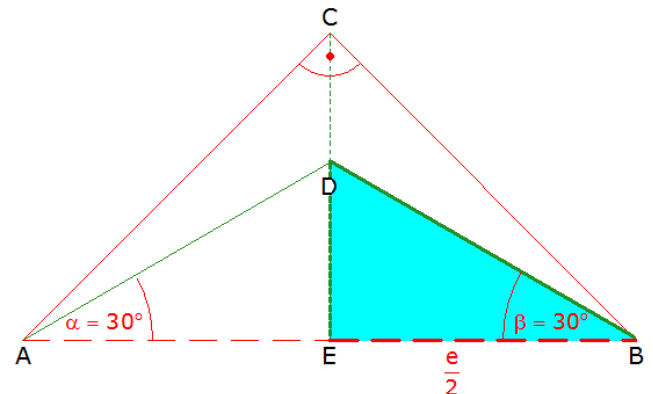
Nenner rational machen

$$\overline{BD} = \frac{e \cdot \sqrt{3}}{\sqrt{3} \cdot \sqrt{3}}$$

$$\overline{BD} = \frac{e \cdot \sqrt{3}}{3}$$

$$\overline{BD} = \frac{e}{3}\sqrt{3}$$

$$\overline{AD} = \frac{e}{3}\sqrt{3}$$



3. Berechnung des Umfangs u_{ADBC} :

$$u_{\text{ADBC}} = \overline{AD} + \overline{BD} + \overline{BC} + \overline{AC}$$

$$u_{\text{ADBC}} = 2 \cdot \overline{AD} + 2 \cdot \overline{BC}$$

$$u_{\text{ADBC}} = 2 \cdot \frac{e}{3}\sqrt{3} + 2 \cdot \frac{e}{2}\sqrt{2}$$

$$u_{\text{ADBC}} = 2 \cdot \frac{e}{3}\sqrt{3} + e\sqrt{2}$$

$$u_{\text{ADBC}} = 2 \cdot \frac{e}{3}\sqrt{3} + 3 \cdot \frac{e}{3}\sqrt{2}$$

$$u_{\text{ADBC}} = \frac{e}{3}(2\sqrt{3} + 3\sqrt{2})$$

$$u_{\text{ADBC}} = \frac{e}{3}(3\sqrt{2} + 2\sqrt{3})$$

