NOMBRES RACIONALS

NIVELL1

NIVELL2

DEFINICIÓ

$\frac{a}{b} \in Q \quad a \ i \ b \in Z \quad amb \ \ b \neq 0$

EQUIVALÈNCIA

$\frac{a}{b} = \frac{c}{d} \quad \Leftrightarrow \quad a \cdot d = c \cdot b$

OPERACIONS

$Si \quad \frac{a}{b} \in Q \ \ i \ \ \frac{c}{d} \in Q \quad a, b, c, d \in Z \ \ b \neq 0 \quad d \neq 0$

$\frac{a}{b} + \frac{c}{d} = \frac{ad + bc}{bd}$ $\qquad$ $\frac{a}{b} - \frac{c}{d} = \frac{ad - bc}{bd}$

$\frac{a}{b} \cdot \frac{c}{d} = \frac{a \cdot c}{b \cdot d}$ $\qquad$ $\frac{\frac{a}{b}}{\frac{c}{d}} = \frac{a \cdot d}{b \cdot c}$

$\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$ $\qquad$ $\left(\frac{a}{b}\right)^{-n} = \frac{b^n}{a^n}$

NIVELL 1

OPERACIONS

1.1

Opera i simplifica:

a) $\frac{5}{2}+\frac{2}{4}$	b) $-\frac{3}{4}+2$	c) $\frac{1}{3}+6$	d) $\frac{3}{2}-\frac{2}{5}$	e) $\frac{3}{2}+\frac{4}{5}$
f) $-\frac{2}{3}+\frac{6}{5}$	g) $\frac{5}{3}+\frac{2}{10}$	h) $-\frac{1}{4}+\frac{2}{3}$	i) $\frac{5}{2}+\frac{4}{5}$	j) $\frac{7}{4}-\frac{2}{3}$
k) $\frac{5}{2}-\frac{2}{4}$	l) $\frac{3}{4}+2$	m) $-\frac{1}{3}+6$	n) $\frac{3}{2}+\frac{2}{5}$	o) $\frac{3}{2}-\frac{4}{5}$
p) $\frac{2}{3}+\frac{6}{5}$	q) $\frac{5}{3}-\frac{2}{10}$	r) $\frac{1}{4}+\frac{2}{3}$	s) $\frac{5}{2}-\frac{4}{5}$	t) $\frac{7}{4}+\frac{2}{3}$
RAONAMENT t) $\frac{7}{4}+\frac{2}{3}=\frac{21+8}{12}=\frac{29}{12}$				

Sol.

a)3	b)5/4	c)19/3	d)11/10	e)23/10
f)8/15	g)28/15	h)5/12	i)33/10	j)13/12
k)2	l)11/4	m)17/3	n)19/10	o)7/10
p)28/15	q)22/15	r)11/12	s)17/10	t)29/12

1.2

Opera i simplifica:

a) $\frac{1}{3}+\frac{1}{2}-\frac{1}{5}$	b) $\frac{1}{2}-\frac{1}{3}+\frac{1}{4}$	c) $\frac{3}{4}-\frac{1}{2}+1$	d) $3-\frac{1}{2}+\frac{2}{3}$
e) $\frac{1}{6}+2-\frac{1}{3}$	f) $2-\frac{1}{3}+\frac{1}{2}$	g) $\frac{1}{4}+\frac{1}{3}+1$	h) $\frac{1}{6}+\frac{1}{3}+\frac{1}{2}$
i) $4-\frac{1}{3}-\frac{1}{2}+\frac{1}{5}$	j) $\frac{7}{12}+\frac{1}{2}-\frac{1}{3}+\frac{1}{4}$	k) $\frac{9}{4}-\frac{3}{4}+\frac{1}{2}-1$	l) $\frac{5}{6}+3-\frac{1}{2}+\frac{2}{3}$
m) $-\frac{5}{3}+\frac{1}{6}+2-\frac{1}{3}$	n) $-\frac{1}{3}+2-\frac{1}{3}+\frac{1}{2}$	o) $-\frac{7}{12}+\frac{1}{4}+\frac{1}{3}+1$	p) $\frac{1}{6}+\frac{1}{3}+\frac{1}{2}$
RAONAMENT p) $\frac{1}{6}+\frac{7}{2}-\frac{1}{3}+\frac{1}{2}=\frac{1+21-2+3}{6}=\frac{23}{6}$			

Sol: a) 19/30 b) 5/12 c) 5/4 d) 19/6 e) 11/6 f) 13/6
g) 19/12 i) 101/30 j)1 k) 1 l) 4 m) 1/6 n) 11/6 o) 1

1.3

Opera i simplifica:

$a)\frac{1}{3}+\frac{5}{4}+\frac{3}{2}$	$b)\frac{4}{3}+\frac{5}{3}-\frac{3}{2}$	$c)\frac{1}{3}+\frac{9}{5}-\frac{10}{6}$	$d)\frac{3}{6}-\frac{15}{18}+\frac{7}{3}$

RAONAMENT $d)\frac{3}{6}-\frac{15}{18}+\frac{7}{3}=\frac{3\cdot3-15+7\cdot6}{18}=\frac{9-15+42}{18}=\frac{36}{18}=2$

Sol: *a) 37/12* *b) 3/2* *c) 7/15* *d) 2*

1.4

Opera i simplifica:

$a)\frac{1}{3}+\frac{1}{2}-\frac{1}{5}$	$b)\frac{1}{2}-\frac{1}{3}+\frac{1}{4}$	$c)\frac{3}{4}-\frac{1}{2}+1$	$d)3-\frac{1}{2}+\frac{2}{3}$
$e)\frac{1}{6}+2-\frac{1}{3}$	$f)2-\frac{1}{3}+\frac{1}{2}$	$g)-\frac{1}{4}+\frac{1}{3}+1$	$h)-\frac{1}{6}+\frac{1}{3}+\frac{1}{2}$

RAONAMENT $h)-\frac{1}{6}+\frac{1}{3}+\frac{1}{2}=\frac{-1+2+3}{6}=\frac{4}{6}=\frac{2}{3}$

Sol:

a) 19/30 *b) 5/12* *c) 5/4* *d) 19/6* *e) 11/6* *f) 13/6* *g) 13/12*

1.5

Opera i simplifica:

$a)\frac{5}{2}\cdot\frac{2}{4}$	$b)\frac{3}{4}\cdot2$	$c)\frac{1}{3}\cdot6$	$d)\frac{3}{2}\cdot\frac{2}{5}$	$e)\frac{3}{2}\cdot\frac{4}{5}$
$f)\frac{2}{3}\cdot\frac{6}{5}$	$g)\frac{5}{3}\cdot\frac{2}{10}$	$h)\frac{1}{4}\cdot\frac{2}{3}$	$i)\frac{5}{2}\cdot\frac{4}{5}$	$j)\frac{7}{4}\cdot\frac{2}{3}$

RAONAMENT $j)\frac{7}{4}\cdot\frac{2}{3}=\frac{7\cdot2}{4\cdot3}=\frac{14}{12}=\frac{7}{6}$

k) $\frac{5}{2}:\frac{2}{4}$	l) $\frac{3}{4}:2$	m) $\frac{1}{3}:6$	n) $\frac{3}{2}:\frac{2}{5}$	o) $\frac{3}{2}:\frac{4}{5}$
p) $\frac{2}{3}:\frac{6}{5}$	q) $\frac{5}{3}:\frac{2}{10}$	r) $\frac{1}{4}:\frac{2}{3}$	s) $\frac{5}{2}:\frac{4}{5}$	t) $\frac{7}{4}:\frac{2}{3}$
RAONAMENT t) $\frac{7}{4}:\frac{2}{3}=\frac{7}{4}\cdot\frac{3}{2}=\frac{7\cdot3}{4\cdot2}=\frac{21}{8}$				

Sol:
a) 5/4 b) 3/2 c) 2 d) 3/5 e) 6/5 f) 4/5 g) 1/3 h) 1/6
i) 2 j)7/6 k) 5 l) 3/8 m) 1/18 n) 15/4 o) 15/8 p) 5/9
q) 25/3 r) 3/8 s) 25/ t) 21/8

1.6

Opera i simplifica:

a) $\frac{5}{2}\cdot\frac{2}{4}$	b) $\frac{3}{4}\cdot2$	c) $\frac{1}{3}\cdot6$	d) $\frac{3}{2}\cdot\frac{2}{5}$	e) $\frac{3}{2}\cdot\frac{4}{5}$
f) $\frac{2}{3}\cdot\frac{6}{5}$	g) $\frac{5}{3}\cdot\frac{2}{10}$	h) $\frac{1}{4}\cdot\frac{2}{3}$	i) $\frac{5}{2}\cdot\frac{4}{5}$	j) $\frac{7}{4}\cdot\frac{2}{3}$
RAONAMENT j) $\frac{7}{4}\cdot\frac{2}{3}=\frac{14}{12}=\frac{7}{6}$				

Sol: a)5/4 b)3/2 c)2 d)3/5 e)6/5 f)4/5 g)1/3 h)1/6 i)2

1.7

Opera i simplifica:

a) $\frac{1}{3}\cdot\frac{1}{2}\cdot\frac{1}{5}$	b) $\frac{1}{2}\cdot\frac{1}{3}:\frac{1}{4}$	c) $\frac{3}{4}:\frac{1}{2}:1$	d) $3:\frac{1}{2}\cdot\frac{2}{3}$
e) $\frac{1}{6}\cdot2\cdot\frac{1}{3}$	f) $2\cdot\frac{1}{3}:\frac{1}{2}$	g) $\frac{1}{4}:\frac{1}{3}:1$	h) $\frac{1}{6}:\frac{1}{3}\cdot\frac{1}{2}$

RAONAMENT h) $\frac{1}{6}:\frac{1}{3}\cdot\frac{1}{2}=\frac{1}{2}\cdot\frac{1}{2}=\frac{1}{4}$

Sol: a) 1/30 b) 2/3 c) 3/2 d) 4 e) 1/9 f) 4/3 g) 3/4

1.8

Opera i simplifica:

a) $2-\left(\frac{2}{3}+\frac{1}{6}\right)$	b) $\left(3-\frac{2}{3}\right)+\left(3-\frac{1}{4}\right)$	c) $\frac{2}{3}+2+\frac{1}{2}$
d) $3-\left(\frac{1}{2}+\frac{1}{3}\right)$	e) $\frac{1}{3}+\left(2+\frac{1}{2}\right)$	f) $\left(\frac{3}{2}-\frac{1}{4}\right)-\left(\frac{2}{3}+\frac{1}{2}\right)$

RAONAMENT f) $\left(\frac{3}{2}-\frac{1}{4}\right)-\left(\frac{2}{3}+\frac{1}{2}\right)=\frac{5}{4}-\frac{7}{6}=\frac{15-14}{12}=\frac{1}{12}$

Sol: a) 7/6 b) 61/12 c) 19/6 d) 13/6 e) 17/6 f) 1/12

1.9

Opera i simplifica:

a) $\frac{12}{3}+\frac{3}{2}$	b) $\left(\frac{2}{3}+2\right)\cdot\left(3-\frac{2}{3}\right)$	c) $\left(\frac{5}{3}-1\right)\cdot\left(\frac{2}{3}-\frac{1}{2}\right)$	d) $\left(\frac{5}{2}-1\right)\cdot 3$

RAONAMENT d) $\left(\frac{5}{2}-1\right)\cdot 3=\left(\frac{3}{2}\right)\cdot 3=\frac{9}{2}$

Sol: a) 11/2 b) 56/9 c) 1/9 d) 9/2

1.10

Opera i simplifica:

$a)\frac{1}{3}+\frac{1}{2}\cdot\frac{1}{5}$	$b)-\frac{1}{2}+\frac{1}{3}:\frac{1}{4}$	$c)\frac{3}{4}\cdot\frac{1}{2}+1$	$d)3-\frac{1}{2}\cdot\frac{2}{3}$
$e)(\frac{1}{6}+2):\frac{1}{3}$	$f)2\cdot(\frac{1}{3}+\frac{1}{2})$	$g)\frac{1}{4}\cdot\frac{1}{3}+1$	$h)\frac{1}{6}+\frac{1}{3}:\frac{1}{2}$
RAONAMENT $h)\frac{1}{6}+\frac{1}{3}:\frac{1}{2}=\frac{1}{6}+\frac{2}{3}=\frac{5}{6}$			

Sol: a) 13/30 b) 5/6 c) 11/8 d) 8/3 e) 13/2 f) 5/3 g) 13/12

1.11

Opera i simplifica:

$a)-\frac{1}{3}-\frac{1}{2}\cdot\frac{1}{5}-\frac{1}{2}+\frac{1}{3}:\frac{1}{4}$	$c)\frac{3}{4}\cdot\frac{1}{2}+1+3-\frac{1}{2}\cdot\frac{2}{3}$
$e)(\frac{1}{6}+2):\frac{1}{3}+2\cdot(\frac{1}{3}+\frac{1}{2})$	$g)\frac{1}{4}\cdot\frac{1}{3}+1+\frac{1}{6}+\frac{1}{3}:\frac{1}{2}$

Sol: a) 6/15 b) 97/24 c)49/6 g) 23/12

1.12

Opera i simplifica:

$a)$ $2-\left(\frac{2}{3}+\frac{1}{6}\right)$	$b)$ $\left(3-\frac{2}{3}\right)+\left(3-\frac{1}{4}\right)$	$c)$ $-\frac{2}{3}+2-\frac{1}{2}$
$d)$ $3-\left(\frac{1}{2}+\frac{1}{3}\right)$	$e)$ $-\frac{1}{3}+\left(2+\frac{1}{2}\right)$	$f)$ $\left(\frac{3}{2}-\frac{1}{4}\right)-\left(\frac{2}{3}+\frac{1}{2}\right)$
RAONAMENT $f)\left(\frac{3}{2}-\frac{1}{4}\right)-\left(\frac{2}{3}+\frac{1}{2}\right)=\frac{5}{4}-\frac{7}{6}=\frac{15-14}{12}=\frac{1}{12}$		

Sol: a) 7/6 b) 61/12 c) 5/6 d) 13/6 e) 13/6 f) 1/12

1.13

Opera i simplifica:

$a)\frac{3}{4}\cdot\frac{4}{5}$	$b)\left(\frac{3}{2}-\frac{4}{3}\right):\frac{1}{3}$	$c)\frac{\frac{1}{3}-\left(\frac{1}{2}-1\right)}{\frac{3}{2}-1}$	$d)\frac{2\left(\frac{2}{5}-\frac{1}{3}\right)}{3\left(\frac{2}{3}-\frac{1}{5}\right)}$

RAONAMENT $d)\frac{2\left(\frac{2}{5}-\frac{1}{3}\right)}{3\left(\frac{2}{3}-\frac{1}{5}\right)}=\frac{2\left(\frac{1}{15}\right)}{3\left(\frac{7}{15}\right)}=\frac{2}{21}$

Sol: a)3/5 b) 1/2 c) 5/3 d) 2/21

1.14

Opera i simplifica:

a) $\frac{1}{3}-\frac{1}{2}+\frac{1}{4}\cdot\frac{2}{3}$	*b)* $\left(\frac{5}{3}-\frac{1}{2}+\frac{1}{4}\right)-\left(\frac{2}{3}-\frac{1}{2}+\frac{1}{4}\right)$
c) $-\frac{1}{3}+\left(\frac{1}{4}+\frac{2}{3}\right)+3\cdot\frac{1}{2}$	*d)* $\left(-\frac{3}{5}+\frac{1}{2}\right)\cdot 4-\frac{1}{3}+2$
e) $-\frac{1}{2}+\left(\frac{1}{3}+\frac{2}{4}\right)+3\cdot\frac{1}{2}$	*f)* $-\frac{1}{4}+\frac{3}{2}-2\left(\frac{1}{3}-\frac{1}{2}\right)$
g) $-\frac{1}{4}+\frac{1}{3}\cdot\frac{1}{2}+\frac{3}{2}$	*h)* $-\frac{2}{4}\cdot\frac{1}{3}+\left(\frac{2}{6}+1\right)$

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

Sol:a) 0 b) 5/6 c) 25/12 d) 19/15 e) 11/6 f) 19/12 g) 17/12

1.15

Opereu i simplifiqueu:

a) $2:\left(\frac{1}{2}-\frac{1}{3}\right)+\frac{1}{4}$	*b)* $\left(\frac{3}{2}:\frac{1}{2}\right)+\left(\frac{1}{3}:\frac{1}{2}\right)$	*c)* $\frac{2}{3}+3:\left(\frac{1}{4}\cdot\frac{2}{3}\right)$
d) $\left(\frac{1}{3}-\frac{1}{2}\right):\left(-\frac{2}{3}\cdot\frac{1}{2}\right)-\frac{1}{4}$	*e)* $\left(\frac{1}{4}-\frac{1}{3}\right)\cdot\left(-\frac{1}{3}-\frac{1}{2}\right)$	*f)* $\left(\frac{2}{3}-\frac{1}{2}\right):\frac{1}{6}+\frac{1}{2}$

RAONAMENT *f)* $\left(\frac{2}{3}-\frac{1}{2}\right):\frac{1}{6}+\frac{1}{2}=\frac{1}{6}:\frac{1}{6}+\frac{1}{2}=1+\frac{1}{2}=\frac{3}{2}$

Sol: a) 49/4 b) 11/3 c) 56/3 d) 1/4 e) 5/72 f) 3/2

1.16

Completa la següent taula calculant els valors exactes de la variable y.

x	*-3/4*	*4/3*	*1/2*	*-2/3*	*9*	*3/5*	*1/9*
$y=\frac{3x-2}{5}$							

Sol.

$y=\frac{3x-2}{5}$ *-1/20 2/5 -1/10 -4/5 5 -1/25 -1/3*

NIVELL 2

2.1

Trobeu la fracció generatriu dels nombres següents:

a) $2'\overline{3}$	*b)* $3'\overline{12}$	*c)* 0'05	*d)* $31'\overline{23}$	*e)* $112'\overline{31}$
f) $11'3\overline{2}$	*g)* 1'2	*h)* $21'3\overline{2}$	*i)* 2'13	*j)* $4'03\overline{1}$
k) 0'34	*l)* $1'\overline{34}$	*m)* $2'3\overline{5}$	*n)* 4'23	*o)* $0'03\overline{47}$

RAONAMENT *o)* $0'03\widehat{47} = 0'034747... = \frac{00347-003}{9900} = \frac{344}{9900}$				

Sol:

a) 7/3	*b) 103/33*	*c) 1/20*	*d) 3092/99*	*e) 11119/99*
f) 1019/90	*g) 6/5*	*h) 2111/990*	*i) 213/100*	*j) 3991/990*
k) 34/100	*l) 133/99*	*m) 212/90*	*n) 423/100*	*o) 344/9900*

2.2

Opereu en forma de fracció:

a) $0'\widehat{2}+0'\widehat{3}-1'\widehat{1}$	*b)* $1'\widehat{3}-0'\widehat{4}+0'\widehat{1}$
c) $0'\widehat{2}-0'1\widehat{2}+2'\widehat{1}$	*d)* $1'2-1'\widehat{2}+0'\widehat{3}$
e) $0'\widehat{9}-0'\widehat{3}$	*f)* $1'\widehat{5}-0'5+0'\widehat{6}$
RAONAMENT *f)* $1'\widehat{5}-0'5+0'\widehat{6}=\frac{14}{9}-\frac{1}{2}+\frac{2}{3}=\frac{31}{18}$	

Sol: a) -5/9 b) 17/9 c) 14/45 d) 14/45 e) 2/3 f) 31/18

2.3

Opera i simplifica:

a) $\frac{1}{3}+2\left(\frac{1}{4}-\frac{1}{3}\right)+\frac{2}{4}:\frac{1}{3}$	*b)* $\frac{2}{4}-\frac{1}{2}+2\left(\frac{3}{5}-\frac{6}{10}\right)+\frac{2}{5}$
c) $\frac{3}{2}-\frac{1}{4}\left(\frac{2}{3}-\frac{1}{4}\right)$	*d)* $\left(\frac{1}{3}-\frac{1}{5}\right)\cdot\frac{1}{2}+\frac{1}{6}:\frac{1}{3}$

$e) 3 \cdot \left(\frac{2}{4} - \frac{1}{3}\right) - \frac{1}{3}\left(\frac{2}{3} - \frac{1}{6}\right)$	$f) 2\left(\frac{3}{2} - \frac{1}{4}\right) + \frac{1}{2}\left(\frac{3}{5} - \frac{1}{3}\right)$
$g)\left(\frac{3}{2} + \frac{1}{4}\right) : \left(\frac{3}{3} - \frac{1}{4}\right)$	$h)\left(\frac{2}{3} + \frac{1}{2} - \frac{1}{4} + \frac{3}{6}\right) : \left(\frac{1}{2} - \frac{3}{4}\right)^{-1}$

RAONAMENT

h)

$$\left(\frac{2}{3} + \frac{1}{2} - \frac{1}{4} + \frac{3}{6}\right) : \left(\frac{1}{2} - \frac{3}{4}\right)^{-1} = \frac{8+6-3+6}{12} : \frac{4}{-1} = -\frac{17}{12}\cdot\frac{1}{4} = -\frac{17}{48}$$

Sol:a)5/3 b)2/5 c)67/48 d)17/30 e)1/3 f)79/30 g)7/3 h)-17/48

2.4

Opereu i simplifiqueu:

$a) \dfrac{\frac{3}{2} + \frac{4}{3} - \frac{2}{4} + \frac{5}{3}}{\frac{6}{3} + \frac{3}{2} + \frac{5}{6} - \frac{9}{4}}$	$b) \dfrac{\left(\frac{3}{2} + \frac{4}{5}\right)\cdot\left(\frac{7}{3} - \frac{5}{2}\right)}{\frac{2}{3} + \frac{-5}{4} - \left(\frac{4}{2} - \frac{3}{4}\right)}$

RAONAMENT

$$b) \frac{\left(\frac{3}{2} + \frac{4}{5}\right)\cdot\left(\frac{7}{3} - \frac{5}{2}\right)}{\frac{2}{3} + \frac{-5}{4} - \left(\frac{4}{2} - \frac{3}{4}\right)} = \frac{\frac{23}{10}\cdot\frac{-1}{6}}{\frac{2}{3} - \frac{5}{4} - \frac{5}{4}} = \frac{\frac{-23}{60}}{\frac{8-15-15}{12}} = \frac{-23\cdot 12}{-60\cdot 22} = \frac{23}{110}$$

Sol: a) 48/25 b) 23/110

2.5

Opereu i simplifiqueu:

a) $\dfrac{\frac{1}{3}-\frac{2}{3}}{\frac{1}{2}\cdot\frac{1}{4}} - \dfrac{\frac{7}{8}+\frac{3}{8}}{\frac{3}{4}+\frac{1}{4}}$ $\qquad$ $\dfrac{3-\frac{1}{2}}{\frac{1}{4}-\frac{1}{8}} + \dfrac{\frac{2}{3}+2}{\frac{2}{3}+\frac{1}{3}}$

b) $\dfrac{\frac{3-5}{4+2}-\frac{7+4}{3+1}-\frac{5-2}{7-1}}{\frac{6+2}{5-4}-\frac{7-3}{6-2}+\frac{2+1}{3+3}}$

RAONAMENT

b) $\dfrac{\frac{3-5}{4+2}-\frac{7+4}{3+1}-\frac{5-2}{7-1}}{\frac{6+2}{5-4}-\frac{7-3}{6-2}+\frac{2+1}{3+3}} = \dfrac{\frac{-1}{3}-\frac{11}{4}-\frac{1}{2}}{\frac{8}{1}-\frac{1}{1}+\frac{1}{2}} = \dfrac{\frac{-43}{12}}{\frac{15}{2}} = -\dfrac{43}{90}$

Sol: a) -47/272 b) -43/90

2.6

Opereu i simplifiqueu:

a) $\dfrac{\frac{2}{3}-\frac{1}{3}}{\frac{1}{2}\cdot\frac{1}{4}} - \dfrac{\frac{7}{8}+\frac{3}{8}}{\frac{3}{4}+\frac{1}{4}}$ $\qquad$ $\dfrac{3-\frac{1}{2}}{\frac{1}{4}-\frac{1}{8}} + \dfrac{\frac{2}{3}+2}{\frac{2}{3}+\frac{1}{3}}$

b) $\dfrac{\left(\frac{3}{5}-\frac{1}{4}+\frac{1}{10}\right)\cdot\frac{3}{2}-\frac{1}{5}}{\left(\frac{2}{6}+\frac{1}{3}-\frac{6}{4}\right):\frac{2}{3}+\frac{1}{6}}$

c) $\dfrac{\left(\frac{4}{5}+\frac{1}{6}-\frac{2}{10}\right)+\frac{1}{6}-\frac{1}{4}}{\frac{3}{2}\cdot\frac{2}{4}+\frac{1}{6}-\frac{1}{4}:\frac{2}{3}}$ $\qquad$ d) $\dfrac{\frac{2}{6}+\frac{3}{2}+\frac{2}{4}:\left(\frac{1}{6}+\frac{1}{3}-\frac{3}{2}\right)}{\frac{1}{4}+\frac{1}{6}-\frac{2}{4}\cdot\frac{2}{6}+\left(\frac{1}{3}-\frac{1}{2}-\frac{1}{6}\right)}$

RAONAMENT

$$\frac{\left(\frac{3}{5}-\frac{1}{4}+\frac{1}{10}\right)\cdot\frac{3}{2}-\frac{1}{5}}{\left(\frac{2}{6}+\frac{1}{3}-\frac{6}{4}\right):\frac{2}{3}+\frac{1}{6}} = \frac{\frac{9}{20}\cdot\frac{3}{2}-\frac{1}{5}}{\frac{-10}{12}:\frac{2}{3}+\frac{1}{6}} = \frac{\frac{27}{40}-\frac{1}{5}}{\frac{1}{6}-\frac{15}{12}} = \frac{\frac{19}{40}}{\frac{-13}{12}} = -\frac{19\cdot 3}{-13\cdot 10} = -\frac{57}{130}$$

Sol: a) 1/16 b) -57/130 c) 82/65 d) 31/3

2.7

Opera i simplifica:

a) $\left(\frac{3}{2}-\frac{1}{3}\right)\cdot\frac{1}{2}+\frac{3}{4}-\frac{1}{3}$	b) $\left(\frac{2}{6}+\frac{1}{3}\right)-\frac{2}{4}+\frac{1}{3}:\frac{2}{4}$
c) $\left(\frac{3}{6}+\frac{1}{4}\right)^{2}-\frac{1}{3}:\frac{2}{4}$	d) $\left(\frac{3}{5}-\frac{1}{5}\right)^{-1}\cdot\frac{5}{2}+\frac{3}{4}-\frac{1}{3}$
e) $\left(\frac{2}{3}+\frac{1}{6}-1\right)^{2}-\left(\frac{1}{3}+2\right)^{2}$	f) $\left(\frac{2}{4}-\frac{1}{3}\right)\cdot\frac{6}{5}+\frac{1}{5}-\frac{1}{2}$
g) $\left(\frac{1}{6}-\frac{1}{3}\right)^{2}\cdot 2+\left(\frac{1}{4}-\frac{1}{2}\right)$	h) $\left(\frac{3}{6}+\frac{1}{2}\right)^{-1}\cdot\frac{3}{2}+\frac{1}{4}:\frac{1}{2}$
RAONAMENT h) $\left(\frac{3}{6}+\frac{1}{2}\right)^{-1}\cdot\frac{3}{2}+\frac{1}{4}:\frac{1}{2}=1.\frac{3}{2}+\frac{1}{2}=2$	

Sol:a)1 b)5/ c)-5/48 d)20/3 e)-65/12 f)-1/10 g)-7/36 h)2

2.8

Opera i simplifica:

a) $\left(\frac{3}{6}+1\right)^{-1}\cdot\frac{3}{2}-\left(\frac{1}{4}+\frac{9}{12}\right)$	b) $\left(\frac{3}{6}+1\right)^{-1}\cdot\frac{3}{2}-\left(\frac{1}{4}+\frac{9}{12}\right)$
c) $\left(\frac{3}{2}-\frac{1}{3}\right)\frac{2}{4}-\frac{1}{2}$	d) $\left(\frac{1}{3}\cdot\frac{1}{2}\right)-\frac{1}{6}+\frac{3}{2}$
e) $\left(\frac{3}{2}-\frac{1}{4}\right):\left(\frac{1}{3}-\frac{2}{4}\right)$	f) $\left(\frac{3}{2}+\frac{1}{6}\right)-\frac{1}{3}:\frac{1}{4}$
g) $\left(\frac{2}{3}-\frac{1}{2}\right)+\frac{1}{6}:\frac{3}{2}$	h) $\left(\frac{2}{4}-\frac{1}{6}\right):\frac{3}{2}-\frac{2}{4}$
RAONAMENT	

$b)\left(\frac{3}{6}+1\right)^{-1}\cdot\frac{3}{2}-\left(\frac{1}{4}+\frac{9}{12}\right)=\frac{2}{3}\cdot\frac{3}{2}-1=1-1=0$

Sol: a)0 b)0 c)1/12 d)3/2 e)-15/2 f)1/3 g)5/18 h)-5/18

2.9

Opera i simplifica:

$a)\left(\frac{1}{6}-\frac{1}{3}\right)+\frac{1}{2}-\frac{1}{3}:\frac{1}{4}$	$b)\left(\frac{3}{2}:\frac{1}{3}\right)+\frac{1}{4}-\frac{1}{6}:\frac{3}{2}$
$c)\left(\frac{1}{3}-\frac{1}{4}\right)-\frac{1}{6}+\frac{1}{3}:\frac{2}{3}$	$d)\left(\frac{3}{2}-\frac{1}{3}\right)^{-1}\cdot\frac{2}{6}+\left(\frac{1}{4}-\frac{1}{3}\right)\cdot 2$
$e)\left(\frac{3}{4}-\frac{1}{3}\right)^{-1}\cdot 2+\left(\frac{1}{6}-\frac{1}{3}\right)^{-1}$	$f)\left(\frac{3}{3}-\frac{1}{4}\right)^{-1}\cdot\frac{3}{4}+\frac{2}{3}-\frac{1}{4}$
$g)\frac{3-3+\left(\frac{1}{2}-\frac{2}{4}\right)-(3+2)}{-5+2+(3-1)\cdot(2-3)-2}$	$h)\frac{3+(-3)-\frac{1}{2}+\frac{2}{4}+(-3+2)}{-4+3-\frac{1}{2}+\frac{1}{4}+\frac{4}{16}}$

RAONAMENT

$$h)\frac{3+(-3)-\frac{1}{2}+\frac{2}{4}+(-3+2)}{-4+3-\frac{1}{2}+\frac{1}{4}+\frac{4}{16}}=\frac{3-3-\frac{1}{2}+\frac{1}{2}-3+2}{-4+3-\frac{1}{2}+\frac{1}{4}+\frac{1}{4}}=\frac{-1}{-1}=1$$

Sol:a)-1 b)167/36 c)5/12 d)5/42 e)-6/5 f)17/12 g)5/7

2.10

Opera i simplifica:

$a)\left[\frac{\left(\frac{3}{6}-\frac{1}{3}\right)\left(\frac{4}{6}+\frac{1}{3}\right)^{-1}}{\left(\frac{3}{4}+\frac{1}{3}-\frac{1}{6}+\frac{1}{3}\right)^{-1}}\right]^{-2}$	$b)\frac{\left(\frac{3}{4}+\frac{1}{3}\right)^{-1}-\left(\frac{3}{6}+\frac{7}{12}\right)^{-1}}{\left(\frac{3}{5}-\frac{1}{6}\right)^{-24}\left(\frac{1}{3}-\frac{1}{4}\right)^{37}}$

c) $\dfrac{\left(\frac{3}{3}\right)^{-8}+\left(\frac{1}{4}-\frac{1}{6}\right)^{-1}}{\left(\frac{3}{4}-\frac{2}{3}\right)\left(\frac{3}{4}-\frac{2}{3}\right)}$	d) $\dfrac{\left[\left(\frac{4}{9}+\frac{1}{6}\right)^{-1}\cdot\left(\frac{3}{4}\right)-1\right]^{-1}}{\left[\left(\frac{3}{2}-\frac{1}{5}\right)^{-1}\left(\frac{4}{3}+\frac{1}{6}\right)^{-1}\right]^{-1}}$
e) $\dfrac{\left(\frac{2}{4}+\frac{1}{3}\right)^{-1}\left(\frac{1}{2}+\frac{4}{12}\right)}{\left(\frac{3}{6}+\frac{1}{3}\right)^{-1}\left(\frac{2}{4}+\frac{3}{9}\right)}$	f) $\dfrac{\left(\frac{3}{4}-\frac{1}{6}\right)-\frac{2}{6}-\left(\frac{2}{3}-\frac{1}{4}\right)}{\left(\frac{2}{6}+\frac{1}{6}\right)\cdot\left(\frac{2}{3}-\frac{1}{6}\right)\cdot 4}$
g) $\dfrac{\left(\frac{3}{3}+\frac{1}{6}\right)-\left(\frac{1}{4}+\frac{1}{3}\right)^{-1}\cdot\frac{1}{2}}{\left(\frac{3}{4}-\frac{1}{6}\right)^{-1}-\left(\frac{1}{3}+\frac{1}{4}\right)-\frac{1}{6}}$	h) $\dfrac{\left(\frac{3}{6}\cdot\frac{2}{4}\right)-\frac{1}{3}+\frac{1}{6}}{\left(\frac{3}{4}-\frac{1}{4}\right)^{-1}+\frac{1}{4}-\frac{1}{3}}$
RAONAMENT h) $\dfrac{\left(\frac{3}{6}\cdot\frac{2}{4}\right)-\frac{1}{3}+\frac{1}{6}}{\left(\frac{3}{4}-\frac{1}{4}\right)^{-1}+\frac{1}{4}-\frac{1}{3}}=\dfrac{\frac{1}{4}-\frac{1}{3}+\frac{1}{6}}{\frac{2}{1}+\frac{1}{4}-\frac{1}{3}}=\dfrac{\frac{1}{12}}{\frac{23}{12}}=\dfrac{1}{23}$	

Sol: a) $(24/5)^2$ b)0 c)1872 d)88/39 e)1 f)-1/6 g)26/81

2.11

Opera i simplifica:

a) $\dfrac{\left(\frac{3}{6}+\frac{1}{3}\right)-\left(\frac{1}{4}-\frac{1}{6}\right)+\left(\frac{1}{3}-\frac{1}{2}\right)}{\left(\frac{2}{6}+\frac{2}{6}\right)\cdot 2-\left(\frac{1}{3}-\frac{1}{4}\right)\cdot 2}$	b) $\dfrac{\left(\frac{3}{4}+\frac{1}{6}-\frac{1}{3}\right)\cdot 2-\left(\frac{1}{4}+\frac{1}{6}\right)\cdot\frac{3}{2}}{\left(-\frac{1}{4}+\frac{1}{3}\right)\cdot\frac{-3}{4}+\frac{1}{3}\cdot\frac{1}{4}}$
c) $\dfrac{\left(\frac{3}{4}-\frac{1}{3}+\frac{1}{6}\right)^{-1}\cdot\frac{1}{12}-\frac{1}{4}+\left(\frac{1}{6}-\frac{1}{3}\right)}{\left(\frac{3}{6}+\frac{1}{6}\right)^{-1}\cdot\frac{1}{3}-\frac{1}{4}+\frac{1}{6}-\left(\frac{3}{2}-\frac{1}{3}\right)}$	d) $\dfrac{\left(\frac{3}{2}\cdot\frac{1}{4}+\frac{2}{3}-\frac{1}{4}\right)\cdot 6}{\left(\frac{3}{2}-\frac{1}{2}\right)^{-1}\cdot\frac{3}{2}+\frac{1}{4}-\frac{1}{6}}$

e) $\left(\dfrac{\left(\frac{3}{2}+\frac{1}{3}-\frac{1}{6}\right)\cdot 2+\frac{1}{4}-\frac{1}{2}}{\frac{3}{2}\left(\frac{2}{3}+\frac{2}{6}\right)-\frac{3}{2}+\frac{1}{4}}\right)\cdot\frac{3}{5}-\frac{1}{2}$	f) $\dfrac{\left(\frac{3}{4}+\frac{1}{6}\right)^{-1}\cdot\frac{1}{4}-\frac{1}{3}-\frac{1}{6}}{\left(\frac{3}{12}+\frac{1}{3}-\frac{2}{6}+\frac{1}{4}\right)\cdot 2\cdot\left(\frac{1}{2}\right)^{-2}}$
g) $\dfrac{\left(\frac{1}{6}+\frac{1}{3}\right)^{-1}\cdot\frac{3}{2}+\frac{1}{4}-\frac{1}{3}}{\left(\frac{1}{12}\right)^{-1}:\left(\frac{1}{4}\right)^{-2}-\frac{1}{3}+\frac{1}{6}+\left(\frac{1}{2}\right)^{2}}$	h) $\dfrac{\left(\frac{1}{5}+\frac{1}{3}\right)\cdot\frac{5}{6}+\frac{1}{3}-\left(\frac{1}{4}+\frac{1}{3}\right)}{\left(\frac{3}{2}+\frac{1}{4}\right)\cdot\frac{2}{3}+\frac{1}{6}-\frac{1}{3}\cdot\frac{2}{4}}$

RAONAMENT

h) $\dfrac{\left(\frac{1}{5}+\frac{1}{3}\right)\cdot\frac{5}{6}+\frac{1}{3}-\left(\frac{1}{4}+\frac{1}{3}\right)}{\left(\frac{3}{2}+\frac{1}{4}\right)\cdot\frac{2}{3}+\frac{1}{6}-\frac{1}{3}\cdot\frac{2}{4}}=\dfrac{\frac{4}{9}+\frac{1}{3}-\frac{7}{12}}{\frac{7}{6}+\frac{1}{6}-\frac{1}{6}}=\dfrac{\frac{16+12-21}{36}}{\frac{7}{6}}=\dfrac{\frac{7}{36}}{\frac{7}{6}}=\dfrac{1}{6}$

Sol: a)7/10 b)26 c)23/63 d)3 e)69/10 f)-5/88 g)7/2

2.12

Opera i simplifica:

a) $\dfrac{\left(\frac{3}{5}-\frac{1}{3}\right)+\frac{1}{4}\cdot\frac{1}{3}}{\left(\frac{2}{6}+\frac{1}{3}-\frac{1}{4}\right)\cdot 2}$	b) $\left[\dfrac{\left(\frac{3}{6}\cdot\frac{1}{3}\right)^{-1}}{\left(\frac{2}{4}+\frac{1}{6}\right)^{-1}}-\left(\dfrac{\frac{3}{2}-\frac{1}{4}+\frac{1}{3}}{\frac{2}{6}-\frac{1}{6}+\frac{1}{3}}\right)^{-1}\right]^{-1}$
c) $\dfrac{\left(\frac{3}{5}-\frac{1}{3}+\frac{1}{6}\right)\cdot\frac{6}{3}}{\left(\frac{2}{4}+\frac{1}{6}\cdot\frac{3}{2}-\frac{1}{4}\right)^{-1}}$	d) $\dfrac{\left(\frac{1}{4}-\frac{1}{3}\right)\cdot 3+\left(\frac{1}{4}-\frac{1}{2}\right)^{-1}}{\left(\frac{3}{6}+\frac{1}{3}\right)^{-1}\cdot\frac{2}{4}+\left(\frac{1}{2}\cdot\frac{2}{3}\right)^{-1}}$
e) $\dfrac{\left(\frac{3}{5}+\frac{1}{3}\right)\cdot\frac{5}{2}-\left(\frac{1}{6}+\frac{1}{3}\right)}{\left(\frac{1}{4}-\frac{1}{2}\right)\cdot\frac{1}{3}-\left(\frac{1}{6}+\frac{1}{4}\right)}$	f) $\dfrac{\left(\frac{3}{2}-\frac{1}{3}+\frac{1}{6}\right)\cdot\frac{3}{2}-\frac{1}{4}}{\left(\frac{2}{6}-\frac{1}{3}\right)+\frac{1}{4}-\frac{5}{4}}$

g) $\dfrac{\left(\frac{1}{4}+\frac{1}{6}\right)\cdot\frac{-2}{3}+\left(\frac{1}{3}\right)^{-1}}{\left(\frac{2}{4}-\frac{3}{6}\right)\cdot\left(\frac{5}{3}+\frac{1}{4}\right)-\frac{1}{2}}$	h) $\dfrac{\left[\left(\frac{2}{3}+\frac{1}{6}\right)\cdot\frac{6}{4}-\left(\frac{1}{3}+\frac{1}{6}\right)\right]^{-1}}{\left(\frac{2}{4}+\frac{1}{6}-\frac{1}{3}\right)\cdot 2}$
RAONAMENT h) $\dfrac{\left[\left(\frac{2}{3}+\frac{1}{6}\right)\cdot\frac{6}{4}-\left(\frac{1}{3}+\frac{1}{6}\right)\right]^{-1}}{\left(\frac{2}{4}+\frac{1}{6}-\frac{1}{3}\right)\cdot 2}=\dfrac{\left(\frac{5}{4}-\frac{1}{2}\right)^{-1}}{1-\frac{1}{3}}=\dfrac{\frac{4}{3}}{\frac{2}{3}}=2$	

Sol: a)21/50 b)19/24 c)13/30 d)-85/72 e)-11/3 f)-7/4 g) -49/9

2.13

Opera i simplifica:

a) $\dfrac{\left(\frac{3}{4}-\frac{1}{5}\right)-\frac{4}{3}:\left(\frac{5}{2}+\frac{3}{4}\right)}{\left(\frac{1}{5}+\frac{1}{3}-\frac{1}{2}\right)-\left(\frac{1/4}{1/6}\right)^{-1}}$	b) $\dfrac{\frac{2}{4}+\frac{1}{3}}{\frac{3}{5}}-\dfrac{\frac{1}{2}+\frac{1}{3}}{\frac{6}{4}}$
c) $\dfrac{\frac{1}{6}+\frac{1}{3}\cdot\frac{2}{4}-\frac{1}{3}:\frac{1}{4}}{\left(\frac{3}{2}-\frac{1}{6}+\frac{1}{4}\right)\cdot\frac{4}{3}:\frac{1}{9}}$	d) $\dfrac{\frac{1}{5}+\frac{3}{2}\cdot\frac{1}{2}-\frac{2}{6}+\frac{3}{2}}{\frac{3}{5}+\frac{1}{3}-\frac{3}{4}:\frac{6}{2}+\frac{1}{4}}-\dfrac{\frac{3}{2}-\frac{1}{4}}{\frac{3}{2}+1}$
e) $\dfrac{\frac{3}{4}+\frac{1}{3}-\frac{5}{4}}{\frac{3}{2}+\frac{1}{3}}\cdot\dfrac{\left(\frac{1}{4}+\frac{1}{6}\right)\cdot 2-\frac{1}{2}}{\frac{3}{4}-\frac{2}{3}}$	f) $\dfrac{\left(\frac{2}{6}+\frac{1}{3}\right):\left(\frac{2}{4}-\frac{1}{3}\right)}{\left(\frac{6}{4}+\frac{3}{2}\right)-\left(\frac{2}{3}-\frac{1}{4}\right)}\cdot\dfrac{\frac{3}{2}+1}{\frac{3}{2}-1}$
g) $\dfrac{\frac{4}{3}-\frac{1}{6}-\frac{2}{2}}{\frac{3}{2}:\frac{1}{2}\cdot\left(\frac{3}{2}+1\right)}\cdot\dfrac{\frac{3}{2}\cdot\frac{4}{3}+1}{\frac{3}{2}-\frac{1}{3}}$	h) $\dfrac{\left[\left(\frac{3}{4}\right)^{-1}+\left(\frac{1}{3}\right)^{-1}\right]^{-1}}{\left(\frac{3}{2}\right)\left(3^{-1}+\frac{1}{4}-\frac{1}{6}\right)^{-1}}$

RAONAMENT $h)\dfrac{\left[\left(\frac{3}{4}\right)^{-1}+\left(\frac{1}{3}\right)^{-1}\right]^{-1}}{\left(\frac{3}{2}\right)\left(3^{-1}+\frac{1}{4}-\frac{1}{6}\right)^{-1}}=\dfrac{\left[\frac{4}{3}+3\right]^{-1}}{\frac{3}{2}\left[\frac{5}{12}\right]^{-1}}=\dfrac{\frac{3}{13}}{\frac{18}{5}}=\dfrac{5}{78}$

Sol: a)132/13 b)5/6 c)-1/19 d)99/56 e)-4/11 f)240/31 g)2/35

2.14

Opereu i simplifiqueu:

a) $\dfrac{a^3\ b^2\ a^{-4}\ b^5}{a^{-4}\ b^{-1}\ a^0\ b^3}\cdot\dfrac{a^{-3}\ b^3\ a^2}{a^7\ a^{-3}\ b^4}$

b) $\dfrac{6^2\ 12^2\ 27^{-2}\ 16^{-3}}{4^{-1}\ 3^5\ 12^{-1}\ 6^3}\cdot\dfrac{3^5\ 12^{-4}\ 8^3}{4^3\ 24^{-1}\ 8^2}$

c) $\dfrac{\left(\frac{5}{3}\right)^{-2}\ 25^2\ 3^{-2}\ 5^{-5}}{\left(\frac{3}{5}\right)^{2}\ 75^3\ 5^{-3}\ \frac{3^3}{5^2}}$

d) $\dfrac{\left(\frac{3}{2}\right)^{-2}\left(\frac{2}{3}\right)^{2}\left(\frac{3}{4}\right)^{-1}}{\left(\frac{1}{3}\right)^{4}\left(\frac{-1}{2}\right)^{-4}\left(\frac{1}{9}\right)^{3}}$

e) $\dfrac{(2/3)^2\ (1/3)^{-3}\ 2^4\ 12^3\ 6^3}{3^2\ (2/4)^3\ (3^2\ 8^2\ 3^3)^{-1}}$ $\qquad 3^2\ 3/2^3\quad 2^{-1}/3^2\quad 3^0\ 3^2$

f) $\dfrac{\frac{3^{-2}\ 3^2\ 2^4}{2^3\ 2^{-2}\ 3^4}\qquad\frac{2^4\ 2\ 2^{-1}}{2^4\ 3^2\ 2}}{\frac{2^2\ 3}{2^4\ 3^{-2}}\qquad\frac{2^4\ 3^2}{2^3\ 2^4}}$

g) $\dfrac{2^4\ 3^2\ 2^{-1}}{2^3\ 3^2\ 2^6\ 2}:\dfrac{2^4\ 3^{-2}\ 4^2}{3^{-3}\ 2^{-2}\ 2}$

h) $\dfrac{\frac{3^2\ 2^{-1}}{3^6\ 2^{-2}\ 3}\qquad\frac{2^4\ 3^{-2}\ 4}{2^{-1}\ 2^4\ 6^{-2}}}{\frac{2^2\ 3^2\ 18}{3^{-2}\ 2^4\ 16}\qquad\frac{2^4\ 2^{-2}\ 36}{2^4\ 18}}$

RAONAMENT $h)\dfrac{\frac{3^2\ 2^{-1}}{3^6\ 2^{-2}\ 3}\qquad\frac{2^4\ 3^{-2}\ 4}{2^{-1}\ 2^4\ 6^{-2}}}{\frac{2^2\ 3^2\ 18}{3^{-2}\ 2^4\ 16}\qquad\frac{2^4\ 2^{-2}\ 36}{2^4\ 18}}=\dfrac{\frac{2}{3^5}}{\frac{3^6}{2^5}}\qquad\dfrac{\frac{2^5}{3^0}}{\frac{1}{2}}=\dfrac{2^{12}}{3^{11}}$

Sol: a) b^4/a^2 *b)* $1/(2^{13}\ 3^7)$ *c)* $1/(3^8\ 5^2)$ *d)* $3^5\ 2^2$ *e)* $2^{28}\ 3^7$ *f)* $2^7/3^{11}$ *g)* $1/(3\ 2^{16})$ *h)* $2^{12}/3^{11}$