**1.1 WORKING with SURDS**

**1.** Express each of the following in its simplest form:

**(a)** √8 **(b)** √12 **(c)**  √50 **(d)**  √20 **(e)**  √24 **(f)** √108

**2**. Simplify:

 **(a)**  5√8 **(b)**  3√32 **(c)**  5√40 **(d)** 2√12 **(e)**  4√18 **(f)**  3√24

**3.** Express each of the following in its simplest form:

**(a)** 5√2 + 3√2 **(b)** 3√7 – √7 **(c)** 4√3 + 2√3 – 3√3

**4.** Express each of the following in its simplest form:

**(a)** √12 + √27 **(b)** √32 ­− √8 **(c)**. √72 − √50

**5.** Simplify:

 **(a)** √5 × √5 **(b)** √2 × √2 **(c)** √11 × √11

**6.** **(a)** 3√2 × √2 **(b)** 2√5 × 3√5 (**c)** 3√2 × 2√7 (**d)** 4√3 × 2√3

**7.** Simplify:

 **(a)**  **(b)**  **(c)**  **(d)** 

**8.** Expand and simplify:

 **(a)** √2(1 – √2) **(b)** √3(√3 + 1) **(c)** √5(√5 – 1)

**9.** Expand and simplify where possible:

 **(a)** (√2 + 3)(√2 – 1) **(b)** (√5 + 1)(2√5 – 4) **(c)** (2√2 + 3)(√2 + 4)

**10.** Express each of the following with a *rational denominator*  and simplify where possible:

 **(a)**  **(b)**  **(c)**  **(d)** 

**11.** Express each of the following with a ***rational denominator***and simplify where possible:

 **(a)**  **(b)**  **(c)**  **(d)** 

**12**. Express each of the following in its simplest form with a rational denominator.

 **(a)**   **(b)**  **(c)**   **(d)**  

**13.** Express each of the following with a ***rational denominator***and simplify where possible:

 **(a)**  **(b)**  **(c)**  **(d)** 

**14.** Rationalise the denominator, in each fraction, using the appropriate conjugate surd.

 **(a)**  **(b)**  **(c)**  **(d)** 

**1.2 INDICES**

**1**. Write each of the following in its simplest index form.

 **(a)** 34 × 32 **(b)** 2 × 23 **(c)** 105 × 102 **(d)**  83 × 85

**2**. Write each of the following in its simplest index form.

 **(a)** 28 ÷ 23 **(b)** 54 ÷ 52 **(c)** 129 ÷ 1 26 **(d)** 711 ÷ 74

**3**. Write each of the following in its simplest index form.

 **(a)** (32)4 **(b)** (82)2 **(c)** (103)2 **(d)** (22)5

**4**. Write the following without brackets.

 **(a)** (2*b*)2 **(b)** (7*a*)3 **(c)** (3*x*)4 **(d)** (2*y*)5

**5**. Simplify these expressions.

 **(a)** 2*a*3 × 5*a*5 **(b)** 7*x* × 9*x*8 **(c)** 12*p*7 ÷ 4*p*4 **(d)** 50*b*12 ÷ 10*b*6

**6**. Write down the value of

 **(a)** 50 **(b)** 20 **(c)** 1000 **(d)** (−3)0 **(e)** 250

**7**. Rewrite the following with positive indices.

 **(a)** 3−2 **(b)** 5−4 **(c)** 2−6 **(d)** 10−3 **(e)** 4−5 **(f)** 200−7

**8**. Rewrite the following with negative indices.

 **(a)**  **(b)**  **(c)**  **(d)**  **(e)**  **(f)** 

**9**. Simplify the following expressions.

 **(a)** *m*3 × *m*−5 **(b)** *x*7 × *x*−2 **(c)** *p*−8 × *p*5 **(d)** *a*−3 × *a*−5

**10**. Find the value of

 **(a)**  **(b)**  **(c)**  **(d)**  **(e)**  **(f)** 

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

 **(a)** ()6 **(b)** ()6 **(c)** ()8 **(d)** ()9

**12**. Write the following in surd form.

 **(a)**  **(b)**  **(c)**  **(d)** 

**13**. Write the following in index form.

 **(a)**  **(b)**  **(c)**  **(d)** 

**14.** Simplify each of the following by …..... (i) changing root signs to fractional powers;

 (ii) moving *x*'s onto the numerators;

 (iii) expanding brackets …… where necessary.

**(a)**  **(b)**  **(c)** 

**1.3 SIGNIFICANT FIGURES

1**. Round to **1** significant figure :

**(a)** 23 **(b)** 5.5 **(c)** 78 **(d)** 31

**2**. Round to **2** significant figures :

 **(a)** 8·72 **(b)** 92·8 **(c)** 0·186 **(d)** 679

**3**. Round to **3** significant figures :

 **(a)** 49·32 **(b)** 2·345 **(c)** 0·5928 **(d)** 4765

**4**. Round 248382 correct to

**(a)** 4 sig. figs **(b)** 3 sig. figs **(c)** 2 sig. figs **(d)** 1 sig. fig

**5**. Round 0∙0286016 correct to

**(a)** 4 sig. figs **(b)** 3 sig. figs **(c)** 2 sig. figs **(d)** 1 sig. fig

**6**. Calculate and give your answer correct to **2** significant figures

 **(a)** 5∙16 × 22∙7 **(b)** 27∙3 ÷ 6∙84 **(c)** 3∙14 × 92

**7.** Calculate and give your answer correct to 3 significant figures

 **(a)** 2∙29 × 58∙1 **(b)** 325∙9 ÷ 68∙2 **(c)** 3∙14 × 18

**2.1 ALGEBRAIC EXPRESSIONS with BRACKETS**

**1**. Multiply out the brackets:

 **(a)** 3 (*x* − 5) **(b)** 5 (*y* + 7) **(c)** 8 (*a* + 6) **(d)** 6 (3 + *t*)

**2**. Expand the brackets:

 **(a)** 4 (2*a* + 5) **(b)** 7 (3*y* − 4) **(c)** 2 (12*x* + 11) **(d)** 9 (4*c* − 7)

**3**. Expand and simplify:

 **(a)** 3(3*a* − 1) + 2*a* **(b)** 2(5*x* + 3) − 3*x* **(c)** 8(*b* + 2) − 9

**4**. Multiply out the brackets:

 **(a)** (*x* + 2)(*x* + 3) **(b)** (*y* +5)(*y* +2) **(c)** (*a* + 4)(*a* + 6)

**5**. Multiply out the brackets:

 **(a)** (*x* − 1)(*x* − 5) **(b)** (*c* − 4)(*c* − 2) **(c)** (*y* − 3)(*y* − 7)

**6**. Multiply out the brackets:

 **(a)** (*x* − 1)(*x* + 5) **(b)** (*a* + 3)(*a* − 7) **(c)** (*t* − 5)(*t* + 4)

**7**. Multiply out the brackets:

 **(a)** (*x* + 3)2 **(b)** (*w* − 2)2 **(c)** (*a* − 5)2 **(d)** (*c* + 8)2

**8**. Multiply out the brackets:

 **(a)** (*a* + *b*)(*c* + *d*) **(b)** (2 + *x*)(3 + *y*) **(c)** (*a* + 4)(*b* + 5)

**9**. Multiply out the brackets:

 **(a)** *x*(*x*2 + *x* − 1) **(b)** 3(2*x*2 −3*x* + 5) **(c)** *x*(3*x*2 − 5*x* + 8)

**10**. Multiply out the brackets and simplify:

 **(a)** (*x* + 2)(*x*2 + 3*x* + 1) **(b)** (*x* + 5)(*x*2 + 4*x*+ 2)

**11**. Multiply out the brackets and simplify:

**(a)** (*x* − 1)(*x*2 + *x* + 1) **(b)** (*x* − 7)(*x*2 + 3*x* + 5)

**12**. Multiply out the brackets and simplify:

 **(a)** (*x* + 5)(2*x*2 + 4*x* + 9) **(b)** (*x* − 3)(5*x*2 + *x* + 6)

**13.** Expand and simplify each of the following expressions:

**(a)**  **(b)** 

**2.2 FACTORISING an ALGEBRAIC EXPRESSION**

**1**. Factorise by first finding a common factor:

**(a)** 2*x* + 2*y* **(b)** 3*c* + 3*d* **(c)** 6*s* + 6*t* **(d)** 12*x* + 12*y*

**2**. Factorise by finding the common factor:

 **(a)** 2*x* + 4 **(b)** 3*d* + 9 **(c)** 6*s* + 3 **(d)** 12*x* + 4

**3**. Factorise by finding the common factor:

 **(a)** 3*x* − 6 **(b)** 4*y* − 8 **(c)** 16 − 8*a* **(d)** 10*c* − 15

**4**. Factorise by finding the common factor:

 **(a)** 2*a* + 4*b* **(b)** 10*x* − 12*y* **(c)** 18*m* + 24*n* **(d)** 10*c* + 15*d*

**5**. Factorise by finding the common factor

 **(a)** *ax* + *ay* **(b)** *xy*2 + *xa*2 **(c)** *pqr* + *pst*

**6**. Factorise by finding the highest common factor:

 **(a)** 2*ax* + 6*a* **(b)** 3*y* + 9*y*2 **(c)** 24*a* − 16*ab*

**7.** Factorise by finding the highest common factor:

 **(a)** *ap* + *aq* − *ar* **(b)** 2*a* + 2*b* + 2*c* **(c)** 6*e* − 2*f* + 4*g*

**8**. Factorise the following expressions, which contain a difference of squares:

 **(a)** *a*2 − *b*2  **(b)** *x*2 − *y*2  **(c)** *p*2 − *q*2  **(d)** *s*2 − *t*2

**9**. Factorise the following expressions, which contain a difference of squares:

 **(a)** *a*2 − 4*b*2 **(b)** *x*2 − 25*y*2 **(c)** *p*2 − 64*q*2 **(d)** 16*c*2 − *d*2

**10**. Factorise the following expressions which contain a common factor and a difference of two squares:

 **(a)** 2*a*2 − 2*b*2 **(b)** 5*p*2 − 5 **(c)** 45 − 5*x*2 **(d)** 4*d*2 − 36

**11**. Factorise the following quadratic expressions:

 **(a)** *x*2+ 3*x* + 2 **(b)** *a*2 + 2*a* + 1 **(c)** *y*2 + 5*y* + 4

**12**. Factorise the following quadratic expressions:

**(a)** *a*2 − 8*a* + 15 **(b)** *x*2 − 9*x* + 8 **(c)** *c*2 − 9*c* + 18

**13**. Factorise the following quadratic expressions:

 **(a)** *b*2 + 3*b* − 10 **(b)** *x*2 + 6*x* − 7 **(c)** *y*2 − *y* − 6

**14**. Factorise the following quadratic expressions:

 **(a)** 3*x*2 + 7*x* + 2 **(b)** 2*a*2 + 5*a* + 2 **(c)** 3*c*2 + 8*c* + 5

**15**. Factorise the following quadratic expressions:

 **(a)** 2*x*2 − 7*x* + 3 **(b)** 2*a*2 − 5*a* + 3 **(c)** 5*p*2 − 17*p* + 6

**16**. Factorise the following quadratic expressions:

**(a)** 3*x*2 − 2*x* − 1 **(b)** 2*a*2 − *a* − 3 **(c)** 4*p*2 − *p* − 3

**17**. Fully factorise these expressions:

 **(a)** 3*x*2 − 3 **(b)** 2*p*2 + 12*p* + 10 **(c)** 9*x*2 − 36

**2.3 COMPLETING THE SQUARE**

**1.** Write the following in the form $(x+a)^{2}+b $and write down the minimum value of each one.

**(a)** $x^{2}+4x$ **(b)** $x^{2}+10x$ **(c)** $x^{2}+7x$ **(d)** $x^{2}+9x$

**2.** Write the following in the form $(x+a)^{2}+b$ and write down the minimum value of each one.

 **(a)** $x^{2}+2x+7$ **(b)** $x^{2}+6x+2$ **(c)** $x^{2}+8x+9$

**3.** Write the following in the form $(x+a)^{2}+b$ and write down the maximum value of each one.

**(a)** $4+2x-x^{2}$ **(b)** $7+4x-x^{2}$ **(c)** $3-6x-x^{2}$

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

**1**. Express these fractions in their simplest form:

 **(a)**  **(b)**  **(c)**  **(d)** 

 **(e)**  **(f)**  **(g)**  **(h)** 

**2**. Simplify by first finding the common factor:

 **(a)**  **(b)**  **(c)**  **(d)** 

 **(e)**  **(f)**  **(g)**  **(h)** 

**3**. Simplify the following by first factorising the numerator and/or denominator:

 **(a)**  **(b)**  **(c)**  **(d)** 

 **(e)**  **(f)**  **(g)**  **(h)** 

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

**1**. Express each sum as a fraction in its simplest form:

**(a)  (b)  (c)  (d) **

**2**. Express each difference as a fraction in its simplest form:

**(a)  (b)  (c)  (d) **

**3**. Express each product as a fraction in its simplest form:

**(a)  (b)  (c)  (d) **

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

**(a)  (b)  (c)  (d) **

**5**. Express each sum as a fraction in its simplest form:

**(a)  (b)  (c)  (d) **

**6**. Express each difference as a fraction in its simplest form:

**(a)  (b)  (c)  (d) **

**7**. Express each product as a fraction in its simplest form

**(a)  (b)  (c)  (d) **

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

**(a)  (b)  (c) **

**9.** Simplify the following:

 **(a)** ** (b)  (c) **

**3.1 DETERMINING the GRADIENT of a STRAIGHT LINE given TWO POINTS**

**4**. Calculate the gradient of the line joining each pair of points below:

**(a)** (2, 1) and ( 6, 3) **(b)** (1, 5) and (3, 1) **(c)** (2, 0) and (4, 6)

**5.** Calculate the gradient of the line joining each pair of points below:

 **(a)** A(−2, 6) and B(8, 8) **(b)** C(3, −3) and D(4, −1)

**6.** Prove that the following sets of points are collinear (have the same gradient):

 **(a)** A(−6,−1), B(2, 3) and C(4, 4)

**7.** Given that each set of points are collinear, find the value of *k* in each case:

 **(a)** P(−4, −2), Q(−1, −1) and R(8, *k*)

**3.2 WORKING with the LENGTH of an ARC of a CIRCLE**

**1.** Calculate the length of the arc in each diagram below, giving your answer correct to 1d.p.

O

O

C

D

E

F

14mm

2m

O

A

B

8cm

90o

140o

35o

 **(a)** **(b)** **(c)**

**2.** Calculate the perimeter of each sector in Question 1. Giving your answers correct to 1 d.p.

**3**. Find the length of the minor arc AB in each of the following circles, giving your answers correct to 1 d.p.



**(a)**  **(b)** **(c)** **(d)**

**4.** Calculate the length of the major arc in the circles shown in Question 3, giving your answers correct to 1 d.p.

**3.2 WORKING with the AREA of a SECTOR of a CIRCLE**

**1.** Calculate the area of the sector in each diagram below, giving your answer correct to 3 significant figures.

O

O

C

D

E

F

14mm

2m

O

A

B

8cm

90o

140o

35o

 **(a)**  **(b)**  **(c)**

**2**. Calculate the area of minor sector OAB in the circles shown below, giving your answers correct to 3 significant figures.



**(a)**  **(b)**  **(c)**  **(d)**

**3.** Calculate the area of the major sector for the circles in Question 2, giving your answers correct to 3 significant figures.

**C**

**D**

**O**

120o

**4**. The length of minor arc CD is 7⋅33 cm.

Calculate the area of the circle.

**3.3** **WORKING with the VOLUME of a SOLID SPHERE, CONE, PYRAMID**

**1.** Calculate the volume of each sphere described below, rounding your answer to 1 decimal place.

 **(a)** *r* = 6cm

*r*

 **(b)** *r* = 2m

 **(c)** *r* = 9mm

 **(d)** *r* = 3cm

**2**. Find the volume of a sphere for the following values of ***r*** and ***d***.

 (give your answers correct to 3 significant figures)

 **(a)** *r* = 10cm **(f)** *d* = 18cm

**r**

 **(b)** *r* = 25cm **(g)** *r* = 80mm

 **(c)** *d* = 2m **(h)** *d* = 55cm

 **(d)** *r* = 200mm **(i)** *r* = 3·5m

 **(e)** *d* = 11cm **(j)** *d* = 48cm

**3.** A sphere has a diameter of 8cm.

Calculate its volume giving your answer correct to 3 significant figures.

**4**. Find the volume of a cone for the following values of ***r*** and ***h***.

 (give your answers correct to 3 significant figures)

**h**

**r**

 **(a)** *r* = 5cm *h* = 14cm

 **(b)** *r* = 7cm *h* = 25cm

 **(c)** *r* = 3cm *h* = 22cm

 **(d)** *r* = 12cm *h* = 7cm

**5.** Find the volume of a cone for the following values of ***d*** and ***h***.

 (give your answers correct to 3 significant figures)

 **(a)** *d* = 15cm *h* = 40cm

 **(b)** *d* = 11cm *h* = 37cm

 **(c)** *d* = 22cm *h* = 125cm

 **(d)** *d* = 8ˑ8cm *h* = 30cm

**6.** Calculate the volume of each cone described below, rounding your answers to 1 decimal place.

*h*

*r*

 **(a)** *r* = 3cm and *h* = 6cm

 **(b)** *r* = 8mm and *h* = 12mm

 **(c)** *r* = 3cm and *h* = 5cm

 **(d)** *r* = 2m and *h* = 6m

**7.** A cone has a base diameter of 8cm and a height of 5cm. Calculate the volume of this cone.

**8.** A cone has a base diameter of 10cm and a **slant height** of 13cm.

***13 cm***

 Calculate the volume of the cone.

***5cm***

**9.** A cone has a base radius of 9cm and a **slant height** of 15cm.

 Calculate the volume of the cone.

**10.** A pyramid has a square base of side 4cm and a vertical height of 7cm.

 Calculate the volume of the pyramid correct to 2 significant figures.

**11.** A pyramid has a rectangular base measuring 16mm by 12mm and a vertical height of 10mm.

Calculate the volume of the pyramid.

**National 5 Expressions and Formulae ANSWERS**

**1.1 WORKING WITH SURDS**

**1.** **(a)** 2√2 **(b)** 2√3 **(c)**  5√2 **(d)**  2√5 **(e)**  2√6 **(f)** 6√3

**2**. **(a)**  10√2 **(b)**  12√2 **(c)**  10√10 **(d)** 4√3 **(e)**  12√2 **(f)**  6√6

**3.** **(a)** 8√2 **(b)** 2√7 **(c)** 3√3 **(d)** 4√6 **(e)** 9√3 **(f)** 6√6 ­

**4. (a)** 5√3 **(b)** 2√2 ­ **(c)** √2 **(d)** 8√2 **(e)** 6√5 **(f)** 5√6

**5.** **(a)** 5 **(b)** 2 **(c)** 11 **(d)** *a* **(e)** 6 **(f)** *c*

**6.** **(a)** 6 **(b)** 30 (**c)** 6√14 (**d)** 24 **(e)** 3√10 **(f)** 18√2

 **7.** **(a)** 2 **(b)**  **(c)**  **(d)**  **(e)** 2 **(f)** 

**8.** **(a)** √2 – 2 **(b)** 3 **+** √3 **(c)** 5 – √5 **(d)** 5√2 + 2

**9.** **(a)** 2√2 – 1 **(b)** 6 – 2√5 **(c)** 16 + 11√2 **(d)** 2

**10.** **(a)**  **(b)**  **(c)**  **(d)**  **(e)**  **(f)** 

**11.** **(a)**  **(b)**  **(c)**  **(d)**  **(e)**  **(f)** 

**12**. **(a)**   **(b)**  **(c)**   **(d)**  

**13.** **(a)**  **(b)**  **(c)**  **(d)** 

**14.** **(a)**  **(b)**  **(c)**  **(d)** 

**1.2 INDICES**

**1**. **(a)** 36 **(b)** 24 **(c)** 107 **(d)**  88 **(e)** 77 **(f)** 58

**2**. **(a)** 25 **(b)** 52 **(c)** 123 **(d)** 77 **(e)** 204 **(f)** 84

**3**. **(a)** 38 **(b)** 84 **(c)** 106 **(d)** 210 **(e)** 415 **(f)** 1

**4**. **(a)** 4*b*2 **(b)** 343*a*3 **(c)** 81*x*4 **(d)** 32*y*5 **(e)** *a*4*b*4 **(f)** *x*7*y*7

**5**. **(a)** 10*a*8 **(b)** 63*x*9 **(c)** 3*p*3 **(d)** 5*b*6

**6**. **(a)** 1 **(b)** 1 **(c)** 1 **(d)** 1 **(e)** 1 **(f)** 1

**7**. **(a)**  **(b)**  **(c)**  **(d)**  **(e)**  **(f)** 

**8**. **(a)**  **(b)**  **(c)**  **(d)**  **(e)**  **(f)** 

**9**. **(a)** *m*−2 **(b)** *x*5 **(c)** *p*−3 **(d)** *a*−8 **(e)** *y*−12 **(f)** *c*−15

**10**. **(a)** 2 **(b)** 2 **(c)** 6 **(d)** 9 **(e)** 4 **(f)** 10

**11**. **(a)** *x*3 **(b)**  **(c)** *a*6 **(d)**  **(e)**  **(f)** 

**12**. **(a)**  **(b)**  **(c)**  **(d)** 

**13**. **(a)**  **(b)**  **(c)**  **(d)**  **(e)**  **(f)** 

**14.** **(a)**  **(b)**  **(c)** 

**1.3 SIGNIFICANT FIGURES

1**. **(a)** 20 **(b)** 6 **(c)** 80 **(d)** 30 **(e)** 100 **(f)** 300

**2**. **(a)** 8∙7 **(b)** 93 **(c)** 0∙19 **(d)** 680 **(e)** 2∙1 **(f)** 6∙5

**3**. **(a)** 49∙3 **(b)** 2∙35 **(c)** 0∙593 **(d)** 4770

**4**. **(a)** 248400 **(b)** 248000 **(c)** 250000 **(d)** 200000

**5**. **(a)** 0∙02860 **(b)** 0∙0286 **(c)** 0∙029 **(d)** 0∙03

**6**. **(a)** 120 **(b)** 4∙0 **(c)** 250 **(d)** 41

**7**. **(a)** 133 **(b)** 4∙78 **(c)** 56∙5 **(d)** 988

**2.1 ALGEBRAIC EXPRESSIONS with BRACKETS**

**1**. **(a)** 3*x* − 15 **(b)** 5*y* + 35 **(c)** 8*a* + 48 **(d)** 18 + 6*t*

**2**. **(a)** 8*a* + 20 **(b)** 21*y* − 28 **(c)** 24*x* + 22 **(d)** 36*c* −63

**3**. **(a)** 11*a* − 3 **(b)** 7*x* + 6 **(c)** 8*b* + 7 **(d)** 8*h* + 3

**4**. **(a)**  **(b)**  **(c)** 

**5**. **(a)**  **(b)**  **(c)** 

**6.** **(a)**  **(b)**  **(c)** 

**7**. **(a)** *x* ² + 6*x* + 9 **(b)** *w*2 – 4*w* + 4 **(c)** *a*2 – 10*a* + 25

**8**. **(a)** *ac* + *bc* + a*d* + *bd* **(b)** 6 + 3*x* + 2*y* + *xy* **(c)** *ab* + 4*b* + 5*a* + 20

**9**. **(a)** *x*3+ *x*2 − *x* **(b)** 6*x*2 −9*x* + 15 **(c)** 3*x*3 − 5*x*2 + 8 *x*

**10**. **(a)** *x*3 + 5*x*2 + 7*x* + 2 **(b)** *x*3 + 9*x*2 + 22*x* + 10

**11**. **(a)** *x*3 − 1 **(b)** *x*3 − 4*x*2 − 16*x* − 35

**12**. **(a)** 2*x*3 + 14*x*2 + 29*x* + 45 **(b)** 5*x*3 − 14*x*2 + 3*x* − 18

**13.** **(a)**  **(b)**  **(c)** 

**2.1 FACTORISING an ALGEBRAIC EXPRESSION**

**1**. **(a)** 2(*x* + *y*) **(b)** 3(*c* + *d*) **(c)** 6(*s* + *t*) **(d)** 12(*x* + *y*)

**2**. **(a)** 2(*x* + 2) **(b)** 3(*d* + 3) **(c)** 3(2*s* + 1) **(d)** 4(3*x* + 1)

**3**. **(a)** 3(*x* − 2) **(b)** 4(*y* − 2) **(c)** 8(2 − *a*) **(d)** 5(2*c* − 3)

**4**. **(a)** 2(*a* + 2*b*) **(b)** 2(5*x* − 6*y*) **(c)** 6(3*m* + 4*n*) **(d)** 5(2*c* + 3*d*)

**5**. **(a)** *a*(*x* + *y*) **(b)** *x*(*y*2 + *a*2) **(c)** *p*(*qr* + *st*)

**6**. **(a)** 2*a*(*x* + 3) **(b)** 3*y*(1 + 3*y*) **(c)** 8*a*(3 − 2*b*)

**7.** **(a)** *a*(*p* + *q* − *r*) **(b)** 2(*a* + *b* + *c*) **(c)** 2(3*e* − *f* + 2*g*)

**8.** **(a)** (*a* − *b*)(*a + b*) **(b)** (*x* − *y*)(*x + y*) **(c)** (*p* − *q*)(*p + q*)

**9**. **(a)** (*a* − 2*b*)(*a +* 2*b*)**(b)** (*x* − 5*y*)(*x +* 5*y*) **(c)** (*p* − 8*q*)(*p +* 8*q*)

**10**. **(a)** 2(*a* − *b*)(*a + b*) **(b)** 5(*p* − 1)(*p +* 1) **(c)** 5(3 – *x*)(3 + *x*)

**11**. **(a)** (*x*+ 1)(*x* + 2) **(b)** (*a* + 1)(*a* + 1) **(c)** (*y* + 1)(*y* + 4)

**12**. **(a)** (*a* − 5)(*a* − 3) **(b)** (*x* − 1)(*x* − 8) **(c)** (*a* − 6)(*a* − 3)

**13**. **(a)** (*b* + 5)(*b* − 2) **(b)** (*x* + 7)(*x* − 1) **(c)** (*y* + 2)(*y* − 3)

**14**. **(a)** (3*x* + 1)(*x* + 2) **(b)** (2*a* + 1)(*a* + 2) **(c)** (3*c* + 5)(*c* + 1)

**15**. **(a)** (2*x* − 1)(*x* − 3) **(b)** (2*a* − 3)(*a* − 1) **(c)** (5*p* − 2)(*p* − 3)

**16**. **(a)** (3*x* + 1)(*x* − 1) **(b)** (*a* + 1)(2*a* − 3) **(c)** (4*p* + 3)(*p* − 1)

**17**. **(a)**  **(b)**  **(c)** 

**2.3 COMPLETING THE SQUARE**

**1.** **(a)**  $x^{2}+4x$[−4] **(b)** $x^{2}+10x$ [−25] **(c)** $x^{2}+7x$ [−12∙25]

**2.** **(a)** $x^{2}+2x+7$ [6] **(b)** $x^{2}+6x+2$[−7] **(c)** $x^{2}+8x+9$ [−7]

**3.** **(a)**  [5] **(b)** $7+4x-x^{2}$ [11] **(c)** $3-6x-x^{2}$ [12]

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

**1**. **(a)  (b)  (c)  (d)  (e)**  **(f)** 

**2**. **(a)**  **(b)**  **(c)**  **(d)** 

**3**. **(a)**  **(b)**  **(c)**  **(d)**  **(e)**  **(f)** 

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

**1**. **(a)  (b)  (c)  (d)  (e)  (f) **

**2**. **(a)  (b)  (c)  (d)  (e)  (f) **

**3**. **(a)  (b)  (c)  (d)  (e)  (f) **

**4**. **(a)  (b)  (c)  (d)  (e)  (f) **

**5**. **(a)  (b)  (c)  (d)  (e)  (f) **

**6**. **(a)  (b)  (c)  (d)  (e)  (f) **

**7.** **(a)  (b)  (c)  (d)  (e)  (f) **

**8. (a)  (b)  (c)  (d)  (e)  (f) **

**9.** **(a)** ** (b)  (c)  (d) **

**3.1 DETERMINING the GRADIENT of a STRAIGHT LINE given TWO POINTS**

**1.** **(a)** **(i)**  2 **(ii)** **** **(iii)** ** (iv)  (v) 1**

 **(b)**  0; undefined; positive; negative

**2. (a)** 1 **(b)** 2 **(c)  (d) 5 (e)  (f) **

**3. (a)  (b)  (c) 1 (d)  (e)  (f)** 4

**4**. **(a)** **** **(b)** **** **(c)** 3 **(d)** 2 **(e)** **** **(f)** ****

**5.** **(a)** **** **(b)** 2 **(c)** **** **(d)**  1 **(e)**  **** **(f)** ****

**6. (a)** both gradients ** (b)** both gradients ****

**7. (a)** *k* **=** 2 **(b)** *k* **=  (c)** *k* **=  (d)** *k* = 5

**8.** *a* = ** 9.** *k* = 2·5 **10.** *a* = ** 11.** *k* = 1 **12.** *k* = 19

**3.2 WORKING with the AREA of a SECTOR of a CIRCLE**

**1.** **(a)** 50·2cm² **(b)** 239mm² **(c)** 1·22m²

**2**. **(a)** 19·6cm² **(b)** 7·07cm² **(c)** 84·8cm² **(d)** 12·8cm²

**3.** **(a)** 58·9cm² **(b)** 21·2cm² **(c)** 170cm² **(d)** 141cm²

**4**. 12∙8cm²

**WORKING with VOLUME of a CYLINDER**

**1**. **(a)** 1696·5 cm3 **(b)** 4825·5 cm3 **(c)** 603·2 cm3 **(d)** 2513·3 cm3 **(e)** 75398·2 cm3

**2. (a)** 19·8cm **(b)** 3·7 litres **3.** 904cm³

**4.** No; volume is 9·72 litres

**3.3 WORKING with the VOLUME of a SOLID SPHERE, CONE, PYRAMID**

**1.** **(a)** 904·3cm³ **(b)** 33·5m³ **(c)** 3052·1mm³ **(d)** 113·0cm³

**2**. **(a)** 4190cm³ **(b)** 65400cm³ **(c)** 4·19m³ **(d)** 33500000mm³

**3.** 268cm³

**4**. **(a)** 366cm³ **(b)** 1280cm³ **(c)** 207cm³ **(d)** 1060cm³

**5.** **(a)** 2369cm³ **(b)** 1170cm³ **(c)** 15800cm³ **(d)** 608cm³

**6.** **(a)** 56∙5cm³ **(b)** 803·8mm³ **(c)** 47·1cm³ **(d)** 25·1cm³

**7.** 83·7cm³ **8.** 314cm³ **9.** 1020cm³ **10.** 37cm³

**11.** 640mm³