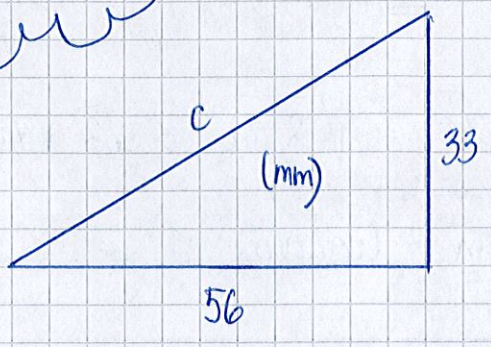
9 Pythagoraan lause

Sovella 3

S. 25

76



$c^2 = a^2 + b^2$

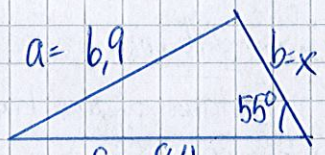
$c = \sqrt{a^2 + b^2}$

$= \sqrt{33^2 + 56^2}$

$= 65$ mm

V: hypotenuusan pituus 65 mm laskemalla ja mittaamalla

77



a) $a^2 + b^2 = c^2$

$b^2 = c^2 - a^2$

$b = \sqrt{c^2 - a^2}$

$x = \sqrt{8,4^2 - 6,9^2} \approx 4,8$ cm

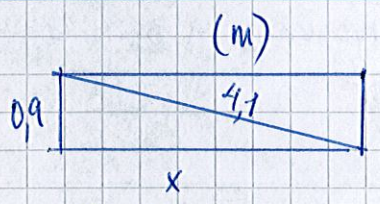
V: kateetin pituus on 4,8 cm

b) $\cos 55° = \frac{x}{8,4}$

$x = 8,4 \cdot \cos 55° \approx 4,8$ cm

78

a)



$a^2 + b^2 = c^2$

$0,9^2 + x^2 = 4,1^2$

$x^2 = 4,1^2 - 0,9^2$

$x = \sqrt{4,1^2 - 0,9^2}$

$x = 4$ m

$A = b \cdot h$

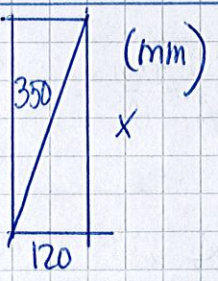
$= x \cdot 0,9$ m

$= 4$ m $\cdot 0,9$ m

$= 3,6$ m^2

V: sivun $x = 4$ m ja $A = 3,6$ m^2

b)



$120^2 + x^2 = 350^2$

$x^2 = 350^2 - 120^2$

$x = \sqrt{350^2 - 120^2}$

$x =$ 329 mm

$A = b \cdot h$

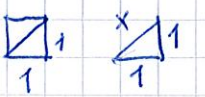
$= 120$ mm $\cdot 329$ mm

$\approx 39\,500$ mm^2

$\approx$ 395 cm^2

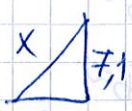
s. 25

79



a) $x^2 = 1^2 + 1^2$

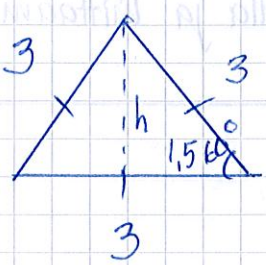
$x = \sqrt{1^2+1^2} = \underline{\underline{\sqrt{2}}}$



b) $x = \sqrt{7{,}1^2 + 7{,}1^2} = \sqrt{2 \cdot 7{,}1^2} = \sqrt{2} \cdot \sqrt{7{,}1^2} = \underline{\underline{\sqrt{2} \cdot 7{,}1}}$ cm (tarkka arvo)

$\approx \underline{\underline{10\text{ cm}}}$ likiarvo

80



a) Pythagoraan lause $a^2 + b^2 = c^2$

$h^2 + 1{,}5^2 = 3^2$

$h = \sqrt{3^2 - 1{,}5^2} \approx \underline{\underline{2{,}6\text{ cm}}}$ ← tarkempi arvo käyttäen $\sqrt{3^2-1{,}5^2}$

$A = \frac{b \cdot h}{2} = \frac{3 \cdot 2{,}6}{2}\text{ cm}^2 \approx \underline{\underline{3{,}9\text{ cm}^2}}$

b) Trigonometriset funktiot

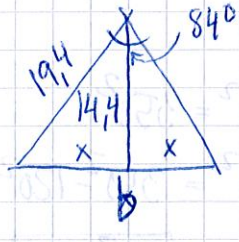
Tasasivuisen kolmion kulmien suuruus 60°.

$\sin 60^\circ = \frac{h}{3}$

$h = 3 \cdot \sin 60^\circ \approx \underline{\underline{2{,}6\text{ cm}}}$ ← tarkempi arvo käyttäen $3 \cdot \sin 60^\circ$

$A = \frac{b \cdot h}{2} = \frac{3 \cdot 2{,}6\text{ cm}}{2} \approx 3{,}9\text{ cm}^2$

81

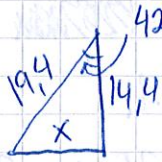


a) $b = 2 \cdot x$

$x^2 + 14{,}4^2 = 19{,}4^2 \Leftrightarrow x = \sqrt{19{,}4^2 - 14{,}4^2}$

$b = 2 \cdot x = 2 \cdot \sqrt{19{,}4^2 - 14{,}4^2} \approx 26{,}0\text{ cm}$

$A = \frac{b \cdot h}{2} = \frac{2\sqrt{19{,}4^2 - 14{,}4^2} \cdot 14{,}4}{2}\text{ cm}^2 \approx 187\text{ cm}^2$



b) $\tan 42^\circ = \frac{x}{14{,}4}$

$x = 14{,}4 \cdot \tan 42^\circ$

$b = 2 \cdot 14{,}4 \cdot \tan 42^\circ \approx \underline{\underline{26\text{ cm}}}$

$A = \frac{b \cdot h}{2}$

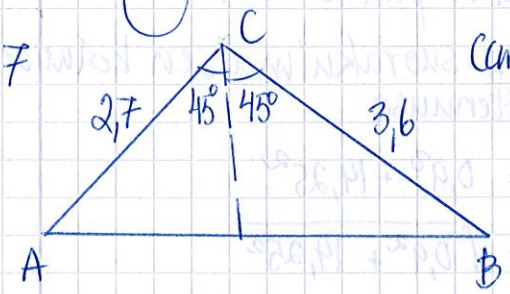
$= \frac{2 \cdot 14{,}4 \cdot \tan 42^\circ \cdot 14{,}4}{2}$

$\approx \underline{\underline{187\text{ cm}^2}}$

s. 177

SYVENNÄ 11 § Pythagoraan lause

S47



(cm)

$\sphericalangle C = 45° + 45° = 90°$

Kolmio ABC on suorakulmainen

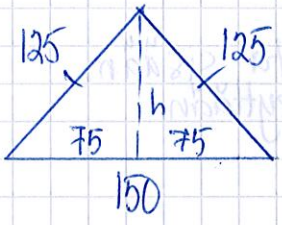
Pythagoraan lauseen mukaan

$AB^2 = 2{,}7^2 + 3{,}6^2$

$AB = \sqrt{2{,}7^2 + 3{,}6^2}$ cm $= 4{,}5$ cm

V: $AB = 4{,}5$ cm

S48



(mm)

$a^2 + b^2 = c^2$

$75^2 + h^2 = 125^2$

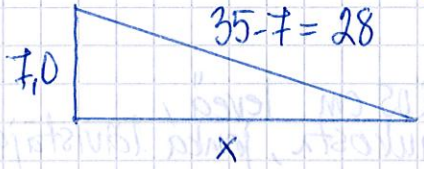
$h = \sqrt{125^2 - 75^2} = \sqrt{10000} = 100$ mm

$A = \frac{b \cdot h}{2} = \frac{150\text{ mm} \cdot 100\text{ mm}}{2} = 7500$ mm^2

≈ 75 cm^2

V: $h = 100$ mm ja $A = 75$ cm^2

S49



(m)

$a^2 + b^2 = c^2$

$7^2 + x^2 = 28^2$

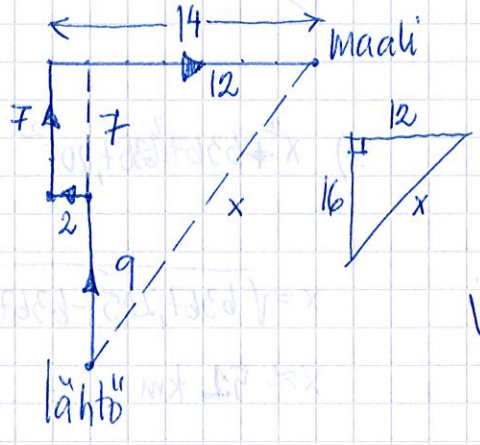
$x^2 = 28^2 - 7^2$

$x = \sqrt{28^2 - 7^2} \approx 27$ m

V: 27 m etäisyydellä

S50

x suora etäisyys lähdöstä maaliin



$a^2 + b^2 = c^2$

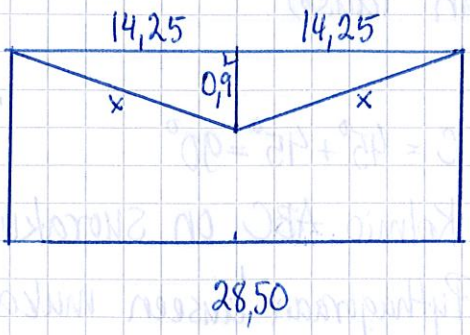
$12^2 + 16^2 = x^2$

$x = \sqrt{12^2 + 16^2}$ m

V: $x = 20$ m

S. 177

S51



Vaijerin pituus $2x$

x on suorakulmaisen kolmion hypotenuusa

$x^2 = 0{,}9^2 + 14{,}25^2$

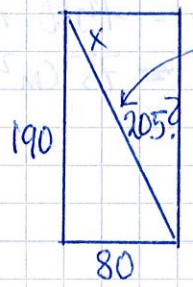
$x = \sqrt{0{,}9^2 + 14{,}25^2}$

Vaijerin pituus $2x = 2 \cdot \sqrt{0{,}9^2 + 14{,}25^2}$

$= 2\sqrt{203{,}8725}$

≈ 29 m

S52 Levy kannetaan pituussuunnassa ovesta sisään. Jos levyä kallistetaan, se mahtuu leveyttään kapeammasta oviaukosta.



Oviaukon lävistäjän pituus x, Pythagoraan lauseen mukaan:

$x^2 = 190^2 + 80^2$

$x = \sqrt{190^2 + 80^2}$

≈ 206 cm

V: Koska levy on 205 cm leveä, se mahtuu oviaukosta, jonka lävistäjä on 206 cm

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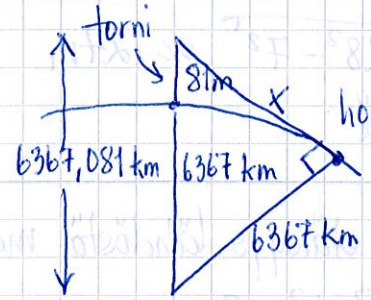
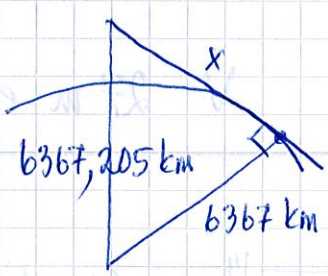
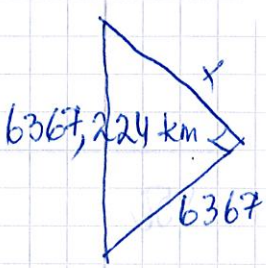
S53







Pythagoraan lauseen mukaan

a) $x^2 + 6367^2 = 6367{,}081^2$

$x^2 = 6367{,}081^2 - 6367^2$

$x = \sqrt{6367{,}081^2 - 6367^2}$

$x \approx 32$ km

b) $x^2 + 6367^2 = 6367{,}205^2$

$x = \sqrt{6367{,}205^2 - 6367^2}$

$x \approx 51$ km

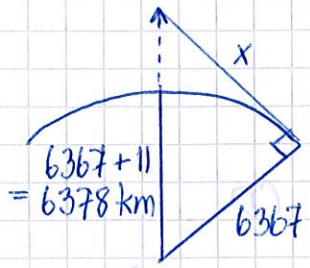
c) $x^2 + 6367^2 = 6367{,}224^2$

$x = \sqrt{6367{,}224^2 - 6367^2}$

$x \approx 53$ km

3.117

S54



Pythagoraan lauseen mukaan

$x^2 + 6367^2 = 6378^2$

$x^2 = 6378^2 - 6367^2$

$x = \sqrt{6378^2 - 6367^2}$

$x \approx 370$ km