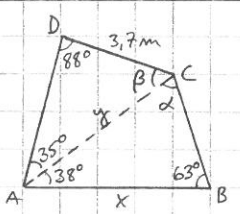


$\Rightarrow \beta = 180^\circ - 55^\circ - 32^\circ = 93^\circ$

Similause: $\frac{x}{\sin 93^\circ} = \frac{5,8 \text{ cm}}{\sin 55^\circ} \cdot \sin 93^\circ$

$\Rightarrow x = \frac{5,8 \text{ cm} \cdot \sin 93^\circ}{\sin 55^\circ} \approx 7,0708 \text{ cm} \approx 7,1 \text{ cm}$

6.15



$\alpha = 180^\circ - 38^\circ - 63^\circ = 79^\circ$
 $\beta = 180^\circ - 35^\circ - 88^\circ = 57^\circ$

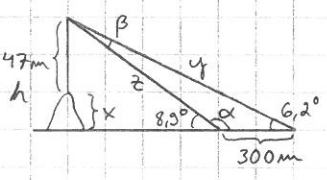
Similause: $\frac{y}{\sin 88^\circ} = \frac{3,7 \text{ m}}{\sin 35^\circ} \cdot \sin 88^\circ$

$\Rightarrow y = \frac{3,7 \text{ m} \cdot \sin 88^\circ}{\sin 35^\circ} \approx 6,4468 \text{ m}$

Similause: $\frac{x}{\sin 79^\circ} = \frac{y}{\sin 63^\circ} \cdot \sin 79^\circ$
 $\Rightarrow x = \frac{6,4468 \text{ m} \cdot \sin 79^\circ}{\sin 63^\circ} \approx 7,1025 \text{ m} \approx 7,1 \text{ m}$

$A = A_1 + A_2 = \frac{1}{2} \cdot 3,7 \text{ m} \cdot 6,4468 \text{ m} \cdot \sin 57^\circ + \frac{1}{2} \cdot 6,4468 \text{ m} \cdot 7,1025 \text{ m} \cdot \sin 38^\circ \cdot 8.1$
 $\approx 24,0975 \text{ m}^2 \approx 24 \text{ m}^2$

6.16



$\alpha = 180^\circ - 8,9^\circ = 171,1^\circ$
 $\beta = 180^\circ - 6,2^\circ - 171,1^\circ = 2,7^\circ$

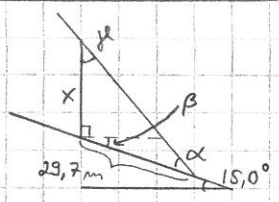
Similause: $\frac{y}{\sin 171,1^\circ} = \frac{300 \text{ m}}{\sin 2,7^\circ} \cdot \sin 171,1^\circ$

$\Rightarrow y = \frac{300 \text{ m} \cdot \sin 171,1^\circ}{\sin 2,7^\circ} \approx 985,282 \text{ m} \quad (z \approx 687,800 \text{ m})$

$\sin 6,2^\circ = \frac{h}{y} \mid y \Rightarrow h = 985,282 \text{ m} \cdot \sin 6,2^\circ \approx 106,41 \text{ m}$

\Rightarrow mään korkeus: $x = h - 47 \text{ m} \approx 59,41 \text{ m} \approx 59 \text{ m}$

6.17



$\alpha = 27^\circ$
 $\beta = 15,0^\circ$ (panonkollaiset kulmat)
 $\gamma = 180^\circ - 27^\circ - (90^\circ + 15,0^\circ) = 48^\circ$

Similause: $\frac{x}{\sin 27^\circ} = \frac{29,7 \text{ m}}{\sin 48^\circ} \cdot \sin 27^\circ$

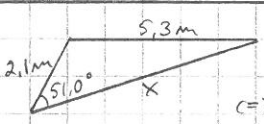
$\Rightarrow x = \frac{29,7 \text{ m} \cdot \sin 27^\circ}{\sin 48^\circ} \approx 18,144 \text{ m} \approx 18,1 \text{ m}$

7.1



Kosinilause: $x^2 = 18^2 + 13^2 - 2 \cdot 18 \cdot 13 \cdot \cos 81^\circ \approx 419,789 \text{ m}^2$
 $\Rightarrow x \approx \pm 20,49887 \approx 20 \text{ (m)}$

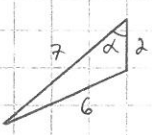
7.2



Kosinilause: $5,3^2 = x^2 + 2,1^2 - 2 \cdot x \cdot 2,1 \cdot \cos 51^\circ$
 $\Rightarrow x^2 - 4,2 \cdot \cos 51^\circ \cdot x + (2,1^2 - 5,3^2) = 0$

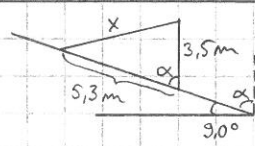
$\Rightarrow x = \frac{4,2 \cdot \cos 51^\circ \pm \sqrt{(4,2 \cdot \cos 51^\circ)^2 - 4 \cdot 1 \cdot (2,1^2 - 5,3^2)}}{2 \cdot 1} = \begin{cases} 6,364 \text{ m} \\ -3,721 \text{ m} \end{cases}$
 $\Rightarrow x \approx 6,4 \text{ m}$

7.3



Kosinilause: $6^2 = 7^2 + 2^2 - 2 \cdot 7 \cdot 2 \cdot \cos \alpha$
 $\Rightarrow 6^2 - 7^2 - 2^2 = -2 \cdot 7 \cdot 2 \cdot \cos \alpha \mid : (-2 \cdot 7 \cdot 2)$
 $\Rightarrow \cos \alpha = \frac{6^2 - 7^2 - 2^2}{-2 \cdot 7 \cdot 2} = \frac{12}{28} \Rightarrow \alpha = 57,61^\circ \approx 57,6^\circ$

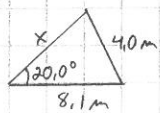
7.9



$\alpha = 90^\circ - 9,0^\circ = 81,0^\circ$
 Kosinilause: $x^2 = 3,5^2 + 5,9^2 - 2 \cdot 3,5 \cdot 5,9 \cdot \cos 81,0^\circ$
 $\Rightarrow x \approx \pm 5,877$

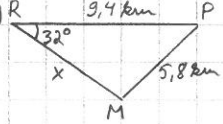
\Rightarrow määrän pituus: $3,5 \text{ m} + 5,9 \text{ m} = 9,4 \text{ m}$

7.16

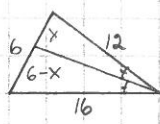


Kosinilause: $4,0^2 = 8,1^2 + x^2 - 2 \cdot 8,1 \cdot x \cdot \cos 20,0^\circ$
 $\Rightarrow x^2 - 16,2 \cdot \cos 20,0^\circ \cdot x + (8,1^2 - 4,0^2) = 0$
 $\Rightarrow x = \frac{16,2 \cdot \cos 20,0^\circ \pm \sqrt{(16,2 \cdot \cos 20,0^\circ)^2 - 4 \cdot 1 \cdot (8,1^2 - 4,0^2)}}{2 \cdot 1}$
 $\approx \begin{cases} 10,4968 \\ 4,7262 \end{cases} \Rightarrow 4,7 \text{ m tai } 10,5 \text{ m}$

7.18

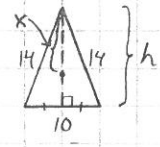


Kosinilause: $5,8^2 = x^2 + 9,4^2 - 2 \cdot x \cdot 9,4 \cdot \cos 32^\circ$
 $\Rightarrow x^2 - 18,8 \cdot \cos 32^\circ \cdot x + (9,4^2 - 5,8^2) = 0$
 $\Rightarrow x = \frac{18,8 \cdot \cos 32^\circ \pm \sqrt{(18,8 \cdot \cos 32^\circ)^2 - 4 \cdot 1 \cdot (9,4^2 - 5,8^2)}}{2 \cdot 1} \approx \begin{cases} 5,0006 \\ 10,9427 \end{cases}$
 $\Rightarrow x \approx 5,0 \text{ km tai } x \approx 10,9 \text{ km}$



Kulmanpuolitteleijalause: $\frac{x}{6-x} = \frac{12}{16} = \frac{3}{4} \mid \times$
 $\Rightarrow 4x = 3(6-x) \Rightarrow 4x = 18 - 3x$
 $\Rightarrow 7x = 18 \Rightarrow x = \frac{18}{7}, 6-x = \frac{24}{7}$

8.2



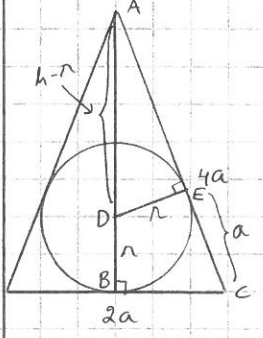
Pythagoras: $h^2 + 5^2 = 14^2 \Rightarrow h^2 = 171 \mid \sqrt{\quad}$
 $\Rightarrow h = \pm \sqrt{171} = \sqrt{9 \cdot 19} = 3\sqrt{19}$
 Etäisyys huippukulman kärjeltä: $x = \frac{2}{3}h = \frac{2}{3} \cdot 3\sqrt{19} = 2\sqrt{19} (\approx 8,7)$

8.8



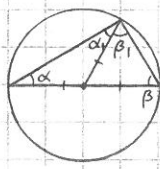
Pythagoras: $h^2 + 3^2 = 6^2 \Rightarrow h^2 = 27 \mid \sqrt{\quad}$
 $\Rightarrow h = \pm \sqrt{27} = \sqrt{9 \cdot 3} = 3\sqrt{3}$
 a) $r = \frac{2}{3}h = \frac{2}{3} \cdot 3\sqrt{3} = 2\sqrt{3}$
 b) $r = \frac{1}{3}h = \frac{1}{3} \cdot 3\sqrt{3} = \sqrt{3}$
 c) $r = 2\sqrt{3}$

8.18



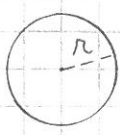
Pythagoras: $h^2 + a^2 = (4a)^2$
 $\Rightarrow h^2 = 16a^2 - a^2 = 15a^2 \mid \sqrt{\quad}$
 $\Rightarrow h = \pm \sqrt{15a^2} = \sqrt{15}a$
 $\Delta ABC \sim \Delta ADE$ (BB)
 $1^\circ \angle A$ yhteinen, $2^\circ \angle B = \angle E = 90^\circ$
 $\frac{h-r}{a} = \frac{4a}{a} = 4 \mid \cdot a$
 $\Rightarrow h-r = 4a \Rightarrow h = 5a \mid :5$
 $\Rightarrow r = \frac{h}{5} = \frac{\sqrt{15}a}{5}$

$\Gamma_{TA1}: r^2 + (4a-a)^2 = (h-r)^2$
 $\Rightarrow r^2 + (3a)^2 = h^2 - 2hr + r^2$
 $\Rightarrow 9a^2 = h^2 - 2hr$
 $\Rightarrow 9a^2 = 15a^2 - 2 \cdot \sqrt{15}a \cdot r$
 $\Rightarrow 2\sqrt{15}a \cdot r = 6a^2 \Rightarrow r = \frac{6a^2}{2\sqrt{15}a} = \frac{3a}{\sqrt{15}} = \frac{3\sqrt{15}a}{15} = \frac{\sqrt{15}a}{5}$



$\alpha = \alpha_1$ (kosykliinisen kolmion kantakulma)
 $\beta = \beta_1$ (" " " ")
 $\alpha + \beta + \alpha_1 + \beta_1 = 2\alpha_1 + 2\beta_1 = 180^\circ \mid :2$
 $\Rightarrow \alpha_1 + \beta_1 = 90^\circ$
 \Rightarrow kolmio on suorakulmainen

9.1



a) $A = \pi r^2 = 18 \text{ cm}^2 \mid : \pi \Rightarrow r^2 = \frac{18 \text{ cm}^2}{\pi} \mid \sqrt{\quad}$
 $\Rightarrow r = \pm \sqrt{\frac{18 \text{ cm}^2}{\pi}} \approx 2,39365 \text{ cm}$
 $\Rightarrow d = 2r = 4,7873 \text{ cm} \approx 4,8 \text{ cm}$
 b) $\gamma = 2\pi r = 2\pi \cdot 2,39365 \text{ cm} \approx 15,0398 \text{ cm} \approx 15 \text{ cm}$