Simplify without using a calculator. Leave your answer as an improper fraction in reduced form.

$$\frac{\frac{5}{4}-8}{2-\frac{7}{6}}$$

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this problem is an example of a Complex Fraction

Complex Fractions: (also known as Compound Fractions)

Fractions whose numerators and/or denominators also have fractions.

Fractions within fractions

Simplify: $\frac{\frac{5}{4}-8}{2-\frac{7}{6}}$

There are many methods to do this, we'll focus on two methods.

$$\frac{\frac{5}{4}-8}{2-\frac{7}{6}}$$

LCM of 4 & 6 is 12

One method:

Find LCM of all the denominators in the complex fraction.

Then multiply the numerator and denominator of the complex fraction by this LCM.

$$\frac{12}{12}\cdot\frac{\left(\frac{5}{4}-8\right)}{\left(2-\frac{7}{6}\right)} = \frac{15-96}{24-14} = \frac{-81}{10}$$

$$\frac{\frac{5}{4}-8}{2-\frac{7}{6}}$$

LCD of 4 & 6 is 12.

Another method:

Get ALL the "parts" of the complex fraction to have the LCD.
Then you can cancel all of the denominators.

$$\frac{3}{3}\cdot\frac{\frac{5}{4}-\frac{8}{1}\cdot\frac{12}{12}}{\frac{12}{12}\cdot\frac{2}{1}-\frac{7}{6}\cdot\frac{2}{2}} = \frac{\frac{15}{12}-\frac{96}{12}}{\frac{24}{12}-\frac{14}{12}} = \frac{15-96}{24-14} = \frac{-81}{10}$$

Simplify: $\dfrac{\frac{11}{9}-\frac{7}{12}}{\frac{13}{24}-5}$

To eliminate all denominators use the LCM of 9, 12, & 24

LCM = 72

$$\frac{72}{72}\cdot\frac{\left(\frac{11}{9}-\frac{7}{12}\right)}{\left(\frac{13}{24}-5\right)} = \frac{88-42}{39-360} = \frac{46}{-321}$$

Simplify: $\dfrac{\frac{2}{x}+\frac{5}{y^3}}{\frac{3}{x^2}-\frac{6}{y^2}}$

Eliminate Denominators

$$\frac{x^2y^3}{x^2y^3}\cdot\frac{\left(\frac{2}{x}+\frac{5}{y^3}\right)}{\left(\frac{3}{x^2}-\frac{6}{y^2}\right)} = \frac{2xy^3+5x^2}{3y^3-6x^2y}$$

Get all denominators to be the same and cancel them.

LCD: x^2y^3

$$\frac{xy^3}{xy^3}\cdot\frac{2}{x}+\frac{5}{y^3}\cdot\frac{x^2}{x^2} \qquad \frac{y^3}{y^3}\cdot\frac{3}{x^2}-\frac{6}{y^2}\cdot\frac{x^2y}{x^2y}$$

Now eliminate denominators

$$\frac{\frac{2xy^3}{x^2y^3}+\frac{5x^2}{x^2y^3}}{\frac{3y^3}{x^2y^3}-\frac{6x^2y}{x^2y^3}} = \frac{2xy^3+5x^2}{3y^3-6x^2y}$$

Simplify: $\dfrac{\frac{10}{x}+\frac{4}{xy}}{\frac{2}{x^2y}-\frac{3}{xy^2}}$

Eliminate denominators method:

$$\frac{x^2y^2}{x^2y^2}\cdot\frac{\left(\frac{10}{x}+\frac{4}{xy}\right)}{\left(\frac{2}{x^2y}-\frac{3}{xy^2}\right)} = \frac{10xy^2+4xy}{2y-3x}$$

Simplify.

$$\frac{\frac{10}{3x}+\frac{4}{xy}}{\frac{2}{x^2y}-\frac{3}{8xy^2}}$$

Eliminate denominators method:

$$\frac{24x^2y^2}{24x^2y^2}\cdot\frac{\left(\frac{10}{3x}+\frac{4}{xy}\right)}{\left(\frac{2}{x^2y}-\frac{3}{8xy^2}\right)}$$

$$\frac{80xy^2+96xy}{48y-9x}$$

Simplify: $\dfrac{6+\frac{2}{x-5}}{\frac{1}{x-5}-8}$

Eliminate denominators method:

$$\frac{(x-5)}{(x-5)}\cdot\frac{\left(6+\frac{2}{x-5}\right)}{\left(\frac{1}{x-5}-8\right)}$$

$$\frac{6(x-5)+2}{1-8(x-5)}=\frac{6x-30+2}{1-8x+40}=\frac{6x-28}{-8x+41}$$