

Surds – Q1 [Practice/E](8/6/21)

Simplify $\left(1 + \left(1 + 2^{-\frac{1}{2}}\right)^{-1}\right)^{-1}$

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Solution

$$\begin{aligned}\left(1 + \left(1 + 2^{-\frac{1}{2}}\right)^{-1}\right)^{-1} &= \frac{1}{1 + \frac{1}{1 + \frac{1}{\sqrt{2}}}} = \frac{1}{1 + \frac{\sqrt{2}}{\sqrt{2} + 1}} = \frac{\sqrt{2} + 1}{\sqrt{2} + 1 + \sqrt{2}} = \frac{\sqrt{2} + 1}{2\sqrt{2} + 1} = \\ &= \frac{(\sqrt{2} + 1)(2\sqrt{2} - 1)}{(2\sqrt{2} + 1)(2\sqrt{2} - 1)} \\ &= \frac{4 - \sqrt{2} + 2\sqrt{2} - 1}{8 - 1} = \frac{3 + \sqrt{2}}{7}\end{aligned}$$