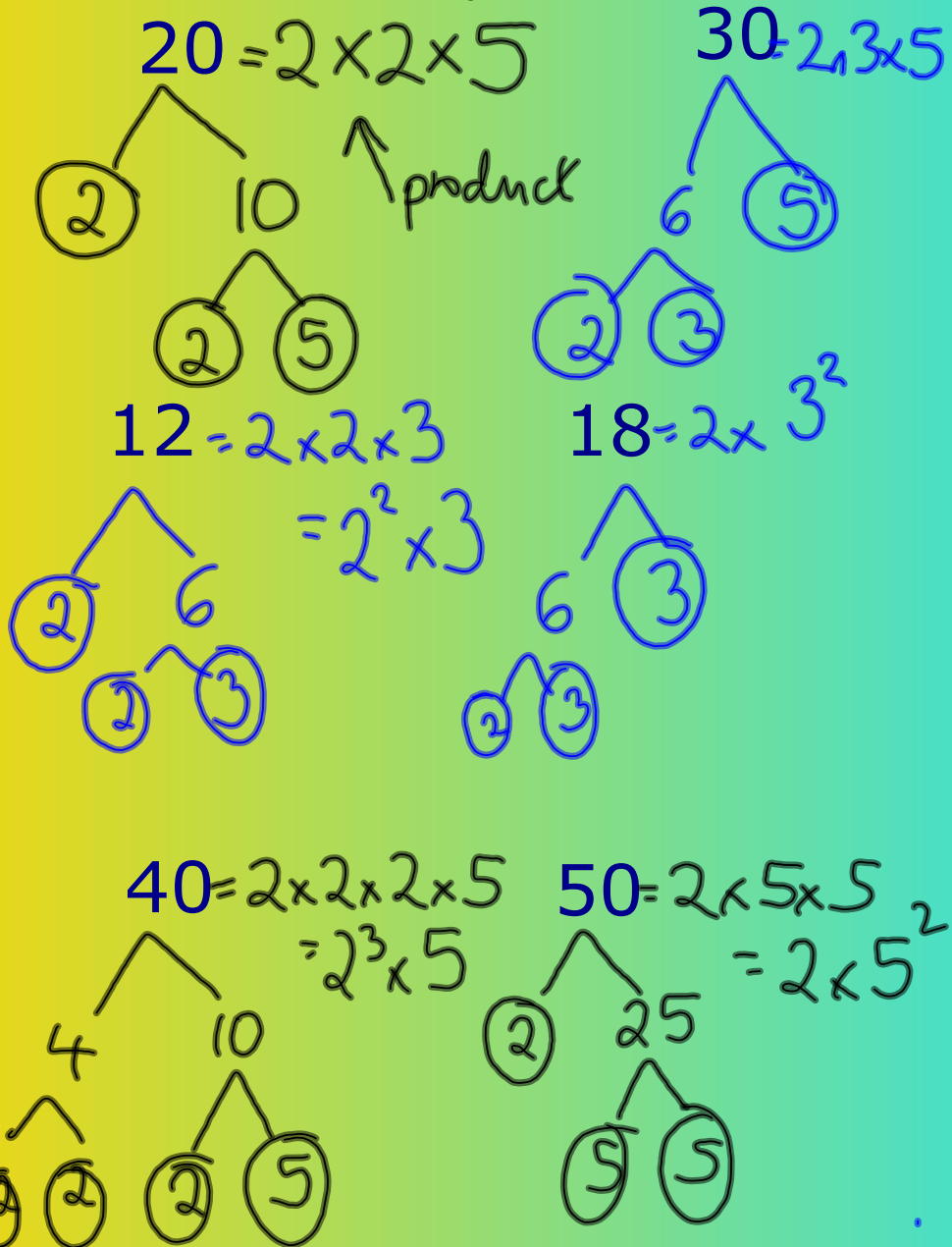


Expressing numbers as the product of their prime factors

Make a list of the first 10 prime numbers:

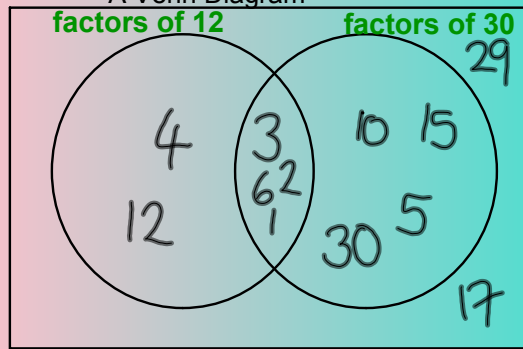
2, 3, 5, 7, 11, 13, 17, 19, 23  
29....

Factor trees: prime factors  
↓

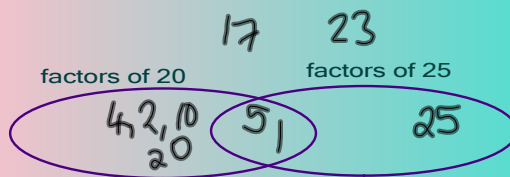


p55

A Venn Diagram



hcf



Express 42 and 60 as the product of their primes.

$$42 = 2 \times 3 \times 7$$

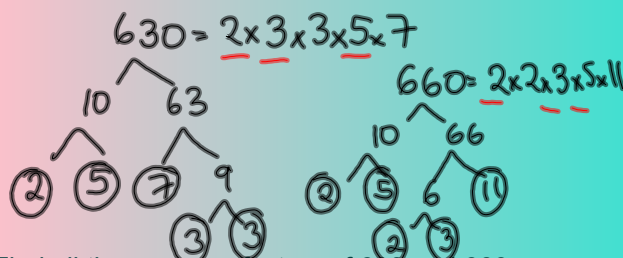
$$60 = 2 \times 2 \times 3 \times 5$$

$HCF = 2 \times 3 = 6$

HCF is the biggest number that divides into 42 and 60.

Find all the common factors of 42 and 60.  
Find the highest common factor (HCF) of 42 and 60.

Express 630 and 660 as the product of their primes.



Find all the common factors of 630 and 660.  
Find the highest common factor (HCF) of 630 and 660.

$$\underline{\underline{HCF = 2 \times 3 \times 5 = 30}}$$

Find the hcf of these numbers

$$\left. \begin{array}{l} 2 \times 2 \times 3 \times 5 \times 11 \\ 2 \times 5 \times 11 \times 13 \end{array} \right\}$$

HCF =  $2 \times 5 \times 11 = 110$

$$\left. \begin{array}{l} \underline{2} \times \underline{2} \times \underline{3} \times \underline{3} \times 5 \\ \underline{2} \times \underline{3} \times \underline{3} \times \underline{3} \times 7 \end{array} \right\}$$

HCF =  $2 \times 3 \times 3$   
 $= 18$

$$\left. \begin{array}{l} 5 \times \textcircled{7} \times 7 \times 7 \times \textcircled{11} \\ 3 \times \textcircled{7} \times \textcircled{11} \times 11 \end{array} \right\}$$

HCF =  $7 \times 11 = 77$

### Highest Common Factor

Find the hcf of

33,6

$$\text{HCF} = 3$$

27,18

$$\begin{aligned} 27 &= 3 \times 3 \times 3 \\ 18 &= 2 \times 3 \times 3 \end{aligned}$$
$$\text{HCF} = 9$$

10,12

$$\text{HCF} = 2$$

18,90

$$\text{HCF} = 18$$

Find the prime factorisation of

10 and 35.

Find the HCF.

a) Find the prime factorisation of 100 and 140.

b) Find the HCF.

$$100 = 2 \times 2 \times 5 \times 5$$

$$140 = 2 \times 2 \times 5 \times 7$$

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

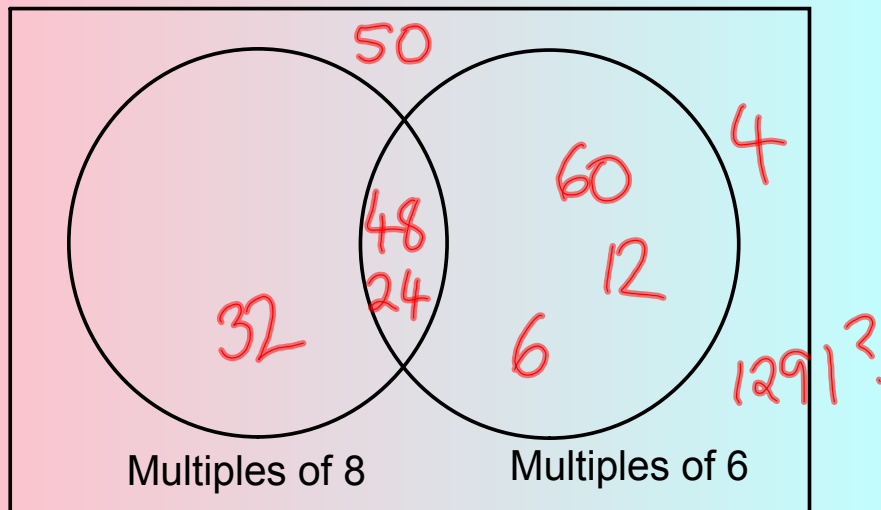
Find the prime factorisation of 105 and 140.

Find the HCF.

$$140 = 2 \times 2 \times 7 \times 5$$

$$105 = 3 \times 5 \times 7$$

$$\text{HCF} = 35$$



Lowest Common Multiple is the smallest number that both 6 and 8 divide into.

10, 25

LCM = 50

6, 10

LCM = 30

LCM=  
HCF=

15, 20

LCM = 60

4, 16

9, 12

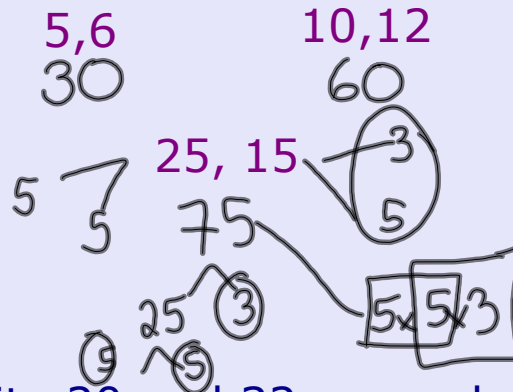
Express 6 and 8 as the product of their primes.

Find some common multiples of 6 and 8.

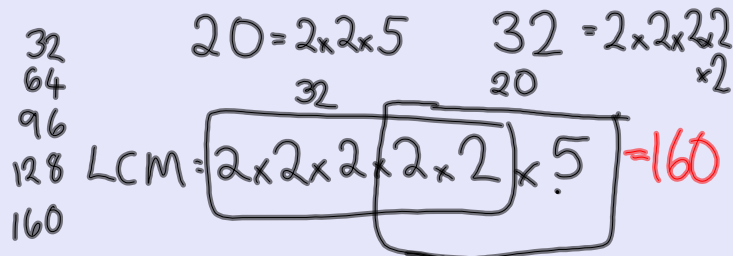
Find the lowest common multiple (LCM) of 6 and 8.

## Lowest common multiples

find the lcm of these numbers



Write 20 and 32 as products of their prime factors. Find their lcm.



$$\left. \begin{array}{l} 2 \times 5 \times 11 \\ 2 \times 2 \times 3 \times 11 \end{array} \right\} \text{LCM} = 2 \times 2 \times 3 \times 11 \times 5$$

$$\left. \begin{array}{l} 2 \times 2 \times 3 \times 3 \times 5 \\ 2 \times 3 \times 3 \times 3 \times 7 \end{array} \right\}$$

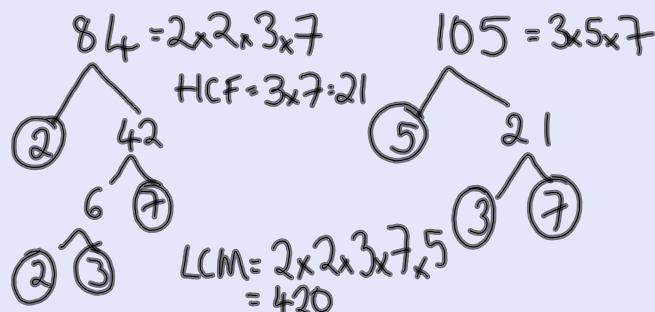
$$\left. \begin{array}{l} 5 \times 7 \times 7 \times 7 \times 11 \\ 3 \times 7 \times 11 \times 11 \end{array} \right\} \text{LCM} = 2 \times 2 \times 3 \times 3 \times 5 \times 7^3 \times 11^2 = 3780$$

$$\text{LCM} = 5 \times 7 \times 7 \times 7 \times 11 \times 3 \times 11$$

**Exam style question:**

Express 84 and 105 as products of their prime factors.

Find the HCF and LCM of 84 and 105.



page 105: E3 and E4  
Extension (B) E5-E7

A pair of numbers have HCF of 5.  
What numbers could they be?

A pair of numbers have HCF of  
12. What numbers could they be?

A pair of numbers have LCM of  
15.

What numbers could they be?

Express each pair of numbers as the product of their primes. Find the LCM and HCF for each pair.

$$1.) 8, 10$$

$$2.) 14, 20$$

$$3.) 15, 50$$

$$4.) 30, 80$$

$$5.) 45, 120$$

$$\text{EXT: } 6.) 210, 1540$$

$$7.) 3000, 780$$

$$6.) 210 = 2 \times 3 \times 5 \times 7$$

$$1540 = 2 \times 2 \times 5 \times 7 \times 11$$

$$\text{HCF} = 2 \times 5 \times 7 = 70$$

$$\text{LCM} = 2 \times 2 \times 3 \times 5 \times 7 \times 11 = 4620$$

$$7.) 3000 = 2 \times 2 \times 2 \times 3 \times 5 \times 5 \times 5$$

$$780 = 2 \times 2 \times 3 \times 5 \times 13$$

$$\text{HCF} = 2 \times 2 \times 3 \times 5 = 60$$

$$\text{LCM} = 2 \times 2 \times 2 \times 3 \times 5 \times 5 \times 5 \times 13 \neq 39000$$

Express 42 and 60 as the product of their primes.

Find some of the common multiples of 42 and 60.  
Find the Lowest Common Multiple (LCM) of 42 and 60.

Standard (index) Form

$$10^6 = 1\,000\,000$$

$$10^5 = 100\,000$$

$$10^4 = 10\,000$$

$$10^3 = 1\,000$$

$$10^2 = 100$$

$$10^1 = 10$$

$$10^0 = 1$$

$$10^{-1} = 0.1$$

$$10^{-2} = 0.01$$

p96 qu 2 -9

A number written in standard form is written as a multiple of a power of 10.

The number is of the form  $a \times 10^x$  where  $1 \leq a < 10$

Examples of numbers in standard form:

- $26000 = 2.6 \times 10^4$
- $560 = 5.6 \times 10^2$
- $3200 = 3.2 \times 10^3$
- $2300 = 2.3 \times 10^3$
- $22 = 2.2 \times 10^1$
- $4 \times 10^2$
- $4 \times 10^3$
- $3.2 \times 10^4 = 4000$
- $7.01 \times 10^9 = 7010000000$
- $9 = 9 \times 10^0 = 9$
- $0.1 = 1 \times 10^{-1}$
- $6.301 \times 10^2 = 630.1$

Which of these numbers are written in standard form?

two hundred and four

$32 \times 10$  ✓

$4.7 \times 10^4$  ✗

$0.76 \times 10^7$  ✗

$2.3 \times 10$  ✓

$62 \times 10^6$  ✗

$6.9 \times 10^{-2}$  ✓

What does  $10^{-2}$  mean?

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 =  $4 \times 10^0$

6 =  $6 \times 10^0$

9 million =  $9 \times 10^6$

0.00456 =  $4.56 \times 10^{-3}$

C1, C2 middle column  
C3, C4 last column  
C5 →

Calculations using sf

$$2 \times 10^3 \times 4 \times 10^5$$

$$6 \times 10^2 \times 4 \times 10^8$$

$$4 \times 10^4 \times 2 \times 10^3$$

Express as a ordinary number:

$$5.1 \times 10^7 \\ = 51\,000\,000$$

$$2.684 \times 10^6 \\ = 2\,684\,000$$

$$3 \times 10^4 = 30\,000$$

Express in standard form:

$$567000 = 5.67 \times 10^5$$

$$310 = 3.1 \times 10^2$$

$$9123.78 \\ = 9.12378 \times 10^3$$

### Small numbers in Standard form

Write these numbers in standard form:

$$4000 = 4 \times 10^3$$

$$400 =$$

$$40 =$$

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

$$0.4 = 4 \times 10^{-1}$$

$$0.04 = 4 \times 10^{-2}$$

$$0.004 = 4 \times 10^{-3}$$

$$32000 = 3.2 \times 10^4$$

$$3200$$

$$320$$

$$32$$

$$3.2$$

$$0.32$$

$$0.032 = 3.2 \times 10^{-2}$$

$$0.0032$$

$$0.00032$$

Write these as ordinary numbers:

a)  $4.5 \times 10^{-1}$

e)  $7.5 \times 10^{-3}$

b)  $3.6 \times 10^{-1}$

f)  $3.06 \times 10^{-1}$

c)  $4.5 \times 10^{-2}$

g)  $4.05 \times 10^{-7}$

d)  $3.6 \times 10^{-3}$

h)  $3.61 \times 10^{-6}$

Write these in standard form:

a) 0.3

e) 0.0303

b) 0.003

f) 0.0103

c) 0.13

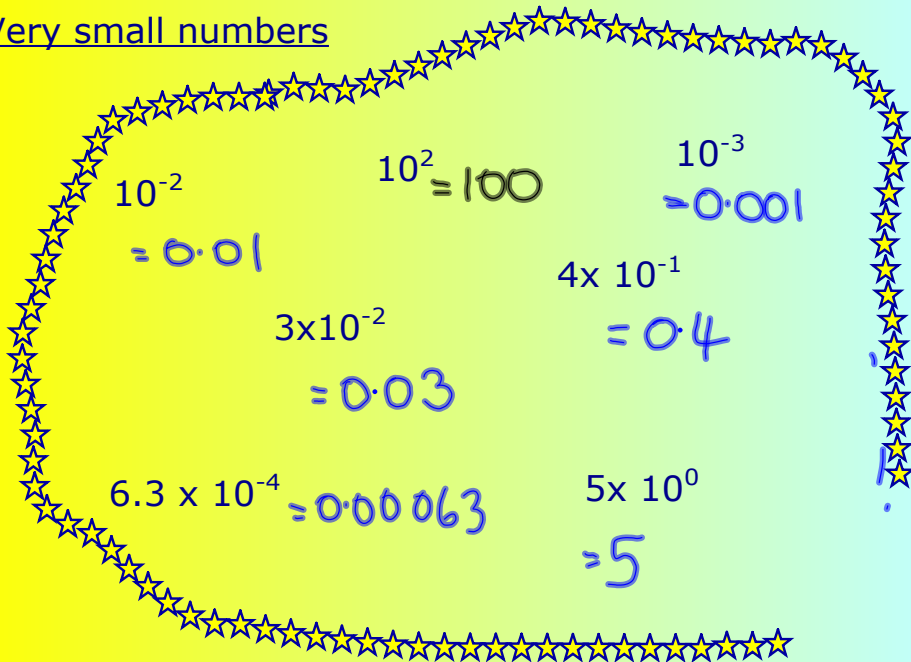
g) 0.83

d) 0.073

h) 0.0000093

Red book: page 268 ex 4

## Very small numbers


$$\begin{array}{ccc} 10^{-2} & 10^2 = 100 & 10^{-3} \\ = 0.01 & & = 0.001 \\ 3 \times 10^{-2} & & 4 \times 10^{-1} \\ = 0.03 & & = 0.4 \\ 6.3 \times 10^{-4} = 0.00063 & & 5 \times 10^0 \\ & & = 5 \end{array}$$

Write these as ordinary numbers:

a)  $4.5 \times 10^{-1} = 0.45$

b)  $3.6 \times 10^{-1} = 0.36$

c)  $4.5 \times 10^{-2} = 0.045$

d)  $3.6 \times 10^{-3} = 0.0036$

e)  $7.5 \times 10^{-3} = 0.0075$

f)  $3.06 \times 10^{-1} = 0.306$

g)  $4.05 \times 10^{-7} =$   
 $= 0.000000405$

h)  $3.61 \times 10^{-6} =$   
 $= 0.00000361$

Write these in standard form:

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

b)  $0.003 = 3 \times 10^{-3}$

c)  $0.13 = 1.3 \times 10^{-1}$

d)  $0.073 = 7.3 \times 10^{-2}$

e)  $0.0303 = 3.03 \times 10^{-2}$

f)  $0.0103 = 1.03 \times 10^{-2}$

g)  $0.83 =$

h)  $0.0000093 = 9.3 \times 10^{-6}$

Calculations using standard form

$$2 \times 10^7 \times 3 \times 10^5 = 2 \times 10000000 \times 3 \times 100000 \\ = 6 \times 10^{12}$$

$$2 \times 10^7 \times 6 \times 10^4 = 12 \times 10^{11} = 1.2 \times 10^{12}$$

$$7 \times 10^{-7} \times 3 \times 10^{11} = 21 \times 10^4 = 2.1 \times 10^5$$

$$9 \times 10^7 \times 8 \times 10^{-5} =$$

$$8 \times 10^{-4} \times 3 \times 10^5 =$$

$$\frac{6 \times 10^7}{3 \times 10^5}$$

$$\frac{8 \times 10^7}{2 \times 10^1} = \frac{10^5}{10^3} = \frac{100000}{1000}$$

$$\frac{9 \times 10^4}{3 \times 10^5} = 3 \times 10^{-1}$$

$$\frac{3 \times 10^7}{6 \times 10^5} = 0.5 \times 10^2 = 5 \times 10^1$$

$$(2 \times 10^8) \div (8 \times 10^5)$$

$$(3 \times 10^7) \div (9 \times 10^8)$$

## Rounding using significant figures

Round these numbers to 1, 2, 3 dp

	To 1sf	2sf	3sf
a) 3.4502	3	3.5	3.45
b) 34.8901	30	35	34.9
c) 89.9992	90	90	90.0
d) 301.4951	300	300	301
e) 0.00564	0.006	0.0056	0.00564

calculations practice page:

**To round to a certain number of significant figures, consider zeros**

**in front of and behind the number as useful only for place value and round appropriately.**

eg to 3 sf:

$$34056 = 34100 \text{ to 3 sf}$$

$$0.005672 = 0.00567 \text{ to 3 sf}$$

$$7.045 = 7.05 \text{ to 3 sf}$$

$$3050307 = 3050000 \text{ to 3 sf}$$

	To 1sf	2sf	3sf
a) 2.4602	2	2.5	2.46
b) 704.9901	700	700	705
<del>c) 49.9892</del>			
<del>d) 1.4951</del>			
<del>e) 0.2345</del>			
f) 0.004 532 1	0.005	0.0045	0.0043
g) 0.000 004 985			

### Using a calculator for standard form.

Use your calculator to work out :

$$430000 \times 26000 = \underline{1.118 \times 10^{10}}$$

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

$$1.118 \times 10^{10}$$

Your calculator is quite good at doing standard form!

Try

$$2 \text{ EXP } 3 = 2 \times 10^3 = 2000$$
$$3 \text{ EXP } 5 = 3 \times 10^5 = 300000$$
$$4 \text{ EXP } 4 = 4 \times 10^4 = 40000$$

On your calculator work out:

$$2 \times 10^5 \times 6 \times 10^6 = 2 \text{ exp } 5 \times 6 \text{ exp } 6$$
$$= 1.2 \times 10^{12}$$

$$2 \times 10^5 + 6 \times 10^6 = 6200000$$
$$= 6.2 \times 10^6$$

$$230000^2 = 5.29 \times 10^{10}$$

page 347

Show hwk presentations

Exam questions page 352

## Attachments

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indices homework.doc

standard form video.wmv