

## FRACCIONES ALGEBRAICAS

1.- Simplifica las siguientes fracciones algebraicas:

a) $\frac{15a^3b^2}{5ab^4}$	b) $\frac{121a^4c^5d^7}{11ac^5d^8}$	c) $\frac{7mn^4p^5}{21m^3np^7}$	d) $\frac{8a-16b}{24}$
e) $\frac{42}{18a+24b}$	f) $\frac{14x+21y}{50x+75y}$	g) $\frac{27m-36n}{36m-48n}$	h) $\frac{x^2-x}{xy-y}$
i) $\frac{a^2+2ab+b^2}{3a+3b}$	j) $\frac{m^2-n^2}{m^2+2mn+n^2}$	k) $\frac{x^2-5x+6}{x^2-2x}$	l) $\frac{a^3-b^3}{a^2-b^2}$
m) $\frac{m^4n-m^2n^3}{m^3n+m^2n^2}$	n) $\frac{x^3+3x^2-10x}{x^3-4x^2+4x}$	ñ) $\frac{(8p^3q^2)^4}{(16p^2q^2)^3}$	o) $\frac{(12mn^3)^3}{(18m^2n)^4}$
p) $\frac{x^4-1}{3x^2-3}$	q) $\frac{m^3-n^3}{5m^2+5mn+5n^2}$	r) $\frac{2ax-4bx}{3ay-6by}$	s) $\frac{x(x-3)^2(x-1)}{x^2(x-1)^3(x-3)^4}$

### Soluciones

a) $\frac{3a^2}{b^2}$	b) $\frac{11a^3}{d}$	c) $\frac{n^3}{3m^2p^2}$	d) $\frac{a-2b}{3}$	e) $\frac{7}{3a+4b}$	f) $\frac{7}{25}$	g) $\frac{3}{4}$
h) $\frac{x}{y}$	i) $\frac{a+b}{3}$	j) $\frac{m-n}{m+n}$	k) $\frac{x-3}{x}$	l) $\frac{a^2+ab+b^2}{a+b}$	m) $m-n$	
n) $\frac{x+5}{x-2}$	ñ) $p^6 \cdot q^2$	o) $\frac{2^4 \cdot n^5}{3^5 \cdot m^5}$	p) $\frac{x^2+1}{3}$	q) $\frac{m-n}{5}$	r) $\frac{2x}{3y}$	
s) $\frac{1}{x(x-1)^2(x-3)^2}$						

2.- Simplifica las siguientes fracciones algebraicas:

a) $\frac{48a}{72ab}$	b) $\frac{25a^2b}{75ab^2}$	c) $\frac{96m^3n^2}{32m^4n^3}$	d) $\frac{3(a+b)}{5(a+b)}$	e) $\frac{4a+4b}{5a+5b}$	f) $\frac{3x-6y}{5x-10y}$
g) $\frac{x^2+xy}{xy+y^2}$	h) $\frac{8x+7y}{64x^2-49y^2}$	i) $\frac{24x-18y}{44x-33y}$	j) $\frac{x^2-16}{x^2+8x+16}$		
k) $\frac{9x^2+30x+25}{6x+10}$	l) $\frac{x^2-25}{x^2+x-20}$	m) $\frac{4y^2-4y+1}{6y-3}$	n) $\frac{x^2+6x+8}{x^2+7x+12}$		
ñ) $\frac{x^2+4x-12}{x^2+8x+12}$	o) $\frac{64-u^2}{u^2-13u+40}$	p) $\frac{(a-b)^2-c^2}{a^2-(b-c)^2}$	q) $\frac{x^2+7x+10}{x^2-25}$		

$$r) \frac{x^2 - x - 2}{x^2 + 3x + 2}$$

$$s) \frac{a^2 - 9}{3(a + 3)}$$

$$t) \frac{m^2 - n^2}{2n - 2m}$$

$$u) \frac{y^2 + y - 12}{y^2 + 2y - 15}$$

$$v) \frac{x^2 + 5x + 6}{x^2 + 8x + 15}$$

$$w) \frac{ac - ad + bc - bd}{2c + 3bc - 2d - 3bd}$$

$$x) \frac{16x^2y - 25y}{4x^2y - 3xy - 10y}$$

$$y) \frac{xy - x + 6y - 6}{xy + x + 6y + 6}$$

### Soluciones

$$a) \frac{2}{3b}$$

$$b) \frac{a}{3b}$$

$$c) \frac{3}{m \cdot n}$$

$$d) \frac{3}{5}$$

$$e) \frac{4}{5}$$

$$f) \frac{3}{5}$$

$$g) \frac{x}{y}$$

$$h) \frac{1}{8x - 7y}$$

$$i) \frac{6}{11}$$

$$j) \frac{x - 4}{x + 4}$$

$$k) \frac{3x + 5}{2}$$

$$l) \frac{x - 5}{x - 4}$$

$$m) \frac{2y - 1}{3}$$

$$n) \frac{x + 2}{x + 3}$$

$$\tilde{n}) \frac{x - 2}{x + 2}$$

$$o) \frac{8 - u}{u - 5}$$

$$p) \frac{a - b - c}{a + b - c}$$

$$q) \frac{x + 2}{x - 5}$$

$$r) \frac{x - 2}{x + 2}$$

$$s) \frac{a - 3}{3}$$

$$t) \frac{m + n}{2}$$

$$u) \frac{y + 4}{y + 5}$$

$$v) \frac{x + 3}{x + 5}$$

$$w) \frac{a + b}{2 + 3b}$$

$$x) \frac{4x - 5}{x - 2}$$

$$y) \frac{y - 1}{y + 1}$$

3.- Simplifica las siguientes fracciones algebraicas:

$$a) \frac{uv - 3u + 2v - 6}{uv - 5v - 3u + 15}$$

$$b) \frac{xy - 4y - 5x + 20}{xy - 24 + 6x - 4y}$$

$$c) \frac{xw + xz - wy - yz}{wx + wy + zx + yz}$$

$$d) \frac{-bd + ac + bc - ad}{ac + bd - ad - bc}$$

$$e) \frac{km + 7m + kn + 7n}{kn - 4m - 4n + km}$$

$$f) \frac{2p - qr - 2q + pr}{pr + 6p - qr - 6q}$$

$$g) \frac{uw - 4u + 3vw - 12v}{uw - 4u - 5vw + 20v}$$

$$h) \frac{6xz + 14y + 7xy + 12z}{7xy + 6xz - 7y - 6z}$$

$$i) \frac{2ac - ad + 10bc - 5bd}{2ac + ad + 10bc + 5bd}$$

$$j) \frac{3jm + 21jn - 2km - 14kn}{3jm - 18jn - 2km + 12kn}$$

### Soluciones

$$a) \frac{u + 2}{u - 5}$$

$$b) \frac{y - 5}{y + 6}$$

$$c) \frac{x - y}{x + y}$$

$$d) \frac{a + b}{a - b}$$

$$e) \frac{k + 7}{k - 4}$$

$$f) \frac{2 + r}{r + 6}$$

$$g) \frac{u + 3v}{u - 5v}$$

$$h) \frac{x + 2}{x - 1}$$

$$i) \frac{2c - d}{2c + d}$$

$$j) \frac{m + 7n}{m - 6n}$$

4.- Simplifica las siguientes fracciones algebraicas:

$$a) \frac{xz + wx - yz - wy}{4x^2 - 4y^2}$$

$$b) \frac{ac - bd - ad + bc}{2a^2 + 4ab + 2b^2}$$

$$c) \frac{3p^2 - 6pq + 3q^2}{pr - p - qr + q}$$

$$\begin{array}{lll}
\text{d)} \frac{c^2+6c+8}{c^2+7c+10} & \text{e)} \frac{d^2-8d+15}{d^2-2d-15} & \text{f)} \frac{x^2+xy-xz-yz}{x^2+xy+xz+yz} \\
\text{g)} \frac{mp-mq+np-nq}{5p^2-5q^2} & \text{h)} \frac{(a+b)^2-4ab}{a-b} & \text{i)} \frac{(a-b)^2+4ab}{a+b} \\
\text{j)} \frac{6xy^2-6xz^2}{3xy-3xz} & \text{k)} \frac{5a^2c+10abc+5b^2c}{15ac+15bc} & \text{l)} \frac{2m^2-2n^2}{4m+4n} \\
\text{m)} \frac{2p^2-4pq+2q^2}{8p^2-8q^2} & \text{n)} \frac{u^4-v^4}{u+v} & \text{ñ)} \frac{(m+n)^3-3mn(m+n)}{m^2-n^2}
\end{array}$$

### Soluciones

$$\begin{array}{lllll}
\text{a)} \frac{z+w}{4(x+y)} & \text{b)} \frac{c-d}{2(a+b)} & \text{c)} \frac{3(p-q)}{r-1} & \text{d)} \frac{c+4}{c+5} & \text{e)} \frac{d-3}{d+3} \\
\text{f)} \frac{x-z}{x+z} & \text{g)} \frac{m+n}{5(p+q)} & \text{h)} a-b & \text{i)} a+b & \text{j)} 2(y+z) \\
\text{k)} \frac{a+b}{2} & \text{l)} \frac{m-n}{2} & \text{m)} \frac{p-q}{4(p+q)} & \text{n)} (u^2+v^2)(u-v) & \text{ñ)} \frac{m^2-nm+n^2}{m-n}
\end{array}$$

5.- Opera y simplifica:

$$\begin{array}{lll}
\text{a)} \frac{9}{x} + \frac{5}{x} - \frac{7}{x} & \text{b)} \frac{4}{a^2} + \frac{5}{a^2} - \frac{9}{a^2} & \text{c)} \frac{6x}{3x-2} - \frac{4}{3x-2} \\
\text{d)} \frac{2x-3}{2x+15} + \frac{7x+8}{2x+15} & & \\
\text{e)} \frac{7}{a^2-3a-4} + \frac{2a-5}{a^2-3a-4} & \text{f)} \frac{5m-8n}{3m-2n} + \frac{7m+9n}{2n-3m} - \frac{5m-15n}{2n-3m} & \\
\text{g)} \frac{m-4}{m^2+2m-3} - \frac{m^2-3m}{m^2+2m-3} + \frac{7+2m^2}{m^2+2m-3} & & 
\end{array}$$

### Soluciones

$$\text{a)} \frac{21}{x} \quad \text{b)} 0 \quad \text{c)} 2 \quad \text{d)} \frac{9x+5}{2x+15} \quad \text{e)} \frac{2}{a-4} \quad \text{f)} 1 \quad \text{g)} \frac{m+1}{m-1}$$

6.- Opera y simplifica:

$$\begin{array}{lll}
\text{a)} \frac{x-3}{6} - \frac{x+2}{9} + \frac{2x-1}{3} - \frac{2x-3}{12} & \text{b)} \frac{6}{x^2} + \frac{7}{2x} - \frac{5}{3x} & \text{c)} \frac{m-2}{8m} + \frac{3m-1}{5m} \\
\text{d)} \frac{x+6}{8x} - \frac{2x+5}{12x} & \text{e)} m-2 - \frac{5}{m+1} & \text{f)} \frac{7}{2a-3} + a+1 \\
\text{g)} \frac{2}{a^2-1} + \frac{3a}{a^2-a-2} & \text{h)} \frac{d+1}{d-3} + \frac{d}{d+3} - \frac{6(d+1)}{d^2-9} & 
\end{array}$$

$$\begin{array}{ll} \text{i)} \frac{9}{5x} - \frac{5}{2x} + \frac{3}{x} & \text{j)} \frac{2}{x^2 + 10x + 24} + \frac{9}{18 - 3x - x^2} + \frac{4x - 5}{x^2 + x - 12} \\ \text{k)} \frac{p+17}{p^2 - p - 12} + \frac{p+1}{p^2 + 5p + 6} - \frac{6}{p^2 - 2p - 8} \end{array}$$

### Soluciones

$$\begin{array}{lllll} \text{a)} \frac{20x-29}{36} & \text{b)} \frac{11x+36}{6x^2} & \text{c)} \frac{29m-18}{40m} & \text{d)} \frac{8-x}{24x} & \text{e)} \frac{m^2-m-7}{m+1} \\ \text{f)} \frac{2a^2-a+4}{2a-3} & \text{g)} \frac{3a^2-a-4}{a^3-2a^2-a+2} & \text{h)} \frac{2d+1}{d+3} & \text{i)} \frac{23}{30x} & \text{j)} \frac{4}{x+4} \\ \text{k)} \frac{2}{p-4} \end{array}$$

7.- Opera y simplifica:

$$\begin{array}{lll} \text{a)} \frac{2xy^4}{3a^3b} \cdot \frac{5x^3y}{7ab^4} & \text{b)} \frac{3(a-b)}{2x} \cdot \frac{-17(a-b)}{19x^3} & \text{c)} \frac{-x^3y^4}{x^4y^5} \cdot \frac{x^7y^8}{-x^{15}y^3} \\ \text{d)} \frac{x^2y^3}{(a^3b^4)^5} \cdot \frac{(a^2b^3)^4}{(x^2y)^5} & \text{e)} \frac{a^2+9a+18}{a^2+8a+15} \cdot \frac{a^2+7a+10}{a^2+11a+18} & \text{f)} \frac{z^2-10z+16}{z^2-9z+14} \cdot \frac{z^2-10z+21}{z^2+2z-15} \\ \text{g)} \frac{x^2-9}{x^2-6x+9} \cdot \frac{x^2-7x+12}{x^2+8x+16} \cdot \frac{x^2+7x+12}{x^2+2x} \end{array}$$

### Soluciones

$$\begin{array}{lllll} \text{a)} \frac{10x^4y^5}{21a^4b^5} & \text{b)} -\frac{51(a-b)^2}{38x^4} & \text{c)} \frac{y^4}{x^9} & \text{d)} \frac{1}{x^8y^2a^7b^8} & \text{e)} \frac{a+6}{a+9} \\ \text{f)} \frac{z-8}{z+5} & \text{g)} \frac{(x+3)^2(x-4)}{x(x+2)(x+4)} = \frac{x^3+2x^2-15x-36}{x^3+6x^2+8x} \end{array}$$

8.- Opera y simplifica:

$$\begin{array}{lll} \text{a)} \frac{35a^3}{18b^3} : \frac{14ab^2}{9b^3} & \text{b)} \frac{a^5b^8c^7}{a^4b^6c^{10}} : \frac{a^6b^8c^9}{a^3b^2c^5} & \text{c)} \frac{6x^2+9xy}{a^3} : \frac{a}{14x^3+21x^2y} \\ \text{d)} \frac{a^3+a}{a^2-a} : \frac{a^3-a^2}{a^2-2a+1} & \text{e)} \frac{m^2+8m+16}{m^2+2m-8} : \frac{m^2-2m-3}{m^2-3m+2} & \text{f)} \frac{x^4-y^4}{x^2+2xy+y^2} : \frac{x^2+y^2}{x^2+2xy+y^2} \\ \text{g)} \frac{x^3-x}{x+1} : \frac{x-1}{x+1} & \text{h)} \frac{m^2-3m+2}{m^2-5m+4} : \frac{m^2+6m-16}{m^2+m-20} \end{array}$$

## Soluciones

$$\begin{array}{llll} \text{a)} \frac{5a^2}{4b^2} & \text{b)} \frac{1}{a^2b^4c^7} & \text{c)} \frac{21x^3(2x+3y)^2}{a^4} & \text{d)} \frac{a^2+1}{a^2} \\ \text{e)} \frac{(m+4)(m-1)}{(m-3)(m+1)} = \frac{m^2+3m-4}{m^2-2m-3} & \text{f)} x^2-y^2 & \text{g)} x^2+x & \text{h)} \frac{m+5}{m+8} \end{array}$$

9.- Opera y simplifica:

$$\begin{array}{ll} \text{a)} \frac{k^2-5k-14}{k^2-4} + \frac{k^2-11k+18}{k^2-4k+4} & \text{b)} \frac{u^2-3u-18}{u^2-10u+24} - \frac{u^2-9}{u^2-7u+12} \\ \text{c)} \frac{n^2+n-2}{n^2-2n-8} \cdot \frac{n-4}{n-1} & \text{d)} \frac{p^2-4p-45}{p^2-5p-36} \cdot \frac{p^2-16}{p^2+10p+25} \\ \text{e)} \frac{q^2-5q-24}{q^2-9} \div \frac{q+3}{q+8} & \text{f)} \frac{r^2-7r+6}{r^2+4r-5} \div \frac{2r-12}{r+5} \\ \text{g)} \frac{u^3+3uz^2-z^3-3u^2z}{(u^3-uz^2)(u-z)} & \text{h)} \frac{m^3-n^3}{m^2-n^2} - \frac{n(m+2n)}{m+n} \\ \text{i)} \frac{m^3+n^3}{m^2-n^2} + \frac{n(m-2n)}{m-n} & \text{j)} \frac{u^3+v^3}{u+v} - \frac{u^3v-uv^3}{u^2-v^2} \end{array}$$
  

$$\begin{array}{ll} \text{k)} \frac{\frac{b}{1} - \frac{a}{1}}{\frac{b}{b} - \frac{a}{a}} & \text{l)} \frac{\frac{x+y}{x-y} - \frac{x-y}{x+y}}{\frac{x+y}{x} - \frac{x+2y}{x+y}} \\ \text{n)} \frac{y}{y-x} - \frac{x}{y+x} & \tilde{\text{n)}} \frac{1+\frac{1}{a-1}}{1-\frac{1}{a+1}} \\ \text{p)} \frac{\frac{3}{a-2} - \frac{2}{a-3}}{\frac{1}{a-3} - \frac{1}{a-2}} & \text{q)} \frac{1}{a - \frac{a}{a - \frac{a^2}{a+1}}} \\ \text{s)} \frac{x^2+x+1}{x^2-\frac{1}{x}} & \text{t)} \frac{2ac+bc-6ad-3bd}{6ac+2ad+3bc+bd} \\ \text{v)} \frac{a-5}{a+5} - 1 - \frac{7}{a+5} & \text{w)} \frac{a+3}{a-2} + \frac{9}{a-2} + 1 \end{array}$$
  

$$\begin{array}{ll} \text{m)} \frac{2(x^3+1)}{x+1} - \frac{x^3-1}{x-1} + \frac{x^3-x}{x^2-1} & \text{o)} \frac{x+\frac{1}{2}}{2+\frac{1}{x}} \\ \text{r)} \frac{2-\frac{5}{x}}{4-\frac{25}{x^2}} & \text{u)} \frac{4m}{2m+5} + \frac{5m+6}{2m+5} - \frac{7m+8}{2m+5} \\ \text{x)} \frac{x}{x-2y} - \frac{2xy}{x^2-2xy} + \frac{y}{x} \end{array}$$

$$y) \frac{6x+5}{3x+3} \cdot \frac{x+1}{6x^2-7x-10}$$

### Soluciones

$$\begin{array}{llllll} \text{a)} \frac{2k-16}{k-2} & \text{b)} 0 & \text{c)} 1 & \text{d)} \frac{p-4}{p+5} & \text{e)} \frac{q^2-8}{q^2-9} & \text{f)} \frac{1}{2} \\ & & & & & \text{g)} \frac{u-z}{u^2+uz} \\ \text{h)} m-n & \text{i)} m+n & \text{j)} u^2+v^2 & \text{k)} -(a+b) & \text{l)} \frac{4x^2}{y(x-y)} & \text{m)} (x-1)^2 \\ \text{n)} \frac{y^2+x^2}{y^2-x^2} & \tilde{\text{n)}} \frac{a+1}{a-1} & \text{o)} \frac{x}{2} & \text{p)} a-5 & \text{q)} -1 & \text{r)} \frac{x}{2x+5} \\ \text{s)} \frac{xy}{x-y} & \text{t)} \frac{c-3d}{3c+d} & \text{u)} \frac{2m-2}{2m+5} & \text{v)} \frac{-17}{a+5} & \text{w)} \frac{2a+10}{a-2} & \text{x)} \frac{x+y}{x} \\ \text{y)} \frac{1}{3(x-2)} & & & & & \end{array}$$

10.- Opera y simplifica:

$$\begin{array}{lll} \text{a)} \frac{\frac{y-x^2}{y}}{\frac{y^2}{x}-x} & \text{b)} \frac{\frac{x-y}{x+y}-\frac{x+y}{x-y}}{1-\frac{x^2-xy-y^2}{x^2-y^2}} & \text{c)} 1+\frac{1}{2+\frac{1}{y}} \\ \text{d)} \frac{\frac{x}{x+1}-\frac{x^2}{x^2-1}}{1+\frac{1}{x-1}} & \text{e)} \frac{1+\frac{1}{1+\frac{1}{x-1}}}{\frac{1}{1-\frac{1}{x+1}}} & \text{f)} \frac{1+\frac{1}{\frac{x}{1}}}{1-\frac{1}{1+\frac{2}{x-4}}} \end{array}$$

### Soluciones

$$\begin{array}{llllll} \text{a)} \frac{x}{y} & \text{b)} -4 & \text{c)} \frac{3y+1}{2y+1} & \text{d)} -\frac{1}{x+1} & \text{e)} \frac{2x-1}{x+1} & \text{f)} \frac{(x+1)(x-2)}{2x} \end{array}$$