

April 3rd

$$a = 999(1 + 2 + 3 + \dots + 1000)$$

$$b = 1000(1 + 2 + 3 + \dots + 999)$$

Find $a - b$

$$a = 999 \times 1 + 999 \times 2 + 999 \times 3 + \dots + 999 \times 999 + 999 \times 1000 \quad (1000 \text{ terms})$$

$$b = 1000 \times 1 + 1000 \times 2 + 1000 \times 3 + \dots + 1000 \times 999 \quad (999 \text{ terms})$$

Therefore

$$a - b =$$

$$- 1 - 2 - 3 - \dots - 999 + 999 \times 1000 =$$

$$999 \times 1000 - \sum_{i=1}^{99} i =$$

$$999 \times 1000 - \left(\frac{1}{2} \times 999 \times 1000 \right) =$$

$$\frac{1}{2} \times 999 \times 1000 =$$

499,500