

Practise, Apply, Solve

A

1. Express as a single power, then evaluate.

- (a) $(2^2)(2^5)$ (b) $(4^{-3})(4^4)$ (c) $(5^{-3})(5^5)$
 (d) $(3^{-1})(3^4)$ (e) $(2^{-2})(2^{-3})$ (f) $(10^2)(10^3)(10^{-4})$
 (g) $(-2)^2(-2)^3$ (h) $(3^5)(3^{-7})(3^4)$

2. Express as a single power, then evaluate.

- (a) $\frac{2^5}{2^2}$ (b) $\frac{4^6}{4^3}$ (c) $\frac{10^{10}}{10^3}$
 (d) $\frac{2^{-5}}{2^2}$ (e) $\frac{3^{-3}}{3^{-2}}$ (f) $\frac{3^2}{3^{-2}}$
 (g) $10^6 \div 10^{-3}$ (h) $5^{-2} \div 5^{-3}$

3. Express as a single power, then evaluate.

- (a) $(2^3)^2$ (b) $(3^2)^3$ (c) $(4^{-1})^2$
 (d) $(5^{-1})^{-2}$ (e) $(10^3)^{-2}$ (f) $(10^{-2})^{-3}$
 (g) $(6^{-1})^{-1}$ (h) $(28^{13})^0$

4. Simplify.

- (a) $(m^4)(m^2)$ (b) $(n^5)(n^{-3})$ (c) $(x^{-4})(x^{-2})$
 (d) $(r^8)(r^{-2})$ (e) $(w^{-6})(w^{-7})$ (f) $(m^3)(m^{-4})(m^2)$
 (g) $(p^{-3})(p^{-2})(p^8)$ (h) $(b^5)(b^{-3})(b^{-7})$ (i) $(x^4)^2$
 (j) $(y^3)^{-4}$ (k) $(m^{-2})^{-3}$ (l) $(p^{-4})^2$
 (m) $\frac{m^6}{m^2}$ (n) $\frac{y^{15}}{y^5}$ (o) $\frac{x^7}{x^{10}}$
 (p) $3^{12} \div 3^3$ (q) $4^{12} \div 4^{-4}$ (r) $\frac{b^{-8}}{b^{-6}}$

5. Simplify.

- (a) $(2y^3)^4$ (b) $(3x^5)^2$ (c) $(5y^6)^{-1}$
 (d) $(4y^{-7})^3$ (e) $(10b^8)^3$ (f) $(10c^3)^{-2}$
 (g) $(-2y^{-3})^{-3}$ (h) $(-2m^2)^4$

7. Evaluate.

- (a) $\frac{(8^6)(8^{-3})}{8^4}$ (b) $\frac{(7^{-2})(7^{-5})}{7^9}$
 (c) $\frac{(3^2)(4^3)(3^5)(4^2)}{(3^7)(4^5)}$ (d) $\frac{(2.0 \times 10^8)(4.0 \times 10^7)}{3.0 \times 10^{12}}$
 (e) $\frac{(5^2)^3(7^3)^4}{(7^{11})(5^7)}$ (f) $\frac{(5^{-2})(6^{-5})}{(5^4)^{-1}(6^{-2})^3}$

12. Write each power in simplified form.

- (a) 4^5 as a base 2 power (b) 9^6 as a base 3 power
 (c) 27^4 as a base 3 power (d) $(-125)^7$ as a base -5 power

13. Write all powers using a common base, then simplify.

- (a) $\frac{16^3}{2^4}$ (b) $\frac{25^4}{5^5}$
 (c) $\frac{3^5}{81^2}$ (d) $\frac{(128^3)(64^2)}{32^5}$

14. Simplify.

- (a) $(x^3y^5)(x^4y^3)$ (b) $(x^{-2}y^4)(x^4y^{-1})$ (c) $\frac{x^3y^6}{x^2y^3}$
 (d) $\frac{x^{-3}y^{-4}}{x^2y^{-2}}$ (e) $(x^3y^4)^4$ (f) $(x^{-2}y^5)^{-2}$
 (g) $\frac{(xy^3)(x^{-3}y^4)}{x^2y^{-1}}$ (h) $\frac{(x^4)^5}{(x^2)^2}$

3.11 Exponent Laws
Practise, Apply, Solve

1. (a) $2^7 = 128$ (b) $4^1 = 4$ (c) $5^2 = 25$
 (d) $3^2 = 27$ (e) $2^{-5} = \frac{1}{32}$ (f) $10^1 = 10$
 (g) $(-2)^5 = -32$ (h) $3^2 = 9$
 (i) $4^2 = 8$ (j) $4^3 = 64$
 (k) $10^5 = 100\,000$ (l) $2^{-7} = \frac{1}{128}$
 (m) $3^{-1} = \frac{1}{3}$ (n) $3^4 = 81$
 (o) $10^9 = 1\,000\,000\,000$
 (p) $5^1 = 5$
 (q) $2^6 = 64$ (r) $3^6 = 729$ (s) $4^{-2} = \frac{1}{16}$
 (t) $10^6 = 1\,000\,000$ (u) $6^1 = 6$
 (v) $28^0 = 1$
 2. (a) m^6 (b) m^2 (c) m^{-6}
 (d) m^4 (e) m^{-13} (f) m^1
 (g) x^8 (h) x^{-12} (i) x^{-8}
 (j) y^{16} (k) y^3 (l) y^1
 (m) x^{10} (n) x^{-3} (o) x^3
 (p) $16m^8$ (q) $16m^8$ (r) $\frac{1}{16}$
 (s) $1000b^{24}$ (t) $\frac{1000}{b}$
 (u) $16y^{12}$ (v) $9x^{10}$ (w) $\frac{1}{64}$
 (x) $\frac{1}{5^6}$ (y) $\frac{1}{5^6}$ (z) $\frac{1}{5^6}$
 3. (a) $2^6 = 64$ (b) $3^6 = 729$ (c) $4^{-2} = \frac{1}{16}$
 (d) $5^2 = 25$ (e) $10^{-6} = 0.000\,000\,001$
 (f) $10^6 = 1\,000\,000$ (g) $6^1 = 6$
 (h) $28^0 = 1$
 4. (a) m^6 (b) m^2 (c) x^{-6} (d) x^6
 (e) w^{-13} (f) m^1 (g) b^{-5}
 (h) d^{-8} (i) y^8 (j) $\frac{1}{9}$
 (k) $16m^8$ (l) $16m^8$ (m) $\frac{1}{16}$
 (n) $\frac{1}{64}$ (o) $\frac{1}{5^6}$ (p) $\frac{1}{5^6}$
 (q) $1000b^{24}$ (r) $\frac{1000}{b}$
 (s) $16y^{12}$ (t) $9x^{10}$ (u) $\frac{1}{64}$
 (v) $\frac{1}{5^6}$ (w) $\frac{1}{5^6}$ (x) $\frac{1}{5^6}$
 5. (a) $15^{\frac{4}{3}}$ (b) $25^{\frac{1}{3}}$ (c) $\frac{3}{10}$
 (d) $100^{\frac{1}{6}}$ (e) 1.0×10^{19}
 (f) 1.0×10^{19} (g) 1.4×10^2
 (h) 7.2×10^{-23} (i) 175 (j) 150
 (k) $266\frac{2}{3}$ (l) 1 (m) 1
 (n) 1.8 (o) $\frac{1}{16}$
 (p) 1 (q) 1 (r) 1
 (s) 1 (t) 1 (u) 1
 (v) 1 (w) 1 (x) 1
 (y) 1 (z) 1
 6. (a) 12 (b) 3 (c) 4
 (d) 6 (e) 312 (f) 312
 (g) 256 (h) 125 (i) $\frac{27}{1}$
 (j) 256 (k) 125 (l) $\frac{27}{1}$
 (m) 12 (n) 12 (o) 12
 (p) 12 (q) 12 (r) 12
 (s) 12 (t) 12 (u) 12
 (v) 12 (w) 12 (x) 12
 (y) 12 (z) 12
 7. (a) $524\,288$ (b) $\frac{12}{7}$
 (c) $\frac{3}{1}$ (d) $100^{\frac{1}{6}}$
 (e) $15^{\frac{4}{3}}$ (f) $25^{\frac{1}{3}}$
 (g) 1.0×10^{19} (h) 1.4×10^2
 (i) 7.2×10^{-23} (j) 175 (k) 150
 (l) $266\frac{2}{3}$ (m) 1 (n) 1
 (o) 1.8 (p) $\frac{1}{16}$
 (q) 1 (r) 1 (s) 1
 (t) 1 (u) 1 (v) 1
 (w) 1 (x) 1 (y) 1
 (z) 1