Indices 2

1	$x^p \times x^q = x^{p+q}$
2	$x^p \div x^q = x^{p-q}$
3	$(x^p)^q = x^{p \times q}$
4	$x^1 = x$
5	$x^0 = 1$
6	$x^{-p} = \frac{1}{x^p}$

Further Examples

1) $x^9 \times x^2 = x^{9+2} = x^{11}$

2) $x^7 \div x^2 = x^{7-2} = x^5$

3) $(x^4)^3 = x^{4 \times 3} = x^{12}$

4) $x \times x^2 = x^1 \times x^2 = x^{1+2} = x^3$

5) $2x^3 \times 3x^2 = 6x^5$

6) $8x^6 \div 4x^5 = \frac{8x^6}{4x^5} = 2x^1 = 2x$

7) $(x^1)^7 = x^{1 \times 7} = x^7$

8) $(x^0)^5 = x^0 = 1$

9) $5x^2 \times 3x^4 \times 2x^3 = 30x^9$

10) $(3x^2)^3 = 27x^6$

Exercise 21C

Simplify

1 (a) $x^8 \times x^2$ (b) $y^3 \times y^8$ (c) $z^7 \times z$ (d) $w^9 \times w^5$

2 (a) $a^5 \times a^3$ (b) $b^3 \times b^3$ (c) $c \times c^9$ (d) $d^7 \times d^4$

3 (a) $p^5 \div p^2$ (b) $q^{12} \div q^2$ (c) $r^9 \div r$ (d) $t^8 \div t^4$

4 (a) $j^9 \div j^3$ (b) $k^5 \div k^4$ (c) $m^2 \div m$ (d) $n^{25} \div n^{23}$

5 (a) $(d^3)^4$ (b) $(e^5)^2$ (c) $(f^3)^3$ (d) $(g^7)^9$

6 (a) $(g^6)^4$ (b) $(h^2)^2$ (c) $(k^4)^0$ (d) $(m^0)^{56}$

7 (a) $3x^2 \times 2x^3$ (b) $5y^9 \times 3y^{20}$ (c) $6z^8 \times 4z$

8 (a) $12p^8 \div 4p^3$ (b) $15q^5 \div 3q^3$ (c) $6r^5 \div 3r$

9 (a) $(3d^2)^7$ (b) $(4e)^3$ (c) $(3f^{129})^0$

10 (a) $x^5 \times x^2 \times x$ (b) $y^2 \times y^4 \times y^3$ (c) $z^3 \times z^5 \times z$

11 (a) $\dfrac{a^4 \times a^5}{a^3}$ (b) $\dfrac{b^7 \times b}{b^4}$ (c) $\dfrac{c^3 \times c^4}{c^2 \times c^5}$

12 (a) $4d^9 \times 2d$ (b) $8e^8 \div 4e^4$ (c) $(4f^2)^2$

13 (a) $3p^6 \times p^3 \times p^4$ (b) $5q^5 \times 3q^3 \times 2q^2$

14 (a) $\dfrac{3x^3 \times 4x^7}{2x^5}$ (b) $\dfrac{(6x^5)^2}{9x^8}$

1 a) $x^8 \times x^2 = x^{8+2} = x^{10}$

1 b) $y^3 \times y^8 = y^{3+8} = y^{11}$

1 c) $z^7 \times z = z^8$

1 d) $w^9 \times w^5 = w^{14}$

2 a) $a^5 \times a^3 = a^8$

2 b) $b^3 \times b^3 = b^6$

2 c) $c \times c^9 = c^{10}$

2 d) $d^7 \times d^4 = d^{11}$

3a) $p^5 \div p^2 = p^3$

3b) $q^{12} \div q^2 = q^{10}$

3c) $r^9 \div r = r^8$

3d) $t^8 \div t^4 = t^4$

4a) $j^9 \div j^3 = j^6$

4b) $k^5 \div k^4 = k$

4c) $m^2 \div m = m$

4d) $n^{25} \div n^{23} = n^2$

5a) $(d^3)^4 = d^{12}$

5b) $(e^5)^2 = e^{10}$

5c) $(f^3)^3 = f^9$

5d) $(g^7)^9 = g^{63}$

6a) $(g^6)^4 = g^{24}$

6b) $(h^2)^2 = h^4$

6c) $(k^4)^0 = k^0 = 1$

6d) $(m^0)^{56} = m^0 = 1$

7a) $3x^2 \times 2x^3$
$= 6x^5$

7b) $= 5y^9 \times 3y^{20}$
$= 15y^{29}$

7c) $6z^8 \times 4z$
$= 24z^9$

8a) $12p^8 \div 4p^3$
$= 3p^5$

8b) $15q^5 \div 3q^3$
$= 5q^2$

8c) $6r^5 \div 3r$
$= 2r^4$

9a) $(3d^2)^7$

$2187d^{14}$

9b) $(4e)^3$

$= 64e^3$

9c) $(3f^{129})^0 = 1$

10a) $x^5 \times x^2 \times x$

$= x^8$

10b) $y^2 \times y^4 \times y^3$

$= y^9$

10c) $2^3 \times 2^5 \times 2$

$= 2^9$

11 (a) $\dfrac{a^4 \times a^5}{a^3}$ (b) $\dfrac{b^7 \times b}{b^4}$ (c) $\dfrac{c^3 \times c^4}{c^2 \times c^5}$

12 (a) $4d^9 \times 2d$ (b) $8e^8 \div 4e^4$ (c) $(4f^2)^2$

13 (a) $3p^6 \times p^3 \times p^4$ (b) $5q^5 \times 3q^3 \times 2q^2$

14 (a) $\dfrac{3x^3 \times 4x^7}{2x^5}$ (b) $\dfrac{(6x^5)^2}{9x^8}$

11a) $\dfrac{a^4 \times a^5}{a^3} = \dfrac{a^9}{a^3} = a^6$

11b) $\dfrac{b^7 \times b}{b^4} = \dfrac{b^8}{b^4} = b^4$

11c) $\dfrac{c^3 \times c^4}{c^2 \times c^5} = \dfrac{c^7}{c^7} = 1$

12a) $4d^9 \times 2d = 8d^{10}$

12b) $8e^8 \div 4e^4 = 2e^4$

12c) $(4f^2)^2 = 16f^4$

13 a) $3p^6 \times p^3 \times p^4 = 3p^{13}$

13 b) $5q^5 \times 3q^3 \times 2q^2 = 30q^{10}$

14 a) $\dfrac{3x^3 \times 4x^7}{2x^5} = \dfrac{12x^{10}}{2x^5} = 6x^5$

14 b) $\dfrac{(6x^5)^2}{9x^8} = \dfrac{36x^{10}}{9x^8} = 4x^2$
