POWERS 1

1) Work out these powers:

a) 5^2 =

b) 2^4 =

c) 3^{-3} =

d) 3^{-2} =

e) $\left(\frac{1}{3}\right)^2 =$

f) $(-3)^3 =$

g) $-(-3)^4$ =

h) $(-2)^2$ =

i) $(-2)^{-2}$ =

j) $(1 + 5)^2$ =

k) $2^2 + 3^2$ =

l) $\left(\frac{1}{2}\right)^4 =$

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

n) $\left(\frac{1}{2}\right)^4 : \left(\frac{1}{2}\right)^2 =$

2) Work out these powers, writing each of following mathematical expressions as a positive power:

a) $\left(3 \cdot 9^2 \cdot 27^{-3}\right)^3 \cdot 9^{10} =$

b) $\frac{x^6 \cdot x^5}{x^3 \cdot x^{-1}} =$

c) $\frac{16^3 \cdot 8^{-3}}{\left(4^{-1}\right)^3} =$

d) $\left(\frac{2^5 \cdot 4^2}{8^3}\right)^2 =$

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

f) $\left(2^4\right)^3 \cdot \left(\frac{1}{4}\right)^8 =$

g) $\frac{3^{-2} \cdot 6^2 \cdot 12^{-1}}{(6^2)^3 \cdot 4^{-2} \cdot 2^3} =$

SOLUTIONS

1) Work out these powers:

b) $5^2 = 5 \cdot 5 = 25$

b) $2^4 = 2 \cdot 2 \cdot 2 \cdot 2 = 16$

d) $3^{-3} = \frac{1}{3^3} = \frac{1}{27}$

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

e) $\left(\frac{1}{3}\right)^2 = \frac{1}{3^2} = \frac{1}{9}$

f) $(-3)^3 = \frac{1}{(-3)^3} = -\frac{1}{27}$

g) $-(-3)^4 = -81$

h) $(-2)^2 = 4$

i) $(-2)^{-2} = \frac{1}{4}$

j) $(1 + 5)^2 = 6^2 = 36$

k) $2^2 + 3^2 = 4 + 9 = 13$

l) $\left(\frac{1}{2}\right)^4 = \frac{1}{2^4} = \frac{1}{16}$

m) $\left(\frac{1}{2}\right)^2 \cdot \left(\frac{2}{3}\right)^3 = \frac{1 \cdot 2^3}{2^2 \cdot 3^3} = \frac{2}{27}$

n) $\left(\frac{1}{2}\right)^4 : \left(\frac{1}{2}\right)^2 = \left(\frac{1}{2}\right)^2 = \frac{1}{4}$

2) Work out these powers, writing each of following mathematical expressions as a positive power:

a) $\left(3 \cdot 9^2 \cdot 27^{-3}\right)^3 \cdot 9^{10} = \left(3 \cdot 3^2 \cdot \left(3^3\right)^{-3}\right)^3 \cdot \left(3^2\right)^{10} = 3^3 \cdot 3^6 \cdot 3^{-27} \cdot 3^{20} = 3^2$

b) $\frac{x^6 \cdot x^5}{x^3 \cdot x^{-1}} = \frac{x^{11}}{x^{-3}} = x^{11-(-3)} = x^{14}$

c) $\frac{16^3 \cdot 8^{-3}}{\left(4^{-1}\right)^3} = \frac{\left(2^4\right)^3 \cdot \left(2^3\right)^{-3}}{\left(2^{-2}\right)^3} = \frac{2^{12} \cdot 2^{-9}}{2^{-6}} = \frac{2^3}{2^{-6}} = 2^{3+6} = 2^9$

d) $\left(\frac{2^5 \cdot 4^2}{8^3}\right)^2 = \left(\frac{2^5 \cdot \left(2^2\right)^2}{\left(2^3\right)^3}\right)^2 = \left(\frac{2^5 \cdot 2^4}{2^9}\right)^2 = \left(\frac{2^9}{2^9}\right)^2 = 1^2 = 1$

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

f) $\left(2^4\right)^3 \cdot \left(\frac{1}{4}\right)^8 = 2^{12} \cdot \frac{1^8}{2^{16}} = \frac{2^{12}}{2^{16}} = \frac{1}{2^4}$

g)

$$\frac{3^{-2} \cdot 6^2 \cdot 12^{-1}}{(6^2)^3 \cdot 4^{-2} \cdot 2^3} = \frac{3^{-2} \cdot (2 \cdot 3)^2 \cdot \left(2^2 \cdot 3\right)^{-1}}{(2^2 \cdot 3^2)^3 \cdot (2^2)^{-2} \cdot 2^3} = \frac{3^{-2} \cdot 2^2 \cdot 3^2 \cdot 2^{-2} \cdot 3^{-1}}{2^6 \cdot 3^6 \cdot 2^{-4} \cdot 2^3} = \frac{3^{-1} \cdot 2^0}{2^5 \cdot 3^6} = \frac{1}{2^5 \cdot 3^7}$$