

4.2

$A_1 = 3,6 \text{ m}^2$

$A_2 = 2,0 \text{ m}^2$

$\frac{A_1}{A_2} = k^2 = \left(\frac{x}{1,8 \text{ m}}\right)^2 \sqrt{\quad}$

$(\Rightarrow) \frac{x}{1,8 \text{ m}} = \pm \sqrt{\frac{A_1}{A_2}} \cdot 1,8 \text{ m} \Rightarrow x = 1,8 \text{ m} \sqrt{\frac{3,6 \text{ m}^2}{2,0 \text{ m}^2}} \approx 2,4150 \text{ m} \approx 2,4 \text{ m}$

5.1

a)  $x^2 = 5^2 + 9^2 = 106 \sqrt{\quad} (\Rightarrow) x = \pm \sqrt{106}$   
 b)  $x^2 + 3^2 = 7^2 (\Rightarrow) x^2 = 40 \sqrt{\quad} (\Rightarrow) x = \pm \sqrt{40} = \sqrt{4 \cdot 10} = 2\sqrt{10}$

4.7

$A_1 = 310 \text{ cm}^2 \quad A_2 = 8,5 \text{ m}^2$   
 $V_1 = ? \quad V_2 = 1300 \text{ l}$

$\frac{V_1}{V_2} = k^3 \quad \frac{A_1}{A_2} = k^2 \sqrt{\quad} (\Rightarrow) k = \pm \sqrt{\frac{A_1}{A_2}}$

$\Rightarrow V_1 = V_2 k^3 = V_2 \left(\sqrt{\frac{A_1}{A_2}}\right)^3 = 1300 \text{ l} \cdot \left(\sqrt{\frac{310 \text{ cm}^2}{8,5 (100 \text{ cm})^2}}\right)^3$   
 $\approx 0,286324 \text{ l} \approx 2,9 \text{ dl}$

5.4

$\sin 65^\circ = \frac{x}{45 \text{ m}} \mid 45 \text{ m} (\Rightarrow) x = 45 \text{ m} \cdot \sin 65^\circ \approx 40,784 \text{ m} \approx 41 \text{ m}$

5.10

a)  $\tan \alpha = \frac{x}{172} = \frac{143 \text{ cm}}{62} \mid \cdot 172$   
 $(\Rightarrow) x = \frac{143 \text{ m} \cdot 172}{62} \approx 4,0517 \text{ m} \approx 4,1 \text{ m}$   
 b)  $\tan \alpha = \frac{143 \text{ cm}}{6 \cdot 28 \text{ cm}} \Rightarrow \alpha \approx 40,404^\circ \approx 40^\circ$   
 c)  $\alpha = 40^\circ$

4.9

$A_1$

$A_2$

Tarvittava lehtikulman määrä on muoran normaalin pintaa-alaan:

$\frac{m_2}{m_1} = \frac{sA_2}{sA_1} = \frac{A_2}{A_1} = k^2 = \left(\frac{2,5 \text{ m}}{1,8 \text{ m}}\right)^2 \mid \cdot m_1$

$(\Rightarrow) m_2 = \left(\frac{2,5 \text{ m}}{1,8 \text{ m}}\right)^2 \cdot m_1 = \left(\frac{2,5 \text{ m}}{1,8 \text{ m}}\right)^2 \cdot 85,7 \text{ g} = 165,316 \text{ g} \approx 165 \text{ g}$

5.13

a)  $\tan \alpha = \frac{5,9 \text{ m}}{4,2 \text{ m}} \Rightarrow \alpha \approx 54,554^\circ \approx 55^\circ$   
 b)  $\sin 37^\circ = \frac{82 \text{ m}}{x} \mid \cdot \frac{x}{\sin 37^\circ} (\Rightarrow) x = \frac{82 \text{ m}}{\sin 37^\circ} \approx 136,254 \text{ m} \approx 140$

4.10

$x_1 \{0 \quad x_2 \{0 \quad x_3 \{0$   
 $x_1 = 7,5 \text{ cm} \quad V_2 = 270 \text{ cm}^3$   
 $x_3 = 25 \text{ cm} \quad V_3 = 1250 \text{ cm}^3$

a)  $\frac{V_1}{V_3} = k^3 = \left(\frac{x_1}{x_3}\right)^3 \mid \cdot V_3$   
 $(\Rightarrow) V_1 = \left(\frac{x_1}{x_3}\right)^3 V_3 = \left(\frac{7,5 \text{ cm}}{25 \text{ cm}}\right)^3 \cdot 1250 \text{ cm}^3 = 33,75 \text{ cm}^3 \approx 34 \text{ cm}^3$

b)  $\frac{V_2}{V_3} = k^3 = \left(\frac{x_2}{x_3}\right)^3 \mid \sqrt[3]{\quad} (\Rightarrow) \frac{x_2}{x_3} = \sqrt[3]{\frac{V_2}{V_3}} \mid \cdot x_3$   
 $(\Rightarrow) x_2 = \sqrt[3]{\frac{V_2}{V_3}} \cdot x_3 = \sqrt[3]{\frac{270 \text{ cm}^3}{1250 \text{ cm}^3}} \cdot 25 \text{ cm} = 15 \text{ cm}$

5.14

$x = 21 - 3,9 = 17,1 \text{ (m)}$   
 Pythagoras:  $y^2 + 3,9^2 = 17,1^2$   
 $(\Rightarrow) y = \pm \sqrt{17,1^2 - 3,9^2} = 16,649 > 16$   
 $\Rightarrow$  ovasi ei ole tervessä

4.11

$\triangle ABC \sim \triangle ADE \sim \triangle AFG$  (k.k.)  
 1°  $\sphericalangle A$  yhteinen  
 2°  $\sphericalangle B = \sphericalangle D = \sphericalangle F$  (samankohk. & BC||DE||FG)

$\frac{A(ABC)}{A(AFG)} = k_1^2 = \left(\frac{1}{2}\right)^2 = \frac{1}{4}$   
 $\frac{A(ADE)}{A(AFG)} = k_2^2 = \left(\frac{3}{4}\right)^2 = \frac{9}{16}$

$\Rightarrow A(BCDE) = A(ADE) - A(ABC) = \frac{9}{16} A(AFG) - \frac{1}{4} A(ABC)$   
 $= \frac{5}{16} A(AFG) = \frac{5}{16} \cdot 220 \text{ cm}^2 = 68,75 \text{ cm}^2 \approx 69 \text{ cm}^2$

5.16

Pythagoras:  $x^2 = a^2 + (2a)^2 = a^2 + 4a^2 = 5a^2$   
 $(\Rightarrow) x = \pm \sqrt{5a^2} = \sqrt{5}a$   
 $\frac{x}{a+2a} = \frac{\sqrt{5}a}{3a} = \frac{\sqrt{5}}{3} \approx 0,74536$   
 $\Rightarrow$  lighthouse:  $1 - 0,74536 = 0,25464 \approx 25\%$

4.17

$\Delta_2 \sim \Delta_0$  (k.k.)  
 1° yhteinen huippukulma  
 2° samankohkaiset kantakulmat

$\frac{A_1}{A_0} = \frac{A_0 - A_2}{A_0} = \frac{A_0}{A_0} - \frac{A_2}{A_0} = 1 - \frac{A_2}{A_0} = 1 - k^2$   
 $= 1 - \left(\frac{a}{3a}\right)^2 = 1 - \left(\frac{1}{3}\right)^2 = 1 - \frac{1}{9} = \frac{8}{9} \mid \cdot A_0$   
 $(\Rightarrow) A_1 = \frac{8}{9} \cdot A_0 = \frac{8}{9} \cdot 12 = \frac{32}{3}$

5.17

$\sin 59^\circ = \frac{42 \text{ m}}{x} \mid \cdot \frac{x}{\sin 59^\circ}$   
 $(\Rightarrow) x = \frac{42 \text{ m}}{\sin 59^\circ} \approx 48,9986 \text{ m}$   
 $\Rightarrow$  maajärvi:  $3x = 146,996 \text{ m} \approx 150 \text{ m}$

4.13

$\frac{V_1}{V_0} = \frac{V_0 - V_2}{V_0} = \frac{V_0}{V_0} - \frac{V_2}{V_0} = 1 - k^3$   
 $= 1 - \left(\frac{7 \text{ cm}}{12 \text{ cm}}\right)^3 \approx 0,801505 \approx 80\%$

5.20

1° Pythagoras:  $x^2 = 4^2 + 7^2 = 65 \sqrt{\quad}$   
 $(\Rightarrow) x = \pm \sqrt{65}$   
 2° Pythagoras:  $x^2 + 4^2 = 7^2 (\Rightarrow) x^2 = 49 - 16 = 33$   
 $(\Rightarrow) x = \pm \sqrt{33}$

4.20

$A_1$

$A_2$

$\frac{A_2}{A_1} = k^2 = \left(\frac{y}{x}\right)^2 \sqrt{\quad}$   
 $(\Rightarrow) \frac{y}{x} = \pm \sqrt{\frac{A_2}{A_1}} = \sqrt{\frac{1}{2}} \approx 0,707107$

Jokaisen korkeus pienenee yhtä monta % kuin arkin korkeus:  
 $1 - \frac{y}{x} = 0,292893 \approx 29\%$

6.1

$A = \frac{1}{2} \cdot 24,4 \text{ cm} \cdot 13,0 \text{ cm} \cdot \sin 39,0^\circ$   
 $= 99,8102 \text{ cm}^2 \approx 99,8 \text{ cm}^2$

6.3

$\alpha = 180^\circ - 84^\circ - 49^\circ = 47^\circ$   
 Sinilause:  $\frac{x}{\sin 47^\circ} = \frac{9,3 \text{ cm}}{\sin 84^\circ} \mid \cdot \sin 47^\circ$   
 $(\Rightarrow) x = \frac{9,3 \text{ cm} \cdot \sin 47^\circ}{\sin 84^\circ} \approx 6,839 \text{ cm} \approx 6,8 \text{ cm}$   
 Sinilause:  $\frac{y}{\sin 49^\circ} = \frac{9,3 \text{ cm}}{\sin 84^\circ} \mid \cdot \sin 49^\circ (\Rightarrow) y = \frac{9,3 \text{ cm} \cdot \sin 49^\circ}{\sin 84^\circ}$   
 $\approx 7,057 \text{ cm} \approx 7,1 \text{ cm}$

4.20

$\frac{A_2}{A_1} = k^2 = \left(\frac{y}{x}\right)^2 \sqrt{\quad}$   
 $(\Rightarrow) \frac{y}{x} = \pm \sqrt{\frac{A_2}{A_1}} = \sqrt{\frac{1}{2}} \approx 0,707107$

Jokaisen korkeus pienenee yhtä monta % kuin arkin korkeus:  
 $1 - \frac{y}{x} = 0,292893 \approx 29\%$

6.4

$\alpha = 180^\circ - 48^\circ - 55^\circ = 77^\circ$   
 Sinilause:  $\frac{x}{\sin 48^\circ} = \frac{467 \text{ m}}{\sin 77^\circ} \mid \cdot \sin 48^\circ$   
 $(\Rightarrow) x = \frac{467 \text{ m} \cdot \sin 48^\circ}{\sin 77^\circ} \approx 356,177 \text{ m} \approx 356 \text{ m}$

6.5

Sinilause:  $\frac{3,7 \text{ cm}}{\sin \alpha} = \frac{5,8 \text{ cm}}{\sin 55^\circ}$   
 $(\Rightarrow) \sin \alpha = \frac{3,7 \text{ cm} \cdot \sin 55^\circ}{5,8 \text{ cm}} \approx 0,522563$   
 $\Rightarrow \alpha = 31,504^\circ$  tai  $\alpha = 180^\circ - 31,504^\circ = 148,496^\circ$  k. k. k.  
 $55^\circ + 148,496^\circ > 180^\circ$