

ALGEBRAIC EXPRESSIONS
SIMPLIFICATION & EXPANSION

EXERCISE 3A

1 Simplify, where possible, by collecting like terms:

- | | | | |
|------------------------|--------------------------|----------------------|---------------------------|
| a $5 + a + 4$ | b $6 + 3 + a$ | c $m - 2 + 5$ | d $x + 1 + x$ |
| e $f + f - 3$ | f $5a + a$ | g $5a - a$ | h $a - 5a$ |
| i $x^2 + 2x$ | j $d^2 + d^2 + d$ | k $5g + 5$ | l $x^2 - 5x^2 + 5$ |
| m $2a + 3a - 5$ | n $2a + 3a - a$ | o $4xy + xy$ | p $3x^2z - x^2z$ |

2 Simplify, where possible:

- | | | |
|---------------------------------|-----------------------------|---------------------------------|
| a $7a - 7a$ | b $7a - a$ | c $7a - 7$ |
| d $xy + 2yx$ | e $cd - 2cd$ | f $4p^2 - p^2$ |
| g $x + 3 + 2x + 4$ | h $2 + a + 3a - 4$ | i $2y - x + 3y + 3x$ |
| j $3m^2 + 2m - m^2 - m$ | k $ab + 4 - 3 + 2ab$ | l $x^2 + 2x - x^2 - 5$ |
| m $x^2 + 5x + 2x^2 - 3x$ | n $ab + b + a + 4$ | o $2x^2 - 3x - x^2 - 7x$ |

3 Simplify, where possible:

- | | | |
|----------------------------------|-------------------------------|------------------------------------|
| a $4x + 6 - x - 2$ | b $2c + d - 2cd$ | c $3ab - 2ab + ba$ |
| d $x^2 + 2x^2 + 2x^2 - 5$ | e $p^2 - 6 + 2p^2 - 1$ | f $3a + 7 - 2a - 10$ |
| g $-3a + 2b - a - b$ | h $a^2 + 2a - a^3$ | i $2a^2 - a^3 - a^2 + 2a^3$ |
| j $4xy - x - y$ | k $xy^2 + x^2y + x^2y$ | l $4x^3 - 2x^2 - x^3 - x^2$ |

EXERCISE 3B

1 Write the following algebraic products in simplest form:

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|-----------------------|--------------------------------|------------------------|-------------------------|
| a $c \times b$ | b $a \times 2 \times b$ | c $y \times xy$ | d $pq \times 2q$ |
|-----------------------|--------------------------------|------------------------|-------------------------|

2 Simplify the following:

- | | | | |
|--------------------------|---------------------------|----------------------------|---------------------------|
| a $2 \times 3x$ | b $4x \times 5$ | c $-2 \times 7x$ | d $3 \times -2x$ |
| e $2x \times x$ | f $3x \times 2x$ | g $-2x \times x$ | h $-3x \times 4$ |
| i $-2x \times -x$ | j $-3x \times x^2$ | k $-x^2 \times -2x$ | l $3d \times -2d$ |
| m $(-a)^2$ | n $(-2a)^2$ | o $2a^2 \times a^2$ | p $a^2 \times -3a$ |

3 Simplify the following:

- | | | |
|---------------------------------------|---------------------------------------|--|
| a $2 \times 5x + 3x \times 4$ | b $5 \times 3x - 2y \times y$ | c $3 \times x^2 + 2x \times 4x$ |
| d $a \times 2b + b \times 3a$ | e $4 \times x^2 - 3x \times x$ | f $3x \times y - 2x \times 2y$ |
| g $3a \times b + 2a \times 2b$ | h $4c \times d - 3c \times 2d$ | i $3a \times b - 2c \times a$ |

REVIEW SET 3A

1 Expand and simplify:

a $4x \times -8$

b $5x \times 2x^2$

c $-4x \times -6x$

d $3x \times x - 2x^2$

e $4a \times c + 3c \times a$

f $2x^2 \times x - 3x \times x^2$

2 Expand and simplify:

a $-3(x+6)$

b $2x(x^2-4)$

c $2(x-5) + 3(2-x)$

d $3(1-2x) - (x-4)$

e $2x - 3x(x-2)$

f $x(2x+1) - 2x(1-x)$

g $x^2(x+1) - x(1-x^2)$

h $9(a+b) - a(4-b)$

3 Expand and simplify:

a $(3x+2)(x-2)$

b $(2x-1)^2$

c $(4x+1)(4x-1)$

d $(5-x)^2$

e $(3x-7)(2x-5)$

f $x(x+2)(x-2)$

g $(3x+5)^2$

h $-(x-2)^2$

i $-2x(x-1)^2$

4 Expand and simplify:

a $5 + 2x - (x+3)^2$

b $(x+2)^3$

c $(3x-2)(x^2+2x+7)$

d $(x-1)(x-2)(x-3)$

e $x(x+1)^3$

f $(x^2+1)(x-1)(x+1)$

REVIEW SET 3B

1 Expand and simplify:

a $3x \times -2x^2$

b $2x^2 \times -3x$

c $-5x \times -8x$

d $(2x)^2$

e $(-3x^2)^2$

f $4x \times -x^2$

2 Expand and simplify:

a $-7(2x-5)$

b $2(x-3) + 3(2-x)$

c $-x(3-4x) - 2x(x+1)$

d $2(3x+1) - 5(1-2x)$

e $3x(x^2+1) - 2x^2(3-x)$

f $3(2a+b) - 5(b-2a)$

3 Expand and simplify:

a $(2x+5)(x-3)$

b $(3x-2)^2$

c $(2x+3)(2x-3)$

d $(5x-1)(x-2)$

e $(2x-3)^2$

f $(1-5x)(1+5x)$

g $(5-2x)^2$

h $-(x+2)^2$

i $-3x(1-x)^2$

4 Expand and simplify:

a $(2x+1)^2 - (x-2)(3-x)$

b $(x^2-4x+3)(2x-1)$

c $(x+3)^3$

d $(x+1)(x-2)(x+5)$

e $2x(x-1)^3$

f $(4-x^2)(x+2)(x-2)$

5 Use the binomial expansion $(a+b)^4 = a^4 + 4a^3b + 6a^2b^2 + 4ab^3 + b^4$ to expand and simplify:

a $(2x+1)^4$

b $(x-3)^4$

ANSWERS

EXERCISE 3A

- 1 a $a + 9$ b $9 + a$ c $m + 3$ d $2x + 1$ e $2f - 3$
f $6a$ g $4a$ h $-5a$ i cannot be simplified
j $2d^2 + d$ k cannot be simplified l $-4x^2 + 5$
m $5a - 5$ n $4a$ o $5xy$ p $2x^2z$
- 2 a 0 b $6a$ c cannot be simplified d $3xy$ e $-cd$
f $3y^2$ g $3x + 7$ h $4a - 2$ i $2x + 5y$ j $2m^2 + m$
k $3ab + 1$ l $2x - 5$ m $3x^2 + 2x$
n cannot be simplified o $x^2 - 10x$
- 3 a $3x + 4$ b cannot be simplified c $2ab$ d $5x^2 - 5$
e $3y^2 - 7$ f $a - 3$ g $-4a + b$ h cannot be simplified
i $a^2 + a^3$ j cannot be simplified k $xy^2 + 2x^2y$
l $3x^3 - 3x^2$

EXERCISE 3B

- 1 a bc b $2ab$ c xy^2 d $2yq^2$
- 2 a $6x$ b $20x$ c $-14x$ d $-6x$ e $2x^2$ f $6x^2$
g $-2x^2$ h $-12x$ i $2x^2$ j $-3x^3$ k $2x^3$
l $-6d^2$ m a^2 n $4x^2$ o $2a^4$ p $-3x^3$
- 3 a $22x$ b $15x - 2y^2$ c $11x^2$ d $5ab$ e x^2
f $-xy$ g $7ab$ h $-2cd$ i $3ab - 3ac$

REVIEW SET 3A

- 1 a $-32x$ b $10x^3$ c $24x^2$ d x^2 e $7ac$ f $-x^3$
- 2 a $-3x - 18$ b $2x^3 - 8x$ c $-x - 4$ d $-7x + 7$
e $8x - 3x^2$ f $4x^2 - x$ g $2x^3 + x^2 - x$ h $5a + 9b + ab$
- 3 a $3x^2 - 4x - 4$ b $4x^2 - 4x + 1$ c $16x^2 - 1$
d $x^2 - 10x + 25$ e $6x^2 - 29x + 35$ f $x^3 - 4x$
g $9x^2 + 30x + 25$ h $-x^2 + 4x - 4$ i $-2x^3 + 4x^2 - 2x$
- 4 a $-x^2 - 4x - 4$ b $x^3 + 6x^2 + 12x + 8$
c $3x^3 + 4x^2 + 17x - 14$ d $x^3 - 6x^2 + 11x - 6$
e $x^4 + 3x^3 + 3x^2 + x$ f $x^4 - 1$

REVIEW SET 3B

- 1 a $-6x^3$ b $-6x^3$ c $40x^2$ d $4x^2$ e $9x^4$ f $-4x^3$
- 2 a $-14x + 35$ b $-x$ c $2x^2 - 5x$ d $16x - 3$
e $5x^3 - 6x^2 + 3x$ f $16a - 2b$
- 3 a $2x^2 - x - 15$ b $9x^2 - 12x + 4$ c $4x^2 - 9$
d $5x^2 - 11x + 2$ e $4x^2 - 12x + 9$ f $1 - 25x^2$
g $25 - 20x + 4x^2$ h $-x^2 - 4x - 4$ i $-3x + 6x^2 - 3x^3$
- 4 a $5x^2 - x + 7$ b $2x^3 - 9x^2 + 10x - 3$
c $x^3 + 9x^2 + 27x + 27$ d $x^3 + 4x^2 - 7x - 10$
e $2x^4 - 6x^3 + 6x^2 - 2x$ f $-x^4 + 8x^2 - 16$