



## 1. Indices: Introduction

1. Simplify the following expressions.

- (a)  $5g^5 \times 3g^3$
- (b)  $12h^{12} \div 4h^4$
- (c)  $(2a^2)^3 \times (3a)^2$
- (d)  $(3m^4n^2)^3 \times (2mn^2)^2$
- (e)  $(2xy^2z^3)^2 \div (2xy^2z^3)$

2. Simplify the following, giving each answer in the form  $2^n$ .

- (a)  $2^{11} \times (2^5)^3$
- (b)  $4^3$
- (c)  $\frac{2^2 \times 2^3}{(2^2)^2}$
- (d)  $2 \times 4^4 \div 8^3$

3. Express each of the following as an integer or fraction.

- (a)  $2^{-3}$
- (b)  $5^{-1}$
- (c)  $(\frac{1}{2})^{-1}$
- (d)  $2^{-7}$
- (e)  $(1\frac{1}{3})^{-3}$

4. If  $x = 2$ , find the value of each of the following.

- (a)  $4x^{-3}$
- (b)  $\frac{1}{4}x^{-3}$
- (c)  $(\frac{1}{4}x)^{-3}$

5. Express each of the following in as simple a form as possible.

- (a)  $a^4 \times a^{-3}$
- (b)  $(c^{-2})^3$
- (c)  $(p^2q^4r^3)^{-4}$
- (d)  $(5a^3c^{-1})^2 \div (2a^{-1}c^2)$
- (e)  $(3x^{-2}y)^2 \div (4xy)^{-2}$

6. Evaluate the following without a calculator.

- (a)  $25^{\frac{1}{2}}$
- (b)  $32^{\frac{1}{5}}$
- (c)  $49^{-\frac{1}{2}}$
- (d)  $1000^{-\frac{1}{3}}$



## 4. Indices: Introduction

1. Simplify the following expressions.

- (a)  $5g^5 \times 3g^3$   $15g^8$
- (b)  $12h^{12} \div 4h^4$   $3h^8$
- (c)  $(2a^2)^3 \times (3a)^2$   $72a^8$
- (d)  $(3m^4n^2)^3 \times (2mn^2)^2$   $108m^{14}n^{10}$
- (e)  $(2xy^2z^3)^2 \div (2xy^2z^3)$   $2xy^2z^3$

2. Simplify the following, giving each answer in the form  $2^n$ .

- (a)  $2^{11} \times (2^5)^3$   $2^{26}$
- (b)  $4^3$   $2^6$
- (c)  $\frac{2^2 \times 2^3}{(2^2)^2}$   $2^1$
- (d)  $2 \times 4^4 \div 8^3$   $2^0$

3. Express each of the following as an integer or fraction.

- (a)  $2^{-3}$   $\frac{1}{8}$
- (b)  $5^{-1}$   $\frac{1}{5}$
- (c)  $(\frac{1}{2})^{-1}$   $2$
- (d)  $2^{-7}$   $\frac{1}{128}$
- (e)  $(1\frac{1}{3})^{-3}$   $\frac{27}{64}$

4. If  $x = 2$ , find the value of each of the following.

- (a)  $4x^{-3}$   $\frac{1}{2}$
- (b)  $\frac{1}{4}x^{-3}$   $\frac{1}{32}$
- (c)  $(\frac{1}{4}x)^{-3}$   $8$

5. Express each of the following in as simple a form as possible.

- (a)  $a^4 \times a^{-3}$   $a$
- (b)  $(c^{-2})^3$   $c^{-6}$
- (c)  $(p^2q^4r^3)^{-4}$   $p^{-8}q^{-16}r^{-12}$
- (d)  $(5a^3c^{-1})^2 \div (2a^{-1}c^2)$   $\frac{25}{2}a^7c^{-4}$
- (e)  $(3x^{-2}y)^2 \div (4xy)^{-2}$   $144x^{-2}y^4$

6. Evaluate the following without a calculator.

- (a)  $25^{\frac{1}{2}}$   $5$
- (b)  $32^{\frac{1}{5}}$   $2$
- (c)  $49^{-\frac{1}{2}}$   $\frac{1}{7}$
- (d)  $1000^{-\frac{1}{3}}$   $\frac{1}{10}$