



1

a. Simplify $x^3 \times x \times x^4$

b. Simplify $x^7 \div x^2$

c. Simplify $(x^2)^3$

(3 marks)

a)

$$x^3 \times x^1 \times x^4$$

add the powers: $3 + 1 + 4 = 8$

$$x^8$$

b)

$$7 - 2 = 5$$

$$x^5$$

c)

$$2 \times 3 = 6$$

$$x^6$$

2

- a. Write $2^5 \times 2^3$ as a single power of 2.
 b. Work out the value of $3^8 \div 3^5$
 c. Write $(5^2)^3 \div 5^4$ as a single power of 5.

(3 marks)

a)

$$5 + 3 = 8$$

$$2^8$$

b)

$$8 - 5 = 3$$

$$3^3 = 3 \times 3 \times 3 = 27$$

$$27$$

c)

$$(5^2)^3 = 5^{2 \times 3} = 5^6$$

$$5^6 \div 5^4 = 5^{6-4}$$

$$5^2$$

3

- a. Simplify $t^8 \div t^3$
 b. Simplify $(k^4)^5$
 c. Simplify $\frac{12x^6y^3}{4x^2y}$

(3 marks)

a) Subtract the indices

$$t^{(8-3)} = t^5$$

b) Multiply the indices

$$k^{(4 \times 5)} = k^{20}$$

c) Divide the numbers

$$12 \div 4 = 3. \text{ Subtract indices: } x^{(6-2)} = x^4 \text{ and } y^{(3-1)} = y^2, \\ \text{giving } 3x^4y^2$$

Keep the original restriction: t , x and y must be non-zero wherever they occur in a denominator or with a negative power

4

a. Simplify $5a^3 \times 4a^6$ b. Simplify $(2c^4)^3$

(3 marks)

a) Multiply the numbers

 $5 \times 4 = 20$. Add the indices: $a^{(3+6)} = a^9$, giving $20a^9$

b) Cube the 2 as well as the power

 $2^3 = 8$ and $(c^4)^3 = c^{12}$, giving $8c^{12}$

5

a. Simplify $n^{-5} \times n^8$ b. Write down the value of 2^{-3}

(3 marks)

a) Add the indices

 $n^{(-5+8)} = n^3$ b) $2^{-3} = 1 / 2^3 = \frac{1}{8}$

A negative power means a reciprocal, not a negative answer

 $2^3 \times 2^{-3}$ must equal $2^0 = 1$, so $2^{-3} = 1/8$. Here n must be non-zero because n^{-5} occurs in the original expression

6

a. Simplify $3x^2y \times 4xy^3$ b. Simplify $20p^5q^2 \div 5p^2q$

(4 marks)

a)

numbers: $3 \times 4 = 12$ x : $2 + 1 = 3$ y : $1 + 3 = 4$ $12x^3y^4$

b)

numbers: $20 \div 5 = 4$ p : $5 - 2 = 3$ q : $2 - 1 = 1$ $4p^3q$

7

Find the value of n in each of these.

a. $7^n \times 7^4 = 7^{10}$

b. $3^8 \div 3^n = 3^5$

(2 marks)

a)

$$\begin{array}{rcl} n + 4 & = & 10 \\ -4 & & -4 \\ \hline n & = & 6 \end{array}$$

$$\boxed{n = 6}$$

b)

$$\begin{array}{rcl} 8 - n & = & 5 \\ +n & & +n \\ \hline 8 & = & 5 + n \\ -5 & & -5 \\ \hline 3 & = & n \end{array}$$

$$\boxed{n = 3}$$

8

a. Simplify $(h^5)^2$

b. Simplify $15d^7 \div 3d^2$

c. Expand $3t(2t + 5)$

(4 marks)

a) Multiply the indices

$$h^{(5 \times 2)} = h^{10}$$

$$b) 15 \div 3 = 5 \text{ and } d^{(7-2)} = d^5, \text{ giving } 5d^5$$

$$c) 3t \times 2t = 6t^2 \text{ and } 3t \times 5 = 15t, \text{ giving } 6t^2 + 15t$$

Keep the original restriction: d must be non-zero wherever they occur in a denominator or with a negative power

9

a. Simplify $\frac{15a^4b^6}{5a^2b^2}$

b. Simplify $\frac{(3p^2q)^3}{9pq^2}$

(4 marks)

a)

$$15 \div 5 = 3$$

$$a: 4 - 2 = 2$$

$$b: 6 - 2 = 4$$

$$\boxed{3a^2b^4}$$

b)

$$(3p^2q)^3 = 27p^6q^3$$

$$27 \div 9 = 3$$

$$p: 6 - 1 = 5$$

$$q: 3 - 2 = 1$$

$$\boxed{3p^5q}$$

10

a. Write down the value of 17^0

b. Write down the value of 4^{-2}

c. Simplify $(m^{-3})^4 \times m^{14}$

(4 marks)

a) Any non-zero number to the power 0 is 1

$$b) 4^{-2} = 1 / 4^2 = \frac{1}{16}$$

$$c) (m^{-3})^4 = m^{-12}, \text{ then } m^{-12} \times m^{14} = m^{(-12+14)} = m^2$$

Keep the original restriction: m must be non-zero wherever they occur in a denominator or with a negative power

11

- a. Simplify $(5p^4q)^2$
- b. Simplify $24m^8 \div 6m^2$
- c. Solve $4x - 7 > 2x + 3$

(5 marks)

a) Square each factor

$$5^2 = 25, (p^4)^2 = p^8, q^2 = q^2, \text{ giving } 25p^8q^2$$

$$b) 24 \div 6 = 4 \text{ and } m^{(8-2)} = m^6, \text{ giving } 4m^6$$

c) Subtract $2x$ from both sides: $2x - 7 > 3$. Add 7: $2x > 10$.

Divide by 2: $x > 5$

Keep the original restriction: m must be non-zero wherever they occur in a denominator or with a negative power