**Brute Force 1 Example**

> restart

**Element Equations**

> $OhmR1 := v1 = i1 \cdot R1$

$$OhmR1 := v1 = i1\,R1 \quad (1)$$

> $OhmR2 := v2 = i2 \cdot R2$

$$OhmR2 := v2 = i2\,R2 \quad (2)$$

**KCL Equations (Third one not used)**

> $KCLna := -ia + i1 + i2 = 0$

$$KCLna := -ia + i1 + i2 = 0 \quad (3)$$

> $KCLnb := -i2 + ib = 0$

$$KCLnb := -i2 + ib = 0 \quad (4)$$

> $KCLnc := ia - i1 - ib = 0$

$$KCLnc := ia - i1 - ib = 0 \quad (5)$$

**KVL Equations**

> $KVLl1 := -va + v1 = 0$

$$KVLl1 := -va + v1 = 0 \quad (6)$$

> $KVLl2 := -v1 + v2 + vb = 0$

$$KVLl2 := -v1 + v2 + vb = 0 \quad (7)$$

**Symbolically Solve**

> $MySoln := simplify(expand(solve(\{OhmR1, OhmR2, KCLna, KCLnb, KCLnc, KVLl1, KVLl2\}, [i1, i2, ib, v1, v2, va])))$

$$MySoln := \left[\left[ i1 = \frac{R2\,ia + vb}{R1 + R2},\ i2 = \frac{R1\,ia - vb}{R1 + R2},\ ib = \frac{R1\,ia - vb}{R1 + R2},\ v1 = \frac{R1\,(R2\,ia + vb)}{R1 + R2},\ v2 = \frac{R2\,(R1\,ia - vb)}{R1 + R2},\ va = \frac{R1\,(R2\,ia + vb)}{R1 + R2} \right]\right] \quad (8)$$

**Define and Substitute Numerical Values**

> $Vals := R1 = 1000, R2 = 2.2e3, ia = 5e{-}3, vb = 12$

$$Vals := R1 = 1000,\ R2 = 2200.,\ ia = 0.005,\ vb = 12 \quad (9)$$

> $MyNumSoln := subs(Vals, MySoln)$

$$MyNumSoln := [[i1 = 0.007187500000,\ i2 = -0.002187500000,\ ib = -0.002187500000,\ v1 = 7.187500000,\ v2 = -4.812500000,\ va = 7.187500000]] \quad (10)$$

> $evalf[4](MyNumSoln)$

$$[[i1 = 0.007188,\ i2 = -0.002188,\ ib = -0.002188,\ v1 = 7.188,\ v2 = -4.812,\ va = 7.188]] \quad (11)$$

**Define Auxiliary Equations**

> $AuxEqn := [pdelia = va \cdot ia, pdelvb = -vb \cdot ib, pabsR1 = v1 \cdot i1, pabsR2 = v2 \cdot i2, ]$

$$AuxEqn := [pdelia = va\,ia,\ pdelvb = -vb\,ib,\ pabsR1 = v1\,i1,\ pabsR2 = v2\,i2] \quad (12)$$

**Substitute in Symbolic Solutions to Auxiliary Variables**

> $MyFinalAnswer := subs(MySoln[1][\ ], AuxEqn)$

$$MyFinalAnswer := \left[ pdelia = \frac{R1\,(R2\,ia + vb)\,ia}{R1 + R2},\ pdelvb = -\frac{vb\,(R1\,ia - vb)}{R1 + R2}, \right. \tag{13}$$
$$\left. pabsR1 = \frac{R1\,(R2\,ia + vb)^2}{(R1 + R2)^2},\ pabsR2 = \frac{R2\,(R1\,ia - vb)^2}{(R1 + R2)^2} \right]$$

**Substitute in Symbolic Solutions then Numerical Values to Auxiliary Variables**

```
> MyFinalNumAnswer := subs(MySoln[1][ ], Vals, AuxEqn)
```

$$MyFinalNumAnswer := [pdelia = 0.03593750000,\ pdelvb = 0.02625000000,\ pabsR1 = 0.05166015625,\ pabsR2 = 0.01052734375] \tag{14}$$

```
> evalf[4](MyFinalNumAnswer)
```

$$[pdelia = 0.03594,\ pdelvb = 0.02625,\ pabsR1 = 0.05166,\ pabsR2 = 0.01053] \tag{15}$$

```
>
```