

Unit 2

Getting started

- 1 a $2n$ b $n+5$
- 2 12
- 3 a $7c+7d$ b $2xy+8yz$
- 4 a $4x+12$ b $12-18y$
- 5 a $n=3$ b $m=9$
c $p=9$ d $r=6$
- 6 $x \geq 3$

Exercise 2.1

- 1 In the expression $4x+9$, x is a variable, $4x$ and 9 are terms of the expression. 4 is the coefficient of x . 9 is a constant. The expression is not equal to anything so cannot be solved.
- 2 a i $x-2$ ii $x+2$
iii $\frac{x}{2}$ iv $2x$
b i 10 ii 14
iii 6 iv 24
- 3 a i $6n+1$ ii $\frac{n}{4}+5$
iii $2n-3$ iv $\frac{n}{10}-7$
b i 121 ii 10
iii 37 iv -5
- 4 a and iv, b and i,
c and v, d and ii,
e and vii, f and iii
vi: subtract n from 4, then multiply by 5
- 5 learners' answers including Sofia is correct
- 6 a $\frac{x}{3}+1$ b $\frac{x+1}{3}$
c $\frac{x-1}{3}$ d $\frac{x}{3}-1$
- 7 Learners' answers including they are all correct. The usual convention is to write the expression without a multiplication sign (i.e. like Zara and Arun, not like Sofia).
- 8 a Equivalent to $\frac{3x}{4}$ are: A, E, F and H
Equivalent to $\frac{4x}{3}$ are: C, D and I
Equivalent to $\frac{x+3}{4}$ are: B and J
b $G: \frac{3}{4}+x$
- 9 a correct
b incorrect, should be $5-\frac{2y}{5}$ or $5-\frac{2}{5}y$
- 10 a i $\frac{x}{2}+8$ or $\frac{1}{2}x+8$
ii $\frac{3x}{4}-12$ or $\frac{3}{4}x-12$
iii $7+\frac{4x}{5}$ or $7+\frac{4}{5}x$
iv $20-\frac{5x}{9}$ or $20-\frac{5}{9}x$
b i one-sixth of x add 2
ii five-sevenths of x subtract 4
iii eight subtract two-thirds of x
iv three add seven-eighths of x
- 11 a perimeter is $a+12b$ cm area is $3ab$ cm²
b perimeter is $14c+\frac{6}{5}d$ cm area is $\frac{21}{5}cd$ cm²
- 12 $4y+9$
- 13 a $c+3s$ b $3c+4g+6s$

$$14 \text{ a } a + \frac{b}{2} \quad \text{b } 2b + \frac{3c}{4}$$

$$\text{c } 3a + \frac{b}{4} + \frac{4c}{5}$$

$$15 \text{ a } 6\left(\frac{v}{2} + 5\right) \quad \text{b } 2\left(\frac{v}{5} + 6\right)$$

$$\text{c } 5\left(\frac{5v}{6} + 2\right) \quad \text{d } 6\left(\frac{2v}{5} + 5\right)$$

Exercise 2.2

$$1 \text{ a } 2 \quad \text{b } -2$$

$$\text{c } -18 \quad \text{d } -5$$

$$\text{e } 3 \quad \text{f } -7$$

$$2 \text{ a } -21 \quad \text{b } 4$$

$$\text{c } 23 \quad \text{d } -7$$

$$\text{e } -3 \quad \text{f } 2$$

$$3 \text{ a } 21 \quad \text{b } -15$$

$$\text{c } 45 \quad \text{d } -15$$

$$\text{e } 16 \quad \text{f } 3$$

$$\text{g } 54 \quad \text{h } 3$$

$$\text{i } -44 \quad \text{j } 8$$

$$4 \text{ a } -3 \times -3 = 9 \text{ not } -9$$

$$\text{b } 1 \quad \text{c } 29$$

$$5 \text{ a } \text{She must work out } (-2)^3 \text{ first before multiplying by 5.}$$

$$\text{b } -40 \quad \text{c } -54$$

$$6 \text{ a i months} = \text{years} \times 12$$

$$\text{ii } m = 12y$$

$$\text{b } m = 96$$

$$7 \text{ a i cost} = 6 + \text{kilometres} \times 2$$

$$\text{ii } c = 6 + 2k$$

$$\text{b } c = 76$$

$$8 \text{ a } v = 125$$

$$\text{b } v = 158$$

$$\text{c } v = 200$$

$$9 \text{ a } F = 12$$

$$\text{b } F = 54$$

$$\text{c } F = -32$$

$$10 \text{ a } 145 \text{ cm} \quad \text{b } 157.5 \text{ cm}$$

$$\text{c } 132.5 \text{ cm} \quad \text{d } 175 \text{ cm}$$

$$\text{e } 160 \text{ cm} \quad \text{f } 120 \text{ cm}$$

$$11 \text{ a } 60 \text{ m or } 57 \text{ m} \quad \text{b } 59.7 \text{ m}$$

$$12 \text{ Prism A } V = 360 \text{ cm}^3, \text{ Prism B } V = 378 \text{ cm}^3.$$

No, Xavier is wrong. Prism B has the larger volume by 18 cm^3 .

$$13 \text{ a } B \quad \text{b } C$$

$$\text{c } A \quad \text{d } B$$

$$\text{e } A$$

$$14 \text{ a } T = 45 \quad \text{b } m = \frac{T}{8}$$

$$\text{c } m = 32$$

$$15 \text{ a } h = 35 \quad \text{b } k = h + d$$

$$\text{c } k = 2.25$$

$$16 \text{ a } f = 5 \quad \text{b } w = fp$$

$$\text{c } w = 13$$

$$17 \text{ a } \text{learners' answers}$$

$$\text{b } \text{learners' answers}$$

$$\text{c i } p = 9 \quad \text{ii } m = 6$$

Exercise 2.3

$$1 \text{ a } 3x + 12 \quad \text{b } 8y - 16$$

$$\text{c } 27q - 36$$

$$2 \text{ a } 4x + 24 \quad \text{b } 7z - 14$$

$$\text{c } 2a + 16 \quad \text{d } 18 - 24e$$

$$\text{e } 4p + 6q \quad \text{f } 54t - 18s$$

$$\text{g } 42xy - 14z \quad \text{h } 10x + 5y + 20$$

$$3 \text{ a } xy + 3x \quad \text{b } y^2 - 2y$$

$$\text{c } 3p + 4p^2 \quad \text{d } 6q^2 - 15q$$

$$4 \text{ a } y^2 + 8y \quad \text{b } 2wz - z$$

$$\text{c } m^2 - 4m \quad \text{d } 2n^2 + 5n$$

$$\text{e } 9n - 8n^2 \quad \text{f } a - 3ab$$

$$\text{g } 2e^2 + 7ef \quad \text{h } 3gh + 7g^2$$

$$\text{i } 2h^2 - 5hk \quad \text{j } 3cd - 5de$$

5 learners' answers

Both Zara and Arun are correct but convention is that we write the letters in alphabetical order like Zara.

6 a learners' answers

b learners' answers

c i $2x^2 + 6xy$ ii $15y^2 + 18y$
iii $24b^2 - 8ab$ iv $4f^2 + 2fg - 6f$

7 $16x^3 + 12x^2$: A, E, I

$30x^3 + 20x$: B, D, G

$24x^3 + 18x^2$: C, F, H

8 a $x(2x+5) - 3x(2x+4) = 2x^2 + 5x - 6x^2 - 12x$

b $x(2x+5) - 3x(2x-4) = 2x^2 + 5x - 6x^2 + 12x$

c $\otimes(\otimes + \otimes) + \odot(\star + \diamond) = \otimes\otimes + \otimes\otimes + \odot\star + \odot\diamond$
 $\otimes(\otimes + \otimes) + \odot(\star - \diamond) = \otimes\otimes + \otimes\otimes + \odot\star - \odot\diamond$
 $\otimes(\otimes + \otimes) - \odot(\star + \diamond) = \otimes\otimes + \otimes\otimes - \odot\star - \odot\diamond$
 $\otimes(\otimes + \otimes) - \odot(\star - \diamond) = \otimes\otimes + \otimes\otimes - \odot\star + \odot\diamond$

9 a $2x^2 + 7x$

b $6z^2 + 6z$

c $u^2 + 2u$

d $2w^2 + 20wx$

10 a Q1: the +21 should be -21

Q2: up to $ae + 3be$ is correct, but this cannot be simplified as they are not like terms

Q3: the $9x^2$ should be $3x^2$

b Q1: $2x + 19$

Q2: $ae + 3be$

Q3: $3x^2 + 2y^2 + 14xy$

Activity 2.3

Correct expansions are:

A $17x^2 + 5x$

B $7y^3 + 48y^2 + 4y$

C $14p^3 + 49p^2 + 2p$

D $15k^3 - 6k + 18$

E $3n^3 - 4n^2 - 20n$

F $30m$

Exercise 2.4

1 a $3(x+5)$

b $5(2y-3)$

c $7(2-4x)$

d $3(4-3y)$

2 a $x(4x+5)$

b $6y(x+2)$

c $7y(1-y)$

d $3x(7-4y)$

3 peer discussion, e.g.

Arun has fully factorised $6x+18$ to get $6(x+3)$.

Marcus has only partially factorised $6x+18$ to get $3(2x+6)$.

Marcus has used a common factor, but Arun has used the highest common factor.

4 a $2(x+2)$

b $2(2b-3)$

c $2(4+5y)$

d $2(9-10m)$

5 a $3(6+7p)$

b $3(y-6)$

c $3(3+5m)$

d $3(4-9x)$

6 a $5(2z+1)$

b $4(2a-1)$

c $7(2+3x)$

d $6(3-4z)$

7 a peer discussion; Sofia is correct.

b i $4y$

ii $3p$

iii a

8 A and iii, B and i, C and iv, D and ii

9 a $x(3x+1)$

b $6y(y-2)$

c $3b(1+3b)$

d $3n(4-5n)$

e $9(2y-x)$

f $3(4y+3x)$

g $4y(2x-1)$

h $5z(3+2y)$

10 a $2(x+3y+4)$

b $4(y-2+x)$

c $3(3xy+4y-5)$

d $x(5x+2+y)$

e $y(9-y-x)$

f $3y(y-3+2x)$

11 $5(2x+6) + 2(3x-5) = 10x+30+6x-10$

$= 16x+20$

$= 4(4x+5)$

12 Correct expansion is:

$$\begin{aligned} 6(3y+2) - 4(y-2) &= 18y+12-4y+8 \\ &= 14y+20 \\ &= 2(7y+10) \end{aligned}$$

Marcus has used -8 instead of $+8$ in the first line of the expansion like this:

$$\begin{aligned} 6(3y+2) - 4(y-2) &= 18y+12-4y-8 \\ &= 14y+4 \\ &= 2(7y+2) \end{aligned}$$

13 A length = $a+9$ B length = $4d-5c$

Exercise 2.5

1 a equation b expression
c formula d expression

2 a $x=7$ b $x=9$
c $y=44$ d $y=8$

3 a $\frac{x}{2}-3=15$
 $\frac{x}{2}-3+3=15+3$
 $\frac{x}{2}=18$
 $x=18 \times 2$
 $x=36$

b $\frac{x}{3}+1=12$
 $\frac{x}{3}+1-1=12-1$
 $\frac{x}{3}=11$
 $x=11 \times 3$
 $x=33$

c $\frac{x}{4}+9=30$
 $\frac{x}{4}+9-9=30-9$
 $\frac{x}{4}=21$
 $x=21 \times 4$
 $x=84$

4 learners' answers

Example: It doesn't matter as you will get the same answer, but it is easier to have the greater number of 'y's on the left hand side of the equation.

5 a $x=2$ cm b $x=14$ cm
c $x=12$ cm

6 learners' answers

Example: Substitute the value for x into the expression for each side length of the triangles and the answers should be equal.

7 a $y=7$ cm and side lengths = 16 cm

b $y=4$ cm and side lengths = 27 cm

c $y=12$ cm and side lengths = 36 cm

8 a $x=8, y=7$

b $x=9, y=5$

c $x=7, y=4$

d $x=32, y=3$

To check answers, substitute values of x and y into expressions for side lengths.

9 a $3x+8=23, x=5$

b $\frac{x}{4}-8=5, x=52$

c $5x-4=2x+20, x=8$

d $2(x+5)=5x-14, x=8$

10 a $6n+2n+5+n-5=180$ or $9n=180$

b $n=20$

c $6n=120^\circ, 2n+5=45^\circ, n-5=15^\circ$

11 a $4x-6=2x+18$

b $x=12$

c $4x-6$ and $2x+18$ both equal 42° ,
3rd angle = 96°

12 a $x=2$

b $x=3$

c $y=12$

d $y=30$

13 a $a=-4$

b $c=3.5$

c $d=5$

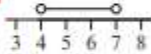

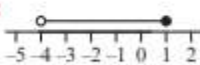
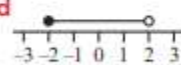
14 a $\frac{y}{4}-18=4, y=88$

b $2y+14=-20, y=-17$

Table shows all possible values for y .

	4	-2	-20
$2y+14$	$y=-5$	$y=-8$	$y=-17$
$8(y-12)$	$y=12.5$	$y=11.75$	$y=9.5$
$\frac{y}{4}-18$	$y=88$	$y=64$	$y=-8$

Exercise 2.6

- 1 a x is greater than 6 and less than 11
 b x is greater than or equal to 12 and less than or equal to 18
 c x is greater than 0 and less than or equal to 20
 d x is greater than or equal to -9 and less than -1
- 2 a $3 \leq y < 17$ b $15 < y < 25$
 c $-2 < y \leq 5$ d $-9 \leq y \leq -3$
- 3 a  b 
 c  d 
- 4 a $12 < x < 16$ b $1 < x \leq 5$
 c $-3 \leq x < 1$ d $2 \leq x \leq 8$
- 5 a Sofia: $x > 5$, $2x > 2 \times 5$, $2x > 10$
 Zara: $x > 5$, $x - 2 > 5 - 2$, $x - 2 > 3$
 b learners' answers
 Examples: $3x > 15$, $4x > 20$, $10x > 50$,
 $x - 3 > 2$, $x - 5 > 0$, $x + 5 > 10$
 c learners' answers
 Example: It is not possible to say as there is an infinite number of possibilities.
- 6 a $x > 8$ is equivalent to $3x > 24$
 b $x < 3$ is equivalent to $5x < 15$
 c $y \geq 7$ is equivalent to $y + 3 \geq 10$
 d $y \leq 2$ is equivalent to $y - 4 \leq -2$
- 7 a Ryan has misunderstood the symbols: he has interpreted \leq as 'greater than' and $<$ as 'less than or equal to'.
 i smallest integer is 12
 ii largest integer is 17
 iii x could be 12, 13, 14, 15, 16, 17
 b peer discussion
- 8 a i 4 ii 7
 iii 4, 5, 6, 7
 b i 5 ii 7
 iii 5, 6, 7
 c i 0 ii 5
 iii 0, 1, 2, 3, 4, 5

- d i -10 ii -6
 iii -10, -9, -8, -7, -6

- 9 peer discussion, including Arun is correct.
 Convention is that we would write $2 < y < 9$ rather than $9 > y > 2$.
- 10 a T b F c T d F
- 11 a i $8 \leq m < 15$ ii $7 < m \leq 10$
 iii $0 < m < 6$
 b No – if you show these inequalities on a number line they are two separate sections that cannot be combined.
- 12 a smallest integer is 3 not 2; m could be 3, 4, 5, 6, 7 (but not 2)
 b A i 6 ii 9 iii 6, 7, 8, 9
 B i -6 ii -3 iii -6, -5, -4, -3
- 13 a learners' answers
 b answers arranged into rows

Inequality	Smallest integer	Largest integer	List of integers
$1.5 \leq x \leq 4$	2	4	2, 3, 4
$0.8 < x < 5.9$	1	5	1, 2, 3, 4, 5
$3 < x \leq 6.1$	4	6	4, 5, 6
$2.2 \leq x < 3.9$	3	3	3
$-4.5 < x < 1.1$	-4	1	-4, -3, -2, -1, 0, 1
$-5.01 < x \leq 0$	-5	0	-5, -4, -3, -2, -1, 0

Check your progress

- 1 $\frac{x}{2} + 5$
- 2 a $K = 48$ b $m = \frac{K}{8}$
 c $m = 7.5$
- 3 a $x^2 + 3x$ b $35y^2 - 20wy$
- 4 a $3(2x + 3)$ b $2y(y - 6)$
- 5 $x = 5$, $y = 12$
- 6 $5 < x \leq 20$

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: $3 \times 2 = 6$
b 5 books: $5 \times 2 = 10$
c 8 books: $8 \times 2 = 16$
d x books: $x \times 2 = 2x$
e y books: $y \times 2 = 2y$
f b books: $b \times 2 = 2b$

- 3** **a** 4 sweets: $4 \div 2 = 2$
b 10 sweets: $10 \div 2 = 5$
c 12 sweets: $12 \div 2 = 6$
d x sweets: $x \div 2 = \frac{x}{2}$
e y sweets: $y \div 2 = \frac{y}{2}$
f s sweets: $s \div 2 = \frac{s}{2}$
- 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 = $8vw + 24w$ cm²
b perimeter = $18x + \frac{5}{4}y$ cm
 area = $\frac{45}{8}xy$ cm²
- 11** $\frac{5}{2}a - \frac{3}{2}b$

12 a $Sp + 3l + 2r$

b $3p + \frac{r}{4}$ or $3p + \frac{1}{4}r$

c $\frac{r}{5}$ or $\frac{1}{5}r$

d $\frac{3r}{5} + \frac{3l}{4}$ or $\frac{3}{5}r + \frac{3}{4}l$

13 a $8\left(\frac{y}{4} + 3\right)$ b $4\left(\frac{y}{3} + 8\right)$

c $8\left(\frac{3y}{4} + 4\right)$ d $4\left(\frac{3y}{8} + 3\right)$

Exercise 2.2

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

2 a 7 b 1 c 9

3 a 13 b 17 c 72

d 8 e 20

4 a 10 b 2 c -9

d -7 e -2 f 7

g 25 h -22 i -22

j 30 k -5 l 12

5 a 27 b -16

6 a 10 b -6 c 25

d -11 e 48 f 501

g 8 h 640 i 6

j 100 k 38 l 10

7 a i number of seconds = $60 \times$ number of minutes

ii $S = 60M$

b 1800 seconds

8 $d = 70$

9 a She has added 6 and 12 instead of multiplying.

b $V = 24$

10 $A = 24$

11 Neither, their volumes are the same. Pyramid

A: $V = 32\text{ cm}^3$, pyramid B: $V = 32\text{ cm}^3$

12 a B $x = y + 8$ b B $x = \frac{y}{k}$

c A $x = y - w$ d C $x = ry$

e C $x = \frac{y-t}{2}$

13 $x - 5$ has a value of -9. All the others have a value of 9.

14 a $x = 0, 1$ b $x = 4$

c $x = 0$ d $x = 0$

15 a $D = 19$ b $p = \frac{D-4}{w}$

c $p = 8$

16 a $s = 75$ b $s = 100$

Exercise 2.3

1 a 4×18

\times	10	8
4	40	32

$4 \times 18 = 40 + 32 = 72$

b 3×21

\times	20	1
3	60	3

$3 \times 21 = 60 + 3 = 63$

2 a $6 \times 58 = 6 \times (50 + 8)$

\times	50	8
6	300	48

$6 \times 58 = 300 + 48 = 348$

b $6 \times 58 = 6 \times (60 - 2)$

\times	60	-2
6	360	-12

$6 \times 58 = 360 + -12 = 348$

3 a $3(x + 5)$

\times	x	5
3	$3x$	15

$3(x + 5) = 3x + 15$

b $2(x + 9)$

\times	x	9
2	$2x$	18

$2(x + 9) = 2x + 18$

c $5(y-1)$

\times	y	-1
5	$5y$	-5

$5(y-1) = 5y - 5$

d $4(y-8)$

\times	y	-8
4	$4y$	-32

$4(y-8) = 4y - 32$

4 a $3(2x+1)$

\times	$2x$	1
3	$6x$	3

$3(2x+1) = 6x + 3$

b $5(4x+9)$

\times	$4x$	9
5	$20x$	45

$5(4x+9) = 20x + 45$

c $2(3y-7)$

\times	$3y$	-7
2	$6y$	-14

$2(3y-7) = 6y - 14$

d $5(8y-5)$

\times	$8y$	-5
5	$40y$	-25

$5(8y-5) = 40y - 25$

5 a $6a+36$ b $5b+35$

c $7c-56$ d $6d-54$

e $40+5e$ f $49+7f$

g $36-6g$ h $35-5h$

6 a $56i+63$ b $48+42j$

c $30k-35$ d $56-63l$

e $54a+48m$ f $35b+30n$

g $49c-56x$ h $54px+48y$

7 No, $4a-28$ is not the same as $28-4a$

8 a $14a+114$ b $38b+92$

c $70c+128$ d $48d+7$

e $-20e-33$ f $108f+33g$

9 a a^2+a b b^2-5b

c $3c^2+6c$ d $4e^2+9e$

e $3i^2+7ix$ f $3aj-7j^2$

g $3k^2-6kx$ h $3m^2+9mx$

i $9r^2-3rx-9r$ j $6a+4a^2+2ab$

k $-3xz-3xy-3x^2$

10 Equivalent to $40y+48y^2$ are: A, C, E, H

Equivalent to $20y^2+24y^3$ are: B, D, F, G

11 a $8x+4\text{cm}^2$ b $6y^2-4y\text{cm}^2$

12 a $2a^2+7a$ b $5b^2+8b$

c $8c^2+10c$ d $2d^2-d$

e $9e-e^2$ f $39fg-27f^2$

13 a Q1. The expansion $3a+15-9a-15$ is correct, but he has not collected like terms correctly.

Q2. The expansion $4pq+pr+2qr-4pq$ is correct, but he has not collected like terms correctly.

Q3. The expansion $5b^2+15ab+4a^2+6ab$ is correct, but he has not collected like terms correctly.

b Q1. $-6a$, Q2. $pr+2qr$,

Q3. $4a^2+5b^2+21ab$

14 Area $= 3x(3x+4)+2x(2x-1)$

$= 9x^2+12x+4x^2-2x$

$= 13x^2+10x$

15 a $4(3x+7)=12x+28$

b $3x(2x-1)=6x^2-3x$

c $6(5x-3)=30x-18$

d $5x(9-x)=45x-5x^2$

e $2(2x+4)+3(4x-8)=16x-16$

f $x(4x+1)-2x(x-5)=2x^2+11x$

Exercise 2.4

1 a

\times	x	6
2	$2x$	12

$$2(x+6) = 2x + 12$$

b

\times	x	5
3	$3x$	15

$$3(x+5) = 3x + 15$$

c

\times	y	-3
5	$5y$	-15

$$5(y-3) = 5y - 15$$

d

\times	y	-7
4	$4y$	-28

$$4(y-7) = 4y - 28$$

2 a $2x + 12 = 2(x+6)$

b $3x + 15 = 3(x+5)$

c $5y - 15 = 5(y-3)$

d $4y - 28 = 4(y-7)$

3 a $2x + 8 = 2(x+4)$ **b** $3x + 9 = 3(x+3)$

c $5y - 25 = 5(y-5)$ **d** $7y - 14 = 7(y-2)$

4 a $3(2x+1) = 6x+3$

b $4(3x+1) = 12x+4$

c $2(5y-1) = 10y-2$

d $6(4y-1) = 24y-6$

5 a $6x+3 = 3(2x+1)$

b $12x+4 = 4(3x+1)$

c $10y-2 = 2(5y-1)$

d $24y-6 = 6(4y-1)$

6 a $4x+6 = 2(2x+3)$

b $6x-15 = 3(2x-5)$

c $35y+10 = 5(7y+2)$

d $28y-63 = 7(4y-9)$

7 a $5(z+3)$ **b** $2(y-7)$

c $4(5x+1)$ **d** $3(3w-1)$

e $2(3v+4)$ **f** $7(2a-3)$

g $6(2-b)$ **h** $7(2+3d)$

8 A and iii, B and iv, C and ii, D and i

9 a $m(7m+1)$ **b** $5a(a-3)$

c $t(t+9)$ **d** $4h(2-h)$

e $3y(1+4y)$ **f** $4y(3-4y)$

g $8e(2e+1)$ **h** $3(5e+2i)$

10 a $14cd-7c = 7c(2d-1)$

b $12a+8ab = 4a(3+2b)$

c $21g+15gh = 3g(7+5h)$

d $30w-15tw = 15w(2-t)$

11 a $2a+4h+8 = 2(a+2h+4)$

b $5b-25+5j = 5(b-5+j)$

c $12tu+16u-20 = 4(3tu+4u-5)$

d $3e^2+4e+ef = e(3e+4+f)$

e $7k-k^2-ak = k(7-k-a)$

f $6n^2-9n+3mn = 3n(2n-3+m)$

12 a Top left: $4x(6+8x)$
Top right: $2(12x+16x^2)$

Bottom left: $x(24+32x)$

Bottom right: $8x(3+4x)$

b Bottom right: $8x(3+4x)$

13 a $7x+7$ **b** $7(x+1)$

14 Correct solution:

$$\begin{aligned} 5(3x-2) - 5(2+x) &= 15x - 10 - 10 - 5x \\ &= 10x - 20 \\ &= 10(x-2) \end{aligned}$$

She has made a mistake on the first line of the expansion. Her last term is $+5x$ and it should be $-5x$.

She has done:

$$\begin{aligned} 5(3x-2) - 5(2+x) &= 15x - 10 - 10 + 5x \\ &= 20x - 20 \\ &= 20(x-1) \end{aligned}$$

15 $2a(3a+4) - 4(a^2+4) + 6a(a-8) = 8(a^2-5a-2)$

16 a length $= 2b-5$

b perimeter $= 16b-10$

Exercise 2.5

- 1 a expression b formula
c expression d equation

2 a $x \times 2$ $2x + 1$ 11
 $5 \div 2$ 10 -1 11
 $x = 5$

b $x \times 5$ -2 18
 $4 \div 5$ 20 $+2$ 18
 $x = 4$

c $x + 4$ $\times 3$ 21
 $3 - 4$ 7 $\div 3$ 21
 $x = 3$

d $x \div 4$ -1 5
 24×4 6 $+1$ 5
 $x = 24$

3 $x \times 3$ $+2$ 26
 $8 \div 3$ 24 -2 26
 $y \div 2$ $+5$ 15
 20×2 10 -5 15
 $x = 8, y = 20$

4 $x + 2$ $\times 4$ 40
 $8 - 2$ 10 $\div 4$ 40
 $y + 3$ $\times 6$ 30
 $2 - 3$ 5 $\div 6$ 30
 $x = 8, y = 2$

5 a $3x + 5 = 17$
 $x \times 3$ $+5$ 17
 $x = 4$ $\div 3$ 12 -5 17

b $5x + 2 = 27$
 $x \times 5$ $+2$ 27
 $x = 5$ $\div 5$ 25 -2 27

c $2x - 4 = 12$
 $x \times 2$ -4 12
 $x = 8$ $\div 2$ 16 $+4$ 12

6 a $\frac{x}{2} + 1 = 20$
 $\frac{x}{2} + 1 - 1 = 20 - 1$
 $\frac{x}{2} = 19$
 $x = 19 \times 2$
 $x = 38$
b $\frac{x}{3} - 2 = 9$
 $\frac{x}{3} - 2 + 2 = 9 + 2$
 $\frac{x}{3} = 11$
 $x = 11 \times 3$
 $x = 33$

$$c \quad \frac{x}{4} - 8 = 16$$

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

$$\frac{x}{4} = 24$$

$$x = 24 \times 4$$

$$x = 96$$

$$7 \quad a = 8 \text{ cm} \quad b = 50 \text{ cm}$$

$$c = 6 \text{ cm} \quad d = 8 \text{ cm}$$

$$8 \quad a = 5 \text{ cm} \quad b = 4 \text{ cm}$$

$$c = 3 \text{ cm}$$

$$9 \quad a = 2 \text{ cm}, d = 50 \text{ cm}$$

$$b = 7 \text{ cm}, f = 50 \text{ cm}$$

$$c = 5 \text{ cm}, j = 4 \text{ cm}$$

$$10 \quad \frac{x}{2} - 9 = 5, x = 28$$

$$b \quad 4x - 1 = 3x + 6, x = 7$$

$$c \quad 8(x - 2) = 16(x - 5), x = 8$$

$$11 \quad a \quad 4(2y + 7) = 52 \text{ or } 8y + 28 = 52$$

$$b \quad y = 3$$

$$c \quad 4(2y + 7) = 4(2 \times 3 + 7) = 52$$

$$12 \quad y = 104$$

$$13 \quad a \quad x = 14$$

$$b \quad i \quad x = -30 \quad ii \quad x = 5$$

$$14 \quad a \quad y = 40 \quad b \quad z = 14$$

$$c \quad n = 2 \quad d \quad m = 12$$

$$15 \quad \begin{array}{|c|c|c|c|c|c|c|c|c|} \hline B & O & B & S & L & E & I & G & H \\ \hline 8 & 11 & 8 & 3 & 7 & 4 & 5 & 2 & 9 \\ \hline \end{array}$$

Exercise 2.6

$$1 \quad a \quad \text{True} \quad b \quad \text{False}$$

$$c \quad \text{True} \quad d \quad \text{False}$$

$$2 \quad A \text{ and } iii, B \text{ and } i, C \text{ and } iv, D \text{ and } ii$$

$$3 \quad a \quad 8 \leq x < 12 \quad b \quad 1 < y < 7$$

$$c \quad 0 \leq m \leq 5 \quad d \quad 0 < n \leq 5$$

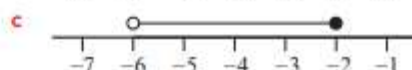
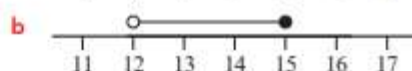
$$4 \quad a \quad x \text{ is greater than } 7 \text{ and less than or equal to } 15$$

$$b \quad y \text{ is greater than } 10 \text{ and less than } 20$$

$$c \quad x \text{ is greater than or equal to } 0 \text{ and less than or equal to } 5$$

$$d \quad y \text{ is greater than or equal to } 50 \text{ and less than } 100$$

$$5 \quad A \text{ and } iii, B \text{ and } iv, C \text{ and } ii, D \text{ and } i$$



$$7 \quad a \quad 25 \leq x \leq 28 \quad b \quad 30 < x < 34$$

$$c \quad -15 < x \leq -10 \quad d \quad -3 \leq x < 1$$

$$8 \quad a \quad x > 4 \text{ is equivalent to } 2x > 8$$

$$b \quad x < 9 \text{ is equivalent to } 7x < 63$$

$$c \quad y \geq 1 \text{ is equivalent to } y + 9 \geq 10$$

$$d \quad y \leq 1 \text{ is equivalent to } y - 5 \leq -4$$

$$9 \quad i \quad \text{smallest integer is } -2 \text{ and not } -3$$

$$ii \quad \text{largest integer is } 2 \text{ not } 3$$

$$iii \quad x \text{ could be } -2, -1, 0, 1, 2$$

$$10 \quad a \quad i \quad 33 \quad ii \quad 37$$

$$iii \quad 33, 34, 35, 36, 37$$

$$b \quad i \quad 25 \quad ii \quad 27$$

$$iii \quad 25, 26, 27$$

$$c \quad i \quad 40 \quad ii \quad 43$$

$$iii \quad 40, 41, 42, 43$$

$$d \quad i \quad -12 \quad ii \quad -9$$

$$iii \quad -12, -11, -10, -9$$

$$11 \quad a \quad T \quad b \quad T \quad c \quad F \quad d \quad F$$

$$12 \quad a \quad i \quad \text{smallest integer is } 6 \text{ not } 5$$

$$ii \quad \text{largest integer is } 8 \text{ not } 9$$

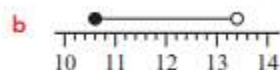
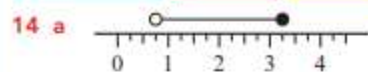
$$iii \quad n \text{ could be } 6, 7, 8$$

$$b \quad A \quad i \quad 7 \quad ii \quad 10 \quad iii \quad 7, 8, 9, 10$$

$$B \quad i \quad -7 \quad ii \quad -4 \quad iii \quad -7, -6, -5, -4$$

13 answers are in rows

Inequality	Smallest integer	Largest integer	List of integers
$1.9 \leq x \leq 5.5$	2	5	2, 3, 4, 5
$0.2 < x < 6.1$	1	6	1, 2, 3, 4, 5, 6
$-0.5 < x \leq 4.9$	0	4	0, 1, 2, 3, 4
$2.95 \leq x < 7.85$	3	7	3, 4, 5, 6, 7



15 a $22.5 \leq y \leq 25.75$ **b** $0.75 < y < 3.25$

16 a i $12 < y < 18$ **ii** $18 > y > 12$

b i $0 \leq y \leq 4$ **ii** $4 \geq y \geq 0$

c i $7 < x \leq 25$ **ii** $25 \geq x > 7$

d i $10 \leq x < 38$ **ii** $38 > x \geq 10$