7 **a** $6.5 \leqslant x < 7.5$

b $27.5 \leqslant x < 28.5$

c $134.5 \leqslant x < 135.5$

d $558.5 \leqslant x < 559.5$

8 **a** $45 \leqslant x < 55$ **b** $415 \leqslant x < 425$

c $3735 \leqslant x < 3745$ **d** $5205 \leqslant x < 5215$

9 **a** $750 \leqslant x < 850$ **b** $1150 \leqslant x < 1250$

c $6650 \leqslant x < 6750$ **d** $9050 \leqslant x < 9150$

10 **a** $18.5\,\text{m}^2$

b $19.5\,\text{m}^2$

c $18.5\,\text{m}^2 \leqslant x < 19.5\,\text{m}^2$

11 **a** **i** 55 **ii** 65

b $55 \leqslant x < 65$

12 **A**, **ii** and **c**; **B**, **ii** and **a**; **C**, **i** and **e**; **D**, **iii** and **b**; **E**, **i** and **f**; **F**, **iii** and **d**

13 **a** **i** 495 g

ii 505 g

iii $495\,\text{g} \leqslant x < 505\,\text{g}$

b **i** $2 \times 495\,\text{g} = 990\,\text{g}$

ii $2 \times 505\,\text{g} = 1010\,\text{g}$

14 **a** **i** 145 cm

ii 155 cm

iii $145\,\text{cm} \leqslant x < 155\,\text{cm}$

b Carlos has worked out the correct answer as all pieces of wood can vary between 145 cm and 155 cm, so you must multiply the upper and lower bounds by 3.

Pepe is incorrect as he has multiplied the rounded number by three then worked out +/− 5 cm from that answer instead of +/− 15 cm from that answer (as there are three pieces of wood).

15 **a** **i** 1.15 litres or 1150 mL

ii 1.25 litres or 1250 mL

iii $1.15\,\text{litres} \leqslant x < 1.25\,\text{litres}$ or $1150\,\text{mL} \leqslant x < 1250\,\text{mL}$

b **i** 5.75 litres or 5750 mL

ii 6.25 litres or 6250 mL

iii $5.75\,\text{litres} \leqslant x < 6.25\,\text{litres}$ or $5750\,\text{mL} \leqslant x < 6250\,\text{mL}$

Exercise 4.1

1 **a**
$$\begin{aligned} 2x - 6 &= 10 \\ 2x &= 10 + 6 \\ 2x &= 16 \\ x &= \frac{16}{2} \\ x &= 8 \end{aligned}$$

b
$$\begin{aligned} 4(3x + 2) &= 32 \\ 12x + 8 &= 32 \\ 12x &= 32 - 8 \\ 12x &= 24 \\ x &= \frac{24}{12} \\ x &= 2 \end{aligned}$$

c
$$\begin{aligned} \frac{y}{2} - 3 &= 1 \\ \frac{y}{2} &= 1 + 3 \\ \frac{y}{2} &= 4 \\ y &= 4 \times 2 \\ y &= 8 \end{aligned}$$

d
$$\begin{aligned} 5y + 3 &= 9 + 2y \\ 5y - 2y &= 9 - 3 \\ 3y &= 6 \\ y &= \frac{6}{3} \\ y &= 2 \end{aligned}$$

2 **a**
$$\begin{aligned} 5 - 2x &= 9 \\ -2x &= 9 - 5 \\ -2x &= 4 \\ x &= \frac{4}{-2} \\ x &= -2 \end{aligned}$$

b
$$\begin{aligned} 6(3 - x) &= 3x \\ 18 - 6x &= 3x \\ 18 &= 3x + 6x \\ 18 &= 9x \\ \frac{18}{9} &= x \\ x &= 2 \end{aligned}$$

c
$$\begin{aligned} \frac{3y}{4} + 1 &= 7 \\ \frac{3y}{4} &= 7 - 1 \\ \frac{3y}{4} &= 6 \\ 3y &= 6 \times 4 \\ 3y &= 24 \\ y &= \frac{24}{3} \\ y &= 8 \end{aligned}$$

d
$$\begin{aligned} 3(y + 5) &= 2(20 - y) \\ 3y + 15 &= 40 - 2y \\ 3y + 2y &= 40 - 15 \\ 5y &= 25 \\ y &= \frac{25}{5} \\ y &= 5 \end{aligned}$$

3 **a**
$$\begin{aligned} \frac{30}{x} &= 5 \\ 30 &= 5x \\ \frac{30}{5} &= x \\ x &= 6 \end{aligned}$$

b
$$\begin{aligned} \frac{63}{y + 1} &= 9 \\ 63 &= 9(y + 1) \\ \frac{63}{9} &= y + 1 \\ 7 &= y + 1 \\ 7 - 1 &= y \\ y &= 6 \end{aligned}$$

4 **a** $g = 12$ **b** $g = -10$

c $p = 7$ **d** $g = 7$

e $y = 5$ **f** $y = 12$

g $x = -3$ **h** $x = -2$

5 **a** $5x+15=10x-20 \rightarrow x=7$

b $x+3=2x-4 \rightarrow x=7$

c Learner's own answers.

6 **a** $8x-32+20-4x=0 \rightarrow 4x-12=0 \rightarrow x=3$

b $2(x-4)+5-x=0 \rightarrow 2x-8+5-x=0 \rightarrow x-3=0 \rightarrow x=3$

c Learner's own answers.

7 **a** $5(23+4)=5\times27=135$ and $2(30-23)=2\times7=14$, $135\neq14$

b Line 1: he added 5 and 4 instead of multiplying 5 and 4.

Line 2: he subtracted $2x$ instead of adding $2x$ and added 9 instead of subtracting 9.

c $x=5\frac{5}{7}$,

$5\left(5\frac{5}{7}+4\right)=5\times9\frac{5}{7}=45+\frac{25}{7}=45+3\frac{4}{7}=48\frac{4}{7}$

and $2\left(30-5\frac{5}{7}\right)=2\times24\frac{2}{7}=48\frac{4}{7}$

8 **a** $a=21$

b $b=\frac{1}{4}$

c $c=2$

d $d=4\frac{3}{5}$

Learner's checks.

9 **a** $n+2(n+3)=90 \rightarrow 3n+6=90$

b $n=28$

c 28 and 62

10 **a** $5(x-8)=2(x+10)$

b 20

11 **a** **B** and **E**

b **A** $x=6480$ **B** $x=5$ **C** $x=\frac{1}{5}$ **D** $x=\frac{1}{5}$ **E** $x=5$

B and **E** give the correct answer of five grandchildren.

12 **a** $x+50$ and $2x+80$

b $2x+80=144$

c $x=32$

13 **a** $s+2s+2s+5=100 \rightarrow 5s+5=100$

b $s=19$

c 43 cm

14 **a** $y+3y+y-2+4(y-2)=116$

b $y=14$

c 48

15 **a** **i** $3(a-2)=a$ **ii** 3 cm

b **i** $3(a-2)+3(a-2)+a+a=44$ or $2a+6(a-2)=44$ or $a+3(a-2)=22$ or $4a-6=22$

ii 7 cm and 15 cm

16 **a** $\frac{420}{9-x}=60$ **b** $x=2$

Exercise 4.2

1 ① $2x-1=x+5$

$2x-x=5+1$

$x=6$

② $y=2x-1$

$=2\times6-1$

$=12-1$

$=11$

③ Check values are correct. $y=x+5$

$=6+5$

$=11$

④ $x=6$ and $y=11$

2 ① $6x+3=2x-9$

$6x-2x=-9-3$

$4x=-12$

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

② $y=6x+3$

$=6\times-3+3$

$=-18+3$

$=-15$

③ $y=2x-9$

$=2\times-3-9$

$=-6-9$

$=-15$

④ $x=-3$ and $y=-15$

3 **a**

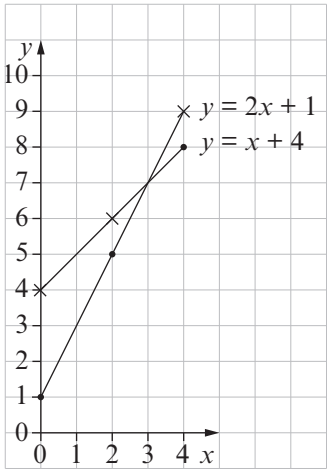
$y=2x+1$

x	0	2	4
y	1	5	9

$y=x+4$

x	0	2	4
y	4	6	8

b



c (3, 7); $x=3$, $y=7$

d ① $2x+1=x+4$
$2x-x=4-1$
$x=3$

② $y=2x+1$
$=2\times3+1$
$=6+1$
$=7$

③ $y=x+4$
$=3+4$
$=7$

④ $x=3$ and $y=7$

e Learner's own answer.

4 a $x+y=10$ and $x-y=4$

① $x+y=10$
$+\quad x-y=4$
$2x+0y=14$
$2x=14,\ x=\frac{14}{2}=7$

② $7+y=10$
$y=10-7$
$=3$

③ $7-3=4$

④ $x=7$ and $y=3$

b $x+5y=28$ and $x+3y=18$

① $x+5y=28$
$-\quad x+3y=18$
$0x+2y=10$
$2y=10,\ y=\frac{10}{2}=5$

② $x+5\times5=28$
$x=28-25$
$=3$

③ $3+3\times5=18$

④ $x=3$ and $y=5$

c $3x+2y=34$ and $x-2y=6$

① $3x+2y=34$
$+\quad x-2y=6$
$4x+0y=40$
$4x=40,\ x=\frac{40}{4}=10$

② $3\times10+2y=34$
$2y=34-30$
$2y=4,\ y=\frac{4}{2}=2$

③ $10-2\times2=6$

④ $x=10$ and $y=2$

5 $x=6,\ y=18$

6 $x=2,\ y=5$

7 $x=6,\ y=-3$

8 a i, ii $x=2,\ y=5$

b Learner's own check.

c Learner's own answers.

9 a $x=18,\ y=2$ **b** $x=9,\ y=3$
c $x=9,\ y=6$ **d** $x=12,\ y=14$

10 a $x=10,\ y=20$ **b** $x=3,\ y=24$
c $x=14,\ y=-9$ **d** $x=-2,\ y=4$

11 a $2x+3y=9,\ 2x+y=5$

b cost of a cake, $x=\$1.50$ and the cost of a coffee, $y=\$2$

12 a $x+y=37.74,\ x-y=9.24$

b \$23.49 and \$14.25

13 $x=13,\ y=8$, so $2x+3y=50$

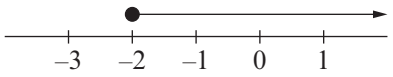
14 $a=9,\ b=3,\ c=4,\ d=10,\ e=5,\ f=11$

a $\text{mean}=\frac{9+3+4+10+5+11}{6}=\frac{42}{6}=7$

b $\text{range}=11-3=8$

Exercise 4.3

1 a $x>2$ **b** $x\geqslant-6$
c $x<0$ **d** $x\leqslant10$
e $-8\leqslant x<0$ **f** $-3<x\leqslant3$

2 a


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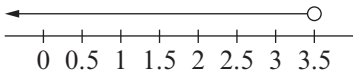

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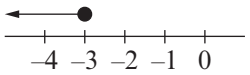

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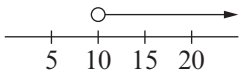

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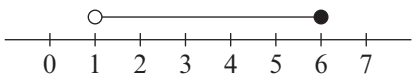

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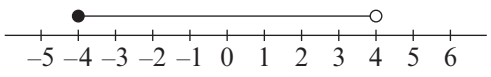


3 a 9

b −6

c −3, −2, −1, 0, 1, 2

4 a Could be true. **b** Could be true.
c Must be true. **d** Cannot be true.

5 **a** $6x > 18$

$x > \frac{18}{6}$

$x > 3$

b $2x - 3 < 19$

$2x < 19 + 3$

$2x < 22$

$x < \frac{22}{2}$

$x < 11$

c $5x + 1 \leqslant -9$

$5x \leqslant -9 - 1$

$5x \leqslant -10$

$x \leqslant \frac{-10}{5}$

$x \leqslant -2$

d $3(x - 4) \geqslant 9$

$3x - 12 \geqslant 9$

$3x \geqslant 9 + 12$

$3x \geqslant 21$

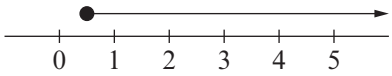
$x \geqslant \frac{21}{3}$

$x \geqslant 7$

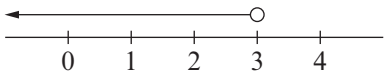
6 **a** $x \geqslant 0.5$ **b** $x < 3$

c $x \leqslant 13$ **d** $x < 6.5$

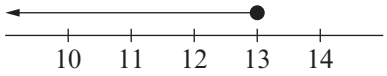
7 **a**



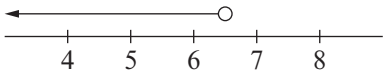
b



c



d



8 **a** $3(y - 4) + 7y \geqslant 8y - 5$

$3y - 12 + 7y \geqslant 8y - 5$

$10y - 8y \geqslant -5 + 12$

$2y \geqslant 7$

$y \geqslant 3.5$

b **i** $y = 3$ $3(3 - 4) + 7 \times 3 \geqslant 8 \times 3 - 5$;

$3 \times -1 + 21 \geqslant 24 - 5$;

$18 \geqslant 19$ false

ii $y = 3.5$ $3(3.5 - 4) + 7 \times 3.5 \geqslant 8 \times 3.5 - 5$;

$3 \times -0.5 + 24.5 \geqslant 28 - 5$;

$23 \geqslant 23$ true

iii $y = 4$ $3(4 - 4) + 7 \times 4 \geqslant 8 \times 4 - 5$;

$3 \times 0 + 28 \geqslant 32 - 5$;

$28 \geqslant 27$ true

9 **a** $x \leqslant 10$ **b** $x > 4$

c $x \geqslant 2$ **d** $x < 20$

Learner's own checks.

10 **a** $5x - 14 > 2x + 1$

b $x > 5$

c Learner's own checks.

11 **a** $3x > 4x + 12$

$3x - 4x > 12$

$-x > 12$

$\frac{-x}{-1} < \frac{12}{-1}$

$x < -12$

b $3x - 3 < 5x - 17$

$3x - 5x < -17 + 3$

$-2x < -14$

$\frac{-2x}{-2} > \frac{-14}{-2}$

$x > 7$

c $6 - 5x \leqslant -12$

$-5x \leqslant -12 - 6$

$-5x \leqslant -18$

$\frac{-5x}{-5} \geqslant \frac{-18}{-5}$

$x \geqslant 3\frac{3}{5}$

12 **a** $x + 2x + x + 30 < 360$ or $4x + 30 < 360$

b $x < 82.5°$

c No, x cannot be 90° because it has to be less than 82.5°.

13 **a** $A + A + 5 + 2(A + 5) < 100 \rightarrow 4A + 15 < 100$

b $A < 21.25$

c No, because $A < 21.25$, so $2(A + 5) < 52.5$.

14 **a** $x + 2x + 3(x - 10) < 360 \rightarrow 6x - 30 < 360$

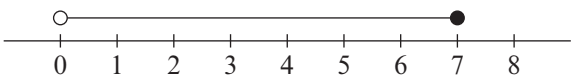
b $x < 65$

c Yes. $2x = 3(x - 10) \rightarrow x = 30$ and this is in the solution set.

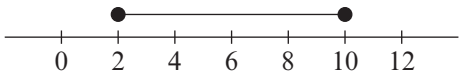
15 **a** $2z + 9 > 13$ **b** $3(z - 4) > -6$

c $4 + 2z > 8$ **d** $5(3z - 2) > 20$

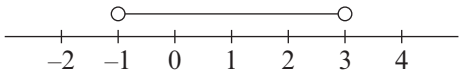
16 **a** $0 < x \leqslant 7$



b $2 \leqslant y \leqslant 10$



c $-1 < n < 3$



d $0 < m < 4.5$