**1.1 WORKING with SURDS**

**1.** **(g)** 2√15 **(h)** 6√2 **(i)**  10√3 **(j)**  3√3 **(k)** 4√6 **(l)**  4√3

**2**. **(g)**  9√3 **(h)**  40√3 **(i)**  12√3 **(j)**  9√5 **(k)**  6√7 **(l)**  8√5

**3.**  **(d)** 4√6 **(e)** 9√3 **(f)** 6√6

**4. d)** 8√2 **(e)** 6√5 **(f)** 5√6 **(g)** 3√5 **(h)** 7√10 **(i)** 3√2

**5.**  **(d)** *a* **(e)** 6 **(f)** *c* **(g)** *k* **(h)** 3√2 **(i)** 4

**6.** **(e)** 3√10 **(f)** 18√2 (**g)** 16√6 **(h)** 15√15

**7.**  **(e)** 2 **(f)**  **(g)**  **(h)** 

**8.**  **(d)** 5√2 + 2 **(e)** 3√2 + 2√3 **(f)**  4√6 + 2√3

**9.** **(d)** 2 **(e)** – 1 **(f)** 1

**10.** **(e)**  **(f)**  **(g)**  **(h)** 

**11.** **(e)**  **(f)**  **(g)**  **(h)** 

**12**. **(e)**   **(f)**  **(g)**  **(h)** 

**13.** **(e)**  **(f)**  **(g)**  **(h)** 

**14.** **(e)**  **(f)**  **(g)**  **(h)** 

**1.2 INDICES**

**1**. **(e)** 77 **(f)** 58 **(g)** 98 **(h)** 613 **(i)** *x*8 **(j)** *c*11

**(k)** *a*14 **(l)** *y*10

**2**. **(e)** 204 **(f)** 84 **(g)** 315 **(h)** 42 **(q)**  **(r)** 6

 **(s)**  **(t)** 1

**3**. **(e)** 415 **(f)** 1 **(g)** 129 **(h)** 525 **(i)** *x*8 **(j)** *y*40

**(k)** *a*21 **(l)** *m*16

**4**. **(e)** *a*4*b*4 **(f)** *x*7*y*7 **(g)** *w*5*z*5 **(h)** *s*3*t*3  **(m)** 1000*x*6

**(n)** 32*c*20 **(o)** 27*a*3*b*6  **(p)** 16*m*4*k*2

**5**. **(e)** 24*y*7 **(f)** 80*q*10 **(g)** 8*c*7 **(h)** 8*z*4

 **(m)**  **(n)**  **(o)**  **(p)** 

**6**. **(f)** 1 **(g)** 1 **(h)** 1 **(i)** 1 **(j)** 1

**7**. **(g)**  **(h)**  **(i)**  **(j)**  **(k)**  **(l)** 

**8**. **(g)**  **(h)**  **(i)**  **(j)**  **(k)**  **(l)** 

**9**. **(e)** *y*−12 **(f)** *c*−15 **(g)** *q*−15 **(h)** *w*8 **(i)** 20*b* **(j)** 27

**(k)** 2*k*5 **(l)**  1∙5*d* -3

**10**. **(g)** 5 **(h)** 27 **(i)** 25 **(j)** 8 **(k)** 6 **(l)** 

**11**. Simplify the following expressions, giving your answers with positive indices.

 **(f)** **(g)**  **(h)**  **(i)**  **(m)** 1 **(n)** *y*

**(o)**  **(p)**  **(u)** 1 **(v)** 2*x* **(w)** 4 **(x)** 

**12**. **(e)**  **(f)**  **(g)**  **(h)** 

**13**. **(e)**  **(f)**  **(g)**  **(h)** 

**1.2 CALCULATIONS USING SCIENTIFIC NOTATION**

**1**. **(b)** The diameter of the earth is 12680 kilometres.

 **(c)** A Building Society has £2150000000 in its funds.

**(d)** The radius of the orbit of an electron is 0∙00000005 mm.

**(e)** A space probe reached a speed of 149000 m.p.h.

**(f)** The earth weighs 6600000000000000000000 tonnes.

**(g)** A film of oil is 0∙00000008 mm thick.

**2**. Use your calculator to answer the following, giving your answers in Standard Form.

**(c)** 4∙14 × 107 **(d)** 1∙365 × 1019 **(i)** 6∙351 × 10−4 **(j)** 9∙09 × 10−38

**2.4 REDUCING an ALGEBRAIC FRACTION to SIMPLEST FORM**

**1**. **(e)**  **(f)**  **(g)**  **(h)**  **(i)** 

**(j)**  **(k)**  **(l)** 

**2**. **(e)**  **(f)**  **(g)**  **(h)** 

**3**. **(e)**  **(f)**  **(g)**  **(h)** 

**2.5 APPLYING the FOUR OPERATIONS to ALGEBRAIC FRACTIONS**

**1**. **(e)  (f)  (g)  (h) **

**2**. **(e)  (f)  (g)  (h) **

**3**. **(e)  (f)  (g)  (h) **

**4**. **(e)  (f)  (g)  (h) **

**5**. **(e)  (f)  (g)  (h) **

**6**. **(e)  (f)  (g)  (h) **

**7**. **(e)  (f)  (g)  (h)  (t) **

**(u)  (v) **

**8**. Express as a single fraction:

 **(d)  (e)  (f)  (m)  (n)  (o) **

**9.** **(d)  (e)  (f) ** **(j)** ****

**(k)  (l) **