Proof of Equality

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Proof. We will prove that:

$$\frac{1}{2}\sqrt{\frac{8\,n+2}{\pi}}\,\sqrt{2}\,\sqrt{\frac{4\,n+1}{\pi}}=\frac{4\,n+1}{\pi}$$

1. Start with the left side of the equation:
$$\frac{1}{2}\left(\frac{8\,n+2}{\pi}\right)^{\frac{1}{2}}2^{\frac{1}{2}}\left(\frac{4\,n+1}{\pi}\right)^{\frac{1}{2}}$$
2. Simplify $2^{\frac{1}{2}}$:
$$\frac{1}{2}\left(\frac{8\,n+2}{\pi}\right)^{\frac{1}{2}}\sqrt{2}\left(\frac{4\,n+1}{\pi}\right)^{\frac{1}{2}}$$
3. Combine terms under square roots:
$$\frac{1}{2}\sqrt{\frac{8\,n+2}{\pi}}\,\sqrt{2}\,\sqrt{\frac{4\,n+1}{\pi}}$$
4. Combine $\sqrt{2}$ with one of the other square roots:
$$\frac{1}{2}\sqrt{\frac{8\,n+2}{\pi}}\,\sqrt{\frac{2\,(4\,n+1)}{\pi}}$$
5. Multiply terms under the square roots:
$$\frac{1}{2}\sqrt{\frac{8\,n+2}{\pi}}\,\sqrt{\frac{8\,n+2}{\pi}}$$
6. Multiply equal square roots:
$$\frac{1}{2}\,\frac{8\,n+2}{\pi}$$
7. Multiply $\frac{1}{2}$ by $(8\,n+2)$:
$$\frac{4\,n+1}{\pi}$$

This is exactly the right side of the equation we were trying to prove.

Therefore, we have shown that:

$$\frac{1}{2}\sqrt{\frac{8\,n+2}{\pi}}\,\sqrt{2}\,\sqrt{\frac{4\,n+1}{\pi}}=\frac{4\,n+1}{\pi}$$

The proof is complete. □