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Overturning Fractions

$$\textcircled{1} \quad \frac{x+y}{xy} = \frac{1}{2}$$

Rearrange:

$$2xy = x+y$$

$$\frac{x+y}{xy} = 2$$

$$\frac{x}{xy} + \frac{y}{xy} = 2$$

$$\frac{1}{y} + \frac{1}{x} = 2$$

$$\frac{1}{y} = 2 - \frac{1}{x}$$

$\textcircled{2}$ Using the same method:

$$\frac{1}{y} + \frac{1}{z} = 3$$

Substitute:

$$(2 - \frac{1}{x}) + \frac{1}{z} = 3$$

$$\frac{1}{z} = 3 - (2 - \frac{1}{x})$$

$$\frac{1}{z} = 3 - 2 + \frac{1}{x}$$

$$\frac{1}{z} = 1 + \frac{1}{x}$$

$\textcircled{4}$

$$\frac{1}{y} = 2 - \frac{1}{x}$$

$$\frac{1}{y} = 2 - 3$$

$$\frac{1}{y} = -1$$

$$\frac{1}{y} = -1$$

$\textcircled{5}$

$$\frac{1}{y} + \frac{1}{z} = 3$$

$$-1 + \frac{1}{z} = 3$$

$$\frac{1}{z} = 4$$

$$4z = 1$$

$$z = \frac{1}{4}$$

$$\boxed{\begin{array}{l} x = \frac{1}{3} \\ y = -1 \\ z = \frac{1}{4} \end{array}}$$

$$\textcircled{3} \quad \frac{1}{x} + \frac{1}{z} = 7$$

Substitute:

$$\frac{1}{x} + (1 + \frac{1}{x}) = 7$$

$$\frac{2}{x} + 1 = 7$$

$$\frac{2}{x} = 6$$

$$6x = 2$$

$$x = \frac{1}{3}$$

$$\frac{1}{x} = 3$$