Exercises in GCSE
Mathematics
Foundation level

Robert Joinson

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Preface

This book covers the GCSE syllabi to be examined for the first time in 2003. It was written with year 11 pupils in mind but can be used in year 10 as part of the course for those pupils intending to do the intermediate papers at the end of year 11.

Some areas have more questions than are needed for some pupils. Exercises on pages 1, 2, 3, 4, 7, 8, 9, 13, 15, 17, 18, 19 and 69, contain lots of questions and are aimed at pupils requiring a great deal of practice. However the questions are graded and it might only be necessary for some students to do the first column and then each row when they begin to have problems. In general questions in the same row tend to be of the same difficulty, whereas the difficulty increases down the page.

All graphs can be accommodated on A4 size graph paper used in 'portrait' mode. The answers to the questions on co-ordinates, nets, reflections, rotations, translations, enlargements and tessellations can be drawn within the size of paper indicated in the question.

I would like to thank my wife Jenny and my daughters Abigail and Hannah for all the help and encouragement they have given me in writing this.

R Joinson   August 2002
                                                                            Chester

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Contents

1. Rounding off and Estimating
Do not use a Calculator

Exercise 1
Round off the following numbers in the way stated
1) 67 to the nearest 10   2) 93 to the nearest 10
3) 141 to the nearest 10   4) 289 to the nearest 10
5) 721 to the nearest 100   6) 473 to the nearest 100
7) 846   a) to the nearest 10 and   b) to the nearest 100
8) 365   a) to the nearest 10 and   b) to the nearest 100
9) 2346   a) to the nearest 100 and   b) to the nearest 1000
10) 5876   a) to the nearest 10,   b) to the nearest 100 and   c) to the nearest 1000

Exercise 2
1) The number of boys in a school is 456 and the number of girls is 512.
    a) Round off both numbers to the nearest 100 and estimate the total number of
       pupils at the school.
    b) Round off both numbers to the nearest 10 and do a similar estimate.

2) A theatre has 37 rows each with 22 seats. The total number of seats is 37×22.
    a) Write down the numbers you would use to get an estimate of the answer.
    b) Calculate this estimate.

3) A CD player costs £167 and a TV costs £280. What simple calculation would you
   do to show that the total cost is less than £500?

4) A jar of jam costs 57p, a tub of margarine costs 48p and a bottle of sauce costs 77p.
   What simple calculation would you do to show that the total cost is less than £2.00?

5) Tickets for a concert cost £5.75 each. A group of 18 people went to the concert.
   What simple calculation would you use to show that the total cost is less than
   £120?

6) I travel 57 miles from home to Birmingham. I then go to my gran's house, a further
   36 miles from Birmingham. What simple calculation must I do to show that I have
   not travelled more than 100 miles?

7) A bus is hired to take a group of pupils on a trip. The bus seats 48 passengers. If the
   cost of each fare is £2.80, show that the total cost for the group is less than £150.

8) A book costs £5.49. If I buy it with a £20 note, do a simple calculation to show that
   my change is less than £15.

9) A case of wine contains 12 bottles. In a store room there are 37 cases.
   Approximately how many bottles is this? Show how you would do this estimate.

Exercise 3
Estimate the value of each of the following. In each case show how it was done.
1) 54×27 2) 34×45 3) 12×63 4) 54×63
5) 86×43 6) 54×25 7) 104×38 8) 163×21
9) 39×123 10) 73×190 11) $203 \div 21$ 12) $120 \div 19$
13) $164 \div 22$ 14) $235 \div 24$ 15) $582 \div 27$ 16) $810 \div 21$
17) $983 \div 47$ 18) $1573 \div 42$ 19) $2056 \div 52$ 20) $2764 \div 68$
21) $\dfrac{32 \times 43}{6}$ 22) $\dfrac{21 \times 43}{8}$ 23) $\dfrac{52 \times 63}{5}$ 24) $\dfrac{32 \times 43}{19}$
25) $\dfrac{321 \times 4}{31}$ 26) $\dfrac{396 \times 23}{41}$ 27) $\dfrac{571 \times 33}{57}$ 28) $\dfrac{321 \times 43}{61}$

2. Reading and Writing Whole Numbers

Exercise 1
Write in words the following numbers
  1) 106   2) 214   3) 356   4) 597   5) 893
  6) 1342   7) 4327   8) 5302   9) 7102   10) 8073
11) 11,345   12) 14,536   13) 27,356   14) 54,362   15) 73,002
16) 163,765   17) 374,305 18) 340,000 19) 543,009 20) 600,087
21) 6,000,000 22) 4,762,800 23) 5,700,345 24) 4,000,764 25) 7,100,067

Exercise 2
Write in number form the following
  1) One hundred and fifty six   2) Seven hundred and six
  3) Four hundred and seven   4) Six hundred and seventy
  5) Three thousand   6) Four thousand three hundred and sixty seven
  7) Two thousand and eighty   8) Six thousand and six
  9) Five thousand and sixty seven 10) Nine thousand, nine hundred and ninety
11) Twenty seven thousand   12) Forty thousand
13) Sixty three thousand and five   14) Eighty seven thousand, five hundred
15) Seventy seven thousand, four hundred and twenty two
16) Eighteen thousand nine hundred and fifty seven
17) Two hundred thousand
18) One hundred and sixty seven thousand
19) Three hundred and twenty four thousand, five hundred and fifty six
20) Seven hundred and fifty four thousand and seventy two
21) Three million
22) Four million, nine hundred thousand
23) Seven million, one hundred and sixteen thousand, nine hundred and fifty six
24) Six million, fourteen thousand, nine hundred and fifty seven
25) Eight million, seven hundred and fifty three thousand and two

Exercise 3
  1) Add together one thousand six hundred and four, and seventy nine.
  2) Add together seven hundred and sixty three and three hundred and twenty seven.
  3) What is one hundred and forty seven add eighty four?
  4) Subtract seventy six from one hundred and fifty two.
  5) What is the answer when fifty four is taken away from one hundred and five?
  6) What is the difference between fifty nine and two hundred?
  7) Calculate the sum of one hundred and two, three hundred and seventeen and four
     hundred and thirty seven.
  8) Add together two thousand and sixty eight and one hundred and seventy one.
  9) What is seventy one subtracted from one hundred and fifty?
10) What is three hundred and forty subtract ninety two?

Exercise 4
Write down each answer in words.
  1) What is the value of the 5 in the number 354?
  2) What is the value of the 7 in the number 1734?
  3) What is the value of the 3 in the number 3256?
  4) What is the value of the 2 in the number 1852?
  5) What is the value of the 1 in the number 17,450?
  6) What is the value of the 6 in the number 16,802?
  7) What is the value of the 9 in the number 394,145?
  8) What is the value of the 3 in the number 3,654,990?
  9) What in the value of the 8 in the number 5,835,000?
10) What is the value of the 7 in the number 6,670,000?

3. Fractions, Decimals and Percentages (1)
Do not use a Calculator

Exercise 1
Change into decimals (correct to 4 decimal places where necessary)

1) $\dfrac{3}{4}$ 2) $\dfrac{5}{8}$ 3) $\dfrac{2}{5}$ 4) $\dfrac{3}{8}$ 5) $\dfrac{5}{12}$ 6) $\dfrac{7}{20}$

7) $\dfrac{8}{15}$ 8) $\dfrac{7}{25}$ 9) $\dfrac{3}{13}$ 10) $\dfrac{4}{27}$ 11) $\dfrac{14}{25}$ 12) $\dfrac{8}{30}$

13) $\dfrac{11}{20}$ 14) $\dfrac{3}{7}$ 15) $\dfrac{5}{9}$ 16) $\dfrac{7}{16}$ 17) $\dfrac{8}{23}$ 18) $\dfrac{9}{16}$

Exercise 2
Change these decimals into percentages
1) 0.26   2) 0.34   3) 0.72   4) 0.87   5) 0.64   6) 0.35
7) 0.42   8) 0.961   9) 0.432   10) 0.614   11) 0.584   12) 0.826
13) 0.932   14) 0.3   15) 0.6   16) 1.9   17) 2.38   18) 6.41

Exercise 3
Change into percentages correct to 4 significant figures

1) $\dfrac{4}{5}$ 2) $\dfrac{8}{10}$ 3) $\dfrac{7}{15}$ 4) $\dfrac{3}{20}$ 5) $\dfrac{9}{16}$ 6) $\dfrac{5}{14}$

7) $\dfrac{10}{23}$ 8) $\dfrac{24}{50}$ 9) $\dfrac{18}{35}$ 10) $\dfrac{12}{37}$ 11) $\dfrac{25}{40}$ 12) $\dfrac{15}{32}$

13) $\dfrac{18}{26}$ 14) $\dfrac{27}{34}$ 15) $\dfrac{81}{94}$ 16) $\dfrac{41}{56}$ 17) $\dfrac{81}{156}$ 18) $\dfrac{57}{96}$

Exercise 4
Compare each of the following sets of numbers by first changing them into percentages. Write them down in order of size, smallest to largest.

1) $\dfrac{1}{4}$ 0.2   23%   2) $\dfrac{3}{8}$ 0.41   36%

3) $\dfrac{7}{8}$ 0.8   87%   4) $\dfrac{5}{16}$ 0.3   31%

5) $\dfrac{3}{20}$ 0.14   10%   6) $\dfrac{7}{16}$ 0.47   43.7%

7) $\dfrac{8}{23}$ 0.35   30%   8) $\dfrac{9}{17}$ 0.47   47.3%

9) $\dfrac{6}{28}$ 0.2   21%   10) $\dfrac{8}{31}$ 0.25   25.6%

Exercise 5
Copy each of the following diagrams into your book. Mark on them the approximate positions of the required numbers

1)   0 _____ 1

    a) 0.8   b) 30%   c) $\dfrac{3}{5}$

2)   0 _____ 1

    a) 75%   b) 0.16   c) $\dfrac{7}{8}$

3)   0 _____ 1

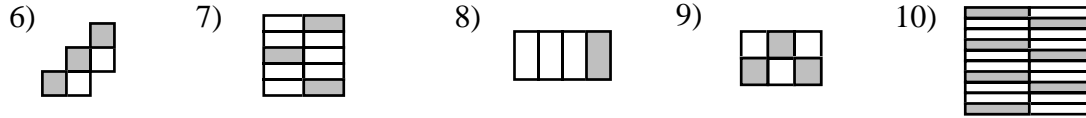   a) $\dfrac{1}{3}$ b) 15%   c) 0.543

4. Fractions, Decimals and Percentages (2)

Exercise 1
What fraction of the following shapes have been shaded in?
1) 2) 3) 4) 5)

What percentage of the following shapes have been shaded in?
6) 7) 8) 9) 10)

Exercise 2
Calculate

1) $\frac{3}{4}$ of 20

2) $\frac{3}{4}$ of 204

3) $\frac{7}{8}$ of £90

4) $\frac{5}{8}$ of £1.68

5) $\frac{5}{8}$ of 20 metres

6) $\frac{3}{4}$ of $12\frac{1}{2}$ metres

7) $\frac{5}{12}$ of £75

8) $\frac{7}{16}$ of 84 m

9) $\frac{7}{30}$ of £66

10) $\frac{9}{16}$ of 4.4 metres

11) $\frac{7}{8}$ of £44

12) $\frac{3}{10}$ of 7.7 m

Exercise 3
Calculate
1) 37% of 600

2) 24% of 50

3) 36% of 950

4) 41% of 500

5) 15% of £6

6) 40% of £1.50

7) 60% of £19

8) 17% of 8 metres

9) 24% of £9

10) 72% of £4.50

11) 52% of £16.50

12) 93% of 1200

Exercise 4
Change these marks into percentages. (Give your answer correct to the nearest whole number)

1) 24 out of 50

2) 38 out of 60

3) 27 out of 40

4) 37 out of 80

5) 56 out of 90

6) 97 out of 150

7) 43 out of 200

8) 63 out of 70

9) 84 out of 120

10) 156 out of 250

11) 17 out of 20

12) 76 out of 110

13) 43 out of 76

14) 58 out of 95

15) 62 out of 68

16) 27 out of 45

Exercise 5
1) A car travels to London, a distance of 200 miles. 60 miles of this is on the motorway. What fraction of the whole journey is on the motorway?
2) A cake weighs 800 grams. If 450 grams of this is flour, what fraction of the cake is flour?
3) David earns £200 a week. He pays £60 in tax. What fraction of his wages does he pay in tax and what is this as a percentage?
4) $\frac{2}{5}$ of the cost of a washing machine goes to the manufacturer. If a washing machine costs £250, how much does the manufacturer get?
5) Jack earns £200. If 15% of this is tax, how much tax does he pay?

5. Fractions, Decimals and Percentages (3)

1) Liam earns £120 per week. If he gets a rise of 10%, what is his new wage?

2) A fridge normally costs £180. In a sale its price is reduced by $\frac{1}{5}$. What is its new price?

3) A house was on sale for £60,000. The owner decided to lower its price by 7%. What is the new price?

4) The basic model of a car will travel 40 miles on a gallon of petrol. The de luxe version will travel $\frac{1}{8}$ further. How far will the de luxe car travel on a gallon of petrol?

5) Due to the bad summer weather, a farmer says that her potato crop will be $\frac{2}{5}$ lower than last year. She harvested 55 tonnes last year. What will it be this year?

6) It is expected that the number of new pupils at Clintster Community College will be 15% up on last year. 180 pupils started last year. How many are expected this year?

7) Sales of a magazine were 30,000 last week. They are expected to be $\frac{1}{4}$ higher this week. Approximately how many will be sold?

8) Packets of seeds normally contain 60 seeds. The new packets say '$\frac{2}{3}$ extra free' on them. How many will now be in each packet?

9) The population of a town was 56,000 last year. It is expected to increase by 6% this year. What will the new population be?

10) 20% of a box of oranges are unfit to be sold. If the box contains 150 oranges, how many will be sold?

11) VAT (value added tax) of 6% is added to an electricity bill. How much is the total bill when £60 of electricity is used?

12) VAT is added onto the cost of work done by a plumber at a rate of $17\frac{1}{2}$%. What is the total bill for £40 of work?

13) A solid bar of metal is cut into the shape of a tube. In doing this the bar loses $\frac{5}{9}$ of its weight. What will the tube weigh if the bar weighed 720 grammes?

14) In a sale the price of a shirt was reduced by $\frac{1}{3}$. If its original price was £12.60, what was its new price?

15) VAT of $17\frac{1}{2}$% is added to the price of a computer. If its original price was £725 calculate the price, including tax, correct to the nearest penny.

16) The height of a plant is 15cm on Monday. By Friday it has increased in height by $\frac{7}{10}$. What is its new height?

17) The telephone company says that my bill will go down by $\frac{3}{20}$ if I subscribe to their new system. What will my next bill be if my last one was £34.56, correct to the nearest penny?

6. Ordering Directed Numbers

Exercise 1

1) Copy the number line below and mark on the numbers
   20, –10, –30, 12, –5, 5, –28, –13

|———|———————|———————|———————|———————|———————|———————|
           –20   0
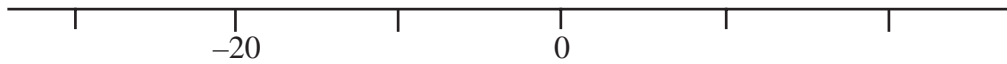
2) Copy the number line below and mark on the numbers
   –1, 1.6, $-\frac{1}{2}$, 2, $1\frac{3}{4}$, –2.9, $-1\frac{3}{4}$

|———|———————|———————|———————|———————|———————|———————|
            –2   0

3) Write down the following numbers in order of size, lowest first
   –6, 5, 26, –13, 1, –1, 0, and –12

4) Write down the following numbers in order of size, lowest first
   –1.3, 1.8, $-\frac{1}{2}$, 2, –6, $2\frac{3}{4}$, 0, 3.1, $-4\frac{1}{4}$

Exercise 2

Calculate the final temperature, if

1) 5^0C increases by 9^0C

2) 5^0C falls by 3^0C

3) 12^0C falls by 15^0C

4) -2^0C increases by 4^0C

5) -5^0C falls by 8^0C

6) 9^0C falls by 4^0C

7) -8^0C falls by 12^0C

8) -4^0C increases by 2^0C

9) 8^0C falls by 12^0C

10) -6^0C falls by 5^0C

Exercise 3

What is the change in temperature between each of the following?

1) 3^0C and 7^0C

2) 17^0C and 23^0C

3) -5^0C and 4^0C

4) -7^0C and 2^0C

5) -6^0C and -3^0C

6) -7^0C and 0^0C

7) 5^0C and 2^0C

8) 7^0C and -2^0C

9) 5^0C and -3^0C

10) -2^0C and -7^0C

Exercise 4

1) The table shows the temperatures at 4 towns in the United Kingdom on one day

	Perth	Llandudno	Norwich	Belfast
Midday	3	5	6	2
Midnight	–7	1	0	–1

   a) Which place had the lowest midday temperature?
   b) Which place had the lowest midnight temperature?
   c) Which place had the biggest change in temperature and by how much?
   d) Which place had the least drop in temperature and by how much?

2) At midnight the temperature was -10^0C. At midday it had risen to 2^0C. What was the change in temperature?

3) If the temperature falls from 5^0C to -7^0C, what is the change in temperature?

4) In a quiz, competitors get 2 marks for every correct answer, –1 for not answering and –2 for every incorrect answer. If three teams were given 20 questions each, calculate their scores and decide which team won. Team A answered 10 correct, 6 incorrect and failed to answer 4. Team B answered 11 correct and 9 incorrect. Team C answered 11 correct, 7 incorrect and failed to answer 2.

7. Multiplying and Dividing by 10, 100 etc.
Do not use a Calculator

Exercise 1
Write down the answer to each of the following

1) 6×10	2) 17×10	3) 36×10	4) 124×10
5) 674×10	6) 4×100	7) 25×100	8) 142×100
9) 362×100	10) 760×100	11) 7×1000	12) 38×1000
13) 97×1000	14) 270×1000	15) $38 \times 10{,}000$	16) $420 \times 10{,}000$
17) $70 \div 10$	18) $400 \div 10$	19) $920 \div 10$	20) $2100 \div 10$
21) $300 \div 100$	22) $4000 \div 100$	23) $8200 \div 100$	24) $10{,}000 \div 100$
25) $6000 \div 1000$	26) $16{,}000 \div 1000$	27) $20{,}000 \div 1000$	28) $37{,}000 \div 1000$

Exercise 2
Write down the answer to each of the following

1) 1.3×10	2) 7.4×10	3) 12.2×10	4) 27.6×10
5) 2.87×10	6) 5.38×10	7) 72.64×10	8) 123.67×10
9) 3.47×100	10) 7.50×100	11) 16.48×100	12) 128.37×100
13) 4.6×100	14) 18.5×100	15) 173.6×100	16) 872.4×100
17) 2.532×1000	18) 12.673×1000	19) 2.46×1000	20) 341.4×1000
21) 0.3×10	22) 0.456×10	23) 0.02×10	24) 0.0074×10
25) 0.5×100	26) 0.19×100	27) 0.937×100	28) 0.002×100
29) 0.023×1000	30) 0.37×1000	31) 0.4×1000	32) 0.0532×1000

Exercise 3
Write down the answer to each of the following

1) $2 \div 10$	2) $2.7 \div 10$	3) $17 \div 10$	4) $153 \div 10$
5) $6.34 \div 10$	6) $0.34 \div 10$	7) $0.056 \div 10$	8) $0.002 \div 10$
9) $2.43 \div 100$	10) $48.4 \div 100$	11) $327 \div 100$	12) $1870 \div 100$
13) $0.367 \div 100$	14) $0.67 \div 100$	15) $0.0183 \div 100$	16) $0.5 \div 100$
17) $6 \div 1000$	18) $16 \div 1000$	19) $2.6 \div 1000$	20) $27.45 \div 1000$
21) $0.3765 \div 1000$	22) $0.0254 \div 1000$	23) $0.034 \div 1000$	24) $0.03 \div 1000$

Exercise 4
1) What must 238 be multiplied by to get 23800?
2) What must 14.6 be multiplied by to get 14600?
3) What must 0.034 be multiplied by to get 34?
4) What must 736 be divided by to get 7.36?
5) What must 6 be divided by to get 0.006?
6) What must 0.087 be divided by to get 0.00087?
7) If 12 is multiplied by 1000 what is the value of the 2 in the answer?
8) If 0.389 is multiplied by 1000, what is the value of the 8 in the answer?
9) If 23 is divided by 100, what is the value of the 3 in the answer?
10) If 0.27 is divided by 100, what is the value of the 7 in the answer?

8. Multiplication and Division
Do not use a Calculator

Exercise 1
Short division with or without remainders

1) $57 \div 7$ 2) $83 \div 6$ 3) $94 \div 8$ 4) $106 \div 4$

5) $183 \div 9$ 6) $401 \div 6$ 7) $372 \div 3$ 8) $861 \div 7$

9) $974 \div 5$ 10) $462 \div 8$ 11) $341 \div 9$ 12) $576 \div 6$

Exercise 2
Long division with or without remainders

1) $87 \div 17$ 2) $96 \div 23$ 3) $84 \div 11$ 4) $143 \div 34$

5) $176 \div 26$ 6) $541 \div 67$ 7) $341 \div 44$ 8) $183 \div 14$

9) $196 \div 16$ 10) $215 \div 18$ 11) $326 \div 24$ 12) $184 \div 17$

13) $285 \div 22$ 14) $497 \div 31$ 15) $567 \div 34$ 16) $674 \div 23$

17) $841 \div 21$ 18) $456 \div 27$ 19) $845 \div 42$ 20) $956 \div 51$

Exercise 3
Division without remainders (answer in decimal form)

1) $15.0 \div 2$ 2) $25.0 \div 4$ 3) $58 \div 8$ 4) $34 \div 5$

5) $30 \div 4$ 6) $93 \div 6$ 7) $188 \div 8$ 8) $90 \div 8$

9) $81 \div 4$ 10) $273 \div 6$ 11) $27.6 \div 5$ 12) $210 \div 8$

13) $145 \div 4$ 14) $238 \div 8$ 15) $214 \div 4$ 16) $156 \div 8$

17) $14.7 \div 5$ 18) $50.4 \div 5$ 19) $58.8 \div 7$ 20) $583 \div 4$

Exercise 4
Long multiplication

1) 27×32 2) 84×19 3) 26×47 4) 33×34 5) 86×54

6) 121×17 7) 216×27 8) 143×34 9) 256×47 10) 354×3

11) 374×63 12) 542×73 13) 431×86 14) 853×64 15) 427×27

16) 862×73 17) 491×93 18) 354×76 19) 529×69 20) 592×74

9. Use of the Calculator

Exercise 1
Calculate each of the following pairs of problems. Predict the answers before you do them.

1) $4 + 8 \div 4$ and $(4 + 8) \div 4$
2) $3 + 5 \times 4$ and $(3 + 5) \times 4$
3) $18 - 2 \times 3$ and $(18 - 2) \times 3$
4) $30 - 6 \div 2$ and $(30 - 6) \div 2$
5) $16 \div 4 + 4$ and $16 \div (4 + 4)$
6) $40 \div 8 + 2$ and $40 \div (8 + 2)$
7) $6 \times 4 + 2$ and $6 \times (4 + 2)$

Exercise 2 (give your answer correct to 1 decimal place in each case)

1) 0.34×0.54 2) 4.2×6.2 3) 15×3.67 4) 5.6×2.7

5) $45 \div 13$ 6) $12 \div 5$ 7) $17.6 \div 3.1$ 8) $85 \div 27$

9) $3.54^2 + 5.46$ 10) $4.17^2 + 13.4$ 11) $8.3^2 - 19.7$ 12) $3.56^2 - 9.43$

13) $4.11^2 + 5.39$ 14) $5.32^2 + 12.1$ 15) $6.7^2 - 23.4$ 16) $5.92^2 - 12.76$

17) $\sqrt{35.41} - 3.62$ 18) $\sqrt{18.45} + 12.6$ 19) $\sqrt{23.7} - 3.5$ 20) $\sqrt{48.4} + 3.75$

21) $\sqrt{43.12} - 4.75$ 22) $\sqrt{24.6} + 15.8$ 23) $\sqrt{37.1} - 5.21$ 24) $\sqrt{77.7} + 5.87$

25) $3.54 + 4.26 - 3.87$ 26) $13.3 - 5.78 + 4.89$ 27) $8.88 + 4.32 - 6.853$

28) $13.44 - 4.76 + 4.56$ 29) $22.3 + 5.99 + 3.66$ 30) $14.54 + 5.33 - 8.54$

31) $\sqrt{45} - 5.36 + 2.45^2$ 32) $6.49^2 - \sqrt{17.3} + 6.86$ 33) $\sqrt{78} + \sqrt{23} - 2.35^2$

34) $\sqrt{67} - 6.67 + 1.95^2$ 35) $7.77^2 + \sqrt{22.1} - 5.87$ 36) $\sqrt{96} + 33 + 6.73^2$

Exercise 3
Use your calculator to change these fractions into decimals. Give each answer correct to 2 decimal places.

1) $\frac{1}{4} + \frac{3}{5}$ 2) $\frac{1}{7} + \frac{1}{9}$ 3) $\frac{2}{3} + \frac{3}{5}$ 4) $\frac{3}{7} + \frac{1}{4}$

5) $\frac{3}{8} + \frac{5}{7}$ 6) $\frac{5}{6} - \frac{1}{4}$ 7) $\frac{1}{12} - \frac{1}{21}$ 8) $\frac{1}{8} - \frac{1}{17}$

9) $\frac{3}{7} + \frac{5}{8}$ 10) $\frac{1}{6} - \frac{1}{12}$ 11) $\frac{1}{13} - \frac{1}{33}$ 12) $\frac{1}{9} - \frac{1}{20}$

13) $\frac{3}{11} - \frac{5}{23}$ 14) $\frac{7}{15} - \frac{5}{21}$ 15) $3\frac{1}{4} + 2\frac{2}{3}$ 16) $4\frac{1}{7} + 3\frac{1}{6}$

17) $5\frac{2}{3} + 1\frac{1}{5}$ 18) $3\frac{4}{5} + 5\frac{1}{4}$ 19) $2\frac{3}{8} + 5\frac{5}{7}$ 20) $3\frac{5}{6} - 2\frac{1}{3}$

21) $4\frac{1}{12} - 3\frac{3}{16}$ 22) $5\frac{1}{8} - 3\frac{3}{13}$ 23) $4\frac{3}{8} - 2\frac{7}{13}$ 24) $5\frac{5}{13} - 3\frac{3}{17}$

10. Types of Numbers

Exercise 1

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50

From the list of numbers above, write down
   1) The square of 5   2) The square root of 49
   3) The largest prime number   4) A multiple of 9 greater than 40
   5) An even prime number   6) All the factors of 48
   7) All the cubic numbers   8) A square, even number
   9) A number which has 8 and 3 as two of its factors.
10) A number which has exactly 3 factors.

Exercise 2
Fill in the spaces in each of the following statements. Use a word from this list each time.

square root, square, prime, multiples, factors, prime, factors, not, cube root, cube, square, even, square.

   1) The .... of 21 are 1,3,7 and 21.
   2) The ...... of 11 is 121.
   3) 15, 20, 25, and 30 are all .... of 5.
   4) 1, 4, 9, 16, 25 are ...... numbers.
   5) 2 is both the smallest ..... number and the smallest .... number.
   6) The ..... numbers between 30 and 40 are 31 and 37.
   7) 64 is the ...... of 8 and the .... of 4.
   8) The .... of 49 is three less than the .... of 1000.
   9) 16 and 32 are both .... of 64.
10) 1 is ... a prime number.

Exercise 3
Without using a calculator, find the answer to each of these.
   1) $\sqrt{64}$ 2) 4^2 3) 5^3
   4) $3^2 + 2^3$ 5) $\sqrt{49} - \sqrt{16}$ 6) $\sqrt{81} \times \sqrt{100}$
   7) $3^2 \times \sqrt{36}$ 8) $\sqrt{64} \div \sqrt{16}$ 9) $8^2 \div 4^2$
10) $5^3 \div 5^2$ 11) $5^3 - 4^3$ 12) $11^2 - \sqrt{144}$

Exercise 4
Each of the following statements are <u>un</u>true. Explain why in each case.
   1) 5 is a factor of 21.   2) 27 is a multiple of 17.
   3) 44 is a prime number.   4) 60 is a square number.
   5) $5^3 = 15$.   6) The square root of 39 is 9.
   7) There is only one prime number between 40 and 50.
   8) 9 is both a square number and a prime number.
   9) 1 is not a factor of 100.
10) All prime numbers are odd.

11. Personal and Household Finance

1) On a market stall, apples are sold at 8 for £1.12. On another stall the same apples are sold at 12 for £1.92. Which stall is selling them cheapest?

2) David's bill at the grocery shop was
   Cat food 98p   6 eggs 80p   Margarine 62p   Milk 77p
   a) What was his total bill?   b) What was his change from a £5 note?

3) Sarah goes to the post office to buy as many stamps as she can for £5. She buys stamps costing 26p each. She uses a £5 note. How many does she buy and how much money is left over?

4) Craig goes to a cafe with his mum, dad and sister. This is what they buy
   2 cups of coffee at 63p each   4 sandwiches at 97p each   2 colas at 53p each.
   a) What was their total bill?   b) What was their change out of a £10 note?

5) A CD player costs £35 deposit and 12 monthly instalments of £7.45. What is its total cost?

6) Karl gets £4.50 pocket money per week. He also does a paper round for which he gets paid £9.50 per week. He saves all his money each week in order to buy a camera. If the camera costs £150, for how many weeks will he have to save?

7) Shirts are sold at £9.50 each or 3 for £25. How much is saved by buying 3 shirts?

8) For her small business, Jill bought a computer for £599.95, a printer for £149.95 and a scanner for £199.95. What was her total bill?

9) Daniel's mum bought packets of balloons for his birthday party. They cost 49p a packet. What is the most number of packets she could buy for £5? How much change did she get?

10) Mrs Brown's electricity bill showed that she used 1328 units. The cost of her bill was made up of a standing charge of £8.47 and the units at 7p each. What was her total bill?

11) A TV costs £105 deposit and 20 weekly payments of £5.37. What is the total cost?

12) CD's cost £2.99 each or 4 for £10. How much money is saved by buying 4?

13) Sarah is making a shelf for her bedroom. She needs 3 brackets costing 55p each, a packet of screws for 95p and a piece of wood for £3.30. What is the total cost of the shelf. What is her change from a £10 note?

14) Jack buys petrol for his car. It costs 67p per litre. If he buys £10 worth, how many litres does he get?

15) A gas bill shows the following information

Present meter reading	0964	
Previous meter reading	0872	
Units used	....	
Cost of each unit	41p	
Cost of units used		....
Standing charge		£8.12
Total cost of bill		....

   Complete the bill by filling in the blanks.

16) Mr Brown's council tax bill for the year is £784.80. He pays in 12 equal monthly instalments. How much per month will he pay?

17) Gail and her family go to town on the train. Tickets cost £3.35 single or £5.45 return for an adult and £1.95 single or £3.35 return for a child. There is one adult and 3 children in the family. How much money is saved by buying return tickets?

18) David buys 21p stamps and 28p stamps from the post office, with a £5 note. If he buys 14 stamps at 21p, how many stamps at 28p can he buy?

19) Cinema tickets normally cost £4.20, but are £2.80 before 5.00pm. How much is saved if a group of 6 people go before 5.00pm?
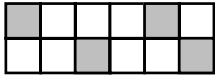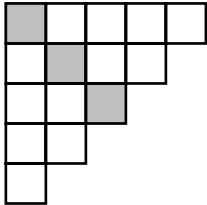
12. Ratio and Proportion

Exercise 1
Divide each of the following into the ratios given.

1) £900 into the ratio 4:5
2) £1000 into the ratio 3:7
3) £200 into the ratio 3:5
4) £600 into the ratio 7:8
5) £1200 into the ratio 5:7
6) £750 into the ratio 7:3
7) £800 into the ratio 5:11
8) £700 into the ratio 5:9
9) £630 into the ratio 7:11
10) £1265 into the ratio 9:14
11) £2205 into the ratio 8:13
12) £1170 into the ratio 4:5
13) £120 into the ratio 7:3:2
14) £450 into the ratio 5:6:7
15) £550 into the ratio 5:8:9
16) £13.86 into the ratio 3:7:11

Exercise 2
1) Peter and Ann win £600 on the lottery. They decide to share it in the ratio 3:2. How much will each receive?
2) A length of electric wire measuring 100 metres is cut into two pieces in the ratio 3:7. How long is each piece?
3) The ratio of squares shaded in to those not shaded in is 1:2. How many more need to be shaded to make the ratio 2:1?

4) Liam makes some chocolate buns. The recipe below will make 8 buns.
> 50 g of butter
> 150 ml of water
> 60g of flour
> 6 eggs
> 170g chocolate

   a) Liam wants to make 12 buns. How much of each ingredient will he need?
   b) Last week Liam's mum made 30 buns. How much of each ingredient did she use?
5) An amount of money was shared between two brothers in the ratio 5:4. The first brother got £200. a) How much did the second brother get? b) How much money was there altogether?
6) In a school there are 950 pupils. The ratio of boys to girls is 13:12. How many boys and how many girls are in the school?
7) A newsagent knows that for every 5 copies of a gardening magazine she sells she also sells 8 copies of a TV magazine. If she sells 100 gardening magazines, how many TV magazines does she sell?

8) The ratio of shaded squares to unshaded squares in this diagram is 1:4. How many more squares need to be shaded to make the ratio 2:1?

9) 15 shortbread biscuits can be made from the following recipe
> 105g of butter
> 45g caster sugar
> 180g plain flour

   Re-write the recipe for 25 biscuits.
10) An alloy is made of copper, tin and lead in the ratio 12:5:3. Calculate how much of each metal is in 800g of the alloy.
11) Three friends buy 6 lottery tickets between them. Ann pays £3, Beverley pays £2 and Carol pays £1. They agree to share their winnings in the ratio of their stakes. If they win £24,000 how much do they each get?

13. Fractions, Decimals and Percentages (4)

Exercise 1
Find the selling price for each of these.

	Buying price	
1)	£100	17% profit
2)	£200	21% profit
3)	£150	20% profit
4)	£2000	15% profit
5)	£4200	32% profit
6)	£200	$7\frac{1}{2}$% loss
7)	£70	25% loss
8)	£49,000	15% loss
9)	£80	27% loss
10)	£450	22% loss

Exercise 2
Find the percentage profit on each of the following, correct to the nearest whole number.

	Buying price	Selling price
1)	£100	£120
2)	£50	£80
3)	£60	£80
4)	£1.50	£1.80
5)	£2.80	£3.10
6)	£1,500	£1,700
7)	£45,000	£47,000
8)	£42.50	£45.00
9)	£900	£950
10)	£2010	£2500

Exercise 3
Find the simple interest on each of the following. Wherever necessary give your answer correct to the nearest penny.
 1) £100 invested for 2 years at 2% interest per annum.
 2) £150 invested for 2 years at 12% interest per annum.
 3) £500 invested for 3 years at 9% interest per annum.
 4) £1000 invested for 4 years at 10% interest per annum.
 5) £1500 invested for 3 years at 7% interest per annum.
 6) £2000 invested for 3 years at 4% interest per annum.
 7) £5200 invested for 4 years at 5% interest per annum.
 8) £120 invested for 2 years at 7% interest per annum.
 9) £550 invested for 3 years at 8% interest per annum.
10) £2100 invested for 4 years at 6% interest per annum.

14. Tables

1) The timetable below shows when the bus leaves the Town Hall and arrives at Apple Way.

Town Hall	0730	0800	0815	0830	0845	0900	Then every 30 minutes until	1800	1900
Apple Way	0752	0822	0837	0852	0907	0922		1822	1922

  a) At what time does the 0815 from the Town Hall arrive at Apple Way?
  b) At what time will the 0930 from the Town Hall arrive at Apple Way?
  c) How long does the 1200 from the Town Hall take to get to Apple Way?
  d) If the 1630 from the Town Hall is late by 16 minutes because of a traffic hold up, at what time will it arrive at Apple Way?

2) The table shows the cost of a 1 week holiday in New York.

Accomodation	2 star	3 star	4 star	5 star
20 Mar-30 Apr	649	689	799	909
01 May-30 Jun	759	765	919	1029
01 Jul-31 Aug	839	899	1009	1119
01 Sep-31 Oct	769	819	929	1039
01 Nov-12 Dec	659	699	809	919
13 Dec-24 Dec	859	919	1029	1139
25 Dec-31 Dec	659	699	809	919

  Calculate
  a) The cost of a holiday for 1 person in a 5 star hotel leaving on 2nd July.
  b) The cost of a holiday for 2 people in a 4 star hotel leaving on 2nd December.
  c) The cost of a holiday for a family of four in a two star hotel, leaving on 17th August.

3) The table shows the evening programmes on television
        6.00 Six O'clock News
        6.30 Regional News
        7.00 Holiday Show
        7.30 Cartoon
        7.40 The Music Programme
        8.10 Film
        9.50 Local News
        10.00 Main Evening News
        10.30 Antiques Show
        11.00 Nature Programme
        11.25 Late Night Show
  a) How long does 'The Music Programme' last?
  b) How long does the film last?
  c) Claire has a 3 hour video tape. She records the film and the 'Antiques Show'. Will she have enough space left on the tape to record the 'Nature Programme'?

4)

Cardiff	99						
Edinburgh	289	373					
Glasgow	290	370	45				
London	113	154	386	403			
Manchester	81	172	213	214	189		
Newcastle	205	298	105	142	281	132	
Swansea	125	45	380	381	192	183	314
	B	C	E	G	L	M	N

  The table shows the distances between some cities in Britain. The distance between London and Cardiff is highlighted.
  What is the distance between a) Swansea and Glasgow? b) Newcastle and London?
  Which towns are closest to each other?

15. Number Patterns and Sequences (1)

Exercise 1
In each of the following patterns write down the next two numbers
 1) 2, 4, 6, 8, 10....   2) 5, 7, 9, 11, 13....   3) 7, 10, 13, 16, 19....
 4) 5, 9, 13, 17, 21....   5) 3, 8, 13, 18, 23....   6) 3, 12, 21, 30, 39....
 7) 3, 4, 6, 9, 13....   8) 5, 5, 6, 8, 11...   9) 5, 7, 11, 17, 25....
10) 2, 3, 5, 8, 12....   11) 20, 21, 23, 26, 30....   12) 3, 5, 8, 12, 17....
13) 15, 13, 11, 9, 7....   14) 20, 20, 19, 17, 14....   15) 22, 19, 16, 13, 10....
16) 15, 13, 10, 6, 1....   17) 7, 5, 3, 1, –1....   18) 8, 8, 7, 5, 2....
19) 5, 2, –2, –7, –13....   20) –1, –2, –4, –7, –11....   21) –2, 1, 4, 7, 10....

Exercise 2
In each of the following patterns (a) write down the next number (b) explain in
words how you would find the eighth number.
1) 1, 2, 4, 7, 11, 16....   2) 0, 2, 5, 9, 14, 20....   3) 1, 1, 2, 4, 7, 11....
4) 1, 1, 2, 3, 5, 8....   5) 2, 4, 8, 16, 32, 64....   6) 1, 4, 7, 10, 13, 16...
7) 1, 3, 7, 15, 31, 63....   8) 1, 3, 9, 27, 81, 243....   9) 128, 64, 32, 16, 8, 4,....

Exercise 3
In each of the following patterns (a) write down the next two numbers, (b) write
down in words the rule for finding the next number and (c) write down the rule for
finding the nth number in the pattern in terms of n.
 1) 1, 3, 5, 7, 9....   2) 2, 5, 8, 11, 14....   3) 5, 9, 13, 17, 21....
 4) 6, 12, 18, 24, 30....   5) 7, 13, 19, 25, 31....   6) 12, 17, 22, 27, 32....
 7) 3, 5, 7, 9, 11....   8) 0, 3, 6, 9, 12, 15....   9) 11, 16, 21, 26, 31....

Exercise 4
1) The diagrams below show how some patterns have been made up with strips of
   square tiles.

   1 strip   2 strips   3 strips   4 strips

a) How many black tiles will there be in 5 strips?
b) Explain in words how the number of black tiles is changing each time.
c) Explain how the number of white tiles is changing each time.

2) The diagrams below show square 'holes' surrounded by centimetre squares.
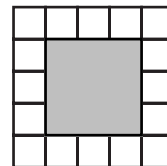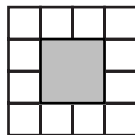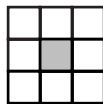
Length of side	1	2	3
Number of squares	8	12	16

Find the number of squares needed for holes of side (a) 4cm (b) 5cm (c) n cm
(d) Calculate the number of squares needed for a hole of side 20cm.

16. Number Patterns and Sequences (2)

1) A child places blocks on a floor making the pattern shown below. The first row
   contains 1 block, the second 3 blocks, the third 5 and so on.

Row   1st   2nd   3rd   4th
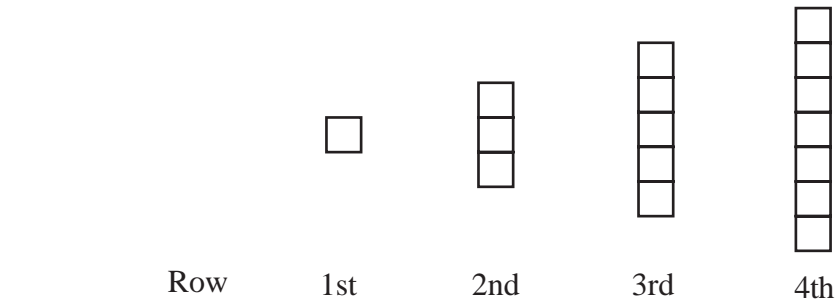
   How many blocks will be in (a) row 5 (b) row 6 (c) row n
   (d) Calculate how many will be in row 40.

2) The diagram shows a number of rectangles where the length is 1 unit longer than
   the width.

Rectangle number	1	2	3	4
Area of rectangle	2	6	12	
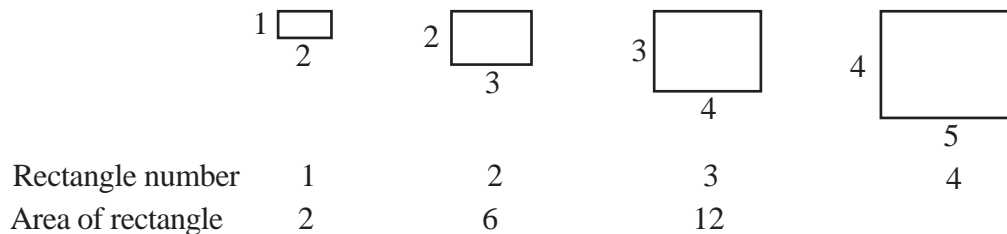
   Find the areas of (a) rectangle 4 (b) rectangle 5
   (c) What do you add on to the area of rectangle 5 to get the area of rectangle 6?

3) A library shelving system is made from uprights and shelves as shown below.

1 upright   2 uprights   3 uprights
no shelves   5 shelves   10 shelves
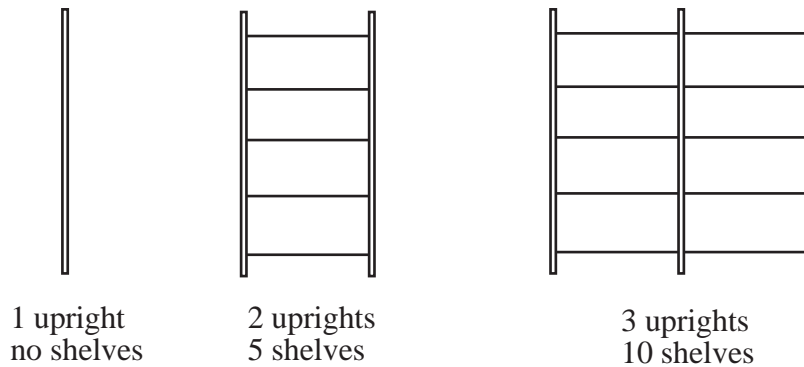
   How many shelves can be made from (a) 4 uprights (b) 5 uprights (c) n uprights.
   (d) How many shelves are needed for 10 uprights.

4) Shapes are made from matchsticks as shown below.

1 layer   2 layers   3 layers
7 matches   12 matches   17 matches
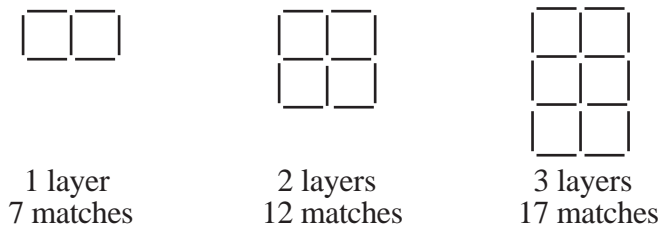
   Write down the number of matches needed for shapes with (a) 4 layers (b) 5 layers
   (c) n layers
   Calculate how many matches are needed for a shape with 12 layers.

17. Substitution

Exercise 1

1) Mark works every Saturday at the local supermarket. His wages are calculated

   using the following formula.

   Wages = Number of hours worked × £3.30

   Calculate his wages if he works a) 8 hours   b) $6\frac{1}{2}$ hours.

2) The cost of an electricity bill is calculated using the formula

   Cost = £8.30 + Number of units used × 8 pence

   Calculate the cost for a) 700 units b) 1150 units

3) The cost of hiring a wallpaper stripper is calculated using the following formula

   C = 3n + 4 where n represents the number of days it is hired for, and C the cost

   in pounds.

   Calculate the cost of hiring it for a) 2 days b) 5 days.

   If the cost is £16, how many days is it hired for?

4) A chicken needs to cook for 20 minutes plus 34 minutes for each kilogram it

   weighs. Calculate the time needed to cook a chicken weighing

   a) 2kg b) 1.5kg

Exercise 2

Calculate the following values given that $a = 3$, $b = 4$ and $c = 5$

1) $a+b$	2) $a+c$	3) $c+b$
4) $c-b$	5) $b-a$	6) $c-a$
7) $a-b$	8) $a-c$	9) $b-c$
10) $2a-b$	11) $2a+b$	12) $2c+2b$
13) $2c-2b$	14) $3a-2c$	15) $4a-4c$
16) $3a+4b+5$	17) $5a-b+3$	18) $a-b+7$
19) $a-b-c$	20) $3a+2b-4c$	21) $3a-2b+6$

Exercise 3

Calculate the values of these expressions given that $a = 1$, $b = -2$ and $c = 3$

1) $a+b$	2) $b+c$	3) $a-c$
4) $2b+a$	5) $b+3c$	6) $b-2$
7) $3a+2b$	8) $4a+b$	9) $-7+2b$
10) $b+a+c$	11) $c+a+b$	12) $3c+2b$
13) $b-6+2a$	14) $3a+2b+c$	15) $5a+5b-7$
16) $b-a+c$	17) $c+b-a$	18) $3b-a-c$
19) $5a+2b-9$	20) $4b+2a-7c$	21) $2b-3a+9$

Exercise 4

Calculate the value of each of these expressions given that $x = 4$, $y = 5$ and $z = -2$

1) $2(x+y)$	2) $3(y-x)$	3) $4(y+z)$
4) $3(y+x)$	5) $x(y+2)$	6) $y(5+z)$
7) $y(x+z)$	8) $2(x+y+z)$	9) $x(z+y)$
10) $x(y+z+7)$	11) $y(z+x+6)$	12) $5(z+y-x)$

18. Simplifying Expressions

Exercise 1

1) (i) The perimeter of this square
    is $2x + 2x + 2x + 2x$
    Simplify it.
  (ii) The area of this square
    is $2x \times 2x$
    Simplify it.
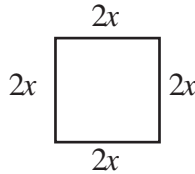
2) (i) The perimeter of this
    rectangle is $5 + y + 5 + y$
    Simplify it.
  (ii) The area of this
    shape is $5 \times y$
    Simplify it.

3) Write down the perimeter of each of the shapes below in the simplest form.
  (i)   (ii)   (iii)   (iv)
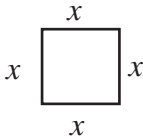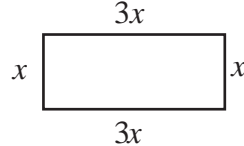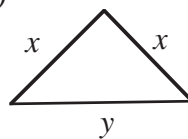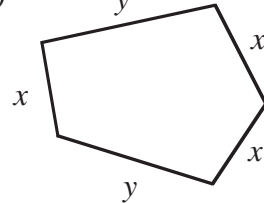
4) Write down the areas of the shapes (i) and (ii) in question 3 in their simplest form.

Exercise 2 Simplify

1) $7 + 4$	2) $10 - 5$
3) $12 - 3$	4) $8 - 9$
5) $6 - 9$	6) $7 - 10$
7) $-4 + 8$	8) $-6 + 9$
9) $-4 + 10$	10) $-5 - 3$
11) $-7 - 4$	12) $-9 - 6$
13) $4 - 3 + 2$	14) $6 - 7 + 1$
15) $5 - 9 + 5$	16) $6 - 10 - 2$
17) $-4 + 6 - 3$	18) $-7 + 2 + 4$
19) $8 - 15 + 3$	20) $-5 - 4 + 9$

Exercise 3 Simplify

1) $3y + 8y$	2) $5y + 3y$
3) $9y - 6y$	4) $12x - 4x$
5) $16y - 18y$	6) $27x - 19x$
7) $-12y + 3y$	8) $-23x + 17x$
9) $-16a - 7a$	10) $-14w - 5w$
11) $12b + 3b + 2a + 3a$	12) $9x + 7y + 3x + 6y$
13) $4b + 5a + 3b + 3a$	14) $x + 6y + y + x$
15) $6a - 2a + 3b + 4b$	16) $12p - 4p + 3q + 7q$
17) $12a + 3b - 4a - b$	18) $5x + 7y - y - x$
19) $16x + 8y - 10x - 9y$	20) $21a + 3b - 17a - 2b$
21) $6x + 3y - 8x - 6y$	22) $12a + 9b - 6a - 12b$

Exercise 4
Multiply out the brackets and simplify

1) $3(x + y)$	2) $6(3x + 4)$
3) $4(2x - 3)$	4) $6(3x + 2)$
5) $3x + 2(2x + 5)$	6) $7(3x - 4)$
7) $5x + 4(3x - 3)$	8) $12x + 5(2x + 3)$
9) $4y + 3(3x - 2y)$	10) $8x + 3(2x - 4y)$
11) $3y + 2(4x + y)$	12) $9y + 4(6x - 2y)$

19. Equations

Exercise 1
1) Claire thought of a number. She doubled it. If the answer was 20, what number was she thinking of?
2) Sam thought of a number. He added 14 to it. If his answer was 20 what number was he thinking of?
3) Beverley thought of a number. She doubled it then added 6. If her answer was 22, what number did she think of?
4) Ben thought of a number. He halved it, then subtracted 5. If his answer was 5, what number did he think of?
5) When a number is multiplied by 9 and then 3 subtracted, the answer is 24. What is the number?
6) A number has 6 added to it. The result is doubled. If the answer is 18, what was the number?
7) A number is multiplied by 2 and then 8 is subtracted. If the answer is –4, what was the number?

Exercise 2
Find the value of the letter in each of the following equations

1) $x + 4 = 6$	2) $x + 7 = 17$	3) $7 + y = 19$
4) $x - 2 = 4$	5) $y - 7 = 11$	6) $a - 9 = 18$
7) $6 - y = 4$	8) $12 - x = 2$	9) $19 - x = 5$
10) $12a = 36$	11) $6x = 42$	12) $8y = 36$
13) $7b = -35$	14) $4y = -24$	15) $4b = -10$
16) $4a + 2 = 10$	17) $9a + 6 = 33$	18) $12x + 6 = 30$
19) $7x - 3 = 18$	20) $12x - 7 = 17$	21) $6x - 7 = 35$
22) $4y + 4 = 14$	23) $3b + 2 = -4$	24) $6y - 5 = -35$

Exercise 3

1) $x + 3 = 2x$	2) $6x - 5 = 5x$	3) $7x - 6 = 6x$
4) $3x + 5 = 4x$	5) $2x + 3 = 3x$	6) $4x + 2 = 5x$
7) $4x - 12 = 2x$	8) $5x - 6 = 2x$	9) $4x - 7 = 2x$
10) $3x + 6 = 5x$	11) $8x + 5 = 10x$	12) $7x + 7 = 9x$
13) $4x + 2 = 2x$	14) $4x + 4 = -12$	15) $3x - 2 = x + 6$
16) $x + 7 = 2x - 2$	17) $6x - 12 = 3x + 12$	18) $5x - 2 = 2x + 4$
19) $4x + 9 = 2x + 15$	20) $3x + 7 = 2x - 1$	21) $4x + 3 = 2x - 3$

Exercise 4
Find the value of the letter in each of the following equations

1) $2(x + 1) = 8$	2) $3(x + 1) = 9$	3) $5(x + 2) = 15$
4) $4(x + 2) = 20$	5) $7(x + 1) = 28$	6) $6(x + 2) = 36$
7) $2(x - 1) = 8$	8) $3(x - 2) = 15$	9) $5(x - 6) = 10$
10) $4(x - 5) = 20$	11) $5(x - 4) = 15$	12) $2(x - 2) = 6$
13) $2(2x + 3) = 10$	14) $3(2x + 1) = 27$	15) $4(3x + 1) = 40$
16) $3(3x - 1) = 24$	17) $2(5x - 6) = 8$	18) $3(2x - 3) = 21$
19) $2(x + 1) = 5x - 4$	20) $3(x + 1) = x + 3$	21) $3(x - 1) = 4x - 6$
22) $3(2x - 2) = 4x - 2$	23) $4(x - 3) = 2x - 2$	24) $2(2x + 2) = 6x - 4$

20. Forming Expressions

1) Andrew buys a bicycle. He pays a deposit of £d and then pays 12 equal monthly
   amounts of £m.
   a) How much does he pay for the bicycle?
   b) If his mum gives him £10 towards it, how much will he pay?
2) Josh works for a local builder. He gets paid £h for each hour he works in the week
   At weekends he is paid double the amount per hour.
   a) How much is he paid if he works for 36 hours during the week?
   b) How much is he paid for working 1 hour at the weekend?
   c) how much is he paid for working 6 hours at the weekend?
   d) How much is he paid for working 36 hours during the week plus 6 hours at the
      weekend? Simplify your answer.
   e) His friend Mark is paid £1 per hour more than him during the week.
      How much is Mark paid for working 35 hours during the week?
3) Beths car will travel T miles on 1 litre of petrol around town. When it gets on the
   motorway it will travel 2 miles more per litre.
   a) How far will Beths car travel on 1 litre of petrol on the motorway?
   Mandy's car will travel 1 mile further than Beths car on 1 litre of petrol in the town.
   b) How far will Mandy's car travel on 1 litre of petrol in town?
   c) On the motorway, Mandy's car travels twice as far as Beths on 1 litre of petrol.
      How far does it travel on 1 litre of petrol on the motorway?
4) The Swift bus company have a formula for calculating their cost of hiring a bus.
   The cost of hiring is £h plus £w for every hour it is hired.
   a) What is the cost of hiring a bus for 8 hours?
   The Swallow bus company charge £2 more than the Swift company for hiring it but
   its hourly rate is £1 less.
   b) What hiring charge does the Swallow company charge?
   c) What is the hourly rate for the Swallow company?
   d) What does the Swallow company charge for hiring the bus for 8 hours?
5) A telephone company charge their customers at a rate of r pence a call.
   a) What is the cost in pence of 200 calls?
   b) What is the cost in pounds of 200 calls?
   The telephone bill of a second company is made up of £c plus p pence for every
   call made.
   c) What is the cost of a bill when no calls are made?
   d) What is the cost of a bill when 100 calls are made?
   e) What is the cost of a bill when 300 calls are made?
6) A glazing company replace broken windows. They charge their customers at a rate
   of £C for being called out and £A for each square metre of glass they have to
   replace.
   a) What is the cost of replacing 8 square metres of glass?
   b) During one week they are called out to the local nightclub twice, once to replace
   8 square metres and once to replace 6 square metres. What is the total bill for the
   week.
7) Kate, Lisa and Rachel save up some of their pocket money each week. Kate saves
   £M, Lisa saves twice as much and Rachel saves £2 more than Kate.
   a) Which of these statements is correct?
      (i) Lisa saves the most.
      (ii) Rachel saves the most.
      (iii) Kate saves the least.
   They decide to combine their money to go to town.
   b) How much do they have altogether?
8) Jack has to plant young trees in straight rows. Each tree needs t metres of row and
   each row needs an extra e metres.
   a) How long is a row of 12 trees?
   b) What is the total length of 2 rows?

21. Distance Time Diagrams (1)

1)
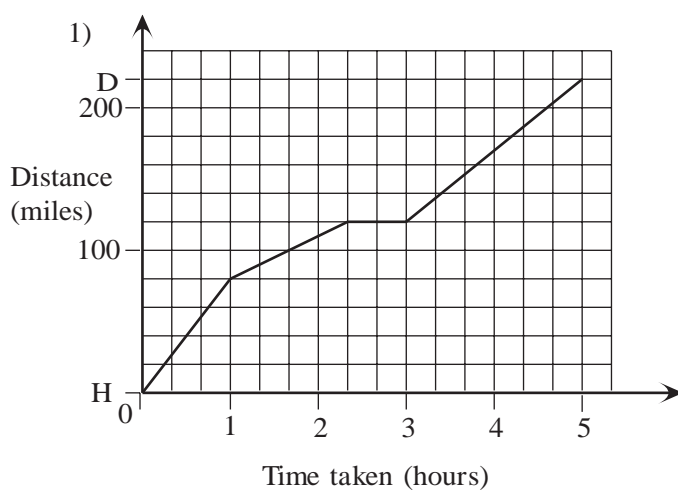
The diagram shows the journey of a lorry
   from home H to destination D.

a) What is the distance between H and D?
b) For how long did the driver stop?
c) What was his average speed when travelling
   slowest?
d) What was the average speed for the whole
journey?

2)
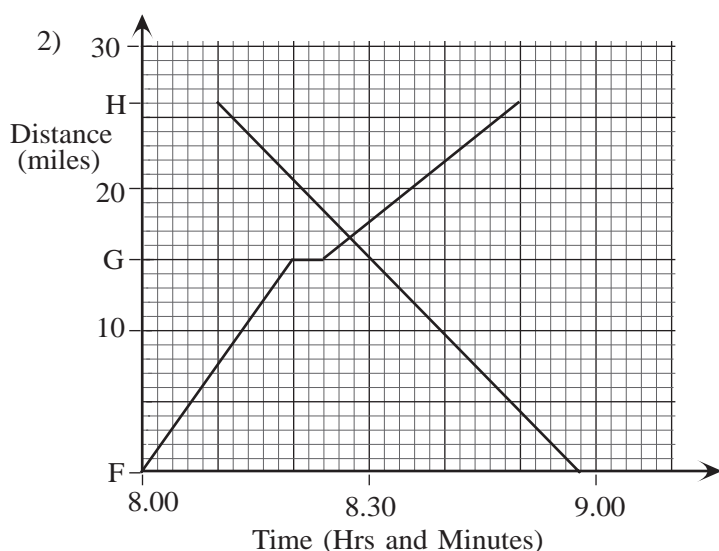
The diagram shows a distance time
graph for two buses A and B,
travelling between towns F, G and H.
Bus A travels from F to H and bus B
from H to F.
Find
a) the average speed of bus A between
   F and G in miles per hour.
b) the length of time bus A stops at G
c) the time at which bus B leaves H
d) the average speed of bus B in m.p.h.
e) the approximate time at which the
   buses pass each other.
f) the approximate distance from G at
   which the buses pass
g) the time at which bus B arrives at F.

3)
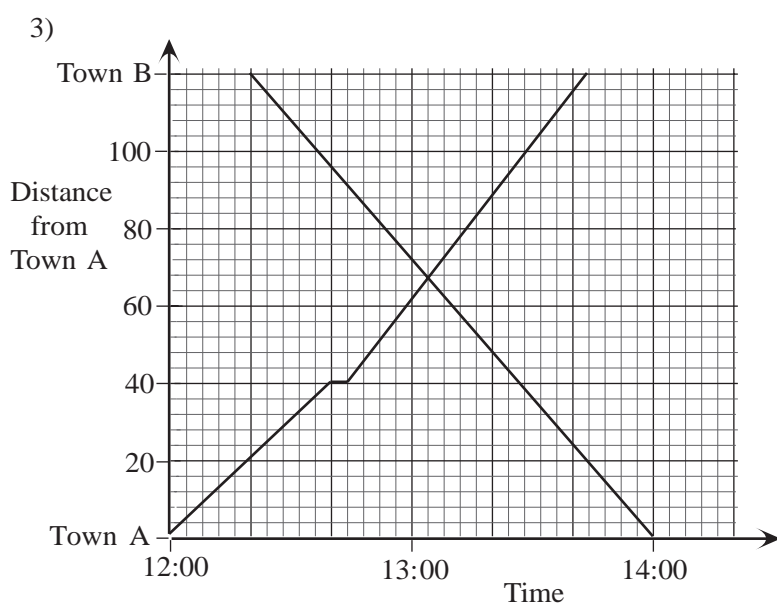
Two towns are 120 miles apart.
The graph shows the journeys of
two trains.
The first goes from A to B.
The second goes from B to A.
From the graph find
a) the speed of the first train over
   the first part of its journey.
b) the time at which the first train
   stopped and for how long.
c) the speed of the train during the
   second part of its journey.
d) the average speed of the second
   train.
e) the time and distance from
   town A when the two trains
   passed each other.

22. Distance Time Diagrams (2)

1)
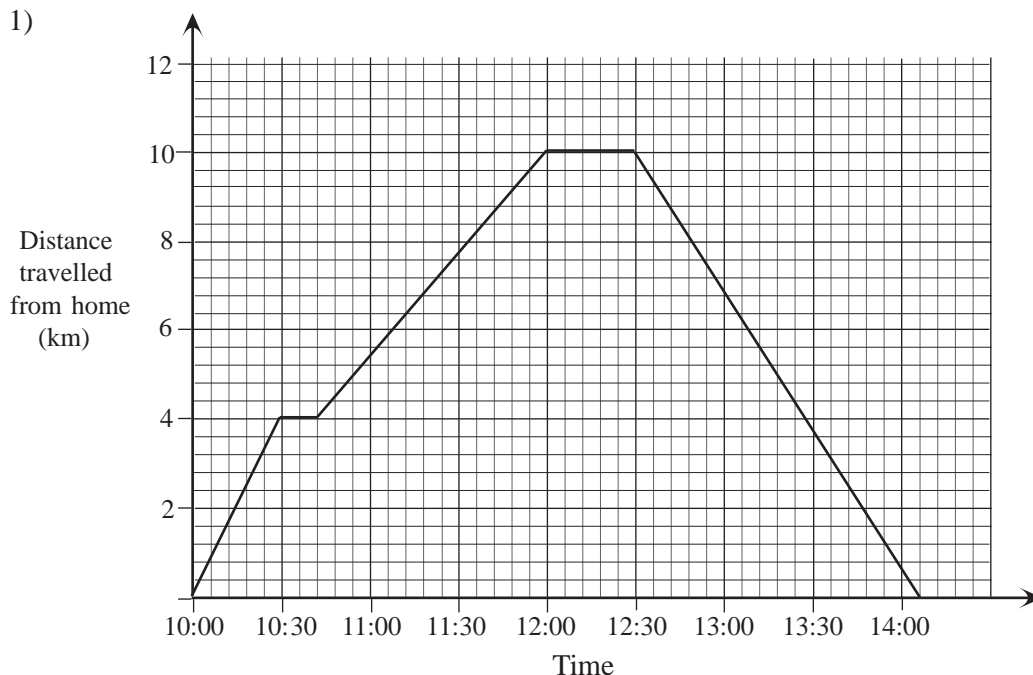
The diagram shows a distance-time graph for a jogger.
The jogger stopped twice on her journey, once on the outward journey
and at the end of the outward journey.
a) For how long was the first stop?
b) What is the average speed on the part of the journey before the first stop?
c) How long did it take to travel the first 10km?
d) What is the average speed of the jogger on her homeward journey?
e) For how long did the jogger stop altogether?
f) At what time did she arrive home?
g) What part of the journey was fastest? Explain your answer.

2)

Two cars, A and B,
travel between two
towns X and Y.
The distance time
graph shows the
distance from town X.
Half of the journey is
along a motorway and
half is not.
a) How far apart are the
   two towns?
b) Calculate the speeds
   of car A over the
   two sections.
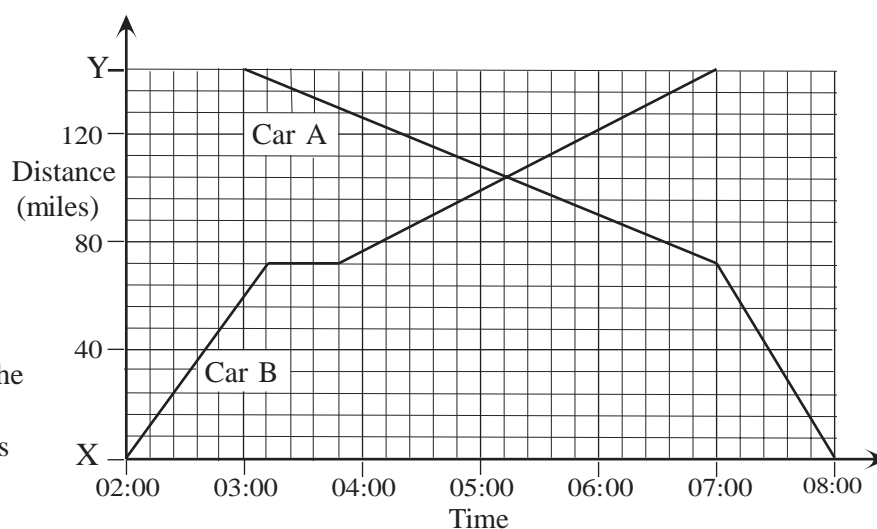
c) For how long did car B stop?
d) At what time, and how far from town X, are the two cars when they pass each other?
e) Approximately how far apart are the two cars at 06:00?

23. Co-ordinates

1) Write down the co-ordinates
   of the corners of this square.
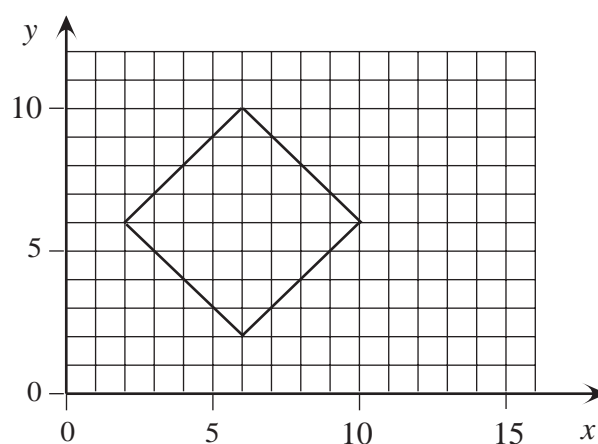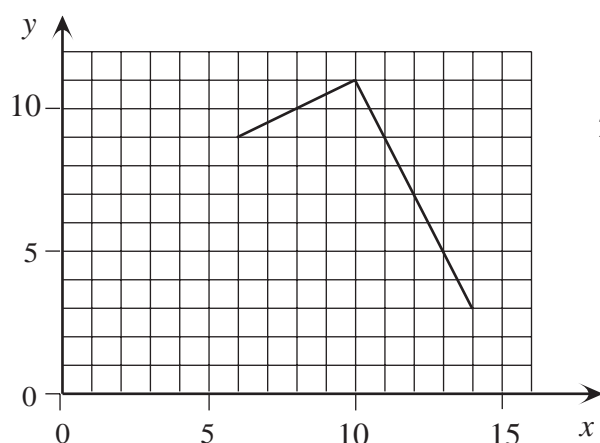
2) The diagram shows two sides
   of a rectangle.
   a) Write down the co-ordinates
      of the corners shown.
   b) What are the co-ordinates of
      the fourth corner?
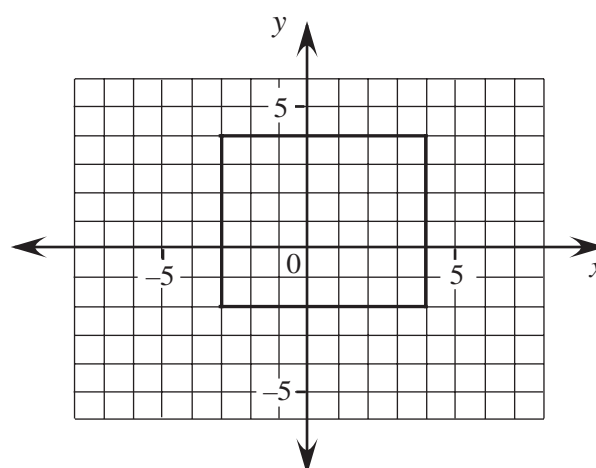
3) The diagram shows a rectangle.
   Write down the co-ordinates
   of its corners
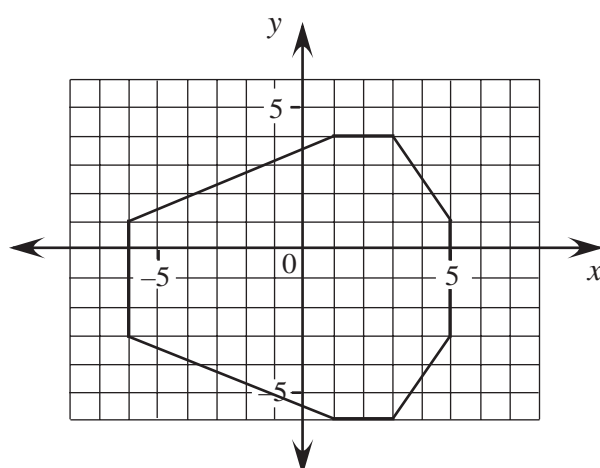
4) The diagram shows an octagon.
   Write down the co-ordinates
   of its corners.
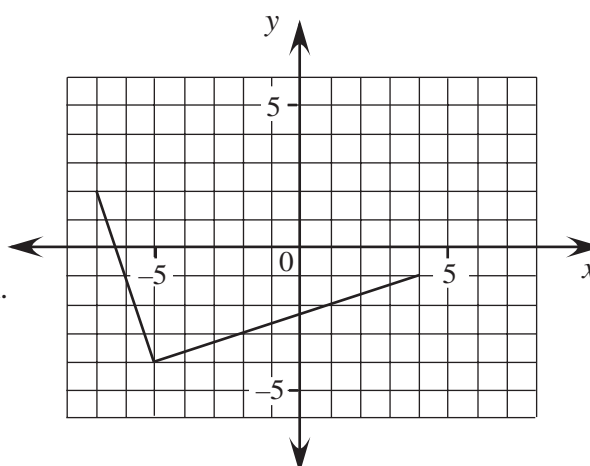
5) The diagram shows two sides
   of a rectangle.
   a) Copy and complete the diagram.
   b) What are the co-ordinates of its
      four corners?

24. Conversion Graphs (1)

1) The graph can be used to convert pounds (£) into French francs. Use it to convert
   a) £5.50 into French francs.
   b) 28 French francs into pounds and pence.
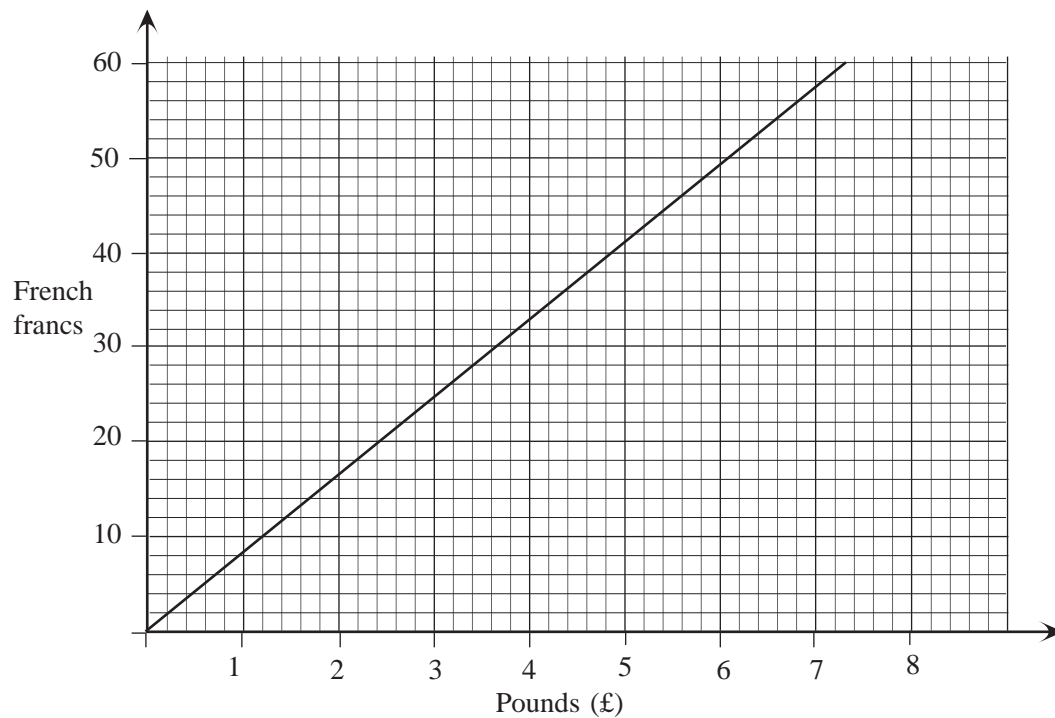
2) The graph can be used to convert pounds (£) into US dollars ($). Use it to convert
   a) £70 into Dollars
   b) $60 into Pounds
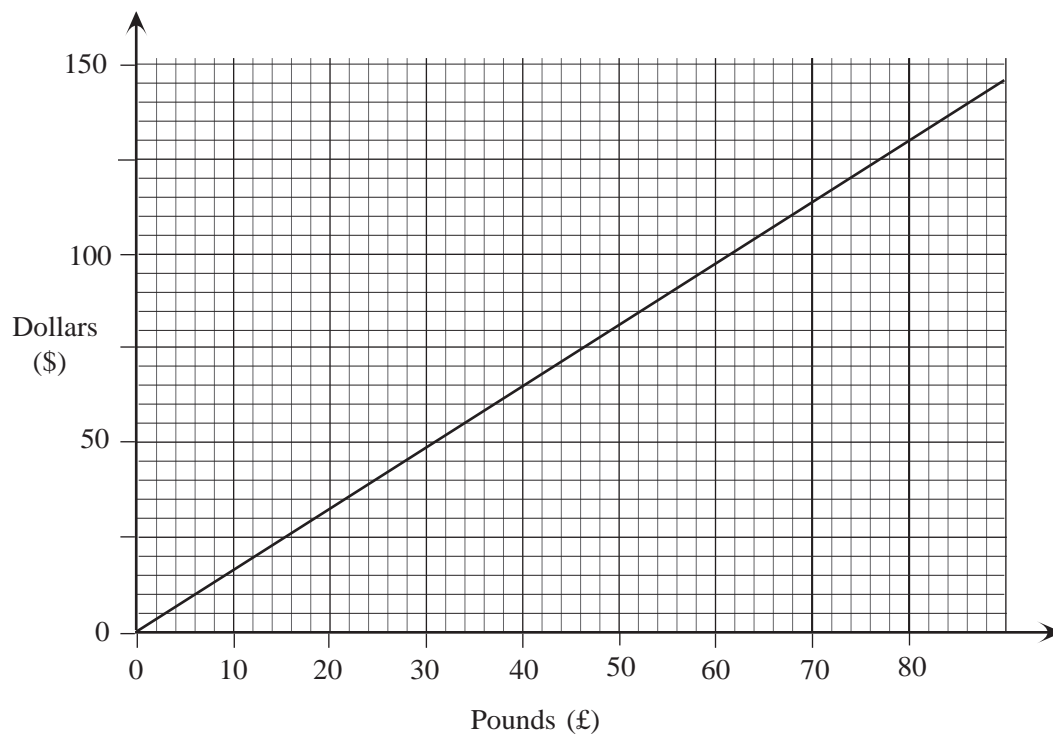
25. Conversion Graphs (2)

1) 1kg is approximately 2.2lbs. Calculate what 40 kg is in pounds.
   From this information draw a conversion graph to convert kg into pounds.
   Use a horizontal scale of 4cm to 10kg and a vertical scale of 4 cm to 20lbs.
   Plot 0kg = 0lb and the value for 40kg and join up the two points for your graph.
   From your graph convert
   a) 23kg into pounds
   b) 75 pounds into kg

2) It is known that 1 gallon is approximately equal to 4.5 litres.
   Use this information to change 10 gallons into litres.
   Plot a graph to convert gallons into litres. Use a scale of 2cm to represent 2 gallons
   on the horizontal axis and 2cm to represent 5 litres on the vertical axis.
   Plot 0 gallons = 0 litres and the value for 10 gallons and join up the two points for
   your graph
   From your graph   a) convert 11 gallons into litres
                       b) convert 32 litres into gallons
           In each case give your answer correct to 1 decimal place.

3) The table below shows the cost of gas. There is a fixed charge of £10.00.

Cost	£10.00	£25.00	£85.00	£160.00
Units used	0	1,000	5,000	10,000

   Use this information to plot a conversion graph with a scale of 2cm to represent
   2000 units on the horizontal scale and 2cm to represent £20 on the vertical scale.
   From your graph find
   a) The cost of 5,200 units
   b) The number of units that can be bought for £145.00.

4) David has to make pastry but his scales measure in ounces and the recipe uses
   grammes. He has a tin of beans which say on the label that 15 ounces is equivalent
   to 425 grammes. Using a scale of 2cm to represent 2oz on the horizontal axis and
   2cm to represent 50 grammes on the vertical axis, draw a line to show the
   relationship between ounces and grammes.
   From the graph convert the following to the nearest half ounce, so that David can
   use his scales
   a) 85g of butter
   b) 200g of flour
   When he has mixed all the ingredients together he weighs out 13 ounces of
   pastry.
   c) What is this weight in grammes?

5) Paul is going to Italy for his holiday so he needs to change some pounds into Italian
   lira. He has a conversion chart which gives him the following information.

Pounds	10	20	30	40	50
Lira	27,000	54,000	81,000	108,000	135,000

   Plot a graph to convert pounds into lira, using the scale 4cm to represent £10 on the
   vertical axis and 2cm to represent 20,000 lira on the horizontal axis.
   a) Paul changes £45 into lira to take on holiday. From your graph determine how
      many lira this is.
   b) At the end of his holiday he brings back 40,000 lira. Change this into pounds.

26. Plotting Graphs

1) The table shows some of the values of x and y for the equation $y = x+3$.

x	1	2	3	4	5
y	4		6		

Complete the table

a) Plot the graph of $y = x+3$. Use the scales of 2cm for 1 unit on the y axis and 2cm for 1 unit on the x axis.

b) Plot the points A(3,2) and B(5,4). Draw the line AB. What can you say about the line AB and the line $y = x+3$?

2) The line $y = x^2 + 2$ can be plotted from the points given in the following table

x	1	2	3	4	5	6
y	3	6	11	18	27	38

a) Plot the graph of $y = x^2+2$. Use the scale of 2cm to represent 1 unit on the x axis and 2cm to represent 5 units on the y axis.

b) From the graph estimate the value of y when $x = 4.5$

3) Complete the table of values for the equation $y = \frac{1}{2}x$.

x	2	4	6	8	10
y	1		3		

a) Plot the graph of $y = \frac{1}{2}x$. Use the scales of 2cm to represent 2 units on the x axis and 2cm to represent 1 unit on the y axis.

b) Plot the points A(2,5) and B(6,3) and join them with a straight line.

c) Complete this statement: "Line AB is ..... to the line $y = \frac{1}{2}x$".

4) Complete the table of values for the equation $y = \frac{1}{2}x + 2$

x	0	2	4	6	8	10
y		3		5		

a) Plot the graph of $y = \frac{1}{2}x + 2$. Use the scales of 2cm to represent 2 units on the x axis and 2cm to represent 1 unit on the y axis.

b) On the same axes, plot the graph of $y = \frac{1}{2}x$.

c) Complete this statement: "The line $y = \frac{1}{2}x + 2$ is ...... to the line $y = \frac{1}{2}x$".

5) Complete the table of values for the equation $y = 3x + 1$.

x	−2	−1	0	1	2
y				4	

a) Plot the graph of $y = 3x + 1$. Use the scales of 4cm to represent 1 unit on the x axis and 2cm to represent 1 unit on the y axis.

b) From your graph, estimate the value of x when $y = 3$.
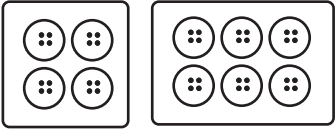
6) Complete the table of values for the equation $y = x^2$.
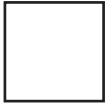
x	−3	−2	−1	0	1	2	3
y	9				1		
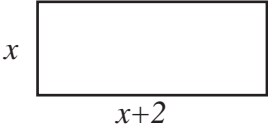
a) Plot the graph of $y = x^2$. Use the scale of 2cm to represent 1 unit on the x axis and 2cm to represent 1 unit on the y axis.

b) On the same axes, draw the graph of $y = x+2$.

c) What are the co-ordinates of the points of intersection of the two graphs?

27. Trial and Improvement

1) A farmer buys some cows and sheep. Cows cost £300 each and sheep cost £50 each. She buys 7 animals altogether. She spends £1100. Use a trial and improvement method to calculate how many of each animal she buys.

2) An antiques dealer buys some tables and chairs. Tables cost £150 each and chairs cost £40 each. She buys 15 items of furniture at a cost of £930. Use a trial and improvement method to calculate how many chairs were purchased.

3) Harry buys some stamps costing 26p each and some costing 20p each. He spends £1.18 and buys 5 stamps. Use a trial and improvement method to calculate how many of each he buys.

4) Laura buys some stamps costing 30p each and some costing 25p each. She spends £4.75 and buys 17 stamps. Use a trial and improvement method to calculate how many of each she buys.

5) Pencils cost 15p each and pens cost 10p each. Karen buys 11 items at a total cost of £1.30. Use a trial and improvement method to calculate how many of each she buys.

6) Pencils cost 12p each and pens cost 14p each. James buys 16 items at a total cost of £2.10. Use a trial and improvement method to calculate how many of each he buys.

7) Buttons are sold on cards of four or six. John bought 62 buttons on 13 cards. Use a trial and improvement method to calculate how many of each card he bought.

8) Shirt buttons are sold on cards of 5 and 12. Sarah buys 83 buttons on 11 cards. Use a trial and improvement method to determine how many of each type of card she buys.

9) A square has an area of 69 cm^2. Use a trial and improvement method to calculate the length of one side, correct to the nearest millimetre.

10) Another square has an area of 84 cm^2. Use a trial and improvement method to calculate the length of one side, correct to the nearest millimetre.

11) A rectangle has an area of 50 cm^2. If the length is 2cm longer than the width, calculate its width, correct to the nearest millimetre.

x

$x+2$

12) Another rectangle has an area of 37 cm^2. The length is 3 cm longer than the width. Use a trial and improvement method to calculate the length of the rectangle, correct to the nearest millimetre.

28. Bearings

Exercise 1
Draw diagrams to show the following bearings.

1) A is 040° from B

2) C is 325° from D

3) G is 153° from H

4) J is 232° from K

5) L is 317° from M

6) P is 208° from Q

Exercise 2
By measuring the angles, write down the bearing of point P from point A in each case.

1)

2)

3)
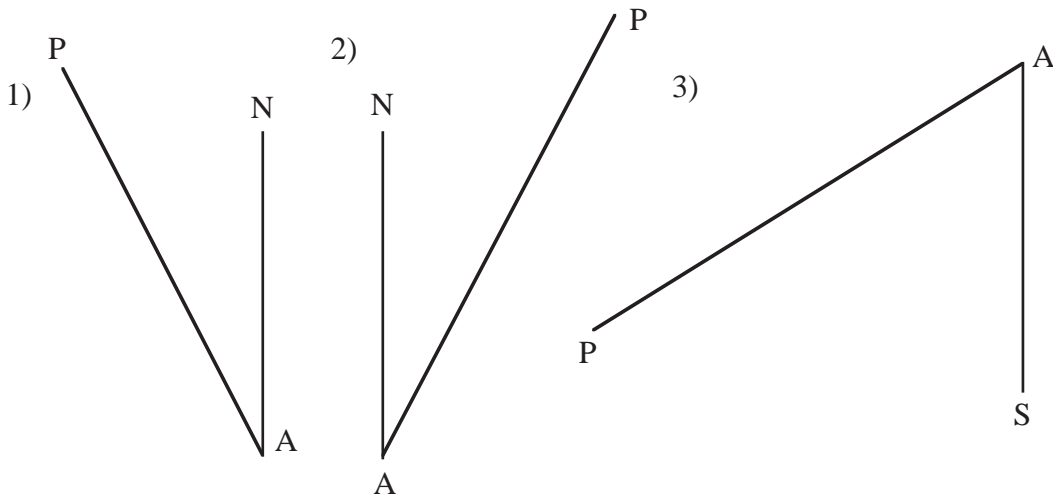
Exercise 3
1) The picture shows a diagram of four towns, A, B, C and D. By measuring, what is the bearing and distance of (a) A from B, (b) C from D, (c) D from A.

Scale 1cm represents 10km
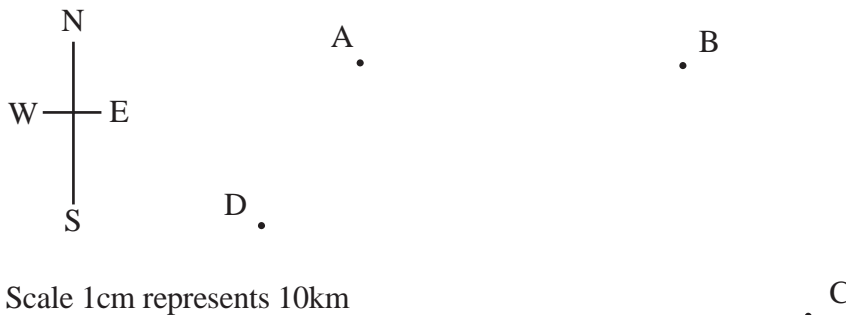
2) A ship sets sail from a port P on a bearing of 035° for a distance 6km until it reaches point X. It then changes course onto a bearing of 132° for a distance of 8km until it reaches point Y. Draw the ship's path accurately using a scale of 1cm to 1km. What is the bearing and distance of point Y from the port P?

3) An aeroplane flies from an airport A on a bearing of 202° for a distance of 75km until it reaches point B. It then changes course onto a bearing of 222° for a distance of 80km until it reaches point C. Draw the aircraft's path accurately using a scale of 1cm to 10km. What is the bearing and distance of point C from the airport A?

29. Nets and Isometric Drawings (1)

1) Which of these shapes represent the net of a cuboid?

a)

b)

c)

d)

e)

f)
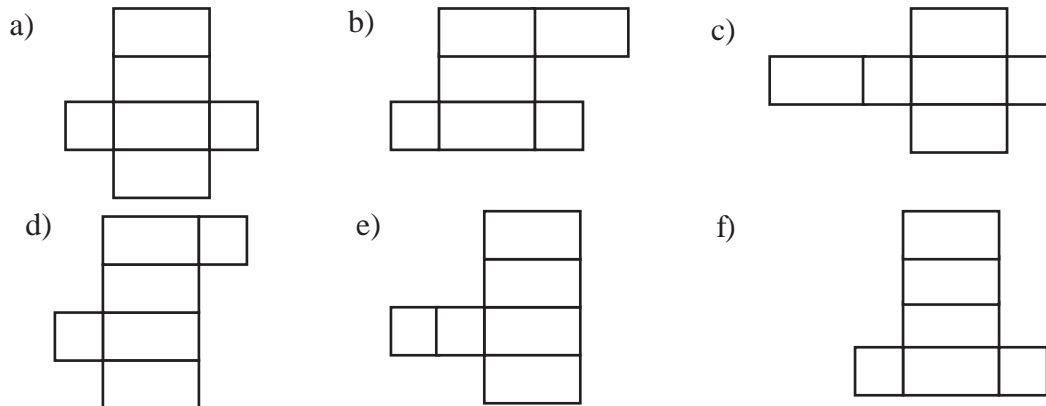
2) The diagram shows part of a cuboid.
   Complete it on isometric paper.
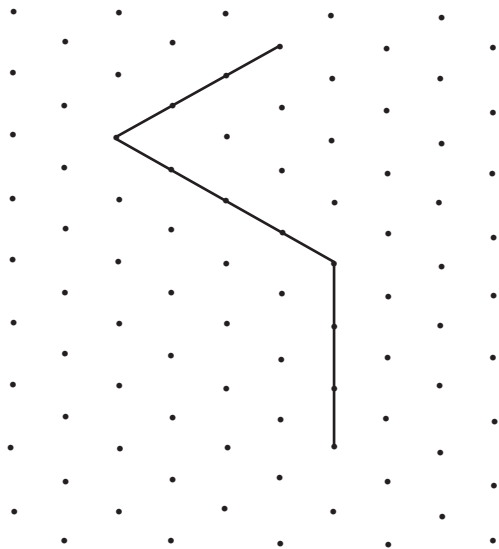
3) The diagram shows a cuboid.
   It measures 4cm by 4cm by 3cm.
   Draw its net.
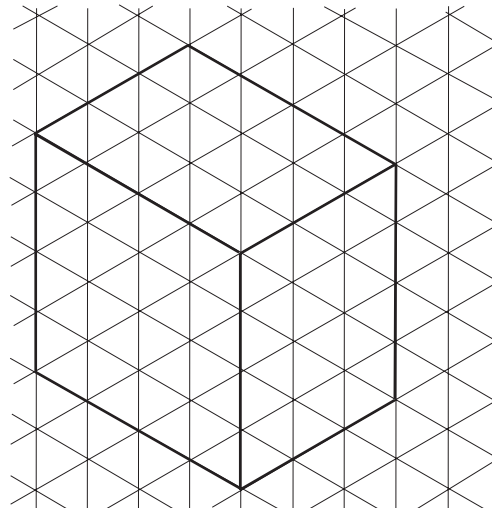
4) This is part of the net of a triangular
pyramid. Complete it on isometric paper.
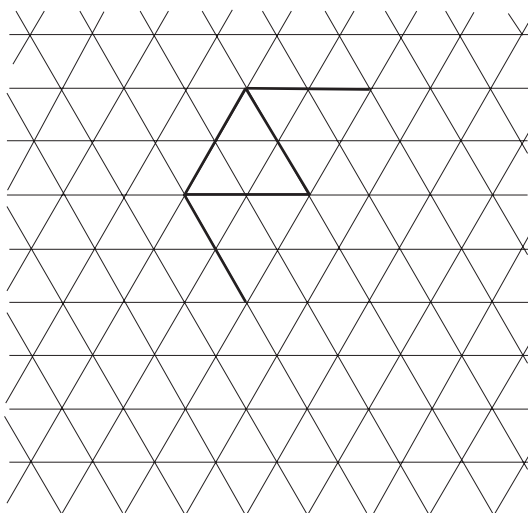
5) The diagram shows part of a square
   based pyramid. Complete it on
   isometric paper.
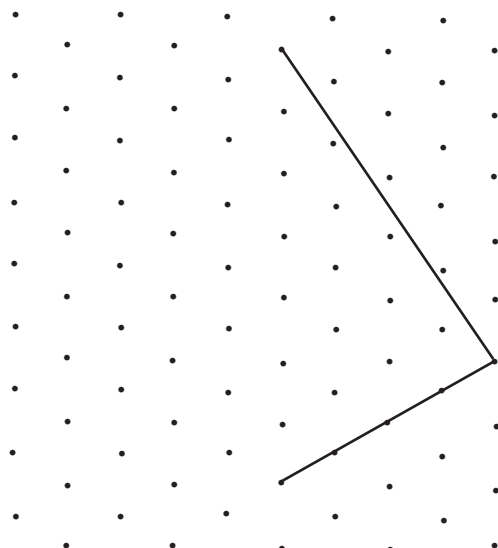
30. Nets and Isometric Drawings (2)

1) Draw the net of a cube whose sides are 4cm.

2) Draw the net of this cuboid.
   Also draw, on triangular dotty paper or isometric
   paper, a cuboid whose volume is the same
   as this one.

2cm

6cm

4cm
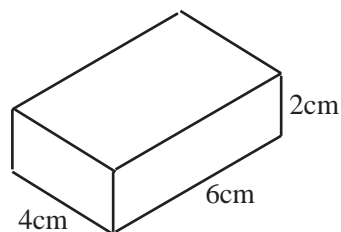
3) The diagram below shows part of the net of a triangular prism.
   Copy and complete the diagram.
   On triangular dotty or isometric paper,
   draw a diagram of the shape.

6cm

4cm

5cm
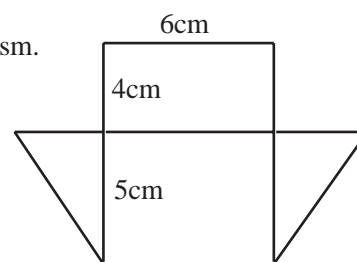
4) Draw the net of this triangular prism.

3cm

5cm   6cm
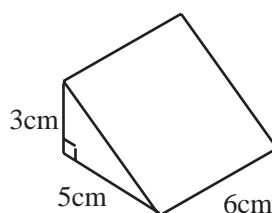
5) The diagram on the right shows part of the net of a square based
   pyramid. Copy and complete the diagram. On triangular dotty
   or isometric paper, sketch a diagram of the shape.

3cm

5cm
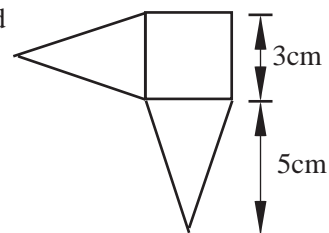
6) The diagram shows a square based pyramid.
   Its base edges measure 3cm and its sloping
   edges are 6cm. Draw the net of the shape.
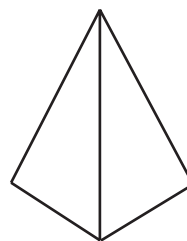
7) The diagram shows part of the net of a rectangular based
   pyramid. Copy and complete the diagram.
   On triangular dotty or isometric paper, sketch a
   diagram of the shape.

5cm

3cm

5cm

5cm
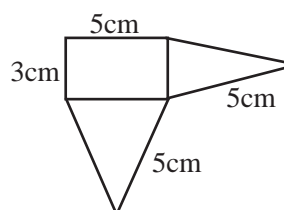
8) The diagram shows a rectangular based pyramid.
   Its base edges measure 2.5cm and 4cm and its
   sloping edges are each 5cm.
   Draw the net of the shape.

31. Reflection Symmetry

1) Which of these designs have one or more lines of symmetry?

a)   b)   c)   d)   e)

f)   g)   h)   i)   j)

2) Reflect this shape about the line AB.

A

B

3) Reflect this shape about the mirror line.

Mirror line

4) In which positions do the four tiles have to be placed in order to make the dark tiles symmetrical?

5) The diagram is reflected in the line AB and then in the line XY. Draw the result.

A

X ———————————— Y

B
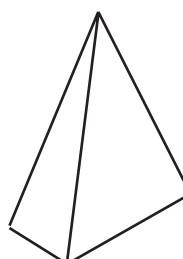
32. Reflection

1) Reflect the triangle about the *y* axis. What are the co-ordinates of the new shape?
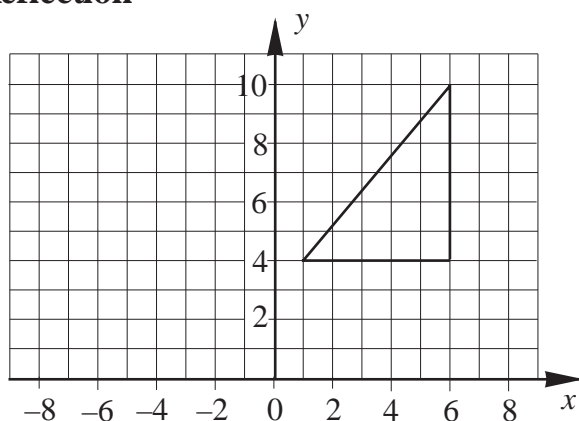
2) Reflect the shape about the line *x=2*. What are the co-ordinates of the new shape?
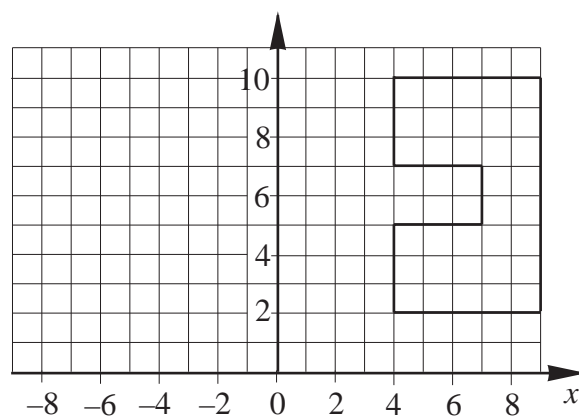
3) Reflect the rhombus about the line *x=−1*. What are the co-ordinates of the new shape?
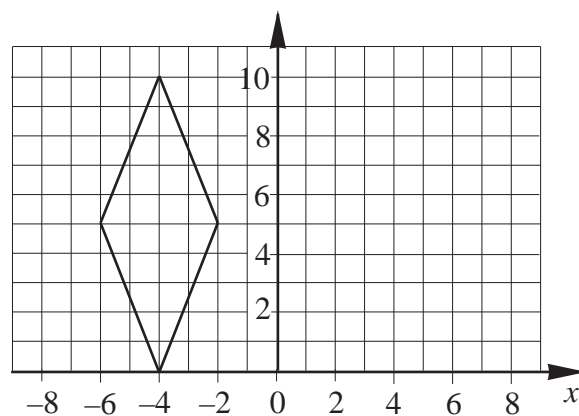
4) Reflect the triangle about the *x* axis. What are the co-ordinates of the new shape?
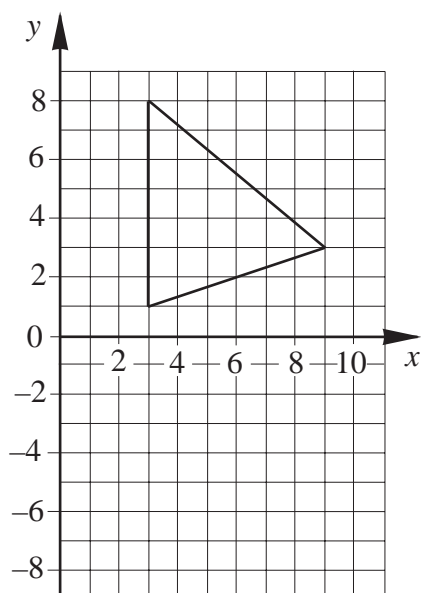
5) Reflect the parallelogram about the line *y=2*. What are the co-ordinates of the new shape?
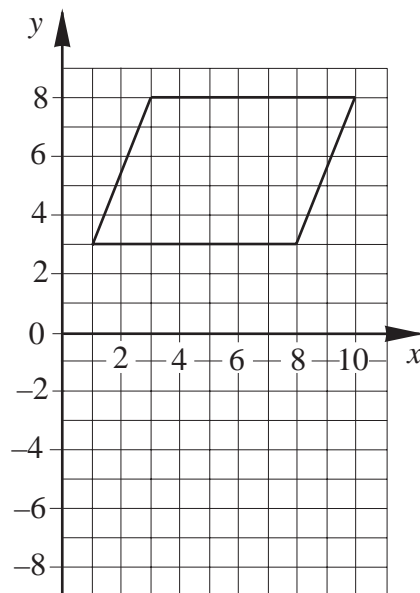
33. Angles

Calculate the sizes of the unknown angles in each of the following diagrams.

1)

x 59°

2)

x
39°

3)

z 38°
x
85° y

4)

55°
x
y

5)

47°
y x

6)

69° x
77°
y z

7)

84°
y x 144°
z

8)

x 79° y
71° z

9)

x
120°
y 25°

10)

x
133°
y
z
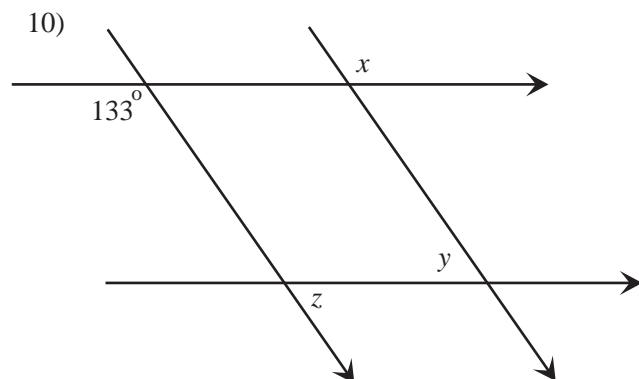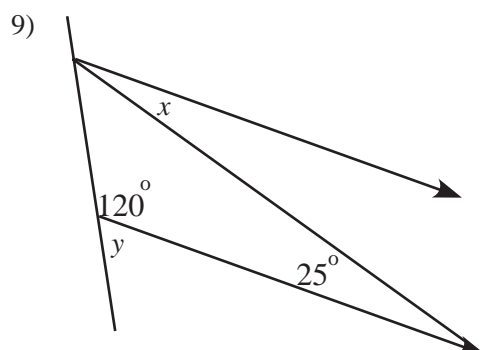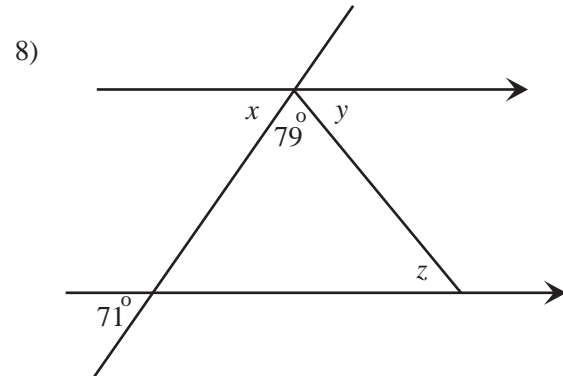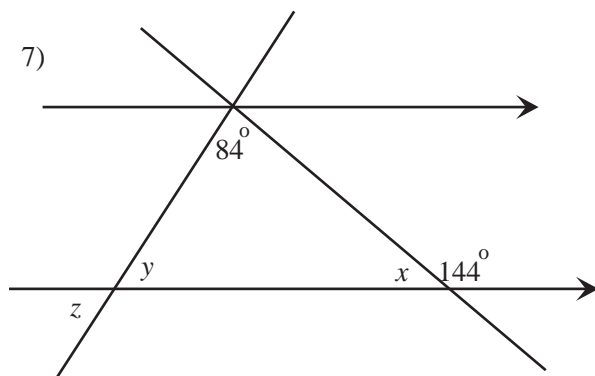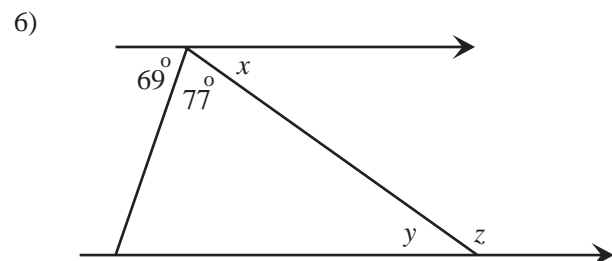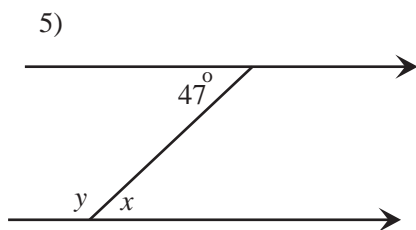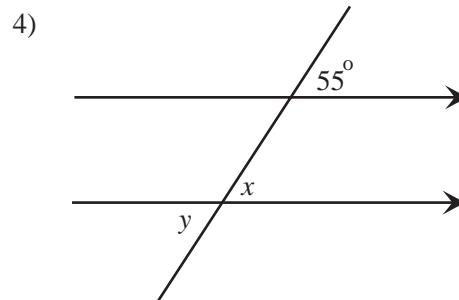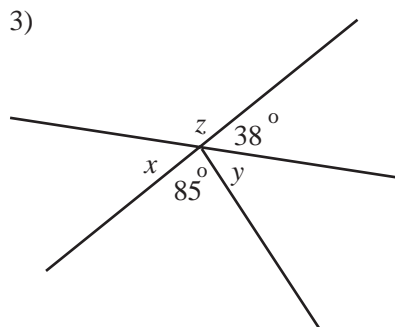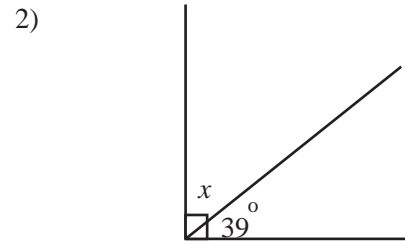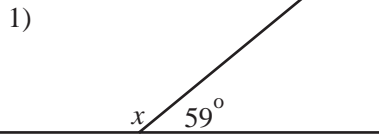
34. Triangles

Calculate the sizes of the unknown angles in each of the following diagrams.

1)
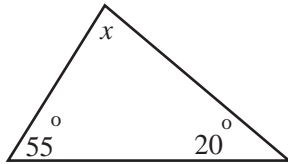
2)
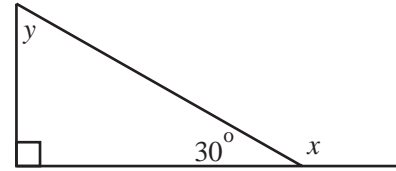
3)
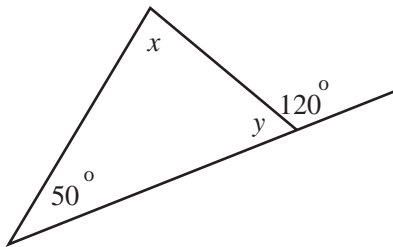
4)
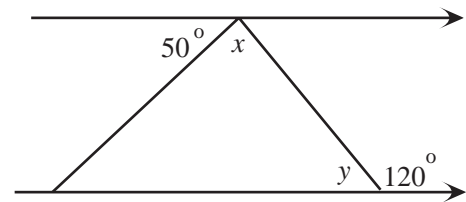
5)
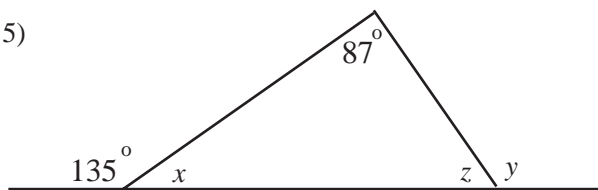
6)
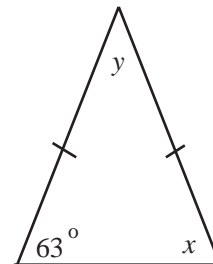
7)
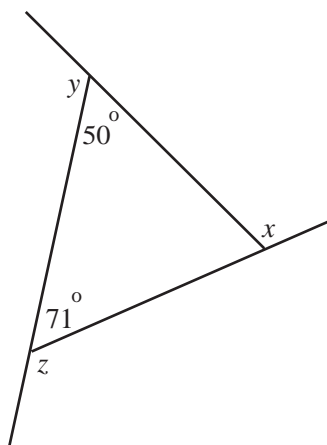
8)
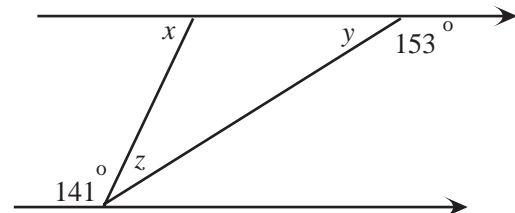
9)
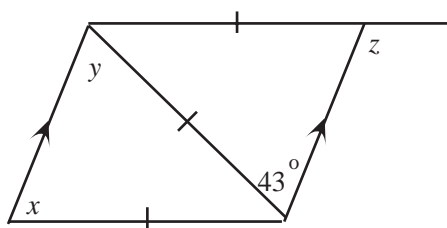
10)
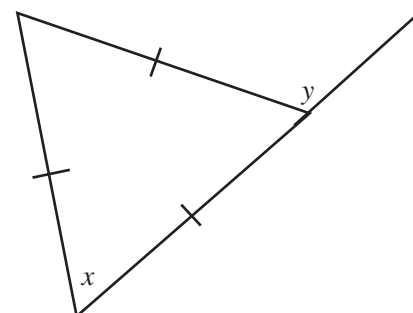
35. Regular Polygons

Make sketches of each of the following regular polygons.
1) A Pentagon
2) A Hexagon
3) A Heptagon
4) An Octagon
5)
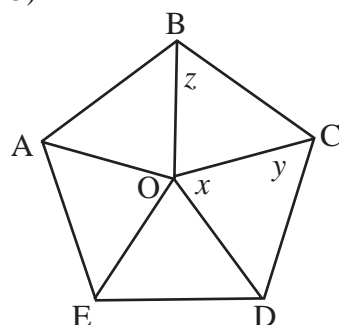
ABCDE is a regular pentagon.
O is its centre.
a) What can you say about the lines OA, OB, OC, OD, OE?
b) What is the size of angle x?
c) Calculate the sizes of angles y and z.

6)
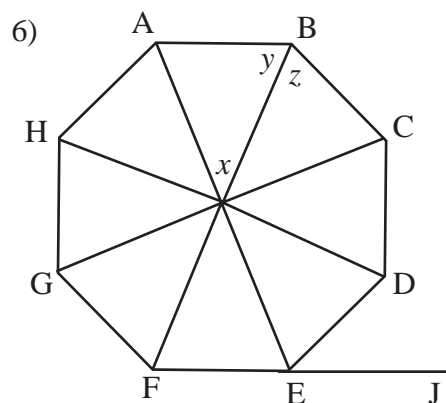
ABCDEFGH is a regular octagon.
a) What is the size of angle x?
b) What is the size of angles y and z?
c) What is the size of angle ABC?
d) What is the size of the exterior angle DEJ?

7)
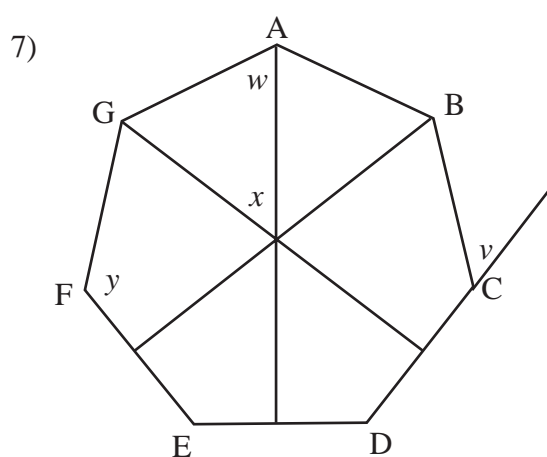
ABCDEFG is a regular heptagon.
Three lines of symmetry are shown.
a) What the size of angle x?
b) Calculate the size of angle w.
c) Write down the size of angle y.
d) What is the size of the exterior angle v?

8) What is the order of rotational symmetry of a regular octagon?
9) Explain why a regular pentagon will not tessellate and a regular hexagon will.
10) How many lines of symmetry has a regular nonagon?

36. Quadrilaterals

1) Draw sketches of each of the following quadrilaterals.
   In each case show any lines of symmetry they may have.
   a) Square   b) Rectangle   c) Rhombus
   d) Parallelogram   e) Trapezium

2) What are the sizes of the angles x and y in this parallelogram?

$53°$

x

y
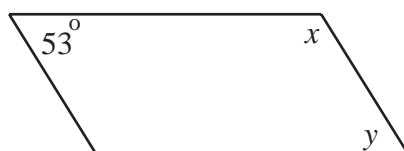
3) What are the sizes of the angles
   x and y in this rhombus?

y

$34°$

x
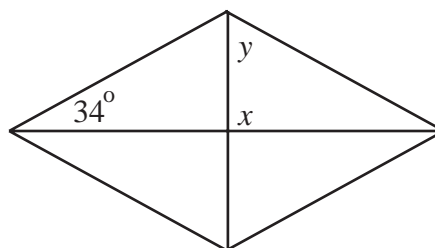
4) Calculate the size of the unknown
   angle in this quadrilateral.

$97°$

$58°$

x $63°$
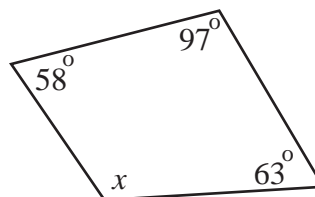
5) A quadrilateral has internal angles of $90°$, $100°$ and $105°$. What is the
   size of the fourth angle?

6) What is the size of the angle x?

x

$60°$

7)

A   B

z

y

O

x

D   C
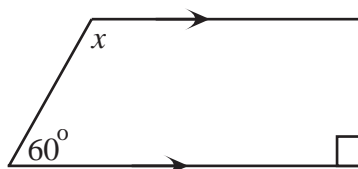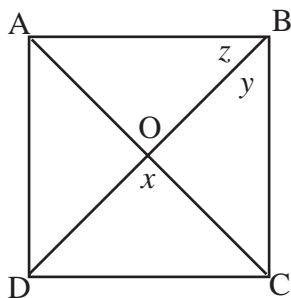
The diagram shows a square ABCD.
O is the point where the diagonals cross.
a) Name three triangles which are congruent to triangle BOC.
b) What are the sizes of angles x, y and z?

8)

A   B

z

y

O

x

$132°$

D   C
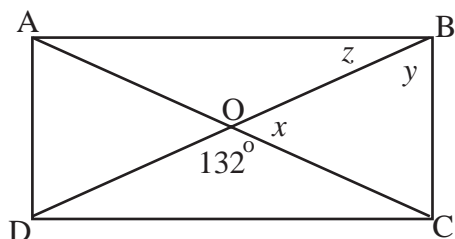
The diagram shows a rectangle ABCD.
O is the point where the diagonals cross.
a) What special name is given to triangle BOC?
b) Which triangle is congruent to triangle BOC?
c) Name two other triangles which are congruent
   to each other.
d) Calculate the sizes of angles x, y and z.

37. Shapes

Each of the diagrams below can be described by one of the given names.
Link a shape with a name in each case.

Square, Rectangle, Parallelogram, Octagon, Trapezium, Triangle,
Triangular prism, Cube, Quadrilateral, Pyramid, Cuboid, Kite,
Hexagon, Cylinder, Circle, Cone, Pentagon.

a)

b)

c)

d)

e)

f)

g)

h)

i)

j)

k)

l)

n)

o)

p)

q)

r)
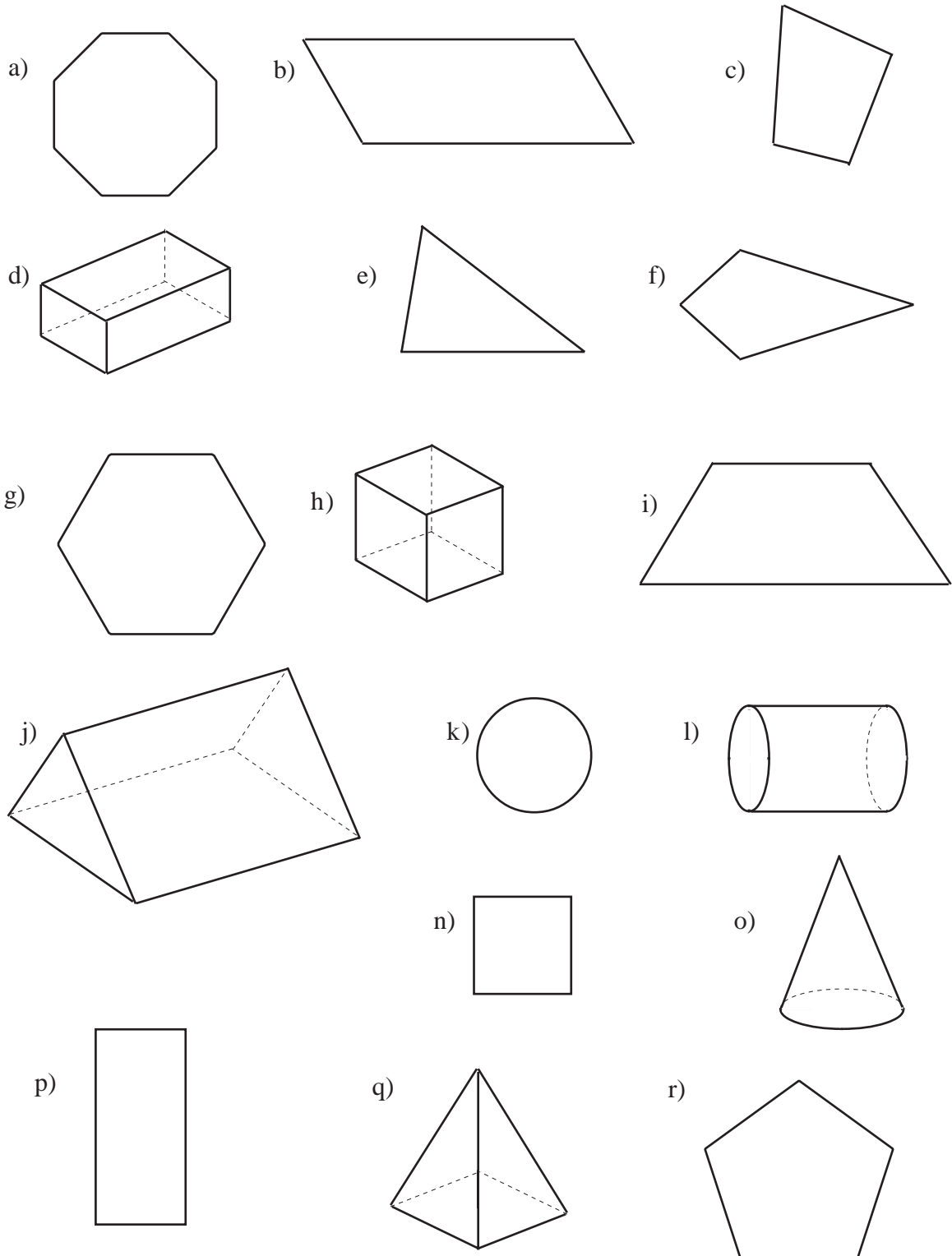
38. Enlargements

1) Enlarge this shape using a scale factor of 3. Line AB is shown enlarged.
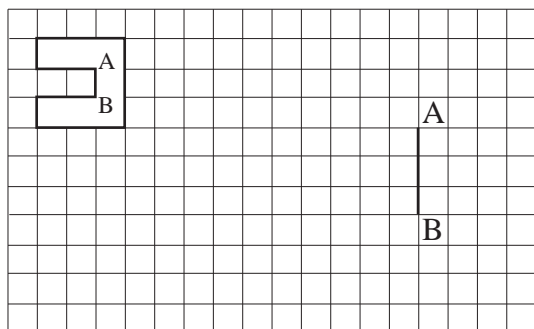
2) Enlarge shape E using a scale factor of 2. Line AB represents one side of the new shape.
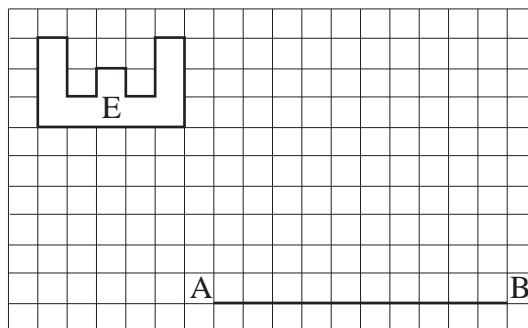
3) Enlarge this shape with a scale factor of 3.
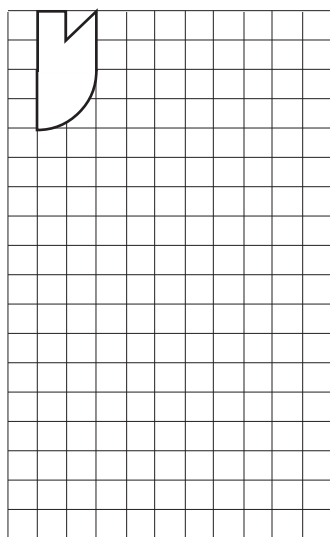
4) Enlarge this shape with a scale factor of 2
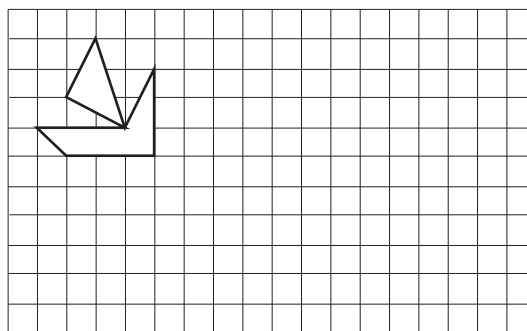
5) Enlarge this shape with a scale factor of 3.
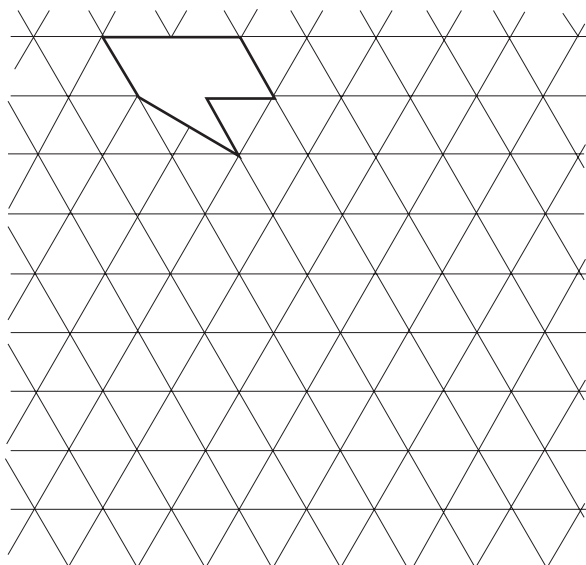
6) Enlarge this shape with a scale factor of 2.
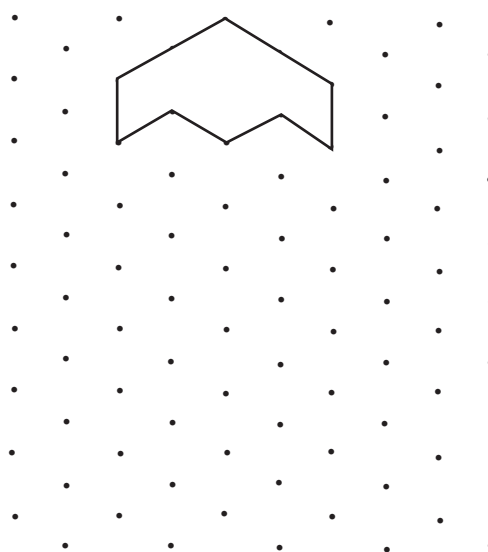
39. Scale Drawings

1) Draw this triangle accurately.
   What is the length of AB?
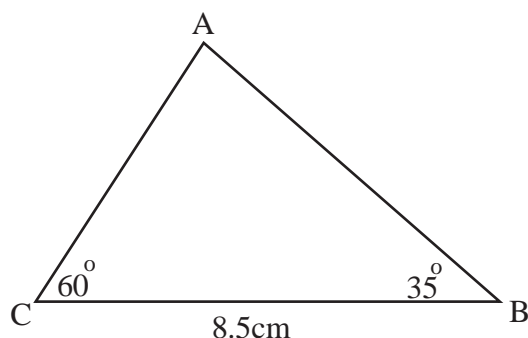
2) Draw this quadrilateral accurately.
   What is the length of AB?
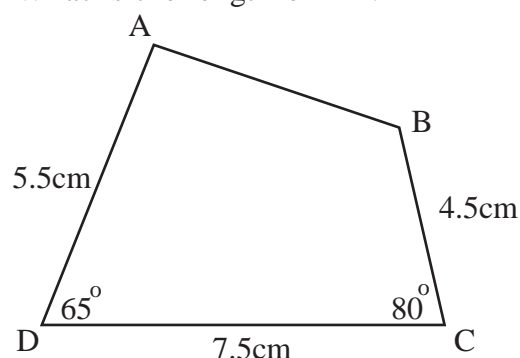
3) The following diagram shows a sketch of a field. Draw a scale drawing of the field
   using the scale of 1cm to represent 10 metres. What is the approximate length of the
   side AB to the nearest metre?
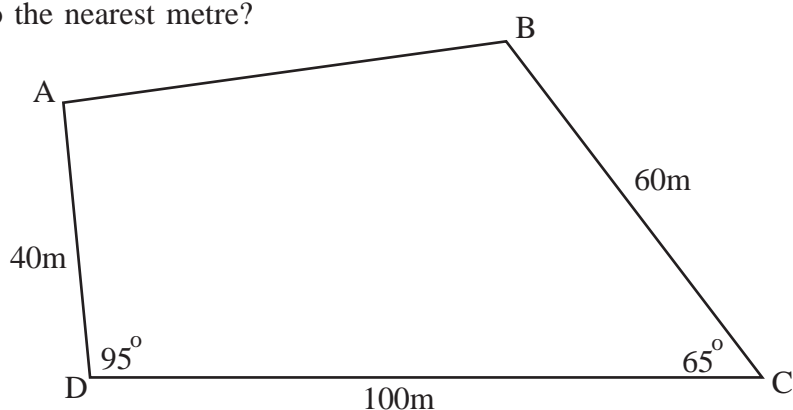
4) The diagram shows a sketch of a garden.
   At one end is a house. Two fences are at right angles to the house.
   Using a scale of 1cm to represent 2 metres, draw an accurate plan of the garden.
   What is the length of the fence DE?
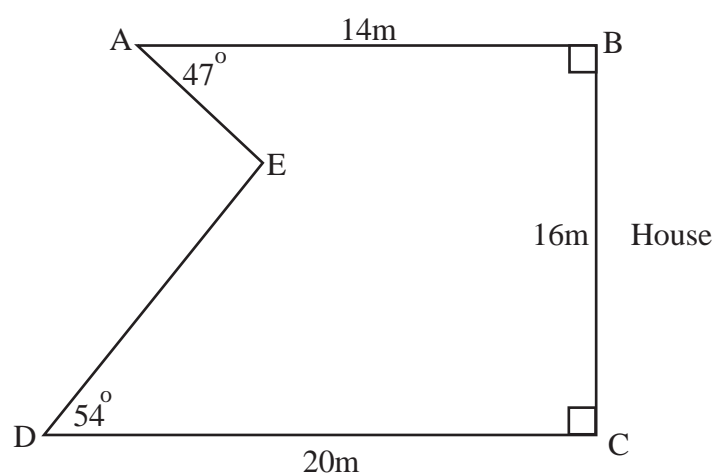
5) Draw accurately a rectangle measuring 9cm by 6cm.
6) Draw accurately a parallelogram measuring 9cm by 6cm with one internal angle of 60°
7) Make a scale drawing of an equilateral triangle with sides of 1 metre. Use a scale of
   1mm to represent 1cm.

40. Rotational Symmetry

1) Each of the following shapes has rotational symmetry.
   What is the order of their symmetry?

a)

b)

c)

d)

e)

f)

g)

h)

i)

j)

k)

l)

m)

n)

p)

q)
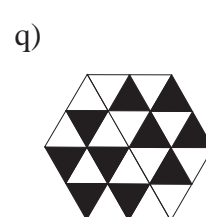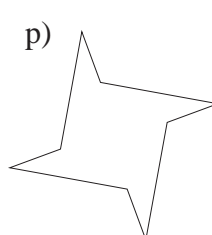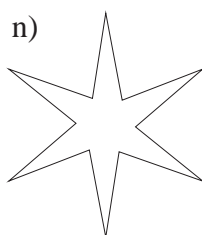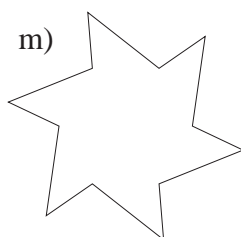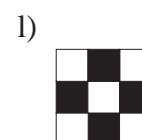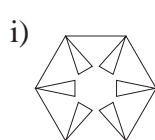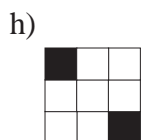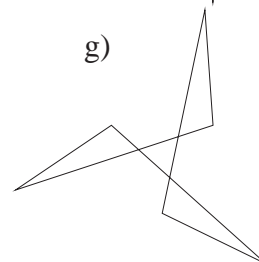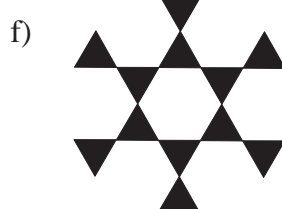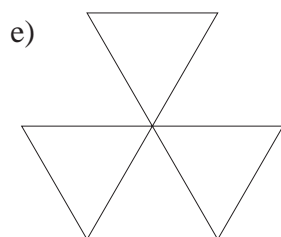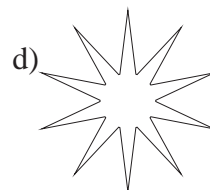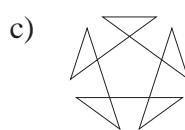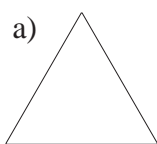
2) Which of these letters have rotational symmetry?

A C D I M N S T U V W X Y Z

3) Rotate each of the following designs 90° clockwise about the point P.
   Sketch the result. The first has been done for you.

a)

P

b)

P

c)

P

d)

P

e)

P

f)

P Z

g)

P

X

h)

P

i)

P
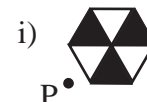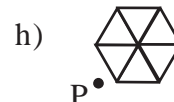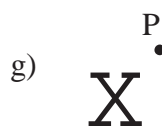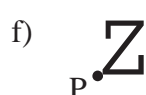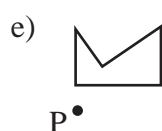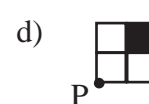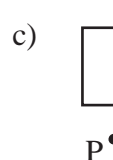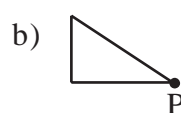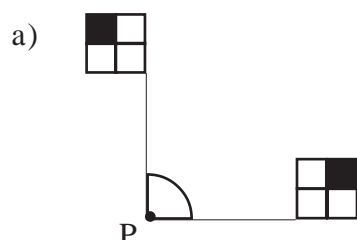
41. Rotation

1) Rotate the triangle 180° about (0,0). What are the co-ordinates of the new triangle?
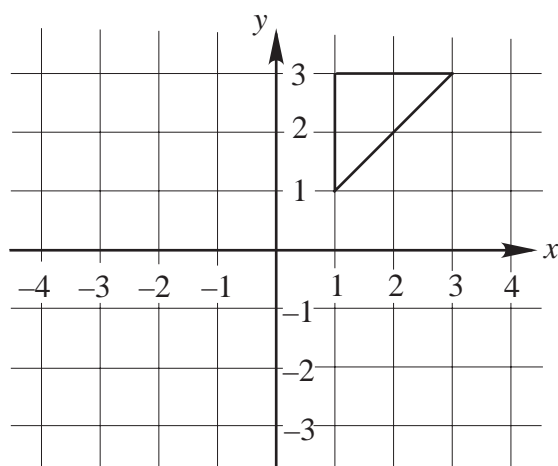
2) Rotate the triangle 90° clockwise about (0,0). What are the co-ordinates of the new triangle?
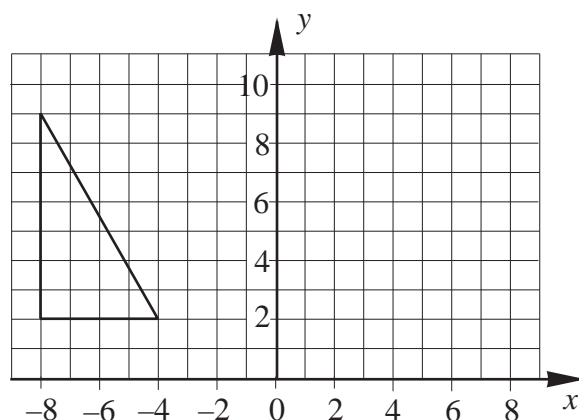
3) Rotate the rectangle 90° anticlockwise about the point (0,0). What are the co-ordinates of the new rectangle?
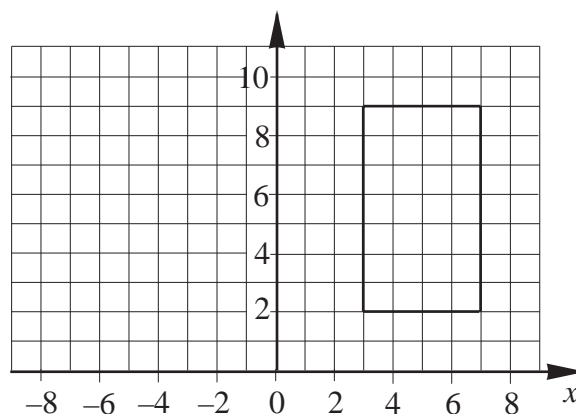
4) Describe fully the transformation which maps shape A onto shape B.
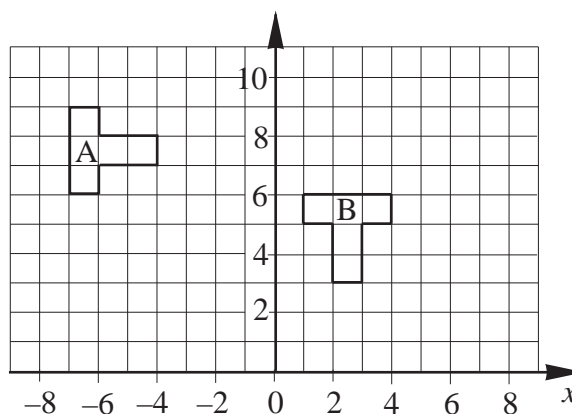
42. Translations (1)

1) The triangle is translated 8 units to the right. Draw the new shape. What are the co-ordinates of the new shape?
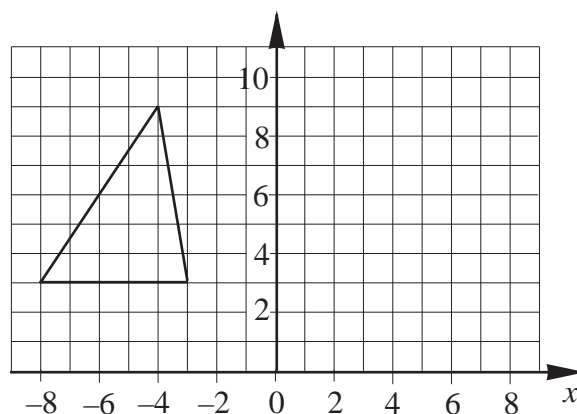
2) The parallelogram is translated 8 units to the left. Draw the new shape. What are the co-ordinates of the new shape?
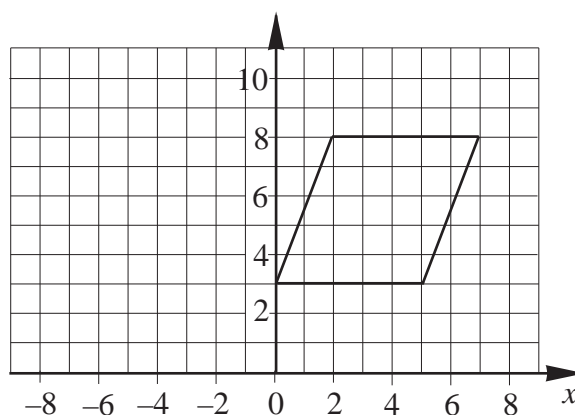
3) The trapezium is translated 7 units down the page. Draw the new shape. What are the co-ordinates of the new shape?
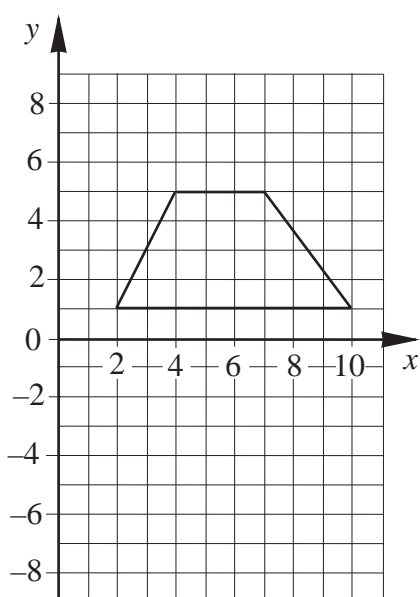
4) The pentagon is translated 10 units up the page. Draw the new shape. What are the co-ordinates of the new shape?
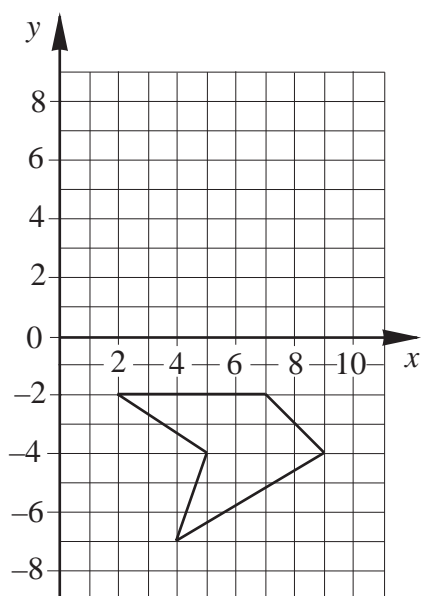
43. Translations (2)

1) The diagram shows a
   triangle A,B,C.
   Copy this diagram.
a) Translate the shape 6
   units in the *x* direction.
b) Translate the new shape
   4 units in the *y* direction.
c) What are the co-ordinates
   of the final shape?
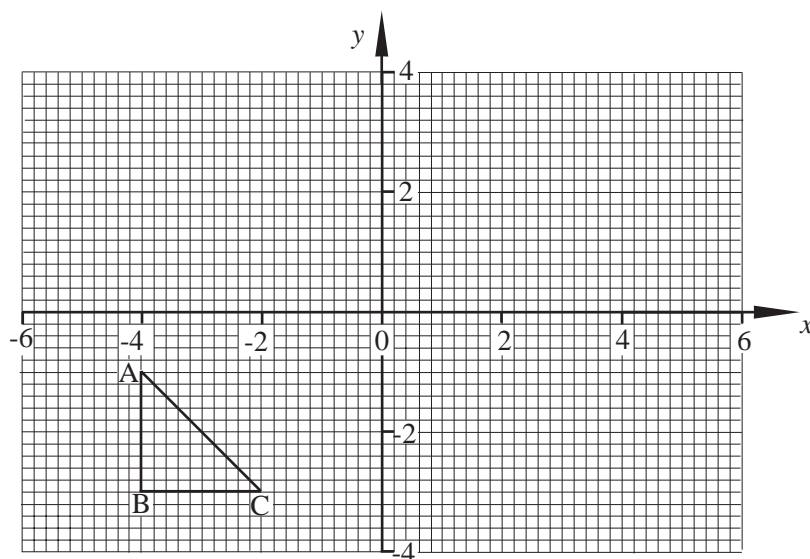
2) The diagram shows a
   square A,B,C,D.
   Copy this diagram.
a) Translate the shape 6
   units in the *x* direction.
b) Translate the new shape
   –5 units in the *y* direction.
c) What are the co-ordinates
   of the final shape?
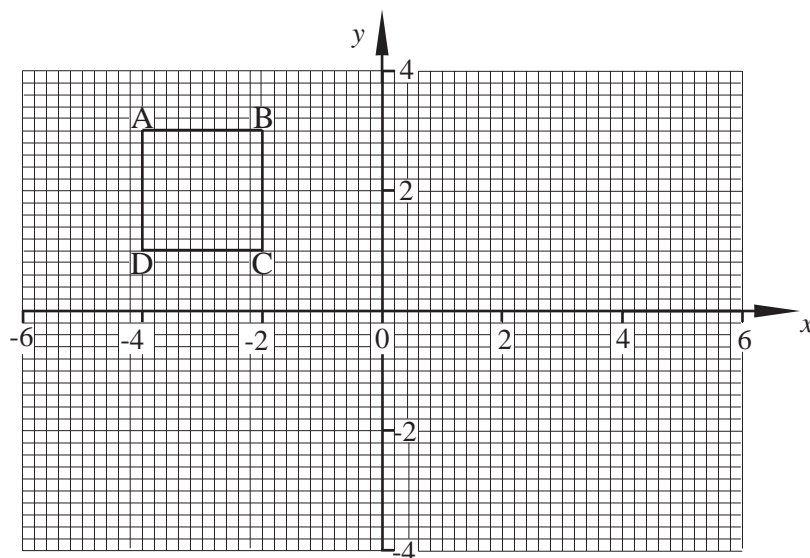
3) The diagram shows a
   quadrilateral A,B,C,D.
   Copy this diagram.
a) Translate the shape –6
   units in the *x* direction.
b) Translate the new shape
   –4 units in the *y* direction.
c) What are the co-ordinates
   of the final shape?
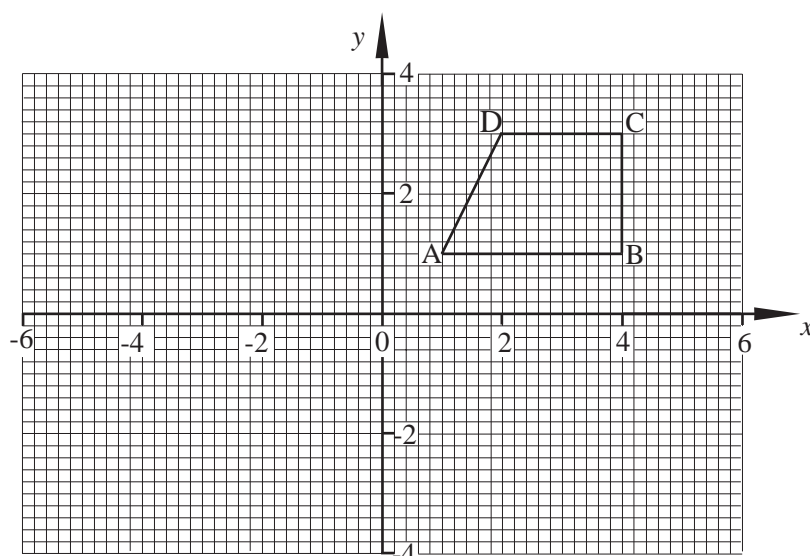
44. Tessellations

1) On the appropriate spotty paper, tessellate each of these shapes six more times

a)
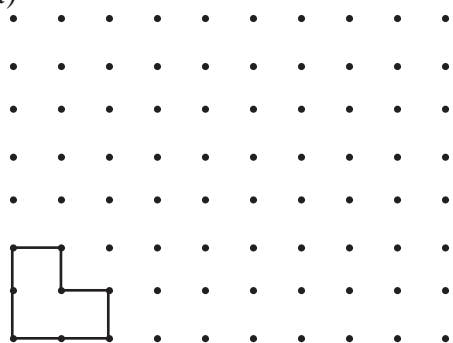
b)
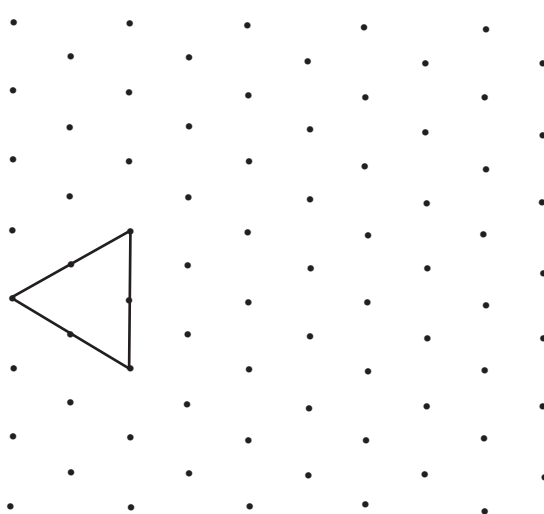
c)
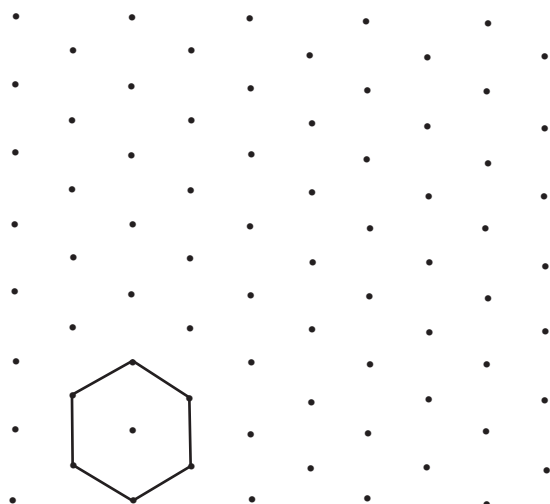
d)
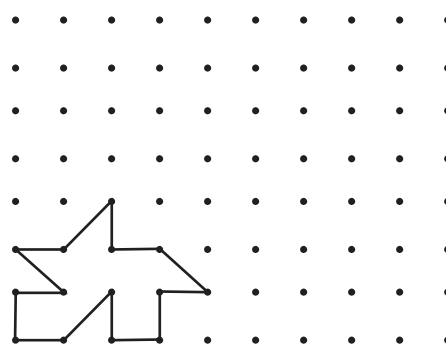
2) The interior angle of a square is 90°. The interior angle of a regular octagon is145^o.
   Explain why squares tessellate but regular octagons do not.

3) The diagrams show how regular octagons, pentagons and heptagons tessellate. What
   are the names of the spaces left between them?

a)
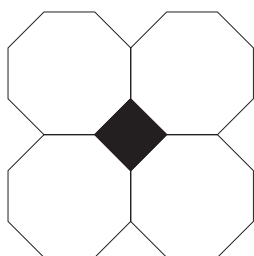
b)
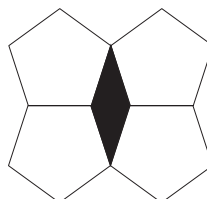
c)
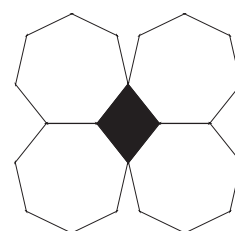
45. Planes of Symmetry

1) The diagram shows a plane cut through
   a cuboid. Is it a plane of symmetry?
   How many planes of symmetry has
   a cuboid got?
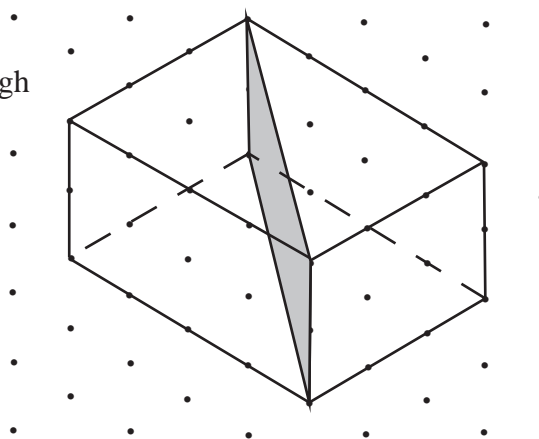
2) How many planes of symmetry has
   a cube got?

3) How many planes of symmetry have these shapes got?

   a)
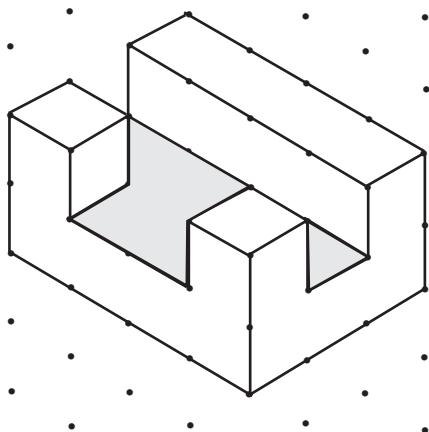
   b)
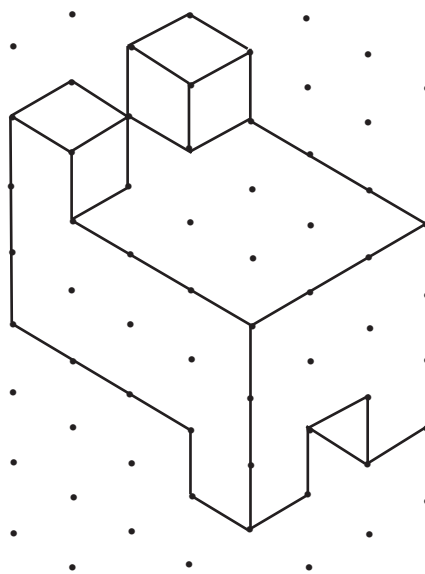
4) Which of the following diagrams represent planes of symmetry of the two shapes
   in question 3?
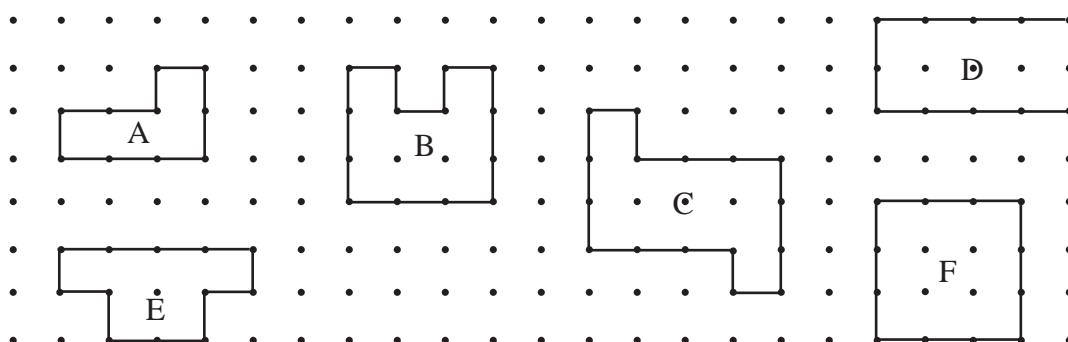
46. Volume

1) This cube measures 3cm by 3cm by 3cm. What is its volume?
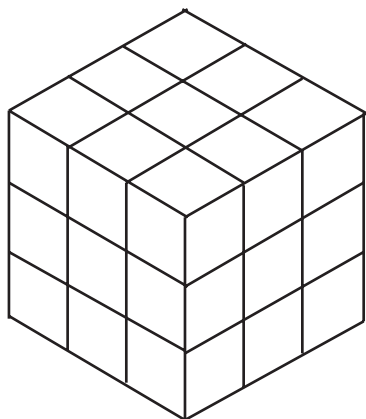
2) What is the volume of this shape?
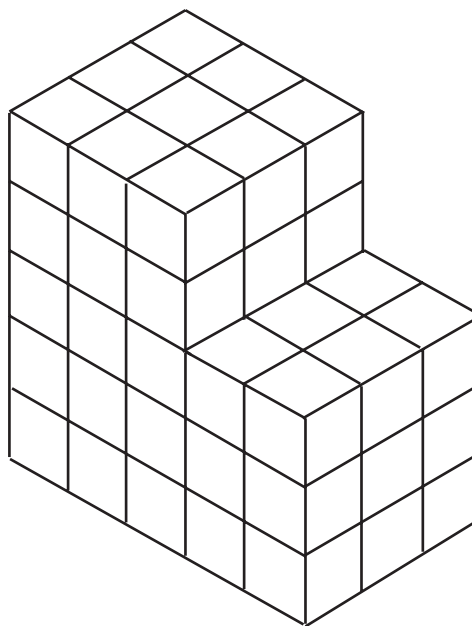
3) What is the volume of this shape
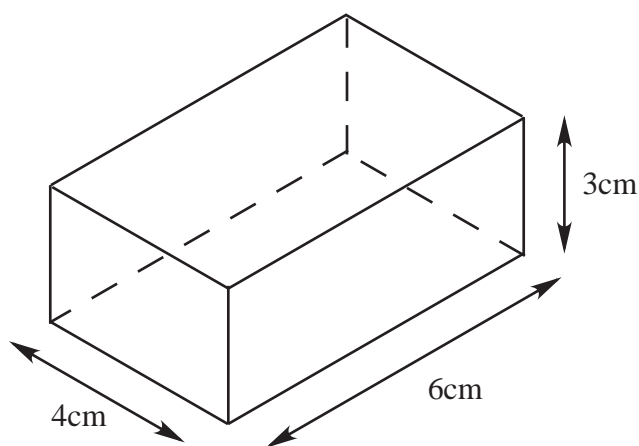
4) What is the volume of a cuboid measuring 2cm by 3cm by 5cm?

5) A box measures 8cm by 6cm by 4cm. How many 2cm cubes will fit inside it?

6) A cuboid measures 6cm by 6cm by 4cm. Sketch another cuboid which has the same volume.

3cm

6cm

4cm

7) The container in the diagram measures 4cm by 4cm by 12cm. It is completely filled with water. The base of the second container measures 8cm by 6cm. The water from the first container is poured into the second container. How far up the sides of the second container does the water rise?

12cm

4cm

4cm

8cm

6cm
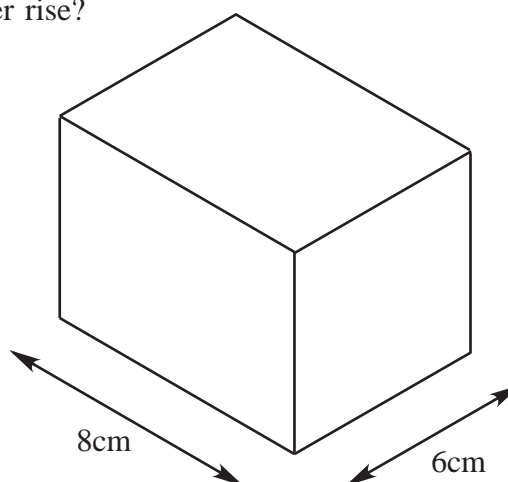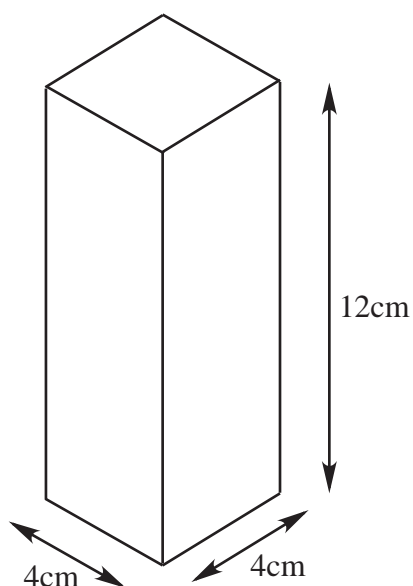
47. Using Measurements

1) What is the length of this pencil a) in millimetres, b) in centimetres and millimetres,
   c) in decimal centimetres?
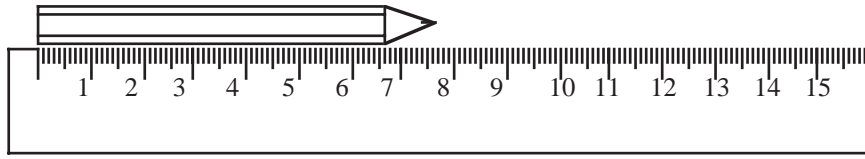
2) What is the length of this pencil a) in millimetres, b) in centimetres and millimetres,
   c) in decimal centimetres?
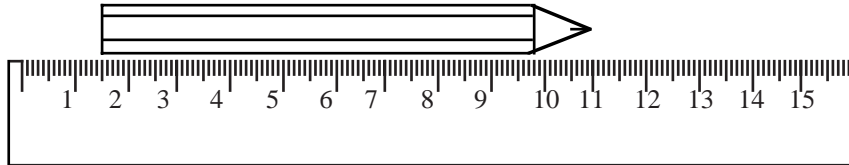
3) What are the approximate lengths, in inches, of the pencils in questions 1 and 2?

4) a) How much liquid is in this jug (i) in millilitres, (ii) as a decimal of a litre?
   b) Is this more or less than 1 pint?
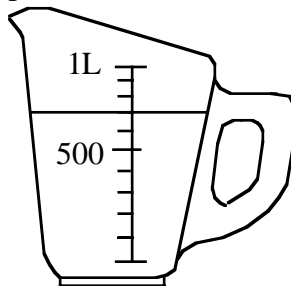
5) Colin and his dad weighed themselves on the bathroom scales. These were the
   results.
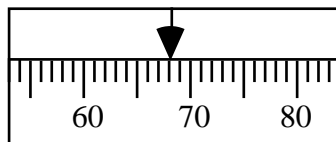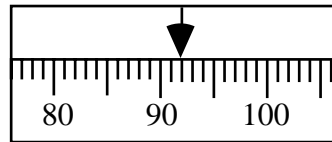
Colin's weight   Colin's dad's weight

   a) Which unit of measure is used? b) What was Colin's weight? c) What was
      Colin's dad's weight? d) What was their difference in weight? e) Approximately
      how many pounds does each of them weigh? f) If there are 14 pounds in one
      stone, what is each of their approximate weights in stones and pounds?

6) The distance from Sarah's home to the centre of London is 56 miles. What is the
   approximate distance in kilometres?

7) Peter's height is 176 centimetres. What is his approximate height in feet and
   inches?

8) A water tank contains 100 litres of water. What is it's approximate capacity in
   gallons?

9) David buys 3 pints of milk and 2kg of carrots from the local shop. Meanwhile his
   mum buys 2 litres of milk and 4 pounds of carrots from the supermarket. Who
   buys the most of each item? Show all your workings out.

48. Circumference of a Circle.

In each of the following questions use π = 3.14 or use the π button on your calculator.

Exercise 1
Calculate the circumference of each of the following circles

1) Radius 4cm	2) Radius 6cm	3) Radius 10cm
4) Radius 18 metres	5) Radius 8 metres	6) Radius 7 metres
7) Diameter 12cm	8) Diameter 16cm	9) Diameter 24cm
10) Diameter 2.3m	11) Diameter 17m	12) Diameter 23m

Exercise 2
Calculate the diameters of circles with the following circumferences (correct to 4 significant figures);

1) 20 cms	2) 105 cms	3) 2.3 metres
4) 15 metres	5) 256 cms	6) 176 metres

Exercise 3

1)
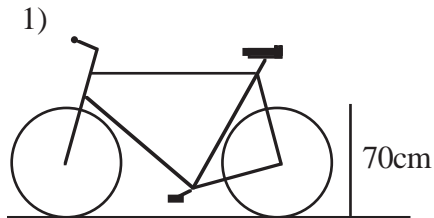
A bicycle wheel has a diameter of 70cm. a) What is its circumference? b) How far will the bicycle travel if the wheel turns 20 times?

70cm

2)
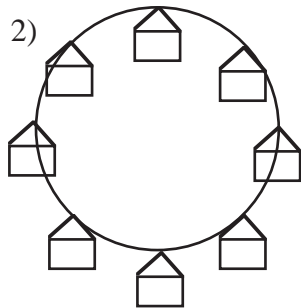
The diagram shows a fairground wheel. Its diameter is 10 metres. Calculate
a) the distance travelled by one of the chairs in one complete revolution.
b) the distance travelled by one chair when the wheel rotates 20 times.

3)
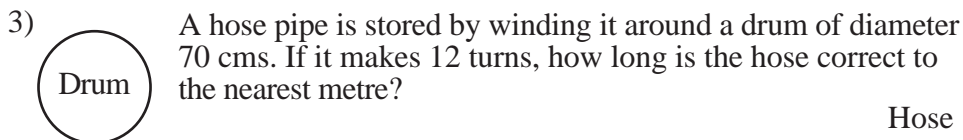
Drum

A hose pipe is stored by winding it around a drum of diameter 70 cms. If it makes 12 turns, how long is the hose correct to the nearest metre?

Hose

4) A car wheel has a diameter of 50 cm. How far will the car travel if the wheel turns 5 times?

5) If the same car wheel turns 500 times, find the distance travelled correct to the nearest metre.

6) A car has a wheel diameter of 55 cms. How many revolutions does it make while travelling a distance of 1 kilometre? (give your answer correct to the nearest whole number)

7) A length of cotton measuring 2 metres is wound around a cotton reel of diameter 3cms. How many turns does it make? (correct to the nearest turn)

49. Areas and Perimeters

1) What is the area and perimeter of each of these shapes?
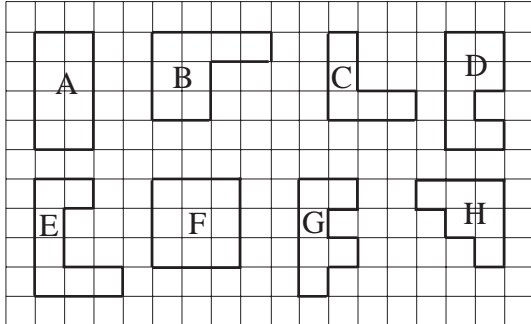
2) Which of these shapes has the larger area?
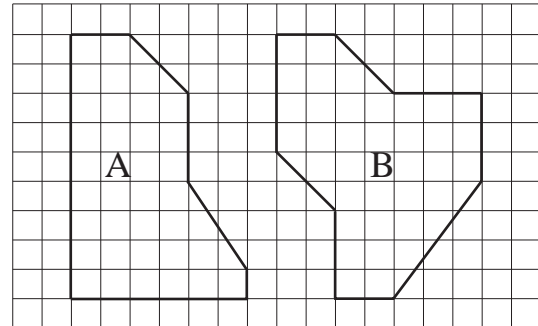
3) By counting squares, estimate the area of this shape.
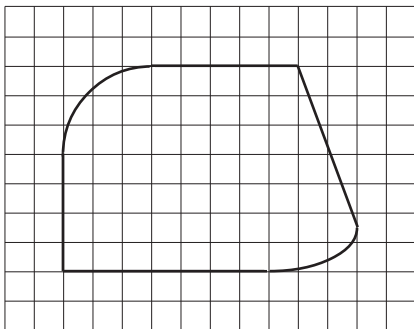
4) Calculate the perimeter and area of this shape.
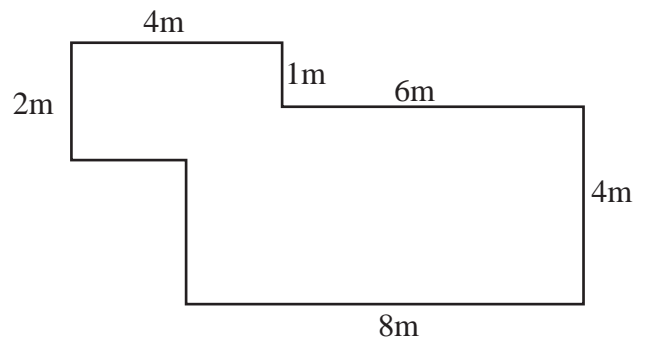
5) The diagram shows part of a conservatory floor. It is to be covered with square tiles measuring 20cm by 20cm. a) How many tiles are needed?
It is to be surrounded with thin lengths of tile each 20cm long.
b) What is the perimeter of the conservatory?
c) How many lengths of tile will be needed?
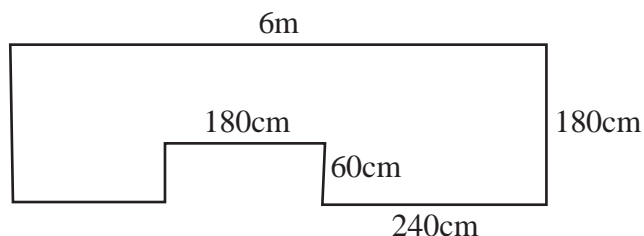
6) What is the area of each of these triangles?

a)
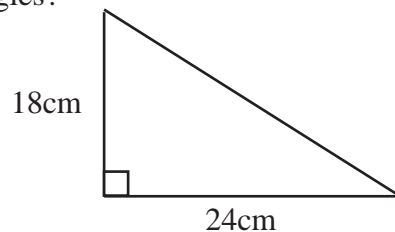
b)
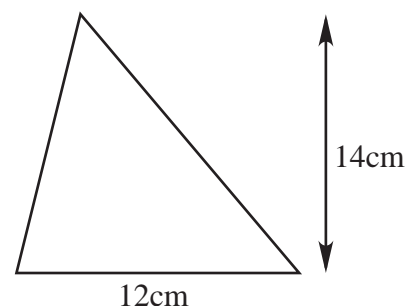
c)
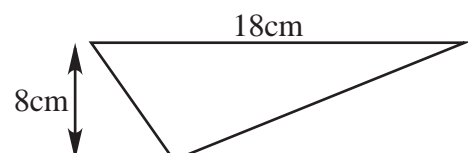
7) What is the area of a triangle with a base of 10cm and a height of 12cm?

50. Time

1) The diagrams below show the start and finish times for some TV programmes.
   Calculate how long the programmes last.

a) Start   Finish   b) Start   Finish

c) Start   Finish   d) Start   Finish
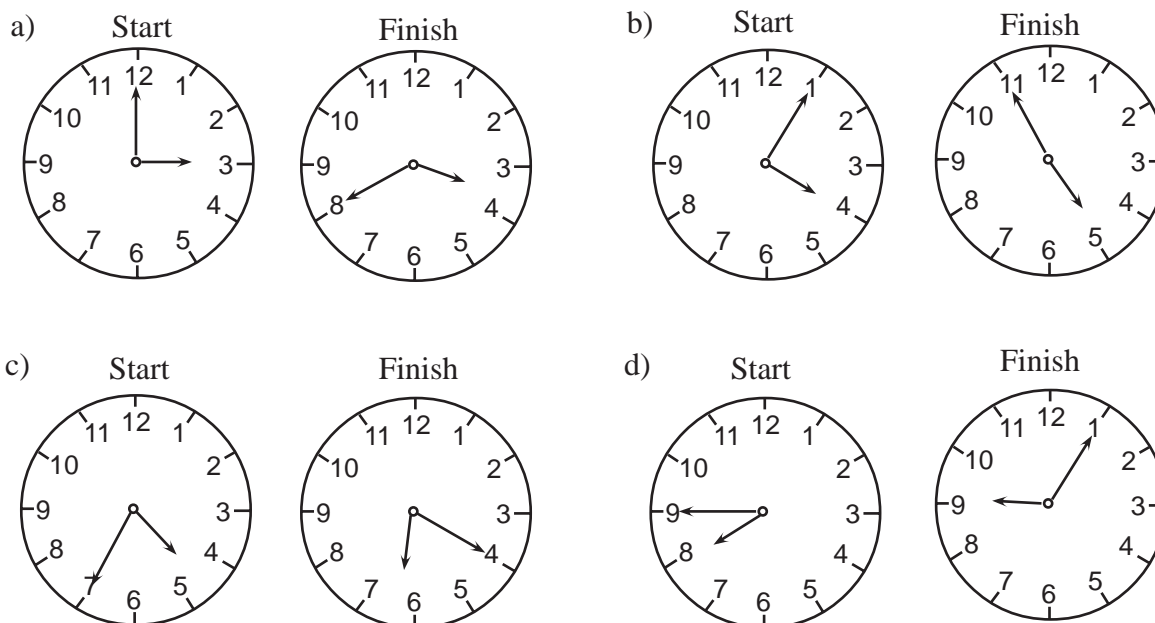
2) The following diagrams show the start and finishing times of rail journeys.
   Calculate how long the journeys take.

a) Start   Finish   b) Start   Finish   c) Start   Finish

   12:00   15:45   05:50   09:56   08:34   10:27

d) Start   Finish   e) Start   Finish   f) Start   Finish

   18:45   21:34   23:50   02:54   22:34   05:22
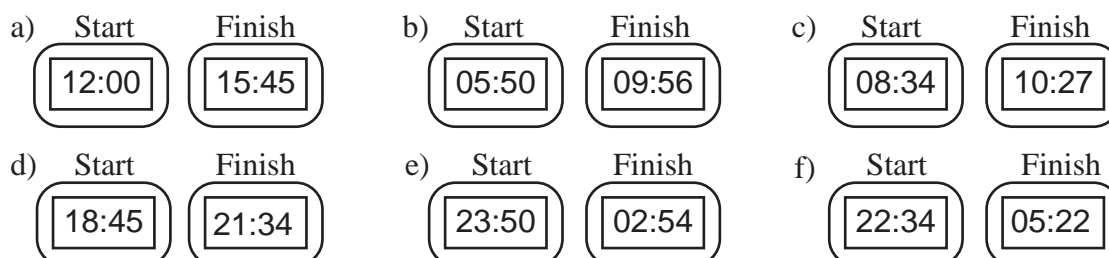
3) A TV programme begins at 3:30. It lasts for 2 hours 20 minutes. At what time does
   it end?

4) A train leaves a station at 11:45am and travels for 2 hours 45 minutes. At what time
   does it arrive at its destination?

5) Sarah goes to the football match on Saturday afternoon. She leaves home at 11:35am
   and arrives back home at 6:15pm. How long is she away from home?

6) An aeroplane leaves Manchester at 15:53 and arrives at London Heathrow at 17:06
   a) What would these times be on the 12 hour clock?
   b) How long is the journey from Manchester to Heathrow?

7) Joe leaves home at 08:05 and takes 32 minutes to get to school. His sister, Hannah,
   leaves home at 07:51 and takes 39 minutes to get there. Who arrives at school first?

8) A car leaves Paris at 06:45 to travel to Marseilles. It arrives at Marseilles 9 hours
   27 minutes later.
   a) What time does it arrive in Marseilles?
   b) If the driver stopped on the way for 53 minutes, what was her total driving time?

9) A ferry leaves port at 22:43 on Tuesday. It arrives at its destination at 06:05 on
   Wednesday morning. How long did the journey take?

51. Plans

1) The diagram shows a
   plan of a kitchen. The
   scale of the plan is 1:50.
   a) What does 1cm on the
   diagram represent?
   b) Measure the length and
   width of the diagram.
   Write them down.
   c) What is the actual
   length and width of the
   room?
   d) What is the actual
   length and width of the
   table?
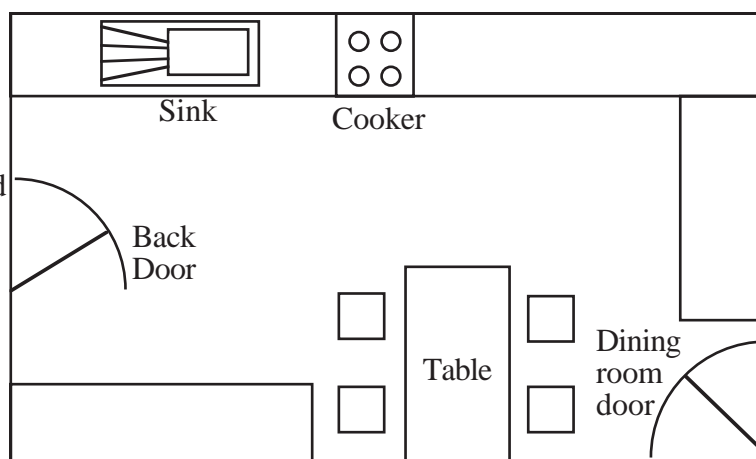
2) Plans of a garage are made to the scale of 1:20.
   Copy and complete the table below .

	Garage	Plan
Length	8metres	
Width		20cm
Height	2.5m	
Number of windows		2

3) The diagram shows a lamp. Its actual height is 30cm.
   a) Measure its height.
   b) What is the scale of the drawing?
   c) What is the actual height of the lamp shade?
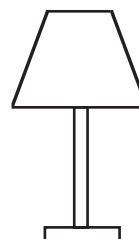
4) The diagram below shows a scale drawing of a paper clip. The actual clip is
   approximately 32.5mm long.
   a) Measure the length of the diagram and write down its scale in the form ?:1.
   b) What is the width of the actual clip?
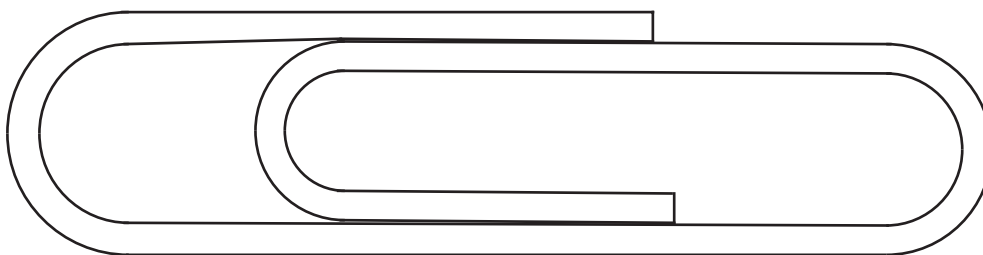
5) An engineer makes a scale drawing of a computer chip. The scale is 5:1 (i.e the
   drawing is bigger than the chip)
   Copy and complete the table below .

	Chip	Drawing
Length	6cm	
Width		10cm
Thickness	2mm	
Number of sides		4

52. Speed

1) The distance between two towns is 100 miles. It takes 2 hours to travel between the towns. What is the average speed?

2) The distance between two towns is 96 miles. Neil takes 3 hours to get from one town to the other. What is his average speed?

3) The distance between two towns is 200 kilometres. A car takes 5 hours to travel between the towns. What is its average speed?

4) The distance between Newcastle and Edinburgh is 105 miles. A car takes 4 hours to travel between the towns. What is its average speed?

5) The distance between London and Swansea is 190 miles. A train takes $2\frac{1}{2}$ hours to travel between the towns. a) How far does it travel each half hour? b) What is its average speed?

6) The distance between two towns is 135 kilometres. It takes $4\frac{1}{2}$ hours to travel between the towns. a) How far is travelled in each half hour? b) What is the average speed?

7) The distance between two towns is 10 kilometres. It takes 15 minutes to travel between the towns. What is the average speed?

8) The distance between two towns is 25 miles. It takes 30 minutes to travel between the towns. What is the average speed?

9) The distance between two towns is 90 kilometres. It takes 1 hour 30 minutes to travel between the towns. What is the average speed?

10) A car travels at an average speed of 30 miles per hour. It takes 2 hours to travel between two towns. How far apart are they?

11) A car travels at an average speed of 25 miles per hour. It takes 3 hours to travel between two towns. How far apart are they?

12) A car travels at an average speed of 50 kilometres per hour. It takes $2\frac{1}{2}$ hours to travel between two towns. How far apart are they?

13) A train travels at an average speed of 50 kilometres per hour. It takes $1\frac{1}{2}$ hours to travel between two towns. How far apart are they?

14) A car travels at an average speed of 36 miles per hour. It takes $3\frac{1}{2}$ hours to travel between two towns. How far apart are they?

15) Two towns are 80 km apart. If a train travels at an average speed of 40 kilometres per hour, how long does it take to make the journey?

16) Two towns are 60 km apart. A train travels at an average speed of 40 kilometres per hour between them. How long does it take to make the journey?

17) Manchester and Cardiff are 170 miles apart. A train travels at an average speed of 68 miles per hour between them. Jane leaves Manchester at 12:50. At what time will she arrive in Cardiff?

18) Two towns are 20 miles apart. A train leaves the first town at 10:15am. It travels to the other town at an average speed of 60 miles per hour. At what time will it arrive?

19) Two towns are 100 kilometres apart. A train travels between them at an average speed of 80 kilometers per hour. If it starts its journey at 11:30pm, at what time will it arrive at the second town?

53. Best Buys

1) Chris sells running socks on his market stall in packs of 3 for £1.71. He sees that the local supermarket sells the same socks in packs of 5 for £3.05. Who sells the cheaper socks?

2) Cassette tapes are sold in packs of three for £1.47 at the corner shop. In the supermarket they are sold in packs of 8 for £3.76. Showing all working, calculate which gives the best value for money.

3)
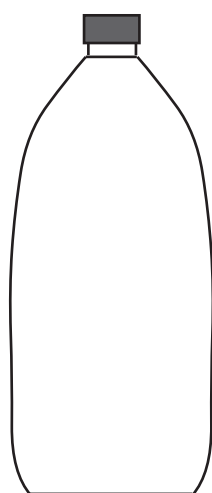
2 litres
95p
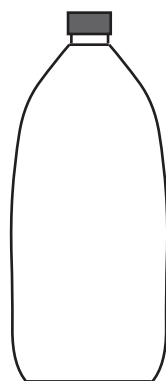
1 litre
45p

500ml
30p

Which of these three bottles of cola is the best value for money. Show all your calculations?

4) Which of these tins of soup gives the best value for money?

5) Which of these two cartons of orange juice gives the best value for money
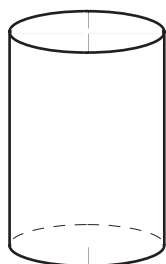
300 grammes
27p

700 grammes
54p
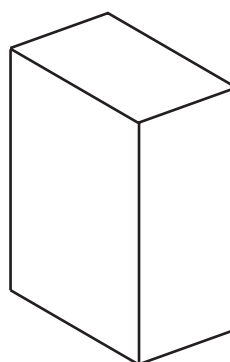
450ml
35p
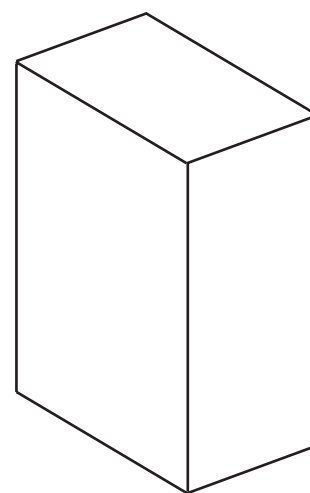
1 Litre
60p

6) Toothpaste costs 90p for a 75ml tube or £1.20 for a 125ml tube.
   Showing all working, calculate the best buy.

7) Shampoo costs 60p for a 250ml bottle or £1.10 for a 500ml bottle.
   Showing all working, calculate the best buy.

8) Baked beans cost 22p for a 250g tin or 34p for a 450g tin.
   Showing all working, calculate the best buy.

9) Paint costs £2.55 for a 1 litre tin or £9.05 for a 4 litre tin.
   Showing all working, calculate the best buy.

10) Oil paint is sold in 2 different sizes. A 75ml tube costs £1.20 and a 200ml tube costs £3.10.
    Showing all working, calculate the best buy.

54. Pictograms

1) The diagram represents the method by which year 7 get to school. From the diagram determine
   a) The total number of pupils in the year.
   b) The number of pupils who travel by bus.
   c) The number of pupils who travel by train.

	☺ Represents 5 pupils	Frequency
Walk	☺☺	10
Bus	☺☺☺☺☺☺☺☺☺	
Car	☺☺☺☺	
Bicycle	☺☺☺☺☺☺	
Train	☺☺☺	
Other	☺	

2) The pictogram shows the number of cars travelling past Sarah's home between 7:00am and 1:00pm

Time	🚗 Represents 60 cars	Frequency
7:00-8:00	🚗 🚗 🚗 🚗	210
8:00-9:00	🚗 🚗 🚗	
9:00-10:00	🚗 🚗 🚗	
10:00-11:00	🚗 🚗	
11:00-12:00	🚗 🚗	
12:00-1:00	🚗 🚗 🚗 🚗 🚗	

   a) How many cars does 🚗 stand for?

   b) How many cars does 🚗 stand for?

   c) How many cars does 🚗 stand for?

   d) How many cars went past between 9:00am and 1:00pm?

3) A survey was carried out to determine which of five sports was the most popular. 100 people were asked which of the sports they liked best. Here are the results.

Badminton	Squash	Netball	Rounders	Hockey
20	10	20	15	35

   Draw a pictogram to show this data using ☺ to represent 5 people.

55. Areas of Circles

In each of the following questions use π = 3.14 or use the π button on your calculator.

1) Calculate the areas of the following circles.

a)
3cms

b)
16mm

c)
8mm

d)
3cms

e)
1.5cms

f)
2cms
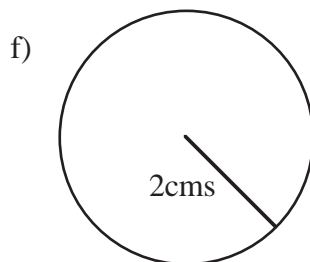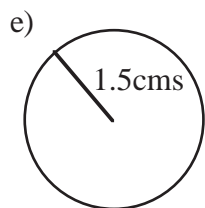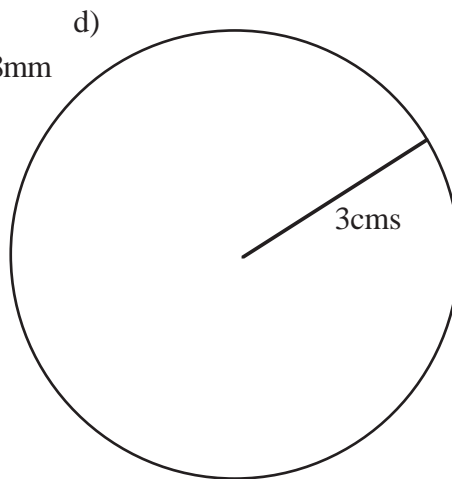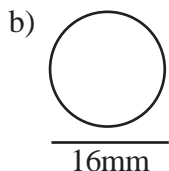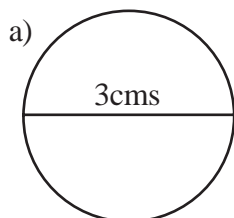
2) Calculate the areas of each of the following circles.
   a) 10cm diameter   b) 6cm diameter   c) 5cm diameter
   d) 12cm radius   e) 9cm radius   f) 7.5cm radius
   g) 4.6cm diameter   h) 4.3cm radius   i) 8.4cm diameter

3) A compact disc has a diameter of 12cms and a
   hole in the centre of diameter 1.5cm.
   Calculate
   a) The area of the big circle.
   b) The area of the hole in the middle.
   c) The area of plastic making up the disc.
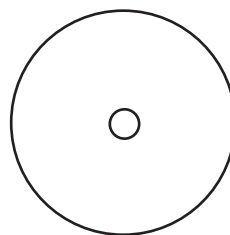
4) Which has the larger area, a circle of diameter
   3cm or a square of side 2.5cm?
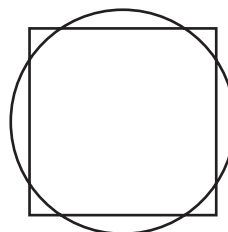
5) The diagram shows a circular garden with a path around
   it.
   The diameter of the garden is 8 metres. The diameter of
   the garden and path is 10 metres. Calculate
   a) The area of the garden
   b) The area of the garden and path
   c) The area of the path only.
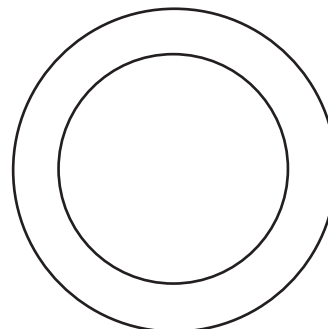
56. Probability-Tables (1)

1) Two dice are thrown together and their values added. Copy and complete the table below to show their sums.

Second dice

	1	2	3	4	5	6
1	2	3	4	5		
2	3	4	5			
3	4	5				
4	5					
5						
6						

First dice

2) Five cards have the letters A, B, C, D, E on them.

A B C D E
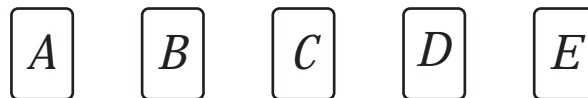
Two cards are taken at random and their letters recorded. Copy and complete this list of results.

(A,B)   (A,C)   (A,D)   (A,E)   (B,C)....

3) The diagram shows two spinners, one numbered 1 to 4, the other 1 to 3. The outcome 1+2=3 is shown. Make a table, as in question 1, to show all the possible outcomes.

4)
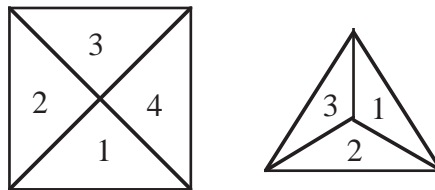
Red discs   Blue discs
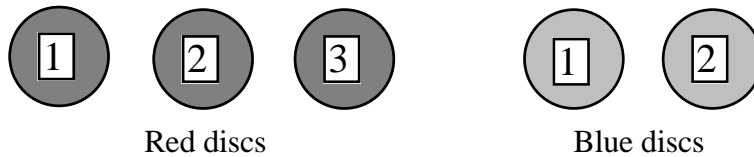
Three red discs are numbered 1 to 3, and two blue discs are numbered 1 and 2.
A red disc is chosen at random followed by a blue disc.
Complete the following list of all the possible outcomes.
(1,1)   (1,2)   (2,1)...

5)
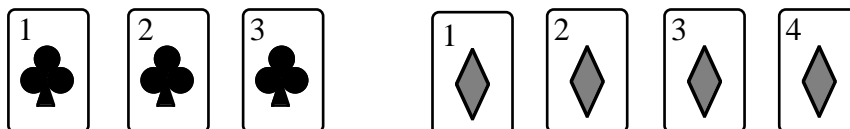
Three black cards are numbered 1 to 3 and 4 red cards are numbered 1 to 4.
A black card is chosen at random followed by a red card. Complete this list of all the possible outcomes.
(1,1) (1,2) (1,3) (1,4) (2,1)....

57. Probability Tables (2)

1) Two dice bearing the numbers 1, 1, 2, 2, 3, 3 are thrown together and the numbers shown are added. Copy and complete the table below which shows the possible outcomes.

Second dice

		1	1	2	2	3	3
	1	2	2	3	3		
	1	2	2	3			
First	2	3	3				
dice	2	3					
	3						
	3						

What is the probability of getting a total of
a) 6
b) more than 4
c) less than 4

2) Four cards have the numbers 1, 2, 3, 4 on them.

[1]   [2]   [3]   [4]

Two cards are taken at random and their sum recorded in this table. Copy and complete the table.

	1	2	3	4
1		3		
2				
3				
4				

Use the table to find the probability of obtaining a sum
a) of 7
b) greater than 4

3) The diagram shows two spinners, one numbered 1 to 4, the other having the letters A, B, C. The outcome (1,B) is shown
a) Make a list of all the possible outcomes.
b) What is the probability of getting (2,A)?
c) What is the probability of getting a 4?
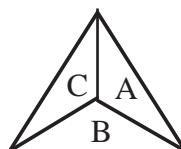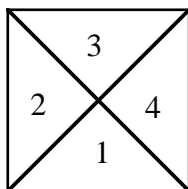
4) Three orange discs are numbered 1 to 3, and two green discs are numbered 1 and 2. An orange disc is chosen at random followed by a green disc.
List all the possible outcomes.
What is the probability of getting
a) a 2 followed by a 1?
b) a 1 and a 2 in any order?
c) a 3 and a 1 in any order?

58. Probability (1)

1) Say whether each of the following events are likely, unlikely or have an even chance of happening
a) Throwing a 1 on a dice
b) Throwing a 6 on a dice
c) Throwing an odd number on a dice
d) Drawing a green disc from a bag of 100 discs when the bag contains 70 green discs

2) Three people, Alan, Betty and Cathy each buy raffle tickets. 100 tickets are sold altogether. Alan buys 5, Betty buys 10, and Cathy buys 20. Copy the following line and mark on it the chance of a) Alan winning b) Cathy winning c) Betty not winning.

```
┌──────────────────────┬──────────────────────┐
   Unlikely                    Likely
```
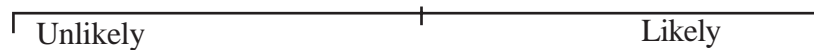
3) Copy the probability line.
There are 10 discs in a bag, 2 red, 5 blue and 3 green. A disc is drawn at random. Show on the line the probability of getting (a) a red (b) a blue (c) a green (d) a red or a blue.

```
┌──────────────────┬──────────────────┐
0                  0.5                 1
no                                   Certainty
chance
```
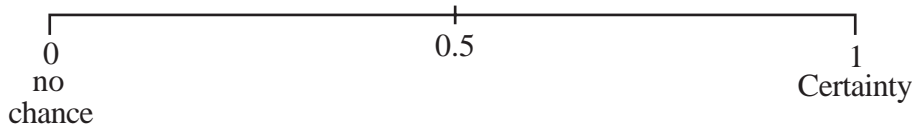
4) The probability of some events happening are given by these numbers
0, 0.1, 0.3, 0.5, 0.7, 0.9, 1.0.
The same events have the following chances of happening
Likely, Even, Very unlikely, No chance, Very likely, Unlikely, and Certain.
Match the number against each of the chances.

5) Another set of events have the following probabilities of happening.
19%, 5%, 100%, 98%, 67%, 50%, 0%
Match each of these numbers against each of the words in question 4.

6) A race horse won five times out of his last seven races. Is the chance of him winning the next race, good, even or poor? Explain your answer.

7) Ann buys five raffle tickets. 1000 tickets are sold altogether. She wins a prize. She then says "buying five tickets in a raffle always gives you a good chance of winning". Is she correct? Explain your answer.

8) Liam carries out a survey in the high street. After one hour he collects together his data and draws up this table.

Vehicle	Cars	Vans	Lorries	Buses	Other
Number	156	43	23	8	27

Do you think that the chance of the next vehicle being a car is good? Explain your answer.

9) Tracy buys a CD player from a store. Because she spends more than £100 her name is entered into a prize draw. She says that the chance of a girl winning is 0.5 because there are the same number of girls in the world as boys. Is she correct? Explain your answer.

59. Probability (2)

Find the probability of the events in questions 1 to 6 happening

1) Throwing a number 2 on a dice numbered 1 to 6

2) Drawing a king from a pack of 52 playing cards (there are 4 kings in a pack)

3) Selecting a girl at random from a class of 20 boys and 15 girls.

4) Winning first prize in a raffle if you hold 10 tickets and 200 have been sold.

5) Picking an even number from the numbers 1 to 20.

6) Throwing an odd number on a dice numbered 1 to 6.

7) The order of play in a badminton competition is decided by drawing names from a
   hat. Six names, Jane, Andrew, Stephen, Claire, Jenny and Jonathan are put into
   the hat and drawn at random. Find the probabilities of
   a) drawing Claire's name first
   b) drawing a boy's name first
   c) not getting Stephen's name first.

8) A bag contains 12 discs - 4 red, 5 green and 3 blue. A disc is taken out at random
   What is the probability of drawing
   a) a green disc
   b) a red disc
   c) a disc which is not a blue disc.

9) In a raffle, 1000 tickets are sold. Emily buys 5 tickets.
   a) What is her chance of winning?
   b) The chance of David winning is 10%
      How many tickets does he buy?

10) A <u>biased</u> spinner has the numbers 1, 2, 3 and 4 on it.
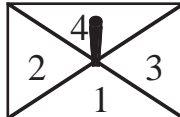
   The probability of getting a 1 is 0.1, a 2 is 0.2, and a 3 is 0.2.
   a) What number are you most likely to get?
   b) If it is spun 100 times, how many 2's would you expect to get?
   c) What is the probability of scoring a 6?

11) 10 cards have the numbers 1 to 10 written on them.

   The cards are shuffled and placed face down on the table. A card is drawn at
   random. Calculate the probability of each of the following
   a) The card drawn will have the number 6 on it
   b) The number on the card will be greater than 6
   c) The number on the card will not be a 6

12) The probability of getting a 6 when rolling a dice is $\frac{1}{6}$. What is the probability of
    not getting a 6? Explain your answer.

60. Grouped Frequency

1) Below is shown a list of marks scored by 33 pupils in an examination.

40,   35,   56,   98,   56,   87,   43,   23,   54,   57,   19,
39,   53,   85,   67,   83,   35,   49,   28,   51,   62,   68,
58,   43,   23,   73,   80,   52,   48,   33,   43,   21,   58

Copy and complete this grouped frequency table for the marks.

Mark Class interval	Tally	Number of pupils Frequency
0-10		0
11-20	/	1
21-30	////	
31-40		
41-50		
51-60		
61-70		
71-80		
81-90		
91-100		

2) "From his window Jack could see the leafless trees on the far side of the railway cutting. There was a slight wind which from time to time rustled the discarded paper on the ground. And *there* was the magpie; the bird that had given him so much trouble in the past".

From the paragraph above, complete this table

Number of letters in a word Class interval	Tally	Number of words Frequency
1-2		
3-4		
5-6		
7-8		
9-10		

3) Below is shown the number of TV's sold each day by an electrical shop over a period of six weeks (36 days - excluding Sunday)

5,   4,   8,   11,   15,   14,   3,   13,   8,   13,   19,   19,
13,   15,   10,   15,   21,   15,   9,   6,   8,   14,   8,   14,
4,   5 ,   1,   8,   2,   3,   4,   6,   4,   3,   1,   2.

Copy and complete this grouped frequency table.

Number sold Class interval	Tally	Number of days Frequency
1-4		
5-8		
9-12		
13-16		
17-20		
21-24		

4) The following list shows the runs scored by batsmen in a game of cricket.

30,   1,   40,   20,   22,   11,   31,   32,   35,   23,   28,
33,   13,   23,   38,   29,   27,   39,   15,   27,   29,   21,
24,   17,   26,   3,   14,   17,   16,   5,   26,   45,   19,
7,   12,   8,   25.

Make a frequency table using the class intervals 0-10, 11-20, 21-30, 31-40 and 41-50.

61. Pie Charts

1) The pie chart shows the mixture of trees in a wood.
   There are 1,000 trees altogether.
   a) What percentage of the trees are ash?
   b) What fraction of the trees are oak?
   c) How many oak trees are there?
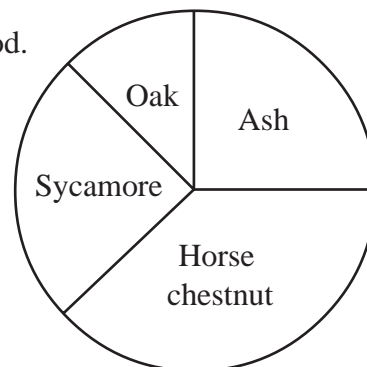
2) This pie chart represents Caroline's daily
   activities
   a) What fraction of the day is spent sleeping?
   b) How many hours are spent working?

3) A survey asked 90 people how they intended to vote in the next general election.
   The results are shown in the table below.

Conservative	Labour	Liberal democrat	Other	Not known
20	30	20	5	15

   Draw a pie chart to show this information. You must show clearly all your calculations.

4) A class of 36 pupils were asked how they normally came to school. 10 said they came
   by bus, 14 walked, 7 came by car and 5 by bicycle.
   Draw a pie chart to show this information. Calculate
   a) the number of degrees representing 1 pupil
   b) the number of degrees representing each of the groups.

5) A survey was carried out to determine the type of newspaper people read. The 120
   replies are shown in the table below.

Local	Daily	Sunday	None
25	50	30	15

   Draw a pie chart to show this information.

6) In a library there are 600 shelves to hold the books. The shelves are used in the
   following way.

Reference	Fiction	Non fiction	Magazines and newspapers
100	250	200	50

   Draw a pie chart for the information by first calculating
   a) the angle needed to represent 10 shelves, then
   b) the number of degrees needed for each group.

62. Bar Charts.

1) This bar chart shows the types of houses the pupils of 10G live in.
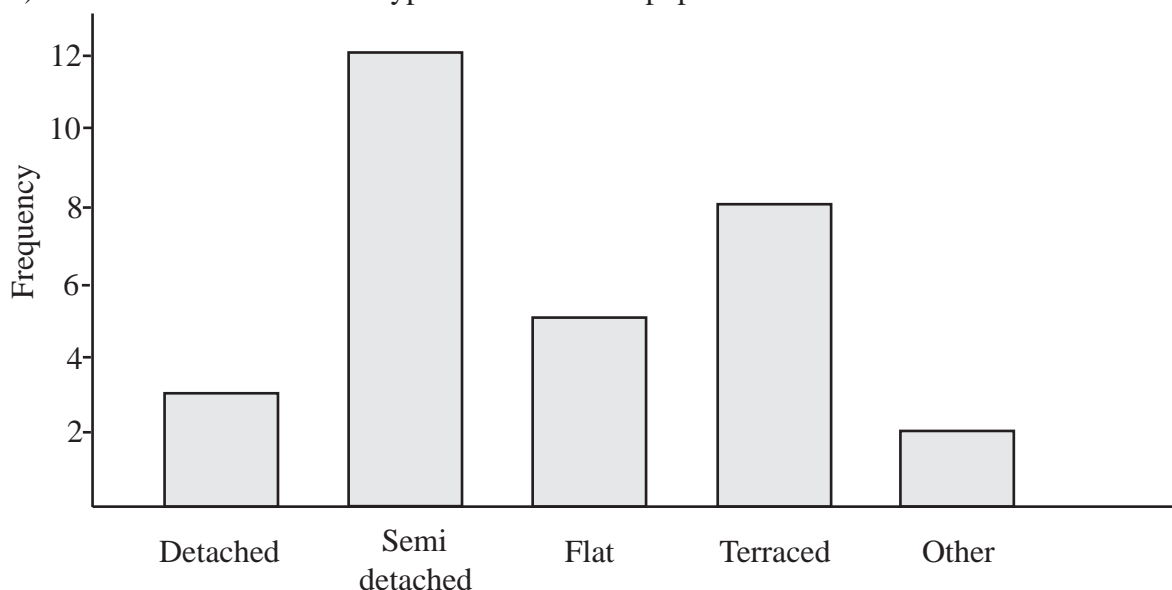
From the diagram determine
a) Which type of building is the most popular
b) The number of pupils who live in flats
c) The total number of pupils in 10G.

2) The bar chart shows the marks obtained in an examination by students at a college. For example 50 students scored between 40 and 49 marks
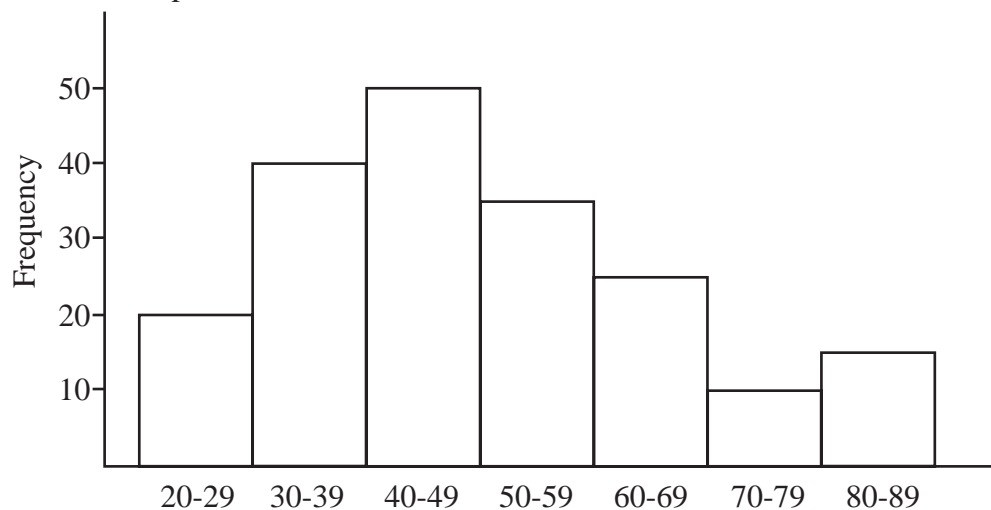
a) How many students scored between 30 and 39?
b) How many students scored between 50 and 59?
c) How many students scored 60 or more?
d) Approximately how many students sat the examination?

3) Sixty people were asked to name their favourite fruit. The results are shown in this table.

Apple	Banana	Orange	Pear	Grapes	Other
13	18	10	6	8	5

Draw a bar chart to show this information.

63. Mean

1) Calculate the mean of these numbers

     3,   7,   5,   6,   5,   4,   5,   3

2) Calculate the mean of these numbers, correct to one decimal place.

     8,   6,   6,   5,   8,   9,   5,   10,   8,   6,   4

3) Calculate the mean of these numbers

     52,   56,   53,   48,   54,   50,   58,   55,   51,   49,   57

4) Calculate the mean of these numbers

     13,   5,   10,   11,   12,   13,   14,   15,   10,   12

5) A cricketer plays in 7 games and scores a total of 224 runs.

  a) What was his mean score?

  b) If he scores 0 runs in his eighth game, what is his new mean?

6) Barchester United Football Club score an average of 2.5 goals in 6 games.

  a) What was their total score?

  b) In the next game they score 5 goals. Is this sufficient to bring their average up to 3?

7) A class of 30 pupils have a test. It is marked out of 5. The table shows the marks gained.

Mark gained	0	1	2	3	4	5
Number of pupils	2	2	5	10	7	4
Total marks gained	0	2	10			

  a) How are the numbers in the bottom row obtained?

  b) Complete the bottom row

  c) What was the total number of marks obtained by all the pupils in the class?

  d) What was the mean mark?

8) 26 pupils in a class are asked how many brothers and sisters they have. The results are shown in the table below.

Brothers or sisters.	0	1	2	3	4	5
Number of pupils	2	4	8	6	3	3

  a) Calculate the total number of brothers and sisters.

  b) What is the mean number of brothers and sisters?

9) Claire did a survey of 12 people. She asked them how many TV's they had in their house. She worked out the mean to be 2.5.

  This is the data she collected

     5,   2,   3,   3,   3,   4,   2,   2,   1,   1,   0

  When she checked the data she found one to be missing. What was the number?

64. Median, Mode and Range

1) Copy and complete the frequency table for these numbers.

2,	3,	3,	3,	4,	2,	6,	1,	5,
1,	1,	4,	4,	3,	5,	2,	3,	2,
1,	1,	1,	3,	1,	5,	4,	5,	1,
2,	2,	2,	3,	4,	7,	6,	4,	6

Number	Tally	Frequency

From the table, determine

a) The mode   b) The range

2) Construct a frequency table for these numbers

1,	4,	7,	4,	3,	8,	0,	2,	1,	8,
2,	9,	2,	6,	0,	8,	2,	2,	6,	2,
8,	1,	9,	0,	3,	7,	1,	0,	7,	5,
1,	9,	8,	3,	2,	6,	2,	6,	0,	2,
5,	2,	8,	7,	3,	0,	1,	2,	3,	4

From the table, determine a) the mode and b) the range of the numbers.

3) Construct a frequency table from the following numbers. From the table determine

a) the mode and b) the range.

13,	14,	17,	14,	15,	14,	17,	14,	13,
16,	15,	13,	16,	17,	15,	13,	16,	17,
17,	16,	14,	15,	13,	17,	14,	16,	16,
15,	15,	15,	14,	14,	15,	15,	15,	13,
15,	16,	13,	15,	14,	16,	14,	17,	15,

4) Re-arrange the following numbers into order of size. From the list, determine the median and the range

8, 7, 4, 10, 1, 5, 6, 6, 5, 4, 3, 4, 8, 7, 10, 4, 9, 5, 3, 2, 7.

5) Determine the median and range of these numbers

9, 9, 7, 6, 7, 4, 3, 2, 3, 7, 7, 6, 5, 7, 5, 8, 5.

6) Determine the median and range of these numbers

70, 72, 30, 74, 80, 83, 36, 50, 38, 85, 92, 50, 70,
68, 17, 48, 77, 72, 60, 74, 14, 75, 83, 65, 33, 52.

65. Mean, Median, Mode and Range

1) A car manufacturer designs a family car. She knows that the mean number of people in a family is 4.4 and the mode is 4. How many seats should she put in the car. Explain your answer.

2) The following table shows the age of the people at the youth club.

Age	Less than 14	14	15	16	over 16
Number of people	10	16	20	15	12

   Explain why the mean cannot be calculated.

3) Sarah carries out a survey on two groups of people.
   On the first group she calculates their mean age to be 10 and the range to be 3.
   With the second group she calculates the mean age to be 10 with a range of 7.
   Explain the difference between the ages of the two groups of people.

4) Chris has to decide which type of battery his company is to use in their toys.
   He has a choice between two different batteries.
   Type A have a median life of 15 hours with a range of 2 hours.
   Type B have a median life of 15 hours, but have a range of 6 hours.
   Which type of battery does Chris choose and why?

5) The manager of a shoe shop calculates the mean, median and mode of the mens shoe sizes she sells. These were the results.
   Mode is 8, Mean is 7.5, Median is 7
   She has to buy in some more stock. She can only order one size. Which size will she buy? Explain your answer.

6) A football team has 11 players. The mean weight is 95 kilograms, and the range is 12 kilograms. A player weighing 100kg is replaced by one weighing 90kg. What effect will this have on the range and mean? Explain why you say this.

7) A football team plays 20 matches. The mean number of goals scored is 1.5 and the mode is 2. In the 21st game they score 3 goals. What effect will this have on the mean and mode? Explain your answer.

8) A class sits an examination. The paper is marked out of 40. Eve calculates the median mark to be 23 and the range to be 25. She later finds that one mark of 30 should be 15. What effect will this have on the median and the range?

66. Scatter graphs

1) The diagrams show three different types of scatter graph.

a)

b)

c)
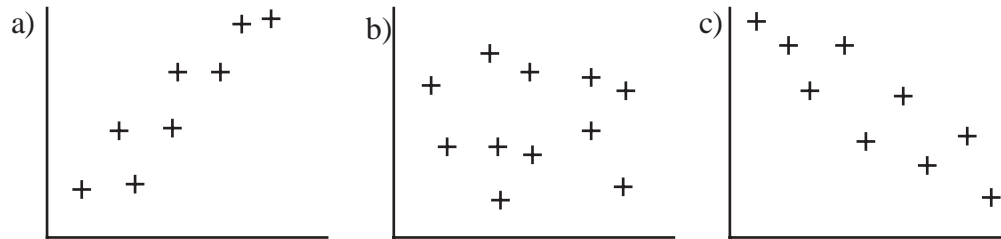
Describe each of the different kinds of correlation

The diagrams represent these three situations

   (i) the age of cars plotted against their value,

   (ii) the number of rooms in a house plotted against the value of the house

   (iii) the age of adults plotted against their weight.

Which diagram represents each of the situations?

2) A class of pupils sat an examination in mathematics.

The examination consisted of two papers.

The following table shows the marks scored by a sample of 10 of the pupils.

Paper 1	46	77	49	57	67	52	72	59	54	27
Paper 2	53	84	43	63	65	61	74	73	57	35

On graph paper plot these values. Put paper 1 on the horizontal axis and paper 2 on the vertical axis. Use 2cm to represent 10 marks on each axis.

From this diagram answer these two questions.

a) A pupil missed paper 2 but got 53 on paper 1.

   What was her estimated mark for paper 2?

b) Another pupil missed paper 1 but got 70 on paper 2.

   What was her estimated mark for paper 1?

3) The table shows the number of hours of rainfall per day at Northend-on-Sea and the number of deck chairs hired out each day over a period of one week.

Hours of rainfall	2	5	3	0	7	10	8
No. of deck chairs hired out	150	100	160	190	45	10	70

On graph paper plot these values. Show the hours horizontally allowing 2cm to represent 2 hours. Plot the deck chairs vertically allowing 2cm to represent 20 chairs.

From your graph predict how many deck chairs would be hired out if there were 6 hours of rainfall.

67. Line graphs

1) The table shows the temperatures at two places, one in Europe and one in
   Australia.
   The values are given for the months January, March, May, July, September and
   November.

Month	Jan	Mar	May	July	Sept	Nov
Temperature in Europe °C	9	15	20	28	25	14
Temperature in Australia °C	27	32	23	13	12	20

This graph shows the temperatures for Europe plotted against the months.
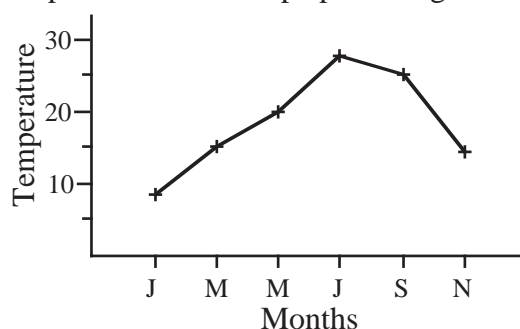
a) Plot the values for Australia on a similar graph.

b) Compare the two graphs. What do you notice about the temperatures in Europe
   compared with those in Australia?

2) A company makes egg timers. They are supposed to run for exactly 4 minutes. A
   sample of 100 were tested and the times they gave are shown below.

Time (seconds)	237	238	239	240	241	242
Frequency	10	14	18	30	17	11

a) Copy and complete this line graph for the table.
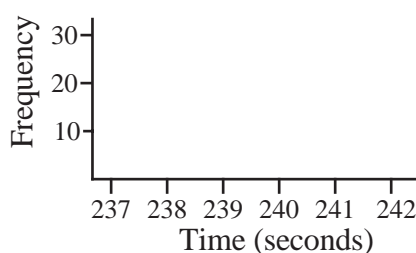
b) Use the graph to comment on the results.

3) The table below shows the heights of 20 tomato plants. Draw a line graph for the
   values. Let the horizontal axis represent the heights. Let the vertical axis represent
   the frequency.

Height of tomato plant	89cm	90cm	91cm	92cm	93cm
Frequency	2	4	5	6	3

68. Surveys and Questionnaires

1) Jack did a survey. He asked the question "Do you think smoking is bad for
   health?". He carried out the survey at three different places, a) people coming out
   of a cigarette factory, b) a group of nurses and doctors and c) the customers at a
   supermarket.
   The results he gained were (i) yes 97%, no 3% (ii) yes 70%, no 30%,
   (iii) yes 30%, no 70%.
   Which set is which?

2) A large company want to build a supermarket in the town.
   Paul does a survey to find out a) if the local people want it and b) whether they
   will use it.
    (i) Write down three questions he might use.
    (ii) Write down a choice of two responses for each question.

3) The school committee decide that the tuck shop is to sell vegetarian snacks.
   The snacks they want are a) fruit, b) yoghurt, c) oatmeal biscuits, d) nuts and
   e) wholemeal sandwiches.
   Devise a questionnaire in order to survey the pupils.
   You need to know (i) whether pupils want vegetarian snacks, and (ii) the types of
   snacks they like.

4) The manager of a D.I.Y. store wants her staff to wear a new uniform.
   She thinks that they should all wear green tops and either a black skirt or trousers.
   The deputy manager thinks that they would prefer a red top and jeans.
   The manager designs this questionnaire for the staff

```
        I think that it is a good idea
     to have green tops and either a black
        skirt or trousers as our new uniform.
     Please indicate whether you agree with me
        by ticking the appropriate box below.

             Agree      ☐

             Disagree   ☐
```

   Do you think that this is a good questionaire? Make comments.

69. More Estimation

Do not use a calculator

In each of the following questions a) write down a calculation that could be done to check the answer and b) write down your answer to the estimation.

Exercise 1
1) $22.5 + 57.7$ 2) $17.6 + 61.4$ 3) $87.3 + 62.7$ 4) $59.3 + 81.6$
5) $38.4 - 17.6$ 6) $59.6 - 28.4$ 7) $83.5 - 41.6$ 8) $84.9 - 35.3$
9) $73.4 + 28.1$ 10) $23.3 + 48.7$ 11) $91.2 + 57.6$ 12) $43.5 + 67.3$
13) $87.4 - 26.9$ 14) $75.2 - 33.9$ 15) $107.6 - 66.7$ 16) $142.3 - 84.9$

Exercise 2
1) 81×18 2) 43×21 3) 62×29 4) 76×33 5) 104×19
6) 54×29 7) 137×24 8) 79×41 9) 117×57 10) 173×9
11) 246×13 12) 354×31 13) 507×39 14) 607×51 15) 683×52

Exercise 3
1) 3.7×6 2) 5.2×5 3) 7.9×8 4) 6.3×11 5) 4.2×16
6) 7.1×23 7) 4.5×31 8) 3.9×37 9) 8.4×49 10) 6.3×26
11) 9.3×53 12) 6.4×71 13) 8.2×42 14) 3.9×63 15) 6.7×82

Exercise 4
1) 4.2×3.1 2) 5.3×7.8 3) 9.3×6.3 4) 5.2×4.9 5) 6.7×3.7
6) 3.9×5.2 7) 7.6×8.4 8) 9.5×6.3 9) 5.8×2.9 10) 7.9×8.4
11) 4.9×10.2 12) 7.6×11.5 13) 2.4×20.6 14) 8.7×19.8 15) 4.3×18.7

Exercise 5
1) $\dfrac{31}{5.2}$ 2) $\dfrac{43}{8.6}$ 3) $\dfrac{56}{11.1}$ 4) $\dfrac{93}{18}$ 5) $\dfrac{65.2}{9}$ 6) $\dfrac{87}{9.2}$

7) $\dfrac{56.1}{27.2}$ 8) $\dfrac{87.3}{32.1}$ 9) $\dfrac{62.3}{16.1}$ 10) $\dfrac{38.9}{9.7}$ 11) $\dfrac{107}{32.1}$ 12) $\dfrac{123}{41.3}$

13) $\dfrac{145}{7.1}$ 14) $\dfrac{193}{38.7}$ 15) $\dfrac{308}{48.2}$ 16) $\dfrac{112}{10.8}$ 17) $\dfrac{385}{77}$ 18) $\dfrac{523}{18.6}$

Exercise 6
1) $\dfrac{84.2}{3.8 \times 5.2}$ 2) $\dfrac{57.4}{2.3 \times 4.8}$ 3) $\dfrac{93.5}{2.8 \times 3.1}$ 4) $\dfrac{47.6}{1.9 \times 2.9}$

5) $\dfrac{14.7 + 27.1}{4.1}$ 6) $\dfrac{3.2 + 16.7}{10.2}$ 7) $\dfrac{34.8 + 58.3}{15.2}$ 8) $\dfrac{74.3 - 21.4}{5.1}$

9) $\dfrac{54.7 - 13.6}{22.3}$ 10) $\dfrac{19.7 + 53.2}{14.3}$ 11) $\dfrac{35.4 - 6.1}{2.1 \times 2.9}$ 12) $\dfrac{67 + 84.3}{7.2 \times 1.9}$

13) $\dfrac{68.7 - 25.5}{4.2 \times 9.5}$ 14) $\dfrac{14.3 \times 25.4}{7.1 \times 5.1}$ 15) $\dfrac{7.9 \times 33.4}{8.6 \times 10.9}$ 16) $\dfrac{24.3 \times 37.4}{10.8 \times 4.1}$

70 Making and Solving Equations

1) This is an example of three consecutive numbers being added together
$$6 + 7 + 8 = 21$$
   Three other consecutive numbers are added together.
   The first number is x
   a) In terms of x what is the second number?
   b) In terms of x what is the third number?
   c) In terms of x, what is the sum of all three numbers? Simplify your answer.
   d) The three numbers add up to 45. Write down an equation in terms of x to show this.
   e) Calculate the values of the three numbers.

2) Three other consecutive numbers are added together.
   The middle number is y
   a) In terms of y what is the first number?
   b) In terms of y what is the third number?
   c) In terms of y, what is the sum of all three numbers? Simplify your answer.
   d) Complete this statement
      'To calculate the sum of three consecutive numbers, multiply the middle number by....'
   e) Hence calculate the sum of the numbers 149, 150, 151.
   f) If three consecutive numbers add up to 75, what are they?

3) The top of a *square* garden table is made by sticking a number of tiles measuring $x$cm by $y$cm onto a wooden board.
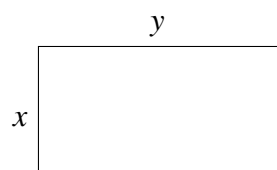
   a) If the length of the tile, y, is 4cm longer than it's width, x, complete this equation
$$y = x$$
   35 of these tiles are put together to make the table top.
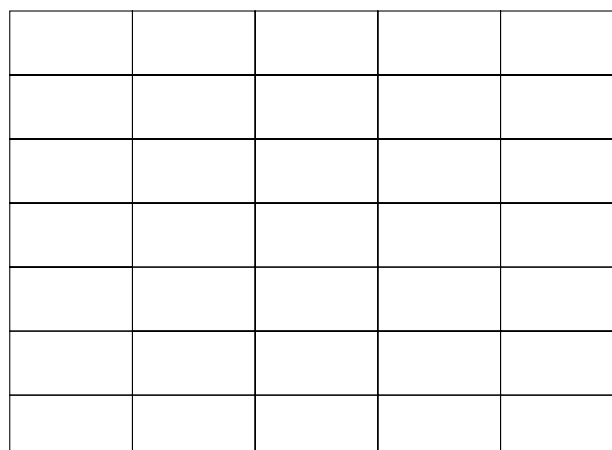
   b) In terms of x, write down two expressions for the sides of the square.
   c) Write down an equation satisfied by x.
   d) Solve the equation and write down the length of the sides of the square.
   e) What is the area of the table top?

71 Congruency
Do not use a ruler or protractor in any of these questions

1) These two triangles are congruent. Answer the following questions about them.
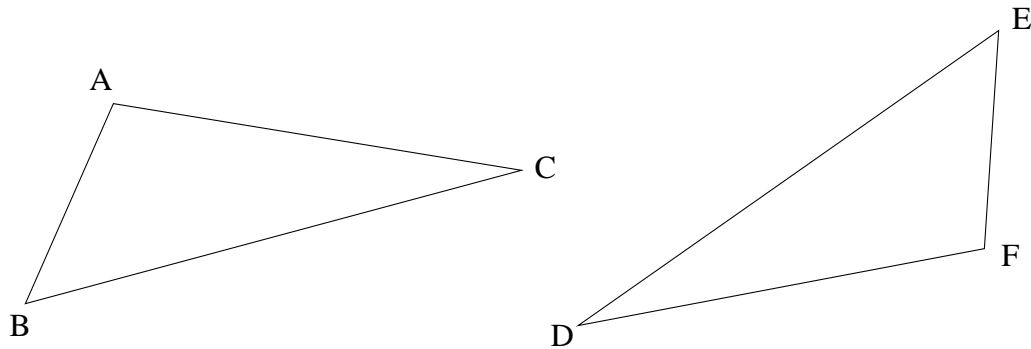
   a) Which other angle is equal to angle ABC?
   b) Which other angle is equal to angle EFD?
   c) Which side in triangle DEF is equal to side AC?
   d) Which of the following statements are true about the two triangles?
      (i) AB > FD
      (ii) Angle ACB ≠ angle EDF
      (iii) The angle opposite side CB = The angle opposite side ED
      (iv) The area of triangle ABC = The area of triangle DEF

2) Congruent triangles can be constructed by joining together the ends of parallel lines of equal
   length, like this -
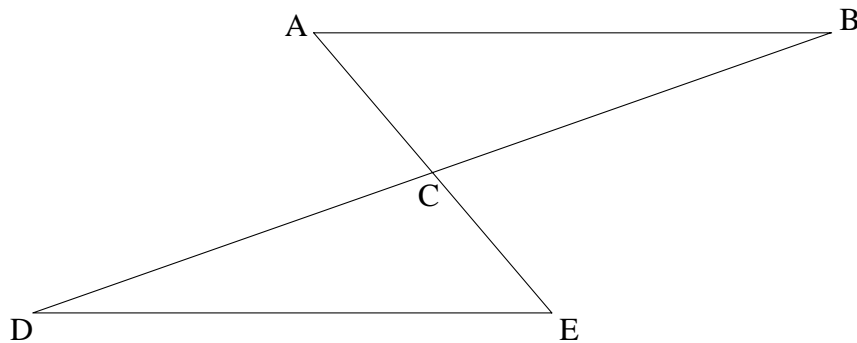
   a) Which angles are equal to each other?
   b) Which lengths are equal to each other?

3) Triangles can be proved to be congruent when corresponding angles and sides in one are
   equal to those in the other. State which of the following will show congruency and which will
   not.
   a) All three sides in the first triangle are the same lengths as the three sides in the second.
   b) All three angles in the first triangle are equal to the three angles in the second.
   c) Two sides and the included angle in the first triangle are equal to two sides and the included
      angle in the second triangle.
   d) One side and two angles in the first triangle are equal to one sides and two angles in the
      second triangle

72 Plans and Elevations 1

The diagram below shows a cuboid with a smaller cuboid cut from it. In the grid below it three views have been started, two elevations in directions S(side) and F(front), and a plan P. Finish off these three elevations.

P

6   3

4

10

S   3   F

S

F   P
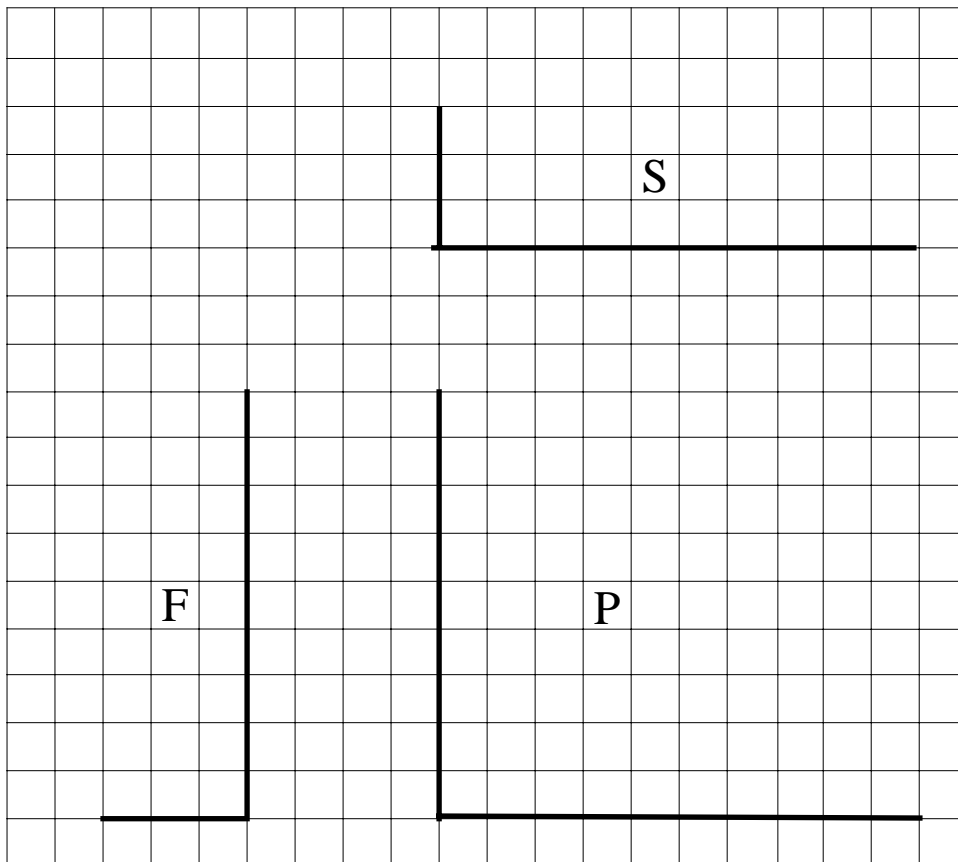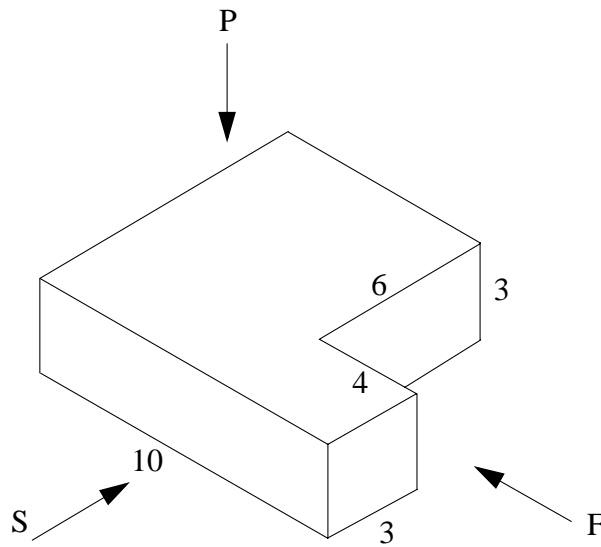
73 Plans and Elevations 2

The diagram below shows a cuboid with a smaller cuboid on top of it. In the grid below it three views have been started, two elevations in directions S(side) and F(front), and a plan P. Finish off these three elevations.
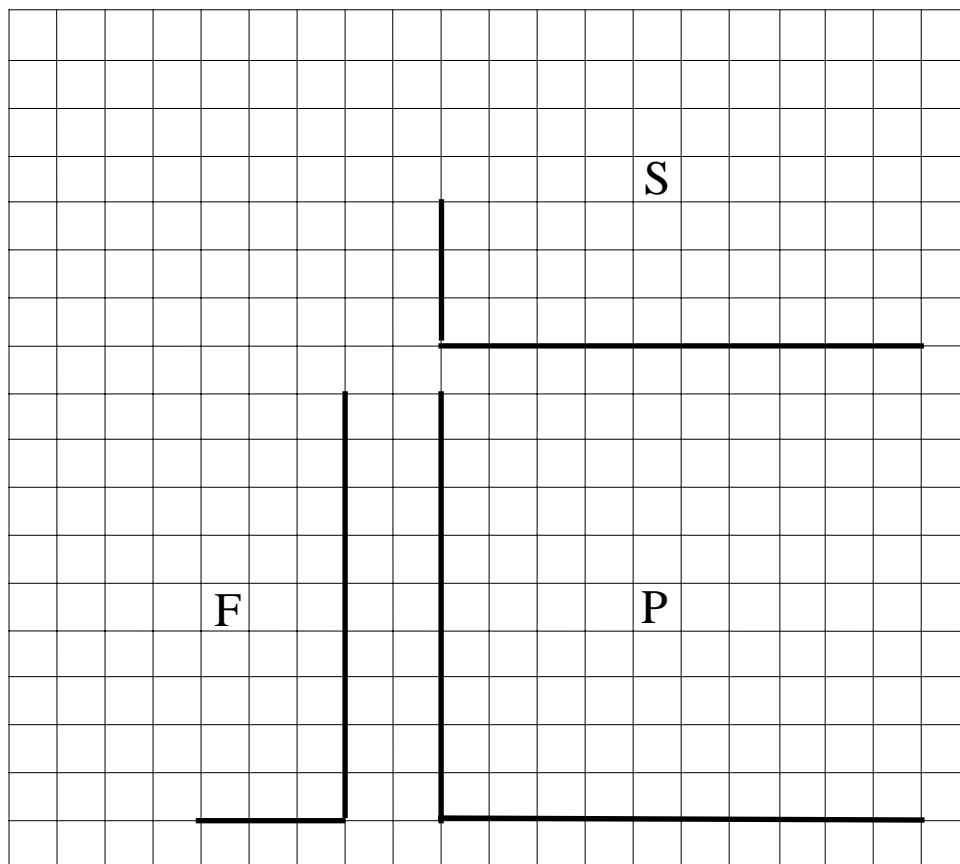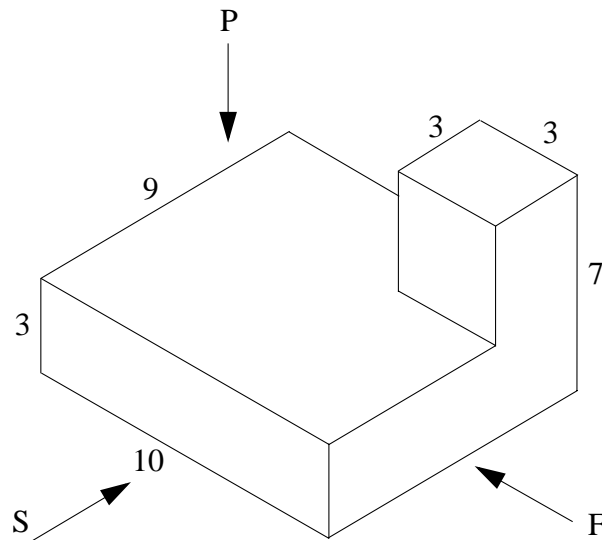
74 Plans and Elevations 3

Below are shown two cuboids with parts cut away. Draw diagrams of each shape when viewed
from the directions A, B and C. All the dimensions are in centimetres.

1)
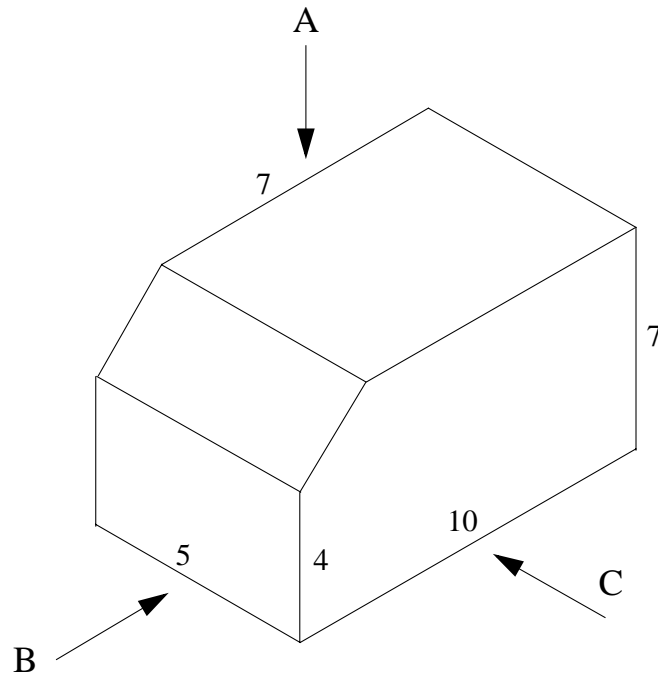
2)
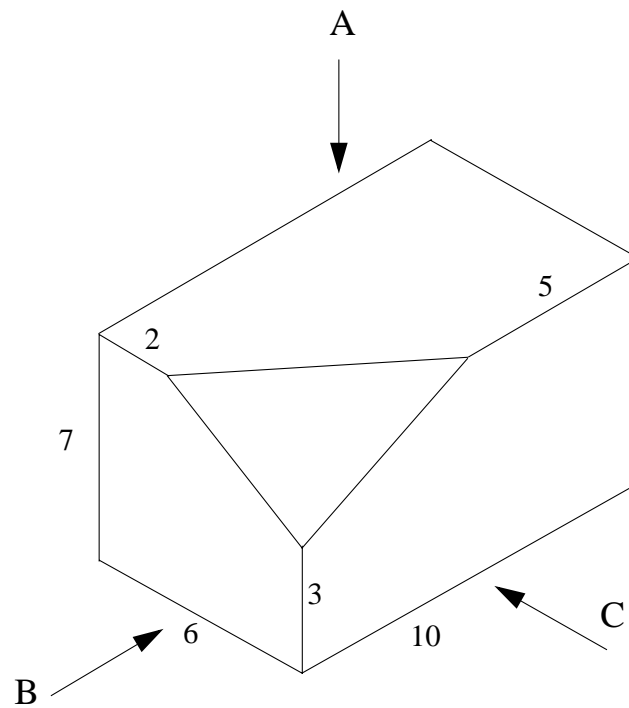
75 Recognising Graphs

Below there are 12 sketches of graphs and 12 functions representing them. Write down the letter of the function which goes with its graph.

(i)

(ii)

(iii)

(iv)

(v)

(vi)

(vii)

(viii)

(ix)

(x)

(xi)

(xii)
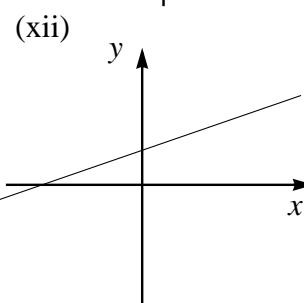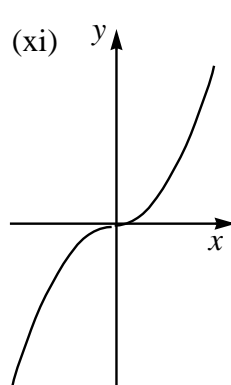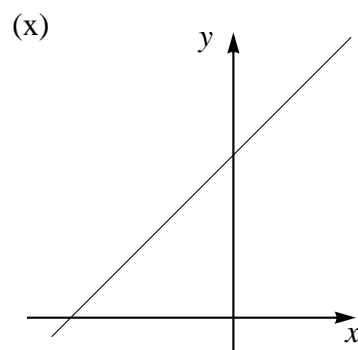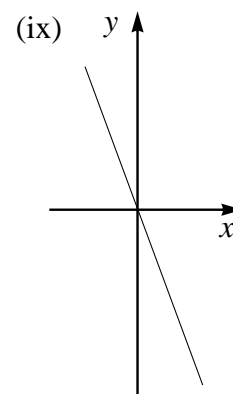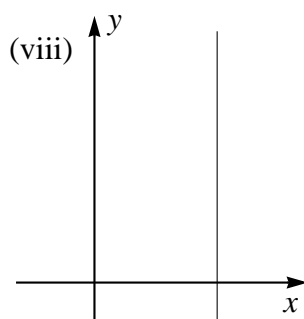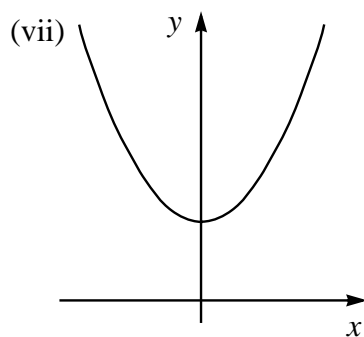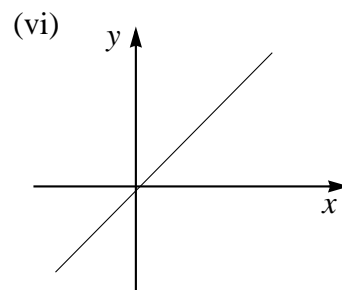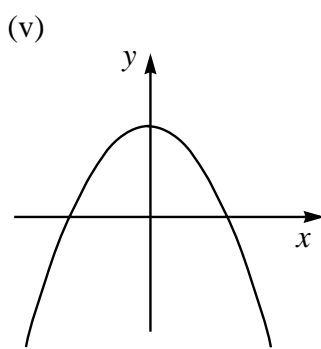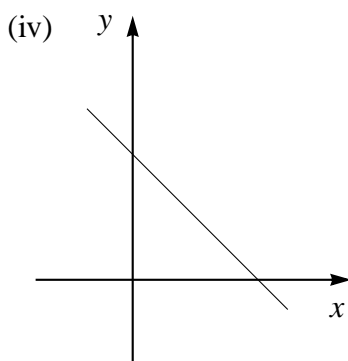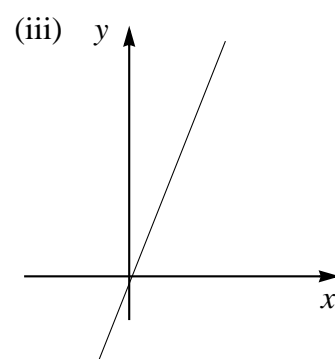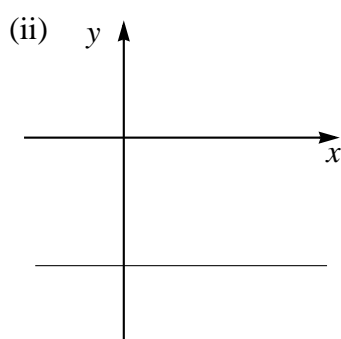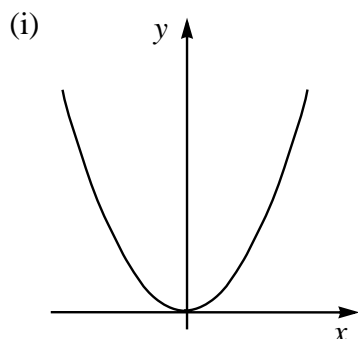
a) $y = -5$ b) $y = x^2$ c) $y = x + 5$ d) $y = x^3$ e) $y = \frac{1}{2}x + 1$ f) $y = x^2 + 4$

g) $y = x$ h) $y = -x^2 + 5$ i) $y = 2x$ j) $x = 6$ k) $y = -2x$ l) $y = -x + 4$

76 Number Machines

1) In each of the following number machines, say what the question mark represents.

a) $4 \longrightarrow \times 5 \longrightarrow ?$ b) $5 \longrightarrow \times 3 \longrightarrow ?$

c) $3 \longrightarrow \times ? \longrightarrow 21$ d) $6 \longrightarrow \times ? \longrightarrow 42$

e) $? \longrightarrow \times 8 \longrightarrow 48$ f) $? \longrightarrow \times 5 \longrightarrow 35$

g) $80 \longrightarrow \div 5 \longrightarrow ?$ h) $48 \longrightarrow \div ? \longrightarrow 8$

i) $? \longrightarrow \div 7 \longrightarrow 9$ j) $? \longrightarrow \div 2.5 \longrightarrow 4$

2) In the following number machines, say what number comes out each time.

a)   Number in $\longrightarrow$ $\boxed{\times 5}$ $\longrightarrow$ $\boxed{+3}$ $\longrightarrow$ Number out

        Numbers in are   (i) 2   (ii) 7   (iii) -4

b)   Number in $\longrightarrow$ $\boxed{\times 7}$ $\longrightarrow$ $\boxed{-4}$ $\longrightarrow$ Number out

        Numbers in are   (i) 3   (ii) 8   (iii) -1

c)   Number in $\longrightarrow$ $\boxed{\div 2}$ $\longrightarrow$ $\boxed{+5}$ $\longrightarrow$ Number out

        Numbers in are   (i) 6   (ii) 12   (iii) 0

d)   Number in $\longrightarrow$ $\boxed{\div 6}$ $\longrightarrow$ $\boxed{-6}$ $\longrightarrow$ Number out

        Numbers in are   (i) 18   (ii) 42   (iii) -12

3) In the following number machines, write down an expression, in terms of n, for the rule.

a) $n \longrightarrow$ $\boxed{\begin{array}{c}\text{Multiply}\\\text{by 3}\end{array}}$ $\longrightarrow$ $\boxed{\text{Add 7}}$ $\longrightarrow$

b) $n \longrightarrow$ $\boxed{\begin{array}{c}\text{Multiply}\\\text{by 5}\end{array}}$ $\longrightarrow$ $\boxed{\text{Add 4}}$ $\longrightarrow$

c) $n \longrightarrow$ $\boxed{\begin{array}{c}\text{Multiply}\\\text{by 8}\end{array}}$ $\longrightarrow$ $\boxed{\begin{array}{c}\text{Subtract}\\3\end{array}}$ $\longrightarrow$

d) $n \longrightarrow$ $\boxed{\begin{array}{c}\text{Divide}\\\text{by 6}\end{array}}$ $\longrightarrow$ $\boxed{\text{Add 9}}$ $\longrightarrow$

e) $n \longrightarrow$ $\boxed{\begin{array}{c}\text{Divide}\\\text{by 2}\end{array}}$ $\longrightarrow$ $\boxed{\begin{array}{c}\text{Subtract}\\7\end{array}}$ $\longrightarrow$

77 Enlargements Through a Point 1

The following shapes are enlarged through the points indicated. Draw in the enlargements.

1)

×2

2)

×3

3)

Enlargement point

×4
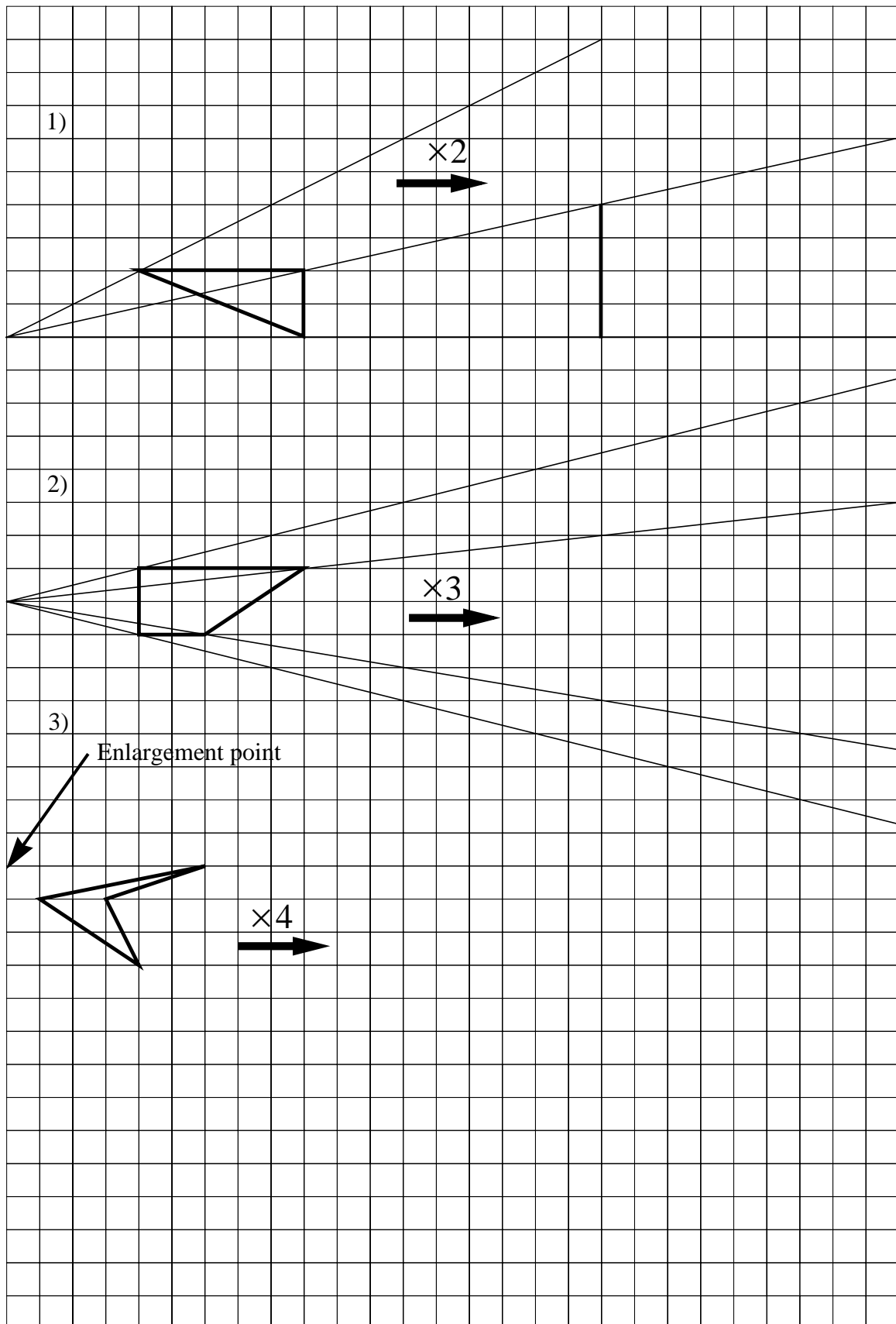
78 Enlargements Through a Point 2

1) The diagram shows a square A, B, C, D.

   Copy this diagram and enlarge it by a scale factor of 2 through the point (0,0)
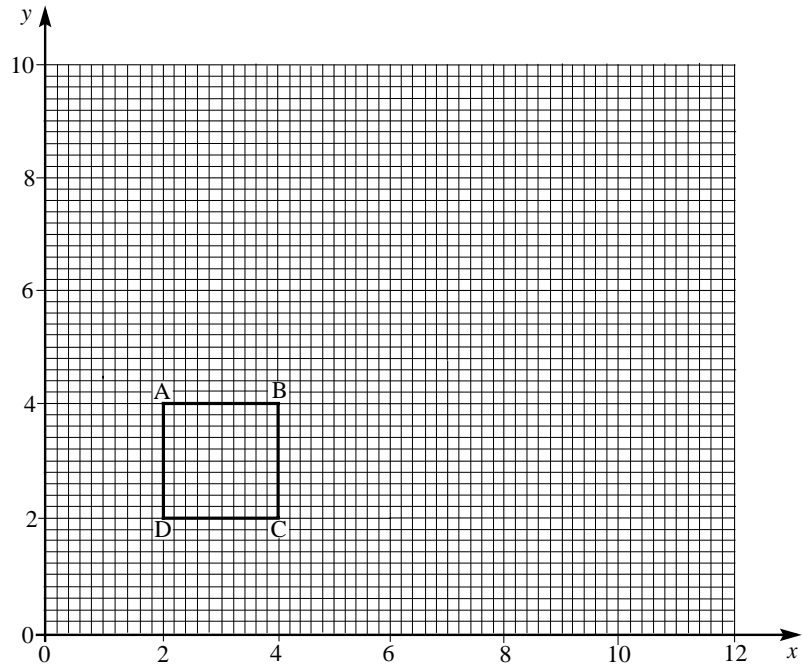
2) The diagram shows an octagon.

   Copy this diagram and enlarge it by a scale factor of 3 through the point (0,0)
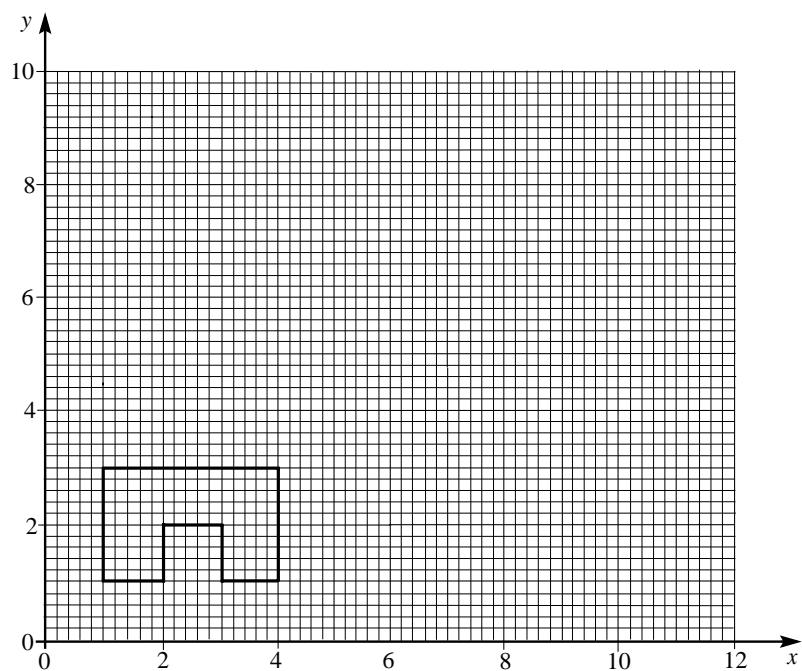
79 Enlargements Through a Point 3

1) The diagram shows a rectangle A, B, C, D.
   Copy this diagram and enlarge it by a scale factor of 3 through the point (–4, –4)
   One of the construction lines has already been put in.

2) The diagram shows a triangle.
   Copy this diagram and enlarge it by a scale factor of 2 through the point (5,5)

Answers

1. Rounding off and Estimating
Exercise 1
1) 70   2) 90   3) 140   4) 290   5) 700   6) 500
7) a. 850   b. 800   8) a. 370   b. 400   9)a. 2300
b. 2000   10) a. 5880   b. 5900   c. 6000
Exercise 2
1)a. 1000   b. 460 + 510 = 970
2)a.40, 20   b. 800   3) 200 + 300 = 500
4) 60p + 50p + 80p = 190p
5) $6 \times 20 = £120$ 6) 60 + 40 = 100
7) $50 \times 3 = 150$ 8) 20 – 5 = 15
9) $10 \times 40 = 400$
Exercise 3
1) $50 \times 30 = 1500$ 2) $30 \times 50 = 1500$
3) $10 \times 60 = 600$ 4) $50 \times 60 = 3000$
5) $90 \times 40 = 3600$ 6) $50 \times 30 = 1500$
7) $100 \times 40 = 4000$ 8) $200 \times 20 = 4000$
9) $40 \times 100 = 4000$ 10) $70 \times 200 = 14000$
11) $200 \div 20 = 10$ 12) $120 \div 20 = 6$
13) $160 \div 20 = 8$ 14) $240 \div 24 = 10$
15) $600 \div 30 = 20$ 16) $800 \div 20 = 40$
17) $1000 \div 50 = 20$ 18) $1600 \div 40 = 40$
19) $2000 \div 50 = 40$ 20) $2800 \div 70 = 40$
21) $\dfrac{30 \times 40}{6} = 200$ 22) $\dfrac{20 \times 40}{8} = 100$
23) $\dfrac{50 \times 60}{5} = 600$ 24) $\dfrac{30 \times 40}{20} = 60$
25) $\dfrac{300 \times 4}{30} = 40$ 26) $\dfrac{400 \times 20}{40} = 200$
27) $\dfrac{600 \times 30}{60} = 300$ 28) $\dfrac{300 \times 40}{60} = 200$

2. Reading and Writing Whole Numbers
Exercise 1
1) One hundred and six
2) Two hundred and fourteen
3) Three hundred and fifty six
4) Five hundred and ninety seven
5) Eight hundred and ninety three
6) One thousand three hundred and forty two
7) Four thousand three hundred and twenty seven
8) Five thousand three hundred and two
9) Seven thousand one hundred and two
10) Eight thousand and seventy three
11) Eleven thousand three hundred and forty five
12) Fourteen thousand five hundred and thirty six
13) Twenty seven thousand three hundred and fifty six
14) Fifty four thousand three hundred and sixty two
15) Seventy three thousand and two
16) One hundred and sixty three thousand seven hundred and sixty five
17) Three hundred and seventy four thousand three hundred and five
18)Three hundred and forty thousand

19) Five hundred and forty three thousand and nine
20) Six hundred thousand and eighty seven
21) Six million
22) Four million seven hundred and sixty two thousand eight hundred
23) Five million seven hundred thousand three hundred and forty five
24) Four million seven hundred and sixty four
25) Seven million one hundred thousand and sixty seven
Exercise 2
1) 156   2) 706   3) 407   4) 670   5) 3000
6) 4367 7) 2080 8) 6006 9) 5067 10) 9990
11) 27,000   12) 40,000   13) 63,005
14) 87,500   15) 77,422   16) 18,957
17) 200,000   18) 167,000   19) 324,556
20) 754,072   21) 3,000,000   22) 4,900,000
23) 7,116,956 24) 6,014,957 25) 8,753,002
Exercise 3
1) 1683   2) 1090   3) 231   4) 76   5) 51
6) 141   7) 856   8) 2239   9) 79   10) 248
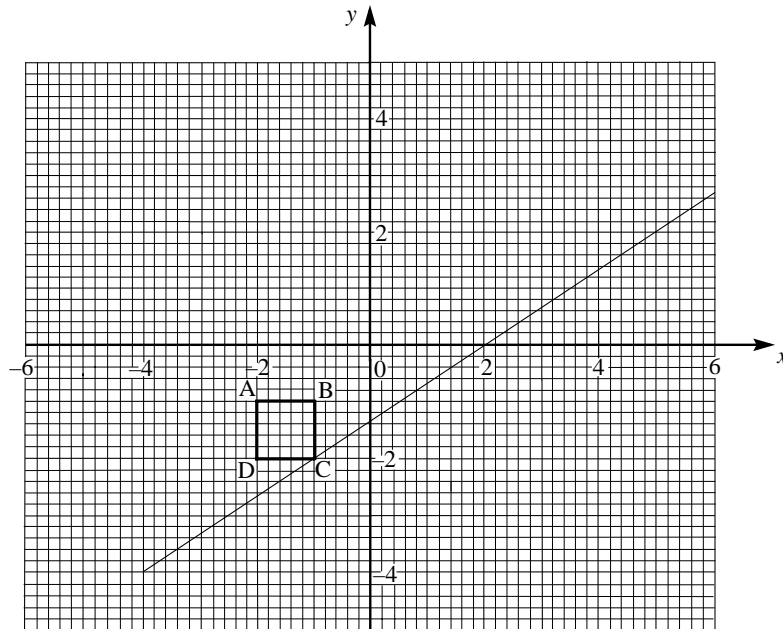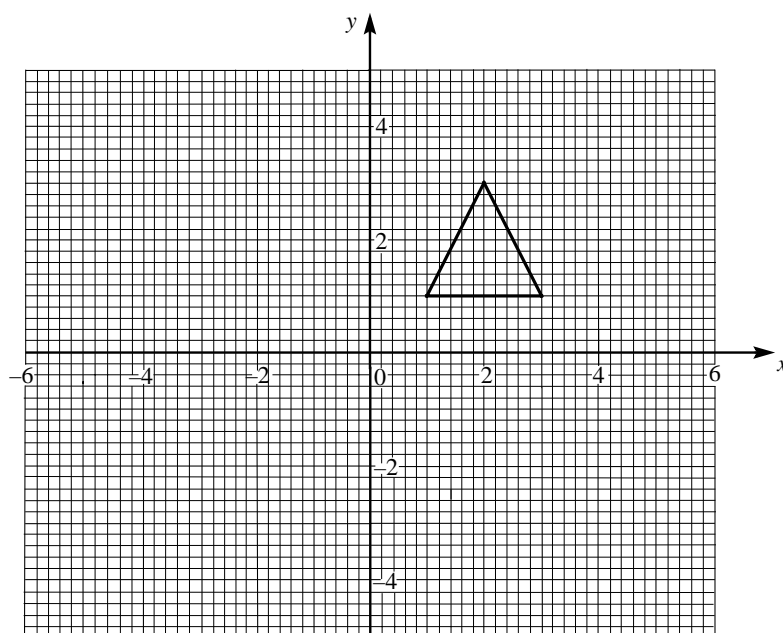**Exercise 4**
1) Fifty 2) Seven hundred   3) Three thousand
4) Two   5) Ten thousand   6) Six thousand
7) Ninety thousand   8) Three million
9) Eight hundred thousand
10) Seventy thousand

3. Fractions, Decimals and Percentages (1)
Exercise 1
1) 0.75 2) 0.625 3) 0.4 4) 0.375 5) 0.4167
6) 0.35   7) 0.5333   8) 0.28   9) 0.2308
10) 0.1481   11) 0.56   12) 0.2667   13) 0.55
14) 0.4286   15) 0.5556   16) 0.4375
17) 0.3478   18) 0.5625
Exercise 2
1) 26%   2) 34%   3) 72%   4) 87%   5) 64%
6) 35%   7) 42%   8) 96.1%   9) 43.2%
10) 61.4%   11) 58.4%   12) 82.6%   13) 93.2%
14) 30%   15) 60%   16) 190%   17) 238%
18) 641%
Exercise 3
1) 80%   2) 80%   3) 46.67%   4) 15%
5) 56.25%   6) 35.71%   7) 43.48%   8) 48%
9) 51.43%   10) 32.43%   11) 62.5%
12) 46.88%   13) 69.23%   14) 79.41%
15) 86.17%   16) 73.21%   17) 51.92%
18) 58.38%
Exercise 4
1) 0.2, 23%, $\frac{1}{4}$ 2) 36%, $\frac{3}{8}$, 0.41
3) 0.8, 87%, $\frac{7}{8}$ 4) 0.3, 31%, $\frac{5}{16}$
5) 10%, 0.14, $\frac{3}{20}$ 6) 43.7%, $\frac{7}{16}$, 0.47
7) 30%, $\frac{8}{23}$, 0.35   8) 0.47, 47.3%, $\frac{9}{17}$
9) 0.2, 21%, $\frac{6}{28}$ 10) 0.25, 25.6%, $\frac{8}{31}$

Exercise 5

1)

2)

3)

4. Fractions, Decimals and Percentages (2)
Exercise 1
1) $\frac{1}{4}$ 2) $\frac{2}{5}$ 3) $\frac{3}{10}$ 4) $\frac{1}{5}$ or $\frac{4}{20}$ 5) $\frac{5}{9}$
6) 60% 7) 30% 8) 25% 9) 50% 10) 35%
Exercise 2
1) 15 2) 153 3) £78.75 4) £1.05 5) 12.5m
6) 9.375m 7) £31.25 8) 36.75m 9) £15.40
10) 2.475m   11) £38.50   12) 2.31 metres
Exercise 3
1) 222   2) 12   3) 342   4) 205   5) 90p
6) 60p   7) £11.40   8) 1.36 metres
9) £2.16   10) £3.24   11) £8.58   12) 1116
Exercise 4
1) 48%   2) 63%   3) 68%   4) 46%   5) 62%
6) 65%   7) 22%   8) 90%   9) 70% 10) 62%
11) 85%   12) 69%   13) 57%   14) 61%
15) 91%   16) 60%
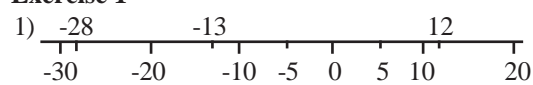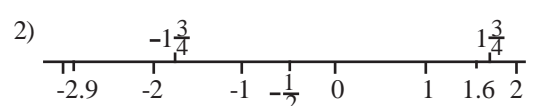**Exercise 5**
1) $\frac{60}{200}$ or $\frac{3}{10}$ 2) $\frac{450}{800}$ or $\frac{45}{80}$ or $\frac{9}{16}$ 3) $\frac{3}{10}$, 30%

4) £100   5) £30

5. Fractions. Decimals and Percentages (3)
1) £132   2) £144   3) £55,800   4) 45 miles
5) 33 tonnes   6) 207   7) 37,500   8) 100
9) 59, 360   10) 120   11) £63.60   12) £47
13) 320g   14) £8.40   15) £851.88
16) 25.5 cm   17) £29.38

6. Ordering Directed Numbers
Exercise 1
1)

2)

3) –13, –12, –6, –1, 0, 1, 5, 26
4) –6, $-4\frac{1}{4}$, –1.3, $-\frac{1}{2}$, 0, 1.8, 2, 3.1.
Exercise 2.
1) 14   2) 2   3) –3   4) 2   5) –13
6) 5   7) –20 8) –2   9) –4 10) –11
Exercise 3
1) 4   2) 6   3) 9   4) 9   5) 3
6) 7   7) 3   8) 9   9) 8   10) 5
Exercise 4
1) a) Belfast   b) Perth   c) Perth 10º
d) Belfast 3ºc   2) 12ºc   3) 12ºc
4) A gets 4, B gets 4, C gets 6 so C wins.

7. Multiplying and Dividing by 10,100 etc
Exercise 1
1) 60   2) 170   3) 360   4) 1240   5) 6740
6) 400   7) 2,500   8) 14,200   9) 36,200
10) 76,000   11) 7000   12) 38,000
13) 97,000   14) 270,000   15) 380,000
16) 4,200,000 17) 7   18) 40   19) 92
20) 210   21) 3   22) 40   23) 82
24) 100   25) 6   26) 16   27) 20   28) 37
Exercise 2
1) 13   2) 74   3) 122   4) 276   5) 28.7
6) 53.8   7) 726.4   8) 1236.7   9) 347
10) 750   11) 1648   12) 12837   13) 460
14) 1850   15) 17360   16) 87240
17) 2532   18) 12,673   19) 2460
20) 341,400   21) 3   22) 4.56   23) 0.2
24) 0.074   25) 50   26) 19   27) 93.7
28) 0.2 29) 23 30) 370 31) 400 32) 53.2
Exercise 3
1) 0.2   2) 0.27   3) 1.7   4) 15.3   5) 0.634
6) 0.034   7) 0.0056   8) 0.0002   9) 0.0243
10) 0.484   11) 3.27   12) 18.7   13) 0.00367
14) 0.0067   15) 0.000183   16) 0.005
17) 0.006   18) 0.016   19) 0.0026
20) 0.02745   21) 0.0003765   22) 0.0000254
23) 0.000034   24) 0.00003
Exercise 4
1) 100   2) 1000   3) 1000   4) 100   5) 1000
6) 100   7) 2000   8) 80   9) 0.03   10) 0.0007

8. Multiplication and Division
Exercise 1
1) 8r1   2) 13r5   3) 11r6   4) 26r2   5)20r3
6) 66r5 7) 124 8) 123   9) 194r4   10) 57r6
11) 37r8 12) 96
Exercise 2
1) 5r2   2) 4r4   3) 7r7   4) 4r7   5) 6r20
6) 8r5   7) 7r33 8)13r1 9) 12r4 10) 11r17
11) 13r14   12) 10r14   13) 12r21   14) 16r1
15) 16r23   16) 29r7   17) 40r1
18) 16r24   19) 20r5   20) 18r38
Exercise 3
1) 7.5   2) 6.25   3) 7.25   4) 6.8   5) 7.5
6) 15.5   7) 23.5   8) 11.25   9) 20.25
10) 45.5   11) 5.52   12) 26.25   13) 36.25
14) 29.75   15) 53.5   16) 19.5   17) 2.94
18)10.08   19) 8.4   20) 145.75
Exercise 4
1) 864   2) 1596   3) 1222   4) 1122
5) 4644   6) 2057   7) 5832   8) 4862
9) 12,032   10) 1062   11) 23,562
12) 39,566   13) 37,066   14) 54,592
15) 11,529   16) 62,926   17) 45,663
18) 26,904   19) 36,501   20) 43,808

9. Use of the Calculator
Exercise 1
1) 6,3   2) 23,32   3) 12,48   4) 27,12
5) 8,2   6) 7,4   7) 26,36

Exercise 2
1) 0.2   2) 26.0   3) 55.1   4) 15.1   5) 3.5
6) 2.4   7) 5.7   8) 3.1   9) 18.0   10) 30.8
11) 49.2   12) 3.2   13) 22.3   14) 40.4
15) 21.5   16) 22.3   17) 2.3   18) 16.9
19) 1.4   20) 10.7   21) 1.8   22) 20.8
23) 0.9   24) 14.7   25) 3.9   26) 12.4
27) 6.3   28) 13.2   29) 32.0   30) 11.3
31) 7.4   32) 44.8   33) 8.1   34) 5.3
35) 59.2   36) 88.1

Exercise 3
1) 0.85   2) 0.25   3) 1.27   4) 0.68   5) 1.09
6) 0.58   7) 0.04   8) 0.07   9) 1.05   10) 0.08
11) 0.05   12) 0.06   13) 0.06   14) 0.23   15) 5.92
16) 7.31   17) 6.87   18) 9.05   19) 8.09   20) 1.5
21) 0.90   22) 1.89   23) 1.84   24) 2.21

10. Types of Numbers
Exercise 1
1) 25   2) 7   3) 47   4) 45   5) 2
6) 1, 2, 3, 4, 6, 8, 12, 16, 24, 48
7) 1, 8, 27   8) 4 or 16 or 36   9) 24 or 48
10) 4, 9, 25, or 49

Exercise 2
1) Factors   2) Square   3) Multiples   4) Square
5) Even, Prime   6) Prime   7) Square, Cube
8) Square root, Cube root   9) Factors   10) Not

Exercise 3
1) 8   2) 16   3) 125   4) 17   5) 3   6) 90
7) 54   8) 2   9) 4   10) 5   11) 61   12) 109

Exercise 4
1) 21 cannot be divided exactly by 5
2) 27 cannot be divided exactly by 17
3) 44 is divisible by other numbers.
4) No whole number can be multiplied by
   itself to get 60.
5) Means $5 \times 5 \times 5$ not 5×3.
6) 9×9 is not equal to 39
7) 41, 43 and 47 are prime
8) 9 has 3 factors, 1, 3 and 9. A prime number
   has only 2 factors.
9) 1 divides into 100 exactly so it is a factor.
10) 2 is even and prime.

11. Personal and Household Finance
1) 8 for £1.12   2) a) £3.17 b) £1.83
3) 19 stamps, 6p left over   4) a) £6.20 b) £3.80
5) £124.40   6) 11 weeks   7) £3.50
8) £949.85   9) 10 with 10p over
10) £101.43   11) £212.40   12) £1.96
13) £5.90, £4.10   14) 14.9
15) 92, £37.72, £45.84   16) £65.40
17) £2.90   18) 7   19) £8.40

12. Ratio and proportion
Exercise 1
1) 400 : 500   2) 300 : 700   3) 75 : 125
4) 280 : 320   5) 500 : 700   6) 525 : 225
7) 250 : 550   8) 250 : 450   9) 245 : 385
10) 495 :770   11) 840 : 1365   12) 520 : 650

13) 70 : 30: 20   14) 125 : 150 : 175
15) 125 : 200 : 225   16) £1.98 : £4.62 : £7.26

Exercise 2
1) £360 : £240   2) 30 metres, 70 metres
3) 4   4) a) 75g, 225ml, 90g, 9, 255g
b) 187.5g, 562.5ml, 225g, 22.5eggs, 637.5g
5) a) £160 b) £360   6) 494 : 456   7) 160
8) 7   9) 175g, 75g, 300g   10) 480, 200, 120.
11) £12,000, £8,000, £4,000

13. Fractions, Decimals and Percentages (4)
Exercise 1
1) £117   2) £242   3) £180   4) £2,300
5) £5,544   6) £185   7) £52.50   8) £41,650
9) £58.40   10) £351

Exercise 2
1) 20%   2) 60%   3) 33%   4) 20%   5) 11%
6) 13%   7) 4%   8) 6%   9) 6%   10) 24%

Exercise 3
1) £4   2) £36   3) £135   4) £400   5) £315
6) £240   7) £1040   8) £16.80   9) £132
10) £504

14. Tables
1) a) 0837   b) 0952   c) 22 minutes   d) 1708
2) a) £1119   b) £1618   c) £3356
3) a) 30 minutes   b) 1 hour 40 minutes   c) yes
4) a) 381   b) 281   c) Glasgow and Edinburgh
or Swansea and Cardiff

15. Number Patterns and Sequences (1)
Exercise 1
1) 12, 14   2) 15, 17   3) 22, 25   4) 25, 29
5) 28, 33   6) 48, 57   7) 18, 24   8) 15, 20
9) 35, 47   10) 17, 23   11) 35, 41   12) 23,30
13) 5, 3   14) 10, 5   15) 7, 4   16) –5, –12
17) –3, –5   18) –2, –7   19) –20, –28
20) –16, –22   21) 13, 16

Exercise 2
1) a) 22   b) add on 7   2) a) 27   b) add on 8
3) a) 16   b) add on 6   4) a) 13   b) add previous
   two numbers together
5) a) 128 b) double previous number
6) a) 19   b) add on 3   7) a) 127 b) double the
   previous number and add 1.
8) a) 729   b) multiply previous number by 3
9) a) 2   b) half previous number

Exercise 3
1) a) 11, 13   b) add 2 to the previous number
   c) $2n - 1$
2) a) 17, 20   b) add 3 to the previous number
   c) $3n - 1$
3) a) 25, 29   b) add 4 to the previous number
   c) $4n + 1$
4) a) 36, 42   b) add 6 to the previous number
   c) $6n$
5) a) 37, 43   b) add 6 to the previous number
   c) $6n + 1$

6) a) 37, 42   b) add 5 to the previous number
   c) 5n + 7
7) a) 13, 15   b) add 2 to the previous number
   c) 2n + 1
8) a) 18, 21   b) add 3 to the previous number
   c) 3n – 3
9) a) 36, 41   b) add 5 to the previous number
   c) 5n + 6

Exercise 4
1) a) 8   b) add 2 and 1 alternately   c) add 1
   and 2 alternately
2) a) 20   b) 24   c) 4(n+ 1) or 4n + 4
   d) 4(21) = 84

16. Number Patterns and Sequences (2)
1) a) 9   b) 11   c) $2n - 1$ d) 79
2) a) 20   b) 30   c) 12
3) a) 15   b) 20   c) $5n - 5$ or $5(n - 1)$ d) 45
4) a) 22   b) 27   c) $5n + 2$, 62

17. Substitution
Exercise 1
1) a) £26.40   b) £21.45   2) a) £64.30
   b) £100.30
3) a) £10   b) £19, 4 days   4) a) 88 minutes
   b) 71 minutes

Exercise 2
1) 7   2) 8   3) 9   4) 1   5) 1   6) 2   7) –1
8) –2   9) –1   10) 2   11) 10   12) 18
13) 2   14) –1   15) –8   16) 30   17) 14
18) 6   19) –6   20) –3   21) 7

Exercise 3
1) –1   2) 1   3) –2   4) –3   5) 7   6) –4
7) –1   8) 2   9) –11   10) 2   11) 2
12) 5   13) –6   14) 2   15) –12   16) 0
17) 0   18) –10   19) –8   20) –27   21) 2

Exercise 4
1) 18   2) 3   3) 12   4) 27   5) 28   6) 15
7) 10   8) 14   9) 12   10) 40   11) 40   12) –5

18. Simplifying Expressions
Exercise 1
1) (i) $8x$ (ii) $4x^2$ 2) (i) $10 + 2y$ (ii) $5y$
3) (i) $4x$ (ii) $8x$ (iii) $2x + y$ (iv) $3x + 2y$
4) (i) x^2 (ii) $3x^2$

Exercise 2
1) 11   2) 5   3) 9   4) –1   5) –3   6) –3   7) 4
8) 3   9) 6   10) –8   11) –11   12) –15   13) 3
14) 0   15) 1   16) –6   17) –1   18) –1   19) –4
20) 0

Exercise 3
1) $11y$ 2) $8y$ 3) $3y$ 4) $8x$ 5) $-2y$ 6) $8x$
7) $-9y$ 8) $-6x$ 9) $-23a$ 10) $-19w$
11) $15b + 5a$ 12) $12x + 13y$ 13) $7b + 8a$
14) $7y + 2x$ 15) $4a + 7b$ 16) $8p + 10q$
17) $8a + 2b$ 18) $4x + 6y$ 19) $6x - y$
20) $4a + b$ 21) $-2x - 3y$ 22) $6a - 3b$

Exercise 4
1) $3x + 3y$ 2) $18x + 24$ 3) $8x - 12$
4) $18x + 12$ 5) $7x + 10$ 6) $21x - 28$

7) $17x - 12$ 8) $22x + 15$ 9) $9x - 2y$
10) $14x - 12y$ 11) $5y + 8x$ 12) $y + 24x$

19. Equations
Exercise 1
1) 10   2) 6   3) 8   4) 20   5) 3   6) 3   7) 2
Exercise 2
1) 2   2) 10   3) 12   4) 6   5) 18   6) 27
7) 2   8) 10   9) 14   10) 3   11) 7   12) 4.5
13) –5   14) –6   15) –2.5   16) 2   17) 3
18) 2   19) 3   20) 2   21) 7   22) 2.5
23) –2   24) –5
Exercise 3
1) 3   2) 5   3) 6   4) 5   5) 3   6) 2   7) 6
8) 2   9) 3.5   10) 3   11) 2.5   12) 3.5
13) –1   14) –4   15) 4   16) 9   17) 8
18) 2   19) 3   20) –8   21) –3
Exercise 4
1) 3   2) 2   3) 1   4) 3   5) 3   6) 4   7) 5
8) 7   8) 8   10) 10   11) 7   12) 5   13) 1
14) 4   15) 3   16) 3   17) 2   18) 5   19) 2
20) 0   21) 3   22) $x = 2$ 23) 5   24) 4

20. Forming Expressions
1) a) $d + 12m$ b) $d + 12m - 10$
2) a) £36h b) 2h c) £12h d) £48h
e) £35$(h + 1)$ 3) a) T + 2 miles
b) T + 1 miles   c) $2(T + 2)$ or $2T + 4$
4) a) £$h + 8w$ b) £$h + 2$ c) £$w - 1$
d) £$h + 8w - 6$ 5) a) 200r b) £2r c) £c
d) £c + p   e) £c + 3p   6) a £C + 8A
b £2C + 14A   7) a) (iii)   d) $4m + 2$
8) a) $12t + e$ b) $24t + 2e$

21. Distance Time Diagrams (1)
1) a) 220 miles   b) 40 minutes
c) 30 miles per hour   d) 44 mph
2) a) 45 mph   b) 4 minutes   c) 8:10
d) 32.5 mph   e) 8:27   f) 1.5 miles   g) 8:58
3) a) 60 mph   b) 12:40, 4 mins   c) 80 mph
d) 72 mph   e) 13:04, 68 miles

22. Distance Time Diagrams (2)
1) a) 12 minutes   b) 8 km per hour   c) 2 hours
d) 6.25 km per hour   e) 42 minutes   f) 14.06
g) The first 4 km. The graph is steepest
2) a) 144 miles   b) 18 mph and 72 mph
c) 36 minutes   d) 05:12, 104 miles
e) 32 miles

23. Co-ordinates
1) (2,6)   (6,10)   (10,6)   (6,2)
2) a) (6,9)   (10,11)   (14,3)   b) (10,1)
3) (–3,4)   (4,4)   (4, –2)   (–3,–2)
4) (–6,1)   (1,4)   (3,4)   (5,1)   (5,–3)   (3,–6)
   (1,–6)   (–6,–3)
5) b) (4,–1) (–5,–4) (–7,2) (2,5)

24. Conversion Graphs (1)
1) a) 45   b) £3.40   2) a) $113 approx.
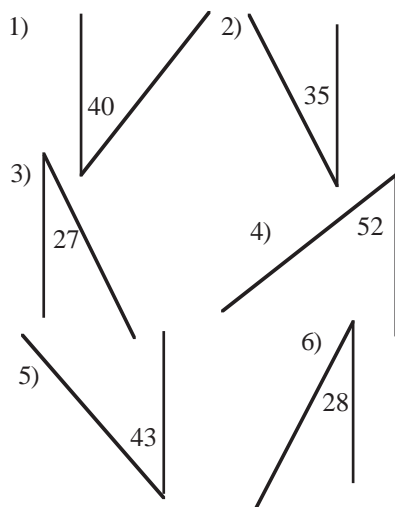b) £37 approx.

25. Conversion Graphs (2)
1) 88 lbs   a) approximately 50.5 lbs
b) approximately 34 kg
2) 45 litres   a) 49.5   b) 7.1
3) a) £88   b) 9000
4) a) 3 ozs   b) 7 ozs   c) 368 g. approximately
5) a) 122,000 Lira   b) £14.65 approximately

26. Plotting Graphs
1) b) Lines are parallel   2) b) 22.2
3) c) Perpendicular   4) c) Parallel
5) c) 0.65   6) c) (2,4) (–1,1)

27. Trial and Improvement
 1) 3 cows 4 sheep   2) 3 tables 12 chairs
 3) 3 at 26p, 2 at 20p   4) 10 at 30p, 7 at 25p
 5) 4 pencils, 7 pens   6) 7 pencils, 9 pens
 7) 8 of 4 and 5 of 6   8) 7 of 5 and 4 of 12
 9) 8.3 cm   10) 9.2 cm   11) 6.1 cms
12) 7.8 cms

28. Bearings
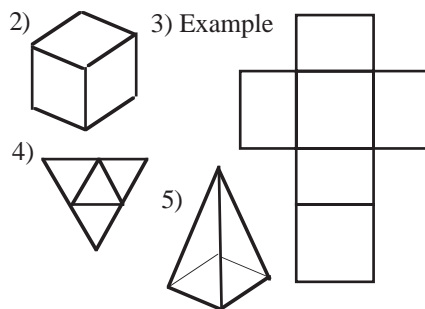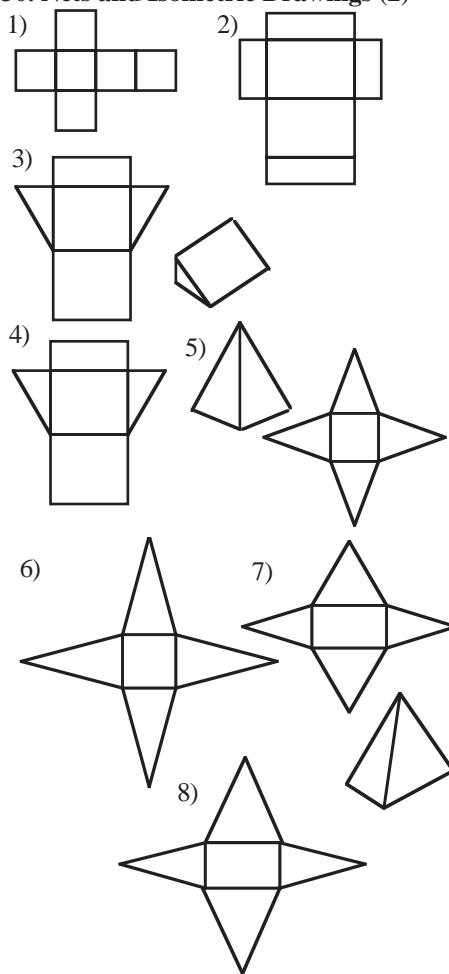**Exercise 1**

Exercise 2
1) N28ºW (332º)   2) N28⁰E (028º)
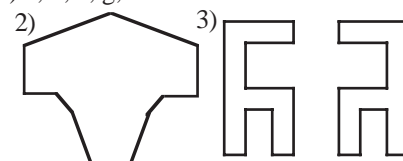3) S58ºW (238º)
Exercise 3
1) a) 43 km (N89º W or 271º)
   b) 73 km S 80º E (100º)
   c) 25 km S 32º W (212º)
2) 9.4km S 87º E (093º)
3) 153 km S 33º W (213º)
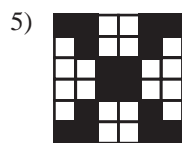
29. Nets and Isometric Drawings (1)
1) a, c, d, f

30. Nets and Isometric Drawings (2)

31. Reflection Symmetry
1) a, b, c, g, i.

4) i, p, x, s.

5)

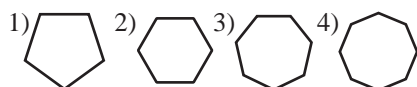## 32. Reflection
1) (–1,4) (–6,4) (–6,10)
2) (0,2) (–5,2) (–5,10) (0,10) (0,7)
   (–3,7) (–3,5) (0,5)
3) (2,0) (0,5) (2,10) (4,5)
4) (3,–1) (9,–3) (3,–8)
5) (1,1) (8,1) (10,–4) (3,–4)

33. Angles
1) 121º   2) 51º   3) 38º, 57º, 142º
4) 55º, 55º   5) 47º, 133º   6) 34º, 34º, 146º
7) 36º, 60º, 60º   8) 71º, 30º, 30º
9) 25º, 60º   10) 133º, 47º, 47º

34. Triangles
1) 105º   2) 150º, 60º   3) 70º, 60º
4) 70º, 60º   5) 45º, 48º, 132º
6) 63º, 54º   7) 121º, 130º, 109º
8) 39º, 27º, 12º
9) 43º, 43, 137º   10) 60º, 120º

35. Regular Polygons

1) 2) 3) 4)

5) a) Equal in length b) 72º   c) 54º, 54º
6) a) 45º   b) 67.5, 67.5 c) 135º   d) 45º
7) a) 51.4º b) 64.3º   c) 128.6º   d) 51.4º
8) 8   9) The interior angle of a pentagon is not
   a factor of 360º. The interior angle of a
   hexagon (120º) is a factor of 360º. Therefore
   three of these angles will fit together to make
   360º.   10) 9

36. Quadrilaterals
1) a)   b)

c)   d)

e)

2) 127º, 53º   3) 90º, 56º   4) 142º   5) 65º
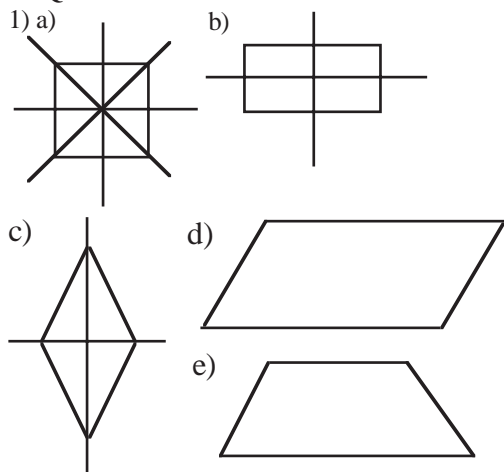
6) 120º   7) a) AOB, AOD, DOC b) 90º,
45º, 45º ,   8) a) Isosceles triangle   b) AOD
c) AOB and DOC   d) 48º, 66º, 24º.

37. Shapes
a) Octagon   b) Parellelogram c) Quadrilateral
d) Cuboid   e) Triangle   f) Kite   g) Hexagon
h) Cube   i) Trapezium   j) Triangular prism
k) Circle l) Cylinder   n) Square   o) Cone
p) Rectangle   q) Pyramid   r) Pentagon

38. Enlargements

39. Scale Drawings
1) 7.4 cm   2) 4.5 cm   3) 80 metres
4) 15.4 metres

40. Rotational Symmetry
1) a) 3 b) 4   c) 5 d) 10 e) 3 f) 6 g) 3 h) 2
i) 6 j) 3 k) 3 l) 4 m) 6 n) 6 p) 4 q) 2
2) I, S, X, Z
   3) b)   c)   d)

e)   f)   g)

h)   i)
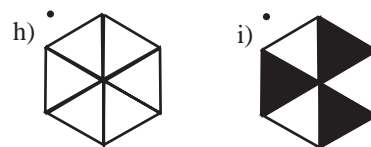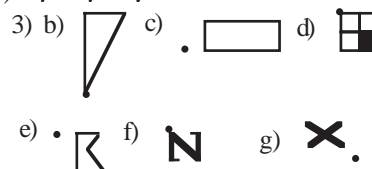
41. Rotation
1) (–1,–1) (–1,–3) (–3.–3)
2) (2,4) (2,8) (9,8)
3) (–2,3) (–9,3) (–9,7) (–2,7)
4) Rotation of 90º clockwise about point (–3,2)

42. Translations (1)
1) (0,3) (5,3) (4,9)
2) (–3,3) (–8,3) (–6,8) (–1,8)
3) (4,–2) (7,–2) (10,–6) (2,–6)
4) (2,8) (7,8) (9,6) (4,3) (5,6)

43. Translations (2)
1) c) (2,3) (2,1) (4,1)
2) c) (2, –2) (4.–2) (4,–4) (2,–4)
3) c) (–5,–3) (–2,–3) (–2,–1) (–4,–1)

44. Tessellations
2) Four corners of 90º will fit together around
a point to make 360º. 145º will not divide into
360º exactly.
3) a) Square b) Rhombus c) Rhombus

45. Planes of Symmetry
1) No   3
2) 9   3) a) 1   b) 1   4) A and D

46. Volume
1) 27cm^3 2) 63cm^3 3) 72 cm^3 4) 30 cm^3
5) 24   6) $3 \times 12 \times 4$ or $3 \times 6 \times 8$ etc
7) 4 cm

47. Using Measurements
1) a) 77 mm   b) 7 cm 7 mm   c) 7.7 cm
2) a) 95 mm   b) 9 cm 5 mm   c) 9.5 cm
3) a) 3.1   b) 3.8   4) a) (i) 700ml   (ii) .7L
b) more   5) a) kilograms   b) 68 kg
c) 92kg   d) 24kg   e) 150 pounds, 202 pounds
f) 10 stones, 10 pounds and 14 stone 6 pounds
6) 90 km   7) 5 feet 10 inches   8) 22 gallons
9) 2 litres are greater than 3 pints, 2 kgs are
greater than 4 pounds

48. Circumference of a circle
Exercise 1
1) 25.12   2) 37.68   3) 62.8   4) 113.04
5) 50.24   6) 43.96   7) 37.68   8) 50.24
9) 75.36   10) 7.222   11) 53.38   12) 72.22
Exercise 2
1) 6.369   2) 33.44   3) 0.7325   4) 4.777
5) 81.53   6) 56.05
Exercise 3
1) a) 219.8 cm   b) 4396 cm or 43.96 metres
2) a) 31.4 metres   b) 628 metres
3) a) 26 metres   4) 7 m 85 cm
5) 785 metres   6) 579 turns   7) 21 turns

49. Areas and Perimeters
1) A 8,12   B 8,14   C 5,12   D 7,14   E 7,16
F 9,12   G 6,14   H 6,12
2) B   3) 62   4) 30 m, 38 m^2
5) a) 243 tiles   b) 16 m 80 cm   c) 84
6) a) 216 cm^2 b) 84 m^2 c) 72 m^2
7) 60 cm^2

50. Time
1) a) 40 minutes   b) 50 minutes
c) 1 hr 45 mins   d) 1 hr 20 mins
2) a) 3 hours 45 minutes   b) 4 hours 6 minutes
c) 1 hour 53 minutes   d) 2 hours 49 minutes
e) 3 hours 4 minutes   f) 6 hours 48 minutes
3) 5:50   4) 2: 30 pm   5) 6 hours 40 minutes
6) a) 3:53 pm 5:06 pm   b) 1 hour 13 minutes
7) Hannah
8) a) 16:12   b) 8 hours 34 minutes
9) 7 hours 22 minutes

51. Plans
1) a) 50 cm   b) 10 cm, 6cm
c) 5 metres, 3 metres   d) 130cm, 70 cm
2) 40 cm, 4 metres, 12.5 cm, 2
3) a) 3 cm   b) 1:10   c) 13 cms
4) a) 4:1   b) 8 mm

5) 30 cm, 2 cm, 1 cm, 4.

52. Speed
1) 50 mph   2) 32 mph   3) 40 kpm
4) 26.25 mph   5) a) 38 miles   b) 76 mph
6) a) 15 km   b) 30 kph   7) 40 km per hour
8) 50 mph   9) 60 kph   10) 60 miles
11) 75 miles   12) 125 km   13) 75 km
14) 126 miles   15) 2 hours
16) 1 hour 30 minutes   17) 15:20 or 3:20 pm
18) 10:35 am   19) 12:45 am.

53. Best Buys
1) Chris   2) Supermarket   3) 1 litre
4) 700 g   5) 1 litre   6) 125 ml   7) 500 ml
8) 450 g tin   9) 4 litre   10) 200 ml tube

54. Pictograms
1) a) 125   b) 45   c) 15
2) a) 30   b) 45   c) 15   d) 585
3)

Badminton	☺☺☺☺
Squash	☺☺
Netball	☺☺☺☺
Rounders	☺☺☺
Hockey	☺☺☺☺☺☺☺

55. Area of Circles
1) a) 7.065cm^2 b) 200.96mm^2 c) 50.24mm^2
d) 28.26cm^2 e) 7.065cm^2 f) 12.56cm^2
2) a) 78.5cm^2 b) 28.26cm^2 c) 19.63cm^2
d) 452.2cm^2 e) 254.3cm^2 f) 176.6cm^2
g) 16.61cm^2 h) 58.06cm^2 i) 55.39cm^2
3) a) 113.04cm^2 b) 1.766cm^2
c) 111.27cm^2
4) Square 6.25cm^2 Circle 7.065cm^2
    Circle is larger.
5) a) 50.24 m^2 b) 78.5 m^2 c) 28.26 m^2

56. Probability Tables (1)
1)

	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

2) (A,B)   (A,C)   (A,D)   (A,E)   (B,C)
   (B,D)   (B,E)   (C,D)   (C,E)   (D,E)
3)

	1	2	3	4
1	2	3	4	5
2	3	4	5	6
3	4	5	6	7

4) (1,1) (1,2) (2,1) (2,2) (3,1) (3,2)
5) (1,1) (1,2) (1,3) (1,4) (2,1) (2,2)
(2,3) (2,4) (3,1) (3,2) (3,3) (3,4)

57. Probability Tables (2)
1)

	1	1	2	2	3	3
1	2	2	3	3	4	4
1	2	2	3	3	4	4
2	3	3	4	4	5	5
2	3	3	4	4	5	5
3	4	4	5	5	6	6
3	4	4	5	5	6	6

a) $\frac{4}{36}$ or $\frac{1}{9}$ b) $\frac{12}{36}$ or $\frac{1}{3}$ c) $\frac{12}{36}$ or $\frac{1}{3}$

2)

	1	2	3	4
1	■	3	4	5
2	3	■	5	6
3	4	5	■	7
4	5	6	7	■

a) $\frac{2}{12}$ or $\frac{1}{6}$ b) $\frac{8}{12}$ or $\frac{2}{3}$

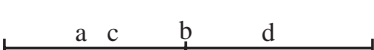3) a) (1,A) (1,B) (1,C) (2,A) (2,B) (2,C)
(3,A) (3,B) (3,C) (4,A) (4,B) (4,C)
b) $\frac{1}{12}$ b) $\frac{3}{12}$ or $\frac{1}{4}$

4) (1,1) (1,2) (2,1) (2,2) (3,1) (3,2)
a) $\frac{1}{6}$ b) $\frac{2}{6}$ or $\frac{1}{3}$ c) $\frac{1}{6}$

58. Probability (1)
1) a Unlikely   b Unlikely   c Even
d Likely

2)

3)

4) 0, no chance;   0.1, very unlikely;
0.3, unlikely;   0.5, even;   0.7, likely;
0.9, very likely;   1.0, certain
5) 0%, no chance;   5%, very unlikely;
19%, unlikely;   50%, even;   67%, likely;
98% very likely;   100% certain.
6) Good.   On his past performance it has 5
chances out of 7 of winning.
7) 5 chances out of 1000 is not a good chance.
8) Yes.There have been 156 cars out of 257
which is better than an even chance.
9) Only if the number of girls entering the
competition is the same as the number of
boys entering it.

59. Probability (2)
1) $\frac{1}{6}$ 2) $\frac{4}{52}$ or $\frac{1}{13}$ 3) $\frac{15}{35}$ or $\frac{3}{7}$ 4) $\frac{10}{200}$ or $\frac{1}{20}$
5) $\frac{10}{20}$ or $\frac{1}{2}$ 6) $\frac{3}{6}$ or $\frac{1}{2}$ 7) a) $\frac{1}{6}$ b) $\frac{3}{6}$ or $\frac{1}{2}$
c) $\frac{5}{6}$ 8) a) $\frac{5}{12}$ b) $\frac{4}{12}$ or $\frac{1}{3}$ c) $\frac{9}{12}$ or $\frac{3}{4}$
9) a) $\frac{5}{1000}$ or $\frac{1}{200}$ b) 100   10) a) 4   b) 20

c) 0   11) a) $\frac{1}{10}$ b) $\frac{4}{10}$ or $\frac{2}{5}$ c) $\frac{9}{10}$ 12) $\frac{5}{6}$
because there are 5 other numbers that can be
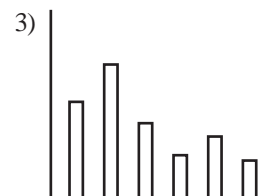obtained.

60. Grouped Frequency
1)

0-10	0
11-20	1
21-30	4
31-40	5
41-50	5
51-60	9
61-70	3
71-80	2
81-90	3
91-100	1

2)

1-2	7
3-4	27
5-6	11
7-8	5
9-10	1

3)

1-4	11
5-8	9
9-12	3
13-16	10
17-20	2
21-24	1

4)

0-10	5
11-20	10
21-30	14
31-40	7
41-50	1

61. Pie Charts
1) a) 25%   b) $\frac{1}{8}$ c) 125
2) a) $\frac{1}{3}$ b) 6 hrs
3) Angles are 80º, 120º, 80º, 20º, 60º
4) a) 10º   b) 100º, 140º, 70º and 50º
5) Angles are 75º, 150º, 90º and 45º
6) a) 6º   b) 60º , 150º, 120º, 30º

62. Bar Charts
1) a) Semi detached   b)5   c) 30   2) a) 40
b) 35   c) 50   d) 195

3)

63. Mean
1) 4.75   2) 6.8   3) 53   4) 11.5
5) a) 32   b) 28   6) a) 15   b) No

7) a) By multiplying together the top two rows
b) 30, 28, 20   c) 90   d) 3   8) a) 65   b) 2.5
9) 4

64. Median, Mode and Range

1)   1   8
               2   7
               3   7
               4   6
               5   4
               6   3
               7   1

2)   0   6
               1   6
               2   11
               3   5
               4   3
               5   2
               6   4
               7   4
               8   6
               9   3
a) 2 b) 9
3)   13   7
               14   10
               15   13
               16   8
               17   7
a) 15   b) 4
4) 5 and 9   5) 6 and 7   6) 69 and 78

65. Mean, Median, Mode and Range
The following answers are examples and in some cases are more detailed than required.
1) Either   a) 4 seats because more families have 4 members than any other number or b) 5 seats because this covers all family sizes up to 5
2) It is not known the exact ages of the people who are less than 14 and over 16.
3) The ages of the second group are more spread out than the ages of the first group.
4) Type A – as they have a smaller range they are more reliable.
5) Size 8 – she sells more of this size than any other size.
6) The mean will go down slightly (to 94.1). The range could go down or stay the same eg if it was 88 to 100 then there would be a change.
7) The mean will increase slightly (to 1.57). The mode will stay the same at 2. If there are now the same number of 2's as there are 3's then both these numbers will be modes. However, since the mean is only 1.5 it seems more likely that there are not many 3's compared with 2's so the mode will stay the same.
8) The median will either be lower, or if there

are a number of 23's it could stay the same. If 30 and 15 lie between the top and bottom mark then there will be no change in the range. If 30 is the largest number, or 15 the smallest then the range could change.

66. Scatter Graphs
1) Positive correlation, no correlation and negative correlation   (i) c)   (ii) a)   (iii) b)
2) a) About 58   b) about 65   3) About 90

67. Line Graphs
1) b) The temperatures in Europe are high in July and low in January.   The temperatures in Australia are low in July and high in January.   2) b e.g. most egg timers were within 2 seconds of 4 minutes.

68. Surveys and Questionaires
1) a) and (iii)   b) and (i)   c) and (ii)
2) Examples only

Question	Response
Do you want a supermarket in town?	Yes / no
Where do you think a supermarket should be built?	In town / Out of town
What is your age?	30 or less / Over 30
Do you normally shop for others?	Yes / No
Where do you normally shop?	Town / Other
What is your gender?	Male / Female

3) Would you be prepared to buy vegetarian food from the tuck shop?   Yes/No
   Which two of the following would you prefer to eat? a) fruit b) yoghurt c) oatmeal biscuits   d) nuts   e) wholemeal sandwiches
4) Not a good questionaire because   a) it only gives one choice   b) it puts pressure on the staff to agree by saying the manager thinks it is a good idea. It would be better to give the two choices with no comment about what the manager likes. A third choice such as "none of these" or a space for their own comments would make it less biased.

69 More Estimation
Exercise 1

1) $20 + 60 = 80$	2) $20 + 60 = 80$
3) $90 + 60 = 150$	4) $60 + 80 = 140$
5) $40 - 20 = 20$	6) $60 - 30 = 30$
7) $80 - 40 = 40$	8) $85 - 35 = 50$
9) $70 + 30 = 100$	10) $20 + 50 = 70$
11) $90 + 60 = 150$	12) $40 + 70 = 110$
13) $90 - 30 = 60$	14) $70 - 30 = 40$
15) $110 - 70 = 40$	16) $140 - 80 = 60$

Exercise 2

1) $80 \times 20 = 1600$	2) $40 \times 20 = 800$
3) $60 \times 30 = 1800$	4) $80 \times 30 = 2400$
5) $100 \times 20 = 2000$	6) $50 \times 30 = 1500$
7) $140 \times 20 = 2800$	8) $80 \times 40 = 3200$
9) $100 \times 60 = 6,000$	10) $170 \times 10 = 1700$

11) $250 \times 10 = 2500$
12) $400 \times 30 = 12,000$
13) $500 \times 40 = 20,000$
14) $600 \times 50 = 30,000$
15) $700 \times 50 = 35,000$

Exercise 3

1) $4 \times 6 = 24$	2) $5 \times 5 = 25$
3) $8 \times 8 = 64$	4) $6 \times 10 = 60$
5) $4 \times 20 = 80$	6) $7 \times 20 = 140$
7) $5 \times 30 = 150$	8) $4 \times 40 = 160$
9) $8 \times 50 = 400$	10) $6 \times 30 = 180$
11) $9 \times 50 = 450$	12) $6 \times 70 = 420$
13) $8 \times 40 = 320$	14) $4 \times 60 = 240$
15) $7 \times 80 = 560$	

Exercise 4

1) $4 \times 3 = 12$	2) $5 \times 8 = 40$
3) $9 \times 6 = 54$	4) $5 \times 5 = 25$
5) $7 \times 4 = 28$	6) $4 \times 5 = 20$
7) $8 \times 8 = 64$	8) $10 \times 6 = 60$
9) $6 \times 3 = 18$	10) $8 \times 8 = 64$
11) $5 \times 10 = 50$	12) $8 \times 10 = 80$
13) $2 \times 20 = 40$	14) $9 \times 20 = 180$
15) $4 \times 20 = 80$	

Exercise 5

|	
1) $30 \div 5 = 6$	2) $40 \div 8 = 5$
3) $60 \div 10 = 6$	4) $100 \div 20 = 5$
5) $70 \div 10 = 7$	6) $90 \div 9 = 10$
7) $60 \div 30 = 2$	8) $90 \div 30 = 3$
9) $60 \div 15 = 4$	10) $40 \div 10 = 4$
11) $90 \div 30 = 3$	12) $120 \div 40 = 3$
13) $140 \div 7 = 20$	14) $200 \div 40 = 5$
15) $300 \div 50 = 6$	16) $100 \div 10 = 10$
17) $400 \div 80 = 5$	18) $500 \div 20 = 25$

Exercise 6

1) $80 \div 20 = 4$	2) $60 \div 10 = 6$
3) $90 \div 9 = 10$	4) $50 \div 6 = 10$(approx)
5) $40 \div 4 = 10$	6) $60 \div 10 = 6$
7) $90 \div 15 = 6$	8) $50 \div 5 = 10$
9) $40 \div 20 = 2$	10) $70 \div 14 = 5$
11) $30 \div 6 = 5$	12) $150 \div 15 = 10$
13) $40 \div 40 = 1$	14) $300 \div 35 = 10$(approx)
15) $240 \div 90 = 3$(approx)	16) $800 \div 40 = 20$

70 Making and Solving Equations 1
1) a) $x + 1$ b) $x + 2$ c) $3x + 3$
d) $3x + 3 = 45$ e) 14, 15 and 16
2) a) $y - 1$ b) $y + 1$ c) $3y$ d) 3
e) $150 \times 3 = 450$ f) 24, 25 and 26
3) a) $y = x + 4$ b) $7x$ and $5x + 20$
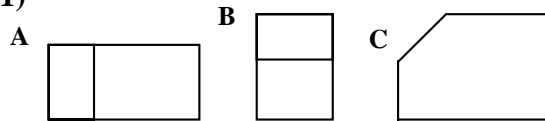   c) $7x = 5x + 20$ d) 70cm   e) $4,900 \text{cm}^2$

71 Congruency
1) a) DEF   b) BAC   c) FD   d) (iii) (iv)
2) a) $\angle BAC = \angle CED$, $\angle ABC = \angle CDE$
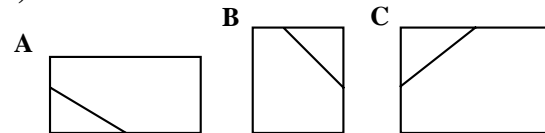$\angle ACB = \angle DCE$ b) AB = DE, BC = CD, AC = CE
3) a and c

72 Plans and Elevations 1
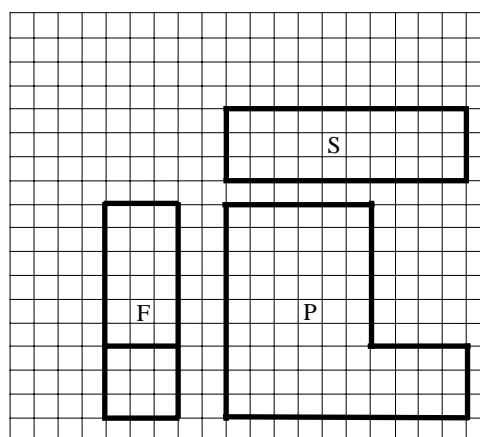
73 Plans and Elevations 2
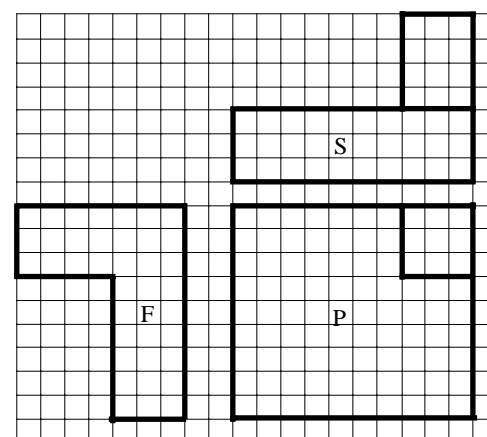
74 Plans and Elevations 3
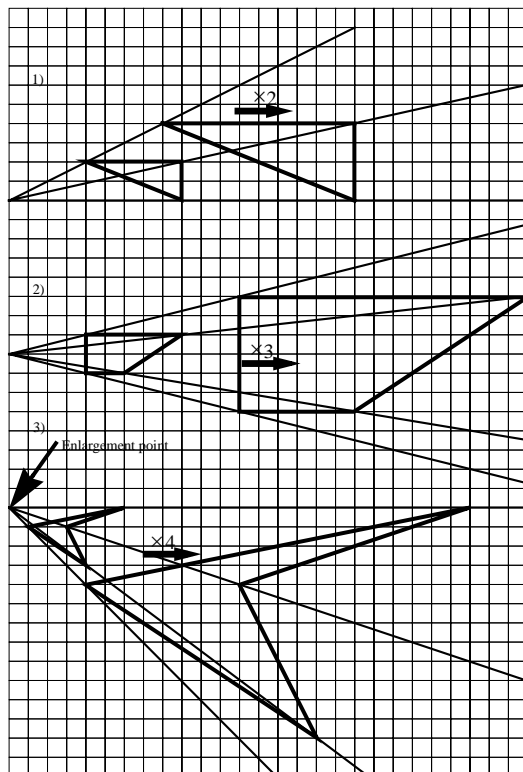**1)**

A
B
C

2)

A
B
C

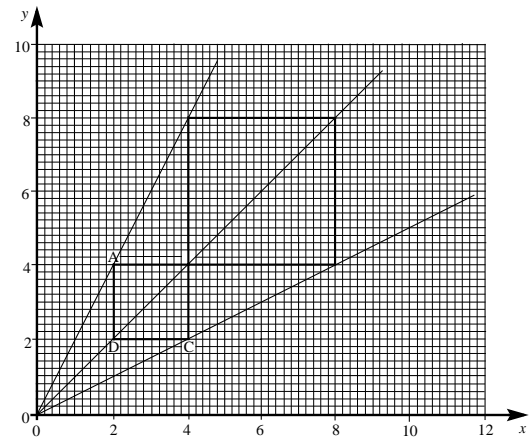## 75 Recognising Graphs
  (i) b   (ii) a   (iii) i   (iv) l   (v) h   (vi) g
(vii) f (viii) j   (ix) k   (x) c   (xi) d   (xii) e

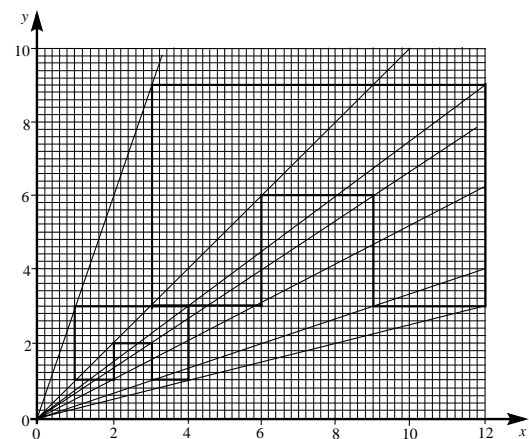## 76 Number Machines
1) a) 20   b) 15   c) 7   d) 7   e) 6
    f) 7   g) 16   h) 6   i) 63   j) 10
2) a) (i) 13   (ii) 38   (iii) –17
   b) (i) 17   (ii) 52   (iii) –11
   c) (i) 8   (ii) 11   (iii) 5
   d) (i) –3   (ii) 1   (iii) –8
3) a) $3n + 7$ b) $5n + 4$ c) $8n - 3$

   d) $\dfrac{n}{6} + 9$ e) $\dfrac{n}{2} - 7$

77 Enlargement Through a Point 1
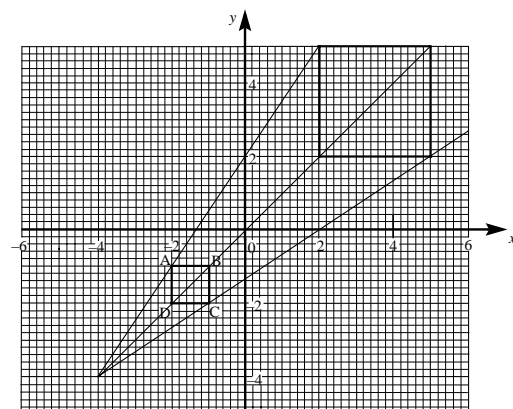

78 Enlargement Through a Point 2
1)

2)

79 Enlargement Through a Point 3
1)

2)