Lösungen AB 1

1a) $\sin(\alpha) = \frac{12}{13}$ $\quad$ $\sin(\beta) = \frac{5}{13}$

$\cos(\alpha) = \frac{5}{13}$ $\quad$ $\cos(\beta) = \frac{12}{13}$

$\tan(\alpha) = \frac{12}{5}$ $\quad$ $\tan(\beta) = \frac{5}{12}$

1b) $\sin(\alpha) = \frac{4}{5}$ $\quad$ $\sin(\beta) = \frac{3}{5}$

$\cos(\alpha) = \frac{3}{5}$ $\quad$ $\cos(\beta) = \frac{4}{5}$

$\tan(\alpha) = \frac{4}{3}$ $\quad$ $\tan(\beta) = \frac{3}{4}$

1c) $\sin(\alpha) = \frac{8}{17}$ $\quad$ $\sin(\beta) = \frac{15}{17}$

$\cos(\alpha) = \frac{15}{17}$ $\quad$ $\cos(\beta) = \frac{8}{17}$

$\tan(\alpha) = \frac{8}{15}$ $\quad$ $\tan(\beta) = \frac{15}{8}$

1d) $\sin(\alpha) = \cos(\beta)$

$\cos(\alpha) = \sin(\beta)$

2a) $\sin^{-1}\left(\frac{1}{2}\right) = 30°$ $\quad$ 2b) $\cos^{-1}\left(\frac{1}{6}\right) = 80{,}4°$

2c) $\sin^{-1}(0{,}4) = 23{,}6°$ $\quad$ 2d) $\tan^{-1}(0{,}6) = 31°$

2e) $\cos^{-1}(1) = 0°$ $\quad$ 2f) $\cos^{-1}(0{,}03) = 88{,}3°$

2g) $\tan^{-1}(0{,}1) = 5{,}7°$ $\quad$ 2h) $\sin^{-1}(0{,}2) = 11{,}5°$

3a) $\sin^{-1}(0{,}4384) = \mathbf{26}°$

$180° - 26° = \mathbf{154}°$

3b) $\sin^{-1}(-0{,}2588) = -15°$

$-15° + 360° = \mathbf{345}$

$180° - (-15°) = \mathbf{195}°$

3c) $\sin^{-1}(0{,}8090) = \mathbf{54}°$

$180° - 54° = \mathbf{126}°$

3d) $\sin^{-1}(0{,}2924) = \mathbf{17}°$

$180° - 17° = \mathbf{163}°$

3e) $\cos^{-1}(0{,}6428) = \mathbf{50}°$

$360° - 50° = \mathbf{310}°$

3f) $\cos^{-1}(-0{,}9848) = \mathbf{170}°$

$360° - 170° = \mathbf{190}°$

3g) $\cos^{-1}(0{,}6691) = \mathbf{48}°$

$360° - 48° = \mathbf{312}°$

3h) $\cos^{-1}(0{,}1219) = 83°$
$360° - 83° = 277°$

3i) $\tan^{-1}(1{,}7321) = \mathbf{60}°$
$180° + 60° = \mathbf{240}°$

3j) $\tan^{-1}(-0{,}8693) = -41°$
-41° + 180° = **139°**
139° + 180° = **319°**

4a) $\sin(12°) = \cos(90° - 12°) = \cos(78°)$
$\sin(27°) = \cos(90° - 27°) = \cos(63°)$
$\sin(34°) = \cos(90° - 34°) = \cos(56°)$
$\sin(48°) = \cos(90° - 48°) = \cos(42°)$
$\sin(67°) = \cos(90° - 67°) = \cos(23°)$

4b) $\cos^{-1}(19°) = \sin(90° - 19°) = \sin(71°)$
$\cos^{-1}(33°) = \sin(90° - 33°) = \sin(57°)$
$\cos^{-1}(41°) = \sin(90° - 41°) = \sin(49°)$
$\cos^{-1}(58°) = \sin(90° - 58°) = \sin(32°)$
$\cos^{-1}(82°) = \sin(90° - 82°) = \sin(8°)$

Mögliche Lösungswege bei 5!!

5a) $\tan(\alpha) = \frac{a}{b} \leftrightarrow a = b \times \tan(\alpha) = 7cm \times \tan(13°) = 1{,}6\ cm \leftrightarrow \boldsymbol{a = 1{,}6cm}$
$\cos(\alpha) = \frac{b}{c} \leftrightarrow c = \frac{b}{\cos(\alpha)} = \frac{7cm}{\cos(13°)} = 7{,}2\ cm \leftrightarrow \boldsymbol{c = 7{,}2cm}$
$\sin(\beta) = \frac{b}{c} \leftrightarrow \beta = \sin^{-1}(\frac{b}{c}) = \sin^{-1}\left(\frac{7}{7{,}2}\right) = 76{,}5° \approx 77° \leftrightarrow \boldsymbol{\beta \approx 77°}$

5b) $\sin(\beta) = \frac{b}{a} \leftrightarrow a = \frac{b}{\sin(\beta)} = \frac{4{,}3\ cm}{\sin(43°)} = 6{,}3cm \leftrightarrow \boldsymbol{a = 6{,}3\ cm}$
$\cos(\gamma) = \frac{b}{a} \leftrightarrow \gamma = \cos^{-1}\left(\frac{b}{a}\right) = \cos^{-1}\left(\frac{4{,}3\ cm}{6{,}3\ cm}\right) \leftrightarrow \boldsymbol{\gamma = 47°}$
$\tan(\beta) = \left(\frac{b}{c}\right) \leftrightarrow c = \frac{b}{\tan(\beta)} = \frac{4{,}3\ cm}{\tan(43°)} = 4{,}6\ cm \leftrightarrow \boldsymbol{c = 4{,}6\ cm}$

5c) $\sin(\gamma) = \frac{c}{b} \leftrightarrow c = b \times \sin(\gamma) = 195\ m \times \sin(61°) = 170{,}6\ m \leftrightarrow \boldsymbol{c = 170{,}6\ m}$
$\cos(\gamma) = \frac{a}{b} \leftrightarrow a = b \times \cos(\gamma) = 195\ m \times \cos(61°) = 94{,}5\ m \leftrightarrow \boldsymbol{a = 94{,}5\ m}$
$\sin(\alpha) = \frac{a}{b} \leftrightarrow \alpha = \sin^{-1}\left(\frac{a}{b}\right) = \sin^{-1}\left(\frac{94{,}5\ m}{195\ m}\right) = 29° \leftrightarrow \boldsymbol{\alpha = 29°}$

5d) $\cos(\beta) = \frac{a}{c} \leftrightarrow a = c \times \cos(\beta) = 40\ cm \times \cos(32°) = 33{,}9\ cm \leftrightarrow \boldsymbol{a = 33{,}9\ cm}$
$\sin(\beta) = \frac{b}{c} \leftrightarrow b = c \times \sin(\beta) = 40\ cm \times \sin(32°) = 21{,}2\ cm \leftrightarrow \boldsymbol{b = 21{,}2\ cm}$
$\sin(\alpha) = \frac{a}{c} \leftrightarrow \alpha = \sin^{-1}\left(\frac{a}{c}\right) = \sin^{-1}\left(\frac{33{,}9\ cm}{40\ cm}\right) = 58° \leftrightarrow \boldsymbol{\alpha = 58°}$

5e) $\sin(\beta) = \frac{b}{c} \leftrightarrow c = \frac{b}{\sin(\beta)} = \frac{20{,}3\ m}{\sin(35°)} = 35{,}4\ m \leftrightarrow \boldsymbol{c = 35{,}4\ m}$

$\cos(\beta) = \frac{a}{c} \leftrightarrow a = c \times \cos(\beta) = 35{,}4\ m \times \cos(35°) = 28{,}9\ m \leftrightarrow \boldsymbol{a = 28{,}9\ m}$

$\tan(\alpha) = \frac{a}{b} \leftrightarrow \alpha = \tan^{-1}\left(\frac{a}{b}\right) = \tan^{-1}\left(\frac{28{,}9\ m}{20{,}3\ m}\right) = 55° \leftrightarrow \boldsymbol{\alpha = 55°}$

5f) $\sin(\beta) = \frac{b}{a} \leftrightarrow \beta = \sin^{-1}\left(\frac{b}{a}\right) = \sin^{-1}\left(\frac{50\ m}{60\ m}\right) = 56° \leftrightarrow \boldsymbol{\beta = 56°}$

$\cos(\gamma) = \frac{b}{a} \leftrightarrow \gamma = \cos^{-1}(\frac{b}{a}) = \cos^{-1}(\frac{50}{60}) = 34° \leftrightarrow \boldsymbol{\gamma = 34°}$

$\tan(\beta) = \frac{b}{c} \leftrightarrow c = \frac{b}{\tan(\beta)} = \frac{50\ m}{\tan(56°)} = 33{,}7\ m \leftrightarrow \boldsymbol{c = 33{,}7\ m}$

5g) $\cos(\beta) = \frac{a}{c} \leftrightarrow a = c \times \cos(\beta) = 253\ cm \times \cos(21°) = 236\ cm \leftrightarrow \boldsymbol{a = 236\ cm}$

$\sin(\beta) = \frac{b}{c} \leftrightarrow b = c \times \sin(\beta) = 253\ cm \times \sin(21°) = 90{,}6\ cm \leftrightarrow \boldsymbol{b = 90{,}6\ cm}$

$\sin(\alpha) = \frac{a}{c} \leftrightarrow \alpha = \sin^{-1}\left(\frac{a}{c}\right) = \sin^{-1}(\frac{236\ cm}{253\ cm}) = 69° \leftrightarrow \boldsymbol{\alpha = 69°}$

5h) $\tan(\alpha) = \frac{a}{c} \leftrightarrow \alpha = \tan^{-1}\left(\frac{a}{c}\right) = \tan^{-1}\left(\frac{42{,}7\ m}{83{,}2\ m}\right) = 27° \leftrightarrow \boldsymbol{\alpha = 27°}$

$\cos(\alpha) = \frac{c}{b} \leftrightarrow b = \frac{c}{\cos(\alpha)} = \frac{83{,}2\ m}{\cos(27°)} = 93{,}4\ m \leftrightarrow \boldsymbol{b = 93{,}4\ m}$

$\sin(\gamma) = \frac{c}{b} \leftrightarrow \gamma = \sin^{-1}\left(\frac{c}{b}\right) = \sin^{-1}\left(\frac{83{,}2\ m}{93{,}4\ m}\right) = 63° \leftrightarrow \boldsymbol{\gamma = 63°}$

5i) $\tan(\gamma) = \frac{c}{b} \leftrightarrow \gamma = \tan^{-1}\left(\frac{c}{b}\right) = \tan^{-1}\left(\frac{97{,}5\ m}{68{,}4\ m}\right) = 55° \leftrightarrow \boldsymbol{\gamma = 55°}$

$\tan(\beta) = \frac{b}{c} \leftrightarrow \beta = \tan^{-1}\left(\frac{b}{c}\right) = \tan^{-1}\left(\frac{68{,}4\ m}{97{,}5\ m}\right) = 35° \leftrightarrow \boldsymbol{\beta = 35°}$

$\cos(\gamma) = \frac{b}{a} \leftrightarrow a = \frac{b}{\cos(\gamma)} = \frac{68{,}4\ m}{\cos(55°)} = 119{,}3\ m \leftrightarrow \boldsymbol{a = 119{,}3\ m}$

5j) $\tan(\alpha) = \frac{a}{c} \leftrightarrow \alpha = \tan^{-1}\left(\frac{a}{c}\right) = \tan^{-1}\left(\frac{113{,}1\ m}{342{,}6\ m}\right) = 18° \leftrightarrow \boldsymbol{\alpha = 18°}$

$\tan(\gamma) = \frac{c}{a} \leftrightarrow \gamma = \tan^{-1}\left(\frac{c}{a}\right) = \tan^{-1}\left(\frac{342{,}6\ m}{113{,}1\ m}\right) = 72° \leftrightarrow \boldsymbol{\gamma = 72°}$

$\cos(\alpha) = \frac{c}{b} \leftrightarrow b = \frac{c}{\cos(\alpha)} = \frac{342{,}6\ m}{\cos(18°)} = 360{,}2\ m \leftrightarrow \boldsymbol{b = 360{,}2\ m}$

5k) $\cos(\beta) = \frac{a}{c} \leftrightarrow \beta = \cos^{-1}\left(\frac{a}{c}\right) = \cos^{-1}\left(\frac{272\ mm}{353\ mm}\right) = 40° \leftrightarrow \boldsymbol{\beta = 40°}$

$\sin(\beta) = \frac{b}{c} \leftrightarrow b = c \times \sin(\beta) = 353\ mm \times \sin(40°) = 227 mm \leftrightarrow \boldsymbol{c = 227 mm}$

$\sin(\alpha) = \frac{a}{c} \leftrightarrow \alpha = \sin^{-1}\left(\frac{a}{c}\right) = \sin^{-1}\left(\frac{272 mm}{353\ mm}\right) = 50° \leftrightarrow \boldsymbol{\alpha = 50°}$

5l) $\cos(\gamma) = \frac{a}{b} \leftrightarrow \gamma = \cos^{-1}\left(\frac{a}{b}\right) = \cos^{-1}\left(\frac{65{,}9\ cm}{272{,}4\ cm}\right) = 76° \leftrightarrow \boldsymbol{\gamma = 76°}$

$\cos(\alpha) = \frac{c}{b} \leftrightarrow c = b \times \cos(\alpha) = 272{,}4\ cm \times \cos(14°) = 264{,}3\ cm \leftrightarrow \boldsymbol{c = 264{,}3\ cm}$

$\sin(\alpha) = \frac{a}{b} \leftrightarrow \alpha = \sin^{-1}\left(\frac{a}{b}\right) = \sin^{-1}\left(\frac{65{,}9\ cm}{272{,}4\ cm}\right) = 14° \leftrightarrow \alpha = \boldsymbol{14°}$

5m) $\tan(\alpha) = \frac{a}{b} \leftrightarrow b = \frac{a}{\tan(\alpha)} = \frac{209\ m}{\tan(61°)} = 115{,}9\ m \leftrightarrow \boldsymbol{b = 115{,}9\ m}$

$\tan(\beta) = \frac{b}{a} \leftrightarrow \beta = \tan^{-1}\left(\frac{b}{a}\right) = \tan^{-1}(\frac{115{,}9\ m}{209\ m}) = 29° \leftrightarrow \boldsymbol{\beta = 29°}$

$\sin(\alpha) = \frac{a}{c} \leftrightarrow c = \frac{a}{\sin(\alpha)} = \frac{209\ m}{\sin(61°)} = 239\ m \leftrightarrow \boldsymbol{c = 239\ m}$

5n) $\sin(\beta) = \frac{b}{a} \leftrightarrow a = \frac{b}{\sin(\beta)} = \frac{15{,}47\ m}{\sin(55°)} = 18{,}9\ m \leftrightarrow \boldsymbol{a = 18{,}9\ m}$

$\cos(\beta) = \frac{c}{a} \leftrightarrow c = a \times \cos(\beta) = 18{,}9\ m \times \cos(55°) = 10{,}8\ m \leftrightarrow \boldsymbol{c = 10{,}8\ m}$

$\cos(\gamma) = \frac{b}{a} \leftrightarrow \gamma = \cos^{-1}\left(\frac{b}{a}\right) = \cos^{-1}\left(\frac{15{,}47\ m}{18{,}9\ m}\right) = 35° \leftrightarrow \boldsymbol{\gamma = 35°}$

5o) $\cos(\alpha) = \frac{b}{c} \leftrightarrow b = c \times \cos(\alpha) = 233m \times \cos(63°) = 106\ m \leftrightarrow \boldsymbol{b = 106\ m}$

$\sin(\beta) = \frac{b}{c} \leftrightarrow \beta = \sin^{-1}\left(\frac{b}{c}\right) = \sin^{-1}\left(\frac{106\ m}{233\ m}\right) = 27° \leftrightarrow \boldsymbol{\beta = 27°}$

$\sin(\alpha) = \frac{a}{c} \leftrightarrow a = c \times \sin(\alpha) = 233m \times \cos(63°) = 208\ m \leftrightarrow \boldsymbol{a = 208\ m}$

5p) $\cos(\gamma) = \frac{b}{a} \leftrightarrow b = a \times \cos(\gamma) = 1045\ km \times \cos(41°) = 789\ km \leftrightarrow \boldsymbol{b = 789\ km}$

$\tan(\gamma) = \frac{c}{b} \leftrightarrow c = b \times \tan(\gamma) = 789\ km \times \tan(41°) = 686\ km \leftrightarrow \boldsymbol{c = 686\ km}$

$\sin(\beta) = \frac{b}{a} \leftrightarrow \beta = \sin^{-1}\left(\frac{b}{a}\right) = \sin^{-1}\left(\frac{789\ km}{1045\ km}\right) = 49° \leftrightarrow \boldsymbol{\beta = 49°}$