1 Number: Number skills and properties

1.1 Solving real-life problems

HOMEWORK 1A

1 25 × 12 = 300 + 60 (20%) = 360. He buys 384 tiles, so he has enough.

2 No. £30 ÷ 85p = 35.29, so she can buy 35 packets of balloons, which is only 875.

3 Yes, the shop covers its costs, as 10% is £11, so £110 + £11 = £121 per TV.
Rental is £3.50 × 40 weeks = £140 (£140 – £110 = £30 profit per TV)

4 27

5 £728

6 No. 860 ÷ 15 = 57.333... weeks, which is more than one year
Or: £860 ÷ 52 = £16.54 per week to save enough for one year
Or: £15 × 52 weeks = £780 saved in a year; £860 – £780 = £80 short ÷ £15 = 5.333... more weeks to save

7 £2664

8 Mutya earns £60 each week. Neil earns £210 each week. Mutya will need to work for four weeks to earn over £210.

9 No, Mary is €30 short. She has enough money for only three presents.
£504 ÷ 36 = £14 per person per ticket. Mary has £150 – £14 = £136.
£136 × €1.25 = €170

10 1536

11 23

12 **a** £1000 **b** £912

13 **a** 28 m² **b** £10.71

14 28

15 Comparing over one year, 52 ×38 = 1976; 12 × 150 =1800
So stock is decreasing

1.2 Multiplication and division with decimals

HOMEWORK 1B

1 **a** 0.25 **b** 7.56 **c** 5.04
d 1.68 **e** 3.9

2 **a** **i** 8 **ii** 8.88, 0.88
b **i** 15 **ii** 14.88, 0.12
c **i** 20 **ii** 21.42, 1.42
d **i** 21 **ii** 16.25, 4.75

3 **a** 240
b **i** 2.4 **ii** 2.4 **iii** 7.2

4 **a** 24.48 **b** Subtract 3.4 (answer 21.08)

5 **a** 17.25 **b** 48

6 **a** 43.68 **b** 78.6 **c** 29.92
d 188.25 **e** 867.2

7 **a** £22.08 **b** £5.76 **c** £31.50

8 20

9 **a** 16

b **i** 160 **ii** 0.16 **iii** 0.16

10 19.74 ÷ 2.1 (Answer 9.4. This is approximately 20 ÷ 2 = 10)

1.3 Approximation of calculations

HOMEWORK 1C

1 **a** 50 000 **b** 60 000 **c** 30 000
d 90 000 **e** 90 000 **f** 50
g 90 **h** 30 **i** 100
j 200 **k** 0.5 **l** 0.3
m 0.006 **n** 0.05 **o** 0.0009
p 10 **q** 90 **r** 90
s 200 **t** 1000

2 Hellaby: 850 to 949
Hook: 645 to 654
Hundleton: 1045 to 1054

3 **a** 6700 **b** 36 000 **c** 69 000
d 42 000 **e** 27 000 **f** 7000
g 2200 **h** 960 **i** 440
j 330

4 **a** 50 000 **b** 6200 **c** 89.7
d 220 **e** 8 **f** 1.1
g 730 **h** 6000 **i** 67
j 6 **k** 8 **l** 9.75
m 26 **n** 30 **o** 870
p 40 **q** 0.085 **r** 0.0099
s 0.08 **t** 0.0620

5 95 or 96

6 650 –549 = 101

7 63

HOMEWORK 1D

1 **a** 30 000 **b** 24 **c** 8
d 900 **e** 125 **f** 0.42
g 60 000 **h** 5600

2 **a** 200 **b** 40 **c** 800
d 40 000 **e** 15 000 **f** 2000
g 150 **h** 52 500

3 **a** 37 800 **b** 180

4 20 × 80 000 = 1 600 000; 6000 × 300 = 1 800 000;
500 × 7000 = 3 500 000; 10 000 × 900 = 9 000 000

5 100 000 km ($\frac{400000}{8}$ × 2; i.e. to and from Earth)

HOMEWORK 1E

1 **a** 28 000 **b** 42 000 **c** 210
d 20 000 **e** 2000 **f** 2100
g 5 **h** 9 **i** 700
j 75 **k** 50 **l** 8

2 **a** £4000 **b** £2000 **c** £1500

3 **a** £30 000 **b** £36 000

4 £1400

5 Yes. £50 ÷ 250 = 20p per apple; he pays only £47 ÷ 250 = 18.8p per apple

6 **a** 105 km **b** 450 km **c** 5000 km

7 6 litres

8 £10 (£20 ÷ 2)

HOMEWORK 1F

1 **a** 1.62 m **b** 20 minutes **c** 3 kg
d 1.2 °C **e** 24 000

2 25 jars

3 65 minutes to 2 sf

4 £140 a day (45 weeks × 5 days a week = 225 days; £31 500 ÷ 225 = £140)

5 £217

6 I left home at 10 minutes past 2, and walked for 50 minutes.
The temperature was 13 °C. I could see an aeroplane overhead at 3000 feet.
Altogether I had walked three miles.

7 70 mph

1.4 Multiples, factors, prime numbers, powers and roots

HOMEWORK 1G

1 **a** 28, 36, 64, 56, 60
b 60, 15, 45
c 19, 43, 53, 29, 61
d 36, 60, 15, 45

2 3

3 **a** –6 **b** –9 **c** –10
d –30 **e** –19 **f** –13
g –15 **h** –1000 **l** –21
j –35

4 **a** 2 **b** 4 **c** 5
d 10 **e** 30 **f** –3
g –1 **h** –6 **l** –20
j –7

5

	Square number	Factor of 40
Cube number	64	8
Multiple of 5	25	20

6 2197 (13^3)

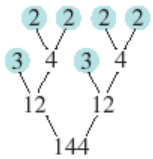
7 18

8 **a** ±0.6 **b** ±0.9 **c** ±1.3
d ±0.3 **e** ±0.1 **f** ±1.2
g ±1.5 **h** ±1.4 **i** ±2.1
j ±3.5

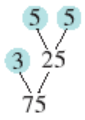
1.5 Prime factors, LCM and HCF

HOMEWORK 1H

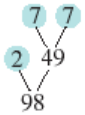
1 **a**



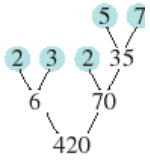
b



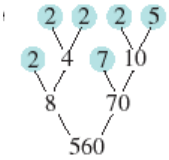
c



d



e



2 **a** $2^4 \times 3$ **b** 2×3^3 **c** $2^3 \times 3^3$
d $2^3 \times 5^3$ **e** $3^3 \times 5^2$

3 **a** $2 \times 2 \times 3 \times 3$ **b** $2^2 \times 3^2$
c $18 = 2 \times 3^3$ and $72 = 2^3 \times 3^3$

4 **a** $7^2 \times 17^2$ **b** $7^3 \times 17^3$ **c** $7^{10} \times 17^{10}$

5 £3, £6, £9 or £6, £6, £6

6 The number 7 is the third odd prime number and is therefore a factor of 105.

HOMEWORK 1I

1 **a** 35 **b** 24 **c** 18
d 60 **e** 30 **f** 48
g 48 **h** 105

2 **a** 7 **b** 9 **c** 5
d 5 **e** 12 **f** 36
g 18 **h** 33

3 **a** x^5 **b** x^9 **c** x^7
d x^{10} **e** x^9

4 1355

5 1296
6 Three packs of nuts and two packs of bolts
7 10 and 15

7.3 Negative numbers

HOMEWORK 1J

1 **a** –68
b 68°
c 6 × 4

2 **a** –8 **b** –18 **c** –35
d 12 **e** 16 **f** 7
g 4 **h** –5 **i** 2
j 2 **k** –21 **l** –18
m –28 **n** 27 **o** 14
p –7 **q** –4 **r** –5
s 5 **t** –25 **u** 24
v –7 **w** –63 **x** 6
y –56

3 **a** 2 **b** 3 **c** 2
d –7 **e** –10 **f** –12
g –12 **h** 30 **i** –8
j –4 **k** –4 **l** 3
m 3 **n** –12 **o** –9
p 32 **q** 15 **r** –48
s –12 **t** 52 **u** –11
v 48 **w** –2 **x** –20
y 1

4 **a** –5 **b** 6 **c** –10
d 20 **e** –15

5 –18 ÷ 12; 0.3 × (–2); –21 ÷ (–14); –0.5 × (–4)

HOMEWORK 1K

1 **a** –12 **b** –8 **c** 6
d 36 **e** 15 **f** 6
g 12 **h** –9

2 **a** 23 **b** –4 **c** –1
d –4 **e** –17 **f** 10
g –2 **h** –7

3 **a** $4x$ (– 3 + 2) = –4 **b** (–6 ÷ (–3)) + 2 = 4 **c** –6 ÷ (–3 + 2) = 6

4 **a** 4 **b** –49 **c** –8
d 50

5 **a** 159 **b** 2 **c** – 39
d 9

6 For example: –4 × 6 ÷ 8 = –3

7 For example: (1 + 2) × (3 – 6) = –9

8 (1 + 2) × (3 ÷ 4) – 5 = 2.75

Functional Maths Activity

Flooring specialist

1 Examples of costing tables are shown below.

Flooring type	Material required	Material cost (£)	Labour cost (£)	Job cost (£)	Job cost per m^2 (£)
Carpet tiles	10 packs	18.90	83.48	102.38	4.29
Plain carpet	9 m	12.51	95.40	107.91	4.52
Luxury carpet	9 m	26.91	95.40	122.31	5.13
Wood (beech)	14 packs	214.20	202.73	416.93	17.48
Wood (oak)	14 packs	315.00	202.73	517.73	21.71
Ceramic tiles	41 packs	143.09	155.03	298.12	12.50

Flooring type	Waste m^2	Waste cost (£)	Fraction of material cost wasted, %
Carpet tiles	1.15	0.87	4.6
Plain carpet	12.15	4.22	33.7
Luxury carpet	12.15	9.08	33.7
Wood (beech)	3.66	31.11	14.5
Wood (oak)	3.66	45.75	14.5
Ceramic tiles	0.75	4.36	3.0

2 She can afford to lay a luxury carpet.

3 Answers may vary, but further properties that students could consider are comfort, appearance, warmth, and so on.

4 Student's answers will vary and will depend on the properties being sought.

2 Number: Fractions and percentages

2.1 One quantity as a fraction of another

HOMEWORK 2A

1 **a** $\frac{1}{4}$ **b** $\frac{1}{3}$ **c** $\frac{1}{2}$

d $\frac{7}{15}$ **e** $\frac{3}{7}$ **f** $\frac{1}{6}$

2 $\frac{3}{8}$

3 $\frac{8}{13}$

4 Mark saves $\frac{40}{120} = \frac{1}{3}$

Bev saves $\frac{60}{150} = \frac{2}{5}$ which is greater than $\frac{1}{3}$, so Bev saves the greater proportion of his earnings

5 $\frac{7}{10} = \frac{14}{20}$, so Sally's mark is better

6 $\frac{1}{5}$

7 34 to 37

2.2 Adding and subtracting fractions

HOMEWORK 2B

1 **a** $\frac{7}{10}$ **b** $\frac{5}{6}$ **c** $\frac{13}{30}$

d $\frac{17}{24}$ **e** $\frac{19}{20}$ **f** $\frac{11}{15}$

g $\frac{39}{40}$ **h** $\frac{9}{10}$

2 **a** $\frac{3}{4}$ **b** $\frac{1}{2}$ **c** $\frac{7}{10}$

d $\frac{7}{8}$

3 **a** $\frac{1}{8}$ **b** $\frac{3}{10}$ **c** $\frac{7}{15}$

d $\frac{7}{20}$

4 **a** $1\frac{3}{8}$ **b** $1\frac{1}{10}$ **c** $1\frac{1}{12}$

d $1\frac{5}{12}$

5 **a** $\frac{1}{12}$ **b** 36

6 $\frac{1}{10}$

7 13 125

8 97

9 $\frac{5}{12} + \frac{1}{4} + \frac{1}{3} = \frac{5}{12} + \frac{3}{12} + \frac{4}{12} = \frac{12}{12} = 1$

10 To make a 2-m pipe, use two $\frac{3}{4}$-m pipes and one $\frac{1}{2}$-m pipe

2.3 Multiplying fractions

HOMEWORK 2C

1 **a** $\frac{1}{3}$ **b** $\frac{3}{10}$ **c** $\frac{3}{10}$

d $\frac{2}{7}$ **e** $\frac{5}{9}$ **f** $\frac{1}{5}$

g $\frac{7}{15}$ **h** $\frac{3}{20}$ **i** $\frac{1}{6}$

j $\frac{7}{20}$

2 $2\frac{1}{4}$ km

3 $\frac{2}{5}$

4 $\frac{1}{20}$ metre

5 $\frac{1}{16}$

6 $\frac{1}{3}$

7 **a** 3 **b** $2\frac{1}{3}$ **c** 2

d $2\frac{1}{6}$ **e** $5\frac{1}{5}$ **f** $4\frac{2}{3}$

g $4\frac{1}{12}$ **h** 12

8 $\frac{2}{3}$ of $4\frac{2}{5} = 2\frac{14}{15}$

9 Yes: 66 litres

10 $\frac{1}{24}$

11 The first statement is inaccurate as two-thirds is not an exact number (of people).

12 400

2.4 Dividing by a fraction

HOMEWORK 2D

1 **a** $\frac{3}{5}$ **b** $1\frac{3}{5}$ **c** $1\frac{1}{5}$

d $\frac{9}{14}$ **e** $2\frac{2}{3}$ **f** $1\frac{4}{11}$

g $4\frac{4}{7}$ **h** $4\frac{4}{5}$ **i** $4\frac{1}{8}$

j $2\frac{13}{16}$ **k** $1\frac{1}{4}$ **l** $\frac{64}{75}$

2 48

3 15

4 80

5 $\frac{2}{15}$

6 4

7 23

8 **a** $\frac{3}{20}$ **b** $\frac{7}{16}$ **c** $\frac{1}{2}$

d 1 **e** $\frac{25}{33}$ **f** 1

2.5 Increasing and decreasing quantities by a percentage

HOMEWORK 2E

1 **a** £84 **b** 14.84 kg **c** £43.26

2 **a** 374 g **b** 67.2 m **c** £49.20

3 £35 568

4 15 336

5 907

6 £15

7 $\frac{6}{40} \times 100 = 15$

8 Items that costs £20 or less

HOMEWORK 2F

1 **a** £18 **b** £120 **c** 63 kg

d 440 m **e** £247 **f** 60 cm

g 232 g **h** £327.25 **i** 12 kg

j £39.69

2 £6384

3 2112

4 £459

5 No, he is £1.60 short. (£24 + £104 + £33.60 = £161.60)

6 Seven absentees

7 680 units

8 Goods are cheaper, for example, £100 + 10% = £100 + £10 = £111
£111 – 10% = £111 – £11.10 = £99.90

9 Students should show all workings for proof.

2.6 Expressing one quantity as a percentage of another

HOMEWORK 2G

1 **a** 20% **b** 25% **c** 10%

d 75% **e** 80% **f** 46%

g 33.3% **h** 30% **i** 67.5%

j 23.8%

2 **a** 75% **b** 37.5%

3 **a** 60% **b** 40%

4 29.3%

5 Micro hi-fi system: 66.7%
CD radio cassette: 50.0%
MiniDisc player: 50.0%
Cordless headphones: 66.6%

6 Paul 33.3% ($\frac{10}{30} \times 100$), Val 39.2% ($\frac{11}{28} \times 100$)
Val has the greater percentage increase.

7 60
8 1000
9 Maths 84%, English 70%, Science 62.5%, French 45%
10 22%

2.7 Compound interest and repeated percentage change

HOMEWORK 2H

1 **a** 5.5 cm **b** 6.05 cm **c** 7.32 cm
d 9.74 cm
2 **a** £32 413.50 **b** 7 years
3 **a** £291.60 **b** £314.93 **c** £367.33
4 **a** 1725 **b** 1984 **c** 2624
5 After 11 years, the sycamore is 93.26 cm tall and the conifer is 93.05 cm tall.
After 12 years, the sycamore is 100.73 cm tall and the conifer is 107 cm tall.
6 Two years
7 Four weeks

2.6 Reverse percentage (working out the original quantity)

HOMEWORK 2I

1 **a** 800 g **b** 96 m **c** 840 cm
2 **a** 70 kg **b** £180 **c** 40 hours
3 Jumper £12, Socks £1.60, Trousers £20
4 £15
5 £180
6 **a** £22 454 **b** 6.8%
7 100% (still twice as many)
8 £1800

Functional Maths Activity

Value Added Tax

Task 1

VAT table								
Rate	**£1**	**£10**	**£100**	**£500**	**£1000**	**£2000**	**£5000**	**£10 000**
5%	5p	50p	£5	£25	£50	£100	£250	£500
8%	8p	80p	£8	£40	£80	£160	£400	£800
15%	15p	£1.50	£15	£75	£150	£300	£750	£1500
17.5%	18p (17.5p)	£1.75	£17.50	£87.50	£175	£350	£875	£1750
20%	20p	£2	£20	£100	£200	£400	£1000	£2000

Total cost table								
Rate	**£1**	**£10**	**£100**	**£500**	**£1000**	**£2000**	**£5000**	**£10 000**
5%	£1.05	£10.50	£105	£525	£1050	£2100	£5250	£10 500
8%	£1.08	£10.80	£108	£540	£1080	£2160	£5400	£10 800
15%	£1.15	£11.50	£115	£575	£1150	£2300	£5750	£11 500
17.5%	£1.18 (17.5p)	£11.75	£117.50	£587.50	£1175	£2350	£5875	£11 750
20%	£1.20	£12	£120	£600	£1200	£2400	£6000	£12 000

Task 2

Toy: £19.98 Shirt: £9.40

Television: £528.75 iPod or similar: £124.55

Task 3

Doll: £9.79 (£1.71 VAT) Dress: £16.64 (£2.91 VAT)

Sound system: £187.91 (£32.89 VAT) Jacket: £62.64 (£10.96 VAT)

3 Number: Ratios and proportion

3.1 Ratio

HOMEWORK 3A

1 **a** 1 : 3 **b** 1 : 5 **c** 1 : 6
d 1 : 3 **e** 2 : 3 **f** 3 : 5
g 5 : 8 **h** 15 : 2 **i** 2 : 5
j 5 : 2

2 **a** 1 : 4 **b** 3 : 4 **c** 1 : 8
d 2 : 5 **e** 2 : 5 **f** 8 : 15
g 10 : 3 **h** 1 : 3 **i** 3 : 8
j 1 : 5

3 **a** $\frac{1}{4}$ **b** $\frac{3}{4}$

4 **a** $\frac{2}{5}$ **b** $\frac{3}{5}$

5 **a** $\frac{1}{10}$ **b** $\frac{9}{10}$

6 2 :1

7 $\frac{1}{16}$

8 3 : 7

HOMEWORK 3B

1 **a** £2 : £8 **b** £4 : £8
c £10 : £30 **d** 10 g : 50 g
e 1 h : 9 h

2 **a** 300 **b** 100

3 2 m and 18 m

4 **a** 10 kg : 15 kg **b** 18 days : 12 days
c 30 m : 40 m **d** £1.50 : £3.50
e 15 h : 9 h

5 400

6 45

7 £6

8 £30 and £36

9 **a** 1 : 1.5 **b** 1 : 2.5 **c** 1 : 1.25
d 1 : 1.6 **e** 1 : 2.1

10 $\frac{1}{30}$

11 £8

12 £324

13 **Note:** this question will be omitted in the reprints.

HOMEWORK 3C

1 20
2 80
3 **a** 15 litres **b** 25 litres
4 **a** 80 kg **b** 5 kg
5 90
6 **a** 200 g **b** 320 g
7 **a** £4000 **b** £6000
8 Fred's, at 4 : 1; Jodie's is only 3.5 : 1
9 2
10 17

3.2 Speed, time and distance

HOMEWORK 3D

1 15 mph
2 180 miles
3 46 mph
4 2 pm
5 **a** 30 mph **b** 50 km/h **c** 20 miles
d 50 km **e** $3\frac{1}{4}$ hours **f** 3 hours 36 minutes
6 **a** 130 km **b** 52 km/h
7 **a** 30 minutes **b** 12 mph
8 **a** 1.25 hour **b** 45 miles
9 24 mph
10 40 mph
11 30 minutes

3.3 Direct proportion problems

HOMEWORK 3E

1 £8
2 £2.16
3 £49.60
4 **a** €2.25 **b** 20
5 **a** £27.20 **b** 11
6 **a** 6 litres **b** 405 miles
7 48 seconds
8 **a** **i** 50 g, 2, 40 g, 100 g
ii 200 g, 8, 160 g, 400 g
iii 250 g, 10, 200 g, 500 g
b 60
9 6
10 6
11 3

3.4 Best buys

HOMEWORK 3F

1 **a** Both work out at same price: £1.99 for two (to nearest penny)
b £1.20 for 20 is better value

2 **a** Large size, 4.0 g/p
b 200 g bar, 2.2 g/p
c 500 g tin, 0.64 g/p
d Large jar, 3.8 g/p

3 Large size

4 72p, 66p, 70p, 65p; therefore 3-litre bottle is best value for money

5 Better value for money: 3 for the price of 2; 1500 g for £3.38

6 Hannah got the better mark, since it is equivalent to 85 out of 100.
John's mark is equivalent to 80 out of 100.

3.5 Density

HOMEWORK 3G

1 0.9 g/cm^3

2 62.5 g/cm^3

3 30 g

4 500 cm^3

5 1350 g

6 909 cm^3

7 5.25 g/cm^3

8 996 tonnes

9 1.11 g/cm^3

10 **a** 13.04 m^3 **b** 5.2 tonnes

11 275 grams

12 Different metals vary in density, resulting in more or less mass, even though the volume may be the same.

Functional Maths Activity

Metal objects

Item	Mass g	Cost per gram
Ring (gold)	9.65	£16.58
Statue (cast iron)	108	83p
Jug (silver)	31.2	80p
Tankard (stainless steel)	30	33p
Candlestick (brass)	51	29p
Plate(copper)	62.3	22p

4 Geometry: Length, area and volume

4.1 Circumference and area of a circle

HOMEWORK 4A

1 **a** 9.4 cm **b** 31.4 cm **c** 50.3 m
d 44.0 cm **e** 20.1 cm **f** 22.0 cm

2 200π

3 **a** 15.7 cm **b** 2

4 1705 complete revolutions

5 **a** 16π cm^2 **b** 153.9 cm^2 **c** 254.5 cm^2
d π m^2 **e** 1385.4 cm^2 **f** 0.6 cm^2

6 18.0 cm

7 $6\pi + 12$

8 3.82 cm

9 66 m^2

10 88.4 cm^2

11 3.99 m

12 49.7 cm^2

13 329 m^2

14 814 cm^2

15 110 metres

4.2 Area of a trapezium

HOMEWORK 4B

1 **a** 23.1 cm, 28 cm^2 **b** 36 cm, 66. 5 cm^2

2 **a** 89 m^2 **b** 35.5 cm^2

3 **a** = 10 cm^2 ; **b** = 9.6 cm$^{2;}$ so **a** has the largest area

4 57 cm^2

5 About 3 kg

6 5 cm

7 **a** 45 cm^2 **b** 24 cm^2

8 64.7%

4.3 Sectors

HOMEWORK 4C

1 **a** 8.7 cm, 43.6 cm^2 **b** 11 cm, 38.5 cm^2

2 2.5π 6.25π

3 **a** 51.4 cm **b** 80.5 cm

4 **a** 134 cm^2 **b** 222.7 cm^2

5 268 m^2

6 26.1 cm

7 707 cm^2

8 Unshaded part is 96.6 cm^2

4.4 Volume of a prism

HOMEWORK 4D

1 **a** 10.5 m^2, 42 m^3 **b** 25 m^2, 250 m^3

2 21.5 cm^2

3 90 cm^3

4 **a** **i** is the heaviest (190 g)

b **ii** is the lightest (187.8 g) (**iii** weighs 189 g)

4.5 Cylinders

HOMEWORK 4E

1 **i** 100π cm^3 **ii** 40π cm^2

2 **i** 3400 cm^3 **ii** 850 cm^2

3 **a** **i** 785 cm^3 **ii** 471 cm^2

b **i** 393 cm^3 **ii** 314 cm^2

4 2 cm

5 18 cm

6 3 cm

7 159 cm^3

8 297 cm^2

9 125π cm^3

10 79.6 cm^3

11 10.4 cm

12 211 cylinders

Functional Maths Activity

Packaging sweets

	Cuboid	Triangular prism	Cylinder
Side length	7.07 cm	10.75 cm	
Radius			3.99 cm
Surface area	666 cm^2	745 cm^2	601 cm^2

Differences between the three surface areas:

- triangular prism is 79 cm^2 larger than the cuboid and 144 cm^2 larger than the cylinder
- cuboid is 65 cm^2 larger than the cylinder.

How surface area affects production costs: the larger the surface area, the more packaging material that is required therefore the higher the production costs.

5 Algebra: Expressions and equations

5.1 Basic algebra

HOMEWORK 5A

1 **a** 15 **b** 27 **c** 47
2 **a** 5 **b** 14 **c** 29
3 **a** 9 **b** 12 **c** 19
4 **a** 2 **b** –4 **c** –16
5 **a** 0.5 **b** 6.5 **c** 26.5
6 **a** –8 **b** –3 **c** 109.5
7 **a** –11 **b** –15 **c** 7
8 **a** 13 **b** 16 **c** 5.4
9 **a** 11 **b** –14 **c** –0.75
10 **a** 3.5 **b** 19.4 **c** 8.03
11 **a** 25 **b** 169
12 **a** 16 **b** 21
13 **a** 51 **b** 36 **c** 19
14 **a** 17 **b** 28
15 **a** 624 **b** 217
16 **a** 102 **b** 791
17 162 m by 27 m by 16.2 m
18 **a** $4a + 6b - 5c$ and $4a - 4b + c$ **b** 48
19 **a** 20 °C **b** $F = \frac{9}{5}C + 32$
20 **a** £155.25 **b** £20.25 in credit
21 **a** 64.4 **b** 76 **c** 57.2
22 **a** 3p
b Basic charge of £4.50 plus 2p profit (5 – 3) per page
c £44.50

HOMEWORK 5B

1 $12 + 3m$ **2** $18 + 6p$ **3** $16 - 4y$
4 $18 + 21k$ **5** $12 - 20f$ **6** $8 - 46w$
7 $7g + 7h$ **8** $8k + 16m$ **9** $12d - 6n$
10 $t^2 + 5t$ **11** $m^2 + 4m$ **12** $k^2 - 2k$
13 $4g^2 + g$ **14** $3y^2 - 21y$ **15** $7p - 8p^2$
16 $2m^2 + 10m$ **17** $3t^2 - 6t$ **18** $15k - 3k^2$
19 $8g^2 + 6g$ **20** $8h^2 - 12h$ **21** $12t - 10t^2$
22 $12d^2 + 20de$ **23** $12y^2 + 15ky$ **24** $18m^3 - 6m^2p$
25 $y^3 + 7y$ **26** $h^4 + 9h$ **27** $k^3 - 4k$
28 $3t^3 + 9t$ **29** $5h^4 - 10h$ **30** $4g^4 - 12g$
31 $10m^3 + 5m^2$ **32** $8d^3 - 2d^4$ **33** $12w^3 + 4wt$
34 $15a^3 - 3ab$ **35** $14p^4 - 16mp$ **36** $3m^2 + 5m^3$
37 $4t^4$ **38** $4g^2t - 3g^4$ **39** $14t^3 + 2mt^2$

40 $12h^3 + 15gh^2$

41 **a** –4 °C **b** $F = 2(C + 15)$

42 $y + y = 2y$, $3y + 6 = 3(y + 2)$, $5y – 10 = 5(y – 2)$

43 Correct answers such as: $2(6x + 12y)$, $12(x + 2y)$, $6(2x + 4y)$

HOMEWORK 5C

1 **a** $9t$ **b** $7m$ **c** $7y$
d $10d$ **e** $2e$ **f** $3g$
g $2p$ **h** $4t$ **i** $5t^2$
j $3y^2$ **k** $7ab$ **l** a^2d

2 **a** $18 + 7t$ **b** $22 + 24k$ **c** $13 + 32m$
d $17 + 13y$ **e** $28 + 12f$ **f** $20 + 33g$
g $2 + 2h$ **h** $9g + 5$ **i** $6y + 11$
j $7t – 4$ **k** $17k + 16$ **l** $6e + 20$
m $5m + 2p + 2mp$ **n** $4k + 5h + 3hk$ **o** $t + 3n + 7nt$
p $p + 5q + 8pq$ **q** $6h + 12j + 11hj$ **r** $15y + 2t + 20ty$
s $4t^2 + 13t$ **t** $15y^2 + 7y$ **u** $11w^2 + 22w$
v $17p^2 + 6p$ **w** $m^2 + 8m$ **x** $14d – 3d^2$
y $2a^3 + 10a^2 + 15ab + 3ac$ **z** $4y^3 + 3y^2 + 12yw – 4ty$

3 **a** $100x + 300y$ **b** £1700

4 He has worked out 2×3 as 5 instead of 6
And he has worked out –2 + 15 as –13, not +13
Answer should be $16x + 13$

5 **a** **ii** $5(x + 0.75) + 3(x + 0.25)$
b £44.50

5.2 Factorisation

HOMEWORK 5D

1 $3(3m + 4t)$ **2** $3(3t + 2p)$ **3** $4(m + 3k)$
4 $2(2r + 3t)$ **5** $m(2n + 3)$ **6** $g(4g + 3)$
7 $4(w – 2t)$ **8** $2(5p – 3k)$ **9** $2(6h – 5k)$
10 $2m(2p + k)$ **11** $2b(2c + 3k)$ **12** $4a(2b + c)$
13 $y(3y + 4)$ **14** $t(5t – 3)$ **15** $d(3d – 2)$
16 $3m(2m – p)$ **17** $3p(p + 3t)$ **18** $4p(2t + 3m)$
19 $2b(4a – 3c)$ **20** $4a(a – 2b)$ **21** $2t(4m – 3p)$
22 $4at(5t + 3)$ **23** $2bc(2b – 5)$ **24** $2b(2ac + 3ed)$
25 $2(3a^2 + 2a + 5)$ **26** $3b(4a + 2c + 3d)$ **27** $t(6t + 3 + a)$
28 $3mt(32t – 1 + 23m)$ **29** $2ab(3b + 1 – 2a)$ **30** $5pt(t + 3 + p)$

31 **a** Does not factorise **b** $m(3 + 2p)$ **c** $t(t – 5)$
d Does not factorise **e** $2m(4m – 3p)$ **f** Does not factorise
g $a(3a – 7b)$ **h** Does not factorise **i** $b(7a – 4bc)$
j Does not factorise **k** $3mt(2m + 3t)$ **l** Does not factorise

32 **a** Tess, as 9.99 – 1.99 = 8, so she will just have to work out 8 × 8
b Tom £48, Tess £64

33 **a** **i** $x - 4$ **ii** $3(x - 4)$ **iii** $x(x - 4)$

b $x - 4$ as a factor

34 **a** Each bracket adds up to 101, and there are 50 brackets.

b 5050

5.3 Solving linear equations

HOMEWORK 5E

1 **a** 18 **b** 28 **c** 54

d 64 **e** 6 **f** 12

g 12.5 **h** 12 **i** 1

j –2 **k** 18 **l** 15

2 Any valid equations

3 **a** 8 **b** 2 **c** 6

d 2 **e** 3 **f** –4

g 2.5 **h** –1.5

4 **a** $\frac{x-16}{8} = 11.25$ **b** £106

HOMEWORK 5F

1 **a** –1 **b** 10 **c** 2

d 1.5 **e** 3 **f** 4

g 1 **h** 3 **i** –0.5

j 1 **k** 2 **l** –1

m 7 **n** 7 **o** 4.5

p 2 **q** –5 **r** –3

s 0 **t** 5 **u** 0.25

v –1 **w** 1 **x** –2

2 Length is 5 m; width is 4 m; area is 45 m^2. Carpet costs £13.50 per square metre.

3 $a = 5$, $b = 2$, $c = 4$

4 Zak is wrong, as he has not multiplied the bracket correctly to get $10x + 3 = 13$ in both cases. First equation $x = -0.2$, second equation $x = 0.7$

HOMEWORK 5G

1 $x = 1$ **2** $y = 1$ **3** $a = 2$

4 $t = 5$ **5** $p = 3$ **6** $k = 3$

7 $d = 7$ **8** $x = 21$ **9** $y = 6$

10 $b = 3$ **11** $c = 2$

12 $5x + 120 = 3x + 908$, $2x = 788$, $x = 394$

13 $x = 4$, perimeter = 27 cm

14 $5x + 2 = 3x - 6$, $x = -4$

5.4 Setting up equations

HOMEWORK 5H

1 $Y + 23 = 37$, 14 years

2 $3X = 24$, 8 years

3 $2(x + 7) = 24$, $x = 5$

4 $5x + 2 = 32$, $x = 6$

5 $6b + 5 = 65$, $b = 10$, 20 crime novels, 28 science fiction and 17 romance

6 $4x + 6 = 26$, so $4x = 20$, $x = 5$

7 $3(x – 4) = 24$, so $x – 4 = 8$, $x = 12$

8 If a magazine costs m pence, then a book costs $2m$ pence. Then, Derek will have spent $2m$ on a book and $2m$ on magazines, so $4m = 600$, $m = 150$p or £1.50. Assuming Kerry bought x books and x magazines, he will have spent $x \times (m + 3m)$ which is $3mx$ or $450x$ pence. But he paid £22.50, which is 2250p, so $450x = 2250$ and $x = 5$. Kerry bought 5 magazines.

9 **a** Suppose there are x 50p coins. Then, totalling the numbers of coins, $2x$ [£1 coins] + x [50p coins] + $(x + 4)$ (£2 coins] = $4x + 4$ coins. Now $4x + 4 = 44$, so $x = 10$. Therefore, there are 20 £1 coins, 10 50p coins and 14 £2 coins.

b (20 × £1) + (10 × 50p) + (14 × £2) = £20 + £5 + £28 = £53

5.5 Trial and improvement

HOMEWORK 5I

1 **a** 1 and 2 **b** 3 and 4 **c** 4 and 5 **d** 4 and 5

2 **a** 3.1 **b** 4.6 **c** 5.4 **d** 7.0

3 3.5

4 4.7

5 10.7 and 18.7 cm

6 21.8 and 36.8 m

7 5.4 and 7.4 cm

8 12.6 and 9.6 cm

9 **a** $x^3 + 3x^2 = 1000$ **b** 9.1 cm

10 3.3

11 7.6 and 2.6

Problem-solving Activity

Throwing a ball

a

1.5	1.75	2	2.25	2.5	2.75	3	3.25
12.75	12.69	12	10.69	8.75	6.19	3	–0.81

b Approx 3.2 sec

c $0 = 16t – 5t^2$, so $t = 0$ or 3.2

d 2.75
$h = 1.6 \times 16 – 5 \times 1.6^2 = 12.8$

e Student's own answer

6 Geometry: Pythagoras' theorem

6.1 Pythagoras' theorem

HOMEWORK 6A

1 **a** 5 cm
b 4.41 cm
c 10.6 cm
d 35.4 cm
e 20 cm
f 19.2 cm

2 **a** 40.15 m **b** 2100 m^3

3 15 cm, because $7.5^2 + 10^2 = 12.5^2$

4 3.81 metres, so the beam is long enough

6.2 Finding a shorter side

HOMEWORK 6B

1 **a** 23.7 cm **b** 22.3 cm **c** 6.9 cm
d 32.6 cm **e** 8.1 cm **f** 760 m
g 0.87 cm **h** 12 m

2 **a** 10 m **b** 27.2 cm **c** 29.4 m
d 12.4 cm

3 6.7 m

4 **a** 8.2 cm **b** 8.0 cm

5 No, because the ladder can only reach 3.6 metres

6 3 cm and 5 cm

6.3 Applying Pythagoras' theorem in real-life situations

HOMEWORK 6C

1 9 m

2 3.23 m

3 14.14 m

4 10 km

5 3.22 km

6 **a** 7.9 m **b** 3.9 m

7 $\sqrt{2}$

8 12 cm^2

9 Yes, $61^2 = 60^2 + 11^2$

10 14.76 units

11 **a** 1 cm represents 2.5 km **b** 40.4 km

12 12.7 metres

13 The diagonal of the drawer is $\sqrt{(40^2 + 33^2)}$ = 51.8 cm, so it will fit in the drawer if it is put in at an angle.

HOMEWORK 6D

1 32.8 cm^2, 9.17 cm^2

2 36.7 cm^2

3 43.3 cm^2

4 **a** 173.2 cm^2

b Only the lengths have doubled; the area has quadrupled.

5 **a** Student's sketches

b 8, 8, 6 has area 22.25 cm^2 and 6, 6, 8 has 17.9 cm^2

6 54.5 mm^2

7 56.7%

8 49 cm or 49.2 cm

6.4 Pythagoras' theorem in three dimensions

HOMEWORK 6E

1 Yes

2 **a** **i** AC = 12.8 cm **ii** BG = 11.7 cm **iii** BE = 10.0 cm

b BH = 14.1 cm

3 Yes

4 **a** 21 cm and 18.4 cm **b** 13.4 cm

5 14.1 m and 14.5 m

6 **a** DG = 11.2 cm **b** HA = 7.1 cm

c DB = 11.2 cm **d** AG = 12.2 cm

7 26 cm

8 14.1 cm

9 **a** AC = 9.9 cm **b** EX = 10.9 cm **c** EM = 11.5 cm

10 42 cm

Functional Maths Activity

Access ramps

a The ratio of the maximum rise to the going is equal to the gradient.

b The angles are 2.9 degrees and 4.7 degrees, a difference of 1.9 degrees.

c Yes. By interpolation, the maximum gradient is 1 : 17 and the corresponding maximum rise is 412 mm, which is greater than the 400 mm he wants.

7 Geometry: Angles and constructions

7.1 Special angles and quadrilaterals

HOMEWORK 7A

1 **a** $a = 62°$, $b = 108°$

b $c = 58°$, $d = 122°$, $e = 58°$

c $f = 15°$, $g = 161°$

2 **a** $x = 50°$, $y = 40°$ **b** $x = 11°$, $y = 40°$

3 **a** $x = 100°$, trapezium **b** $x = 50°$, kite

4 **a** 360° **b** Student's proof

5 D = 120° (because A = 60°)

6 Angle B = 75° (opposite angles in a parallelogram are equal), so $x = 90°$ (angles in a triangle = 180°)

7 For example, only one pair of parallel sides, opposite angles are not the same, no rotational symmetry, diagonals do not bisect each other

7.2 Angles in polygons

HOMEWORK 7B

1 **a** 900° **b** 1620° **c** 3240°

d 5940°

2 **a** 156° **b** 160° **c** 168°

d 176.4°

3 **a** 10 **b** 16 **c** 36

d 40

4 **a** 18 **b** 12 **c** 20

d 90

5 **a** 8 **b** 24 **c** 36

d 15

6 Octagon

7 **a** Decagon **b** 115°

8 117°

9 Angle A and angle B are 120°; angle C = 60°

10 Angle AED = 108° (interior angle of a regular pentagon), angle ADE = 36° (angles in an isosceles triangle)

11 True statements:

b The size of each interior angle is 120°.

c The size of each exterior angle is 60°.

7.3 Constructing triangles

HOMEWORK 7C

1 **a–e** Student's own drawings

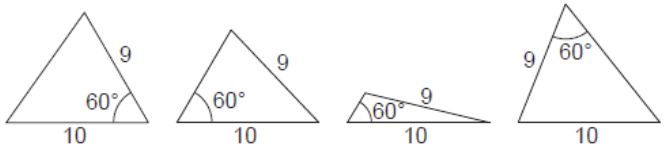
2 Student's own drawing

3 To draw this triangle, draw sides at 60° to each other; measure 5 cm along one side; use compasses from this point to find 6 cm intersection with other line.

4 **a** Student's own drawing **b** Rhombus

5 Yes, he is correct

6



7.4 Bisectors

HOMEWORK 7D

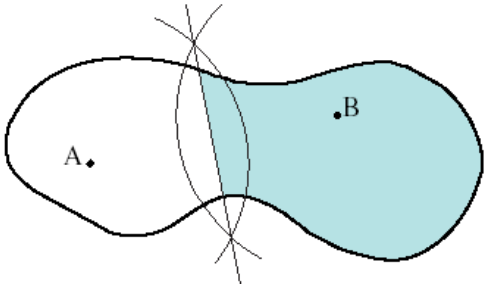
1 Student's own drawings

2 **a–c** Student's own drawings

3 **a–c** Student's own drawings

4 **a–c** Student's own drawings

5



6 **a** Bisect 60, then bisect the 30 to get 15.

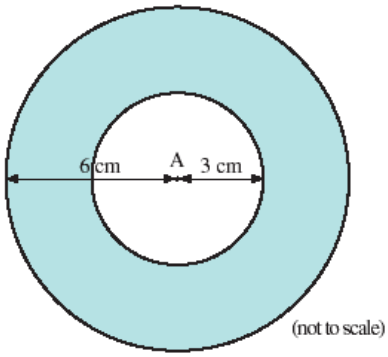
b Create a 60° angle, then on top of that, create the 15° to make 75°.

7 Each angle bisector is the locus of points equidistant from the two sides bisected – hence, where they all meet will be the only point that is equidistant from each of the three sides.

7.5 Defining a locus

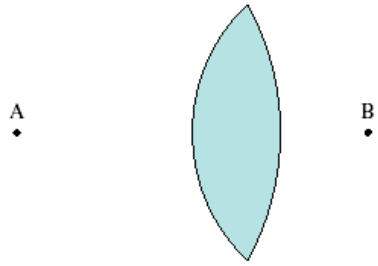
HOMEWORK 7E

1



2 **a**

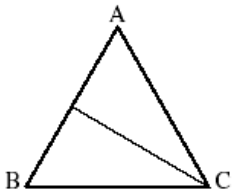
b



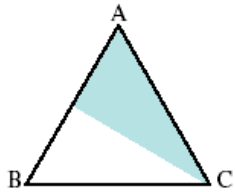
3 Sphere radius 1 metre

4

a



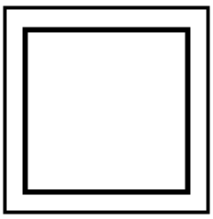
b



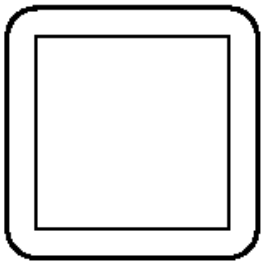
c

d

5



6



7

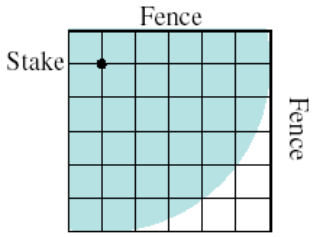
8 **a–b** Student's own drawings

9 Student's own drawings – starting point may be any point along the locus

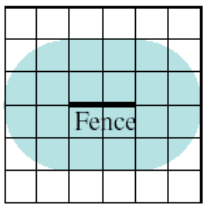
7.6 Loci problems

HOMEWORK 7F

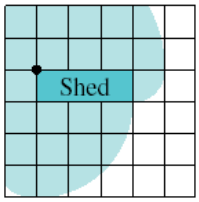
1



2



3



4 **a** Student's diagram **b** No **c** No

5 No

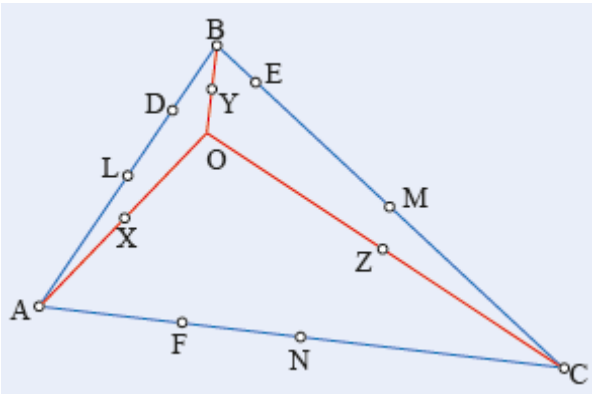
6 **a** Student's diagram **b** No

7 Between 50 and 210 km

8 **b** could be true – the locus is just two points

Problem-solving Activity

The nine-point circle



8 Geometry: Transformation geometry

8.1 Congruent triangles

HOMEWORK 8A

1 **a** Yes – SAS **b** Yes – SSS **c** Yes – AS

2 Student's diagrams; triangles that are congruent to each other: ABC, CDA, DAB and DCB (Note: if the point of intersection of AC and DB is T, then ATB, BTC, CTD and DTA are also congruent)

3 Student's diagrams; depending on how the kite figure is oriented and labelled, EFG and GHE or HFE and HFG are congruent

4 Student's diagrams: triangles that are congruent to each other: ABC and ACD; ABD and BCD

5 Student's diagrams: Triangles that are congruent to each other: ATC, CTB and ATB (and if the mid-points of AB, BC and CA are P, Q and R respectively, also ATP, PTB, BTQ, CTQ, CTR and RTA)

6 For example: AB = CD (given), ∠ABD = ∠CDB (alternate angles), ∠BAC = ∠DCA (alternate angles), so ΔABX ≡ ΔCDX (ASA)

7 AB and PQ are the corresponding sides to the 50° angle, but they are not equal in length.

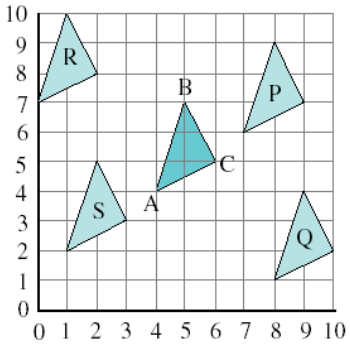
8.2 Translations

HOMEWORK 8B

1 **i** $\begin{pmatrix}7\\1\end{pmatrix}$ **ii** $\begin{pmatrix}10\\-2\end{pmatrix}$ **iii** $\begin{pmatrix}3\\-2\end{pmatrix}$

iv $\begin{pmatrix}-7\\-1\end{pmatrix}$ **v** $\begin{pmatrix}3\\-3\end{pmatrix}$ **vi** $\begin{pmatrix}-4\\-3\end{pmatrix}$

2 **a** See triangle in centre of grid
b See P on grid
c See Q on grid
d See R on grid
e See S on grid



3 **a** $\begin{pmatrix}1\\-5\end{pmatrix}$ **b** $\begin{pmatrix}-8\\6\end{pmatrix}$ **c** $\begin{pmatrix}1\\-5\end{pmatrix}$

d $\begin{pmatrix}6\\4\end{pmatrix}$ **e** $\begin{pmatrix}7\\-1\end{pmatrix}$ **f** $\begin{pmatrix}7\\-1\end{pmatrix}$

g $\begin{pmatrix}8\\-6\end{pmatrix}$ **h** $\begin{pmatrix}-6\\-4\end{pmatrix}$

4 $\begin{pmatrix}6\\2\end{pmatrix}$

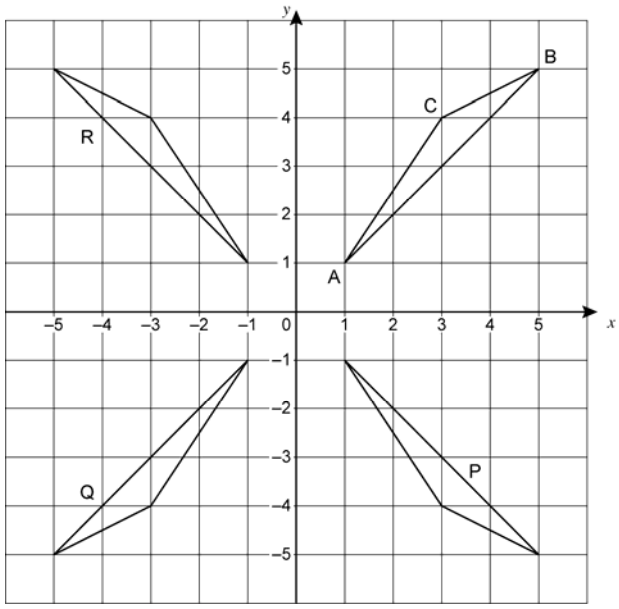
5 $\begin{pmatrix}2\\5\end{pmatrix}$, $\begin{pmatrix}3\\-3\end{pmatrix}$, $\begin{pmatrix}-5\\-2\end{pmatrix}$ or $\begin{pmatrix}5\\2\end{pmatrix}$, $\begin{pmatrix}-3\\3\end{pmatrix}$, $\begin{pmatrix}-2\\-5\end{pmatrix}$

6 No, it is $\begin{pmatrix}3\\-2\end{pmatrix}$

8.3 Reflections

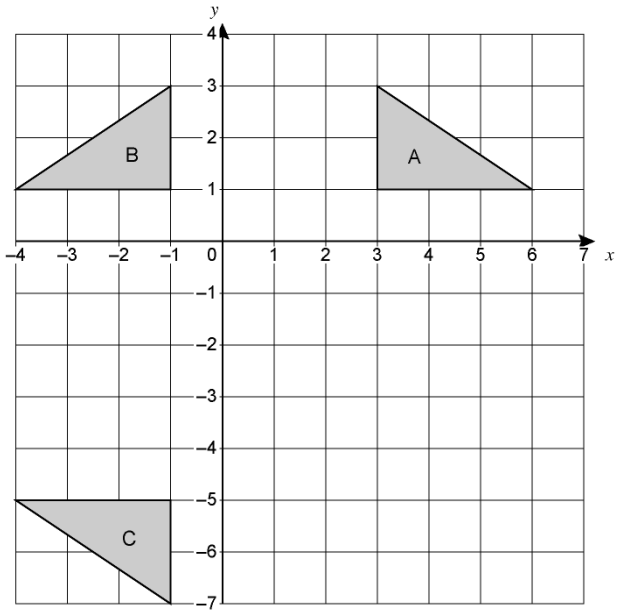
HOMEWORK 8C

1 a–e

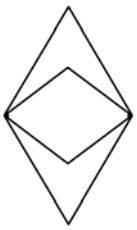


f Reflection in *y*-axis

2 a–b



3



4 (6 – a, b)

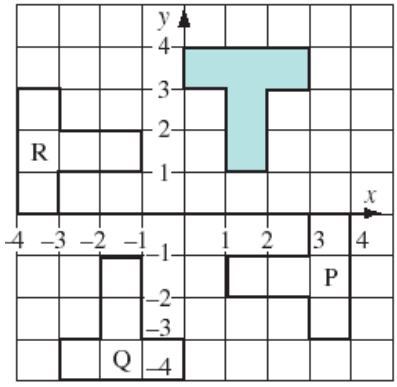
5 **a–e** Student's diagrams

f Reflection in $y = -x$

8.4 Rotations

HOMEWORK 8D

1 **a–c**



d Rotation 90° clockwise about O

2 **a** (1, 1), (3, 1), (3, 3), (1, 3)

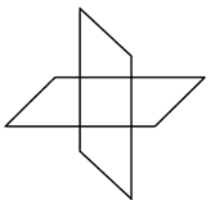
b (1, –1), (3, –1), (3, –3), (1, –3)

c (–1, –1), (–3, –1), (–3, –3), (–1, –3)

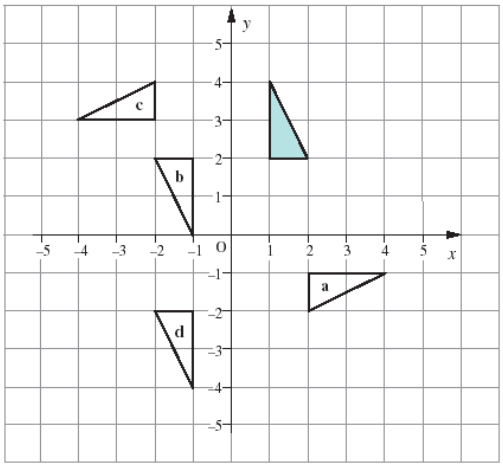
d (–1, 1), (–3, 1), (–3, 3), (–1, 3)

e Same numbers, different signs

3



4 **a–d**



5 **a** Rotation 90° anticlockwise about (0, 0)

b Rotation 180° (anti-)clockwise about (0, 0)

c Rotation 90° clockwise about (2.5, 0.5)

d Rotation 180° (anti-)clockwise about (2, –1)

6 **a** $(b, -a)$ **b** $(-a, -b)$ **c** $(-b, a)$

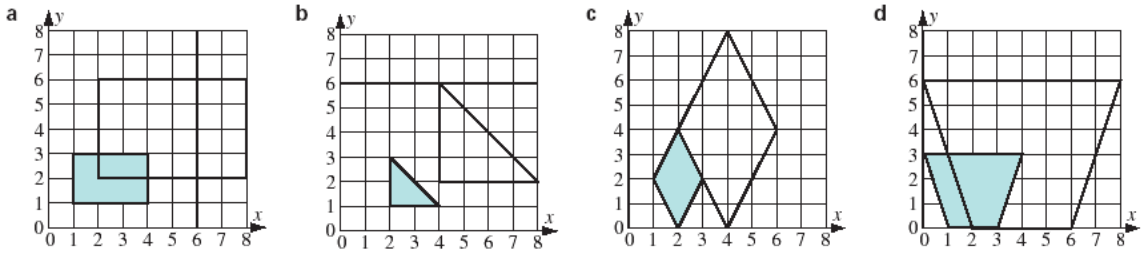
7 A rotation 90° anticlockwise about (2, 2)

8.5 Enlargements

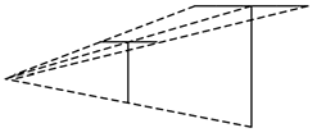
HOMEWORK 8E

1 Student's diagrams; check centre of enlargement and scale factor.

2



3



4 (1, 1), (3, 1) and (3, 2)

5 **c** an enlargement of scale factor –3 about (1, 2)

8.6 Combined transformations

HOMEWORK 8F

1 **a** Reflection in x-axis **b** Reflection in y-axis **c** Translation of $\begin{pmatrix} 6 \\ -1 \end{pmatrix}$

d Rotation of 180° (anti-)clockwise about (0, 0)

e Rotation of 90° clockwise about (0, 0)

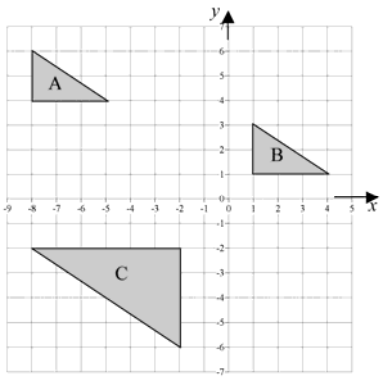
f Reflection in $y = -x$ **g** Reflection in $y = x$

2 **a–d** Student's diagrams **e** 90° clockwise about (0, 0)

3 **a** (–5, –2) **b** $(-b, -a)$

4 **a** (–3, 4) **b** $(-b, a)$

5 **a**



b Enlargement of scale factor $-\frac{1}{2}$ about (–6, 2)

Functional Maths Activity

Transforming the sorting office

1 You need to examine each of the four possible starting points for the stamp. These are at the top right and bottom left of each side, allowing for 180° rotation of each side.

2 No, the machine would not detect the stamp on the top left-hand corner.

3 Four corners on each side could possibly be the ‘top right’.

4 One way is to rotate about H and then rotate about one of the diagonals (call it D). Keep repeating this sequence H, D, H, D, … and you will eventually check all eight corners.

9 Statistics: Data handling

9.1 Averages

HOMEWORK 9A

1 **a** **i** Mode 6, median 4, mean 4
ii Mode 15, median 15, mean 15.1
iii Mode 32, median 32, mean 33
b **i** Mean, balanced data
ii Mode, appears six times
iii Median, 46 is an extreme value

2 **a** Mode 135 g, median 141 g, mean 143 g
b Mean, takes all weights into account

3 **a** 71 kg **b** 70 kg
c Median, 53 kg is an extreme weight

4 **a** 59 **b** 54
c Median, the higher average

5 Kathy – mean, Connie – median, Evie – mode

6 **a** For example: 1, 1, 4
b For example: 1.5, 3, 4.5

7 The teacher might be quoting the mean, while the student might be quoting the mode.

9.2 Frequency tables

HOMEWORK 9B

1 **a** Mode 16, median 15, mean 15.3
b Mode 5, median 5, mean 4.67

2 **a** 289 **b** 2 **c** 142
d 1.7

3 Find where the middle number of the data is located by dividing the total frequency (52) by two (26). The 26th value is three days a week and is the median.

4 **a** 256 **b** 3.53 **c** 72
d 62%

5 Eggs: 3 and 4; Frequency: 6 and 4

9.3 Grouped data

HOMEWORK 9C

1 **a** **i** 61–80 **ii** 57.87
b **i** 20.01–30.00 **ii** £27.39

2 **a** 79 **b** 34 minutes **c** Mode
d 94%

3 **a** 114 **b** 9.4 **c** Mode
d 5.3%

4 The 15 and the 10 are the wrong way around.

5 Find the midpoint of each group, multiply that by the frequency and add those products. Divide that total by the total frequency.

9.4 Frequency diagrams

HOMEWORK 9D

1

Time in minutes	10 or less	Between 10 and 30	30 or more
Angle on pie chart	48°	114°	198°

2

GCSE passes	9 or more	7 or 8	5 or 6	4 or less
Angle on pie chart	40°	200°	100°	20°

3 a

Main use	E-mail	Internet	Word processing	Games
Angle on pie chart	50°	130°	30°	150°

b Most used the computer for playing games and only a few used it for word processing.

c Not enough in sample, only a small age range of people, probably only boys, and so on.

4 a

Type of programme	Comedy	Drama	Films	Soaps	Sport
Angle on pie chart	54°	33°	63°	78°	132°

b No; only asked people who are likely to have similar interests, such as sport.

5 a 25% **b** Rarely

c No, it only shows proportions.

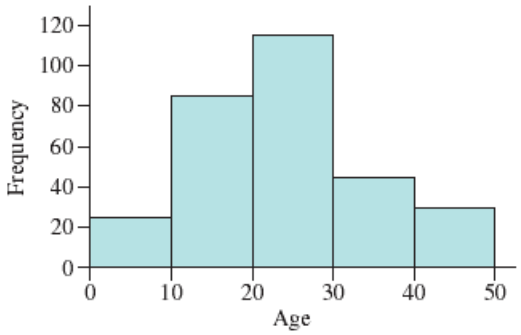
d What is your age? How often do you exercise? How often do you see a doctor?

6 $\frac{5}{36}$

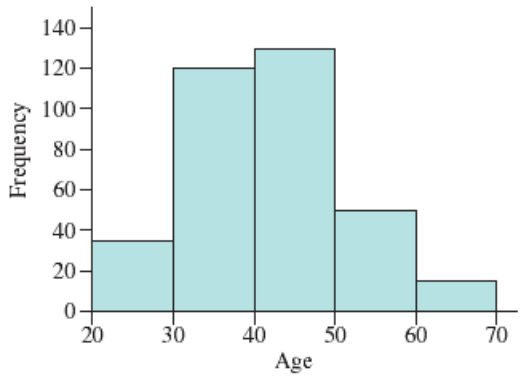
7 A sample of students and the number of different breakfasts taken

HOMEWORK 9E

1 a

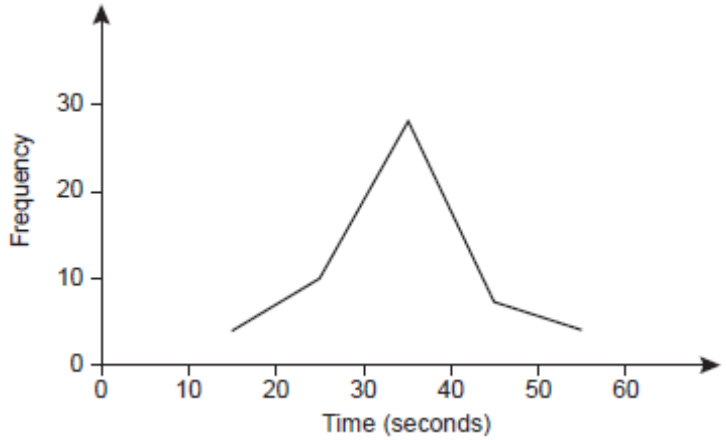


b



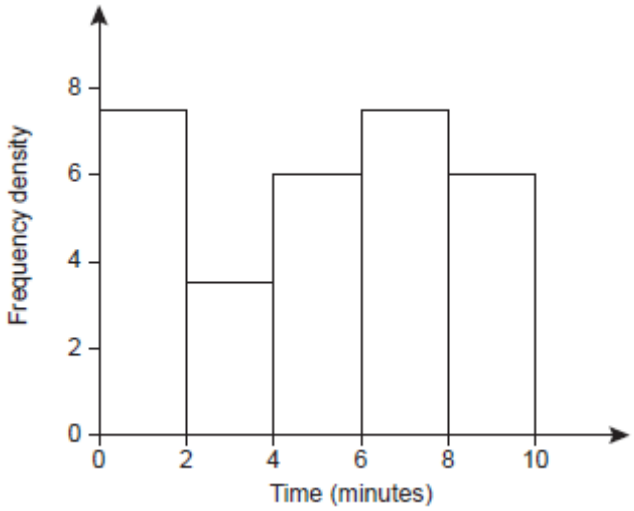
c The first film was seen by mainly 10–30 year-olds, whereas the second film was seen by mainly 30–50 year-olds.

2 a



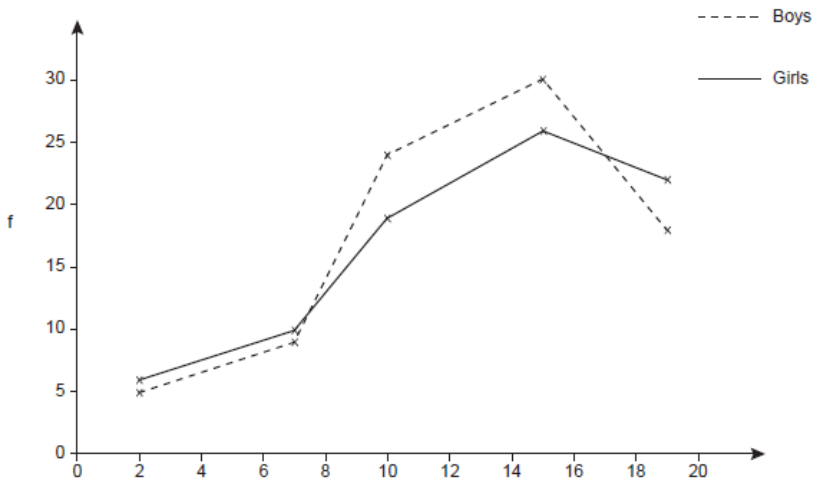
b 34.8 seconds

3 a



b 5.1 minutes

4 a



b Boys 12.6, girls 12.8; the girls had a higher mean score.

5 Five hours

6 The 5 minutes spent waiting is halfway between the 4- and 6-minute groups. These people are in that band, but maybe no one had to wait exactly 5 minutes.

9.5 Surveys

HOMEWORK 9F

1 Answers will vary.

2 Answers will vary.

3 Answers will vary.

4 **a** The form should be similar to the following example.

Question: Do you go to rock concerts?

	Male	Female
Yes		
No		

b Yes, it looks correct as a greater proportion of girls go to rock concerts. (63% of boys and 73% of girls go to rock concerts.)

5 The form should look something like the following example.

Question: What of mobile phone do you own?

	Tally
Orange	
O2	
Virgin	
Vodafone	
... and so on	

Many variations are acceptable as answers, as long as students have provided some choices to be made that can distinguish one from the others.

6 Some examples include: types of goods, year of student, tally space, frequency.

9.6 Questionnaires

HOMEWORK 9G

1 Answers will vary.

2 Answers will vary.

3 Answers will vary.

4 **a–b** Answers will vary.

5 **a** It is a leading question and there is no possibility of showing disagreement.

b It is a clear direct question that has an answer and good responses as only one selection can be made.

c One example might be to ask, ‘Which of the following types of DVD might you consider buying?’ and give choices including ‘Thriller’, ‘Romance’, ‘Comedy’, ‘Musical’, ‘Sci Fi’ or ‘None of those’.

6 Possible questions: 'How old are you?' (Responses: '30 or younger', 'Between 30 and 50'; '50 or over'); 'Do you go to Tango Lessons?' (Responses: 'Yes' or 'No')

7 The groups overlap each other, 'More than 5 times' and 'More than 10 times' are included in 'More than 20 times', there is no time limit, and the response 'Never' is pointless if they are actually coming out of the football ground.

9.7 The data-handling cycle

HOMEWORK 9H

1 Secondary data

2 Primary data

3 Primary or secondary data

4 Primary data

5 Primary data

9.8 Other uses of statistics

HOMEWORK 9I

1 92.6, 96.1, 98.8, 100.6, 105.0

2 £55

3 That the general cost of living in 2010 increased by 2% of the costs in 2008.

9.9 Sampling

HOMEWORK 9J

1 You will need to pick a sample from all ages.
You will need to ask a proportionate numbers of boys and girls.
Ask people with different interests, as sporty people may want to finish earlier.

2 **a** Likely to have an interest in religion, so opinions may be biased

b This would be quite reliable as the sample is likely to be representative.

c Younger children will not like the same sorts of games as older students, so the sample is likely to give a biased result.

3 **a** This is quite a good method. The sample is not random but should give reliable results.

b Not very reliable as people at a shopping centre are not likely to be sporty. Better to ask a random sample at different venues and different times.

c Not everyone has a phone; people don't like being asked in the evening. Need to do other samples such as asking people in the street.

4 **a** About 10% of the population

b

Year	Boys	Girls	Total
7	16	14	30
8	16	16	32
9	14	16	30
10	15	16	31
11	13	14	27
Total	**74**	**76**	**150**

5 Not everyone has a phone. People may not travel by train every week. 200 may not be a big enough sample.

6 **a** Good questions might include: How many times in a week, on average, do you have your lunch out of school? (Responses: 'Never', '1 or 2 times', '3 or 4 times' or 'every day')

b

	Boys	Girls
Y9	10	6
Y10	9	9
Y11	8	8

7 315

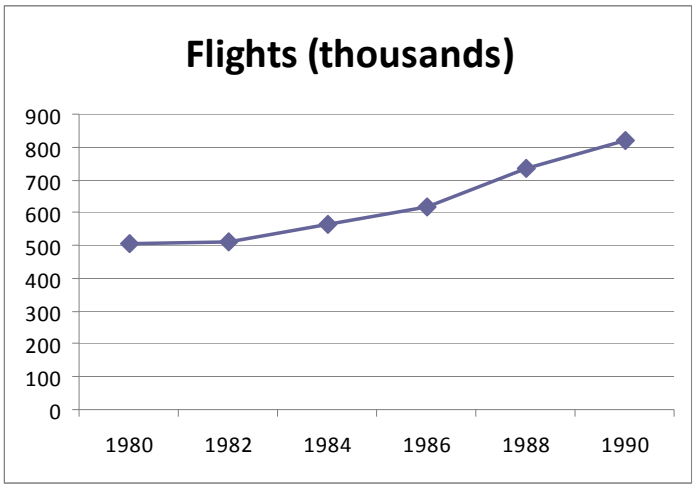
8 Find the approximate proportion of men and women, girls and boys, then decide on a sample size and base your work on the proportion of each group multiplied by the sample size.

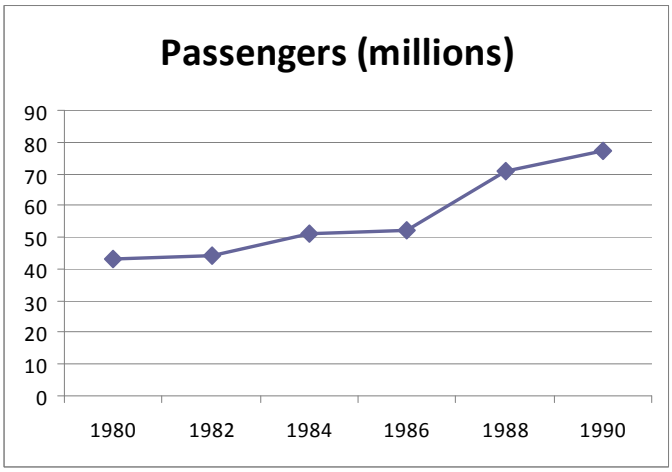
Functional Maths Activity

Air traffic

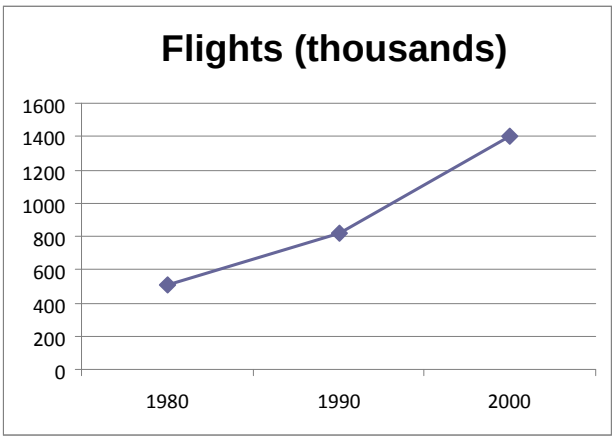
1 Examples of diagrams to illustrate changes over a ten-year period are as follows.

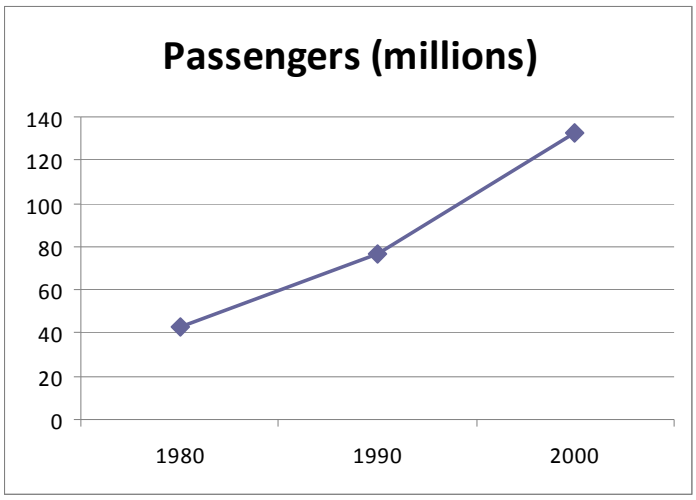
UK international air traffic





2 Students' research may vary, as will their diagrams. Examples of diagrams to show changes over the period 1980, 1990, 2000 are as follows.





3 Extrapolating the data given in the table between 1980 and 1990 gives:
Passengers in 2010 – approximately 145 (million)

Flights in 2010 – approximately 1400 (thousand) or 1.4 million

However, looking at current data on the internet, the above 2010 estimates were already being approached in 2000 (cheap flights were introduced).

Extrapolating the later data (up to 1999) gives:

Passengers in 2010 – approximately 200 (million)

Flights in 2010 – approximately 2000 (thousand) or 2.0 million.

10 Algebra: Real-life graphs

10.1 Straight-line distance–time graphs

HOMEWORK 10A

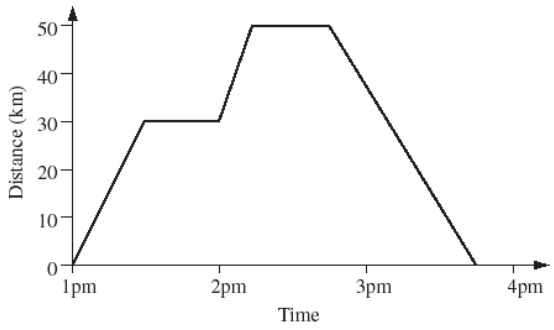
1 **a** **i** 10.30 pm **ii** 11.10 pm **iii** 12.00 midnight

b **i** 50 km/h **ii** 75 km/h **iii** 50 km/h

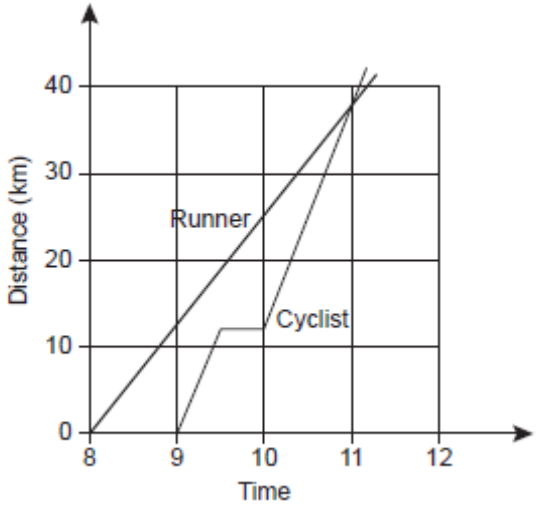
2 **a** 20 km **b** 40 km **c** 60 km/h

d 100 km/h

3



4 11 am



HOMEWORK 10B

1 **a** 2 **b** $\frac{1}{5}$ **c** –2 **d** $\frac{3}{2}$

e $\frac{1}{2}$ **f** $-\frac{3}{2}$ **g** 0 **h** $-\frac{4}{5}$

i $\frac{5}{2}$ **j** $-\frac{2}{5}$

2 **a** 17.5 km/h **b** 30 mph

3 **a** 28.125 grams per ounce **b** 28.125 g

4 **a** 3 hours **b** Faster, on the way back, as the line is steeper

5 76° ± 1°

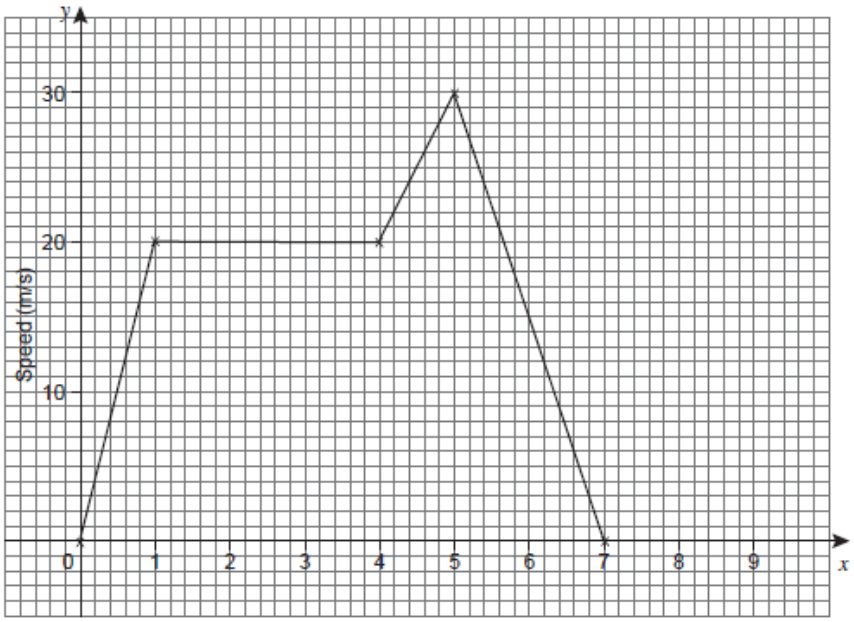
10.2 Other types of graphs

HOMEWORK 10C

1 **a** 20 m/s^2 **b** 0 m/s^2

2 **a** 3 m/s^2 **b** 2 m/s^2

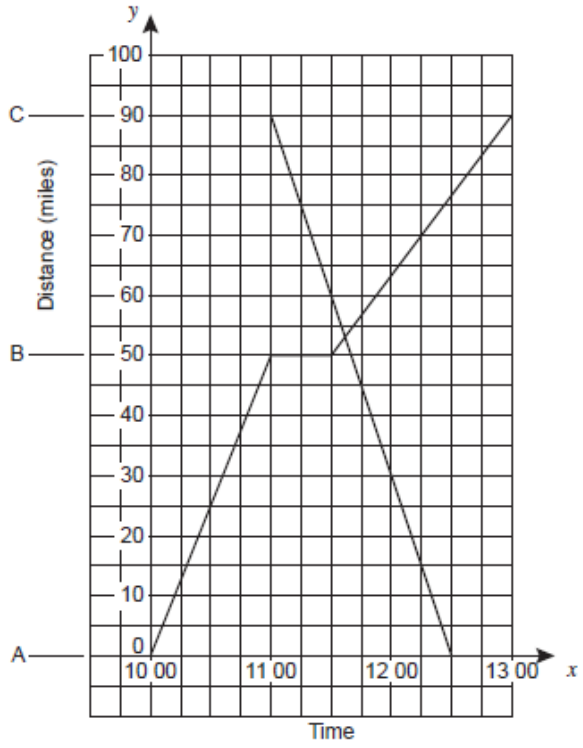
3 **a**



b 1.5 m/s^2

4 **a** 50 km/h **b** 30 minutes

c



d 53 km

Functional Maths Activity

Driving in the United States

a Approximately 3.6 litres in a US gallon

b **i** About 936 litres

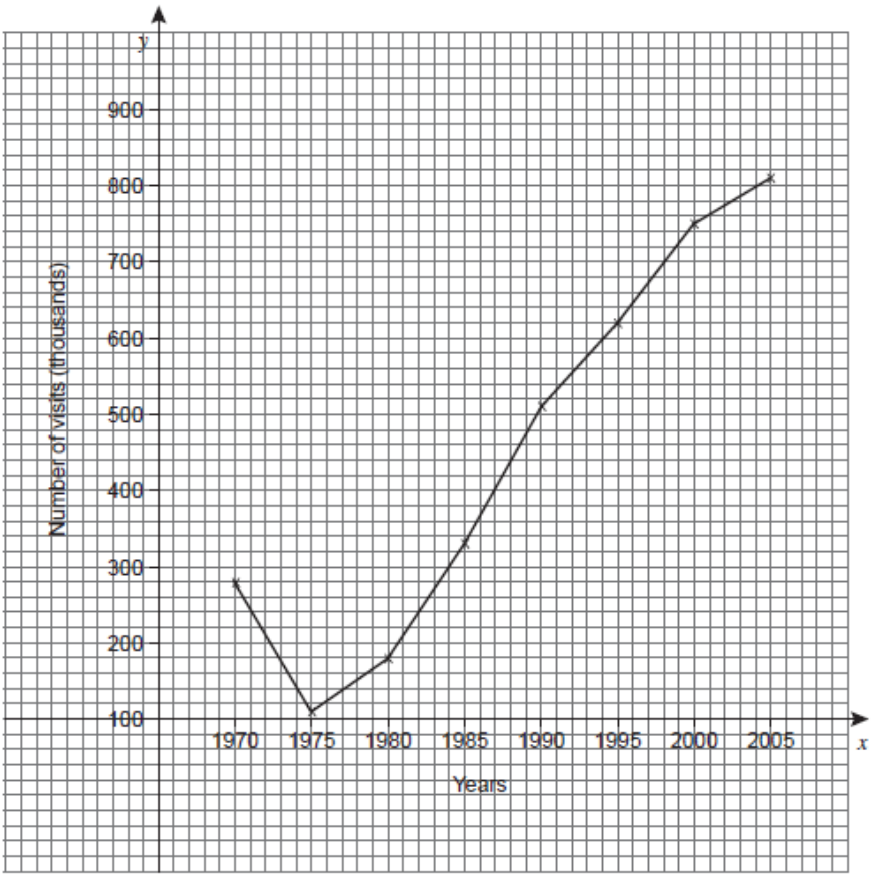
ii US fuel would cost $551.20, which is about £344.50.
UK fuel would cost £898.56, which is about £554.06 more.

11 Statistics: Statistical representation

11.1 Line graphs

HOMEWORK 11A

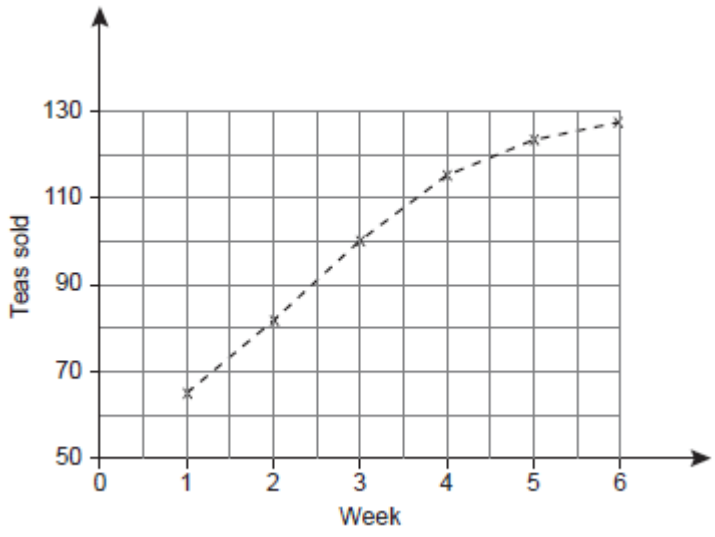
1 a



b 700 000 **c** 1985–1990

d Reduction from 1970 to 1975, advent of video. Increase from 1980 to 2005, due to many multi-screen cinemas being developed.

2 a



b 128

c The same people keep coming back and tell others, but new customers each week becomes more difficult to find.

3 Students should use a graph to estimate 600 g.

4 All the temperatures were presumably higher than 10 degrees.

11.2 Stem-and-leaf diagrams

HOMEWORK 11B

1 **a** 4 | 7 8
5 | 3 4 5 7 7 8
6 | 0 0 2 2 2 7 7

b 67 g **c** 62 g **d** 20 g

2 **a** 0 | 4 4 8 8 8
1 | 1 4 7 8 8 9
2 | 0 1 2 3 3

b 23 **c** 8

3 **a** 6 | 8 9
7 | 0 0 1 3 4 5 6 9 9
8 | 0 0 1 4 5 5 7 9
9 | 2

b 79 **c** 24

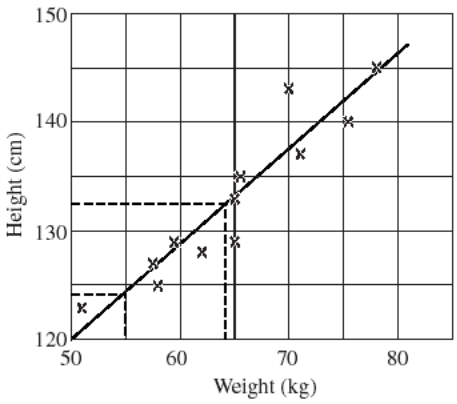
4 For example, 5 | 4 means 54 kg and the girls' weights (on the right) while 3 | 6 shows 63 kg and the boys' weights (on the left).

5 Because every number in the data starts with a 2 and has only two digits

11.3 Scatter diagrams

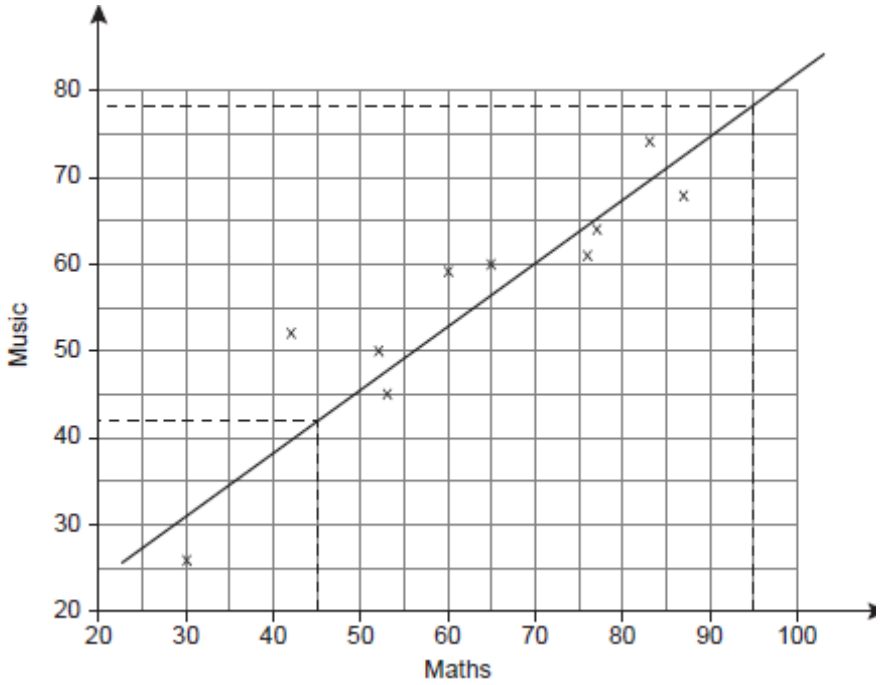
HOMEWORK 11C

1 **a–b**



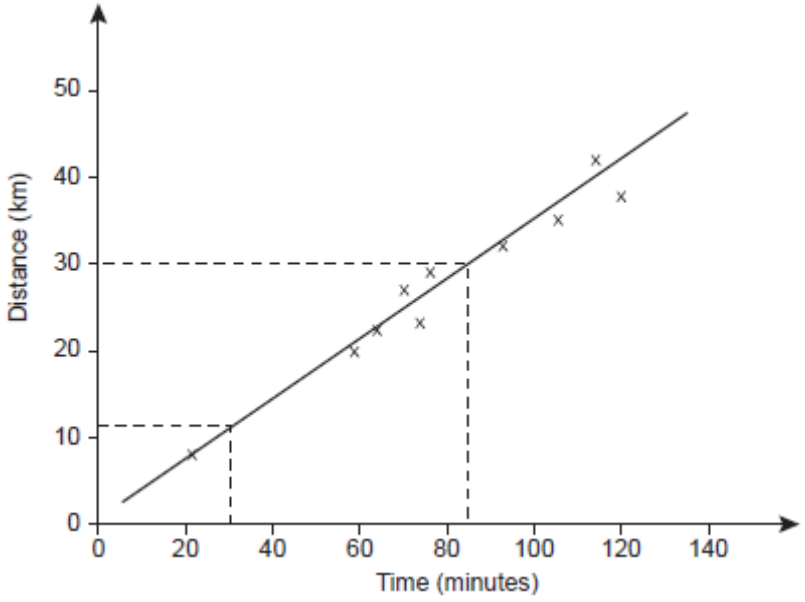
c 64 kg **d** 124 cm

2 **a–b** See the following graph.



c Irene **d** 42 **e** 95

3 a–b



c 12 km **d** 86 min

4 133 miles

5 Points showing a line of best fit sloping up from bottom left to top right.

Functional Maths Activity

Buying wine in the UK

Students' diagrams, measures and reports will vary.

12 Probability: Probabilities of events

12.1 Experimental probability

HOMEWORK 12A

1 **a** 0.2 0.3 0.36 0.42 0.384 **b** 0.4 **c** 2000

2 **a** 0.16 0.253 0.142 0.17 0.103 0.168

b 100 **c** No, 2 occurs too often

3 **a**

Red	White	Blue
0.31	0.52	0.17
0.272	0.48	0.248
0.255	0.508	0.238
0.254	0.504	0.242

b The last line of the relative frequency table is likely to be the closest to the truth because it results from the highest sample frequency (500).
The likely ratio of balls in the bag is therefore R : W : B :: 127 : 252 : 121.
We know there are 50 balls, so this likely ratio gives R : W : B :: 13 : 25 : 12.
For example, (127/500) × 50 = 13 red balls (to the nearest whole number).

4 **a** C **b** A **c** C **d** A

e B **f** A **g** B

5 **a** **i** 0.2 **ii** 0.7 **iii** 0.6

b 10

6 Monday 0.145; Tuesday 0.166; Wednesday 0.134; Thursday 0.141; Friday 0.146

7 The spinner could be considered unfair since the 3 only landed 31 times and the majority of the other numbers landed over the anticipated 40 times.

8 Although you would expect the probability to be close to $\frac{1}{2}$, hence 25 tails, we know that there is more chance of the number of tails being **close to** 25 rather than **actually** 25.

12.2 Mutually exclusive and exhaustive events

HOMEWORK 12B

1 **a** Yes **b** Yes **c** Yes

d No **e** No

2 Also exhaustive: **b** – Throwing an even number with a dice/throwing an odd number with a dice.

3 **a** **i** $\frac{4}{11}$ **ii** $\frac{2}{11}$ **iii** $\frac{4}{11}$

b **i** Yes **ii** Yes **iii** Yes

c **iii** Picking an I / picking a consonant

4 **a** Ann, Joan; Ann, Jack; Ann, John; Ann, Arthur; Ann, Ethel; Joan, Jack; Joan, John; Joan, Arthur; Joan, Ethel; Jack, John; Jack, Arthur; Jack, Ethel; John, Arthur; John, Ethel; Arthur, Ethel

b **i** $\frac{1}{5}$ **ii** $\frac{1}{5}$ **iii** $\frac{4}{15}$

iv $\frac{11}{15}$

c **i**, **ii, iv**

d **ii**

5 $\frac{1}{6}$

6 **a** **i**, **iv**, **v** **b** **i**

Answers will vary regarding explanation about they are not mutually exclusive.

7 May be windy and rainy. Windy and rainy are not independent events.

8 0.05

9 These are not mutually exclusive events.

12.3 Expectation

HOMEWORK 12C

1 100

2 250

3 **a** 52 **b** 8 **c** 4

d 2

4 21

5 1667

6 **a** 100 **b** 100 **c** 130

d 0

7 120

8 **a** One cannot add probabilities for events like this.

b Increase, as he is more experienced

9 **a** 33 **b** 83

10 **a** 28 000 **b** 90% of 112 is 100.8 out of 200, so they should win.

11 Three times

12 Multiply the number of students by: 0.14

12.4 Two-way tables

HOMEWORK 12D

1 **a** 9 **b** 16 **c** 40%

d 71.4%

2 **a** 18% **b** 13% **c** £170

d Female; there are about twice as many male students as female students, but two of the three highest categories have a much greater proportion of female earners.

3 **a**

	2	**3**	**4**	**5**	**6**	**7**	**8**	**9**
5	7	8	9	10	11	12	13	14
6	8	9	10	11	12	13	14	15
7	9	10	11	12	13	14	15	16
8	10	11	12	13	14	15	16	17
9	11	12	13	14	15	16	17	18

b Most unlikely score: 7 or 18

c $\frac{1}{10}$

d $\frac{37}{40}$

e 0.5

4 $\frac{20}{36}$

5 Either Harold, as he had bigger tomatoes, or Connie, as she had more tomatoes.

12.5 Addition rule for events

HOMEWORK 12E

1 **a** $\frac{1}{2}$ **b** $\frac{1}{6}$ **c** $\frac{2}{3}$

2 **a** $\frac{1}{2}$ **b** $\frac{1}{2}$ **c** 1

3 **a** $\frac{1}{13}$ **b** $\frac{1}{13}$ **c** $\frac{2}{13}$

4 **a** $\frac{3}{10}$ **b** $\frac{3}{10}$ **c** $\frac{3}{5}$

5 **a** $\frac{1}{3}$ **b** $\frac{2}{5}$ **c** $\frac{11}{15}$

d $\frac{11}{15}$ **e** $\frac{1}{3}$

6 **a** 0.75 **b** 0.6 **c** 0.25

d 0.6

e **i** Because 3 only occurs on blue **ii** 0.5

7 **a** $\frac{3}{5}$ **b** $\frac{4}{5}$ **c** $\frac{3}{5}$

8 **a** 3 **b** Not certain he has three double yolks to start with

9 **a** $\frac{11}{15}$ **b** $\frac{2}{3}$ **c** 0

d $\frac{2}{3}$

10 **a** **i** 0.1 **ii** 0.75 **iii** 0.85

b 0.5

c 2 hours 6 minutes

11 8

12 ‘Not blue’ and ‘not yellow’ are not mutually exclusive events.

12.6 Combined events

HOMEWORK 12F

1 **a** **i** $\frac{1}{6}$ **ii** $\frac{1}{4}$ **iii** $\frac{1}{6}$

iv $\frac{5}{36}$ **v** $\frac{1}{2}$ **vi** $\frac{29}{36}$

2 **a** $\frac{1}{6}$ **b** $\frac{11}{36}$ **c** $\frac{1}{9}$

d $\frac{3}{4}$ **e** $\frac{1}{36}$ **f** $\frac{11}{36}$

g $\frac{10}{36}$

3

Score on second dice

6	–4	–2	0	2	4	6
5	–3	–1	1	3	5	7
4	–2	0	2	4	6	8
3	–1	1	3	5	7	9
2	0	2	4	6	8	10
1	1	3	5	7	9	11
	1	**2**	**3**	**4**	**5**	**6**

Score on second dice

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

d $\frac{1}{6}$ **e** $\frac{13}{36}$

4 a $\frac{1}{2}$ **b** $\frac{1}{2}$ **c** $\frac{3}{4}$

5 a $\frac{1}{4}$ **b** $\frac{3}{8}$ **c** $\frac{7}{8}$

6 a $\frac{1}{12}$ **b** $\frac{1}{4}$

7 a DD, TD, HD, TT, HH, TH

b

Hyacinth	DH	DH	TH	HH
Tulip	DT	DT	TT	HT
Daffodil	DD	DD	TD	HD
Daffodil	DD	DD	TD	HD
	Daffodil	**Daffodil**	**Tulip**	**Hyacinth**

c $\frac{1}{4}$

d More daffodils

8 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 $\frac{1}{36}$

c 36

d Three times

9 $\frac{5}{16}$

10 It's not possible to draw a diagram and there are many different events to list.

Functional Maths Activity

Lottery competition

1 0.000206 or 4845:1

2 Evie is incorrect. The order of the numbers does not matter. The probability is the same whichever four numbers are selected.

3 The company would expect to raise £2484 for charity.
Company collects: 870 × 0.10 = £87 per time, total 87 × 32 = £2784
Number of wins expected = 0.0002064 × 870 × 32 = 5.75, say 6
Winnings paid out = 6 × 50 = £300
Amount to charity = £2784 – £300 = £2484

13 Algebra: Number and sequences

13.1 Number sequences

HOMEWORK 13A

1 **a** 12, 14, 16: + 2 **b** 15, 18, 21: + 3 **c** 32, 64, 128: × 2
d 33, 40, 47: + 7 **e** 30 000, 300 000, 3 000 000: × 10
f 25, 36, 49: square numbers

2 **a** 34, 55: add previous two terms
b 23, 30: add one more each time

3 **a** 112, 224, 448: × 2
b 38, 45, 52: + 7
c 63, 127, 255: add twice the difference each time *or* × 2 + 1
d 30, 25, 19: subtract one more each time
e 38, 51, 66: add two more each time
f 25, 32, 40: add one more each time
g 13, 15, 16: + 2, + 1
h 20, 23, 26: + 3
i 32, 40, 49: add one more each time
j 0, –5, –11: subtract one more each time
k 0.32, 0.064, 0.012 8: ÷ 5
l 0.1875, 0.093 75, 0.046 875: ÷ 2

4 **a** £290 **b** £490 **c** 6
d Four sessions plus 3 sessions cost 160 + 125 = 285
Seven sessions cost 255, so he would have saved £30

5 The fractions are $\frac{2}{3}$, $\frac{3}{5}$, $\frac{4}{7}$, $\frac{5}{9}$, $\frac{6}{11}$, $\frac{7}{13}$, $\frac{8}{15}$, $\frac{9}{17}$, which as decimals are 0.6666, 0.6, 0.571..., 0.5555, 0.54545..., 0.5384..., 0.53333, 0.529..., so only $\frac{3}{5}$ gives a terminating decimal. The denominators that give terminating decimals are power of 5, i.e. 5, 25, 125, 625, and so on.

13.2 Finding the *n*th term of a linear sequence

HOMEWORK 13B

1 **a** $2n + 3$ **b** $4n – 1$ **c** $5n + 1$
d $6n – 3$ **e** $3n + 1$ **f** $7n – 4$

2 **a** 101 **b** 201 **c** 253
d 296 **e** 152 **f** 345

3 **a** **i** $7n – 2$ **ii** 698 **iii** 103
b **i** $2n + 7$ **ii** 207 **iii** 99
c **i** $5n – 3$ **ii** 497 **iii** 102
d **i** $4n – 2$ **ii** 398 **iii** 98 or 102
e **i** $8n – 3$ **ii** 797 **iii** 101
f **i** $n + 5$ **ii** 105 **iii** 100

4 **a** $\frac{2n+1}{3n+2}$ **b** 0.6, 0.625, 0.636, 0.643

c **i** 0.6656 **ii** 0.667

d 0.667

5 **a** **i** 13 **ii** By adding the 8th and 9th terms

b $4n - 3$

6 **a** $2k + 2$ **b** $2k + 3$ **c** $2k + 4$

d $2k + 5$ **e** £2

7 **a** $2n + 1$ **b** $3n + 4$

c **i** $\frac{2001}{3004}$ **ii** 0.0.666111.

d No, as the bottom has a +4 and the top is only +1 so it will always be less than $\frac{2}{3}$

13.3 Special sequences

HOMEWORK 13C

1 **a** Odd **b** Either **c** Even

d Odd **e** Even **f** Odd

g Even **h** Either

2 **a** 243, 729, 2187

b **i** $3^n - 1$ **ii** 2×3^n

3 **a** The numerical value of the powers is equal to the number of zeros after the decimal point.

b 6

4 **a**

+	Prime	Odd	Even
Prime	Either	Either	Either
Odd	Either	Even	Odd
Even	Either	Odd	Even

b

×	Prime	Odd	Even
Prime	Either	Either	Even
Odd	Either	Odd	Even
Even	Even	Even	Even

5 **a** Student to draw equilateral triangle

b Perimeter is 36 cm

c Perimeter is 48 cm

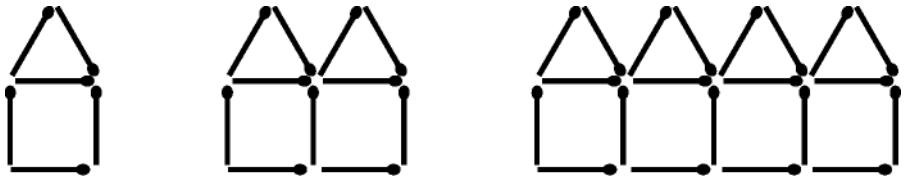
d 64

e When n = 100, P = 6.31 × 10^13 = 63 139 143 790 000 cm or 631 million km

13.4 General rules from given patterns

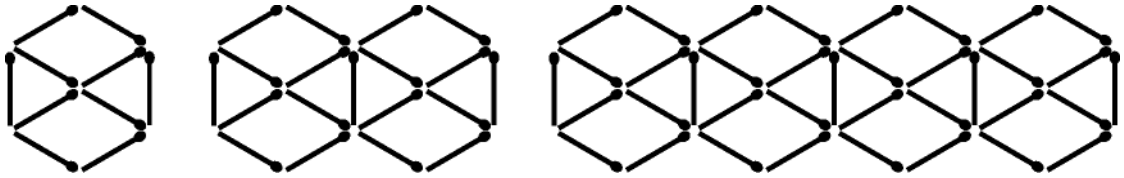
HOMEWORK 13D

1 a



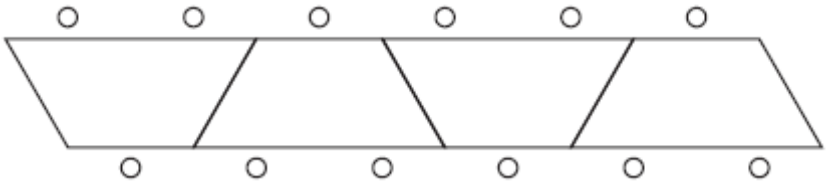
b $5n + 1$ **c** 126 **d** Diagram 39

2 a



b $9n + 1$ **c** 541 **d** 11

3



a 12 **b** $3n$ **c** 17

4 a 14

b i 57 **ii** Add 3 more each time

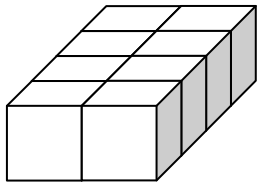
5 a 11, 23, 35 **b** $12n - 1$

Functional Maths Activity

Packaging

First identify the third arrangement. (1 mark) You can do this by drawing or by describing the size of the cuboid.

On the right, is a 1 by 2 by 4 cuboid.



Now work out the amount of string for any of the arrangements, for example, the cuboid.

(1 mark each for working and for correct answer)

Make sure it is clear which shape you are working out the amount of string for.

For the cuboid:

$S = 2 \times 30 + 2 \times 30 + 4 \times 30 + 20 = 260$ cm

Do the same for the two other shapes. (1 mark each)

For the 1 by 1 by 8:

$S = 2 \times 120 + 2 \times 15 + 4 \times 15 + 20 = 350$ cm

For the 1 by 2 by 4:

$S = 2 \times 60 + 2 \times 30 + 4 \times 15 + 20 = 260$ cm

Then write down a conclusion referring to the calculated values. (1 mark)

Masood should pack either as a cube or a 1 by 2 by 4 package, as these both use the same length (260 cm) of string.

14 Algebra: Graphs and their equations

14.1 Linear graphs

HOMEWORK 14A

1 Check student's straight-line graph with end points at: (0, 3) and (5, 13)

2 Check student's straight-line graph with end points at: (0, –1) and (5, 14)

3 Check student's straight-line graph with end points at: (0, –2) and (12, 4)

4 Check student's straight-line graph with end points at: (–2, –3) and (2, 5)

5 Check student's straight-line graph with end points at: (–6, 2) and (6, 8)

6 **a** Check student's straight-line graphs with end points at: (0, –1) and (5, 14), and (0, 3) and (5, 13)

b (4, 11)

7 **a** Check student's straight-line graphs with end points at: (0, –3) and (6, 21), and (0, 2) and (6, 20)

b (5, 17)

8 **a** Check student's straight-line graphs with end points at: (0, 1) and (12, 7), and (0, 2) and (12, 6)

b (6, 4)

9 **a** Check student's straight-line graphs with end points at: (0, 3) and (4, 11), and (0, –1) and (4, 7)

b No, the lines have the same gradient and so are parallel.

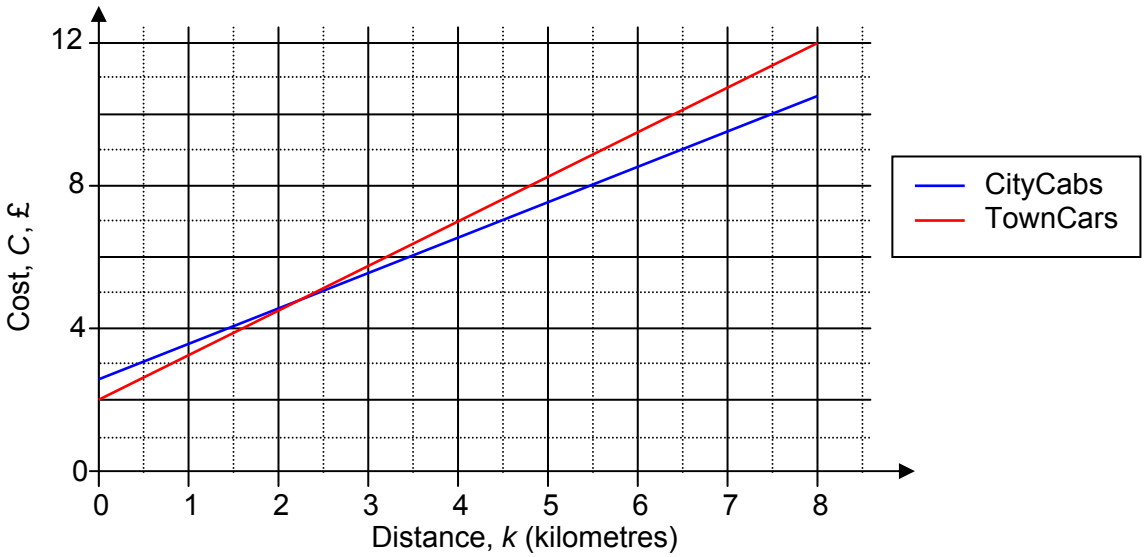
10 **a**

x	0	1	2	3	4	5	6
y	6	5	4	3	2	1	0

b Check student's graph of $x + y = 3$, through (0, 3) and (3, 0).

11 **a**

b 2 kilometres



12 Two lines with a sum or difference ($a \pm b$) of 2, e.g. $y = 1$, $x = 1$, or $x = 3$, $y = 5$.

HOMEWORK 14B

1 **a** 2 **b** –3 **c** $\frac{2}{3}$

d $-\frac{1}{3}$ **e** 4 **f** $-\frac{4}{5}$

g $-\frac{1}{4}$ **h** $\frac{1}{6}$ **i** 7

j –4

2 **a–f** Check student's diagrams.

3 **a** and **b i–viii** Check student's diagrams.

c Check student's descriptions.

4 **a** Approximately 225 feet in 0.6 of a mile (3168 feet), so gradient is about 0.07

b Approximately 500 feet in 0.4 (2112 ft), so gradient is about 0.24

c Category AS; approximately 1000 feet of climbing in 3.1 miles ≈ 312 feet of ascent on average

5 First line has a gradient of 1.2 and second has a gradient of 4.8, so ratio is 1 : 4

6 4 : 5, 5 : 7, 6 : 13, 3 : 7, 1 : 3, 2 : 9

14.2 Drawing graphs by the gradient-intercept method

HOMEWORK 14C

1 **a–l** Check student's diagram(s).

2 **a** **i–ii** Check student's diagram. **b** (–3, –7)

3 **a** Check student's diagram. **b** $(\frac{1}{2}, 2\frac{1}{2})$

4 **a** They have the same gradient: (4)

b They intercept the y-axis at the same point: (0, –3)

c (0, –3)

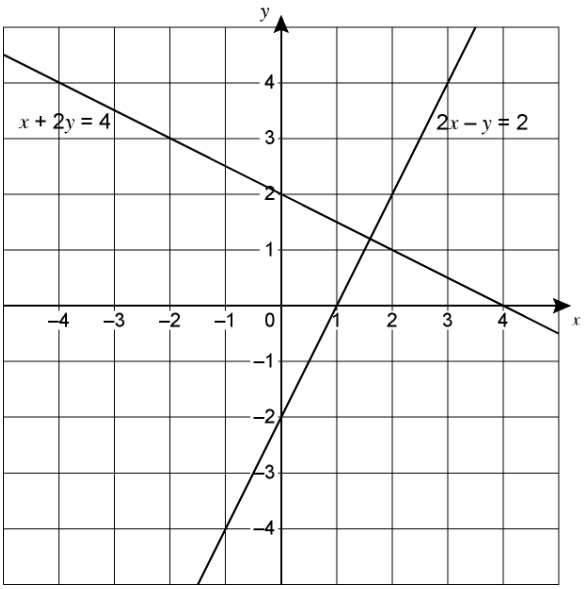
5 **a** –3 **b** $\frac{1}{3}$ **c** 90°

d Negative reciprocal **e** 2

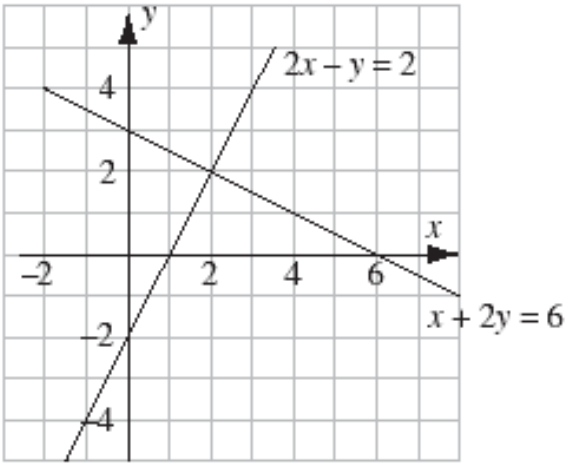
HOMEWORK 14D

1 **a–l** Check student's diagrams.

2 **a** **i–ii** **b** $x = 1.6$, $y = 1.2$



3 The lines cross at: $x = 2$, $y = 2$



4 **a** They both have a y-intercept of 3, so they intersect at: (0, 3)

b They both cross the x-axis (so they intersect) at: (3, 0)

c $a = 3$, $b = -8$, so $3x - 8y = 12$

5 **a** **i** $y = -3$ **ii** $x - y = 4$ **iii** $y = x + 5$

iv $x + y = -5$

b –2

14.3 Finding the equation of a line from its graph

HOMEWORK 14E

1 **a** $y = x + 2$ **b** $y = 3x - 1$ **c** $5y = 2x + 4$

2 **a** **i** $y = x$, $y = -x$ **ii** Reflection in x- and y-axes

b **i** $y = \frac{1}{2}x + 2$, $y = -\frac{1}{2}x + 2$

ii Reflection in y-axis and $y = 2$

c **i** $2y = 5x + 3$, $2y = -5x + 13$

ii Reflection in $x = 1$ and $y = 4$

3 $y = 2x + 4$, $y = 2x - 6$, $y = -\frac{1}{2}x + 4$, $y = -\frac{1}{2}x + \frac{3}{2}$

4 **a** The x-coordinates go $-2 \rightarrow -1 \rightarrow 0$ and y-coordinates go $5 \rightarrow 3 \rightarrow 1$

b The x-step between the points is 1 and the y-step is -2

c $y = -3x + 2$

14.4 Quadratic graphs

HOMEWORK 14F

1 **a**

x	–3	–2	–1	0	1	2	3
$y = 2x^2$	18	8	2	0	2	8	18

b $y = 4$ **c** ±2.2

2 **a**

x	–5	–4	–3	–2	–1	0	1	2	3	4	5
$y = x^2 + 3$	28	19	12	7	4	3	4	7	12	19	28

b $y = 9.2$ or 9.3 **c** ±2.6

3 **a**

x	–3	–2	–1	0	1	2	3	4
$y = x^2 - 3x + 2$	20	12	6	2	0	0	2	6

b 8.75 **c** –0.15, 3.15

4 B and C

14.5 The significant points of a quadratic graph

HOMEWORK 14G

1 **a**

x	–1	0	1	2	3	4	5	6
$y = x^2 - 5x + 4$	10	4	0	–2	–2	0	4	10

b 1, 4

2 **a**

x	–1	0	1	2	3	4	5
$y = x^2 - 3x + 2$	6	2	0	0	2	6	12

b 1, 2

3

x	–5	–4	–3	–2	–1	0	1	2
$y = x^2 + 4x - 6$	–1	–6	–9	–10	–9	–6	–1	6

b 1.15, –5.15

4 **a** (0, 2) **b** (1.5, –0.25)

5 **a** (0, 4) **b** (2.5, –2.25)

6 **a** (–2, –10)

b $(x + 2)^2 – 10 = 0$

c The minimum point is $(–a, –b)$

d (–3, –14)

7 $y = (x – 2)^2 – 6$, $y = x^2 – 4x + 4 – 6$, $y = x^2 – 4x – 2$

Problem-solving Activity

Drawing linear graphs

a–c In all three of these, check student's drawings; the lines are at 90° to one another.

d For each pair of lines, the gradients are reciprocals and of opposite sign.

e The gradients of perpendicular lines are the negative reciprocals of one another.

15 Algebra: Inequalities and regions

15.1 Solving inequalities

HOMEWORK 15A

1 **a** $x < 5$ **b** $t > 8$ **c** $p \geq 8$
d $x < 3$ **e** $y \leq 6$ **f** $t > 9$
g $x < 13$ **h** $y \leq 11$ **i** $t \geq 37$
j $x < 10$ **k** $x \leq 2$ **l** $t \geq \frac{7}{4}$
m $x \geq -6$ **n** $t \leq 4$ **o** $y \leq 6$
p $x \geq \frac{1}{2}$ **q** $w \leq 3.5$ **r** $x \leq \frac{5}{8}$

2 **a** 5, 4, 3, 2, 1 **b** No answer **c** 25, 16, 9, 4, 1
d 5, 3, 1 **e** 7, 5, 3, 2

3 $3x + 3.50 < 6$, $3x < 2.50$; so the most a can could have cost was 83p

4 **a** $2 < x < 3$ **b** $1 < x < 4$ **c** $-2 < x < 4$
d $2 \leq x < \frac{19}{3}$ **e** $3.5 \leq x < 7.5$ **f** $\frac{1}{2} \leq x < 3.75$
g $2 \leq x \leq 4$ **h** $\frac{5}{2} \leq x < 8$ **i** $\frac{4}{5} \leq x < 4.2$

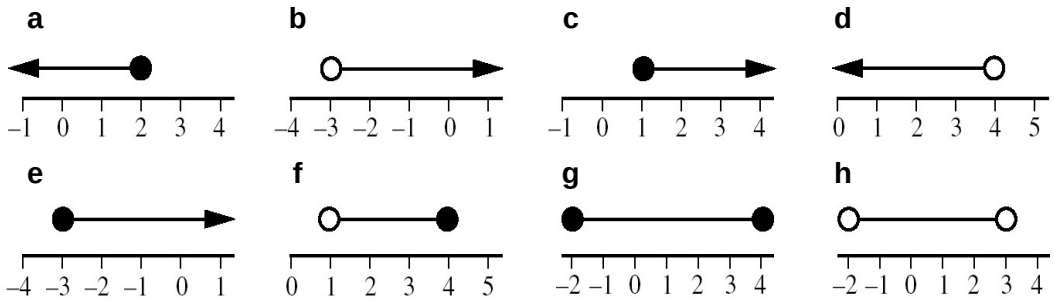
5 $6x - 2 > 10$, so $x > 2$ or $6x - 2 < 16$, so $x < 3$; hence the sides are 2 by 3 or 3 by 5, so the area is between 6 cm^2 and 15 cm^2

6 **a** **i** $x > 0$, $x = 2$, $x < 9$
ii $x = 3$, $x \geq 3$, $x < 2$
b Any value between 3 (inclusive) and 9 (not included)

HOMEWORK 15B

1 Top row from left to right: $x \geq 1$; $x < 2$; $x > -2$
Second row from left to right: $x \leq 0$; $x > -5$; $x \geq -1$

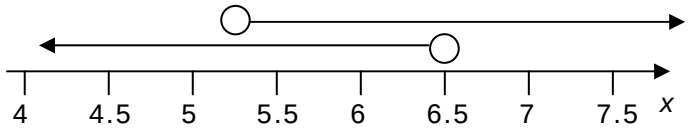
2



3 **a** $x \geq 4$ **b** $x < -2$ **c** $x \leq 5$
d $x > 3$ **e** $x \leq 1.5$ **f** $x \geq 4$
g $x > 7$ **h** $x < -1$ **i** $x < 7$
j $x \leq 3$ **k** $x > 24$ **l** $x \geq -2$

4 **a** Because 2 CDs plus the DVD cost more than £20; $x > 5.25$
b Because 2 CDs plus the lipstick cost less than £20; $x \leq 6.5$

c



d £6

5 Any two inequalities that overlap only on the integers 5, 6, 7 and 8; for example, $x \geq 5$ and $x < 9$

6 Number being described: 3

7 **a** $x > \frac{4}{5}$ **b** $x \leq 3$ **c** $x \geq \frac{19}{4}$

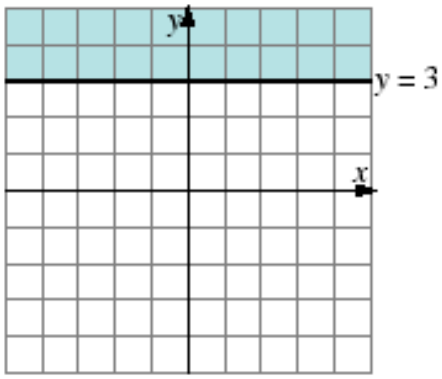
d $x < 6.5$ **e** $x \leq \frac{1}{2}$ **f** $x > -2$

g $x \geq -7$ **h** $x \leq -\frac{2}{5}$

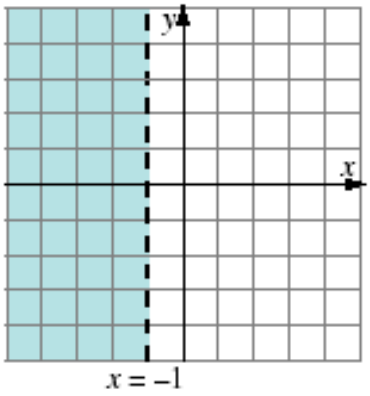
15.2 Graphical inequalities

HOMEWORK 15C

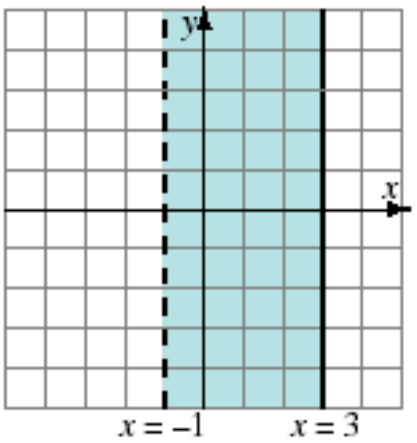
1 **a–b**



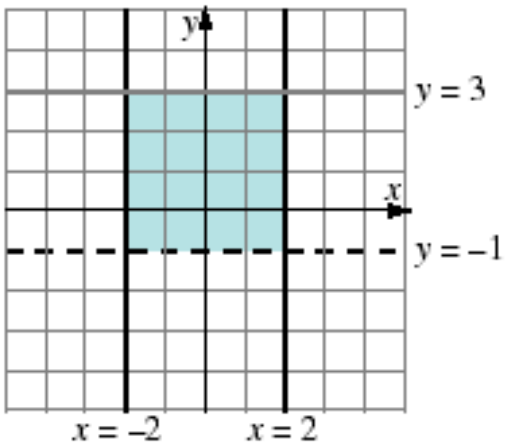
2 **a–b**



3 a–c

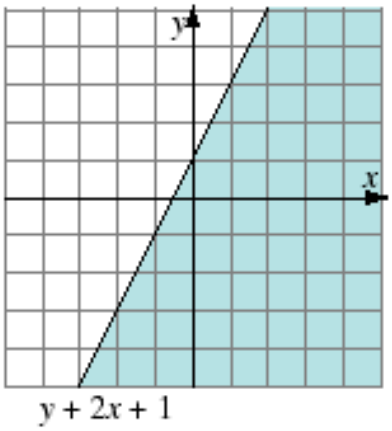


4 a

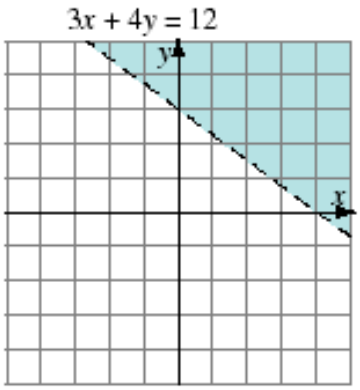


b **i** Yes **ii** Yes **iii** No
iv Yes

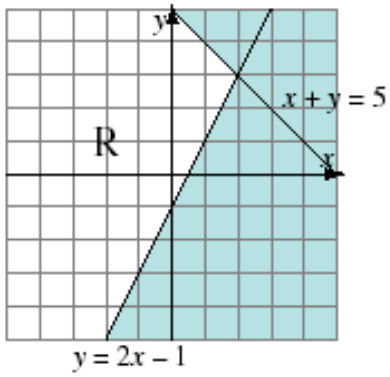
5 a–b



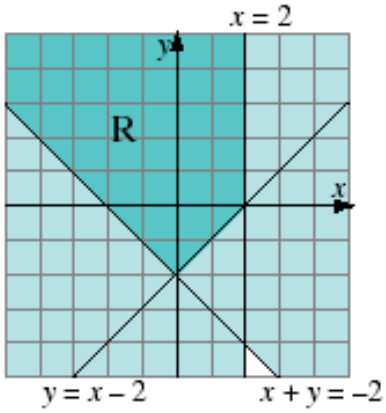
6 a–b



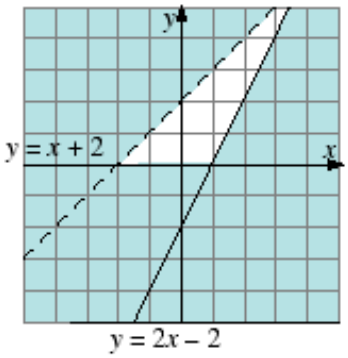
7 a–e



8 a–b

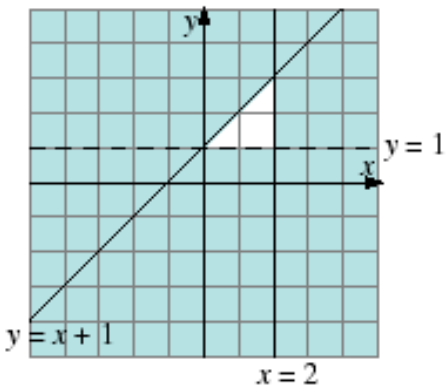


9 a



b **i** No **ii** No **iii** Yes
iv No

10 a



b (1, 2) (2, 2) (2, 3)

11 For example, $y \geq 1$, $x \leq 2$ and $y \leq x$. There are many other valid answers.

12 May be true (M): **a**, **c**, **d**, **g**

False (F): **b**, **e**

Must be true (T): **f**, **h**

Functional Maths Activity

League champions

1 It is likely that w represents the number of wins and d the number of draws.

2 The total number of games cannot be greater than 4, hence $w + d \leq 4$. The number of points must be 8 or more, they score 3 for a win, 1 for a draw, hence $3w + d \geq 8$. The shaded area is the region that satisfies these two inequalities.

3 In four games, they need to score at least 8 points.

4 The team would still need to score at least 8 points, but now they have five games in which to do it.

The inequalities would be $w + d \leq 5$ and $3w + d \geq 8$ (unchanged).

The lines would be draw for the equations $w + d = 5$ – shifted up to go through (0, 5) and (5, 0) and $3w + d = 8$ (unchanged) and the area between them would be shaded.