$$ac^2 + bs^2 = a_1$$
$$as^2 + bc^2 = a_2$$
$$-2(a-b)cs = a_3$$

$$\Rightarrow a_1 + a_2 = a(c^2+s^2) + b(s^2+c^2)$$
$$= a+b$$
$$a_1 - a_2 = (a-b)(c^2-s^2)$$

$$\Rightarrow \frac{a_3}{a_1-a_2} = \frac{-2(a-b)cs}{(a-b)(c^2-s^2)} = -\tan(2\theta)$$

$$\frac{2\sin\theta\cos\theta}{\cos^2\theta - \sin^2\theta}$$

$$\Rightarrow \theta = \frac{1}{2}\tan^{-1}\left(\frac{a_3}{a_2-a_1}\right)$$

$$\Rightarrow a-b = \frac{-1}{2}\cdot\frac{a_3}{cs}$$

$$\Rightarrow a + (a-a_1-a_2) = \frac{-a_3}{2cs}$$

$$\Rightarrow a = \frac{1}{2}\left[a_1+a_2-\frac{a_3}{2cs}\right]$$

$$b = a_1+a_2-a$$
$$= \frac{+1}{2}\left[a_1+a_2+\frac{a_3}{2cs}\right]$$