

- 11 a) $x \leq 18$ b) $x \leq 5$
 c) $x < 4$ d) $x > 10$
 e) $x \leq 14\frac{1}{2}$ f) $x \geq -2$
 g) $x > 1\frac{7}{10}$
- 12 a) $\frac{1}{4}x + 8 + \frac{1}{2}x + 1 + x = 30$
 which simplifies to $\frac{7x}{4} = 21$
 b) $x = 12$; lengths are 7 cm, 11 cm and 12 cm.
- 13 a) (i) $\pounds(100 - x)$ (ii) $\pounds\frac{2}{3}(100 - x)$
 (iii) $\pounds[x + \frac{2}{3}(100 - x)]$ or $\pounds(\frac{x + 200}{3})$
 b) $\frac{x + 200}{3} \leq 80$
 c) $x \leq 40$; the most she could have paid for the jeans is $\pounds 40$.

5 Percentage increase and decrease

Exercise 5.1 (page 43)

- 1 a) 1.06 b) 1.09
 c) 1.175 d) 1.0125
 e) 1.04 f) 1.18
 g) 1.125 h) 1.056
- 2 a) 0.94 b) 0.91
 c) 0.825 d) 0.9875
 e) 0.96 f) 0.82
 g) 0.875 h) 0.944
- 3 a) $\pounds 420$ b) $\pounds 480$
 c) $\pounds 720$
- 4 a) $\pounds 5040$ b) $\pounds 5904$
 c) $\pounds 8592$
- 5 a) $\pounds 192$ b) $\pounds 140$
 c) $\pounds 60$
- 6 a) $\pounds 699.20$ b) $\pounds 630.80$
 c) $\pounds 281.20$
- 7 $\pounds 168$
 8 1107
 9 $68\,000\text{ m}^2$
 10 105.3 cm
 11 $\pounds 4.28$
 12 $\pounds 789.60$
 13 $\pounds 19.20$
 14 $\pounds 810.75$
 15 $\pounds 4.12$
 16 $\pounds 622.50$
 17 $\pounds 141$
 18 79.2 p (or 79 p)

Exercise 5.2 (page 45)

- 1 $\pounds 53.75$
 2 75 tonnes
 3 40

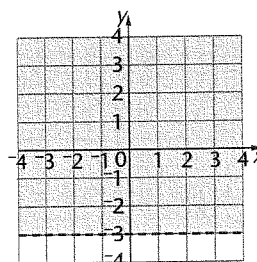
- 4 $\pounds 50$
 5 $\pounds 75.05$
 6 56500
 7 $\pounds 12\,500$
 8 $\pounds 14\,200$
 9 1540
 10 $\pounds 8800$
 11 $\pounds 27\,000$
 12 2.48 million
 13 $\pounds 24\,000$
 14 $\pounds 11\,000$
 15 $\pounds 480$
 16 a) $\pounds 87.87$ b) $\pounds 14.99$
 17 a) 79p b) $\pounds 1.24$

6 Linear inequalities

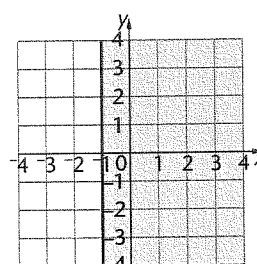
Exercise 6.1 (page 50)

- 1 $x > 2$
 2 $y < -2$
 3 $y < 2x$
 4 $y \geq x + 2$
 5 $3x + 4y > 12$
 6 $y \leq 2x - 4$
 7 $y < 2x + 1$
 8 $2x + 3y \leq 12$

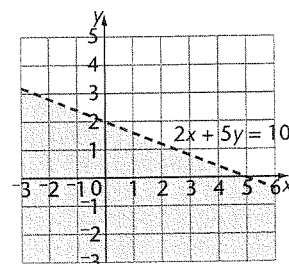
9



10



11



21 a)

	AB (£)	BB (£)
(i)	£5237.50	£5225
(ii)	£5460.09	£5460.13
(iii)	£5692.15	£5705.83

b) She might only want to save for one year or to change to another bank after one year.

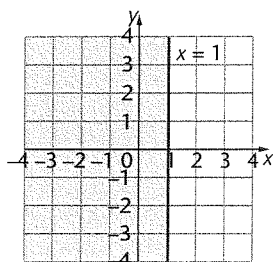
22 5 years

Exercise 8.2 (page 72)

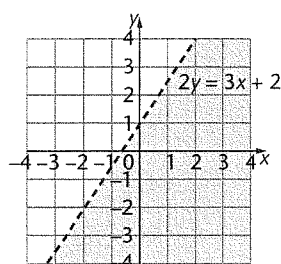
- 1 a) $\frac{6}{5}$ b) $\frac{11}{9}$
- c) $\frac{9}{8}$ d) $\frac{9}{7}$
- e) $\frac{7}{6}$ f) $\frac{12}{11}$
- g) $\frac{8}{5}$ h) $\frac{10}{7}$
- 2 a) $\frac{4}{5}$ b) $\frac{7}{9}$
- c) $\frac{7}{8}$ d) $\frac{5}{7}$
- e) $\frac{5}{6}$ f) $\frac{10}{11}$
- g) $\frac{2}{5}$ h) $\frac{4}{7}$
- 3 a) £696.73 b) £7982.44
- c) £3124.13 d) £39912.49
- 4 a) £168.79 b) £41.99
- c) £874.01 d) £4398.49
- 5 £19.26
- 6 £96
- 7 £18575
- 8 £14.87
- 9 2340 rabbits

Revision exercise B1 (page 74)

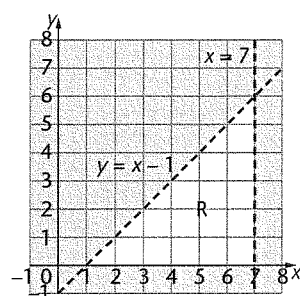
- 1 £17680
- 2 £55.25
- 3 79p
- 4 £520
- 5 a) $y \leq 3$ b) $3x + 4y > 12$
- 6 a)



b)

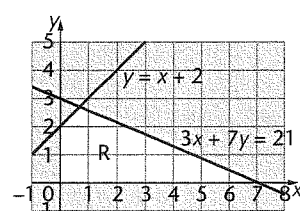


7



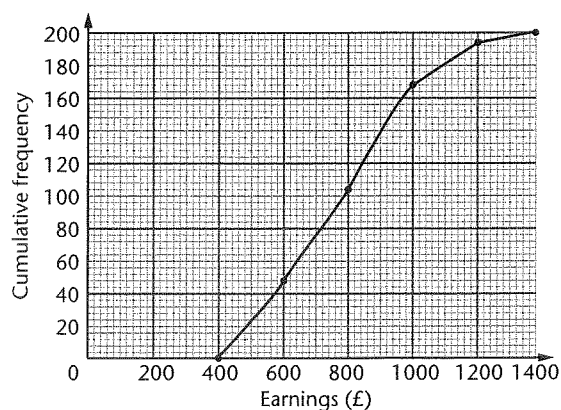
The region required is labelled R.

8



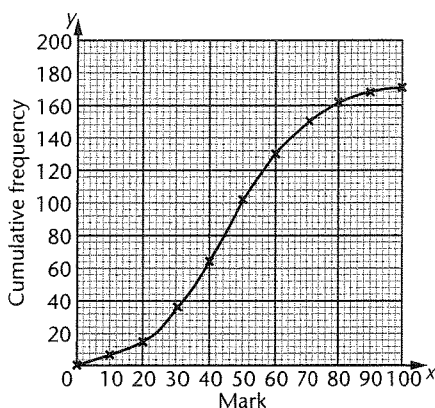
The region required is labelled R.

9 a)



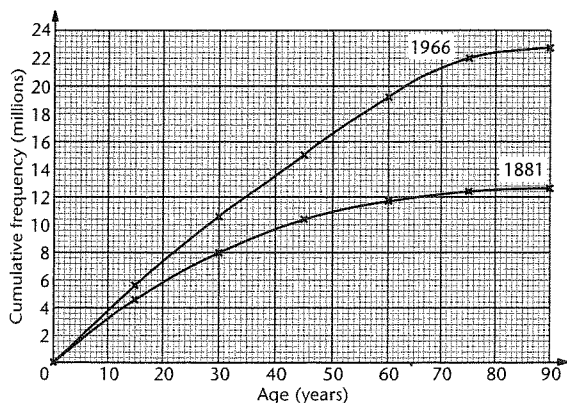
- b) (i) Median is £780
- (ii) Interquartile range is £940 - £600 = £340
- (iii) Number of employees earning more than £900 is 60

10 a)



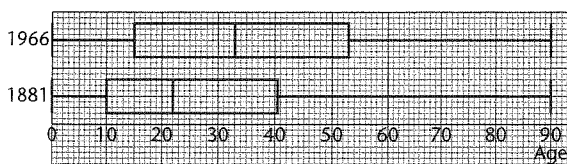
- b) (i) Median is 46
 (ii) Interquartile range is $58 - 32 = 26$
 (iii) $170 - 118 = 52$
 (iv) $60\% = 102$
 102 candidates got more than 42%

11 a)



- b) 1881: median 22, lower quartile 10, upper quartile 40.5
 1966: median 33, lower quartile 15, upper quartile 53

c)



- d) The average age was much higher in 1966 and the ages were more spread out.

12 £540, £777.60

13 1679 bacteria

14 a) £6083.26

b) 9 years

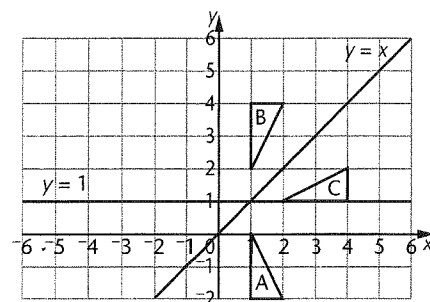
15 331 people

16 576 accidents

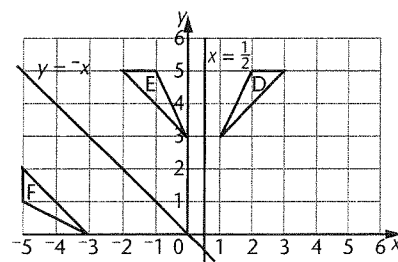
9 Transformations

Exercise 9.1 (page 78)

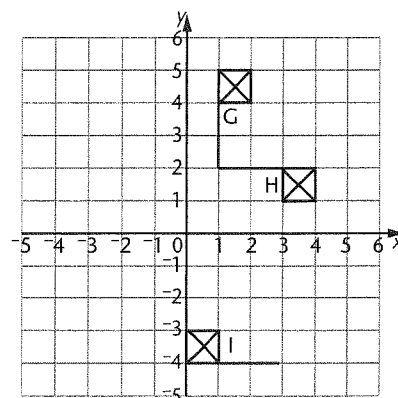
1 a), b)



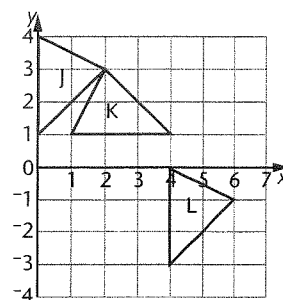
2 a), b)



3 a), b)



4 a), b)



5 Triangles C, F, G are reflections; triangles B, D, E are rotations.

6 a) Rotation through 90° clockwise about (2, 4)

b) Reflection in the line $x = -1$

c) Reflection in the line $y = -x$

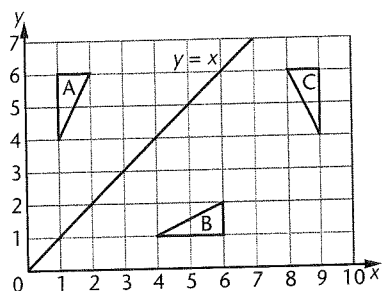
d) Rotation through 180° about (4, 2)

e) Rotation through 90° clockwise about (3, -1)

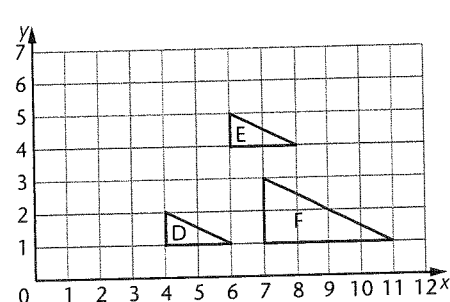
f) Reflection in the line $y = -2\frac{1}{2}$

Revision exercise C1 (page 121)

1 a), b)

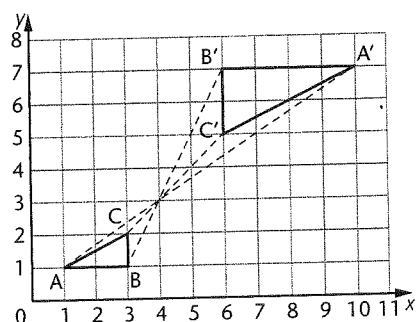
c) Reflection in the line $x = 5$

2 a), b)



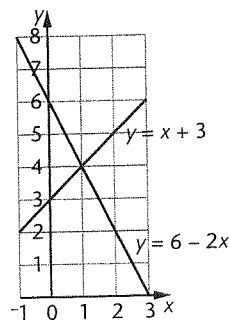
c) Enlargement, scale factor 2, centre (1, 1)

3

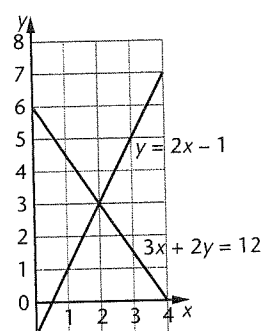
4 a) Translation through $\begin{pmatrix} -6 \\ 0 \end{pmatrix}$ b) Reflection in the line $x = -4.5$ c) Rotation through 90° clockwise about (0, 2)d) Rotation through 90° anticlockwise about (-3, -1)e) Enlargement, scale factor $\frac{1}{2}$, centre (0, 2)f) Reflection in the line $y = -x$

g) Enlargement, scale factor -2, centre (0, 0)

5 a)

 $x = 1, y = 4$

b)

 $x = 2, y = 3$ 6 a) $x = 7, y = 8$ c) $x = 3, y = 1$ e) $x = -1, y = 2$ g) $x = 1, y = 2$ i) $x = \frac{1}{2}, y = -1$

7 a) 79 000

c) 635 100

e) 8 500 000

g) 86 700 000

8 a) 7.6×10^3 c) 6×10^4 e) 5.6×10^{-2} g) 5.5×10^{-3} i) 4.2×10^{-5}

9 a) 6000

c) 0.007

e) 0.0084

g) 4700

i) 7 230 000

10 a) 6×10^8 c) 4×10^3 e) 1.2×10^{10} g) 6.3×10^4 i) 3.6×10^{-3} 11 a) 8.96×10^7 c) 3.17×10^3 e) 5.96×10^{10} g) 6.65×10^4 i) 3.90×10^{-4}

12 a) 2.5

c) 0

b) $x = 2, y = 3$ d) $x = 5, y = 2$ f) $x = -2, y = 3$ h) $x = \frac{1}{2}, y = 2\frac{1}{2}$

b) 0.000 538

d) 0.0704

f) 0.0050

h) 0.0010

b) 8.99×10 d) 4.66×10^2 f) 5.646×10^5 h) 6.74×10^4 j) 2.4×10^7

b) 500

d) 450

f) 0.002 87

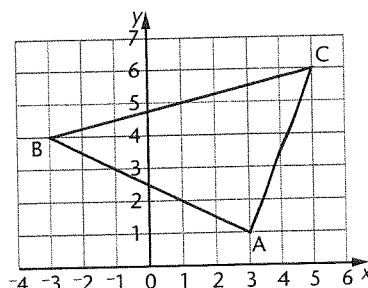
h) 0.055

j) 0.000 054 8

b) 6×10^5 d) 3×10^7 f) 5×10^3 h) 7.7×10^5 b) 7.82×10^4 d) 7.97×10^6 f) 5.21×10^3 h) 7.85×10^5

b) -1

13

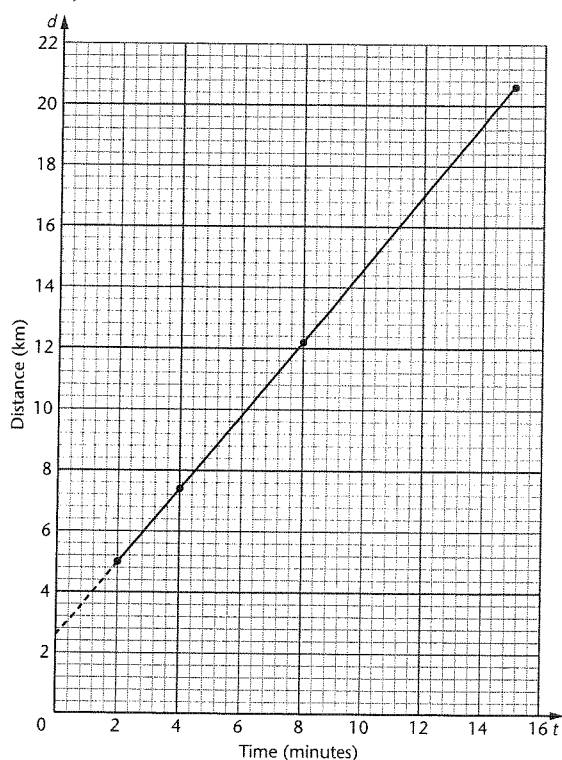


Gradient of AB = -0.5

Gradient of BC = 0.25

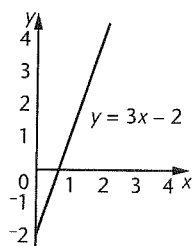
Gradient of AC = 2.5

14 a)

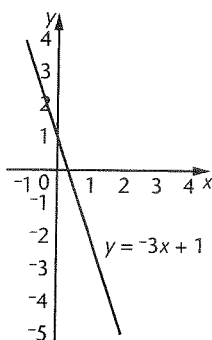


- b) 1.2 (km/minute)
c) 2.6 km

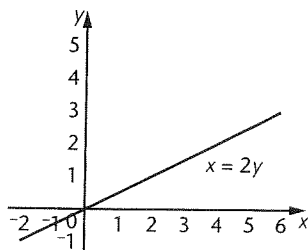
15 a)



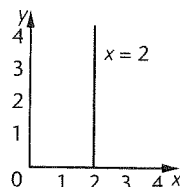
b)



c)



d)



16 Check students' answers.

Lines should be of the form given below.

- a) $y = 3x + k$
b) $y = -3x + k$
c) $x = 2y + k$ or $y = \frac{1}{2}x + k$
d) $x = k$

13 Similar figures

Exercise 13.1 (page 127)

- 1 8 cm
- 2 8 cm
- 3 $PQ = 4.2$ cm, $PR = 5.88$ cm
- 4 $PQ = 3.5$ cm, $QR = 6.02$ cm
- 5 $UV = 3.4$ cm, $UW = 4.4$ cm
- 6 3 cm
- 7 42 m
- 8 $x = 2.7$ cm, $y = 3$ cm
- 9 42 m
- 10 a) Angle BAC = angle CDE (alternate angles)
Angle ACB = angle DCE (vertically opposite angles)
Angle ABC = angle CED (alternate angles)
Corresponding angles are equal so triangle ABC is similar to triangle CDE.
b) $AC = 13.5$ cm, $BC = 27$ cm
- 11 Angles are equal but the sides not proportional. (AR is smaller than AE but AB is the same in both.)
- 12 Sides are proportional but the angles not equal.
- 13 a) Angle A is common
Angle APQ = angle ABC (corresponding angles)
Angle AQP = angle ACB (corresponding angles)
(One of these can be substituted by 'angle sum of triangle'.)
b) 6.27 cm
- 14 a) Angle ADC = angle BAC (right angles)
Angle DAB = angle DCA = 90° - angle DAC
Angle DBA = angle DAC (angle sum of triangle)
b) 1.8 cm

- 5 a) None b) Length
 c) Area d) Volume
 e) None f) Length
 6 a) Nonsense b) Area
 c) Nonsense d) Volume
 e) Nonsense f) Area
 g) Volume h) Volume
 i) Length
 7 a) Cube (3) b) Square (2)
 c) Square (2)

Revision exercise D1 (page 159)

- 1 2.4 cm
 2 No: $\frac{6}{8} = 0.75$; $\frac{3}{5} = 0.6$ or $\frac{8}{5} = 1.6$; $\frac{6}{3} = 2$
 3 a) Angle BAC = 85° ; Angle QRP = 40° ;
 corresponding angles are equal so the
 triangles are similar.
 b) 1.7
 4 PR = 6.64 cm, QR = 6.24 cm
 5 David takes longer but his times are more
 consistent.
 6 10F median 15, range 21; 10G median 11,
 range 28; 10G students do the problem more
 quickly on average but with a wider spread
 of times. The interquartile range would
 eliminate extremes.
 7 French adults drink more wine than English
 adults. Spread of amounts is similar but
 slightly wider in England.
 8 Mean £161 400, range a maximum of £160 000.
 House prices are higher in the Southeast, with
 a wider spread of prices.
 9 a) 35.1° b) 61.0°
 c) 59.7° d) 8.43 cm
 e) 7.55 cm f) 19.43 cm
 10 43.5 m
 11 45.6° , 45.6° , 88.9° (to 3 s.f.)
 12 4.6 m
 13 a) West 4.83 km, North 1.29 km
 b) 131.6° , 6.46 km
 14 a) Area b) Length
 c) Volume
 15 a) 2 (square) b) 2 (square)
 c) 3 (cube)

17 Quadratics

Exercise 17.1 (page 164)

- 1 $a^2 + 6a + 8$ 2 $a^2 + 6a + 5$
 3 $x^2 + 7x + 6$ 4 $x^2 + 11x + 18$
 5 $a^2 + 10a + 21$ 6 $a^2 + 13a + 30$
 7 $y^2 - 2y - 15$ 8 $x^2 - 3x - 28$

- 9 $a^2 - 4a - 12$ 10 $p^2 + 3p - 18$
 11 $a^2 - 3a + 2$ 12 $a^2 - 2a - 15$
 13 $x^2 + x - 6$ 14 $y^2 - y - 20$
 15 $x^2 - 10x + 16$ 16 $a^2 - 11a + 18$
 17 $y^2 + 10y + 25$ 18 $x^2 + 9x - 22$
 19 $x^2 - 2x + 1$ 20 $x^2 - 6x + 9$
 21 $y^2 + 4y + 4$ 22 $y^2 - 4y + 4$
 23 $a^2 - 12a + 36$ 24 $a^2 + 12a + 36$
 25 $a^2 + 16a + 64$ 26 $x^2 - 9$
 27 $x^2 - 25$ 28 $a^2 - 64$
 29 $a^2 - 81$ 30 $a^2 + 40a + 400$
 31 $y^2 - 1$ 32 $a^2 - 36$
 33 $(x + 5)(x + 3)$, $x^2 + 8x + 15$

Exercise 17.2 (page 168)

- 1 $(x + 3)(x + 2)$ 2 $(x + 5)(x + 2)$
 3 $(x + 5)(x + 1)$ 4 $(x + 3)(x + 1)$
 5 $(x + 4)(x + 2)$ 6 $(x + 5)(x + 3)$
 7 $(x + 4)(x + 1)$ 8 $(x + 5)(x + 4)$
 9 $(x + 1)(x + 1)$ 10 $(x + 6)(x + 1)$
 11 $(x - 6)(x - 1)$ 12 $(x - 6)(x - 3)$
 13 $(x - 2)(x - 5)$ 14 $(x - 3)(x - 4)$
 15 $(x - 3)(x - 1)$ 16 $(a - 1)(a - 1)$
 17 $(y - 7)(y - 2)$ 18 $(b - 6)(b - 4)$
 19 $(x - 4)(x - 2)$ 20 $(c - 3)(c - 1)$
 21 $(a + 6)(a + 2)$ 22 $(a + 12)(a + 3)$
 23 $(a - 3)(a - 3)$ 24 $(x - 9)(x - 3)$
 25 $(b - 8)(b - 4)$ 26 $(b - 5)(b - 5)$
 27 $(x + 3)(x + 8)$ 28 $(x + 12)(x + 2)$
 29 $(x - 5)(x - 4)$ 30 $(x - 7)(x - 8)$

Exercise 17.3 (page 169)

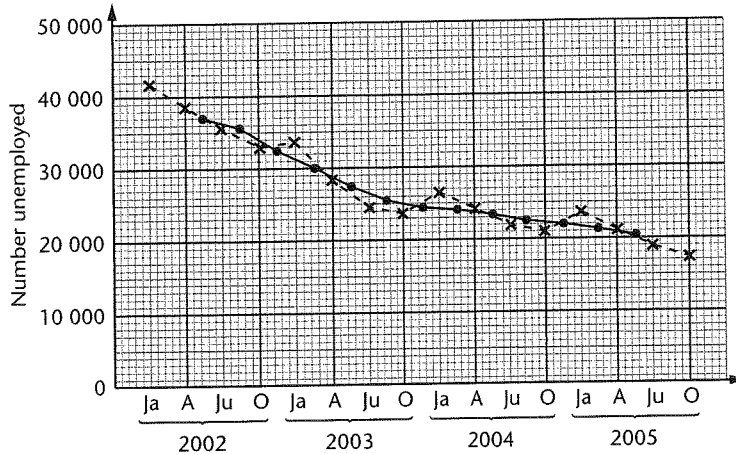
- 1 $(x - 4)(x + 2)$ 2 $(x + 3)(x - 1)$
 3 $(x - 1)(x + 5)$ 4 $(x + 5)(x - 2)$
 5 $(x + 2)(x - 3)$ 6 $(x - 4)(x + 3)$
 7 $(x + 6)(x - 1)$ 8 $(x + 7)(x - 2)$
 9 $(x + 3)(x - 1)$ 10 $(x - 5)(x + 3)$
 11 $(x - 6)(x + 3)$ 12 $(x - 7)(x + 4)$
 13 $(x - 10)(x + 1)$ 14 $(x - 2)(x - 15)$
 15 $(x + 7)(x + 2)$ 16 $(x - 4)(x + 8)$
 17 $(y + 11)(y - 2)$ 18 $(a + 12)(a - 3)$
 19 $(x + 4)(x - 3)$ 20 $(x + 5)(x - 4)$
 21 $(a - 2)(a + 10)$ 22 $(y + 3)(y + 16)$
 23 $(a - 9)(a + 3)$ 24 $(a - 8)(a + 2)$
 25 $(b + 2)(b + 10)$ 26 $(b - 12)(b - 3)$
 27 $(x + 13)(x - 2)$ 28 $(x + 10)(x - 3)$
 29 $(x - 3)(x - 6)$ 30 $(x - 8)(x + 5)$

Exercise 17.4 (page 170)

- 1 $(x + 2)(x - 2)$ 2 $(x + 1)(x - 1)$
 3 $(x + 5)(x - 5)$ 4 $(x + 6)(x - 6)$
 5 $(x + 7)(x - 7)$ 6 $(x + 9)(x - 9)$
 7 $(y + 10)(y - 10)$ 8 $(m + 12)(m - 12)$
 9 $(y + 20)(y - 20)$ 10 $(a + 13)(a - 13)$
 11 $(y + 11)(y - 11)$ 12 $(b + 15)(b - 15)$
 13 $(a + 17)(a - 17)$ 14 $(p + q)(p - q)$

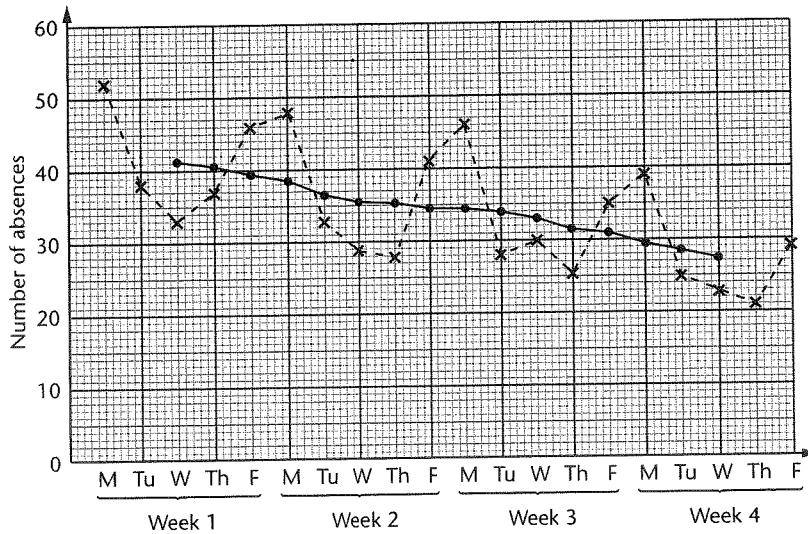
Revision exercise E1 (page 191)

- 1 a) $x^2 + 12x + 27$ b) $y^2 + y - 42$ c) $a^2 - 16a + 64$ d) $b^2 - 12b + 20$
e) $p^2 + 7p - 30$ f) $a^2 - 81$ g) $a^2 + 18a + 81$ h) $x^2 - 21x + 20$
- 2 a) $(x + 4)(x + 1)$ b) $(x - 2)(x - 4)$ c) $(x - 8)(x - 2)$ d) $(x + 5)(x + 3)$
e) $(x - 7)(x + 1)$ f) $(x + 2)(x - 5)$ g) $(x - 6)(x - 2)$ h) $(x - 5)(x + 3)$
i) $(x - 10)(x + 7)$ j) $(x + 12)(x + 4)$ k) $(x - 9)(x + 2)$ l) $(x + 10)(x - 2)$
- 3 a) $(a + 8)(a - 8)$ b) $(x + 3)(x - 3)$ c) $(p + 10)(p - 10)$ d) $(x + 14)(x - 14)$
- 4 a), c)



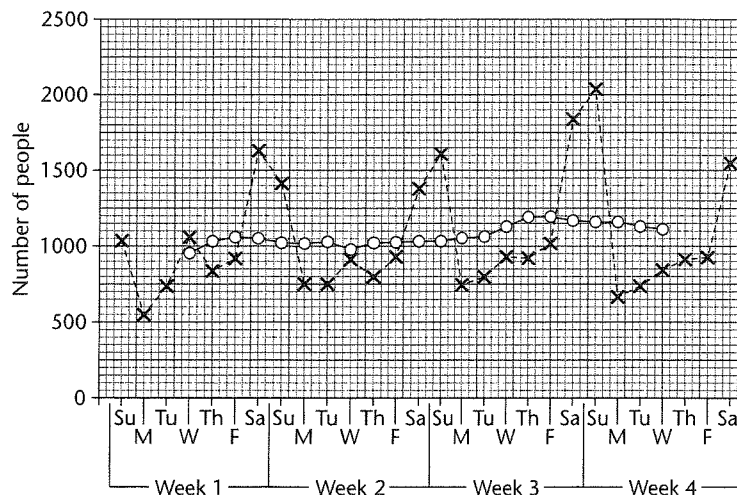
- b) Moving averages 37 175, 35 200, 32 750, 30 000, 27 600, 25 800, 24 675, 24 075, 23 475, 22 775, 22 000, 21 175, 20 325
- d) General trend downwards; quarter up to January always highest, then steadily lower

5 a), c)



- b) Moving averages 41.2, 40.4, 39.4, 38.6, 36.8, 35.8, 35.4, 34.4, 34.6, 34, 32.8, 31.4, 30.8, 29.4, 28.6, 27.4
- d) General trend downwards; Mondays always highest, followed by Friday

6 a)



b) 964, 1017, 1045, 1048, 1022, 1017, 1020, 988, 1016, 1019, 1027, 1030, 1050, 1063, 1129, 1192, 1183, 1172, 1163, 1158, 1146, 1100

c) The trend is fairly steady, with just a slight increase. The weekend numbers (Saturday and Sunday) are always higher than the weekday numbers (Monday to Friday).

7 a) $x = 2$ or 4

b) $x = -2$ or -3

c) $x = 3$ or -1

d) $x = 5$ or -2

e) $x = 4$ or 1

f) $x = -5$ or -2

g) $x = 7$ or -2

h) $x = -15$ or -2

i) $x = 5$ or 4

j) $x = -3$ or -1

k) $x = 12$ or -3

l) $x = -9$ or 2

8 a) $x = 0$ or -8

b) $x = 0$ or 5

c) $x = \pm 8$

d) $x = \pm 10$

e) $x = 0$ or 10

f) $x = 5$ or -1

g) $x = -4$ or 2

h) $x = 9$ or -1

9 a) $a = \sqrt{x - by}$

b) $y = \frac{x}{1 - a}$

c) $b = \frac{cd}{a - x}$

d) $b = \frac{ac - cd}{a + d}$

e) $b = \sqrt[3]{A - 3c^2d}$

f) $a = \frac{2A}{2b + \pi}$

g) $x = \frac{4y + 15}{3 + 3y}$

h) $r = \sqrt{\frac{V}{\pi h}}$

i) $y = \frac{-x}{8a + 3}$

j) $s = \sqrt{\frac{3t - P}{5}}$

k) $u = \frac{fv}{v - f}$

10 a) 1070 cm^3

b) $r = \sqrt[3]{\frac{3V}{2\pi}}$

c) 13.4 cm