CONJUNTO DE LOS NÚMEROS REALES

Resolución. NÚMEROS IRRACIONALES I

CONTENIDO: En esta guía encontrarás ejercicios de las operaciones básicas en el conjunto de los números irracionales.		
COMPETENCIA	**UNIDAD DE COMPETENCIA**	**CRITERIOS DE DESEMPEÑO**
(CG1): Aprender a aprender con calidad	(CG1 – U1): Abstrae, analiza y sintetiza información.	CG1-U1-CD1. Resume información de forma clara y ordenada.
(CG1): Aprender a aprender con calidad	(CG1 – U2): Demuestra conocimiento sobre su área de estudio y profesión	CG1-U2-CD2. Aplica los procedimientos de la disciplina para resolver problema y aportar soluciones

Desarrolla los siguientes planteamientos simplificando al máximo:

1) $\left(\sqrt{0{,}16}\right)^{-3}$

2) $\sqrt{(x^2y)^3.\sqrt{y^5}}$

3) $\left(\dfrac{\sqrt[3]{x}.y}{x^{-4}}\right)^3$

4) $x\left(x^{-1}+\sqrt{y}\right)^{-1}$

5) $4\sqrt{75}+6\sqrt{18}-\sqrt{128}-\sqrt{245}-\sqrt{98}-3\sqrt{125}$

6) $\dfrac{3}{4}\sqrt{176}-\dfrac{2}{3}\sqrt{45}+\dfrac{1}{8}\sqrt{320}+\dfrac{1}{5}\sqrt{275}$

7) $\dfrac{\sqrt{5}}{12}-\dfrac{3\sqrt{6}}{8}+\dfrac{2\sqrt{5}}{3}+\dfrac{\sqrt{6}}{4}-\dfrac{3\sqrt{5}}{4}-\dfrac{\sqrt{6}}{2}$

8) $\dfrac{5ab}{5}\sqrt{\dfrac{2a^5}{9b}}+\dfrac{1}{3}a\sqrt{\dfrac{5ab^6}{12}}-a^2b\sqrt{\dfrac{8a^3}{9b}}+2\sqrt{\dfrac{5a^3b^6}{48}}$

9) $\sqrt[4]{32x^8}-4x^2\sqrt[4]{512}$

10) $\dfrac{2}{5}\sqrt[3]{250}+\dfrac{3}{4}\sqrt[3]{128}-\dfrac{1}{3}\sqrt[3]{54}$

11) $\left(\dfrac{4}{9}\right)^{-0{,}5}+\left(\dfrac{16}{81}\right)^{-0{,}25}+32^{-0{,}2}$

12) $\left(\sqrt{\dfrac{25}{36}}-\sqrt{\dfrac{1}{36}}\right)^2\div\dfrac{1}{3}-2\left[\dfrac{5}{4}-\dfrac{1}{2}\right]^2$

13) $\sqrt{(6-4)^2.8}-\sqrt{(10-8)}$

14) $\left(\dfrac{2}{3}\sqrt{5}\right)\left(\dfrac{3}{4}\sqrt{10}\right)\left(\dfrac{1}{2}\sqrt{15}\right)$

15) $\sqrt{16}.\left(\sqrt[3]{8}\right)^{\frac{3}{2}}+\left(\sqrt[6]{16}\right)^3.\left(\sqrt{45}-\sqrt{80}\right)$

16) $\left(2^{\frac{1}{4}}.4^{-\frac{3}{2}}.8^{\frac{1}{4}}\right)^4+\left(\sqrt[6]{8}\right)^{-10}$

17) $\dfrac{\left(\dfrac{45}{180}\right)^{0{,}5}+\left(\dfrac{729}{144}\right)^{0{,}25}-\left(\dfrac{75}{125}\right)\left(\dfrac{63}{175}\right)^{-0{,}5}}{\left(\dfrac{32}{243}\right)^{0{,}2}-\left(\dfrac{135}{180}\right)^{-1}}$

18) $\left(\dfrac{3x^{\frac{2}{3}}\sqrt[9]{x^{2n}}}{\sqrt[5]{a^{-\frac{n}{3}}.a^{-0{,}8}}}\right)^3\left(\dfrac{a^{-\frac{1}{5}}\sqrt[3]{x^{-2}}}{3x^{\frac{n+1}{3}}\left(\sqrt[5]{a}\right)^{\frac{n}{2}+3}}\right)^{-2}$

19) $\left(4+\sqrt{1+2\sqrt{6+5\sqrt{\sqrt{5}-1}.\sqrt{\sqrt{5}+1}}}\right)^{-1}$

20) $10-4^{-1}\dfrac{(0{,}2^{-1}-1{,}5)^{-1}}{\left(1+\frac{5}{2}\right)^{-2}}-\left(2\frac{9}{8}\right)^{-0{,}5}\div 128^{-0{,}5}$

21) $1-4\left[\left(\sqrt[3]{\dfrac{8}{27}}\right)^{-1}+\left(\dfrac{3}{2}\right)^{-2}\dfrac{9}{16}-\dfrac{\sqrt[5]{-3}}{\sqrt[5]{96}}\right]\div\left(\sqrt{32}-\sqrt{18}\right)^{2}$

22) $Dado\ a^2+b^2=8\ y\ a.b=2,\qquad calcule\ el\ valor\ numérico\ de$

$$\sqrt{\frac{a}{b}+\frac{b}{a}}\left[\frac{(3a)^2+(3b)^2}{18}-a(a-2b)+b(5a-b)\right]$$

23) $Calcule\ el\ valor\ numérico\ de\ la\ expresión\ \left(\dfrac{a+b}{b}-\dfrac{2b}{ab}\right)+\left(\dfrac{a^2+1}{a-1}-\dfrac{a}{2}\right)\div\left(\dfrac{2+a}{2(a-1)}\right)$

$si\ a=2^{-1}\quad y\ es\ \ b=3^{-1}$

RESOLUCIÓN

1) $\left(\sqrt{0{,}16}\right)^{-3} = \left(\sqrt{\frac{4}{25}}\right)^{-3} = \left(\frac{2}{5}\right)^{-3} = \frac{5^3}{2^3} = \boxed{\frac{125}{8}}$

2) $\sqrt{(x^2y)^3.\sqrt{y^5}} = \sqrt{\sqrt{y^5(x^2y)^6}} = \sqrt[4]{y^5x^{12}y^6} = x^3\sqrt[4]{y^{11}} = \boxed{x^3y^2\sqrt[4]{y^3}}$

3) $\left(\frac{\sqrt[3]{x}.y}{x^{-4}}\right)^3 = \frac{xy^3}{x^{-12}} = x^{1+12}y^3 = \boxed{x^{13}y^3}$

4) $x\left(x^{-1}+\sqrt{y}\right)^{-1} = x\left(\frac{1}{x}+\sqrt{y}\right)^{-1} = x\left(\frac{1+x\sqrt{y}}{x}\right)^{-1} = x\left(\frac{x}{1+x\sqrt{y}}\right) = \boxed{\frac{x^2}{1+x\sqrt{y}}}$

5) $4\sqrt{75}+6\sqrt{18}-\sqrt{128}-\sqrt{245}-\sqrt{98}-3\sqrt{125}$

$= 4\sqrt{5^2\cdot 3}+6\sqrt{3^2\cdot 2}-\sqrt{2^7}-\sqrt{5\cdot 7^2}-\sqrt{2\cdot 7^2}-3\sqrt{5^3}$

$= 4\cdot 5\sqrt{3}+6\cdot 3\sqrt{2}-2^3\sqrt{2}-7\sqrt{5}-7\sqrt{2}-3\cdot 5\sqrt{5}$

$= 20\sqrt{3}+18\sqrt{2}-8\sqrt{2}-7\sqrt{5}-7\sqrt{2}-15\sqrt{5}$

$\boxed{= 20\sqrt{3}+3\sqrt{2}-22\sqrt{5}}$

6) $\frac{3}{4}\sqrt{176}-\frac{2}{3}\sqrt{45}+\frac{1}{8}\sqrt{320}+\frac{1}{5}\sqrt{275}$

$= \frac{3}{4}\sqrt{2^4\cdot 11}-\frac{2}{3}\sqrt{3^2\cdot 5}+\frac{1}{8}\sqrt{2^6\cdot 5}+\frac{1}{5}\sqrt{5^2\cdot 11}$

$= \frac{3}{4}\cdot 2^2\sqrt{11}-\frac{2}{3}\cdot 3\sqrt{5}+\frac{1}{8}\cdot 2^3\sqrt{5}+\frac{1}{5}\cdot 5\sqrt{11}$

$= 3\sqrt{11}-2\sqrt{5}+\sqrt{5}+\sqrt{11}$

$\boxed{= 4\sqrt{11}-\sqrt{5}}$

7) $\frac{\sqrt{5}}{12}-\frac{3\sqrt{6}}{8}+\frac{2\sqrt{5}}{3}+\frac{\sqrt{6}}{4}-\frac{3\sqrt{5}}{4}-\frac{\sqrt{6}}{2}$

$$=\frac{2\sqrt{5}-9\sqrt{6}+16\sqrt{5}+6\sqrt{6}-18\sqrt{5}-12\sqrt{6}}{24}=\frac{-15\sqrt{6}}{24}=\boxed{\frac{-5\sqrt{6}}{8}}$$

8) $\frac{5ab}{5}\sqrt{\frac{2a^5}{9b}}+\frac{1}{3}a\sqrt{\frac{5ab^6}{12}}-a^2b\sqrt{\frac{8a^3}{9b}}+2\sqrt{\frac{5a^3b^6}{48}}$

$$=\frac{5ab}{5}\sqrt{\frac{2a^5}{3^2b}}+\frac{1}{3}a\sqrt{\frac{5ab^6}{2^23}}-a^2b\sqrt{\frac{2^3a^3}{3^2b}}+2\sqrt{\frac{5a^3b^6}{2^43}}$$

$$=\frac{aba^2}{3}\sqrt{\frac{2a}{b}}+\frac{1}{3}a\frac{b^3}{2}\sqrt{\frac{5a}{3}}-\frac{a^2b2a}{3}\sqrt{\frac{2a}{b}}+\frac{2ab^3}{2^2}\sqrt{\frac{5a}{3}}$$

$$=\frac{a^3b}{3}\sqrt{\frac{2a}{b}}+\frac{ab^3}{6}\sqrt{\frac{5a}{3}}-\frac{2a^3b}{3}\sqrt{\frac{2a}{b}}+\frac{ab^3}{2}\sqrt{\frac{5a}{3}}$$

$$=\left(\frac{a^3b}{3}-\frac{2a^3b}{3}\right)\sqrt{\frac{2a}{b}}+\left(\frac{ab^3}{6}+\frac{ab^3}{2}\right)\sqrt{\frac{5a}{3}}$$

$$=-\frac{a^3b}{3}\sqrt{\frac{2a}{b}}+\frac{4ab^3}{6}\sqrt{\frac{5a}{3}}$$

$$\boxed{=-\frac{a^3b}{3}\sqrt{\frac{2a}{b}}+\frac{2ab^3}{3}\sqrt{\frac{5a}{3}}}$$

Se puede racionalizar, si entiendes el tema, pero como aún no lo repasamos, lo dejaremos hasta aquí.

9) $\sqrt[4]{32x^8}-4x^2\sqrt[4]{512}$

$$=\sqrt[4]{2^5x^8}-4x^2\sqrt[4]{2^9}$$

$$=2x^2\sqrt[4]{2}-4x^22^2\sqrt[4]{2}$$

$$=2x^2\sqrt[4]{2}-16x^2\sqrt[4]{2}$$

$$=\boxed{-14x^2\sqrt[4]{2}}\neq-7x\sqrt{1}$$

10) $\frac{2}{5}\sqrt[3]{250}+\frac{3}{4}\sqrt[3]{128}-\frac{1}{3}\sqrt[3]{54}$

$=\frac{2}{5}\sqrt[3]{5^3 2}+\frac{3}{4}\sqrt[3]{2^7}-\frac{1}{3}\sqrt[3]{3^3 2}$

$=\frac{2}{5}\cdot 5\sqrt[3]{2}+\frac{3}{4}\cdot 2^2\sqrt[3]{2}-\frac{1}{3}\cdot 3\sqrt[3]{2}$

$=2\sqrt[3]{2}+3\sqrt[3]{2}-\sqrt[3]{2}=\boxed{4\sqrt[3]{2}}$

11) $\left(\frac{4}{9}\right)^{-0,5}+\left(\frac{16}{81}\right)^{-0,25}+32^{-0,2}$

$=\left(\frac{2^2}{3^2}\right)^{-\frac{1}{2}}+\left(\frac{2^4}{3^4}\right)^{-\frac{1}{4}}+(2^5)^{-\frac{1}{5}}$

$=\frac{3}{2}+\frac{3}{2}+\frac{1}{2}=\boxed{\frac{7}{2}}$

12) $\left(\sqrt{\frac{25}{36}}-\sqrt{\frac{1}{36}}\right)^2\div\frac{1}{3}-2\left[\frac{5}{4}-\frac{1}{2}\right]^2$

$=\left(\frac{5}{6}-\frac{1}{6}\right)^2\div\frac{1}{3}-2\left(\frac{3}{4}\right)^2$

$=\left(\frac{4}{6}\right)^2\div\frac{1}{3}-2\cdot\frac{9}{16}$

$=\left(\frac{2}{3}\right)^2\cdot 3-\frac{9}{8}$

$=\frac{4}{9}\cdot 3-\frac{9}{8}$

$=\frac{4}{3}-\frac{9}{8}$

$=\frac{32-27}{24}=\boxed{\frac{5}{24}}$

13) $\sqrt{(6-4)^2.8}-\sqrt{(10-8)}$

$=\sqrt{2^2\cdot 2^3}-\sqrt{2}$

$=\sqrt{2^5}-\sqrt{2}$

$=4\sqrt{2}-\sqrt{2}=\boxed{3\sqrt{2}}$

14) $\left(\frac{2}{3}\sqrt{5}\right)\left(\frac{3}{4}\sqrt{10}\right)\left(\frac{1}{2}\sqrt{15}\right)$

$=\frac{2}{3}\sqrt{5}\cdot\frac{3}{4}\sqrt{2\cdot 5}\cdot\frac{1}{2}\sqrt{3\cdot 5}$

$=\frac{1}{4}\sqrt{2\cdot 3\cdot 5^3}$

$=\frac{1}{4}\cdot 5\sqrt{2\cdot 3\cdot 5}$

$\boxed{=\frac{5}{4}\sqrt{30}}$

15) $\sqrt{16}.\left(\sqrt[3]{8}\right)^{\frac{3}{2}}+\left(\sqrt[6]{16}\right)^3.\left(\sqrt{45}-\sqrt{80}\right)$

$=\sqrt{2^4}\cdot\left(\left(2^3\right)^{\frac{1}{3}}\right)^{\frac{3}{2}}+\left(\left(2^4\right)^{\frac{1}{6}}\right)^3\cdot\left(\sqrt{3^2\cdot 5}-\sqrt{2^4\cdot 5}\right)$

$=2^2\cdot 2^{\frac{3}{2}}+\left((2)^{\frac{2}{3}}\right)^3\cdot\left(3\sqrt{5}-4\sqrt{5}\right)$

$=4\sqrt{2^3}+2^2\left(-\sqrt{5}\right)$

$\boxed{=8\sqrt{2}-4\sqrt{5}}$

16) $\left(2^{\frac{1}{4}}\cdot 4^{-\frac{3}{2}}\cdot 8^{\frac{1}{4}}\right)^4+\left(\sqrt[6]{8}\right)^{-10}$

$=\left(2^{\frac{1}{4}}\cdot 2^{-3}\cdot 2^{\frac{3}{4}}\right)^4+\left(\sqrt[6]{2^3}\right)^{-10}$

$$= 2 \cdot 2^{-12} \cdot 2^3 + \left(\sqrt{2}\right)^{-10}$$

$$= 2^{-8} + 2^{-5}$$

$$= \frac{1}{2^8} + \frac{1}{2^5}$$

$$= \frac{1+2^3}{2^8}$$

$$= \frac{1+8}{2^8} = \boxed{\frac{9}{256}}$$

17) $$\frac{\left(\frac{45}{180}\right)^{0,5} + \left(\frac{729}{144}\right)^{0,25} - \left(\frac{75}{125}\right)\left(\frac{63}{175}\right)^{-0,5}}{\left(\frac{32}{243}\right)^{0,2} - \left(\frac{135}{180}\right)^{-1}}$$

$$= \frac{\left(\frac{1}{4}\right)^{\frac{1}{2}} + \left(\frac{81}{16}\right)^{\frac{1}{4}} - \frac{3}{5} \cdot \left(\frac{9}{25}\right)^{-\frac{1}{2}}}{\left(\frac{2^5}{3^5}\right)^{\frac{1}{5}} - \left(\frac{3}{4}\right)^{-1}}$$

$$= \frac{\frac{1}{2} + \frac{3}{2} - \frac{3}{5} \cdot \frac{5}{3}}{\frac{2}{3} - \frac{4}{3}}$$

$$= \frac{\frac{4}{2} - 1}{-\frac{2}{3}}$$

$$= \frac{2-1}{-\frac{2}{3}}$$

$$= \frac{1}{-\frac{2}{3}} = \boxed{-\frac{3}{2}}$$

18) $$\left(\frac{3x^{\frac{2}{3}}\sqrt[9]{x^{2n}}}{\sqrt[5]{a^{-\frac{n}{3}} . a^{-0,8}}}\right)^3 \left(\frac{a^{-\frac{1}{5}}\sqrt[3]{x^{-2}}}{3x^{\frac{n+1}{3}}\left(\sqrt[5]{a}\right)^{\frac{n}{2}+3}}\right)^{-2}$$

$$= \left(\frac{3 \cdot x^{\frac{2}{3}} \cdot x^{\frac{2n}{9}}}{a^{-\frac{n}{15}} \cdot a^{-\frac{4}{25}}}\right)^3 \left(\frac{a^{-\frac{1}{5}} \cdot x^{-\frac{2}{3}}}{3 \cdot x^{\frac{n+1}{3}} \cdot a^{\frac{n+6}{10}}}\right)^{-2}$$

$$= \frac{3^3 \cdot x^2 \cdot x^{\frac{2n}{3}}}{a^{-\frac{n}{5}} \cdot a^{-\frac{12}{25}}} \cdot \frac{a^{\frac{2}{5}} \cdot x^{\frac{4}{3}}}{3^{-2} \cdot x^{\frac{-2n-2}{3}} \cdot a^{-\frac{n+6}{5}}}$$

$$= 3^{3+2} \cdot x^{2+\frac{2n}{3}+\frac{4}{3}+\frac{2n+2}{3}} \cdot a^{\frac{2}{5}+\frac{n}{5}+\frac{12}{25}+\frac{n+6}{5}}$$

$$= 3^5 \cdot x^{\frac{6+2n+4+2n+2}{3}} \cdot a^{\frac{10+5n+12+5n+30}{25}}$$

$$\boxed{= 3^5 \cdot x^{\frac{4n+12}{3}} \cdot a^{\frac{10n+52}{25}}}$$

Otra respuesta puede ser:

$$= 3^5 \cdot \sqrt[3]{x^{4n+12}} \cdot \sqrt[25]{a^{10n+52}}$$

$$= 3^5 \cdot \sqrt[75]{x^{100n} \cdot x^{300} \cdot a^{30n} \cdot a^{156}}$$

$$\boxed{= 3^5 \cdot x^4 \cdot a^2 \sqrt[75]{x^{100n} \cdot a^{30n} \cdot a^6}}$$

19) $\left(4+\sqrt{1+2\sqrt{6+5\sqrt{\sqrt{5}-1}.\sqrt{\sqrt{5}+1}}}\right)^{-1}$

$$= \left(4+\sqrt{1+2\sqrt{6+5\sqrt{\left(\sqrt{5}-1\right)\cdot\left(\sqrt{5}+1\right)}}}\right)^{-1}$$

$$= \left(4+\sqrt{1+2\sqrt{6+5\sqrt{4}}}\right)^{-1}$$

$$= \left(4+\sqrt{1+2\sqrt{6+5\cdot 2}}\right)^{-1}$$

$$= \left(4+\sqrt{1+2\sqrt{16}}\right)^{-1}$$

$$= \left(4+\sqrt{1+2\cdot 4}\right)^{-1}$$

$$= \left(4+\sqrt{9}\right)^{-1}$$

$$= (4+3)^{-1}$$

$$= 7^{-1} = \boxed{\frac{1}{7}}$$

20) $10 - 4^{-1} \cdot \dfrac{(0{,}2^{-1} - 1{,}5)^{-1}}{\left(1 + \frac{5}{2}\right)^{-2}} - \left(2\dfrac{9}{8}\right)^{-0{,}5} \div 128^{-0{,}5}$

$$= 10 - \frac{1}{4} \cdot \frac{\left(\left(\frac{1}{5}\right)^{-1} - \frac{3}{2}\right)^{-1}}{\left(\frac{7}{2}\right)^{-2}} - \left(\frac{25}{8}\right)^{-\frac{1}{2}} \div (2^7)^{-\frac{1}{2}}$$

$$= 10 - \frac{1}{4} \cdot \frac{\left(5 - \frac{3}{2}\right)^{-1}}{\frac{2^2}{7^2}} - \left(\frac{8}{25}\right)^{\frac{1}{2}} \div \left(\frac{1}{2^7}\right)^{\frac{1}{2}}$$

$$= 10 - \frac{1}{4} \cdot \frac{\left(\frac{7}{2}\right)^{-1}}{\frac{2^2}{7^2}} - \frac{2\sqrt{2}}{5} \cdot (2^7)^{\frac{1}{2}}$$

$$= 10 - \frac{1}{4} \cdot \frac{\frac{2}{7}}{\frac{2^2}{7^2}} - \frac{2\sqrt{2}}{5} \cdot \sqrt{2^7}$$

$$= 10 - \frac{1}{4} \cdot \frac{7}{2} - \frac{2\sqrt{2} \cdot 2^3\sqrt{2}}{5}$$

$$= 10 - \frac{1}{4} \cdot \frac{7}{2} - \frac{2^4 \cdot 2}{5}$$

$$= 10 - \frac{7}{8} - \frac{32}{5}$$

$$= \frac{400 - 35 - 256}{40} = \boxed{\frac{109}{40}}$$

21) $1 - 4\left[\left(\sqrt[3]{\dfrac{8}{27}}\right)^{-1} + \left(\dfrac{3}{2}\right)^{-2} \dfrac{9}{16} - \dfrac{\sqrt[5]{-3}}{\sqrt[5]{96}}\right] \div \left(\sqrt{32} - \sqrt{18}\right)^2$

$$= 1 - 4\left[\left(\frac{2}{3}\right)^{-1} + \frac{4}{9} \cdot \frac{9}{16} - \sqrt[5]{\frac{-3}{96}}\right] \div \left(4\sqrt{2} - 3\sqrt{2}\right)^2$$

$$= 1 - 4\left[\frac{3}{2} + \frac{1}{4} - \sqrt[5]{-\frac{1}{32}}\right] \div \left(\sqrt{2}\right)^2$$

$$= 1 - 4\left[\frac{3}{2} + \frac{1}{4} + \frac{1}{2}\right] \div 2$$

$$= 1 - 4\left[\frac{9}{4}\right] \cdot \frac{1}{2}$$

$$= 1 - \frac{9}{2} = \boxed{-\frac{7}{2}}$$

$22)\ Dado\ a^2 + b^2 = 8\ y\ a.b = 2, calcule\ el\ valor\ numérico\ de$

$$= \sqrt{\frac{a}{b} + \frac{b}{a}}\left[\frac{(3a)^2 + (3b)^2}{18} - a(a - 2b) + b(5a - b)\right]$$

$$= \sqrt{\frac{a^2+b^2}{ab}}\left[\frac{9a^2+9b^2}{18} - a^2 + 2ab + 5ab - b^2\right]$$

$$= \sqrt{\frac{a^2 + b^2}{ab}}\left[\frac{9a^2}{18} + \frac{9b^2}{18} - a^2 - b^2 + 7ab\right]$$

$$= \sqrt{\frac{a^2 + b^2}{ab}}\left[\frac{a^2}{2} + \frac{b^2}{2} - (a^2 + b^2) + 7ab\right]$$

$$= \sqrt{\frac{a^2 + b^2}{ab}}\left[\frac{a^2 + b^2}{2} - (a^2 + b^2) + 7ab\right]$$

Ahora que todo está en función de $a^2 + b^2$ y ab, sustituimos sus valores $\{a^2 + b^2 = 8\ ab = 2$

$$= \sqrt{\frac{8}{2}} \cdot \left[\frac{8}{2} - (8) + 7 \cdot 2\right]$$

$$= \sqrt{4} \cdot [4 - 8 + 14]$$

$$= 2 \cdot 10 = \boxed{20}$$

$23)\ Calcule\ el\ valor\ numérico\ de\ la\ expresión\ b\left(\frac{a+b}{b}-\frac{2b}{ab}\right)+\left(\frac{a^2+1}{a-1}-\frac{a}{2}\right)\div\left(\frac{2+a}{2(a-1)}\right)$

$si\ a=2^{-1}\ y\ b=3^{-1}$

Mientras más pequeña la expresión, más fácil calcular su valor numérico.

$$=b\left(\frac{a(a+b)-2b}{ab}\right)+\left(\frac{2(a^2+1)-a(a-1)}{2(a-1)}\right)\cdot\frac{2(a-1)}{2+a}$$

$$=\frac{a^2+ab-2b}{a}+\frac{2a^2+2-a^2+a}{2+a}$$

$$=\frac{a^2+ab-2b}{a}+\frac{a^2+a+2}{2+a}$$

Sustituimos los valores $\{a=2^{-1}=\frac{1}{2}\ b=3^{-1}=\frac{1}{3}$

$$=\frac{\left(\frac{1}{2}\right)^2+\frac{1}{2}\cdot\frac{1}{3}-2\cdot\frac{1}{3}}{\frac{1}{2}}+\frac{\left(\frac{1}{2}\right)^2+\frac{1}{2}+2}{2+\frac{1}{2}}$$

$$=\frac{\frac{1}{4}+\frac{1}{6}-\frac{2}{3}}{\frac{1}{2}}+\frac{\frac{1}{4}+\frac{1}{2}+2}{\frac{5}{2}}$$

$$=\frac{\frac{3+2-8}{12}}{\frac{1}{2}}+\frac{\frac{1+2+8}{4}}{\frac{5}{2}}$$

$$=\frac{-\frac{3}{12}}{\frac{1}{2}}+\frac{\frac{11}{4}}{\frac{5}{2}}$$

$$=-\frac{1}{2}+\frac{11}{10}=\frac{6}{10}=\boxed{\frac{3}{5}}$$