

Practice book answers

Practice 1a

- 1 a 9542 b 9425 c 2594
 2 a 662 b 1014 c 10 416.1
 3 a 15 303 b 250 000 c 6 000 000 000
 d 909 009
 4 a 6129, 6132, 6233, 6320 b 1.067, 1.635, 1.67, 1.7
 c 0.012, 0.035, 0.155, 0.2
 5 a True b False c True
 d True e True f False
 6 a 241 b 741

Practice 1b

- 1 a -8°C , -4°C , 3°C
 b -5°C , -3°C , 0°C , 1°C
 c -11°C , -8°C , -2°C , 22°C
 d -3°C , -2.5°C , -1°C , 5°C
 2 a 1, -1 b -2, -6 c -5, -10
 d 0, 2 e -5, -4 f -1, -5
 3 a 3 b -3 c -6 d -8
 e 2 f -10 g -16 h -7
 i 5 j -7 k -18 l 0
 m 7 n 2 o -12 p -5
 q -7 r 0 s -9 t 15
 u -22 v -2 w 2 x -11

4 a

1	-2	-7	-11
5	2	-3	-7
2	-1	-6	-10
11	8	3	-1

b

3	5	11	4
-8	-6	0	-7
-4	-2	4	-3
0	2	8	1

- 5 a -10 b 6 c -32 d -6
 e 5 f 36 g 1 h -16
 i 2 j -4 k -6 l -7
 m 56 n 6 o 30 p 72
 q -600 r -32 s 0.25 t -10 000

6 a

-6	-2	10	-4	6
12	4	-20	8	-12
-3	-1	5	-2	3
15	5	-25	10	-15
3	1	-5	2	-3

b

-35	5	0	15	-25
7	-1	0	-3	5
21	-3	0	-9	15
-42	6	0	18	-30
70	-10	0	-30	50

- 7 a 1 b 5 c 3
 d 17 e -12 f 2
 g 7 h 0 i -1
 j 12 k 8 l -16
 8 a -4 b -12 c 1 d -4 e 16
 f -13 g 2 h -3 i -6 j 0
 k -12 l 8 m -4 n -100 o -12
 p -5
 9 a -2 b -11 c -20 d 5 e -6
 f -9 g -1 h 9 i 6 j 0
 k -5 l -15 m 12 n -4 o 4
 p -115
 10 a + b \times c \div d \times e -
 f - g \div h + i \times
 11 a True b True c True d True e False
 f True g False h True i True

Practice 1c

- 1 a 11.73 b 0.85 c 3.02 d 18.11
 e 204.66 f 0.67 g 0.08 h 0.98
 2 a 19 b 190 c 2400 d 0.75
 e 0.85 f 60 000 g 110 h 250 000
 3 0.564 0.6 0.6 0.56
 5.46 5.5 5 5.5
 180.52 180.5 200 180
 19.064 19.1 20 19
 0.0782 0.1 0.08 0.078
 206.55 206.6 200 210
 4 a 125.4 b 11.8 c 13.5 d 234.4
 e 8.6 f 1.6 g 2.7 h 88.1

Practice 1d

- 1 a 1851 b 6.889 c 1.214 d 0.4189
 e 7.889 f 19.35 g 0.049 47 h 221.5
 i 24.37 j 6.619
 2 a 3.3 b 2.3 c 42 d 8.2
 e 0.1 f 0.50 g 21 h 10
 i 6.2 j 10
 3 a 8.63 b 22.02 c 1.09 d 44.72
 e 45.66 f 52.86 g 22.51 h 5.48
 i 5.27 j 0.21

- 4 a 4.6052 b 1.1529 c 1.8580 d 0.8264 2
 e 2.7171 f 4.8405 g 10.8667 h 7.4254
 i 13.4917 j 0.7392
 5 a $\frac{16}{21}$ b $\frac{3}{35}$ c $\frac{1}{18}$ d $2\frac{5}{9}$
 e $1\frac{1}{2}$ f $43\frac{2}{5}$ g $14\frac{3}{8}$ h 1

Practice 2a

- 1 a 3 b 8

Practice 2b

- 1 a 17 b 35 cm c 96 cm

2 a

Stem	Leaf
3	3 4 7 8
4	0 2 4 5 6
5	3 6 7 8
6	2 2 4 7
7	3 5 5
8	0 1 2 6 7
9	0 4

b 62

Key 3 | 3 means 33 marks

Practice 2c

- 1 9.45 cm 2 2.7

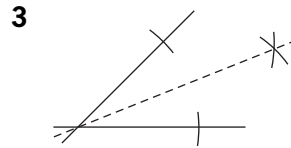
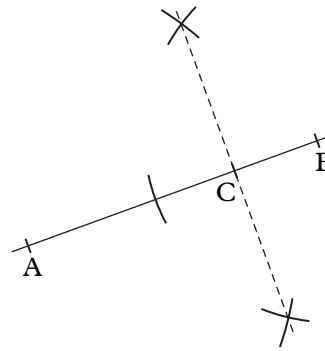
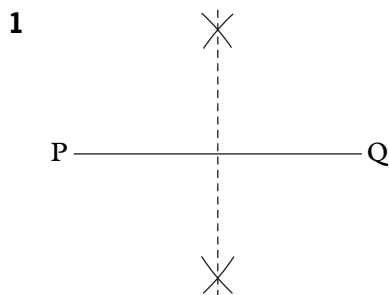
Practice 2d

- 1 a $10 < h \leq 20$ b 17.75 cm
 c Precise heights are not known 2 140

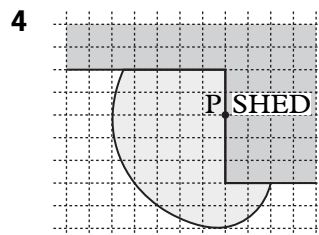
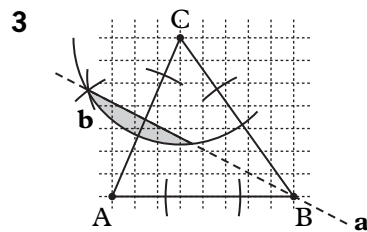
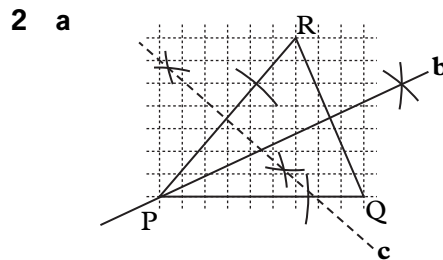
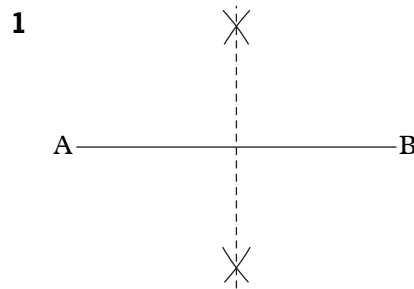
Practice 2e

- 1 a Provide a list of everything sold and ask them to tick their preference.
 b i His grandfather is not an independent person
 ii He should give at least 4 options.

Practice 3a



Practice 3b



Practice 3c

- 1 a 5 km b 6.4 km c 225 m
 2 60 cm
 3 4 cm

4 $1\,000\,000\text{ cm}^2 = 100\text{ m}^2$

5 a 3.5 b 6

Practice 4a

- 1 a 1, 2, 4 and 8 b 1, 2, 3, 6, 9 and 18
 c 1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 30 and 60
- 2 2, 3, 5, and 23
- 3 a $104 = 2 \times 2 \times 2 \times 13$
 b $396 = 2 \times 2 \times 3 \times 3 \times 11$
- 4 a 25 b 17 and 31 c 25 d 27
- 5 10 6 64
- 7 a $2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 11$ b 11
- 8 4, 8, 12, 16 and 20
- 9 a 7, 14, 21, 28 and 35 b 11, 22, 33, 44 and 55
- 10 a 8, 16, 24 and 32 b 12, 24, 36 and 48 c 24
- 11 a 1, 3, 5, 9, 15 and 45
 b 1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 30 and 60 c 15
- 12 12

13

2	1	7
6	9	3
8	4	5

 14

1	4	9
2	8	6
5	7	3

15

2, 3, 5	1, 3, 5	1, 2, 4	2, 4, 6
2, 3	3, 9	1, 2, 4	2, 4, 6
2, 3, 5, 7, 11	1, 3, 5, 7, 9, 11	1, 2, 4, 8	2, 4, 6, 8, 10
13,	13, 15,	16	12, 14, 16

Practice 4b

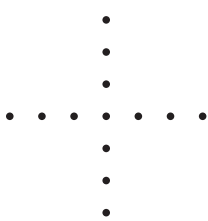
- 1 a 3:2 b 2:5 c 3:4 d 5:8
- 2 $\frac{7}{25}$
- 3 a 25:4 b 1:8 c 3:5

Practice 4c

- 1 £30 and £45
- 2 a £125 b 180 g
- 3 25%
- 4 a 2:3 b $16\text{ cm}^2, 36\text{ cm}^2$ c 4:9
- 5 400 m

Practice 5a

- 1 a $4n$ b $5n$ c $10n$ d $7n$
 e $5n + 1$ f $10n + 2$
- 2 $3n + 1$
- 3 a $2n + 2$ b $5n - 1$ c $9n + 2$

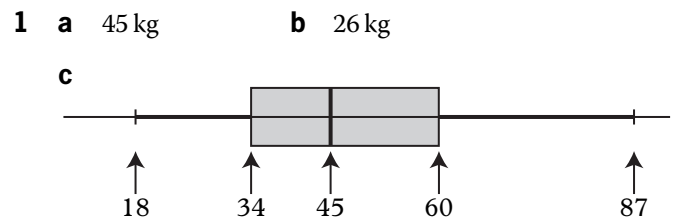
- 4 a  b Missing numbers are 13 and 17.
 c 77
 d $4n - 3$

- 5 27
 6 19

Practice 5b

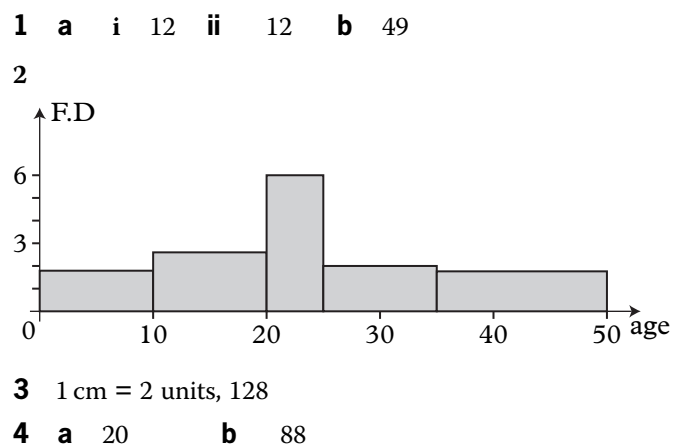
- 1 a 15 b $2n + 3$
- 2 a $3n + 2$ b $6n + 5$ c $8n - 7$
- 3 $d = n - 3$
- 4 a 11 b $15^2 - 14^2 = 29$
 c $n^2 - (n - 1)^2 = 2n - 1$
- 5 a 7 b 103
- 6 a 42 b 73 c $2n + 2$
- 7 a $n^2 + 1$ b $3n^2 + 6$ c $n^2 + n$
 d $2n^2 + 3n$

Practice 6a



- 2 a 42, 38 b 52, 22
 c Adam, smaller IQR d Adam, higher scores and more consistent
- 3 a Missing figures are 72 and 80 b 390 g
 c 137 g d 420 g e 80 g
 e Fertilizer B gives higher weights and better consistency because the IQR is smaller.

Practice 6b



Practice 7a

1 a $a = 4\frac{1}{2}$ b $a = 7$ c $a = \frac{t-b}{n}$
 d $a = \frac{q-v}{m}$ e $a = \frac{A+B}{P}$ f $a = \frac{A+q}{n}$
 g $a = \frac{n^2+w}{k}$ h $a = \frac{n-m}{m}$ i $a = \frac{e-m}{t}$
 j $a = \frac{v^2+w^2}{B}$ k $a = \frac{d-L}{p}$ l $a = \frac{M+n}{m}$
 m $a = \frac{x-y}{x}$ n $a = \frac{v^2+t}{x}$ o $a = \frac{z^2+s^2}{s}$
 p $a = \frac{x^2-pq}{r}$ q $a = \frac{h^2-lm}{b}$ r $a = \frac{d+b-t}{e}$
 s $a = \frac{p^2-m-n}{B}$ t $a = \frac{km+n^2}{m}$

u $a = \frac{t}{m} + n$ or $\frac{t+mn}{m}$
 2 a $a = \frac{x}{u} - x$ or $\frac{x-ux}{u}$ b $a = \frac{y}{p} - w$ or $\frac{y-pw}{p}$
 c $a = \frac{q}{A} + u$ or $\frac{q+Au}{A}$ d $a = \frac{m}{L} - x$ or $\frac{m-Lx}{L}$
 e $a = \frac{x^3}{n} - x^2$ or $\frac{x^3-nx^2}{n}$ f $a = \frac{s^2}{r} + r$ or $\frac{s^2+r^2}{r}$
 g $a = \frac{y^2}{x} + x$ or $\frac{x^2+y^2}{x}$ h $a = 4\frac{1}{3}$
 i $a = -\frac{2}{5}$ j $a = \frac{T}{n} + t$ or $\frac{T+nt}{n}$
 k $a = \frac{V}{w} + y$ or $\frac{V+wy}{w}$
 l $a = \frac{w+q}{m} + w$ or $\frac{w+q+mw}{m}$
 m $a = \frac{x^2-y^2}{z} + z$ or $\frac{x^2-y^2+z^2}{z}$
 n $a = \frac{v^2-ut}{t}$ o $a = \frac{L^2-MN}{m}$
 p $a = \frac{x}{z} - x$ or $\frac{x-xz}{z}$ q $a = \frac{y^2}{w} + w$ or $\frac{w^2+y^2}{w}$
 r $a = \frac{x^2+q^2}{q} + q$ or $\frac{x^2+2q^2}{q}$ s $a = \frac{n}{k}$

3 a $k = an$ b $k = At$ c $k = x^2$
 d $k = Pz$ e $k = vw$ f $k = n^3$
 g $k = -em$ h $k = t(a-b)$ i $k = h(x+y)$
 j $k = -m^2$ k $k = z(a+b)$ l $k = B(m-n)$
 m $k = \frac{e}{a}$ n $k = \frac{c^2}{t}$ o $k = \frac{e}{ab}$
 p $k = \frac{h}{m}$ q $k = \frac{a^2}{g}$ r $k = \frac{a+b}{c}$
 s $k = \frac{d-e}{u}$ t $k = c(h-a^2)$
 4 a $n = t - b$ b $n = h - k$ c $n = p - v$
 d $n = \frac{h-c}{a}$ e $n = \frac{g-q}{t}$ f $n = h - h^2$
 g $n = b - \frac{h}{a}$ or $\frac{ab-h}{a}$
 h $n = t - \frac{d}{t}$ or $\frac{t^2-d}{t}$ i $n = \frac{p-s}{t}$
 j $n = \frac{a}{c-b}$ k $n = \frac{d}{e+f}$ l $n = \frac{h}{v-t}$

5 a $x = \sqrt{\frac{h}{a}}$ b $x = \sqrt{\frac{t}{m}}$ c $x = \sqrt{(m+h)}$
 d $x = \sqrt{h}$ e $x = \sqrt{\left(\frac{c-b}{a}\right)}$ f $x = \sqrt{\left(\frac{v-p}{a}\right)}$
 g $x = c^2 + a$ h $x = e^2 - a$ i $x = \frac{v^2}{m}$
 j $x = \frac{h}{p^2}$ k $x = \frac{m}{y^2}$ l $x = \sqrt{\left(\frac{c+d^2}{m}\right)}$
 6 a $t = \frac{b}{a+1}$ b $t = \frac{h}{n-1}$ c $t = \frac{a}{1-v}$
 d $t = \frac{a-b}{v-w}$ e $t = \frac{a}{3}$ f $t = \frac{ha-ca}{h+c}$ or $\frac{a(h-c)}{h+c}$

Practice 7b

1 a 21 b 2 c -9 d 7 e 18 f 5
 2 4, 11
 3 a 2 b 5 c 7 d 5 e 0.25
 f 0.4 g 3 h $17\frac{1}{3}$ i $\frac{1}{6}$ j 6
 k 22 l -2
 4 10, 5 5 $-1\frac{1}{3}$

Practice 7c

1 a $4(2a+b)$ b $5(a+3b)$ c $5(3a+4b)$
 d $7(a+3b)$ e $9(3a-4b)$ f $4(a+2b+c)$
 2 a $4(5x+3y)$ b $6(5x-2y)$ c $9(3x+y)$
 d $7(5x-2y)$ e $20(2x+y)$ f $5(2x+y+2z)$
 g $x(3x+2)$ h $2x(2x+1)$ i $x(5x+1)$
 j $x(x-2)$ k $y(2y+5)$ l $3x(4x+7)$
 3 a 7 b $5\frac{1}{2}$ c 3 d -2 e $3\frac{1}{3}$
 f 12 g 2 h 3 i 1
 4 3, 5
 5 a 3 b -11 c B and D 6 4.5

Practice 7d

1 a 2 b 4 c 4.5 d 0.5
 e 14 f 36 g -200 h 14
 i 10 j 12 k $9\frac{1}{3}$ l 16
 2 1 3 a 2 b 3 c -2
 4 a True b True c False d True

Practice 7e

1 a $x = p - a$ b $x = m - y$ c $x = z - k$
 d $x = u^2 - t^2$ e $x = \frac{a-bc}{m}$ f $x = \frac{z-k}{a}$

$$\mathbf{g} \quad x = \frac{u^2 - e^2}{k} \quad \mathbf{h} \quad x = \frac{b}{m} - a \text{ or } \frac{b-am}{m}$$

$$\mathbf{i} \quad x = \frac{h}{k} - a \text{ or } \frac{h-ak}{k}$$

$$\mathbf{j} \quad \frac{y}{p} - p \text{ or } \frac{y-p^2}{p} \quad \mathbf{k} \quad x = ky \quad \mathbf{l} \quad x = mn$$

$$\mathbf{m} \quad x = q^2 \quad \mathbf{n} \quad x = mn^2 \quad \mathbf{o} \quad x = \frac{m}{a}$$

$$\mathbf{2} \quad \mathbf{a} \quad x = \frac{n}{e} \quad \mathbf{b} \quad x = \frac{u}{w} \quad \mathbf{c} \quad x = \frac{e}{\sin 32^\circ}$$

$$\mathbf{d} \quad x = \frac{2y}{z} \quad \mathbf{e} \quad x = \frac{3p}{k} \quad \mathbf{f} \quad x = \sqrt{(m+n)}$$

$$\mathbf{g} \quad x = \sqrt{(a-b-v)} \quad \mathbf{h} \quad x = \sqrt{\left(\frac{n^2+n}{b}\right)}$$

$$\mathbf{i} \quad x = \frac{d+e}{a} + b \text{ or } \frac{d+e+ab}{a}$$

$$\mathbf{j} \quad x = \sqrt{\left(\frac{mp+k^2}{k}\right)}$$

$$\mathbf{k} \quad x = y - m \quad \mathbf{l} \quad x = \frac{u}{e} + d \text{ or } \frac{u+de}{e}$$

$$\mathbf{m} \quad x = \frac{z}{a} - y \text{ or } \frac{z-ay}{a} \quad \mathbf{n} \quad x = \frac{w+fy}{ey} \quad \mathbf{o} \quad x = \frac{m-mt}{at}$$

$$\mathbf{3} \quad \mathbf{a} \quad x = y(c+d) \quad \mathbf{b} \quad x = \frac{a-b}{p} \quad \mathbf{c} \quad x = \frac{m+n}{A}$$

$$\mathbf{d} \quad x = \sqrt{\frac{k}{h}} \quad \mathbf{e} \quad x = \frac{A+B}{E} \quad \mathbf{f} \quad x = \frac{4q}{k}$$

$$\mathbf{g} \quad x = \sqrt{\left(\frac{h+ad}{a}\right)} \quad \mathbf{h} \quad x = k^2 - y \quad \mathbf{i} \quad x = \frac{m-g}{n}$$

$$\mathbf{4} \quad \mathbf{a} \quad a = e^2 - b \quad \mathbf{b} \quad a = (fc)^2 \quad \mathbf{c} \quad a = \frac{h^2 - c}{b}$$

$$\mathbf{d} \quad a = \frac{c+d}{h+1} \quad \mathbf{e} \quad a = \frac{d}{m-1} \quad \mathbf{f} \quad a = \frac{h+f}{2c}$$

$$\mathbf{5} \quad r = \sqrt{\left(\frac{S}{4\pi}\right)} \quad \mathbf{6} \quad r = \sqrt{\left(\frac{V}{\pi h}\right)}$$

$$\mathbf{7} \quad r = \sqrt[3]{\left(\frac{3V}{4\pi}\right)}$$

Practice 8a

$$\mathbf{1} \quad \mathbf{a} \quad 5 \text{ cm} \quad \mathbf{b} \quad 6.24 \text{ cm} \quad \mathbf{c} \quad 10.6 \text{ cm} \quad \mathbf{d} \quad 6.23 \text{ cm}$$

$$\mathbf{2} \quad \mathbf{a} \quad 6.63 \text{ cm} \quad \mathbf{3} \quad 8.24 \text{ cm} \quad \mathbf{4} \quad 10.4 \text{ cm} \quad \mathbf{5} \quad 10.9 \text{ cm}$$

$$\mathbf{6} \quad \mathbf{b} \quad 6.93 \text{ cm} \quad \mathbf{c} \quad 27.7 \text{ cm}^2$$

$$\mathbf{7} \quad \mathbf{a} \quad 8.06 \text{ cm} \quad \mathbf{b} \quad 8.60 \text{ cm}$$

Practice 8b

$$\mathbf{1} \quad \mathbf{a} \quad a = 11.55 \quad \mathbf{b} \quad b = 16.1 \quad \mathbf{c} \quad c = 16.4$$

$$\mathbf{d} \quad d = 0.768 \quad \mathbf{e} \quad e = 4.73 \quad \mathbf{f} \quad f = 10.0$$

$$\mathbf{g} \quad g = 5.94 \quad \mathbf{h} \quad h = 6.40 \quad \mathbf{i} \quad t = 4.43$$

$$\mathbf{2} \quad \mathbf{a} \quad k = 10.0 \quad \mathbf{b} \quad a = 5.56 \quad \mathbf{c} \quad m = 162 \quad \mathbf{d} \quad p = 3.95$$

$$\mathbf{e} \quad q = 34.6 \quad \mathbf{f} \quad r = 2.39 \quad \mathbf{g} \quad s = 3.87 \quad \mathbf{h} \quad a = 24.4$$

$$\mathbf{i} \quad b = 9.15 \quad \mathbf{j} \quad c = 201 \quad \mathbf{k} \quad d = 10.6$$

Practice 8c

$$\mathbf{1} \quad \mathbf{a} \quad x = 33.7^\circ \quad \mathbf{b} \quad a = 66.4^\circ \quad \mathbf{c} \quad y = 63.4^\circ$$

$$\mathbf{d} \quad x = 53.1^\circ \quad \mathbf{e} \quad c = 41.4^\circ \quad \mathbf{f} \quad x = 21.8^\circ$$

$$\mathbf{g} \quad a = 51.1^\circ \quad \mathbf{h} \quad x = 71.6^\circ \quad \mathbf{i} \quad a = 12.4^\circ$$

$$\mathbf{2} \quad \mathbf{a} \quad y = 56.3^\circ \quad \mathbf{b} \quad x = 68.2^\circ \quad \mathbf{c} \quad b = 71.8^\circ$$

$$\mathbf{d} \quad c = 21.0^\circ \quad \mathbf{e} \quad a = 16.7^\circ \quad \mathbf{f} \quad x = 72.5^\circ$$

$$\mathbf{g} \quad a = 17.5^\circ \quad \mathbf{h} \quad x = 76.0^\circ \quad \mathbf{i} \quad c = 35.5^\circ$$

$$\mathbf{j} \quad b = 45.6^\circ \quad \mathbf{k} \quad y = 44.4^\circ$$

$$\mathbf{3} \quad 22.6^\circ \quad \mathbf{4} \quad 63.2^\circ$$

$$\mathbf{5} \quad \mathbf{a} \quad a = 6.11 \quad \mathbf{b} \quad b = 13.9 \quad \mathbf{c} \quad c = 23.6^\circ$$

$$\mathbf{d} \quad d = 34.8^\circ \quad \mathbf{e} \quad e = 13.3 \quad \mathbf{f} \quad f = 6.47$$

$$\mathbf{g} \quad g = 57.8^\circ \quad \mathbf{h} \quad h = 89.8 \quad \mathbf{i} \quad i = 1.70$$

$$\mathbf{j} \quad j = 59.3^\circ \quad \mathbf{k} \quad k = 14.4 \quad \mathbf{l} \quad m = 18.8^\circ$$

$$\mathbf{6} \quad \mathbf{a} \quad n = 8.58 \quad \mathbf{b} \quad p = 9.71 \quad \mathbf{c} \quad q = 46.4^\circ$$

$$\mathbf{d} \quad x = 77.5^\circ$$

$$\mathbf{7} \quad \mathbf{a} \quad 26.6^\circ \quad \mathbf{b} \quad 90^\circ \quad \mathbf{c} \quad 22.3^\circ$$

Practice 9a

$$\mathbf{1} \quad \mathbf{a} \quad C \quad \mathbf{b} \quad B \quad \mathbf{c} \quad C \quad \mathbf{d} \quad A \quad \mathbf{e} \quad C$$

$$\mathbf{f} \quad C \quad \mathbf{g} \quad A \quad \mathbf{h} \quad C \quad \mathbf{i} \quad B \quad \mathbf{j} \quad A$$

$$\mathbf{2} \quad \mathbf{a} \quad 49.98 \quad \mathbf{b} \quad 65.27 \quad \mathbf{c} \quad 25.44 \quad \mathbf{d} \quad 81.37 \quad \mathbf{e} \quad 2.97$$

$$\mathbf{f} \quad 11.52$$

$$\mathbf{3} \quad \mathbf{a} \quad 81.78 \quad \mathbf{b} \quad 4.15 \quad \mathbf{c} \quad 13.68 \quad \mathbf{d} \quad 38.94 \quad \mathbf{e} \quad 56.16$$

$$\mathbf{f} \quad 29.24$$

$$\mathbf{4} \quad \mathbf{a} \quad 18.72 \quad \mathbf{b} \quad 89.18 \quad \mathbf{c} \quad 63.99 \quad \mathbf{d} \quad 7.638 \quad \mathbf{e} \quad 31.16$$

$$\mathbf{f} \quad 48.248$$

Practice 9b

$$\mathbf{1} \quad \mathbf{A} \quad \mathbf{a} \quad \frac{3}{10} \quad \mathbf{b} \quad 30\% \quad \mathbf{B} \quad \mathbf{a} \quad \frac{1}{5} \quad \mathbf{b} \quad 20\%$$

$$\mathbf{C} \quad \mathbf{a} \quad \frac{1}{4}, 25\%$$

$$\mathbf{2} \quad \mathbf{a} \quad 60\% \quad \mathbf{b} \quad 5\% \quad \mathbf{c} \quad 30\% \quad \mathbf{d} \quad 44\% \quad \mathbf{e} \quad 75\%$$

$$\mathbf{3} \quad 70\% \quad \mathbf{4} \quad 92.5\% \quad \mathbf{5} \quad 30\%$$

$$\mathbf{6} \quad \mathbf{a} \quad \text{£}11 \quad \mathbf{b} \quad \text{£}20 \quad \mathbf{c} \quad \text{£}42$$

$$\mathbf{7} \quad \mathbf{a} \quad \text{£}1.47 \quad \mathbf{b} \quad \text{£}2.15 \quad \mathbf{c} \quad \text{£}6.93 \quad \mathbf{d} \quad \text{£}7.23$$

$$\mathbf{e} \quad \text{£}8.18 \quad \mathbf{f} \quad \text{£}4.44$$

$$\mathbf{8} \quad \mathbf{a} \quad 0.64 \quad \mathbf{b} \quad 0.11 \quad \mathbf{c} \quad 0.02$$

$$\mathbf{9} \quad \mathbf{a} \quad \frac{2}{3} = 66\frac{2}{3}\% \quad \mathbf{b} \quad \frac{3}{4} = 75\%$$

Practice 9c

$$\mathbf{1} \quad \mathbf{a} \quad \frac{5}{8} \quad \mathbf{b} \quad \frac{3}{4} \quad \mathbf{c} \quad \frac{11}{12} \quad \mathbf{d} \quad \frac{8}{9}$$

$$\mathbf{2} \quad \mathbf{a} \quad \frac{14}{20} \quad \mathbf{b} \quad \frac{36}{48}$$

- 3 a $\frac{2}{6}$ b $\frac{6}{27}$ c $\frac{2}{87}$
- 4 a $\frac{17}{20}$ b $\frac{3}{14}$ c $3\frac{1}{6}$ d $\frac{3}{4}$
- e $1\frac{1}{5}$ f $2\frac{1}{2}$ g 8 h 6
- 5 $\frac{3}{4} - \frac{7}{20}, 1\frac{3}{5} \times \frac{1}{4}, 2 \div 5, \frac{1}{15} + \frac{1}{3}$

Practice 9d

- 1 0.5
- 2 $\frac{31}{99}$
- 3 a $\frac{3}{11} = 0.2\bar{7}$ b 0.2 c $\frac{17}{45}$

Practice 10a

- 1 a $z = 38^\circ$ b $a = 48^\circ$ c $z = 112^\circ$
d $e = 62^\circ$ e $a = 110^\circ, b = 55^\circ$ f $z = 23^\circ$
g $x = 34^\circ$ h $x = 39^\circ$ i $e = 70^\circ$
- 2 a $x = 80^\circ, y = 75^\circ$ b $a = 95^\circ, b = 115^\circ$
c $a = 60^\circ, b = 50^\circ, c = 70^\circ$ d $x = 68^\circ, y = 112^\circ$
e $x = 60^\circ, 2x = 120^\circ$ f $y = 45^\circ, 3y = 135^\circ$
g $x = 75^\circ, x + 30^\circ = 105^\circ, y = 65^\circ, y + 50^\circ = 115^\circ$
h $a = 50^\circ$
i $x = 40^\circ, b = 60^\circ, 2b = 120^\circ$
- 3 a $c = 80^\circ, c + 20^\circ = 100^\circ$
b $d = 105^\circ, d - 30^\circ = 75^\circ$
c $e = 110^\circ$
d $f = 90^\circ$
e $g = 56^\circ$

Practice 10b

- 1 60° 2 $50^\circ, 130^\circ$ 3 9 4 150°
- 5 120° 6 a 162° b 172°

Practice 10c

- 1 a $a = 49^\circ$ b $b = 53^\circ$ c $c = 82^\circ$
d $d = 27^\circ, e = 38^\circ$ e $f = 88^\circ$
f $g = 67^\circ, h = 32^\circ$ g $i = 45^\circ$
h $j = 47^\circ, k = 43^\circ$ i $m = 64^\circ$
j $n = 47^\circ$ k $p = 80^\circ$ l $q = 105^\circ$
- 2 $\angle BAC = 36^\circ$ ($\triangle ABC$ is isosceles). $\angle BDC = 36^\circ$ because it stands on the same arc as $\angle BAC$.

- 3 a 48° ; Stands on same arc as $\angle PRS$.
b 96° ; Angle at centre equals twice the angle on the circumference.
c 42° ; $\triangle POS$ is isosceles.
- 4 a $a = 86^\circ, b = 38^\circ$ b $c = 92^\circ$ c $d = 20^\circ$
d $e = 60^\circ, 2e = 120^\circ$ e $f = 46^\circ$
f $g = 75^\circ, h = 105^\circ$ g $i = 98^\circ$ h $j = 23^\circ$
i $k = 27^\circ, 3k = 81^\circ, m = 108^\circ$
- 5 a 90° , angle is in a semicircle.
b 51° , stands on same arc as $\angle BDA$.
c 102° , angle at centre is twice that at circumference.

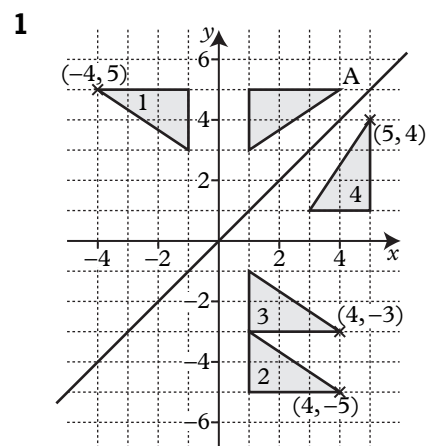
Practice 10d

- 1 $a = 25^\circ$
- 2 $d = 100^\circ$
- 3 $e = 90^\circ$
- 4 $f = 64^\circ$
- 5 $h = 36^\circ, 4h = 144^\circ$

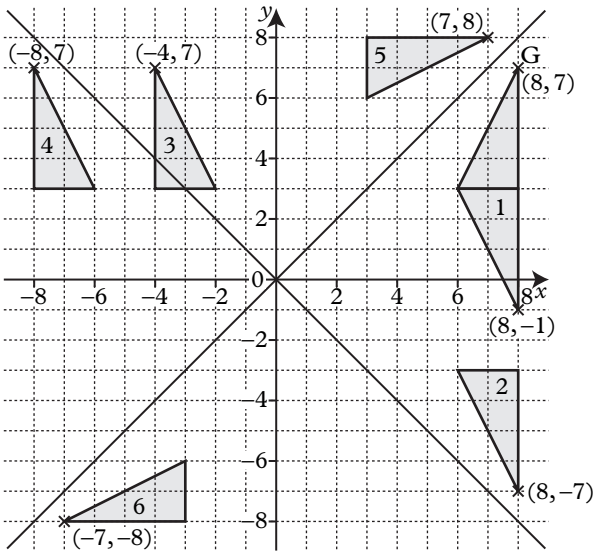
Practice 11a

- 1 $\frac{1}{4}, -1, 4$
- 2 $\frac{5}{4}, \frac{1}{5}, -4$
- 3 a $y = 3x + 2$ b $y = 4x - 1$ c $y = 6 - 2x$
d $y = 2x$ e $y = 8 - \frac{1}{2}x$ f $y = 5 - x$
- 4 a 3 b 5
- 5 $y = 2x + 3$
- 6 a $y = 3x + 5$ b $y = -\frac{1}{2}x$

Practice 12a

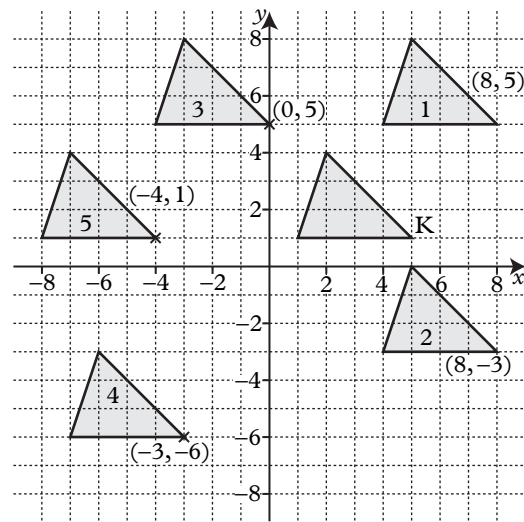


2

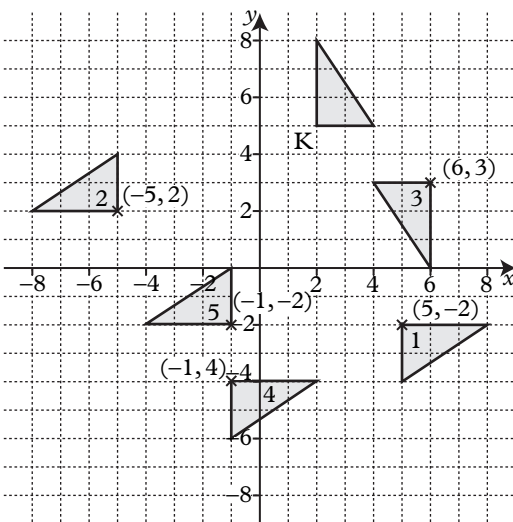


Practice 12b

1

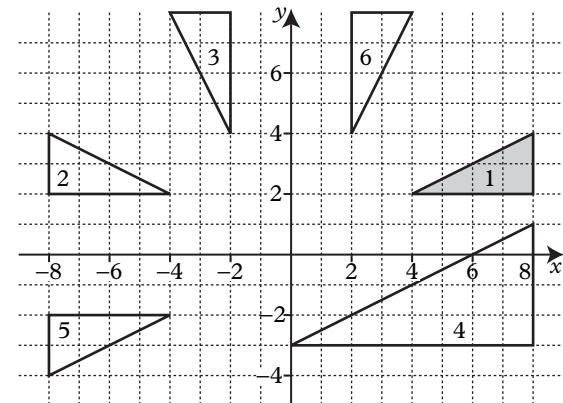


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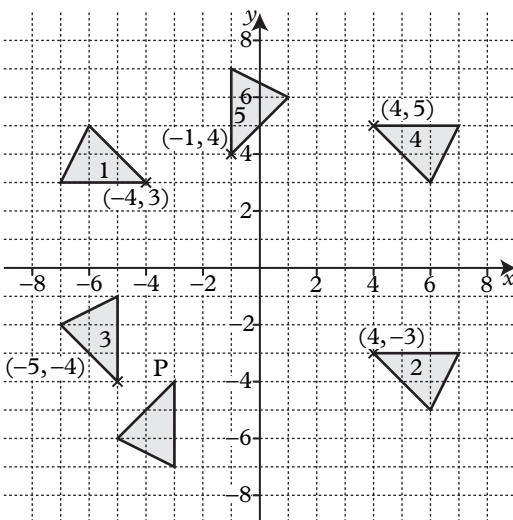


Practice 12c

1 a Reflection in y -axis



4



b Rotation of 90° anticlockwise centre $(0, 0)$

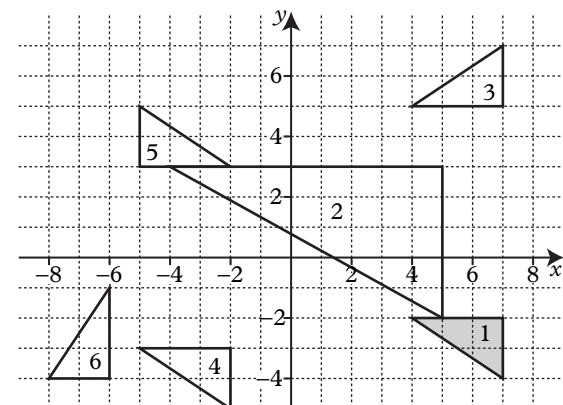
c Enlargement, SF 2, centre $(8, 7)$

d Rotation of 180° , centre $(0, 0)$

e Reflection in $y = x$

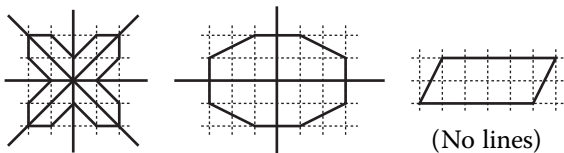
f Reflection in x -axis

2 a Enlargement, SF 3, centre $(8, -6)$



b Reflection in $y = 1$

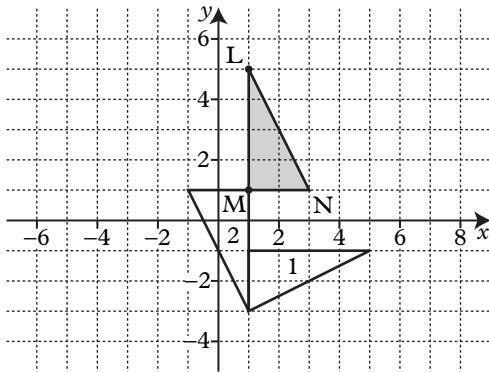
5 a



b 4, 2, 2

- c Translation $\begin{pmatrix} -9 \\ 0 \end{pmatrix}$
 d Rotation of 180° , centre $(1, 0)$
 e Rotation of 90° clockwise, centre $(0, 3)$
 f Rotation of 180° , centre $\left(-3\frac{1}{2}, 0\right)$

- 3 c rotation 90° clockwise, centre $(0, 0)$



- e rotation 180° , centre $(1, 1)$
 f rotation 90° anticlockwise, centre $(2, 0)$

Practice 12d

- 1 A and H
 D and E
 F and I
 2 B, C and G
 3 A and G, C and E, D and F, H and J, L and N, M and O
 4 a 4.5 cm b 3.2 cm c 2 cm d 6.4 cm
 e 6 cm
 5 14 m
 6 a $\angle AEB = \angle CED$, $\angle ECD = \angle EBA$, $\angle EDC = \angle EAB$
 b 12 cm

Practice 13a

- 1 a Negative b None c Positive

Practice 13b

- 1 b £16 000

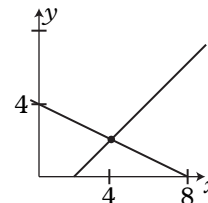
Practice 14a

- 1 a $x = 2$ $y = 3$ b $x = 3$ $y = 2$
 c $x = 2$ $y = -3$ d $x = 0.5$ $y = 3$

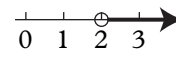
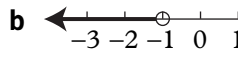
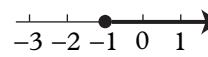
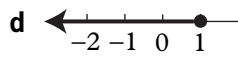
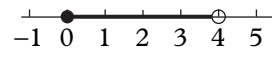
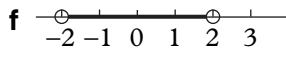
Practice 14b

- 1 a $x = 2$ $y = 1$ b $x = 3$ $y = -2$
 c $x = 5$ $y = -0.5$ d $x = 5$ $y = -2$
 e $x = 2$ $y = -3$

Practice 14c

- 1 a $(8, 3)$ b $(2, 9)$ c $(4, 1)$
 2 a  b $(4, 2)$

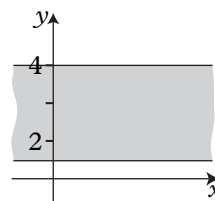
Practice 14d

- 1 a $x > -2$ b $x \leq 1$ c $x < 4$
 d $x \geq -1$ e $-5 < x \leq 2$ f $-4 < x \leq 1$
 g $-1 \leq x < 3$ h $-4 \leq x \leq 0$
 2 a  b 
 c  d 
 e  f 
 3 a 2, 3 and 4 b 1, 2, 3, 4 and 5 c -2, -1, 0 and 1
 4 a $x > 4$ b $x < 3$ c $x > 4$
 d $x > 3$ e $x \geq 2$ f $x < 4$
 5 $11 < x < 24$
 6 a $-1 < x < 4$ b $-\frac{1}{3} < x < \frac{2}{3}$ c $3 \leq x \leq 5$
 d $-6 < x < 6$ e $x > 5$ or $x < -5$

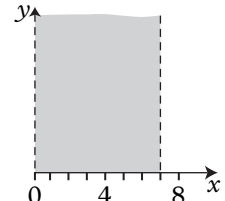
Practice 14e

- 1 $y \geq 2$ 2 $1 \leq x \leq 3$ 3 $x > 4$ and $y > 3$

4

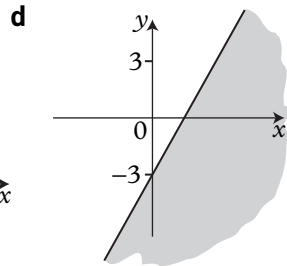
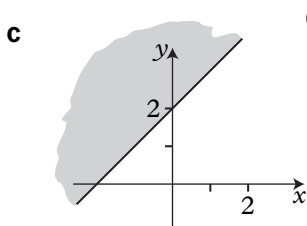
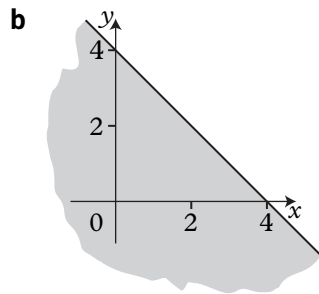
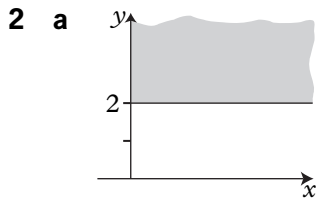


5



Practice 14f

- 1 a $y \geq x + 1$ b $y \leq 2x$ c $x + y \leq 5$
 d $x + y \leq 10$, $y \leq x - 3$ and $y \geq 0$
 e $y \geq x + 2$, $x + y \leq 8$ and $x \geq 0$
 f $x + y \leq 6$, $x \geq -2$ and $y \geq 0$



Practice 15a

- 1 a 16 b 27 c 1 d 10 000
 2 a 6^6 b 7^8 c 3^4 d 7^7
 3 $x = 0$
 4 $n = 9$
 5 True
 6 a nm b $\frac{m}{3}$

Practice 15b

- 1 a $\frac{1}{8}$ b $\frac{1}{4}$ c $\frac{1}{3}$ d 3
 e 5 f $\frac{1}{4}$ g 16 h 10
 2 a n^7 b x^7 c n^6 d m^{-6}
 e a^6 f $4n^4$ g y^{12} h b
 3 2, 3, 1, $\frac{1}{81}$
 4 a 13 b 1 c 4 d 27
 e 1 f 4 g 1 h $\frac{1}{10}$
 5 $n^{-1}, n^0, n^{\frac{1}{2}}, n^3$
 6 a xy b x^2
 7 a 2^{-2} b 3^1
 8 A is $y = 2^{-x}$, B is $y = 2^{\frac{x}{2}}$, C is $y = 2^x$

Practice 15c

- 1 a $2\sqrt{3}$ b $\frac{\sqrt{2}}{2}$ c $2\sqrt{5}$
 2 a 8 b 20 c 18
 3 a $2\sqrt{3}$ b $5\sqrt{2}$ c $4\sqrt{3}$
 4 9 cm^2
 5 $3\sqrt{5}$

Practice 15d

1 $\frac{5+4\sqrt{5}}{5}$ or $1 + \frac{4\sqrt{5}}{5}$

Practice 16a

- 1 a $\overrightarrow{PO} = -\mathbf{b}, \overrightarrow{OQ} = \mathbf{a} + \mathbf{b}, \overrightarrow{QR} = 2\mathbf{a} - \mathbf{b}$
 b $\overrightarrow{BA} = \mathbf{a} - \mathbf{b}, \overrightarrow{BM} = \frac{1}{2}(\mathbf{a} - \mathbf{b}), \overrightarrow{OM} = \frac{1}{2}(\mathbf{a} + \mathbf{b})$
 c $\overrightarrow{EC} = \mathbf{b} - \mathbf{a}, \overrightarrow{ED} = \mathbf{a} + \mathbf{b}, \overrightarrow{OD} = 2\mathbf{a} + \mathbf{b}$
 d $\overrightarrow{HG} = 2\mathbf{b} - \mathbf{a}, \overrightarrow{HM} = \mathbf{b} - \frac{1}{2}\mathbf{a}, \overrightarrow{OM} = \frac{1}{2}\mathbf{a} + \mathbf{b}, \overrightarrow{GH} = \mathbf{a} - 2\mathbf{b}$
 2 a $\overrightarrow{AC} = \mathbf{a} + \mathbf{b}$ b $\overrightarrow{AP} = \frac{1}{3}(\mathbf{a} + \mathbf{b})$
 c $\overrightarrow{MP} = \frac{1}{3}\mathbf{a} - \frac{1}{6}\mathbf{b}$ d $\overrightarrow{PB} = \frac{2}{3}\mathbf{a} - \frac{1}{3}\mathbf{b}$

Practice 16b

- 1 a $\overrightarrow{RP} = \mathbf{b} - \mathbf{a}, \overrightarrow{OQ} = 2\mathbf{a} + \mathbf{b}, \overrightarrow{RQ} = \mathbf{a} + \mathbf{b}$
 b $\overrightarrow{BA} = \mathbf{a} - \mathbf{b}, \overrightarrow{BN} = \frac{1}{3}(\mathbf{a} - \mathbf{b}), \overrightarrow{ON} = \frac{1}{3}\mathbf{a} + \frac{2}{3}\mathbf{b}$
 2 a $\overrightarrow{AB} = \mathbf{b} - \mathbf{a}$ b $\overrightarrow{AM} = \frac{1}{4}(\mathbf{b} - \mathbf{a})$
 c $\overrightarrow{OM} = \frac{3}{4}\mathbf{a} + \frac{1}{4}\mathbf{b}$
 3 a Trapezium b $\overrightarrow{OS} = \mathbf{a} + 2\mathbf{b}$
 c $\overrightarrow{PR} = 2\mathbf{b} - \mathbf{a}$ d $\overrightarrow{OM} = \frac{1}{2}\mathbf{a} + \mathbf{b}$
 4 a i $\overrightarrow{OD} = 2\mathbf{a}$ ii $\overrightarrow{OE} = 4\mathbf{b}$
 iii $\overrightarrow{BA} = \mathbf{a} - \mathbf{b}$ iv $\overrightarrow{ED} = 2\mathbf{a} - 4\mathbf{b}$
 b $\overrightarrow{OC} = 3\mathbf{a} - 2\mathbf{b}$ c $\overrightarrow{EC} = 3\mathbf{a} - 6\mathbf{b}$
 d $\overrightarrow{EC} = \frac{3}{2}\overrightarrow{ED}$ and both pass through E

Practice 17a

- 1 4%
 2 a 6% b 2% c 10%
 3 5% 4 62.5% 5 14% 6 16.64%

Practice 17b

- 1 £450 2 £22 500 3 65p, £65 4 £64 000
 5 a £190 b £440 c £84 500 6 13.5%

Practice 17c

- 1 a £5250 b £5512.50
 2 £3374.59 3 £3573.05
 4 £4800, £4750.75 5 432
 6 29 years later

Practice 17d

1 a 50 b 15

2 a 3 b 48

3

x	2	3	10	22
y	8	12	40	88

4

u	1	2	4	$\frac{1}{2}$
p	4	16	64	1

5 a $C = kA$ b £380 c $25m^2$

Practice 17e

1 a $C = \frac{k}{p}$ b 8

2 a 9 b 10

3

x	2	5	8	20
y	40	16	10	4

4

v	3	4	6	0.5
s	12	6.75	3	432

5 4 ohms

Practice 18a

1 a 36 cm^2 b 45 cm^2 c 42 cm^2
d 24.8 cm^2 e 14.6 cm^2 f 37.5 cm^2

2 a 9.2 cm b 6 cm c 4.26 cm

3 14.0 cm 4 8.94 cm

Practice 18b

1 a 32.7 cm b 53.4 cm c 23.2 cm

2 a 84.9 cm^2 b 227 cm^2 c 43.0 cm^2

3 101 m^2 4 2.04 km

5 a 21.9 cm b 15.9 cm c 14.6 cm

6 a 99.3 cm^2 b 49.7 cm 7 10.3 cm

8 3.66 cm 9 28.5 cm^2 10 27.2 cm

Practice 18c

1 a 9.22 cm b 10.5 cm c 17.1 cm

2 a 36.9 cm^2 b 31.4 cm^2 c 98.3 cm^2

3 57.3° 4 22.0 cm^2

5 22.0 cm^2 6 22.5 cm^2

Practice 19a

1 a $3(n+5)$ b $5(2n-3)$ c $(2n-8)^2$

d $\frac{3n+1}{7}$

2 a +5, $\times 3$ b -2, +9, -1 c $\times 6$, +1, $\times 2$

d +3, -4, cube

3 a $11n$ b $5x$ c $6m$

d $7c$ e $5m+7n$ f $9n+11$

g $4a+8$ h $8h-11y$ i $9y+6$

j $2x-7$ k $x^2+3x+10y$ l $y^2+14y+1$

m $a+3c$ n $10x-5y$ o $d+10$

4 a $3n+5n+2$ b $5m+m+2n+8n$

c $8a+2a+7b+3b+11$ d $x^2+2x+3x+3x+7$

e $x^2+8x+3x+9x+1$

5 a $4x+8$ b $6x$ c $7x$

6 a $12ab$ b $12np$ c $30mn$ d $3an$

e $6pq$ f $2n^2$ g $12n^2$ h $18n^2$

i $49a^2$

7 a $\frac{5n}{2}$ b $\frac{1}{3}$ c $\frac{x+2}{2}$ d $\frac{2n+1}{n}$

e $\frac{3a}{b}$ f $\frac{x}{x+2}$ g $\frac{3x+1}{2x}$ h $\frac{1}{2}$

8 a 6 b $\frac{x+1}{2}$ c $\frac{1}{2}$ d $\frac{a}{3}$

e $\frac{10}{xz}$ f $\frac{2(x+1)}{x-1}$

9 A and F, B and D, C and E

10 a True b True c False d True

e False f True g True h False

i False j False k False l True

Practice 19b

1 a $2x+6$ b $5b-20$ c $8a-16$

d $3x+3c$ e $7t-7y$ f $10m+10$

g $6y+12$ h $4u-4x$ i n^2+2n

j n^2-3n k n^2-10n l $2x^2+x$

m $3x^2-2x$ n $4x^2+4x$ o $6x^2+2x$

p $2x^2-6x$

2 a $7x, 2y$ b $x+3, 2y+3$ c $2x+1, 5y+3$

d $4x-2, 2y+7$

3 a $20x-10$ b n^2+5n c 13

d $3a^2-a$ e $9a+8$ f $3x$

g $4y-13$ h $5a^2-7a$ i $5b+18$

j n^2+4n

4 a $x+x+x, 4x-x$ b x^2+x, x^2+2x-x

c $2x+2$

Practice 19c

- 1 a $n^2 + 6n + 8$ b $n^2 + 2n - 3$
 c $n^2 - 25$ d $n^2 - 4n - 21$
 e $2n^2 - 7n - 4$ f $6n^2 + n - 12$
 g $n^2 + 4n + 4$ h $2n^2 + 2$
 i $2n^2 + 12n + 18$
- 2 a $6x + 4$ b $2x^2 + 5x - 3$
- 3 a $n^2 + 7n + 12$ b $n^2 + 3n - 12$
- 4 a $2x^2 + 5x + 2$ b $3x^2 - x - 12$
- 5 a $8x^6 y^3$ b $x = 1$ c $3a^2 b(2a - 5b)$

Practice 19d

- 1 a $(x + 2)(x + 3)$ b $(x + 4)(x + 1)$
 c $(x + 7)(x + 4)$ d $(x - 5)(x + 2)$
 e $(x - 6)(x - 1)$ f $(x - 12)(x - 2)$
 g $(x + 3)(x - 7)$ h $(x + 4)(x - 5)$
 i $(x + 16)(x + 3)$
- 2 $(n + 3)(n - 1), 4n + 4, (n - 7)(n - 10), 4n - 34$
- 3 a $\frac{2x}{x + 1}$ b $\frac{x - 3}{x}$ c $\frac{x + 3}{x - 2}$
- 4 $(a + b)(a + b + 3)$ 5 $(x + 3)(x - 2)$ or $x^2 + x - 6$
- 6 a $(2x + 1)(x + 5)$ b $(3x + 2)(x + 2)$
 c $(2x + 1)(2x + 3)$ d $(2x + 3)(x + 1)$
 e $(2x + 5)(x - 3)$ f $(5x + 3)(x + 1)$
- 7 a $(x - a)(x + a)$ b $(n - p)(n + p)$
 c $(x - 2)(x + 2)$ d $n(n - 1)(n + 1)$
 e $2(x - 5)(x + 5)$ f $p(p - q)(p + q)$
- 8 a $\frac{2x - 1}{x - 4}$ b $\frac{2x + 5}{x + 1}$ c $\frac{4x + 3}{2x}$

Practice 19e

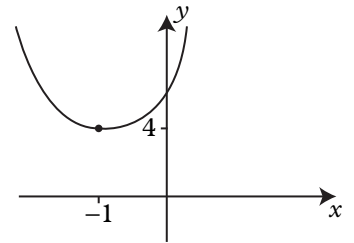
- 1 a $x = 0$ or 3 b $x = -2$ or 5
 c $x = -3$ or -4 d $x = 2$ or -7
 e $x = 1\frac{1}{2}$ or -1 f $x = \frac{1}{2}$ or $-\frac{2}{3}$
- 2 3 3 A is $(\frac{1}{2}, 0)$, B is $(1\frac{1}{3}, 0)$

Practice 19f

- 1 $2(2x^2 - 2x - 1)$
- 2 a $(x + 4)^2 + 4$ b $(x + 3)^2 - 7$
 c $(x + 5)^2 - 25$
- 3 a -2 or -6 b -2 or -8
 c $-1 + \sqrt{3}$ or $-1 - \sqrt{3}$
 d $2 + \sqrt{5}$ or $2 - \sqrt{5}$

4 A is $(0, 11)$, B is $(3, 2)$

5 a $(x + 1)^2 + 4$ b



6 a $a = 16, b = 4$ b $2(x + \frac{1}{2})^2 + \frac{1}{2}$

Practice 19g

- 1 a -0.22 or -2.28 b 1.14 or -1.47
 c -0.19 or 2.69
- 2 b 10.1 or -3.1
- 3 $-0.5(A)$ and $3(B)$ 4 6

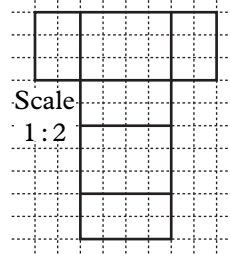
Practice 19h

- 1 a $x = 2, y = 4$ or $x = -8, y = -26$
 b $x = 6, y = 8$ or $x = -8, y = -6$
 c $x = 2, y = -3$ or $x = \frac{-14}{11}, y = \frac{39}{11}$
- 2 A $(-1, 2)$ B $(3, 10)$
- 3 $x = 3, y = 4$ or $x = -3, y = -4$

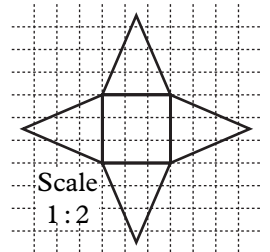
Practice 20a

1 A and B

2 a



3 a



b 52 cm^2 b 31.2 cm^2

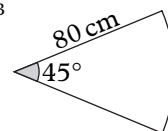
4 a 280 cm^3 b 144 cm^3

5 a 6158 cm^3 b 1005 cm^3

6 B (Volumes are: A = 188.5 cm^3 , B = 240 cm^3)

7 259

8 2513 cm^3



9 1140 seconds or 19 minutes

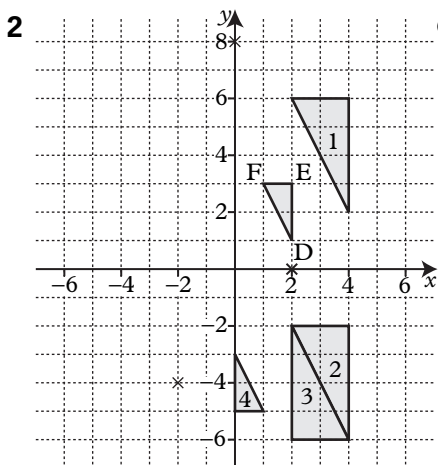
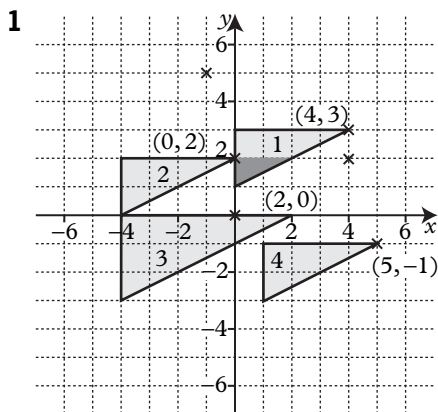
Practice 20b

- 1 a 14.7 cm^3 b 207 cm^3
 2 a 33.5 cm^3 b 0.628 cm^3 c 53
 3 262 seconds
 4 a 2.67 cm b 4.49 cm
 5 11.6 cm 6 7.56 cm 7 6.21 cm

Practice 20c

- 1 a 126 cm^2 b 292 cm^2 2 312 cm^2
 3 a 66.0 cm^2 b 55.4 cm^2 c 15.6 cm^2
 4 18.5 cm^2 5 101 cm^2 6 8.46 cm

Practice 20d



- e Enlargement,
 scale factor -1 ,
 centre $(1, -1)$ or
 rotation of 180°
 about $(1, -1)$.

- 3 a 32 cm^2 b 108 cm^2 c 36 cm^2 d 55 cm^2
 4 245 cm^2 5 $2.5R$
 6 a 6 cm b 12 cm c 11.2 cm d 2.4 cm
 7 a 280 cm^3 b 540 cm^3 c 22 cm d 22 cm
 8 2025 cm^3
 9 21 cm
 10 a 16.8 cm b 144 cm^2

Practice 21a

- 1 A $y = x^2 - 3x + 7$ B $y = \frac{4}{x}$
 C $y = x^3 - 4x$ D $y = 3 - x - 2x^2 - x^3$
 E $y = 6 + x - x^2$ F $y = 2^x$

2

x	-2	-1	0	1	2	3
x^2	4	1	0	1	4	9
$5x$	-10	-5	0	5	10	15
y	-6	-4	0	6	14	24

3

x	-3	-2	-1	0	1	2
x^2	9	4	1	0	1	4
$-2x$	6	4	2	0	-2	-4
$+4$	4	4	4	4	4	4
y	19	12	7	4	3	4

Practice 21b

1 a

x	-3	-2	-1	0	1	2	3
x^2	9	4	1	0	1	4	9
$-4x$	-4	-4	-4	-4	-4	-4	-4
y	5	0	-3	-4	-3	0	5

- b i $-2.65, 2.65$ ii $-1.4, 1.4$

2 a

x	-4	-3	-2	-1	0	1
x^2	16	9	4	1	0	1
$+3x$	-12	-9	-6	-3	0	3
y	4	0	-2	-2	0	4

- b i $-3.8, 0.8$ ii $-2.6, -0.4$

3

x	-4	-3	-2	-1	0	1	2
x^2	16	9	4	1	0	1	4
$2x$	-8	-6	-4	-2	0	2	4
-3	-3	-3	-3	-3	-3	-3	-3
y	5	0	-3	-4	-3	0	5

4

x	-3	-2	-1	0	1	2	3
$2x^2$	18	8	2	0	2	8	18
x	-3	-2	-1	0	1	2	3
-3	-3	-3	-3	-3	-3	-3	-3
y	12	3	-2	-3	0	7	18

Practice 21c

- 1 a -2.56, 1.56 b -2.4, 0.4
2 a -2.2, 2.2 b -2.8, 1.8 c -2, 1
3 b -1.55, 2.55

Practice 22a

- 1 62 mph 2 108 km/h 3 5.4×10^{10} m
4 0.08 m^3 5 67.5 mph
6 a 18 h b 4 h c 40 s 7 120 m
8 a 6283 cm^3 b 0.006283 m^3 c 126 kg

Practice 22b

- 1 a 3.2×10^3 b 1.8×10^4 c 4.3×10^3
d 5.8×10^2 e 7.0×10^5 f 2.6×10^3
g 4.8×10^1 h 2.7×10^4 i 6.5×10^5
j 3.0×10^4 k 2.5×10^6 l 8×10^2
m 1.3×10^1 n 2×10^3 o 6.24×10^5
p 2×10^7 q 2.6×10^{-2} r 7.0×10^{-3}
s 1.2×10^{-5} t 3.52×10^{-4} u 1.67×10^{-6}
v 9.0×10^{-4} w 2.58×10^{-3} x 4.34×10^{-1}
y 2.11×10^{-2} z 8.05×10^{-7}
- 2 a 240 b 3600 c 19 000
d 8300 e 750 f 480 000
g 9200 h 63 i 72 000
j 260 000 k 0.07 l 0.8
m 0.000 02 n 0.000 47 o 0.0213
p 0.001 72
- 3 a 5.04×10^5 b 2.6×10^3
c 2.08×10^6 d 2.7×10^{-2}
e 8.03×10^{-1} f 5.001×10^2

Practice 22c

- 1 a 6×10^3 b 8×10^4 c 4×10^7
d 1.6×10^8 e 2.8×10^0 f 3.5×10^3
g 3.6×10^2 h 1.2×10^{-2} i 4×10^4
j 7×10^3 k 2×10^3 l 1.4×10^3
- 2 4×10^7
- 3 a 2.16×10^4 b 2.45×10^7
c 2.68×10^{13} d 5.8×10^3
e 3.84×10^6 f 3.5×10^1
g 6.2×10^{-1} h 4.3×10^2
i 6.5×10^1 j 4.9×10^2

- 4 a 1.2×10^{12} b 7.5×10^{-4}
c 1.6×10^{15}
5 8×10^{-5} m

Practice 22d

- 1 18.5 cm 2 19.5 cm 3 13.5 km
4 a C b 2.55 kg
5 a 161.5 cm, 162.5 cm b 52.5 kg, 53.5 kg
c 21.55 cm, 21.65 cm d 0.75 litres, 0.85 litres
e 255 m, 265 m 6 3.144 g, 3.135 g to 4 d.p.

Practice 22e

- 1 46.75 cm^2 2 185 cm
3 a 68.25 m^2 b 38 m
4 439.875 cm^3 to 653.125 cm^3
5 9.59 cm^2
6 a 23 b 6.4
7 9.460 cm to 9.513 cm

Practice 23a

- 1 a 6.6 cm b 56.1°
2 a 10 cm b 11.2 cm c 26.6°
3 a 8.25 cm b 55.6° 4 25.0°
5 a 33.2 m b 33.6° 6 35.3°

Practice 23b

- 1 a $a = 11.3 \text{ cm}$ b $b = 10.5 \text{ cm}$ c $c = 17.4 \text{ cm}$
d $d = 9.10 \text{ cm}$ e $e = 4.79 \text{ cm}$
f $f = 17.5 \text{ cm}$ 2 LM = 6.26 cm
3 a $g = 61.1^\circ$ b $h = 50.7^\circ$ c $i = 37.6^\circ$
d $j = 57.6^\circ$ e $k = 39.3^\circ$ f $l = 58.2^\circ$

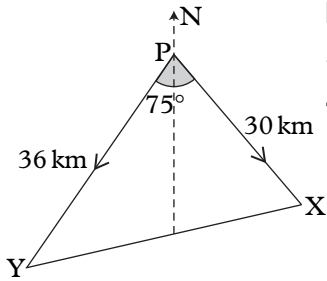
Practice 23c

- 1 a $a = 7.55 \text{ cm}$ b $b = 5.73 \text{ cm}$
c $c = 8.45 \text{ cm}$ d $d = 6.14 \text{ cm}$ e $e = 8.00 \text{ cm}$
2 a $f = 78.5^\circ$ b $g = 38.2^\circ$ c $h = 111.6^\circ$
3 a $i = 4.43 \text{ cm}$ b $j = 90^\circ$ c $k = 9.58 \text{ cm}$

Practice 23d

- 1 a 9.95 cm^2 b 15.1 cm

2 a



b 40.5 km

3 a 63.4° b 121.7°

4 5.37 cm

Practice 24a

1 9.6 2 a 3.7 b 5.9 3 19.1

4 a 4.3 or -2.3 b 5.2 or -6.2 c 3.1

Practice 24b

1 a $-1.5, 3.5$ b $-0.5, 3.5$

2 c i $-1.8, 2.8$ ii $-0.4, 2.4$

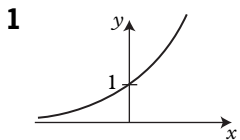
3 a $-0.3, 3.3$ b 0, 2 c $-0.7, 2.7$ d 1

4 a $y = 6$ b $y = -1$ c $y = x + 2$ d $y = x$
e $y = x - 1$

Practice 24c

1 b $x = 2.87$ or -0.87

Practice 24d



2 a $A = Q, B = R, C = P$ b (0, 2) c (0, 1)

Practice 25a

1 a $\frac{1}{12}$ b $\frac{1}{2}$ c $\frac{1}{2}$ d $\frac{1}{6}$

e $\frac{1}{2}$ f 1

2 a $\frac{1}{11}$ b $\frac{2}{11}$ c $\frac{3}{11}$ d $\frac{8}{11}$

3 a $\frac{1}{4}$ b $\frac{1}{8}$ c $\frac{3}{8}$ d $\frac{1}{4}$

4 a 0 b $\frac{2}{9}$ c $\frac{1}{9}$ d 0

5 a $\frac{1}{30}$ b $\frac{1}{5}$ c $\frac{3}{10}$ d $\frac{1}{3}$

e $\frac{1}{6}$ f 0

6 a $\frac{2}{7}$ b Three more fives.

7 $\frac{1}{3}$

8 First bag $\left(\frac{4}{11} > \frac{7}{20}\right)$

Practice 25b

1 0.55 2 a $\frac{1}{4}$ b $\frac{3}{4}$ c $\frac{1}{6}$ d $\frac{5}{6}$

3 $\frac{1}{3}$ 4 a 0.35 b 0.65

5 a 0.4 b 0.3 c 0.7

6 a 45 b 0.45

7 a 0.62 b 180

Practice 25c

1 a 10 b 30

2 a 5 b 10

Practice 25d

1 HH, HT, TH, TT

2 H1, H2, H3, H4, H5, H6, T1, T2, T3, T4, T5, T6

3 a HHH, HHT, HTH, THH, HTT, THT, TTH, TTT

b $\frac{1}{8}$

4 a

Myself	Brother	Myself	Brother
Tea	Tea	Orange	Tea
Tea	Coffee	Orange	Coffee
Tea	Orange	Orange	Orange
Tea	Water	Orange	Water
Coffee	Tea	Water	Tea
Coffee	Coffee	Water	Coffee
Coffee	Orange	Water	Orange
Coffee	Water	Water	Water

$\frac{1}{16}$

5 a

+	4	5	6
1	5	6	7
2	6	7	8
3	7	8	9

b $\frac{2}{9}$

6 a

+	1	2	3	4	5	6
1	2	3	4	5	6	7
2	3	4	5	6	7	8
3	4	5	6	7	8	9
4	5	6	7	8	9	10
5	6	7	8	9	10	11
6	7	8	9	10	11	12

b $\frac{1}{12}$ c $\frac{5}{36}$

7 a

-	1	2	3	4	5	6
1	0	1	2	3	4	5
2	1	0	1	2	3	4
3	2	1	0	1	2	3
4	3	2	1	0	1	2
5	4	3	2	1	0	1
6	5	4	3	2	1	0

b $\frac{1}{6}$ c $\frac{4}{9}$

4 GG $\frac{25}{49}$, GW $\frac{10}{49}$, WG $\frac{10}{49}$, WW $\frac{4}{49}$, same colour $\frac{29}{49}$

5 Not independent, $0.3 \times 0.4 \neq 0.5$

6 a YY $\frac{1}{36}$, YN $\frac{5}{36}$, NY $\frac{5}{36}$, NN $\frac{25}{36}$ b $\frac{5}{18}$

Practice 25e

1 a $\frac{1}{6}$ b $\frac{1}{4}$ c $\frac{1}{24}$ 2 a $\frac{1}{12}$ b $\frac{1}{4}$

3 RR 0.36, RW 0.24, WR 0.24 WW 0.16

Practice 25f

1 a RR $\frac{5}{12}$, RB $\frac{1}{4}$, BR $\frac{1}{4}$, BB $\frac{1}{12}$ b i $\frac{5}{12}$ ii $\frac{1}{2}$

2 a $\frac{1}{36}$ b $\frac{25}{36}$ c $\frac{5}{18}$

3 a FF $\frac{1}{7}$, FC $\frac{2}{7}$, CF $\frac{2}{7}$, CC $\frac{2}{7}$ b $\frac{2}{7}$

4 a RR $\frac{1}{2}$, RW $\frac{1}{10}$, WR $\frac{4}{15}$, WW $\frac{2}{15}$ b $\frac{7}{30}$

5 a $\frac{n(n-1)}{(n+4)(n+5)}$ b 8