<u>Expressing numbers as the product of their prime factors</u>

Make a list of the first 10 prime numbers:

$18 = 2 \times 9$
$\quad = 2 \times 3 \times 3$
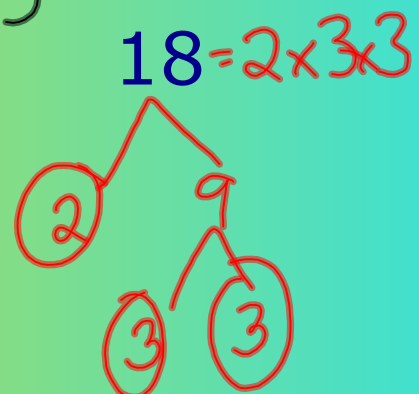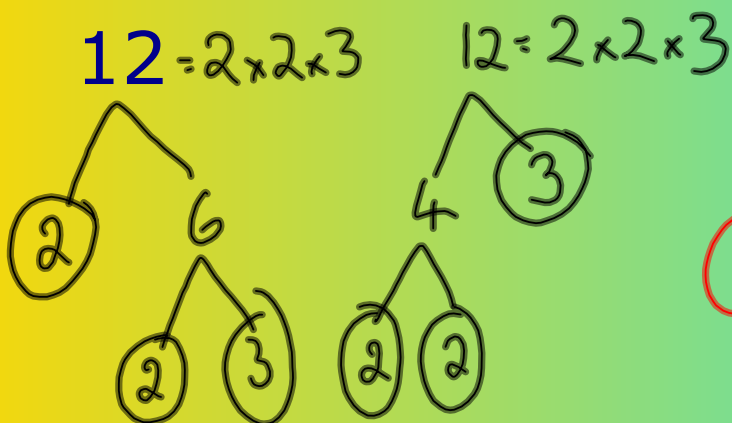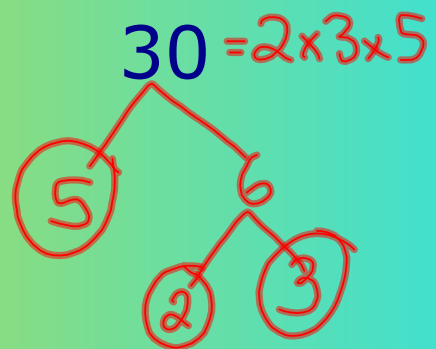
$2, 3, 5, 7, 11, 13, 17, 19, 23$

$4 = 2^2$

$29 \ldots$
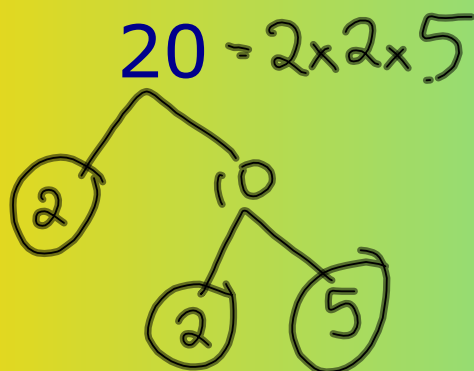
$27 = 3 \times 3 \times 3 = 3^3$

Factor trees:

$20 = 2 \times 2 \times 5$

$30 = 2 \times 3 \times 5$

$12 = 2 \times 2 \times 3$

$12 = 2 \times 2 \times 3$

$18 = 2 \times 3 \times 3$

40
$\quad = 2 \times 2 \times 5 \times 2$
$\quad = 2^3 \times 5$

$50 = 2 \times 5 \times 5$

5

p55

A Venn Diagram

factors of 12   factors of 30

9

12

4

1
2
3
6

30

5 15

10

8

10 ²

29

𝜋

HCF

FACTORS OF 20   FACTORS OF 25

10 2   20

4

1
5

25
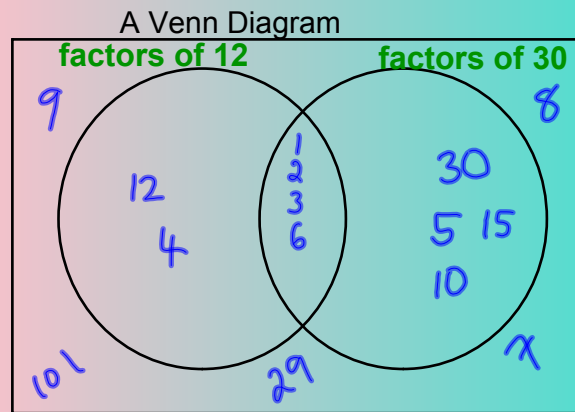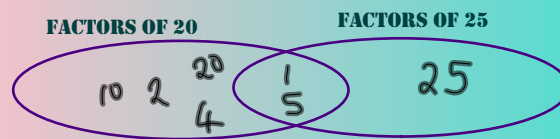
Express 42 and 60 as the product of their primes.

$$42 = 3 \times 2 \times 7 \qquad 60 = 2 \times 2 \times 3 \times 5$$

$$HCF = 3 \times 2 = 6$$

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.

$$630 = 2 \times 3 \times 3 \times 7 \times 5$$

$$660 = 2 \times 2 \times 3 \times 5 \times 11$$

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

$$2 \times 3 \times 3 \times 5 \times 7 \times = 30 ✓$$

Find the hcf of these numbers

2x2x3x5x11
2x5x11x13
        HCF = 2×5×11
             = 110

2x2x3x3x5
2x3x3x3x7

        HCF
        =2×3×3
        = 18

5x7x7x7x11
3x7x11x11
        HCF
        =77

<u>Highest Common Factor</u>

Find the hcf of

33,6   HCF = 3

27,18   HCF = 9

10,12   HCF = 2

18,90   HCF = 18

$$\begin{array}{r} 180\!\!\!\!\!\!\!/ \\ \div 2 \\ \hline 90 \end{array}$$
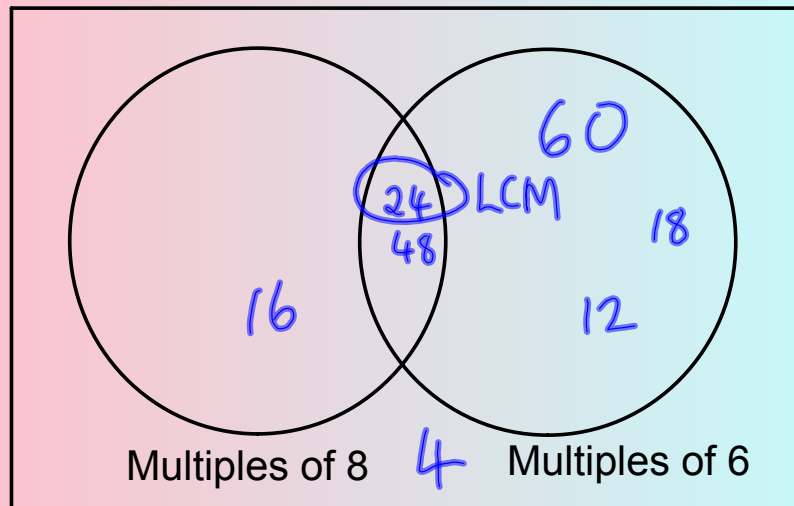
Find the prime factorisation of

10 and 35.

Find the HCF.

Find the prime factorisation of 100 and 140.

Find the HCF.

$$100 = 2 \times 2 \times 5 \times 5$$
$$140 = 2 \times 2 \times 5 \times 7$$

$$HCF = 2 \times 2 \times 5$$
$$= 20.$$

Find the prime factorisation of 105 and 140.

Find the HCF.

page 104 E1 and E2

<u>Multiples</u>

60

(24) LCM

48   18

16   12

Multiples of 8   4   Multiples of 6

10, 25

LCM = 50
HCF = 5

LCM=
HCF=

6, 10

LCM : 30
HCF = 2

15, 20

HCF = 5
LCM = 60
(120)

4, 16   HCF = 4
LCM : 16

9, 12

HCF = 3
LCM = 36

Express 6 and 8 as the product of their primes.

$6 = 2 \times 3$

$8 = 2 \times 2 \times 2$

$HCF = 2$ $LCM = 2 \times 2 \times 2 \times$

$= 24$

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

5,6   10,12

25, 15

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

2x5x11
2x2x3x11 } LCM= 2x2x3x11x5

2x3x3x3x7x2=5 LCM { 2x2x3x3x5
                     2x3x3x3x7

5x7x7x7x11
3x7x11x11 } LCM= 5x7x7x7x11x3x1

Exam style question:
Express 84 and 105 as products of their prime factors.
Find the HCF and LCM of 84 and 105.

84 = 2 x 2 x 3 x 7   HCF = 3x7 = 21
105 = 3 x 5 x 7   LCM = 2x2x3x7x5
                            = 420

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.

For Wednesday

1. 8, 10   2. 14, 20

3. 15, 50   4. 42, 60

5. 450, 120   EXT:6. 210, 1540

6. 210= 2x3x5x7   1540=2x2x5x7x11
HCF= 2x5x7=70
LCM= 2x2x3x5x7x11=4620

7. 3000=2x2x2x3x5x5x5   780=2x2x3x5x13
HCF= 2x2x3x5=60
LCM= 2x2x2x3x5x5x5x13 !!= 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.

<u>**Standard (index) Form**</u>

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

$10^5 = 100\,000$

$10^4 = 10\,000$

$10^3 = 1000$

$10^2 = 100$

$10^1 = 10$

$10^0 = 1$

$10^{-1} = 0.1$

$10^{-2} = 0.01$

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 x 10^x where $1 \leq a < 10$

$26000 = 2.6 \times 10^4$

$560 = 5.6 \times 10^2$

$22 = 2.2 \times 10$ 2300
$= 2.3 \times 10^3$

$4 \times 10^3 = 4000$ 7.01×10^9
$= 7010000000$

$3.2 \times 10^4 = 32\,000$

$6.3001 \times 10^2 = 630.01$

9×1

Which of these numbers are written in standard form?

two hundred and four

32×10 ✗

2.3×10

4.7×10^4 ○

62×10^6 ✗

0.76×10^7 ✓

6.9×10^{-2} ✓

✗

Write these numbers in standard form...

2600

$= 2.6 \times 10^3$

342

$= 3.42 \times 10^2$

$740 = 7.4 \times 10^2$

$4 = 4 \times 10^0$

9 million

$= 9 \times 10^6$

0.00456

Calculations using sf

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

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

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

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Standard form

Express as a ordinary number:

2.684×10^6

5.1×10^7

2684000

$= 51\,000\,000$ 3×10^4 $= 30\,000$

Express in standard form:

$567000 = 5.67 \times 10^5$

$310 = 3.1 \times 10^2$ $9123.78 = 9.12378 \times 10^3$

<u>Small numbers in Standard form</u>

Write these numbers in standard form:

$4000 = 4 \times 10^3$ 32000

$400 = 4 \times 10^2$ 3200

$40 = 4 \times 10$ $\dfrac{4}{100}$ 320

$4 = 4 \times 10^0$ 32 $\dfrac{1}{10} \times 4$

$0.4 = 4 \times 10^{-1}$ 3.2

$0.04 = 4 \times 10^{-2}$ 0.32 $\dfrac{1}{10} = \dfrac{1}{100}$

$0.004 = 4 \times 10^{-3}$ 0.032

0.0032

0.00032

Write these as ordinary numbers:

a) $4.5 \times 10^{-1} = 0.45$ e) $7.5 \times 10^{-3} = 0.0075$

b) $3.6 \times 10^{-1} = 0.36$ f) $3.06 \times 10^{-1} = 0.306$

c) $4.5 \times 10^{-2} = 0.045$ g) $4.05 \times 10^{-7} = 0.000000405$

d) $3.6 \times 10^{-3} = 0.0036$ h) $3.61 \times 10^{-6} = 0.00000361$

Write these in standard form:

a) $0.3 = 3 \times 10^{-1}$ e) $0.0303 = 3.03 \times 10^{-2}$

b) $0.003 = 3 \times 10^{-3}$ f) $0.0103 = 1.03 \times 10^{-2}$

c) $0.13 = 1.3 \times 10^{-1}$ g) $0.83 = 8.3 \times 10^{-1}$

d) $0.073 = 7.3 \times 10^{-2}$ h) $0.0000093 = 9.3 \times 10^{-6}$

Red book: page 268 ex 4

Calculations using standard form

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

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

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

$9 \times 10^7 \times 8 \times 10^{-5} = 72 \times 10^2 = 7.2 \times 10^3$

$8 \times 10^{-4} \times 3 \times 10^5 = 24 \times 10^1 = 2.4 \times 10^2$

$\dfrac{6 \times 10^7}{3 \times 10^5} = 2 \times 10^2$ $\dfrac{8 \times 10^7}{2 \times 10^1} = 4 \times 10^6$

$\dfrac{9 \times 10^4}{3 \times 10^5}$ $\dfrac{3 \times 10^7}{6 \times 10^5}$

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

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

<u>Very small numbers</u>

$10^{-2} = \dfrac{1}{10^2} = 0.01$

$10^2 = 100$

$10^{-3} = \dfrac{1}{1000} = 0.001$

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

$3 \times 10^{-2} = 0.03$

$6.3 \times 10^{-4} = 0.00063$

$5 \times 10^0 = 5$

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

b) 0.003

c) 0.13

d) 0.073

e) 0.0303

f) 0.0103

g) 0.83

h) 0.0000093

<u>Rounding using significant figures</u>

Round these numbers to 1, 2, 3 dp

	To 1dp	2dp	3dp
a) 3.4502	3·5	3·45	3·450
b) 34.8901	34·9	34·89	34·890
c) 89.9992	90·0	90·00	89.999
d) 301.4951	301·5	301·50	301·495
e) 0.00564	0·0	0·01	0·006

calculations practice page:

To round to a certain number of significant figures, consider zeros
infront of and behind the number as useful only for place value and round appropriately.

eg to 3 sf:

34056 = 34100 to 3 sf

0.005672 = 0.00567 to 3 sf

7.045 = 7.05 to 3 sf

3050307 = 3050000 to 3 sf

	To 1sf	2sf	3sf
a) 2.4602	2	2·5	2·46
b) 704.9901 707·99	700	700 710	705
c) 49.9892	50	50	50·0
d) 1.4951	1	1·5	1·50
e) 0.2345	0·2	0·23	0·235
f) 0.004 532 1	0·005	0·0045	0·00453
g) 0.000 004 985			

Using a calculator for standard form.

Use your calculator to work out :

430000x 26000 $= 1.118 \times 10^{10}$ ✓

You cannot copy the calculator's display into your book! 1.118^{10} ✗

Your calculator is quite good at doing standard form!

Try $x 10^x$

2 EXP 3 $= 2000$ 2×10^3

3 EXP 5 $= 300000$ 3×10^5

4 EXP 4 $= 40\ 000$ 4×10^4

On your calculator work out:

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

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

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

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

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Exam questions page 352