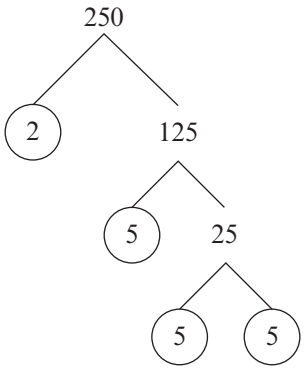
# Workbook answers

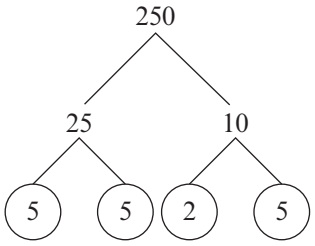
## Exercise 1.1

**1 a**




**b** No. The 125 can only become $5 \times 25$ and 25 as a factor of primes must be $5 \times 5$.

**c**




**d** $250 = 2 \times 5^3$

**2 a & b** Many trees are possible but all end with 2, 2, 3, 5, 5.

**c** $300 = 2^2 \times 3 \times 5^2$

**3 a i** $2 \times 3$ **ii** $2 \times 3 \times 5$

**iii** $2 \times 3 \times 5 \times 7$

**b** $2 \times 3 \times 5 \times 7 \times 11 = 2310$; multiply the last number by the next prime

**4 a** 42

**b** 1764

**c** 74 088

**5 a** Many trees are possible

**b** $8712 = 2^3 \times 3^2 \times 11^2$

**6 a** $96 = 2^5 \times 3$

**b** 97 is a prime number

**c** $98 = 2 \times 7^2$

**d** $99 = 3^2 \times 11$

**7 a** $70 = 2 \times 5 \times 7$

**b** $70^2 = 2^2 \times 5^2 \times 7^2$

**c** $70^3 = 2^3 \times 5^3 \times 7^3$

**8 a i** $3^2$ **ii** $2^2 \times 3^2$

**iii** $3^4$ **iv** $2^4 \times 3^2$

**v** $3^2 \times 5^2$ **vi** $2^6 \times 3^2$

**vii** $5^4$ **viii** $7^4$

**b** There is an even number of each prime factor.

**c** Using the result of part b, it is the square of $2^2 \times 3 \times 5 \times 7$.

**9 a** $3^2 \times 7 = 63$

**b** $3 \times 5 = 15$

**c** $2^2 \times 3 = 12$

**10 a** 360 **b** 300 **c** 1800

**11 a** $104 = 2^3 \times 13$

**b** $130 = 2 \times 5 \times 13$

**c** 26

**d** 520

**12 a** $135 = 3^3 \times 5$

**b** $180 = 2^2 \times 3^2 \times 5$

**c** 45

**d** 540

**13 a** $343 = 7^3$

**b** $546 = 2 \times 3 \times 7 \times 13$

**c** 7

**d** 26 754

**14** 630

**15 a** 24 **b** 1848

**16 a** $48 = 2^4 \times 3$ and $25 = 5^2$; there are no common prime factors, therefore the LCM is 1.

**b** 1200

**17** 18 and 24

## Exercise 1.2

**1** $-1\times-4=4$; $-3\times-4=12$; $-5\times-4=20$

**2** **a** $-40$ **b** 40 **c** 99 **d** 120

**3** A, B, D, F in one group and C, E in the other

**4**

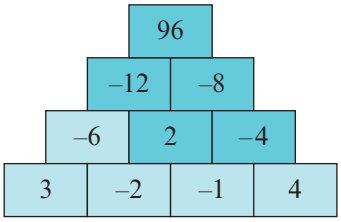
| × | 2 | −4 | −9 |
|---|---|---|---|
| −6 | −12 | 24 | 54 |
| 5 | 10 | −20 | −45 |
| −8 | −16 | 32 | 72 |

**5** **a** 35 **b** −5 **c** 35 **d** 5

**6** **a** 24 **b** −66 **c** 81 **d** 16

**7** $(-6)^2+(-8)^2-(-10)^2=36+64-100=0$

**8** **a**




**b** If 3 and −2 are swapped and −1 and 4 are swapped, then the top number will be 3456.

**9** **a** $1\times-6$ or $-1\times6$ or $2\times-3$ or $-2\times3$

**b** $1\times6$ or $-1\times-6$ or $2\times3$ or $-2\times-3$

**10** **a** $63\div-9=-7$ or $63\div-7=-9$

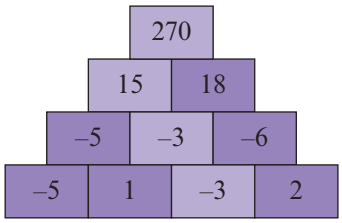
**b** $-84\div12=-7$ or $-84\div-7=12$

**11** **a** −6 **b** 5 **c** −9 **d** 13

**e** −12

**12** **a** −3 **b** 2 **c** −8 **d** −4

**13**




**14** **a** −6 **b** 12 **c** −12 **d** 8

**15** **a** 32 **b** −40 **c** −4 **d** −5

**16** **a** True. $-3\times(-6\times-4)=-3\times24=-72$ and $(-3\times-6)\times-4=18\times-4=-72$

**b** False. $-24\div(-4\div-2)=-24\div2=-12$ and $(-24\div-4)\div-2=6\div-2=-3$

## Exercise 1.3

**1** **a** 196 **b** 196 **c** 400 **d** 900

**2** **a** 64 **b** −216 **c** −1000 **d** 0

**3** **a** impossible **b** −4

**c** −5 **d** −9

**4** **a** $x=5$ or $-5$ **b** $x=15$ or $-15$

**c** $x=9$ or $-9$ **d** no solution

**5** **a** $x=6$ **b** $x=-6$

**c** $x=-10$ **d** $x=-20$

**6** **a** $x=23$ or $-23$ **b** no solution

**c** $x=23$ **d** $x=-23$

**7** **a** true **b** false **c** true

**d** true **e** true

**8** **a**

| $x$ | −3 | −2 | −1 | 0 | 1 | 2 |
|---|---|---|---|---|---|---|
| $x^2+x$ | 6 | 2 | 0 | 0 | 2 | 6 |
| $x^3+x$ | −30 | −10 | −2 | 0 | 2 | 10 |

**b** **i** $x=-2$ or 1

**ii** $x=1$

**9** **a** Yes. If $x=5$ then $x^3-x=5^3-5=125-5=120$

**b** No. If $x=-5$ then $x^3-x=-125--5=-120$

**10** **a** $64=2^6$

**b** $2^6=\left(2^3\right)^2=8^2$ and $\left(2^2\right)^3=4^3$

**c** $729=3^6$

**d** $3^6=\left(3^3\right)^2=27^2$ and $\left(3^2\right)^3=9^3$

**e** 1 is both a square number and a cube number. So is $4^6=4096$ or $5^6=15\,625$; other answers are possible.

**11** $x^6=64$

So $(x^3)^2=64$

So $x^3=8$ or $-8$

If $x^3=8$ then $x=2$

If $x^3=-8$ then $x=-2$

There are two possible answers, $x=2$ or $-2$

## Exercise 1.4

**1** **a** $3^3$ **b** $7^4$ **c** $12^6$ **d** $15^5$

**2** **a** $6^6$ **b** $10^7$ **c** $3^9$ **d** $14^7$

**3** **a** $2^0+2^1+2^2+2^3=1+2+4+8=15=16-1=2^4-1$

**b** $2^6-1$

**c** No. $3^0+3^1+3^2+3^3=1+3+9+27=40$ and $3^4-1=81-1=80$ so they are not equal.

**4** **a** $5^6$ **b** $15^6$ **c** $7^9$ **d** $3^{20}$

**5** **a** $2^2$ **b** $2^6$ **c** $3^6$

**6** **a** $5^8$ **b** $5^{12}$ **c** $5^{16}$

**7** **a** $4^3$ **b** $7^2$

**c** $15^3$ **d** $15^0$ or 1

**8** **a** $8^2$ **b** $5^4$ **c** $2^8$ **d** $3^3$

**e** $12^0$ or 1

**9** **a** $6^3$ **b** $6^4$ **c** $6^8$ **d** $6^6$

**10** **a** $2^7$ **b** $3^3$

**c** $2^4$ or $4^2$ **d** $3^0$ or 1

**11** **a** $5^3$ **b** $5^6$ **c** $5^{12}$

**12** **a** $12^8$ **b** $12^{12}$ **c** $12^2$

**13** No, Marcus is not correct.

$2^4=2\times2\times2\times2=16$ and $4^2=4\times4=16$ so these are equal.

However $3^4=3\times3\times3\times3=81$ and $4^3=4\times4\times4=64$ and these are not equal.

## Exercise 2.1

**1** **A** and **ii**, **B** and **vi**, **C** and **v**, **D** and **iii**, **E** and **iv**, **F** and **i**

**2** **a** 3 books: $3\times2=6$

**b** 5 books: $5\times2=10$

**c** 8 books: $8\times2=16$

**d** $x$ books: $x\times2=2x$

**e** $y$ books: $y\times2=2y$

**f** $b$ books: $b\times2=2b$

**3** **a** 4 sweets: $4\div2=2$

**b** 10 sweets: $10\div2=5$

**c** 12 sweets: $12\div2=6$

**d** $x$ sweets: $x\div2=\frac{x}{2}$

**e** $y$ sweets: $y\div2=\frac{y}{2}$

**f** $s$ sweets: $s\div2=\frac{s}{2}$

**4** **a** $c-2$ **b** $c+2$

**c** $\frac{c}{2}$ **d** $2c$

**5** **A** and **v**, **B** and **i**, **C** and **vi**, **D** and **ii**, **E** and **iv**, **F** and **iii**

**6** **a** $7n+4$ **b** $\frac{n}{6}-8$

**c** $\frac{n+4}{5}$ **d** $\frac{n-4}{5}$

**7** **a** Equivalent to $\frac{7x}{8}$ are: **A**, **E**, **F**, **G**, **J**

Equivalent to $\frac{x+7}{8}$ are: **D**, **I**

Equivalent to $x+\frac{7}{8}$ are: **C**, **H**

**b** **B** $\frac{x-7}{8}$

**8** The answer to a is incorrect. It should be $\frac{x}{5}+7$

The answer to b is correct

**9** **a** **i** $\frac{x}{4}+5$ or $\frac{1}{4}x+5$ **ii** $\frac{3x}{5}-2$ or $\frac{3}{5}x-2$

**iii** $1+\frac{x}{2}$ or $1+\frac{1}{2}x$ **iv** $11-\frac{5x}{6}$ or $11-\frac{5}{6}x$

**b** **i** half of $x$ subtract 9

**ii** two-thirds of $x$ add 10

**iii** 25 subtract two-ninths of $x$

**iv** 12 add seven-tenths of $x$

**10** **a** perimeter $=16w+2v+6$ cm
area $=8vw+24w$ cm$^2$

**b** perimeter $=18x+\frac{5}{4}y$ cm

area $=\frac{45}{8}xy$ cm$^2$

**11** $\frac{5}{2}a-\frac{3}{2}b$