

## Cancelling fractions

Cancel the following fractions:

$$\frac{2 \times \cancel{3} \times 4 \times 5}{\cancel{3} \times 5 \times 7} = \frac{8}{7}$$

$$\frac{5 \times 7 \times 7 \times \cancel{7} \times 11}{\cancel{7} \times 11} = \frac{245}{1} = 245$$

$$\frac{4^2}{2} = \frac{2}{1} = 2$$

$$\frac{2 \times 2 \times 2 \times 3 \times 5 \times 5}{2 \times 2 \times 3 \times 5} = \frac{10}{1} = 10 \div 2 = 2$$

$$\frac{a \times \cancel{a} \times b \times c}{\cancel{a} \times b \times c} = a$$

$$\frac{\cancel{a} \times \cancel{a} \times b \times c \times c}{a \times \cancel{a} \times \cancel{a} \times b \times c} = \frac{c}{a}$$

$$\frac{a^3 \times b}{a} = \frac{a \times a \times a \times b}{\cancel{a}} = a^2 b$$

$$\frac{a^2 \times b^2}{a \times b} = \frac{\cancel{a} \times \cancel{a} \times b \times b}{\cancel{a} \times \cancel{b}} = \underline{\underline{a b}}$$

Evaluate for  $n=2$

Substitution

$$n^3 + n^2 = 8 + 4 = 12$$

$$3^n = 3^2 = 9$$

$$2n^2 = 2 \times 4$$

$$7n - 3 = 14 - 3 = 11$$

$$5^{n+1} = 5^3 = 125 = 8$$

$$5n = 5 \times 2 = 10$$

$$n^2 = 2^2 = 4$$

$$n^5 = 2^5 = 32$$

## Indices

$$3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3$$

$$3^7$$

could be written as  $3^2 \times 3^2 \times 3^2 \times 3$

How else could it be written?

$$3^3 \times 3^2 \quad 3^3 \times 3^2 \times 3 \quad 3^3 \times 3^3 \times 3$$
$$3^3 \times 3^2 \times 3 \quad 3 \times 3^6 \quad 3^3 \times 3^4$$

Evaluate:

$$2^6 = 64$$

$$2^5 = 32$$

$$2^4 = 16$$

$$2^3 = 8$$

$$2^2 = 4$$

$$2^1 = 2$$

$$2^0 = 1$$

$$2^{-1} = \frac{1}{2}$$

$$3^6$$

$$3^5 = 243$$

$$3^4 = 81$$

$$3^3 = 27$$

$$3^2 = 9$$

$$3^1 = 3$$

$$3^0 = 1$$

$$3^{-1} = \frac{1}{3}$$

$$6^{-1} = \frac{1}{6} \quad 5^{-2} = \frac{1}{25} \quad 10^{-3} = \frac{1}{1000}$$
$$7^0 = 1$$

Any number to the power 0 = 1 :  $n^0 = 1$

Any number to a negative power is 1 over the number:  $n^{-1} = 1/n$ ,  $n^{-2} = 1/n^2$  etc

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Evaluate:

$$5^{-2} = \frac{1}{25}$$

$$5^3 = 125$$

$$4^0 = \underline{1}$$

$$10^7 = 10 \text{ } \cancel{000} \text{ } \cancel{000}$$

$$7^{-1} = \frac{1}{7}$$

$$14^2 = 196$$

$$2^6 = 64$$

$$7$$

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Express as a single power

$$3^5 \times 3^2 = 3^7$$

$3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3$   
9 27 81 243

$$4^2 \times 4^8 = 4^{10}$$

$$9^5 \times 9^{11} = 9^{16}$$

To multiply a number raised to a power by the same number raised to a power  
ADD the powers.

$$\frac{3^4}{3^2} = \frac{3 \times 3 \times \cancel{3} \times \cancel{3}}{\cancel{3} \times \cancel{3}} = 3^2$$
$$\frac{5^7}{5^2} = 5^5$$

To divide a number raised to a power by the same number raised to a power  
SUBTRACT the powers.

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### Recap on simplifying

Express as a single power:

$$6^5 \times 6^2 = 6^7$$

$$5^{-1} \times 5^9 = 5^8$$

$$5^{-1} \div 5^9 = 5^{-10}$$

$$7^0 \times 7^7 = 7^7$$

$$6^5 \div 6^2 = 6^3$$

### Brackets and powers

What does

$(3^2)^3$  mean?

$$3^2 \neq 3^2 \times 3^2 = 3^6$$

$$(4^5)^2 = 4^5 \times 4^5 = 4^{10}$$

$$(5^2)^5 =$$

## Using letters as well as numbers

$$axaxaxaxa = a^8$$

$$b^0 = 1$$

$$d^2 \times d^7 = d^9$$

$$\frac{cxcxcxcxc}{cxc} = c^3$$

$$cxc = c^3$$

$$e^{-2} = \frac{1}{e^2}$$

## Simplifying expressions

$$3n \times 5n^2 = 15n^3$$

$$2a^3 \times 7a^5 = 14a^8$$

$$4b \times 5b^3 \times b^9 = 20b^{13}$$

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## Dividing Terms

$$\frac{\cancel{a} \times \cancel{a} \times \cancel{b} \times \cancel{c} \times \cancel{c}}{\cancel{a} \times \cancel{b} \times \cancel{c}} = ac$$

$$a^3 \div a^2 = \frac{a \times a \times a}{a \times a} = a$$

$$b^7 \div b^2 = \frac{b \times b \times b \times b \times b \times b \times b}{b \times b} = b^5$$

$$7^{11} \div 7^4 =$$

page 195 E2, E4

E1, E3, E5 onwards

Evens only

## Negative powers

$$101^{-1} = \frac{1}{101}$$

$$11^{-2} = \frac{1}{11^2} = \frac{1}{121}$$

$$7^{-2} = \frac{1}{7^2} = \frac{1}{49}$$

$$5^{-3} = \frac{1}{5^3} = \frac{1}{125}$$

$$2^{-5} = \frac{1}{2^5} = \frac{1}{32}$$

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## More Simplifying expressions

$$10n^4 \div 5n^2 =$$

$$21a^3 \div 7a =$$

$$5b^3 \div b^3 =$$

$$15a^2 \div 3a^3 =$$

$$\frac{20a^4}{5a}$$

$$\frac{10a^5}{30a}$$

$$\frac{6b^3}{7b^5}$$

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$$9^4 \times 9^{-3}$$

$$3^7 \times 3^3$$

$$5^6 \div 5^4$$

Work out :

$$4^{-1}$$

$$5^3$$

$$10^6$$

$$6^2$$

$$4^2 \times 4^{-3}$$

$$23^0$$

$$(2^3)^2$$

$$\begin{array}{ll}
 2^8 = 256 & 2^1 = 2 \\
 2^4 = 16 & 2^{\frac{1}{2}} = \sqrt{2} \\
 2^2 = 4 & 2^{\frac{1}{4}} = \sqrt[4]{2} \\
 & 2^{\frac{1}{8}} = \sqrt[8]{2}
 \end{array}$$

Alternative: Ede

### Fractional Powers

$$\left. \begin{array}{l}
 4^{1/2} \times 4^{1/2} = 4^1 = 4 \\
 2 \times 2 = 4
 \end{array} \right\}$$

$$\left. \begin{array}{l}
 25^{1/2} \times 25^{1/2} = 25^1 \\
 5 \times 5 = 25
 \end{array} \right\}$$

$a^{1/2}$  means  $\sqrt{a}$   
 $a^{1/3}$  means  $\sqrt[3]{a}$

Work out:  $8^{1/3} = \sqrt[3]{8} = 2$

$$16^{1/2} = \sqrt{16} = 4$$

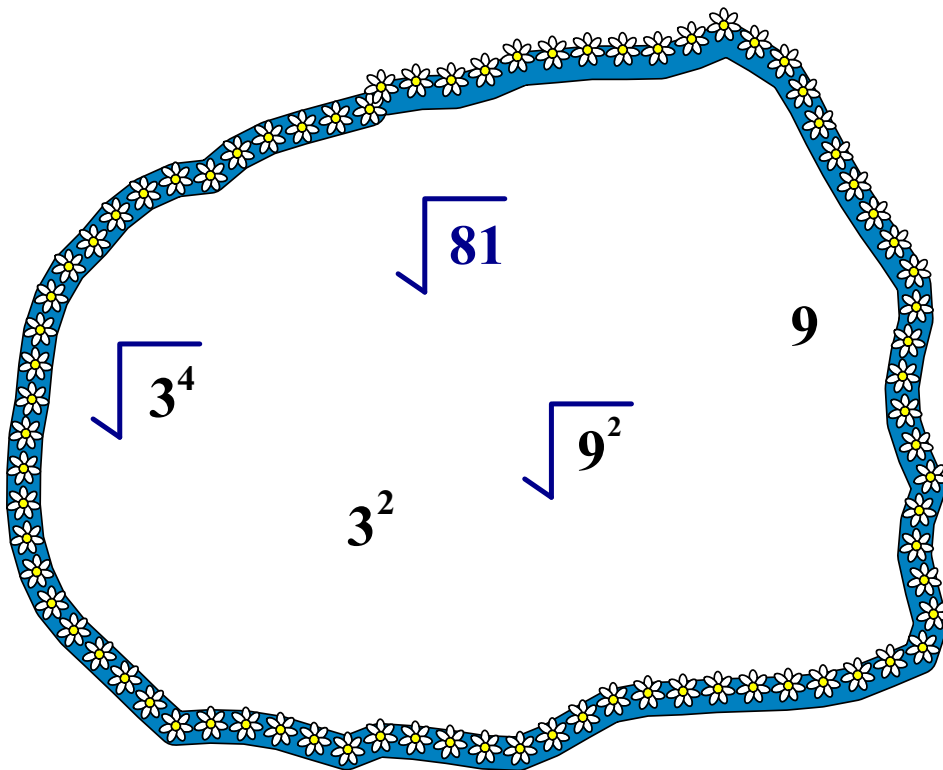
$$125^{1/3} = \sqrt[3]{125} = 5$$

$$144^{1/2} = \sqrt{144} = 12$$

$$16^{1/4} = \sqrt[4]{16} = 2$$

$$9^{-1/2} = \frac{1}{9^{1/2}} = \frac{1}{\sqrt{9}} = \frac{1}{3}$$

Blue higher book p182 ex 22



**fractional powers**



$$a^m \times a^n = a^{m+n}$$

$$a^m \div a^n = a^{m-n}$$

$$(a^m)^n = a^{mn}$$

Rules For Indices

$$a^{-m} = \frac{1}{a^m}$$

$$a^{\frac{1}{m}} = \sqrt[m]{a}$$

Fractional powers

## Attachments

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