Brute Force 1 Example

```
> restart
```

Element Equations

```
> OhmR1 := v1 = i1·R1 :
> OhmR2 := v2 = i2·R2 :
```

KCL Equations (Third one not used)

```
> KCLna := -ia + i1 + i2 = 0 :
> KCLnb := -i2 + ib = 0 :
> KCLnc := ia - i1 - ib = 0 :
```

KVL Equations

```
> KVLl1 := -va + v1 = 0 :
> KVLl2 := -v1 + v2 + vb = 0 :
```

Symbolically Solve

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

$$MySoln := \left[\left[i1 = \frac{R2\,ia + vb}{R1 + R2},\ i2 = \frac{R1\,ia - vb}{R1 + R2},\ ib = \frac{R1\,ia - vb}{R1 + R2},\ v1 = \frac{R1\,(R2\,ia + vb)}{R1 + R2},\ v2 = \frac{R2\,(R1\,ia - vb)}{R1 + R2},\ va = \frac{R1\,(R2\,ia + vb)}{R1 + R2} \right]\right] \quad (1)$$

Define and Substitute Numerical Values

```
> Vals := R1 = 1000, R2 = 2.2e3, ia = 5e-3, vb = 12 :
> MyNumSoln := subs(Vals, MySoln)
```

$$MyNumSoln := [[i1 = 0.007187500000,\ i2 = -0.002187500000,\ ib = -0.002187500000,\ v1 = 7.187500000,\ v2 = -4.812500000,\ va = 7.187500000]] \quad (2)$$

```
> evalf[4](simplify(MyNumSoln))
```

$$[[i1 = 0.007188,\ i2 = -0.002188,\ ib = -0.002188,\ v1 = 7.188,\ v2 = -4.812,\ va = 7.188]] \quad (3)$$

Define Auxiliary Equations

```
> AuxEqn := [pdelia = va·ia, pdelvb = -vb·ib, pabsR1 = v1·i1, pabsR2 = v2·i2, ] :
> MySoln[1][ ]
```

$$i1 = \frac{R2\,ia + vb}{R1 + R2},\ i2 = \frac{R1\,ia - vb}{R1 + R2},\ ib = \frac{R1\,ia - vb}{R1 + R2},\ v1 = \frac{R1\,(R2\,ia + vb)}{R1 + R2},\ v2 = \frac{R2\,(R1\,ia - vb)}{R1 + R2},\ va = \frac{R1\,(R2\,ia + vb)}{R1 + R2} \quad (4)$$

Substitute in Symbolic Solutions to Auxiliary Variables

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

$$MyFinalAnswer := \left[pdelia = \frac{R1\,(R2\,ia + vb)\,ia}{R1 + R2},\ pdelvb = -\frac{vb\,(R1\,ia - vb)}{R1 + R2},\ pabsR1 = \frac{R1\,(R2\,ia + vb)^2}{(R1 + R2)^2},\ pabsR2 = \frac{R2\,(R1\,ia - vb)^2}{(R1 + R2)^2} \right] \quad (5)$$

Substitute in Symbolic Solutions then Numerical Values to Auxiliary Variables

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

$$MyFinalNumAnswer := [pdelia = 0.03593750000,\ pdelvb = 0.02625000000,\ pabsR1 = 0.05166015625,\ pabsR2 = 0.01052734375] \quad (6)$$

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

$$[pdelia = 0.03594,\ pdelvb = 0.02625,\ pabsR1 = 0.05166,\ pabsR2 = 0.01053] \quad (7)$$

```
>
```