Task   Determine the values of $a \in \mathbb{R}, a \geq 0$ which imply the invertibility of

$$A = \begin{bmatrix} 6a & 7\sqrt{a} \\ 2\sqrt{a} & a \end{bmatrix}.$$

Solution   Solving the equation

$$0 = \det(A) = 6a^2 - 14a$$

yields the critical values of a. The set of solutions for this equation is $\left\{0, \frac{7}{3}\right\}$. For all different values of a the determinant of A is different from 0 and hence A is invertible.