Trigonometry

1. a) $\pi/2$
   b) $\pi/3$
   c) $\pi/180$
   d) $2\pi/3$
   e) $180°$
   f) $45°$
   g) $120°$
   h) $180°$

2. a)

a	b	c	α	β	γ
3cm	5, 2cm	6cm	30°	60°	90°
1, 9cm	18, 1cm	18cm	6°	90°	84°
16.6cm	13.1cm	10, 2cm	90°	52°	38°
12, 3cm	27.1cm	24.1cm	27°	90°	63°

   b) i. $a = 8mm$ (gegeben), $b = 8,4mm$ (gegeben), $c = 2,56122mm$
   ii. $a = 5,77169m$, $b = 3,5m$ (gegeben), $c = 6,75m$ (gegeben)
   iii. $a = 3,4m$ (gegeben), $b = 1,82182m$, $c = 2,8707m$
   iv. $a = 3,98785cm$, $b = 6,22293cm$, $c = 8,3cm$ (gegeben)
   v. $a = 6,7mm$ (gegeben), $b = 12,0423mm$, $c = 15,4848mm$
   vi. $a = 7,2cm$ (gegeben), $b = 5,1cm$ (gegeben), $c = 4,33cm$

3. a) $\dfrac{\sin(2\alpha)}{1+\cos(2\alpha)} = \dfrac{2\sin(\alpha)\cos(\alpha)}{1+\cos^2(\alpha)-\sin^2(\alpha)} = \dfrac{2\sin(\alpha)\cos(\alpha)}{1+2\cos^2(\alpha)-1} = \dfrac{2\sin(\alpha)\cos(\alpha)}{2\cos^2(\alpha)} = \dfrac{\sin(\alpha)}{\cos(\alpha)} = \tan(\alpha)$
   For the denominator we use: $\cos(2\alpha) = \cos^2(\alpha) - \sin^2(\alpha) = 2\cos^2(\alpha) - 1 = 1 - 2\sin^2(\alpha)$
   b) $(1+\cos(2\alpha))(1-\sqrt{1-\sin^2(2\alpha)}) = (1+\cos(2\alpha))(1-\cos(2\alpha)) = 1-\cos^2(2\alpha) = \sin^2(2\alpha)$
   OR:
   $(1+\cos(2\alpha))(1-\sqrt{1-\sin^2(2\alpha)}) = (1+\cos(2\alpha))(1-\cos(2\alpha)) = 2\cos^2(\alpha)2\sin^2(\alpha) = 4\cos^2(\alpha)\sin^2(\alpha) = \sin^2(2\alpha)$

4. Applying the addition theorems for sine and cosine results in

$$\begin{aligned}
\sin((x+y)+z) &= \sin(x+y)\cos(z) + \cos(x+y)\sin(z) \\
&= (\sin(x)\cos(y) + \cos(x)\sin(y))\cos(z) + \\
&\qquad (\cos(x)\cos(y) - \sin(x)\sin(y))\sin(z) \\
&= \sin(x)\cos(y)\cos(z) + \cos(x)\sin(y)\cos(z) + \\
&\qquad \cos(x)\cos(y)\sin(z) - \sin(x)\sin(y)\sin(z).
\end{aligned}$$