Shower vs. Bath

Q. What uses more water - a shower or a bath? How much more?

What do I need to know? → Length of time of each?

Shower →	≈ 2:24
Bath →	≈ 8:10 to fill up.

↓

Flow rate of water?

Shower →	1 gallon/27s	≈ 0.04 gallons/s
Bath →	1 gallon/11s	≈ 0.09 gallons/s

Obviously a $2\frac{1}{2}$ minute shower uses less water than filling up a bathtub... but how much less?

Shower

$V = 0.04t$ V = volume (gallons)

$V = 0.04(144s)$ t = time (s)

$\boxed{V = 5.76 \text{ gallons}}$

2:24 $\quad 2\text{min} \cdot \left(\frac{60s}{1\text{min}}\right) = 120s$

$= 120s + 24s$

$= 144s$

more Exact

$V = \frac{1}{27}(144s)$

$= 5.\overline{3}$ gallons

$V = \frac{1}{11}(490s)$

$= 44.5\overline{4}$ gallons

$44.5\overline{4} - 5.\overline{3}$

$= \boxed{39.\overline{21} \text{ gallons}}$

↑ Does it matter?

Bath

$V = 0.09t$ V = volume (gallons)

$V = 0.09(490s)$ t = time (s)

$= \boxed{44.1 \text{ gallons}}$

8:10 $\quad 8\text{min} \cdot \left(\frac{60s}{\text{min}}\right) = 480s$

$= 480s + 10s$

$= 490s$

The Bath uses $44.1 - 5.76 = \boxed{38.34 \text{ gallons}}$ more than the shower.

Sequel: How long of a shower can I take with the same amount of bath water?

Try to solve graphically (approximate solution)

Shower: $V = 0.04t$ Bath: $V = 0.09t$ (max of 44.1 gallons)

You could take a 20 minute shower with the same amount as a full bath.

Try to Solve Algebraically

Bath: $\boxed{V = 44.1 \text{ gallons}}$ substitute Shower: $V = 0.04t$

$$\frac{44.1}{0.04} = \frac{0.04t}{0.04}$$

$$t = 1102.5\,s \cdot \left(\frac{1\,min}{60\,s}\right)$$

$$= 18.375\,min$$

$$\approx \boxed{18\,min}$$

You could take an 18 minute shower with 44.1 gallons of water.