

Soluciones a los ejercicios de Fracciones

Nota: en algunos ejercicios se da solamente la solución final. En otros se hace el desarrollo completo hasta llegar a la solución.

1. Resolver las siguientes operaciones con fracciones, simplificando en todo momento los pasos intermedios y el resultado:

$$a) \frac{1}{4} + \frac{1}{3} \cdot \frac{6}{5} = \frac{13}{20}$$

$$b) \left(\frac{1}{4} + \frac{1}{3} \right) \cdot \frac{6}{5} = \frac{7}{10}$$

$$c) 1 - \frac{2}{3} \cdot \frac{1}{5} = \frac{13}{15}$$

$$d) \left(1 - \frac{2}{3} \right) \cdot \frac{1}{5} = \frac{1}{15}$$

$$e) -\frac{2}{3} + \frac{4}{3} \cdot \frac{1}{2} = 0$$

$$f) \left(-1 + \frac{1}{2} - \frac{1}{3} \right) \cdot \frac{6}{5} = \left(-\frac{6}{6} + \frac{3}{6} - \frac{2}{6} \right) \cdot \frac{6}{5} = -\frac{5}{6} \cdot \frac{6}{5} = -\frac{30}{30} = -1$$

$$g) -\frac{2}{5} + \frac{1}{3} \cdot \frac{4}{5} - \frac{1}{3} \cdot \frac{6}{5} = -\frac{2}{5} + \frac{4}{15} - \frac{6}{15} = -\frac{2}{5} + \frac{4}{15} - \frac{2}{5} = -\frac{6}{15} + \frac{4}{15} - \frac{6}{15} = -\frac{8}{15}$$

$$h) \left(-\frac{2}{5} + \frac{1}{3} \right) \cdot \frac{4}{5} - \frac{1}{3} \cdot \frac{6}{5} = \left(-\frac{6}{15} + \frac{5}{15} \right) \cdot \frac{4}{5} - \frac{6}{15} = -\frac{1}{15} \cdot \frac{4}{5} - \frac{2}{5} = -\frac{4}{75} - \frac{2}{5} =$$

$$= -\frac{4}{75} - \frac{30}{75} = -\frac{34}{75}$$

$$i) \frac{1}{2} + \frac{1}{3} \cdot \frac{4}{3} - \frac{1}{12} + \frac{5}{4} \cdot \frac{8}{3} = \frac{1}{2} + \frac{4}{9} - \frac{1}{12} + \frac{40}{12} = \frac{1}{2} + \frac{4}{9} - \frac{1}{12} + \frac{10}{3} =$$

$$= \frac{18}{36} + \frac{16}{36} - \frac{3}{36} + \frac{120}{36} = \frac{151}{36}$$

$$j) \left(\frac{1}{2} + \frac{1}{3} \right) \cdot \frac{4}{3} - \frac{1}{12} + \frac{5}{4} \cdot \frac{8}{3} = \left(\frac{3}{6} + \frac{2}{6} \right) \cdot \frac{4}{3} - \frac{1}{12} + \frac{40}{12} = \frac{5}{6} \cdot \frac{4}{3} - \frac{1}{12} + \frac{10}{3} = \frac{20}{18} - \frac{1}{12} + \frac{10}{3} =$$

$$= \frac{10}{9} - \frac{1}{12} + \frac{10}{3} = \frac{40}{36} - \frac{3}{36} + \frac{120}{36} = \frac{157}{36}$$

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

$$l) 1 - \frac{1}{2} + \frac{1}{3} \cdot \frac{2}{5} = \frac{19}{30}$$

$$m) -\frac{1}{2} \cdot \frac{4}{7} - \frac{2}{14} + \frac{1}{2} \cdot \frac{5}{7} = -\frac{4}{14} - \frac{2}{14} + \frac{5}{14} = -\frac{1}{14}$$

- n)
$$-\frac{1}{2} \cdot \left(\frac{4}{7} - \frac{2}{14} \right) + \frac{1}{2} \cdot \frac{5}{7} = -\frac{1}{2} \cdot \left(\frac{8}{14} - \frac{2}{14} \right) + \frac{5}{14} = -\frac{1}{2} \cdot \frac{6}{14} + \frac{5}{14} = -\frac{1}{2} \cdot \frac{3}{7} + \frac{5}{14} =$$

$$= -\frac{3}{14} + \frac{5}{14} = \frac{2}{14} = \frac{1}{7}$$
- ñ)
$$\frac{17}{9} - \frac{15}{5} + \frac{4}{3} : \left(\frac{1}{5} + \frac{2}{3} - \frac{1}{15} \right) + \frac{14}{3} : \frac{16}{8} = \frac{17}{9} - 3 + \frac{4}{3} : \left(\frac{3}{15} + \frac{10}{15} - \frac{1}{15} \right) + \frac{14}{3} : 2 =$$

$$= \frac{17}{9} - 3 + \frac{4}{3} : \frac{12}{15} + \frac{14}{6} = \frac{17}{9} - 3 + \frac{4}{3} : \frac{4}{5} + \frac{7}{3} = \frac{17}{9} - 3 + \frac{20}{12} + \frac{7}{3} =$$

$$= \frac{17}{9} - 3 + \frac{5}{3} + \frac{7}{3} = \frac{17}{9} - \frac{27}{9} + \frac{15}{9} + \frac{21}{9} = \frac{26}{9}$$
- o)
$$\frac{1}{3} + \frac{4}{3} : \frac{5}{6} \cdot \left(\frac{1}{2} - \frac{3}{2} \cdot \frac{10}{9} + 4 \right) = \frac{1}{3} + \frac{24}{15} \cdot \left(\frac{1}{2} - \frac{30}{18} + 4 \right) = \frac{1}{3} + \frac{8}{5} \cdot \left(\frac{1}{2} - \frac{5}{3} + 4 \right) =$$

$$= \frac{1}{3} + \frac{8}{5} \cdot \left(\frac{3}{6} - \frac{10}{6} + \frac{24}{6} \right) = \frac{1}{3} + \frac{8}{5} \cdot \frac{17}{6} = \frac{1}{3} + \frac{136}{30} = \frac{1}{3} + \frac{68}{15} = \frac{10}{30} + \frac{136}{30} = \frac{146}{30} = \frac{73}{15}$$
- p)
$$\frac{4}{5} - \frac{7}{3} \cdot \frac{3}{7} + \frac{1}{5} \cdot \left(2 + \frac{1}{2} \right) - \frac{7}{3} + 4 : \frac{6}{5} = \frac{4}{5} - \frac{21}{21} + \frac{1}{5} \cdot \left(\frac{4}{2} + \frac{1}{2} \right) - \frac{7}{3} + \frac{20}{6} =$$

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

$$= \frac{24}{30} - \frac{30}{30} + \frac{15}{30} - \frac{70}{30} + \frac{100}{30} = \frac{39}{30} = \frac{13}{10}$$
- q)
$$\frac{2}{3} + \frac{5}{4} \cdot \left(\frac{3}{5} + \frac{4}{10} \right) - \frac{5}{4} + \left(\frac{3}{5} : 4 \right) + \frac{12}{5} = \frac{2}{3} + \frac{5}{4} \cdot \left(\frac{3}{5} + \frac{2}{5} \right) - \frac{5}{4} + \frac{3}{20} + \frac{12}{5} =$$

$$= \frac{2}{3} + \frac{5}{4} \cdot \frac{5}{5} - \frac{5}{4} + \frac{3}{20} + \frac{12}{5} = \frac{2}{3} + \frac{5}{4} \cdot 1 - \frac{5}{4} + \frac{3}{20} + \frac{12}{5} = \frac{2}{3} + \frac{5}{4} - \frac{5}{4} + \frac{3}{20} + \frac{12}{5} =$$

$$= \frac{40}{60} + \frac{75}{60} - \frac{75}{60} + \frac{9}{60} + \frac{144}{60} = \frac{193}{60}$$
- r)
$$2 + \frac{1}{5} : \left(2 + \frac{7}{3} - \frac{2}{4} + \frac{5}{3} \right) = 2 + \frac{1}{5} : \left(2 + \frac{7}{3} - \frac{1}{2} + \frac{5}{3} \right) = 2 + \frac{1}{5} : \left(\frac{12}{6} + \frac{14}{6} - \frac{3}{6} + \frac{10}{6} \right) =$$

$$= 2 + \frac{1}{5} : \frac{33}{6} = 2 + \frac{1}{5} : \frac{11}{2} = 2 + \frac{2}{55} = \frac{110}{55} + \frac{2}{55} = \frac{112}{55}$$
- s)
$$\left(\frac{2}{7} - \frac{4}{5} + \frac{2}{8} \right) \cdot \frac{3}{2} - \frac{7}{5} : \frac{4}{7} = \left(\frac{2}{7} - \frac{4}{5} + \frac{1}{4} \right) \cdot \frac{3}{2} - \frac{49}{20} = \left(\frac{40}{140} - \frac{112}{140} + \frac{35}{140} \right) \cdot \frac{3}{2} - \frac{49}{20} =$$

$$= -\frac{37}{140} \cdot \frac{3}{2} - \frac{49}{20} = -\frac{111}{280} - \frac{49}{20} = -\frac{111}{280} - \frac{686}{280} = -\frac{797}{280}$$

- t)
$$\frac{3}{2} - \frac{1}{2} \cdot \frac{4}{3} : \left(\frac{4}{3} - \frac{2}{3} \cdot \frac{15}{8} + 1 \right) = \frac{3}{2} - \frac{4}{6} : \left(\frac{4}{3} - \frac{30}{24} + 1 \right) = \frac{3}{2} - \frac{2}{3} : \left(\frac{4}{3} - \frac{5}{4} + 1 \right) =$$

$$= \frac{3}{2} - \frac{2}{3} : \left(\frac{16}{12} - \frac{15}{12} + \frac{12}{12} \right) = \frac{3}{2} - \frac{2}{3} : \frac{13}{12} = \frac{3}{2} - \frac{24}{39} = \frac{117}{78} - \frac{48}{78} = \frac{69}{78} = \frac{23}{26}$$
- u)
$$\frac{2}{3} + \left[1 - \left(\frac{3}{4} - \frac{1}{6} \right) \right] = \frac{2}{3} + \left[1 - \left(\frac{9}{12} - \frac{2}{12} \right) \right] = \frac{2}{3} + \left(1 - \frac{7}{12} \right) = \frac{2}{3} + \left(\frac{12}{12} - \frac{7}{12} \right) =$$

$$= \frac{2}{3} + \frac{5}{12} = \frac{8}{12} + \frac{5}{12} = \frac{13}{12}$$
- v)
$$\frac{2}{3} - \left[\frac{3}{2} - \frac{1}{5} - \left(\frac{2}{5} - \frac{1}{3} \right) + \left(\frac{6}{5} - \frac{1}{2} \right) \right] - \frac{3}{4} + \left(\frac{1}{2} - \frac{1}{3} \right) =$$

$$= \frac{2}{3} - \left[\frac{3}{2} - \frac{1}{5} - \left(\frac{6}{15} - \frac{5}{15} \right) + \left(\frac{12}{10} - \frac{5}{10} \right) \right] - \frac{3}{4} + \left(\frac{3}{6} - \frac{2}{6} \right) =$$

$$= \frac{2}{3} - \left[\frac{3}{2} - \frac{1}{5} - \frac{1}{15} + \frac{7}{10} \right] - \frac{3}{4} + \frac{1}{6} = \frac{2}{3} - \left[\frac{45}{30} - \frac{6}{30} - \frac{2}{30} + \frac{21}{30} \right] - \frac{3}{4} + \frac{1}{6} =$$

$$= \frac{2}{3} - \frac{58}{30} - \frac{3}{4} + \frac{1}{6} = \frac{2}{3} - \frac{29}{15} - \frac{3}{4} + \frac{1}{6} = \frac{40}{60} - \frac{116}{60} - \frac{45}{60} + \frac{10}{60} = -\frac{111}{60} = -\frac{37}{20}$$
- w)
$$2 + \left(\frac{5}{2} - 3 \right) - \left[\frac{7}{10} - \left(\frac{2}{5} + \frac{1}{4} \right) \right] = 2 + \left(\frac{5}{2} - \frac{6}{2} \right) - \left[\frac{7}{10} - \left(\frac{8}{20} + \frac{5}{20} \right) \right] =$$

$$= 2 - \frac{1}{2} - \left[\frac{7}{10} - \frac{13}{20} \right] = 2 - \frac{1}{2} - \left[\frac{14}{20} - \frac{13}{20} \right] = 2 - \frac{1}{2} - \frac{1}{20} = \frac{40}{20} - \frac{10}{20} - \frac{1}{20} = \frac{29}{20}$$
- x)
$$2 - \left[\frac{4}{3} - \left(\frac{1}{2} + \frac{2}{5} \right) - \frac{1}{3} \right] - \left(\frac{4}{3} + 2 \right) - \frac{1}{5} = 2 - \left[\frac{4}{3} - \left(\frac{5}{10} + \frac{4}{10} \right) - \frac{1}{3} \right] - \left(\frac{4}{3} + \frac{6}{3} \right) - \frac{1}{5} =$$

$$= 2 - \left[\frac{4}{3} - \frac{9}{10} - \frac{1}{3} \right] - \frac{10}{3} - \frac{1}{5} = 2 - \left[\frac{40}{30} - \frac{27}{30} - \frac{10}{30} \right] - \frac{10}{3} - \frac{1}{5} =$$

$$= 2 - \frac{3}{30} - \frac{10}{3} - \frac{1}{5} = 2 - \frac{1}{10} - \frac{10}{3} - \frac{1}{5} = \frac{60}{30} - \frac{3}{30} - \frac{100}{30} - \frac{6}{30} = -\frac{49}{30}$$
- y)
$$\left(\frac{4}{3} - \frac{-1}{9} \right) + \left[2 - \left(-\frac{5}{4} + \frac{2}{3} \right) \right] - \frac{7}{2} = \left(\frac{12}{9} - \frac{-1}{9} \right) + \left[2 - \left(-\frac{15}{12} + \frac{8}{12} \right) \right] - \frac{7}{2} =$$

$$= \left(\frac{12}{9} - \frac{-1}{9} \right) + \left[2 - \left(-\frac{15}{12} + \frac{8}{12} \right) \right] - \frac{7}{2} = \frac{13}{9} + \left[2 + \frac{7}{12} \right] - \frac{7}{2} =$$

$$= \frac{13}{9} + \left[\frac{24}{12} + \frac{7}{12} \right] - \frac{7}{2} = \frac{13}{9} + \frac{31}{12} - \frac{7}{2} = \frac{52}{36} + \frac{93}{36} - \frac{126}{36} = \frac{19}{36}$$
- z)
$$\left[\left(\frac{4}{6} + \frac{1}{2} \right) : \left(\frac{4}{3} - \frac{5}{12} \right) \right] \cdot \left(\frac{1}{6} + \frac{1}{15} \right) = \left[\left(\frac{4}{6} + \frac{1}{2} \right) : \left(\frac{4}{3} - \frac{5}{12} \right) \right] \cdot \left(\frac{1}{6} + \frac{1}{15} \right) =$$

$$\begin{aligned} &= \left[\left(\frac{28}{42} + \frac{3}{42} \right) : \left(\frac{16}{12} - \frac{5}{12} \right) \right] \cdot \left(\frac{15}{90} + \frac{6}{90} \right) = \left[\frac{31}{42} : \frac{11}{12} \right] \cdot \frac{21}{90} = \frac{372}{462} \cdot \frac{7}{30} = \\ &= \frac{372}{462} \cdot \frac{7}{30} = \frac{62}{77} \cdot \frac{7}{30} = \frac{434}{2310} = \frac{31}{165} \end{aligned}$$

$$\begin{aligned} \alpha) \quad & \left[-\frac{3}{8} + \left(4 - \frac{1}{2} \right) \right] - \left[\left(2 - \frac{5}{4} \right) + \left(\frac{7}{2} - \frac{1}{8} \right) \right] = \left[-\frac{3}{8} + \left(\frac{8}{2} - \frac{1}{2} \right) \right] - \left[\left(\frac{8}{4} - \frac{5}{4} \right) + \left(\frac{28}{8} - \frac{1}{8} \right) \right] = \\ &= \left[-\frac{3}{8} + \frac{7}{2} \right] - \left[\frac{3}{4} + \frac{27}{8} \right] = \left[-\frac{3}{8} + \frac{28}{8} \right] - \left[\frac{6}{8} + \frac{27}{8} \right] = \frac{25}{8} - \frac{33}{8} = -\frac{8}{8} = -1 \end{aligned}$$

$$\begin{aligned} \beta) \quad & \left(\frac{1}{3} - \frac{4}{5} \right) \cdot \left[\left(\frac{1}{3} - 1 \right) \cdot 3 - \frac{1+2/5}{3} \right] = \left(\frac{5}{15} - \frac{12}{15} \right) \cdot \left[\left(\frac{1}{3} - \frac{3}{3} \right) \cdot 3 - \frac{7/5}{3} \right] = \\ &= -\frac{7}{15} \cdot \left[-\frac{2}{3} \cdot 3 - \frac{7}{15} \right] = -\frac{7}{15} \cdot \left[-\frac{6}{3} - \frac{7}{15} \right] = -\frac{7}{15} \cdot \left[-2 - \frac{7}{15} \right] = -\frac{7}{15} \cdot \left[-\frac{30}{15} - \frac{7}{15} \right] = \\ &= -\frac{7}{15} \cdot \left(-\frac{37}{15} \right) = \frac{259}{225} \end{aligned}$$

$$\begin{aligned} \gamma) \quad & \frac{4}{5} : \left[\frac{12}{16} \left(\frac{1}{6} + \frac{2}{3} \right) - \frac{3}{8} \right] - 3 \left[\frac{1}{6} : \left(1 - \frac{2}{5} \right) \right] = \frac{4}{5} : \left[\frac{3}{4} \left(\frac{1}{6} + \frac{4}{6} \right) - \frac{3}{8} \right] - 3 \left[\frac{1}{6} : \left(\frac{5}{5} - \frac{2}{5} \right) \right] = \\ &= \frac{4}{5} : \left[\frac{3}{4} \cdot \frac{5}{6} - \frac{3}{8} \right] - 3 \left[\frac{1}{6} : \frac{3}{5} \right] = \frac{4}{5} : \left[\frac{15}{24} - \frac{3}{8} \right] - 3 \frac{5}{18} = \frac{4}{5} : \left[\frac{5}{8} - \frac{3}{8} \right] - \frac{15}{18} = \\ &= \frac{4}{5} : \frac{2}{8} - \frac{15}{18} = \frac{32}{10} - \frac{15}{18} = \frac{16}{5} - \frac{15}{18} = \frac{288}{90} - \frac{75}{90} = \frac{213}{90} = \frac{71}{30} \end{aligned}$$

Soluciones a los ejercicios de Potencias

Nota: en algunos ejercicios se da solamente la solución final. En otros se hace el desarrollo completo hasta llegar a la solución.

2. Calcular las siguientes potencias de exponente natural (**sin usar calculadora**):

a) $(-2)^4 = 16$ b) $(-2)^3 = -8$ c) $-2^2 = -4$ d) $(-3)^2 = 9$

e) $-2^{-3} = -\frac{1}{8}$ f) $(-2)^{-2} = \frac{1}{4}$ g) $(-2)^{-3} = -\frac{1}{8}$ h) $-3^2 = -9$

i) $(-1)^{-7} = -1$ j) $\left(\frac{1}{2}\right)^{-2} = 4$ k) $\left(\frac{-1}{2}\right)^{-4} = 16$ l) $(-4)^2 = 16$

m) $\left(\frac{-1}{3}\right)^{-4} = 81$ n) $\left(\frac{4}{5}\right)^0 = 1$ ñ) $1^{-37} = 1$ o) $-5^2 = -25$

p) $(-1)^{523} = -1$ q) $1^0 = 1$ r) $235^0 = 1$ s) $(-1)^0 = 1$ t) $(0,75)^0 = 1$

3. Expresar como una única potencia de base entera o racional:

a) $\left(\frac{2}{5}\right)^2 : \left(\frac{2}{5}\right)^{-1} = \left(\frac{2}{5}\right)^3$ b) $\left(\frac{1}{2}\right)^3 : \left(\frac{1}{2}\right)^5 = \left(\frac{1}{2}\right)^{-2} = 2^2$

c) $\frac{3^5 \cdot 3^{-7}}{3^2} = \frac{3^{-2}}{3^2} = 3^{-4}$ d) $\left(\frac{2}{5}\right)^2 : \left(\frac{2}{5}\right)^3 = \left(\frac{2}{5}\right)^{-1} = \frac{5}{2}$

e) $(2^2 \cdot 2^{-3})^{-4} = (2^{-1})^{-4} = 2^4$ f) $\frac{2^4 \cdot 4^{-2}}{8^2} = \frac{2^4 \cdot 2^{-4}}{2^6} = 2^{-6}$

g) $\left(-\frac{3}{2}\right) \cdot \left(-\frac{3}{2}\right)^3 = \left(-\frac{3}{2}\right)^4 = \left(\frac{3}{2}\right)^4$ h) $\frac{(5^2)^3}{125} = \frac{5^5}{5^3} = 5^2$

i) $\left[\left(\frac{1}{2}\right)^3\right]^2 = \left(\frac{1}{2}\right)^6$ j) $\frac{2}{(-4)^3} = \frac{2}{-2^6} = -2^{-5}$

k) $\left(\frac{2}{3}\right)^2 \cdot \left(-\frac{3}{2}\right)^4 = \left(\frac{3}{2}\right)^{-2} \cdot \left(\frac{3}{2}\right)^4 = \left(\frac{3}{2}\right)^2$ l) $\left[\left(\frac{5}{3}\right)^{-3}\right]^{-2} : \left(\frac{5}{3}\right)^{-2} = \left(\frac{5}{3}\right)^6 : \left(\frac{5}{3}\right)^{-2} = \left(\frac{5}{3}\right)^8$

4. Aplica las propiedades de las potencias y simplifica todo lo que puedas:

a) $\frac{-3^2}{(-3)^2} = \frac{-9}{9} = -1$

b) $\frac{2^{-5} \cdot 4^2 \cdot 3^2}{2^3 \cdot 9^{-1}} = \frac{2^{-5} \cdot 2^4 \cdot 3^2}{2^3 \cdot 3^{-2}} = 2^{-4} \cdot 3^4 = \frac{3^4}{2^4} = \frac{81}{16}$

$$c) \left(\frac{1}{3}\right)^3 : \left(\frac{1}{4}\right)^2 = \frac{1}{3^3} : \frac{1}{4^2} = \frac{4^2}{3^3} = \frac{16}{27}$$

$$d) \frac{3 \cdot (-3)^2 \cdot 4^2}{6^3 \cdot 9^2} = \frac{3 \cdot 3^2 \cdot 2^4}{(2 \cdot 3)^3 \cdot 3^4} = \frac{3^3 \cdot 2^4}{2^3 \cdot 3^3 \cdot 3^4} = 2 \cdot 3^{-4} = \frac{2}{3^4} = \frac{2}{81}$$

$$e) \frac{2^3 \cdot (-3)^2 \cdot 4^2}{6^3 \cdot 9^2} = \frac{2^3 \cdot 3^2 \cdot 2^4}{(2 \cdot 3)^3 \cdot 3^4} = \frac{2^7 \cdot 3^2}{2^3 \cdot 3^3 \cdot 3^4} = 2^3 \cdot 3^{-5} = \frac{2^3}{3^5} = \frac{8}{243}$$

$$f) \frac{2^{-4} \cdot 4^2 \cdot 3 \cdot 9^{-1}}{2^{-5} \cdot 8 \cdot 9 \cdot 3^2} = \frac{2^{-4} \cdot 2^4 \cdot 3 \cdot 3^{-2}}{2^{-5} \cdot 2^3 \cdot 3^2 \cdot 3^2} = \frac{2^0 \cdot 3^{-1}}{2^{-2} \cdot 3^4} = 2^2 \cdot 3^{-5} = \frac{2^2}{3^5} = \frac{4}{243}$$

$$g) \left(\frac{2}{3}\right)^5 \cdot \left(\frac{2}{3}\right)^{-4} \cdot \left(\frac{2}{3}\right)^0 = \left(\frac{2}{3}\right)^1 = \frac{2}{3}$$

$$h) \left[\left(\frac{5}{3}\right)^{-3}\right]^{-2} : \left(\frac{5}{3}\right)^{-2} = \left(\frac{5}{3}\right)^6 : \left(\frac{5}{3}\right)^{-2} = \left(\frac{5}{3}\right)^8 = \frac{5^8}{3^8} = \frac{390625}{6561}$$

$$i) \left[\left(\frac{1}{2}-1\right)^3\right]^2 = \left[\left(-\frac{1}{2}\right)^3\right]^2 = \left(-\frac{1}{2}\right)^6 = \left(\frac{1}{2}\right)^6 = \frac{1}{2^6} = \frac{1}{64}$$

$$j) \frac{(-1)^3 \cdot 2^3 \cdot 8^4}{2^{-2} \cdot 2^6} = \frac{-1 \cdot 2^3 \cdot 2^{12}}{2^{-2} \cdot 2^6} = \frac{-2^{15}}{2^4} = -2^{11} = -2048$$

$$k) (2^4 \cdot 2^{-5}) : 2^3 = 2^{-4} = \frac{1}{2^4} = \frac{1}{16}$$

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

$$= \left(-\frac{1}{2}\right)^5 = -\frac{1}{2^5} = -\frac{1}{32}$$

$$m) \frac{3^4 \cdot 3^{-5}}{3 \cdot 3^2} = \frac{3^{-1}}{3^3} = 3^{-4} = \frac{1}{3^4} = \frac{1}{81}$$

$$n) \left(\frac{25}{14}\right)^2 \cdot 20^2 \cdot 7^2 = \left(\frac{5^2}{2 \cdot 7}\right)^2 \cdot (2^2 \cdot 5)^2 \cdot 7^2 = \frac{5^4}{2^2 \cdot 7^2} \cdot 2^4 \cdot 5^2 \cdot 7^2 = \frac{5^4 \cdot 2^4 \cdot 5^2 \cdot 7^2}{2^2 \cdot 7^2} =$$

$$= 5^6 \cdot 2^2 \cdot 7^0 = 62500$$

$$o) \frac{(3^{-2} \cdot 2^4)^{-1}}{(-2^{-4} \cdot 3^2)^2} = \frac{3^2 \cdot 2^{-4}}{2^{-8} \cdot 3^4} = 3^{-2} \cdot 2^4 = \frac{2^4}{3^2} = \frac{16}{9}$$

$$p) \frac{3^{-2} \cdot (-7^2 \cdot 3^2)^3}{[(-3)^2 \cdot 7^3]^2} = \frac{3^{-6} \cdot (-7^6 \cdot 3^6)}{3^4 \cdot 7^6} = \frac{-3^0 \cdot 7^6}{3^4 \cdot 7^6} = -3^{-4} = -\frac{1}{3^4} = -\frac{1}{81}$$

$$\begin{aligned} \text{q) } \left(\frac{3}{2} - \frac{3}{4}\right)^{-2} \cdot \left(\frac{1}{3} - \frac{7}{9}\right)^{-1} &= \left(\frac{6}{4} - \frac{3}{4}\right)^{-2} \cdot \left(\frac{3}{9} - \frac{7}{9}\right)^{-1} = \left(\frac{3}{4}\right)^{-2} \cdot \left(-\frac{4}{9}\right)^{-1} = \\ &= \left(\frac{4}{3}\right)^2 \cdot \left(-\frac{9}{4}\right)^1 = \frac{16}{9} \cdot \left(-\frac{9}{4}\right) = -4 \end{aligned}$$

$$\text{r) } \frac{\left[\left(\frac{2}{5}\right)^2 \cdot \left(\frac{2}{5}\right)^{-3}\right]^{-4}}{\left[\left(\frac{2}{5}\right)^{-1} \cdot \left(\frac{2}{5}\right)\right]^{-2}} = \frac{\left(\frac{2}{5}\right)^4}{\left(\frac{2}{5}\right)^0} = \left(\frac{2}{5}\right)^4 = \frac{16}{625}$$

$$\text{s) } \frac{\left[\frac{2}{3} \cdot \left(\frac{2}{3}\right)^2\right]^3}{\left[\left(\frac{2}{3}\right)^5 \cdot \left(\frac{2}{3}\right)^3\right]^2} = \frac{\left(\frac{2}{3}\right)^9}{\left(\frac{2}{3}\right)^4} = \left(\frac{2}{3}\right)^5 = \frac{32}{243}$$

5. Simplifica:

$$\text{a) } \left(1 + \frac{1}{2}\right)^2 - \frac{3}{4} = \left(\frac{3}{2}\right)^2 - \frac{3}{4} = \frac{9}{4} - \frac{3}{4} = \frac{6}{4} = \frac{3}{2}$$

$$\text{b) } 4\left(\frac{1}{2} - \frac{1}{4}\right)^2 + 1 = 4\left(\frac{2}{4} - \frac{1}{4}\right)^2 + 1 = 4\left(\frac{1}{4}\right)^2 + 1 = 4\frac{1}{16} + 1 = \frac{4}{16} + 1 = \frac{1}{4} + 1 = \frac{5}{4}$$

$$\text{c) } \left(4 - \frac{4}{3}\right)^2 \cdot \frac{1}{5} + \left(\frac{-1}{2}\right)^2 = \left(\frac{8}{3}\right)^2 \cdot \frac{1}{5} + \frac{1}{4} = \frac{64}{9} \cdot \frac{1}{5} + \frac{1}{4} = \frac{64}{45} + \frac{1}{4} = \frac{64}{45} + \frac{1}{4} = \frac{256}{180} + \frac{45}{180} = \frac{301}{180}$$

$$\text{d) } \left(\frac{1}{2} \cdot \frac{1}{3}\right)^2 - \left(\frac{1}{2} + \frac{3}{2}\right)^3 = \left(\frac{3}{2}\right)^2 - 2^3 = \frac{9}{4} - 8 = \frac{9}{4} - \frac{32}{4} = -\frac{23}{4}$$

$$\text{e) } \left(\frac{1}{3} - \frac{1}{6}\right)^2 \cdot \left(\frac{1}{6} - \frac{1}{3}\right)^2 = \left(\frac{2}{6} - \frac{1}{6}\right)^2 \cdot \left(\frac{1}{6} - \frac{2}{6}\right)^2 = \left(\frac{1}{6}\right)^2 \cdot \left(-\frac{1}{6}\right)^2 = \left(\frac{1}{6}\right)^2 \cdot \left(\frac{1}{6}\right)^2 = 1$$

$$\text{f) } \frac{\frac{1}{5} + \left(1 - \frac{1}{3}\right)^2}{2 + \left(\frac{1}{6} - 1\right)^2} = \frac{\frac{1}{5} + \left(\frac{2}{3}\right)^2}{2 + \left(-\frac{5}{6}\right)^2} = \frac{\frac{1}{5} + \frac{4}{9}}{2 + \frac{25}{36}} = \frac{\frac{9}{45} + \frac{20}{45}}{2 + \frac{25}{36}} = \frac{\frac{29}{45}}{2 + \frac{25}{36}} = \frac{29}{45} = \frac{1044}{4365} = \frac{116}{485}$$