



1. Simplify

(a)  $x^0$  [1]

(m)  $x^8 \div x^2$  [1]

(b)  $6w^0$  [1]

(n)  $t^{21} \div t^7$  [1]

(c)  $n^2 \times n^5$  [1]

(o)  $a^3b^7 \div a^6b^2$  [2]

(d)  $m^4 \times m^3$  [1]

(p)  $36y^5 \div 4y^2$  [2]

(e)  $2x^3 \times 3x^4$  [2]

(q)  $12x^{12} \div 3x^3$  [2]

(f)  $5m^2 \times 2m^3$  [2]

(r)  $x^{\frac{2}{3}} \div x^{-\frac{4}{3}}$  [1]

(g)  $4x^3y \times 5x^2y$  [2]

(s)  $\frac{x^{\frac{2}{3}}}{x^{\frac{3}{8}}}$  [1]

(h)  $x^3y^4 \times x^5y^3$  [2]

(t)  $\frac{5}{8}x^{\frac{3}{2}} \div \frac{1}{2}x^{-\frac{5}{2}}$  [2]

(i)  $3x^2y^3 \times x^4y$  [2]

(u)  $32x^8 \div 8x^{32}$  [2]

(j)  $3y^6 \times 5y^{-2}$  [1]

(v)  $3^2q^{-3} \div 2^3q^{-2}$  [2]

(k)  $6uw^{-3} \times 4uw^6$  [2]

(w)  $\frac{16y^{10} \times 4y^{-4}}{32y^7}$  [2]

(l)  $w^2/w^3$  [1]



2. Simplify

(a)  $(x^2)^5$  [1]

(b)  $(x^8)^3$  [1]

(c)  $(m^5)^{-2}$  [1]

(d)  $(3p^{-3})^{-4}$  [2]

(e)  $(3w^3)^3$  [2]

(f)  $(3p^2m^5)^3$  [2]

(g)  $(3xy^4)^3$  [2]

(h)  $(\frac{1}{2}x^{\frac{2}{3}})^3$  [2]

(i)  $(4pq^2)^3$  [2]

(j)  $\sqrt[3]{27t^{27}}$  [2]

(k)  $(36x^{16})^{\frac{1}{2}}$  [2]

(l)  $(8p^6)^{\frac{1}{3}}$  [2]

(m)  $(32x^{10})^{\frac{3}{5}}$  [2]

(n)  $(32y^{15})^{\frac{2}{5}}$  [2]

(o)  $(16a^6b^2)^{\frac{1}{2}}$  [2]

(p)  $(16x^{16})^{\frac{3}{4}}$  [2]

(q)  $(81y^{16})^{\frac{3}{4}}$  [2]

(r)  $(125x^6)^{\frac{2}{3}}$  [2]

(s)  $(256y^{256})^{\frac{1}{8}}$  [2]

(t)  $(256y^{256})^{\frac{1}{4}}$  [2]

(u)  $(3125t^{125})^{\frac{1}{5}}$  [2]

(v)  $(\frac{8}{a^{12}})^{\frac{1}{3}}$  [2]

(w)  $(\frac{x^6}{27})^{\frac{1}{3}}$  [2]

(x)  $(\frac{x^3}{64})^{\frac{2}{3}}$  [2]

(y)  $(\frac{16}{81}x^{16})^{\frac{1}{2}}$  [2]

(z)  $(\frac{16a^8}{c^{12}})^{\frac{3}{4}}$  [2]

(a1)  $(\frac{x^{64}}{16y^{16}})^{\frac{1}{4}}$  [3]

(b1)  $(\frac{p^4}{16})^{0.75}$  [2]



3. Simplify

(a)  $(64q^{-2})^{\frac{1}{2}}$  [2]

(b)  $\left(\frac{4}{x}\right)^{-2}$  [1]

(c)  $\left(\frac{8}{y^6}\right)^{-\frac{1}{3}}$  [2]

(d)  $(16x^8)^{-\frac{1}{4}}$  [2]

(e)  $\left(\frac{64}{m^3}\right)^{-\frac{1}{3}}$  [2]

(f)  $\left(\frac{x^3}{8}\right)^{-\frac{4}{3}}$  [2]

(g)  $\left(\frac{27x^{12}}{64y^3}\right)^{-\frac{1}{3}}$  [3]

4. Simplify

(a)  $(a^{1/2} - b^{1/2})(a^{1/2} + b^{1/2})$  [2]

(b)  $\frac{q^2 + q^2}{\frac{1}{q^4} \times \frac{1}{q^4}}$  [3]

(c)  $5x^3 - 3x^3$  [1]

(d)  $5^{-3}$ , write as fraction



5. Find the value of

(a)  $(\sqrt{5})^6$  [1]

(b)  $\left(\frac{1}{4}\right)^{0.5}$  [1]

(c)  $(-8)^{2/3}$  [1]

(d)  $\left(\frac{1}{27}\right)^{-\frac{2}{3}}$  [1]

(e)  $81^{\frac{3}{4}}$  [1]

(f)  $\left(\frac{1}{81}\right)^{-\frac{3}{4}}$  [1]

(g)  $3^0 \times 2.5^2$  [1]

(h)  $2.5^{-2}$  [1]

(i)  $\left(\frac{27}{8}\right)^{-\frac{4}{3}}$  Give your answer as an exact fraction. [2]

6. Find the value of

(a) n when,  $5^n = 1/125$  [1]

(b) p when,  $2^3 = 4^p$  [1]

(c) r when,  $2^r = 1/16$  [1]

(d) t when,  $3^t = \sqrt[5]{3}$  [1]

(e)  $\left(\sqrt[3]{10}\right)^2 = 10^p$  [1]



(f)  $x$  when,  $t^x \times t^2 = t^{10}$  [1]

(g)  $x$  when  $81^x = 3$  [1]

(h)  $p$  when,  $3^p = 1/9$  [1]

(i)  $w$  when,  $x^{72} \div x^w = x^8$  [1]

(j)  $n$  when,  $(p^2)^n = \frac{1}{p^6}$  [1]

(k)  $x$  when,  $3^x = \sqrt[4]{3^5}$  [1]

(l)  $n$  when,  $2^n = 1024$  [1]

(m)  $x$  when,  $3^{-2} \times 3^x = 81$  [2]

(n)  $p$  when,  $2^p = \frac{1}{8^4}$  [2]

(o)  $q$  when,  $3^{-q} \times \frac{1}{27} = 81$  [2]

(p)  $x$  when,  $243^x = 3^2$  [2]

(q)  $4^{2n-3} = 16$  [2]



(r)  $x$  when,  $x^{-\frac{1}{3}} = 32x^{-2}$  [3]

(s)  $m$  when  $m^{-\frac{1}{4}} = 27m^{-1}$  [3]

(t)  $k$  when  $25 = 125^k$  [1]

(u)  $p$  when,  $2p^{\frac{3}{2}} = 54$  [2]

(v)  $p$  when  $(2^{24})^{\frac{1}{2}} = p^4$  [2]

(w)  $p$  when,  $5^7 \div 5^9 = p^2$  [2]

(x)  $k$  when  $2^{12} \div 2^{\frac{k}{2}} = 32$  [2]

(y) Find  $y$   $\frac{3(2^{-y})}{16} - 1 = \frac{1}{2}$ , [4]

(z)  $n$  when

$\sqrt[3]{y^2} = \sqrt[6]{x}$  and  $y = \sqrt[n]{x}$  [2]

(A)  $k$  when  $5^{-3} + 5^{-4} = k \times 5^{-4}$



7.  $5^n + 5^n + 5^n + 5^n + 5^n = 5^m$

Find an expression for  $m$  in terms of  $n$ . [2]

8. Write  $243 \times 27^{2n}$  as a single power of 3 in terms of  $n$ . [2]

9. Solve for  $x$  when  $3^{3x} \times \left(\frac{1}{9}\right)^{4-3x} = 3$  [3]

10. Find an expression for  $y$  in terms of  $x$   $3^{2x-1} = \frac{1}{9^x} \times 3^{2y-x}$

11. Find HCF of  $12a^3b$  and  $20a^2b^2$  [2]

Answer 1

(a) 1 (b) 6 (c)  $n^7$  (d)  $m^7$  (e)  $6x^7$  (f)  $10m^5$  (g)  $20x^5y^2$  (h)  $x^8y^7$  (i)  $3x^6y^4$  (j)  $15y^4$  (k)  $24u^2w^3$  (l)  $1/w$   
(m)  $x^6$  (n)  $t^{14}$  (o)  $b^5/a^3$  (p)  $9y^3$  (q)  $4x^9$  (r)  $x^2$  (s)  $x^{-2}$  (t)  $\frac{5}{4}x^4$  (u)  $4/x^{24}$  (v)  $9/8q$  (w)  $2/y$

Answer 2

(a)  $x^{10}$  (b)  $x^{24}$  (c)  $1/m^{10}$  (d)  $p^{12}/81$  (e)  $27w^9$  (f)  $27p^6m^{15}$  (g)  $27x^3y^{12}$  (h)  $\frac{1}{8}x^2$  (i)  $64p^3q^6$  (j)  $3t^9$   
(k)  $6x^8$  (l)  $2p^2$  (m)  $8x^6$  (n)  $4y^6$  (o)  $4a^3b$  (p)  $8x^{12}$  (q)  $27y^{12}$  (r)  $25x^4$  (s)  $2y^{32}$  (t)  $4y^{64}$  (u)  $5t^{25}$   
(v)  $2/a^4$  (w)  $x^2/3$  (x)  $x^2/16$  (y)  $4x^8/9$  (z)  $8a^6/c^9$  (a1)  $x^{16}/2y^4$  (b1)  $p^3/8$

Answer 3

(a)  $8/q$  (b)  $x^2/16$  (c)  $y^2/2$  (d)  $1/2x^2$  (e)  $m/4$  (f)  $16/x^4$  (g)  $4y/3x^4$

Answer 4

(a)  $a - b$  (b)  $2q^{3/2}$  (c)  $2x^3$  (d)  $1/125$

Answer 5

(a) 125 (b)  $1/2$  (c) 4 (d) 9 (e) 27 (f) 27 (g) 6.25 (h) 0.16 (i)  $16/81$

Answer 6

(a)  $n = -3$  (b)  $p = 1.5$  (c)  $r = -4$  (d)  $t = 1/5$  (e)  $p = 2/3$  (f)  $x = 8$  (g)  $x = 1/4$  (h)  $p = -2$  (i)  $w = 64$   
(j)  $n = -3$  (k)  $x = 1\frac{1}{4}$  (l)  $n = 10$  (m)  $x = 6$  (n)  $p = -12$  (o)  $q = -7$  (p)  $x = 2/5$  (q)  $n = 2.5$  (r)  $x = 8$   
(s) 81 (t)  $k = 2/3$  (u)  $p = 9$  (v)  $p = 8$  (w)  $p = 1/5$  (x)  $k = 14$  (y)  $y = -3$  (z)  $n = 4$  (A)  $k = 6$

Answer 7  $m = n+1$

Answer 8  $3^{6n+5}$

Answer 9  $x = 1$

Answer 10  $[y] = \frac{5x-1}{2}$

Answer 11  $4a^2b$