$f(x) = \sqrt{x}, \quad D = [0, \infty); \quad g(x) = \sqrt[3]{8 - x}, \quad D = \mathbb{R}.$

(a) $(f \circ g)(x) = f(g(x)) = f\left(\sqrt[3]{8 - x}\right) = \sqrt{\sqrt[3]{8 - x}} = \sqrt[6]{8 - x}.$
The domain of $f \circ g$ is $\{x \mid \sqrt[3]{8 - x} \geq 0\} = \{x \mid 8 - x \geq 0\} = \{x \mid x \leq 8\} = (-\infty, 8].$

(b) $(g \circ f)(x) = g(f(x)) = g(\sqrt{x}\,) = \sqrt[3]{8 - \sqrt{x}}.$
The domain of $g \circ f$ is $\{x \mid x$ is in the domain of f and $f(x)$ is in the domain of $g\}$. This is the domain of f, that is, $[0, \infty)$.

(c) $(f \circ f)(x) = f(f(x)) = f(\sqrt{x}\,) = \sqrt{\sqrt{x}} = \sqrt[4]{x}$. The domain of $f \circ f$ is $\{x \mid x \geq 0$ and $\sqrt{x} \geq 0\} = [0, \infty)$.

(d) $(g \circ g)(x) = g(g(x)) = g\left(\sqrt[3]{8 - x}\right) = \sqrt[3]{8 - \sqrt[3]{8 - x}}$, and the domain is $(-\infty, \infty)$.