

CHAPTER 4

Basic algebra

Addition and subtraction of like terms

QUESTION 1 Add the following expressions.

a $3x + 8x =$ _____

c $9x + 7x =$ _____

e $16x + 25x =$ _____

g $6xy + 8xy =$ _____

i $15a + 16a + 7a =$ _____

k $15a^2 + 26a^2 + a^2 =$ _____

b $5x + 11x =$ _____

d $18x + 9x =$ _____

f $30x + 14x + x =$ _____

h $9mn + 11nm =$ _____

j $8x + 3x + 7x =$ _____

l $7p + 6p + 5p + p =$ _____

QUESTION 2 Subtract the following expressions.

a $6a - 2a =$ _____

c $8a - 3a =$ _____

e $14m - 6m - m =$ _____

g $15x - 7x - 2x =$ _____

i $25x^2 + 7x^2 - 4x^2 - 6x^2 =$ _____

k $8x - 2x - x =$ _____

b $15a - 7a =$ _____

d $17x - 2x =$ _____

f $8y - 3y - y =$ _____

h $6xy - 3xy - xy =$ _____

j $14y - 3y - y - 2y =$ _____

l $19p - 3p - 5p =$ _____

QUESTION 3 Simplify the following expressions by adding or subtracting.

a $8a + 7a - 3a =$ _____

c $5a + 15a - 6a =$ _____

e $19xy + 2xy - xy =$ _____

g $9x^2 + 8x^2 - 3x^2 - 5x^2 =$ _____

i $5x - 2x + 3x - x =$ _____

k $6m + 7m - 2m - m =$ _____

b $5x + 6x - x - 2x =$ _____

d $8a + 5a + 3a - 2a =$ _____

f $7mn + 3nm - 2mn =$ _____

h $9a^2 + 7a^2 - a^2 - 2a^2 =$ _____

j $8t + 6t + 3t - t =$ _____

l $8a + 16a - 5a - 7a =$ _____

QUESTION 4 Simplify the following.

a $9x + 3y - 6x + 2y =$ _____

c $6m + 3n - n - m =$ _____

e $8a + 3b + 2b - 6a =$ _____

g $7y + 8y - 3x - 4x =$ _____

b $20a + 3b + 8b - 11a =$ _____

d $6x^2 - 4x^2 - x^2 + 3x^2 =$ _____

f $10a + 4a - 5b - b =$ _____

h $6xy + 3yx - xy - 2yx =$ _____

QUESTION 5 Simplify the following expressions.

a $15 - 8x + 7 - 2x =$ _____

c $18x - 3y + y + x =$ _____

e $10m + 3n - 2m - n =$ _____

g $12a + 6b - 3a =$ _____

i $9t + 18 - 3t - 15 =$ _____

b $8m + 3n - 5m =$ _____

d $2x^2 + 9x^2 - 7y^2 =$ _____

f $19xy + 6yz - 13yx =$ _____

h $6a + 9b - 3b - 3a =$ _____

j $6ab + 3ba + 9ab =$ _____



Multiplication of pronumerals

QUESTION 1 Multiply the following expressions.

a $2 \times 5a =$ _____

b $3 \times 6b =$ _____

c $8 \times 9y =$ _____

d $7 \times 3y =$ _____

e $(-6) \times ab =$ _____

f $(-3) \times (-2a) =$ _____

g $3a \times (-b) =$ _____

h $(-2a) \times (-3b) =$ _____

i $(-6x) \times (-3) =$ _____

j $(9ab) \times (-5a) =$ _____

k $(-2a) \times (-8a) =$ _____

l $(-6x) \times (-2x) =$ _____

QUESTION 2 Find the products of the following.

a $6a \times 3b =$ _____

b $(-6x) \times (-x) =$ _____

c $5x \times 8y =$ _____

d $(-8y) \times (-y) \times 3 =$ _____

e $9a \times 3b =$ _____

f $6a \times (-a) \times 5 =$ _____

g $6y \times 8y =$ _____

h $t \times (-3t) \times (-2) =$ _____

i $9x \times 3y \times 2x =$ _____

j $5a \times (-6ab) =$ _____

QUESTION 3 Work out the following products.

a $2a \times ab =$ _____

b $3 \times 6a \times 5 =$ _____

c $5a \times 6bc \times a =$ _____

d $ab \times bc \times ca =$ _____

e $9ab \times (-6bc) =$ _____

f $6a \times 7ap =$ _____

g $(-8x) \times 5 =$ _____

h $3x \times 2y \times y =$ _____

QUESTION 4 Find the following products.

a $8a \times 5b =$ _____

b $(-7k) \times (-2k) =$ _____

c $9x \times (-8y) \times xy =$ _____

d $8ax \times a \times ax =$ _____

e $(-6m) \times (-6m) =$ _____

f $-6t \times 4m \times (-m) =$ _____

g $y \times -y \times -3y =$ _____

h $(-5x) \times (-2) \times (-3x) =$ _____

QUESTION 5 Simplify the following expressions.

a $8ab \times (-ab) =$ _____

b $7 \times 3a \times (-4a) =$ _____

c $9x \times y \times (-2x) =$ _____

d $2a \times 3b \times 5c =$ _____

e $(-a) \times (-2a) \times (-2b) =$ _____

f $(-x) \times (-y) \times (-x) =$ _____

g $(-5p) \times (-5p) =$ _____

h $6a \times (-3a) \times 2 =$ _____

Division of pronumerals

QUESTION 1 Work out the following divisions.

a $\frac{18a}{6} =$ _____

b $\frac{9pq}{3} =$ _____

c $\frac{12m}{15m^2} =$ _____

d $\frac{15x}{5} =$ _____

e $\frac{21xy}{7x} =$ _____

f $\frac{18a^2}{3a} =$ _____

g $\frac{12a}{6} =$ _____

h $\frac{36x^2}{4x} =$ _____

i $\frac{30y}{10y^2} =$ _____

QUESTION 2 Find the following divisions.

a $15x \div 5x =$ _____

b $-36xy \div -9x =$ _____

c $12mn \div 4m =$ _____

d $64m^2 \div 8m =$ _____

e $5x \div -5 =$ _____

f $(-48ab) \div (-6a) =$ _____

g $8x \div 2x =$ _____

h $72a^2 \div 9a =$ _____

i $32xy \div 8x =$ _____

j $15ab \div (-5a) =$ _____

k $27ab \div 9a =$ _____

l $16x^2y \div 4xy =$ _____

QUESTION 3 Divide the following algebraic expressions.

a $(-24)x \div 8 =$ _____

b $(-6ab) \div 3a =$ _____

c $38x^2y \div 19x^2 =$ _____

d $(-15x^2) \div (-5x) =$ _____

e $27x^2y^2 \div 9x^2y =$ _____

f $(-16k) \div (-4k) =$ _____

g $(-52x^2) \div (-13) =$ _____

h $(-36y) \div (-3) =$ _____

i $20pq \div -4p =$ _____

j $50mn \div 5m =$ _____

QUESTION 4 Simplify the following.

a $28x \div -7x =$ _____

b $68xy \div 4xy =$ _____

c $32x^2 \div (-4x) =$ _____

d $(-18x) \div 9x =$ _____

e $(-30x) \div (-15) =$ _____

f $(-48m^3) \div (-8m^2) =$ _____

g $(-25y^2) \div (-5y) =$ _____

h $(-64ab) \div (-8a) =$ _____

QUESTION 5 Find the answers to the following.

a $24ab \div (-6a) =$ _____

b $(-24x^3y^2) \div (-6x^2y^2) =$ _____

c $15ab \div -15ab =$ _____

d $36xy \div 4x =$ _____

e $mn^2 \div mn + n =$ _____

f $15a^2b^2 \div 15abc =$ _____

g $3abc \div bc \div ba =$ _____

h $(-16x^2y) \div (-8xy) =$ _____



Multiplication and division of pronumerals

QUESTION 1 Multiply the following.

- | | |
|-------------------------------------|---|
| a $8a \times 2a =$ _____ | b $5a \times 4a \times 3c =$ _____ |
| c $5a \times 3a =$ _____ | d $24a^2 \times 4a \times 3a =$ _____ |
| e $9x \times (-3x) =$ _____ | f $6a \times 3a \times (-2a) =$ _____ |
| g $15xy \times 3x^2 =$ _____ | h $5y \times (-3y) \times (-y) =$ _____ |
| i $8a \times 3b \times 4a =$ _____ | j $8 \times 9a \times a^2 =$ _____ |
| k $ab \times a^2 \times 3a =$ _____ | l $3ab \times 3ab \times ab =$ _____ |

QUESTION 2 Divide the following expressions.

- | | |
|-------------------------------|--------------------------------------|
| a $15a \div 3a =$ _____ | b $(-72a) \div (-8a) =$ _____ |
| c $60p \div 10p =$ _____ | d $50ab \div 2ab =$ _____ |
| e $8pq \div (-4p) =$ _____ | f $35x^2 \div -5x =$ _____ |
| g $16ab \div (-4a) =$ _____ | h $28a^2b \div (-7ab) =$ _____ |
| i $20p \div 5 =$ _____ | j $64x^2y^2z^2 \div 16x^2yz =$ _____ |
| k $(-10x) \div (-2x) =$ _____ | l $81mn \div (-9m) =$ _____ |

QUESTION 3 Work out the following divisions.

- | | |
|---------------------------------------|-----------------------------------|
| a $(-27x^2) \div (3x^2) =$ _____ | b $15ab \div (-3a^2) =$ _____ |
| c $16xy \div (-16xy) =$ _____ | d $35a^2b^2c^2 \div 5abc =$ _____ |
| e $24ab \div 4a \div 2b =$ _____ | f $56t^3 \div 8t^2 =$ _____ |
| g $48x^2y^2 \div 4xy \div 3x =$ _____ | h $10ab \div -2a =$ _____ |
| i $15xy \div 6xy =$ _____ | j $15abc \div -3bc =$ _____ |

QUESTION 4 Simplify the following expressions.

- | | |
|------------------------------------|---|
| a $5a \times -3a =$ _____ | b $4a \times 5b \times 2c =$ _____ |
| c $8x \times (-7x) =$ _____ | d $-8a \times 3a \times -2a =$ _____ |
| e $15a \times (-2ab) =$ _____ | f $10x \times 2y \times (-2x) =$ _____ |
| g $18a^2 \times 2ab^2 =$ _____ | h $ab \times a^2b^2 \times -ab =$ _____ |
| i $8x \times y \times y^2 =$ _____ | j $-5x \times 3xy =$ _____ |

QUESTION 5 Simplify the following.

- | | | |
|---|---|--|
| a $\frac{8x \times 9y}{12xy} =$ _____ | b $\frac{15a \times 8b}{10ab} =$ _____ | c $\frac{8a \times 5b}{3a \times 4b} =$ _____ |
| d $\frac{(6ab)^2 \times ab}{9a^3b} =$ _____ | e $\frac{(3a)^2 \times (4b)^2}{24ab} =$ _____ | f $\frac{(-2x) \times (-3) \times (-5x)}{-6x \times -5} =$ _____ |

Indices

QUESTION 1 Simplify the following products.

- | | | | | | |
|---|-----------------------------|---|--------------------------------|---|-------------------------------------|
| a | $a^2 \times a^3 =$ _____ | b | $6p^2 \times p^3 =$ _____ | c | $y^3 \times y^8 =$ _____ |
| d | $m^3 \times m^4 =$ _____ | e | $8a^3 \times 4a^5 =$ _____ | f | $x^7 \times x^5 \times x^3 =$ _____ |
| g | $x^5 \times x^7 =$ _____ | h | $9a^2 \times 8a^7 =$ _____ | i | $10p^5 \times 8p^6 =$ _____ |
| j | $x^8 \times x^{12} =$ _____ | k | $a^4b^4 \times a^3b^3 =$ _____ | l | $9x^2 \times 4x^5y^5 =$ _____ |

QUESTION 2 Simplify these divisions.

- | | | | | | |
|---|------------------------------|---|------------------------------|---|---------------------------------------|
| a | $a^{12} \div a^8 =$ _____ | b | $36m^6 \div 9m^4 =$ _____ | c | $20a^8b^7 \div 5a^7b^6 =$ _____ |
| d | $a^{15} \div a^7 =$ _____ | e | $k^{15} \div k^{10} =$ _____ | f | $12a^6b^9 \div 6a^4b^4 =$ _____ |
| g | $a^{48} \div a^{36} =$ _____ | h | $48a^7 \div 12a^5 =$ _____ | i | $36x^{12}y^8 \div (-4x^2y^7) =$ _____ |
| j | $m^{16} \div m^9 =$ _____ | k | $m^6n^8 \div m^4n^6 =$ _____ | l | $64a^8b^9 \div 8a^6b^7 =$ _____ |

QUESTION 3 Simplify these expressions.

- | | | | | | |
|---|-------------------|---|--------------------|---|------------------------|
| a | $(a^2)^3 =$ _____ | b | $(y^5)^4 =$ _____ | c | $(8x^2y^3)^2 =$ _____ |
| d | $(m^5)^2 =$ _____ | e | $(x^3)^7 =$ _____ | f | $(9ab^2)^3 =$ _____ |
| g | $(x^6)^4 =$ _____ | h | $(4a^2)^3 =$ _____ | i | $(5m^4)^3 =$ _____ |
| j | $(a^7)^6 =$ _____ | k | $(9p^2)^2 =$ _____ | l | $(10a^3b^3)^3 =$ _____ |

QUESTION 4 Use index laws to simplify the following.

- | | | | | | |
|---|---------------|---|--------------------|---|------------------|
| a | $a^0 =$ _____ | b | $(2x)^0 =$ _____ | c | $9x^0 =$ _____ |
| d | $m^0 =$ _____ | e | $(3x^2)^0 =$ _____ | f | $2a^0 =$ _____ |
| g | $x^0 =$ _____ | h | $(4mn)^0 =$ _____ | i | $(5a)^0 =$ _____ |

QUESTION 5 Simplify the following.

- | | | | | | |
|---|----------------------------|---|------------------------------|---|-------------------------------|
| a | $x^{10} \div x^3 =$ _____ | b | $p^6q^3 \div p^2q^2 =$ _____ | c | $a^2 \times (a^3)^4 =$ _____ |
| d | $m^5 \times m^4 =$ _____ | e | $(8p^2)^2 =$ _____ | f | $x^{12} \div (x^2)^3 =$ _____ |
| g | $6x^2 \times 5x^3 =$ _____ | h | $9m^4 \times m^2n =$ _____ | i | $(3x^2)^3 \div 9x^3 =$ _____ |

QUESTION 6 Use index laws to simplify the following.

- | | | | | | |
|---|--------------------------------|---|--------------------------------------|---|------------------------------------|
| a | $3(a^4)^3 \times 4a^0 =$ _____ | b | $(2ab^2)^3 \div 4(ab)^2 =$ _____ | c | $a^{12} \div a^8 \div a^2 =$ _____ |
| d | $(6a^2)^2 \div 4a^3 =$ _____ | e | $(8a)^2 \div (4b)^2 =$ _____ | f | $15ab \times 3a \times b =$ _____ |
| g | $(x^5)^2 \div x^7 =$ _____ | h | $a^3b \times a^2b \times ab =$ _____ | i | $28x^2y \div 7x =$ _____ |



Grouping symbols

QUESTION 1 Expand the following expressions.

- | | |
|------------------------|------------------------|
| a $3(x + y) =$ _____ | b $5(2a + 3b) =$ _____ |
| c $4(2a + 3) =$ _____ | d $6(8a - 7b) =$ _____ |
| e $8(m + 3p) =$ _____ | f $3(5a - 4m) =$ _____ |
| g $5x(x + 8) =$ _____ | h $7(x - 5) =$ _____ |
| i $9a(a - 2b) =$ _____ | j $12(2x - 3) =$ _____ |
| k $6m(2a + n) =$ _____ | l $15(3x - 7) =$ _____ |

QUESTION 2 Write these expressions without grouping symbols.

- | | |
|-------------------------|--------------------------|
| a $-3(x + 2) =$ _____ | b $-5x(2x + 1) =$ _____ |
| c $-2(2x - 7) =$ _____ | d $-2x(8x - 3y) =$ _____ |
| e $-3(4x - 5) =$ _____ | f $-y(x + y^2) =$ _____ |
| g $-8(8x - 9) =$ _____ | h $-m(3m + 8) =$ _____ |
| i $-2x(x + 1) =$ _____ | j $-2n(8 - 5m) =$ _____ |
| k $-3x(2x + 5) =$ _____ | l $-6t(2t - 3) =$ _____ |

QUESTION 3 Expand the following expressions.

- | | |
|-------------------------|-------------------------|
| a $5(2x + 7) =$ _____ | b $7(3x - 11) =$ _____ |
| c $-3(4x - 9) =$ _____ | d $-4(2x + 5) =$ _____ |
| e $8(6y + 3) =$ _____ | f $-3a(5a + 5) =$ _____ |
| g $-x(2x + 7) =$ _____ | h $-m(8m - 5) =$ _____ |
| i $-2t(3t + 5) =$ _____ | j $8a(2a + 3b) =$ _____ |
| k $-8x(3x - 5) =$ _____ | l $6p(2p - 3m) =$ _____ |

QUESTION 4 Expand and simplify.

- | | |
|--------------------------------|---------------------------------|
| a $2(x + 3) + 5x =$ _____ | b $4(y + 3) + 7y + 5 =$ _____ |
| c $5(xy - 7) - 3xy =$ _____ | d $9(p - 7) - 8p - 7 =$ _____ |
| e $4y(y + 3) - 2y^2 =$ _____ | f $8x - 3(x - 2) =$ _____ |
| g $9p - 3(8 - p) =$ _____ | h $5m + 4(m - 4) =$ _____ |
| i $9m(2m + 1) - 10m^2 =$ _____ | j $7(x - 5) - 3x + 9 =$ _____ |
| k $8(t - 3) - 3t =$ _____ | l $6(x + 8) - 3(x - 2) =$ _____ |

QUESTION 5 Expand and simplify.

- | | |
|----------------------------------|-----------------------------------|
| a $4(m + 3) + 2(m + 1) =$ _____ | b $5(x + 3) - 3(x - 1) =$ _____ |
| c $8(2x + 7) + 3(x + 2) =$ _____ | d $8(2x + 7) - 4(2x - 5) =$ _____ |
| e $5(y + 7) - 2(y - 1) =$ _____ | f $9(3x + 1) - 5(2x - 3) =$ _____ |
| g $7(n - 4) - 2(n + 2) =$ _____ | h $x(2x + 3) - 3(x + 1) =$ _____ |

Substitution

QUESTION 1 If $m = 7$, $n = 4$ and $p = 12$, evaluate the following.

- | | | | |
|---|----------------------|---|---------------------------|
| a | $mn =$ _____ | b | $mnp =$ _____ |
| c | $mn \div p =$ _____ | d | $m^2n^2 =$ _____ |
| e | $mnp^2 =$ _____ | f | $m^2 + n^2 + p^2 =$ _____ |
| g | $m + n + p =$ _____ | h | $7m - p =$ _____ |
| i | $m^2 - 5p =$ _____ | j | $m^2 + 10 + p =$ _____ |
| k | $mn^2p - mn =$ _____ | l | $8m^2 - 12 =$ _____ |

QUESTION 2 If $a = 4$, find the value of the following expressions.

- | | | | |
|---|---------------------------|---|--------------------------|
| a | $5a + 7 =$ _____ | b | $(a - 5)^2 =$ _____ |
| c | $a^2 - 9 =$ _____ | d | $85 - 4a =$ _____ |
| e | $3a(a + 4) =$ _____ | f | $5a^2 + 8 =$ _____ |
| g | $5(a + 6) =$ _____ | h | $a^3 =$ _____ |
| i | $\sqrt{25 - a^2} =$ _____ | j | $3(2a + 7) =$ _____ |
| k | $3a^2 =$ _____ | l | $(a + 7)(a - 7) =$ _____ |

QUESTION 3 If $x = 7.2$, $y = 3.5$ and $z = 6.4$, evaluate each expression correct to 1 decimal place.

- | | | | |
|---|--------------------------|---|----------------------------|
| a | $x + y =$ _____ | b | $x + y + z =$ _____ |
| c | $2x + 2y + 2z =$ _____ | d | $x^2 + y^2 - z^2 =$ _____ |
| e | $(x + y)^2 =$ _____ | f | $3xyz =$ _____ |
| g | $x^3 + x^2 =$ _____ | h | $\sqrt{xy} =$ _____ |
| i | $(x - z) \div y =$ _____ | j | $\sqrt{x + y + z} =$ _____ |
| k | $(x - z) + 8 =$ _____ | l | $\frac{xy}{z} =$ _____ |

QUESTION 4 If $a = 3$, $b = 4$, $c = 5$ and $d = 6$, find the value of each expression.

- | | | | |
|---|---------------------------|---|---------------------------|
| a | $6c^2 - ab =$ _____ | b | $a^2 + b^2 + c^2 =$ _____ |
| c | $abcd =$ _____ | d | $ab - cd =$ _____ |
| e | $b^2 + c^2 - a^2 =$ _____ | f | $b^2 - 5 =$ _____ |
| g | $6ab + 7bc =$ _____ | h | $a^2 + b^2 - cd =$ _____ |
| i | $3abc \div d =$ _____ | | |



Common factors

QUESTION 1 Factorise the following by taking out the highest common factor.

- | | | |
|--------------------|---------------------|----------------------|
| a $7x + 7 =$ _____ | b $10a - 2 =$ _____ | c $7y + 14 =$ _____ |
| d $8x - 4 =$ _____ | e $3a + 15 =$ _____ | f $4x - 12y =$ _____ |
| g $3y + 3 =$ _____ | h $5m + 30 =$ _____ | i $32x - 28 =$ _____ |
| j $5a - 5 =$ _____ | k $6a - 2b =$ _____ | l $5a + 35 =$ _____ |

QUESTION 2 Factorise the following.

- | | | |
|------------------------|-------------------------|-------------------------|
| a $y^2 + 3y =$ _____ | b $6y^3 - 3y^2 =$ _____ | c $6x^3 - 3x^2 =$ _____ |
| d $2m^2 + 6m =$ _____ | e $8a^2 - 4a =$ _____ | f $m^2 - 9m =$ _____ |
| g $8a^2 + 24a =$ _____ | h $15y^2 - 6y =$ _____ | i $16a^2 - 8a =$ _____ |
| j $x^2 + 9x =$ _____ | k $9a^3 - 6a^2 =$ _____ | l $28x^2 - 7x =$ _____ |

QUESTION 3 Factorise the following by taking out the highest common factor.

- | | | |
|------------------------|------------------------|-------------------------|
| a $-3x - 3 =$ _____ | b $-4y^2 + 16 =$ _____ | c $-6n - 3 =$ _____ |
| d $-5x - 40 =$ _____ | e $-3x + 27 =$ _____ | f $-7t - 14 =$ _____ |
| g $-2m^2 - 4 =$ _____ | h $-5m^2 + 35 =$ _____ | i $-11x^2 - 22 =$ _____ |
| j $-6a^2 + 12 =$ _____ | k $-8a^2 - 32 =$ _____ | l $-13y + 39 =$ _____ |

QUESTION 4 Factorise.

- | | | |
|-------------------------|-----------------------------|--------------------------|
| a $-6x^2 - 12x =$ _____ | b $-16x^2 - 4x =$ _____ | c $-6x - 9 =$ _____ |
| d $-8xy - 4y =$ _____ | e $-9x^3 + 27x^2 =$ _____ | f $-15x^2 - 5xy =$ _____ |
| g $-6mn - 3 =$ _____ | h $-5x^2y^2 + 25xy =$ _____ | i $-6mn + 15m^2 =$ _____ |
| j $-8xyz + 4xy =$ _____ | k $-9x^2 - 15x =$ _____ | l $-x - 3yx =$ _____ |

QUESTION 5 Factorise the following.

- | | | |
|----------------------------|----------------------|--------------------------|
| a $8a + 16b =$ _____ | b $5a - 25 =$ _____ | c $8x - 4y =$ _____ |
| d $9a - 9b =$ _____ | e $8 - 8t =$ _____ | f $m^3 - 4m^2 =$ _____ |
| g $16ab - a^2 =$ _____ | h $14m - 7 =$ _____ | i $16ab - 8a^2b =$ _____ |
| j $15x^2y^2 - 5xy =$ _____ | k $-6m - 36 =$ _____ | l $-4m - 12n =$ _____ |

QUESTION 6 Factorise the following.

- | | | |
|---------------------------|-----------------------|----------------------------|
| a $3a + 3b + 3c =$ _____ | b $16pq - 7p =$ _____ | c $-x^2 - 7x =$ _____ |
| d $8x + 8y - 16z =$ _____ | e $tx - x =$ _____ | f $15a + 5b - 10c =$ _____ |
| g $4x - 8y =$ _____ | h $y^3 - y^2 =$ _____ | i $18x - 9y + 6 =$ _____ |
| j $16x - 32y =$ _____ | k $15mn - 3n =$ _____ | l $6a^2 + 3a + 9 =$ _____ |
| m $m^2 - 2mn =$ _____ | n $8pq - q^2 =$ _____ | o $-6x - 6xy - 12 =$ _____ |

Addition and subtraction of algebraic fractions

QUESTION 1 Find the sum of these algebraic fractions.

a $\frac{x}{8} + \frac{x}{8} =$ _____

b $\frac{3x}{5} + \frac{2x}{5} =$ _____

c $\frac{9x}{15} + \frac{8x}{15} =$ _____

d $\frac{a}{9} + \frac{a}{9} =$ _____

e $\frac{x}{7} + \frac{x}{7} =$ _____

f $\frac{y}{6} + \frac{y}{6} =$ _____

g $\frac{x}{3} + \frac{x}{4} =$ _____

h $\frac{a}{9} + \frac{2a}{7} =$ _____

i $\frac{3a}{7} + \frac{a}{2} =$ _____

j $\frac{3x}{5} + \frac{5x}{7} =$ _____

k $\frac{2m}{3} + \frac{5m}{9} =$ _____

l $\frac{2a}{5} + \frac{3a}{7} =$ _____

QUESTION 2 Subtract the following algebraic fractions.

a $\frac{2a}{3} - \frac{a}{3} =$ _____

b $\frac{5x}{7} - \frac{3x}{7} =$ _____

c $\frac{15y}{11} - \frac{5y}{11} =$ _____

d $\frac{6m}{13} - \frac{2m}{13} =$ _____

e $\frac{5p}{24} - \frac{p}{8} =$ _____

f $\frac{8x}{15} - \frac{3x}{15} =$ _____

g $\frac{x}{3} - \frac{x}{7} =$ _____

h $\frac{x}{8} - \frac{x}{12} =$ _____

i $\frac{y}{12} - \frac{y}{18} =$ _____

j $\frac{3x}{20} - \frac{x}{10} =$ _____

k $\frac{2a+1}{7} - \frac{a}{14} =$ _____

l $\frac{5x+1}{4} - \frac{x}{12} =$ _____

QUESTION 3 Simplify the following.

a $\frac{3x}{2} + \frac{5x}{3} =$ _____

b $\frac{x}{4} - \frac{x}{5} =$ _____

c $\frac{x}{2} + \frac{x}{4} =$ _____

d $\frac{x}{8} - \frac{x}{4} =$ _____

e $\frac{x}{2} + \frac{5x}{6} =$ _____

f $\frac{3x}{4} - \frac{x}{12} =$ _____

g $\frac{2x}{9} + \frac{x}{3} =$ _____

h $\frac{7x}{8} - \frac{x}{12} =$ _____

i $\frac{7x}{10} + \frac{x}{25} =$ _____

j $\frac{5x}{24} - \frac{x}{36} =$ _____

k $\frac{5x}{8} - \frac{x}{4} + \frac{x}{16} =$ _____

l $\frac{m}{10} + \frac{7m}{5} - \frac{2m}{25} =$ _____

QUESTION 4 Find answers to the following.

a $\frac{8p}{9} - \frac{p}{3} =$ _____

b $\frac{8y}{2} + \frac{7y}{4} - \frac{y}{8} =$ _____

c $\frac{8a}{15} + \frac{a}{30} =$ _____

d $\frac{7x}{10} - \frac{x}{5} + \frac{2x}{15} =$ _____

e $\frac{8a}{7} + \frac{3a}{14} =$ _____

f $\frac{6m}{7} + \frac{m}{14} - \frac{2m}{21} =$ _____

g $\frac{8x}{9} - \frac{x}{3} + \frac{2x}{15} =$ _____

h $\frac{9m}{2} + \frac{6m}{4} - \frac{m}{16} =$ _____



Multiplication and division of algebraic fractions

QUESTION 1 Find the products of these algebraic fractions.

a $\frac{a}{3} \times \frac{a}{4} =$ _____

b $\frac{x}{5} \times \frac{y}{6} =$ _____

c $\frac{m}{2} \times \frac{m}{3} =$ _____

d $\frac{p}{4} \times \frac{p}{8} =$ _____

e $\frac{a}{6} \times \frac{3}{x} =$ _____

f $\frac{15}{m} \times \frac{n}{5} =$ _____

g $\frac{5x}{3} \times \frac{15}{2x} =$ _____

h $\frac{x}{5} \times \frac{25}{x^2} =$ _____

i $\frac{8}{x^2} \times \frac{x}{16} =$ _____

j $\frac{2x}{y} \times \frac{y^2}{3x} =$ _____

k $\frac{ab}{4} \times \frac{16}{a^2b} =$ _____

l $\frac{5}{xy} \times \frac{y}{25} =$ _____

QUESTION 2 Divide the following algebraic fractions.

a $\frac{m}{2} \div \frac{m}{5} =$ _____

b $\frac{y}{7} \div \frac{3y}{14} =$ _____

c $\frac{p}{8} \div \frac{8p}{15} =$ _____

d $\frac{x}{3} \div \frac{2x}{5} =$ _____

e $\frac{5}{n} \div \frac{16}{n} =$ _____

f $\frac{2a}{5} \div \frac{4}{a} =$ _____

g $\frac{ab}{6} \div \frac{a^2}{12} =$ _____

h $\frac{x^2y^2}{9} \div \frac{xy}{27} =$ _____

i $\frac{3x}{4y} \div \frac{9x}{24y} =$ _____

j $\frac{5a}{7} \div \frac{16a}{8} =$ _____

k $\frac{6a}{11} \div \frac{5a}{3} =$ _____

l $\frac{ab}{5} \div \frac{ac}{15} =$ _____

QUESTION 3 Simplify the following.

a $\frac{2x}{5} \times \frac{7x}{8} =$ _____

b $\frac{8x}{13} \div \frac{16x}{26} =$ _____

c $\frac{a}{b} \div \frac{b}{a} =$ _____

d $\frac{3a}{5} \div \frac{4a}{9} =$ _____

e $\frac{9a}{10} \div \frac{27a}{20} =$ _____

f $\frac{m}{n} \div \frac{m}{l} =$ _____

g $\frac{15m}{17} \div \frac{16m}{34} =$ _____

h $\frac{5a}{8} \div \frac{6a^2}{10} =$ _____

i $\frac{x}{y} \div \frac{x}{y} =$ _____

j $\frac{7y^2}{8} \div \frac{14y}{12} =$ _____

k $\frac{a^2b}{10} \div \frac{ab}{20} =$ _____

l $\frac{x^3}{y^3} \div \frac{x^2}{y^2} =$ _____

QUESTION 4 Find answers to the following.

a $\frac{6mn}{15} \div \frac{m^2}{20} =$ _____

b $\frac{m}{8} \div \frac{m^3}{32} =$ _____

c $\frac{abc}{14} \div \frac{ab}{7} =$ _____

d $\frac{3m}{4} \div \frac{27m}{16} =$ _____

e $\frac{mn^2}{6p^2} \div \frac{m^2n^2}{12p} =$ _____

f $\frac{3x}{y} \div \frac{4x}{y^2} =$ _____

g $\frac{a^2}{b^2} \times \frac{b^3}{a^3} =$ _____

h $\frac{ab^2}{c} \times \frac{c^2}{a^3b^3} =$ _____

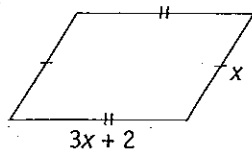
i $\frac{3xy}{5} \times \frac{20}{x^2y^2} =$ _____

Basic algebra

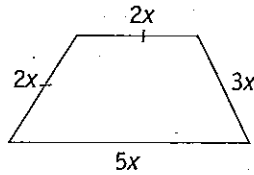
Problem solving and algebra

Find the perimeter of each of the following shapes:

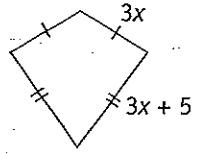
1



2

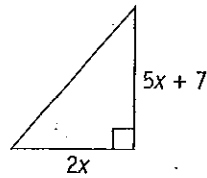


3

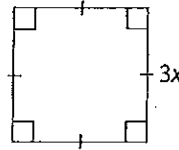


Find the area of each of the following shapes.

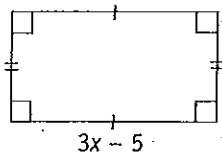
4



5



6



7 Find the sum of $3x$ and $5y$.

8 What is the product of $8m$ and $5n$?

9 Find the average of $6x$, $2x$ and $7x$.

10 Find an expression for 5 more than the sum of 3 and $2x$.

11 Find the area of a square with side length y metres.

12 If the first number is $4x$, write the next consecutive integer.

13 Increase $9x$ by 10 and then decrease this result by $2x$.

14 Find the volume of a cube with side length $2x$ cm.

15 Find the number $(x - 2)$ less than $4x + 5y$.

Basic algebra

TOPIC TEST

PART A

- Instructions**
- This part consists of 15 multiple choice questions
 - Fill in only ONE CIRCLE for each question.
 - Each question is worth 1 mark
 - Calculators may be used

Time allowed: 15 minutes

Total marks = 15

				Marks		
1	If $a = -4$ and $b = 3$ the value of a^2b is	(A) 48	(B) 144	(C) -24	(D) -48	1
2	$a^3 + a^3 =$	(A) a^6	(B) a^3	(C) $2a^6$	(D) $2a^3$	1
3	$15x^8 \div 5x^4 =$	(A) $3x^4$	(B) $3x^2$	(C) $10x^4$	(D) $10x^2$	1
4	$2a \times 3a \times 4a =$	(A) $9a$	(B) $9a^3$	(C) $24a$	(D) $24a^3$	1
5	$\frac{1}{x} \div \frac{1}{y} =$	(A) $\frac{1}{xy}$	(B) $\frac{y}{x}$	(C) $\frac{x}{y}$	(D) xy	1
6	$3x - (-x) =$	(A) 3	(B) $3x$	(C) $3x^2$	(D) $4x$	1
7	$3y^2 - 2y + 5y + 4y^2 =$	(A) $7y^2 + 3y$	(B) $7y^2 - 7y$	(C) $7y^3 + 3y$	(D) $7y^4 - 7y$	1
8	$7t^3 \times (-4t^2) =$	(A) $3t^5$	(B) $3t^6$	(C) $-28t^5$	(D) $-28t^6$	1
9	$3(x + 4) - x =$	(A) 12	(B) 15	(C) $2x + 4$	(D) $2x + 12$	1
10	$(4x^3)^2 =$	(A) $4x^5$	(B) $4x^6$	(C) $16x^5$	(D) $16x^6$	1

11 $\frac{6a^2}{2ab} =$

(A) $3ab$

(B) $\frac{3a}{b}$

(C) $6b$

(D) $\frac{6}{b}$

12 $3ab - b + ab - 2b =$

(A) $2ab - b$

(B) $2ab - 3b$

(C) $4ab - b$

(D) $4ab - 3b$

13 $\frac{x^4 \times x^6}{x^2} =$

(A) x^5

(B) x^8

(C) x^{12}

(D) x^{22}

14 $(y^6 \div y^2)^2 =$

(A) y^5

(B) y^6

(C) y^8

(D) y^9

15 The correct factorisation of $2ab - a$ is

(A) $2a(b - 1)$

(B) $2a(b - a)$

(C) $a(2b - 1)$

(D) $a(2b - a)$

Total marks achieved for PART

Basic algebra

TOPIC TEST

PART B

1

- Instructions**
- This part consists of 15 questions
 - Each question is worth 1 mark
 - Write answers in the 'Answers only' column

1

Time allowed: 15 minutes**Total marks = 15**

Questions

Answers only

- 1** Simplify $3y - 4y - y$
- 2** Simplify $6a^2 \times a$
- 3** Factorise $7x + 14y$
- 4** If $\frac{x}{4} = 11$ find x
- 5** Expand $3x(2x - 5y)$
- 6** If $a = 3$, $b = -2$ and $c = 0$, find the value of $3a + 2b - c$

Simplify the following.

7 $\frac{6x^3}{x^2}$

8 $(3a^2b)^2$

9 $\sqrt{49x^2}$

10 $36m^3 - 12m^3$

11 $\frac{-8a}{9} - \frac{3a}{9}$

12 $\frac{3x+5}{4} + \frac{x}{4}$

13 $\frac{xy}{3} \times \frac{9}{xy}$

14 $\frac{4a}{5} \div \frac{a}{10}$

15 $3(a-4) + 4(a+2b)$

Total marks achieved for PART B

15

Basic algebra

TOPIC TEST

P

- Instructions**
- This part consists of 4 questions
 - Each question is worth 5 marks
 - Show all necessary working

Time allowed: 20 minutes

Total marks = 2

1 If $a = 2$, $b = -4$ and $c = -6$, find the value of each expression.

- a abc _____ b $5(a + b + c)$ _____
c $5ab^2$ _____ d $3ab + 2c$ _____
e $a^2 + b^2 - c^2$ _____

2 Simplify.

- a $-7a + 6a + 4a$ _____ b $6a + 5(3 - a)$ _____
c $-8(2a + 3b) + a$ _____ d $\frac{9}{a} - \frac{5}{a}$ _____
e $\frac{3x}{5} + \frac{2x}{17}$ _____

3 Expand and simplify.

- a $9x - 3(x + 5)$ _____
b $x(3x - 2) - 3(x^2 - x)$ _____
c $25 - (x + 17)$ _____
d $-9(x - y) + 3(2x - y)$ _____
e $-6(a + 2b) - 2(b - a)$ _____

4 Factorise.

- a $3x - x^2$ _____ b $3p^2q + 12pq^2$ _____
c Solve $3(x - 1) = 6$ _____

Simplify the following.

- d $5p^2 \times q^5 \times pq$ _____
e $\frac{15a^3b^2}{8ac^2} \div \frac{25ab}{(2c)^2}$ _____

Total marks achieved for PART C

Answers

12 \$23 072 13 \$426.67 14 300 15 \$375

PAGES 32 & 33 1 D 2 C 3 B 4 B 5 D 6 C 7 D 8 C 9 D 10 A 11 C 12 D 13 C 14 B 15 C

PAGE 34 1 9 2 $16\frac{2}{3}$ 3 750 4 93 5 198 kg 6 817 7 60% 8 74% 9 375 10 99.36 11 12 12 $\frac{22}{25}$ 13 90

14 $\frac{33}{50}$ 15 900

PAGE 35 1 a 90 b 6 c 52 d 340 e 165 2 a 140 cm b \$221 c 4.505 L d 2.94 h e 105 3 a $\frac{11}{20}$, 0.55

b $\frac{17}{20}$, 85% c 1250%, 12.5 d $\frac{1}{16}$, 0.0625 e 60%, 0.6 4 a 48% b 25% c 124% d \$312 e \$64

PAGE 36 1 a 11x b 16x c 16x d 27x e 41x f 45x g 14xy h 20mn i 38a j 18x k $42a^2$ l 19p 2 a 4a b 8a c 5a d 15x e 7m f 4y g 6x h 2xy i $22x^2$ j 8y k 5x l 11p 3 a 12a b 8x c 14a d 14a e 20xy f 8mn g $9x^2$ h $13a^2$ i 5x j 16t k 10m l 12a 4 a $3x+5y$ b $9a+11b$ c $5m+2n$ d $4x^2$ e $2a+5b$ f $14a-6b$ g $15y-7x$ h 6xy 5 a $22-10x$ b $3m+3n$ c $19x-2y$ d $11x^2-7y^2$ e $8m+2n$ f $6xy+6yz$ g $9a+6b$ h $3a+6b$ i $6t+3$ j 18ab

PAGE 37 1 a 10a b 18b c 72y d 21y e -6ab f 6a g -3ab h 6ab i 18x j $-45a^2b$ k $16a^2$ l $12x^2$ 2 a 18ab b $6x^2$ c 40xy d $24y^2$ e 27ab f $-30a^2$ g $48y^2$ h $6t^2$ i $54x^2y$ j $-30a^2b$ 3 a $2a^2b$ b 90a c $30a^2bc$ d $a^2b^2c^2$ e $-54ab^2c$ f $42a^2p$ g -40x h $6xy^2$ 4 a 40ab b $14k^2$ c $-72x^2y^2$ d $8a^3x^2$ e $36m^2$ f $24m^2t$ g $3y^3$ h $-30x^2$ 5 a $-8a^2b^2$ b $-84a^2$ c $-18x^2y$ d 30abc e $-4a^2b$ f $-x^2y$ g $25p^2$ h $-36a^2$

PAGE 38 1 a 3a b 3pq c $\frac{4}{5m}$ d 3x e 3y f 6a g 2a h 9x i $\frac{3}{y}$ 2 a 3 b 4y c 3n d 8m e -x f 8b g 4 h 8a i 4y j -3b k 3b l 4x 3 a -3x b -2b c 2y d 3x e 3y f 4g $4x^2$ h 12y i -5q j 10n 4 a -4 b 17 c -8x d -2 e 2x f 6m g 5y h 8b 5 a -4b b 4x c -1 d 9y e 1 f $\frac{ab}{c}$ g $\frac{3}{b}$ h 2x

PAGE 39 1 a $16a^2$ b $60a^2c$ c $15a^2$ d $288a^4$ e $-27x^2$ f $-36a^3$ g $45x^3y$ h $15y^3$ i $96a^2b$ j $72a^3$ k $3a^4b$ l $9a^3b^3$ 2 a 5 b 9 c 6 d 25 e -2q f -7x g -4b h -4a i 4p j 4yz k 5 l -9n 3 a -9 b $-\frac{5b}{a}$ c -1 d 7abc e 3 f 7t g 4y h -5b i $\frac{5}{2}$ j -5a 4 a $-15a^2$ b 40abc c $-56x^2$ d $48a^3$ e $-30a^2b$ f $-40x^2y$ g $36a^3b^2$ h $-a^4b^4$ i $8xy^3$ j $-15x^2y$ 5 a 6 b 12 c $\frac{10}{3}$ d $4b^2$ e 6ab f -x

PAGE 40 1 a a^5 b $6p^5$ c y^{11} d m^7 e $32a^8$ f x^{15} g x^{12} h $72a^9$ i $80p^{11}$ j x^{20} k a^7b^7 l $36x^7y^5$ 2 a a^4 b $4m^2$ c 4ab d a^8 e k^5 f $2a^2b^3$ g a^{12} h $4a^2$ i $-9x^{10}y$ j m^7 k m^2n^2 l $8a^2b^2$ 3 a a^6 b y^{20} c $64x^4y^5$ d m^{10} e x^{21} f $729a^3b^5$ g x^{24} h $64a^5$ i $125m^{12}$ j a^{42} k $81p^4$ l $1000a^9b^9$ 4 a 1 b 1 c 9 d 1 e 1 f 2 g 1 h 1 i 1 5 a x^7 b p^4q c a^{14} d m^9 e $64p^4$ f x^6 g $30x^5$ h $9m^5n$ i $3x^3$ 6 a $12a^{12}$ b $2ab^4$ c a^2 d 9a e $\frac{4a^2}{b^2}$ f $45a^2b^2$ g x^3 h a^6b^3 i 4xy

PAGE 41 1 a $3x+3y$ b $10a+15b$ c $8a+12$ d $48a-42b$ e $8m+24p$ f $15a-12m$ g $5x^2+40x$ h $7x-35$ i $9a^2-18ab$ j $24x-36$ k $12am+6mn$ l $45x-105$ 2 a $-3x-6$ b $-10x^2-5x$ c $-4x+14$ d $-16x^2+6xy$ e $-12x+15$ f $-xy-y^3$ g $-64x+72$ h $-3m^2-8m$ i $-2x^2-2x$ j $-16n+10mn$ k $-6x^2-15x$ l $-12t^2+18t$ 3 a $10x+35$ b $21x-77$ c $-12x+27$ d $-8x-20$ e $48y+24$ f $-15a^2-15a$ g $-2x^2-7x$ h $-8m^2+5m$ i $-6t^2-10t$ j $16a^2+24ab$ k $-24x^2+40x$ l $12p^2-18mp$ 4 a $7x+6$ b $11y+17$ c $2xy-35$ d $p-70$ e $2y^2+12y$ f $5x+6$ g $12p-24$ h $9m-16$ i $8m^2+9m$ j $4x-26$ k $5t-24$ l $3x+54$ 5 a $6m+14$ b $2x+18$ c $19x+62$ d $8x+76$ e $3y+37$ f $17x+24$ g $5n-32$ h $2x^2-3$

PAGE 42 1 a 28 b 336 c $2\frac{1}{3}$ d 784 e 4032 f 209 g 23 h 37 i -11 j 71 k 1316 l 380 2 a 27 b 1 c 7 d 69 e 96 f 88 g 50 h 64 i 3 j 45 k 48 l -33 3 a 10.7 b 17.1 c 34.2 d 23.13 e 114.49 f 483.84 g 425.088 h 5.0 i 0.2 j 4.1 k 8.8 l 3.9 4 a 138 b 50 c 360 d -18 e 32 f 11 g 212 h -5 i 30

PAGE 43 1 a $7(x+1)$ b $2(5a-1)$ c $7(y+2)$ d $4(2x-1)$ e $3(a+5)$ f $4(x-3y)$ g $3(y+1)$ h $5(m+6)$ i $4(8x-7)$ j $5(a-1)$ k $2(3a-b)$ l $5(a+7)$ 2 a $y(y+3)$ b $3y^2(2y-1)$ c $3x^2(2x-1)$ d $2m(m+3)$ e $4a(2a-1)$ f $m(m-9)$ g $8a(a+3)$ h $3y(5y-2)$ i $8a(2a-1)$ j $x(x+9)$ k $3a^2(3a-2)$ l $7x(4x-1)$ 3 a $-3(x+1)$ b $-4(y^2-4)$ c $-3(2n+1)$ d $-5(x+8)$ e $-3(x-9)$ f $-7(t+2)$ g $-2(m^2+2)$ h $-5(m^2-7)$ i $-11(x^2+2)$ j $-6(a^2-2)$ k $-8(a^2+4)$ l $-13(y-3)$ 4 a $-6x(x+2)$ b $-4x(4x+1)$ c $-3(2x+3)$ d $-4y(2x+1)$ e $-9x^2(x-3)$ f $-5x(3x+y)$ g $-3(2mn+1)$ h $-5xy(xy-5)$ i $-3m(2n-5m)$ j $-4xy(2z-1)$ k $-3x(3x+5)$ l $-x(1+3y)$ 5 a $8(a+2b)$ b $5(a-5)$ c $4(2x-y)$ d $9(a-b)$ e $8(1-t)$

Answers

f $m^2(m-4)$ g $a(16b-a)$ h $7(2m-1)$ i $8ab(2-a)$ j $5xy(3xy-1)$ k $-6(m+6)$ l $-4(m+3n)$ 6 a $3(a+b+c)$
 b $p(16q-7)$ c $-x(x+7)$ d $8(x+y-2z)$ e $x(t-1)$ f $5(3a+b-2c)$ g $4(x-2y)$ h $y^2(y-1)$ i $3(6x-3y+2)$ j $16(x-2y)$
 k $3n(5m-1)$ l $3(2a^2+a+3)$ m $m(m-2n)$ n $q(8p-q)$ o $-6(x+xy+2)$

PAGE 44 1 a $\frac{x}{4}$ b x c $\frac{17x}{15}$ d $\frac{2a}{9}$ e $\frac{2x}{7}$ f $\frac{y}{3}$ g $\frac{7x}{12}$ h $\frac{25a}{63}$ i $\frac{13a}{14}$ j $\frac{46x}{35}$ k $\frac{11m}{9}$ l $\frac{29a}{35}$ 2 a $\frac{a}{3}$

b $\frac{2x}{7}$ c $\frac{10y}{11}$ d $\frac{4m}{13}$ e $\frac{p}{12}$ f $\frac{x}{3}$ g $\frac{4x}{21}$ h $\frac{x}{24}$ i $\frac{y}{36}$ j $\frac{x}{20}$ k $\frac{3a+2}{14}$ l $\frac{14x+3}{12}$ 3 a $\frac{19x}{6}$ b $\frac{x}{20}$ c $\frac{3x}{4}$

d $\frac{-x}{8}$ e $\frac{4x}{3}$ f $\frac{2x}{3}$ g $\frac{5x}{9}$ h $\frac{95m}{16}$ i $\frac{37x}{50}$ j $\frac{13x}{72}$ k $\frac{7x}{16}$ l $\frac{71m}{50}$ 4 a $\frac{5p}{9}$ b $\frac{45y}{8}$ c $\frac{17a}{30}$ d $\frac{19x}{30}$ e $\frac{19a}{14}$

f $\frac{5m}{6}$ g $\frac{31x}{45}$ h $\frac{95m}{16}$

PAGE 45 1 a $\frac{a^2}{12}$ b $\frac{xy}{30}$ c $\frac{m^2}{6}$ d $\frac{p^2}{32}$ e $\frac{a}{2x}$ f $\frac{3n}{m}$ g $12\frac{1}{2}$ h $\frac{5}{x}$ i $\frac{1}{2x}$ j $\frac{2y}{3}$ k $\frac{4}{a}$ l $\frac{1}{5x}$ 2 a $\frac{5}{2}$ b $\frac{2}{3}$

c $\frac{15}{64}$ d $\frac{5}{6}$ e $\frac{5}{16}$ f $\frac{a^2}{10}$ g $\frac{2b}{a}$ h $3xy$ i 2 j $\frac{5}{14}$ k $\frac{18}{55}$ l $\frac{3b}{c}$ 3 a $\frac{7x^2}{20}$ b 1 c $\frac{a^2}{b^2}$ d $\frac{27}{20}$ e $\frac{2}{3}$ f $\frac{l}{n}$ g $\frac{15}{8}$

h $\frac{25}{24a}$ i 1 j $\frac{3y}{4}$ k 2a i $\frac{x}{y}$ 4 a $\frac{8n}{m}$ b $\frac{4}{m^2}$ c $\frac{c}{2}$ d $\frac{4}{9}$ e $\frac{2}{mp}$ f $\frac{3y}{4}$ g $\frac{b}{a}$ h $\frac{c}{a^2b}$ i $\frac{12}{xy}$

PAGE 46 1 $8x+4$ 2 $12x$ 3 $12x+10$ 4 $5x^2+7x$ 5 $9x^2$ 6 $6x^2-10x$ 7 $3x+5y$ 8 $40mn$ 9 $5x$ 10 $2x+8$ 11 y^2m^2
 12 $4x+1$ 13 $7x+10$ 14 $8x^3cm^3$ 15 $3x+5y+2$

PAGES 47 & 48 1 A 2 D 3 A 4 D 5 B 6 D 7 A 8 C 9 D 10 D 11 B 12 D 13 B 14 C 15 C

PAGE 49 1 $-2y$ 2 $6a^3$ 3 $7(x+2y)$ 4 $x=44$ 5 $6x^2-15xy$ 6 5 7 $6x$ 8 $9a^4b^2$ 9 $7x$ 10 $24m^3$ 11 $\frac{5a}{9}$ 12 $\frac{4x+5}{4}$

13 3 14 8 15 $7a+8b-12$

PAGE 50 1 a 48 b -40 c 160 d -36 e -16 2 a $3a$ b $a+15$ c $-15a-24b$ d $\frac{4}{a}$ e $\frac{61x}{85}$ 3 a $6x-15$ b x

c $8-x$ d $-3x+6y$ e $-4a-14b$ 4 a $x(3-x)$ b $3pq(p+4q)$ c $x=3$ d $5p^3q^5$ e $\frac{3ab}{10}$

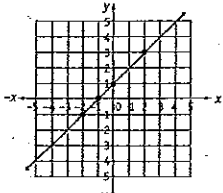
PAGE 51 1 a 1:2 b 1:3 c 1:3 d 1:6 e 1:7 f 1:12 g 1:9 h 1:8 i 1:9 j 1:4 k 1:5 l 1:9 2 a 5:13 b 1:3
 c 1:3 d 2:19 e 1:13 f 2:21 g 2:9 h 1:13 i 3:14 j 2:11 k 2:15 l 4:9 3 a 1:3:5 b 3:1 c 9:16 d 3:4 e 1:5
 f 5:1 g 1:3 h 5:7 i 6:13 j 5:6 k 12:1 l 1:5 4 a 4:21 b 4:15 c 1:6 d 2:5 e 3:4 f 1:7 g 8:25 h 2:3 i 5:2
 j 4:5 k 10:1 l 5:4 5 a 6:25 b 1:15 c 5:18 d 3:1 e 7:18 f 8:1 g 5:7 h 7:8

PAGE 52 1 a 20 kg, 160 kg b \$10, \$35 c \$168, \$672 d \$300 e \$800 2 a 25 cm b 15 c $40^\circ, 60^\circ, 80^\circ$ d 16:25
 e 9 3 a 28 m b \$36, \$60 c 3:10 d \$1200, \$1600, \$2000

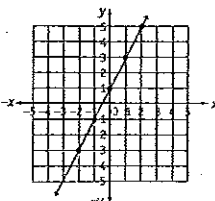
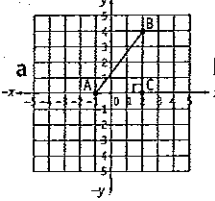
PAGE 53 1 a 80 km/h b \$20 c $5\frac{1}{3}$ L/min d \$7.95 2 a 1 b 960 c 3600 d \$300 e 1800 f 0.6°

3 a 80 km/h b 108 km c 48.6 L 4 a 2.5 km/min b 0.027 km/s c 136 5 a 168.75 km/h b 2.58 m/y c 37

PAGE 54 1 a 1:1500 b 1:200 c 1:30 000 d 1:5000 e 3:500 f 1:40 g 1:30 000 h 3:10 i 1:8000 2 a 1 m
 b 4 m c 6 m d 50 cm e 70 cm f 2 km g 60 cm h 80 cm i 1.5 km 3 a 4 m b 100 m c 8 km d 75 m e 9.3 km
 f 23.45 km g 9 m h 15.2 km i 48.25 km 4 a 6 cm b 7 cm c 13.8 cm d 0.5 cm e 50 cm f 39.65 cm
 5 a $4.8m \times 5.6m$ b 0.58 m

PAGE 55 1 a  b yes c see diagram d $y=x+1$ 2 a $y=2x+1$ b $(-1, -1)$

x	-1	0	1	2
y	-1	1	3	5

(0, 1), (1, 3), (2, 5) c  d yes 3 a  b right-angled triangle c 3 units d 4 units