

$$x + y = y + x \quad \leftarrow \text{Axiom } 7$$

$$x + (y + z) = (x + y) + z \quad \leftarrow 8$$



$$x + (y + z) = (x + z) + y$$

$$3 \div 4 + 2 * 6 = 998 + (374 + 2)$$

$\frac{3}{4} + 12$

$(\frac{3}{4} + 2) * ($

$1000 + 2 =$

$$\underline{x + (y + z) = (x + z) + y}$$

① $\underline{z + y = y + z}$ Inst. Ax 7: $x: z$

② $\underline{x + (y + z) = x + (y + z)}$ Inst. Law of Reflexive identity,

③ $x + (y + z) = x + (z + y)$

$x: x + (y + z)$

R.O.R. ①

into ②

④ $\underline{x + (z + y) = (x + z) + y}$

Inst.

Ax 8 $y: z, z: y$

R.O.R. ④ into ③

⑤ $x + (y + z) = (x + z) + y$

$$(x+y) + (z+t) = \underline{(x+t)} + \underline{(y+z)}$$

① $(x+y) + (z+t) = (x+y) + (z+t)$ L.O.R.I.

② $z+t = t+z$ Ax 7

③ $(x+y) + (z+t) = (x+y) + (t+z)$ P.O.R.
 3a $w = x+y$ Ax 6

④ $w + (z+t) = w + (t+z)$ P.O.R.

⑤ $w + (t+z) = (w+t) + z$ Ax 8

⑥ $(x+y) + (z+t) = [(x+y)+t] + z$ ROR

⑦ $(x+y)+t = (x+t)+y$ Th 9 (3a) intro

⑧ $(x+y) + (z+t) = [(x+t)+y] + z$ ROR

$$(x+y) + (z+t) = \underline{(x+t)} + \underline{(y+z)}$$

⑧ $(x+y) + (z+t) = [(x+t) + y] + z$

⑨ $v = x+t$

Ax6

⑩ $(x+y) + (z+t) = (v+y) + z$

R.O.R. ⑨
into ⑩

⑪ $v + (y+z) = (v+y) + z$

Ax8

⑫ $(x+y) + (z+t) = v + (y+z)$ R.O.R.

⑬ $(x+y) + (z+t) = (x+t) + (y+z)$

⑭ rejoin