EJERCICIOS DE POTENCIAS
2º ESO

1. CALCULA:

a) $(-3)^2 = 9$
b) $(-3)^3 = -27$
c) $(-3)^4 = 81$
d) $(-5)^3 = -125$
e) $(-5)^4 = 625$
f) $(-12)^2 = 144$
g) $(-7)^2 = 49$
h) $(-7)^3 = -343$
i) $(-2)^5 = -32$
j) $(-2)^6 = 64$
k) $2^5 = 32$
l) $(-7)^1 = -7$
m) $(-2)^7 = -128$
n) $5^1 = 5$
o) $(-3)^1 = -3$
p) $9^1 = 9$
q) $5^0 = 1$
r) $(-3)^0 = 1$
s) $(-9)^0 = 1$
t) $(-13)^0 = 1$
u) $(-2)^4 = 16$
v) $(-3)^2 - (-1)^3 = 9 - (-1) = 10$
w) $(1-2)^3 - (-5+1)^2 = -1 - (-4)^2 = -1 - 16 = -17$
x) $[(-2)^3]^2 - [(-3)^3] = 16 - (-27) = 43$
y) $(-2)^2 + (-2)^1 - (-2)^0 = 4 + (-2) - 1 = 1$
z) $(-5)^2 + (-5)^3 - (-5)^0 = 25 - 125 - 1 = -101$

2. CALCULA:

a) $3^{-1} = \frac{1}{3}$
b) $2^{-3} = \frac{1}{8}$
c) $(-3)^{-1} = -\frac{1}{3}$
d) $(-5)^{-2} = \frac{1}{25}$
e) $(-5)^{-3} = -\frac{1}{125}$
f) $(-12)^{-2} = \frac{1}{144}$
g) $(-7)^{-3} = -\frac{1}{343}$
h) $(-7)^{-1} = -\frac{1}{7}$
i) $2^{-5} = \frac{1}{32}$
j) $(-2)^{-5} = -\frac{1}{32}$
k) $3^{-4} = \frac{1}{3^4} = \frac{1}{81}$
l) $(-11)^{-1} = -\frac{1}{11}$
m) $13^{-1} = \frac{1}{13}$
n) $5^1 = 5$
o) $5^{-2} = \frac{1}{25}$
p) $11^{-2} = \frac{1}{121}$
q) $(-11)^{-2} = \frac{1}{121}$
r) $(-13)^{-1} = \frac{-1}{13}$
s) $(-13)^{-2} = \frac{1}{169}$

3. REDUCE A UNA ÚNICA POTENCIA:

a) $6^3 \cdot 6 \cdot 6^5 = 6^9$
b) $(-7)^9 : (-7)^5 = (-7)^4 = 7^4$
c) $[(-2)^4]^3 = (-2)^{12} = 2^{12}$
d) $(-2)^9 : [(-2)^4 \cdot (-2)]^2 = (-2)^9 : (-2)^5 = (-2)^4 = \frac{1}{9}$
e) $20^5 : (-4)^5 = (-5)^5 = -5^5$
f) $(-36)^4 : (-9)^4 = 4^4$
g) $12^9 : [(-3)^9 \cdot (-4)^9] = 12^9 : 12^9 = 12^0 = 1$
h) $(-5)^9 \cdot [20^4 : (-4)^4] = (-5)^9 \cdot (-5)^8 = (-5)^{17}$
i) $(6^3)^2 \cdot [(-7)^5 \cdot (-7)] = 6^6 \cdot (-7)^6 = (-42)^6$
j) $(5^7)^4 \cdot (5^4)^3 = 5^{28} \cdot 5^{12} = 5^{40}$
k) $(-5)^7 : (-5)^4 \cdot (-5) = (-5)^4 \cdot (-5) = (-5)^5$
l) $(8^5)^4 : [(-2)^{12} \cdot (-4)^{12}] = 8^{20} : 8^{12} = 8^8$
m) $(a^5)^3 : (a^7)^2 = a^{15} : a^{14} = a$
n) $2^3 \cdot 8 \cdot 2^7 \cdot 16 = 2^3 \cdot 2^3 \cdot 2^4 \cdot 2^4 = 2^{14}$
o) $(3^2)^3 \cdot 27 \cdot 9^4 = 3^6 \cdot 3^3 \cdot (3^2)^4 = 3^9 \cdot 3^8 = 3^{17}$
p) $3^{15} : 81^3 = 3^{15} : 3^{12} = 3^3$
q) $(m^3 \cdot m)^2 : (m^2)^4 = (m^4)^2 : m^8 = m^8 : m^8 = 1$
r) $(-10)^{20} : [(-2)^8 \cdot 5^8] = (-10)^{20} : ((-10)^8) = (-10)^{12}$
s) $[(-3)^5 \cdot (-2)^5] \cdot (6^4)^4 = ((-6)^5)^3 \cdot 6^8 = 16^{15} \cdot 6^8$ 16^{23}
t) $[a^3 \cdot a^4]^2 : [a^{15} : a^{13}]^2 = (a^7)^2 : (a^2)^2 = a^{14} : a^4 =$ $= a^{10}$

u) $[(-30)^{19} : 5^{19}] : [(-2)^3 \cdot 3^4] = (-6)^{19} : [(-6)^4]^3 = (-6)^3$

v) $m^{14} : (m^5 \cdot m) = m^{14} : m^6 = m^5$

w) $(x^2)^3 : (x^3)^2 = x^6 : x^6 = x^0 = 1$

x) $\dfrac{(8^3 \cdot 2^2) : 16^2}{(-10)^3 : (-5)^3} = \dfrac{(2^3)^3 \cdot 2^2 : (2^4)^2}{(+2)^3} = \dfrac{2^9 \cdot 2^2 : 2^8}{2^3} = \dfrac{2^3}{2^3} = 2^0 = 1$

y) $(b^5)^3 : (b^3 \cdot b)^5 = b^{15} : b^{12} = b^3$

z) $a^5 \cdot a^3 : [a^{13} : a^5] = a^8 : a^8 = a^0 = 1$

4. REDUCE A UNA ÚNICA POTENCIA DE EXPONENTE NATURAL:

a) $7^3 \cdot (7^4 \cdot 7^1)^5 = 7^3 \cdot (7^5)^5 = 7^3 \cdot 7^{25} = 7^{28}$

b) $(-6)^{16} : (-6)^7 = (-6)^{16}$

c) $[(-5)^4]^{-3} = (-5)^{-12}$

d) $(-12)^3 : [(-12)^4 \cdot (-12)]^{-1} = (-12)^3 : (-12)^{-5} = (-12)^8$

e) $15^5 : (-3)^5 = (-5)^5$

f) $81^4 : (-9)^4 = (-9)^4$

g) $15^9 : [(-5)^9 \cdot (-3)^9] = 15^9 : (15)^9 = 1$

h) $(-5)^6 \cdot [35^8 : (-7)^8] = (-5)^6 \cdot (-5)^8 = (-5)^{14}$

i) $(3^3)^2 \cdot [(-5)^3 : (-5)^{-1}] = 3^6 \cdot (-5)^6 = (-15)^6$

j) $(4^7)^4 \cdot (4^9)^{-3} = 4^{28} \cdot 4^{-27} = 4$

k) $(-3)^4 : (-3)^6 \cdot (-3) = (-3)^{-2} \cdot (-3) = (-3)^{-3}$

l) $(-3)^4 : [(-3)^6 \cdot (-3)] = (-3)^4 : (-3)^9 = (-3)^{-5}$

m) $(12^4)^3 : [(-3)^2 \cdot (-4)^2] = 12^9 : 12^{12} = 12^{-4}$

n) $[(-11)^5]^3 : [(-11)^2]^4 = (-11)^{15} : (-11)^8 = (-11)^{23}$

o) $(3^2)^3 \cdot 27 \cdot 9^{-4} = 3^{-6} \cdot 3^3 \cdot (3^2)^{-4} = 3^{-3} \cdot 3 \cdot 3 \cdot 3 = 3$

p) $(2^3 \cdot 2)^2 : (2^2)^5 = (2^4)^2 : 2^8 = 2^8 : 2^8 = 1$

q) $(-20)^7 \cdot [(-4)^5 \cdot 5^5]^{-1} = (-20)^7 : [(-20)^5]^{-1} = (-20)^7 : (-20)^{-5} = (-20)^{12} = 20^{12}$

r) $[(-2)^5 \cdot (-3)^5] \cdot (6^4)^{-2} = (6^5) \cdot 6^{-8} = 6^{13} \cdot 6^{-8} = 6^5$

s) $[40^9 : 20^9] : [2^4 \cdot 2^4] = 2^9 : (2^8)^3 = 2^9 : 2^{24} = 2^{-15}$

t) $(-3)^4 \cdot (-3)^7 : [12^2 : (-4)^2] = (-3)^{11} : (-3)^2 = (-3)^9$

5. Simplifica (utilizando las propiedades de las potencias) las siguientes expresiones y después calcula:

a) $\dfrac{3^5 \cdot 2^2 \cdot 4}{3^3 \cdot 9} = \dfrac{3^5 \cdot 2^2 \cdot 2^2}{3^3 \cdot 3^2} = \dfrac{3^5 \cdot 2^4}{3^5} = 2^4$

b) $\dfrac{32 \cdot 27 \cdot 3}{8 \cdot 4} = \dfrac{2^5 \cdot 3^3 \cdot 3}{2^3 \cdot 2^2} = \dfrac{2^5 \cdot 3^4}{2^5} = 3^4$

c) $\dfrac{6^3 \cdot 12^4 \cdot 36}{27^3 \cdot 8^2 \cdot 64} = \dfrac{2^3 \cdot 3^3 \cdot (2^2)^4 \cdot 3^4 \cdot 2^2 \cdot 3^2}{(3^3)^2 \cdot (2^3)^2 \cdot 2^6} = \dfrac{2^{14} \cdot 3^6}{2^{12} \cdot 3^6} = 2^4 \cdot 3^{-3} = \dfrac{2^4}{3^3}$

d) $\dfrac{8 \cdot 64 \cdot 81 \cdot 2^4 \cdot 5^2}{3^2 \cdot 2^5 \cdot 5^3 \cdot 6^4 \cdot 16} = \dfrac{2^3 \cdot 2^6 \cdot 3^4 \cdot 2^4 \cdot 5^2}{3^2 \cdot 2^5 \cdot 5^3 \cdot 2^4 \cdot 3^4 \cdot 2^4} =$

e) $\dfrac{8 \cdot 25 \cdot 7^3 \cdot 3^4}{20 \cdot 21 \cdot 14 \cdot 7} = \dfrac{2^3 \cdot 5^2 \cdot 7^3 \cdot 3^4}{5 \cdot 2^2 \cdot 7 \cdot 3 \cdot 7 \cdot 2 \cdot 7} =$

f) $\dfrac{54^4 \cdot 10^3 \cdot 5^2 \cdot 15^2}{125^3 \cdot 18^7} = \dfrac{(3^3)^4 \cdot 2^4 \cdot 2^3 \cdot 5^3 \cdot 5^2 \cdot 5^2}{5^3 \cdot (3^2)^7 \cdot 2^7} =$

g) $\dfrac{(7^3 \cdot 8)^4}{8^2 \cdot 49^4 \cdot 14^3} = \dfrac{(7^3)^4 \cdot (2^3)^4}{(2^3)^2 \cdot (7^2)^4 \cdot 7^3 \cdot 2^3} =$

h) $\dfrac{3^{-3} \cdot 4 \cdot 9^{-1}}{3^{-5} \cdot 4^{-1}} = \dfrac{3^{-3} \cdot 2^2 \cdot (3^2)^{-1}}{3^{-5} \cdot (2^2)^{-1}} = \dfrac{2^2 \cdot 3^5}{2^{-2} \cdot 3^{-5}}$

i) $\dfrac{216 \cdot 27^{-3} \cdot 64^{-1}}{12^{-4} \cdot 8^2 \cdot 36^{-1}} = 2^4$

$= \dfrac{2^3 \cdot 3^3 \cdot 3^{-9} \cdot 2^{-6}}{2^{-8} \cdot 3^{-4} \cdot 2^4 \cdot 3^{-2} \cdot 2^{-2}} = \dfrac{3^{-3}}{2^{-4} \cdot 3^{-6}} =$

$= 3^{-3} \cdot 2^4 =$

6. Reduce a una única potencia y después calcula:

a) $(a^3)^{-5} \cdot (a^2 \cdot a)^5 = a^{-15} \cdot (a^3)^5 = a^{-15} \cdot a^{15} = a^0 = 1$

b) $a^4 : [a^7 : a^5]^3 = a^4 : (a^2)^3 = a^4 : a^6 = a^0 = 1$

c) $(x^6)^3 \cdot (x^3)^{-4} : (x^2)^3 = x^{18} \cdot x^{-12} : x^6 = x^6 : x^6 = x^0 = 1$

d) $= \dfrac{2^{13} \cdot 3^4 \cdot 5^2}{2^{13} \cdot 3^6 \cdot 5^3} = 3^{-2} \cdot 5^{-1} = \dfrac{1}{3^2 \cdot 5}$

e) $= \dfrac{2^3 \cdot 5^2 \cdot 7^3 \cdot 3^4}{2^3 \cdot 3 \cdot 5 \cdot 7^3} = 5 \cdot 3^3$

d) $(b^4 \cdot b)^5 : (b^6 : b^3)^5 = (b^5)^5 : (b^3)^5 = b^{25} : b^{15} = 1$

e) $(a^3 \cdot b)^4 : (a^{10} \cdot b^2)^2 = \dfrac{(a^3)^4 \cdot b^4}{(a^5)^2 \cdot (b^2)^2} = \dfrac{a^{12} \cdot b^4}{a^{10} \cdot b^4} = 1$

f) $\dfrac{(a^3)^4 \cdot (b^3)^3 \cdot a^{-4}}{a^7 \cdot (b^4)^3 \cdot b^2} = \dfrac{a^{12} \cdot b^{12} \cdot a^{-4}}{a^7 \cdot b^{12} \cdot b^2} = \dfrac{a^8 \cdot b^{12}}{a^7 \cdot b^{14}} = a$

g) $= \dfrac{3^{12} \cdot 2^3 \cdot 5^3 \cdot 3^2}{5^3 \cdot 3^{14} \cdot 2^3} = \dfrac{2^3 \cdot 3^{14} \cdot 5^3}{2^3 \cdot 3^{14} \cdot 5^3} = 5^4$

g) $= \dfrac{7^{12} \cdot 2^{12}}{2^6 \cdot 7^8 \cdot 2^5 \cdot 2^3} = \dfrac{7^{12} \cdot 2^{12}}{2^{13} \cdot 2^{14}} = 7^{-4} \cdot 2 = \dfrac{2}{7}$