

see ppt1

### Patterns and powers

Investigating the last digit in sequences of numbers:

Consider  $2^n$

$2^n$	$2^1$	$2^2$	$2^3$	$2^4$	$2^{4n-1}$			
last digit	2	4	8	6	2	4	8	6
$2^n$ $n$	1	2	3	4	5	6	7	8

$2^{4n} = \{d=6\}$   
 $2^{4n-1} \quad ld=8$

What will be the last digit of:

- a)  $2^{20}$     b)  $2^{24}$     c)  $2^{19}$     d)  $2^{101}$
- 6    6    8    2

Consider  $7^n$

$7^n$	$7^1$	$7^2$	$7^3$	$7^4$	$7^{4n}$			
last digit	7	9	3	1	7	9	3	1

$7^{4n} \quad ld=1$

What will be the last digit of:

- a)  $7^{20}$     b)  $7^{27}$     c)  $7^{89}$     d)  $7^{901}$
- 1    3    7    7

Consider  $5^n$

$5^n$	$5^1$	$5^2$	$5^3$	$5^4$
last digit	5	5	5	5

What will be the last digit of:

- a)  $5^{20}$     b)  $5^{24}$     c)  $5^{19}$     d)  $5^{90101}$

## Indices

Evaluate (without a calculator)

$$2^6 = 64 \quad 7^{-2} = \frac{1}{49} \quad 10^7 = 10\,000\,000$$

$$5^{-1} = \frac{1}{5} \quad 3^4 = 81 \quad 8^2 = 64$$

$$9^0 = 1 \quad \begin{array}{r} 9^2 = 81 \\ 9 = 9 \\ 9^0 = 1 \end{array} \quad \begin{array}{l} \downarrow \div 9 \\ \downarrow \div 9 \end{array}$$

Revision of year 9 work: page 32,33  
odds only,  
If you finish: A12.

p101

## Revision of prime factorisation

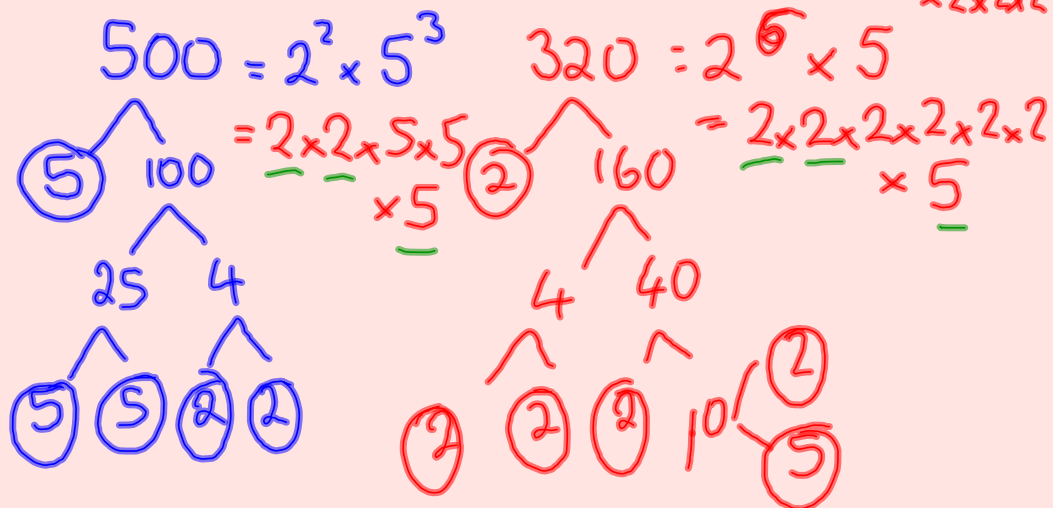
Find the HCF and LCM of the following pairs of numbers:

- |                |          |           |
|----------------|----------|-----------|
| 1) 6 and 10    | HCF = 2  | LCM = 30  |
| 2) 30 and 40   | HCF = 10 | LCM = 120 |
| 3) 100 and 120 | HCF = 20 | LCM = 600 |
| 4) 19 and 21   | HCF = 1  | LCM = 399 |
| 5) 45 and 105  | HCF = 15 | LCM = 315 |

Express 500 and 320 as product of their primes.

$$\rightarrow \text{HCF} = 2 \times 2 \times 5 = 20$$

What is their HCF and LCM? =  $2 \times 2 \times 5 \times 5 \times 5 \times 2 \times 2 \times 2 \times 2$



For Tuesday

page 34 and 35 odds only

B10 ext

Work out :

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

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

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

$$= 59049$$

$$\frac{5 \times 5 \times 5 \times 5 \times 5 \times 5 \times 5}{5 \times 5 \times 5 \times 5}$$

$$5^6 \div 5^4 = 5^2 = 25$$

$$5^3 = 125 \quad 10^6 = 1000000$$

$$6^2 = 36$$

$$23^0 = 1 \quad 4^2 \times 4^{-3} = \frac{1}{4}$$

Pge 54

What do you think this means?

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

Simplify these numbers and express your answer in index form:

$$(4^2)^3 = 4^6 \quad (7^3)^0 = 7^0 \quad (11^5)^3 = 11^{15}$$

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

$$11^3 \times 11^5 \\ = 11^8$$

$$13^7 \div 13^4 \\ = 13^3$$

What about

$$a \times b \times a \times a \times b \times a = a^4 b^2$$

$$3 \times \cancel{m} \times \cancel{n} \times \cancel{m} \times \cancel{m} \times \cancel{m} \times \cancel{n} \times \cancel{n} \times \cancel{n} \times \cancel{n} \times 2 = 6m^4n^5$$

$$6 \times m^4 \times n^5$$

$$6n^5m^4$$

page 36 and 37 odds only

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### Rules For Indices

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

*(add the powers)*

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

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

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

$$a^0 = 1$$

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

One more to come!  
Can you contain your excitement?

pages 39-41  
odds only

## Fractional powers

$$4^4 = 256$$

$$4^2 = 16 = \sqrt{256}$$

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

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

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

$$64^{1/4} = \sqrt[4]{64} = \sqrt[2]{8} = 2$$

$$\sqrt[4]{4} = \sqrt[4]{81^{1/4}} = \sqrt[4]{81} = 3$$

add the last rule!

$$27^{1/3} = 3$$

$$8^{1/3} = \sqrt[3]{8}$$

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

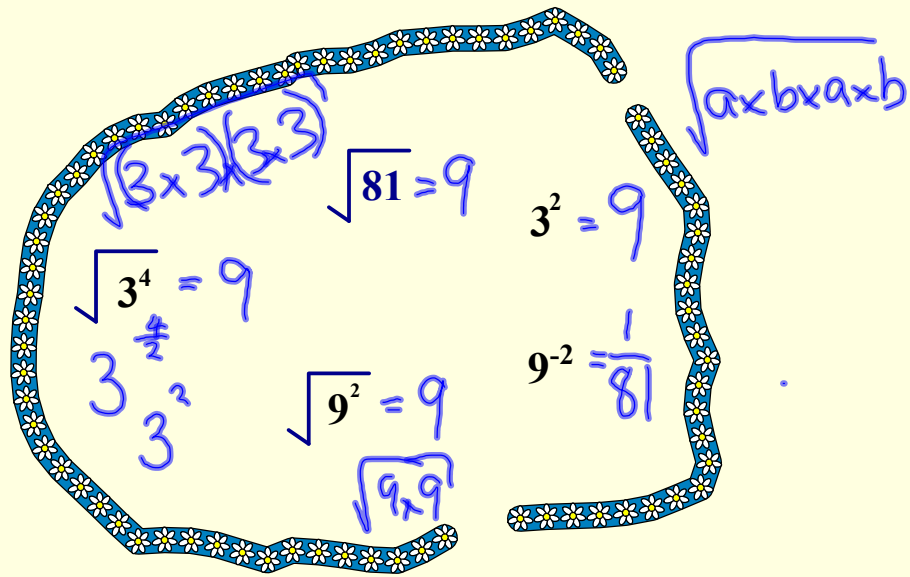
$$8^{1/3} = \sqrt[3]{8} = 2$$

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

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

$$4^{-1/2} = \frac{1}{\sqrt{4}} = \frac{1}{2}$$

$$8^{-1/3} = \frac{1}{\sqrt[3]{8}} = \frac{1}{2}$$



fractional powers

a)  $16^{\frac{1}{2}} = 4$

b)  $100^{-\frac{1}{2}} = \frac{1}{\sqrt{100}} = \frac{1}{10}$

c)  $4^{\frac{3}{2}} = (\sqrt{4})^3 = 8$

d)  $8^{\frac{1}{3}} = 2$

e)  $196^{-\frac{1}{2}} = \frac{1}{14}$

f)  $27^{\frac{2}{3}} = (\sqrt[3]{27})^2 = 9$

page 394, 395 odds only


Extension

draw graphs of

$y=2^x$

$y=5^x$

Bet you can't do this one....


$$\begin{array}{l} 4 \quad 3 \quad \frac{3}{2} \\ \frac{1}{4} \quad \frac{1}{3} \\ \frac{1}{\frac{3}{2}} = \frac{2}{3} \end{array} \quad \frac{9^{-\frac{1}{2}}}{16} \quad \frac{16^{\frac{1}{2}}}{9} = \frac{4}{3}$$

Some puzzles to mull over:

$$2^a \times 3^b = 54 \quad \begin{array}{l} a=1 \\ b=3 \end{array}$$

$$2^a \times 5^b \times 7^c = 700 \quad \begin{array}{l} a=2 \\ b=2 \\ c=1 \end{array}$$

If  $10^x = 3$  and  $10^y = 7$ ,  
what is the value of  $10^{x+y}$ ?

$$10^x \times 10^y = 10^{x+y} = 3 \times 7 = 21$$

Find 2 solutions to the equation:

$$2^x = x^2 \quad x = 2 \text{ or } 4$$

Solve these equations:

a)  $\frac{1}{2}^x = 32 \quad 2^{-x} = 32 \quad \underline{\underline{x=5}}$

b)  $2^x + 3^x = 13 \quad 2^2 + 3^2 = 4 + 9 = 13$

c)  $10^x = 0.0001 \quad \boxed{x=-4}$

$$10^{\frac{1}{4}} = \sqrt[4]{10}$$

$$10^{-4} = \frac{1}{10000} = 0.0001$$

## Standard Form

Which of these numbers are written in standard form?

two hundred and four ~~32 x 10~~  $2.3 \times 10$  ✓  
 $4.7 \times 10^4$  ✓  ~~$62 \times 10^6$~~   $6.9 \times 10^{-2}$  ✓  
 ~~$0.76 \times 10^7$~~

What does  $10^{-2}$  mean?  $= \frac{1}{10^2} = \frac{1}{100}$   
 $= 0.01$

Write these numbers in standard form...

$$2600 = 2.6 \times 10^3$$

$$740 = 7.4 \times 10^2$$

$$342 = 3.42 \times 10^2$$

$$0.3 = 3 \times 10^{-1}$$

$$4 = 4 \times 10^0$$

$$0.00456$$

$$9 \text{ million } 9 \times 10^6$$

$$= 456 \times 10^{-3}$$

page 118, 119 odds only  
page 122 E1-E9  
EXT E10

On Thursday you have a  
**TEST.**

It's on everything we have  
done this term:

Solving Equations

Trial and Improvement

Sequences

Indices

Standard form.

You can have half of  
tomorrow's lesson to  
revise.

## Using a calculator for standard form.

Use your calculator to work out :

$$430000 \times 26000$$

**You cannot copy the calculator's display into your book!**

Try  
2 EXP 3

3 EXP 5

4 EXP 4

page 120,121 D2 and D3  
page 123,124 odds only

## Arithmetic and standard form

Without a calculator evaluate:

$$(2 \times 10^4) + (3.2 \times 10^3)$$

$$4 \times 10^5 \times 3 \times 10^3$$

$$6.2 \times 10^6 \div 2 \times 10^5$$

Calculate, giving your answer in standard form:

$$6.3 \times 10^3 \times 4 \times 10^5$$

$$1.2 \times 10^{-3} \div 4 \times 10^{-2}$$

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## Attachments

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indices homework.doc