Conversions with Complex Units (units with a denominator)

Convert 3.72 g/cm³ to kg/m³.

All of the steps will be exact the same as our usual algorithm except for 2 small additional steps that will sandwich our usual algorithm.

NEW INITIAL STEP: IGNORE THE UNITS IN THE DENOMINATOR UNTIL THE "NEW FINAL STEP".

Think of this problem as Convert 3.72 g to kg.

1) **Q**uestion exponent = 3.72 = 3.72×10^0
2) **I**nputs = g = 10^0
   Outputs = kg = 10^3
   Units = 1 (g and kg in the numerator are just basic units, not squared or cubed, so we should just use "1").
3) Apply the algorithm "(I – O) x U + Q" → (0 - 3) x 1 + 0 = **-3**

4) Preliminary answer "3.72 g = 3.72×10^{-3} kg".

NEW FINAL STEP: FOR THE DENOMINATOR: <u>CIA</u> "CONVERT, INVERT & ADD".

1) Convert 1 cm³ to m³.
2) (-2 – 0) x 3 + 0 = **-6**
3) $1 \text{ cm}^3 = 10^{-6} \text{ m}^3$
4) SINCE THIS IS THE DENOMINATOR, WE NEED TO INVERT THE EXPONENT!
   -6 becomes +6.
5) Add this exponent to your initial answer:
   -3 + 6 = **3**

WRITE YOUR ANSWER:

   $3.72 \text{ g/cm}^3 = 3.72 \times 10^3 \text{ kg/m}^3 = 3{,}720 \text{ kg/m}^3$

Conversions with Complex Units (units with a denominator)

Convert 0.03456 L/m² to mL/cm².

All of the steps will be exact the same as our usual algorithm except for 2 small additional steps that will sandwich our usual algorithm.

NEW INITIAL STEP: IGNORE THE UNITS IN THE DENOMINATOR UNTIL THE "NEW FINAL STEP".

Think of this problem as Convert 0.03456 L to mL.

1) **Q**uestion exponent = $0.03456 = 3.456 \times 10^{-2}$
2) **I**nputs = L = 10^0
   Outputs = mL = 10^{-3}
   Units = 1 (L and mL in the numerator are just basic units, not squared or cubed, so we should just use "1").
3) Apply the algorithm "$(I - O) \times U + Q$" → $(0 - -3) \times 1 + -2 = \mathbf{1}$

4) Preliminary answer "$0.03456\ L = 3.456 \times 10^{1}\ mL$".

NEW FINAL STEP: FOR THE DENOMINATOR: <u>CIA</u> "CONVERT, INVERT & ADD".

5) Convert 1 m² to cm².
6) $(0 - -2) \times 2 + 0 = \mathbf{4}$
7) $1\ m^2 = 10^{4}\ cm^2$
8) SINCE THIS IS THE DENOMINATOR, WE NEED TO INVERT THE EXPONENT!
   +4 becomes -4.
9) Add this exponent to your initial answer:
   $1 + -4 = \mathbf{-3}$

WRITE YOUR ANSWER:

$0.03456\ L/m^2 = 3.456 \times 10^{-3}\ mL/cm^2 = 0.003456\ mL/cm^2$