

This topic is concerned with the use of mathematics in problems relating to cars.

It uses information from a variety of sources, including the *Vehicle Licensing Centre* at Swansea (tel: 01792 782318). Further information, including the monthly number of vehicle registrations, is available from them. A vast number of car magazines from which information can be obtained on such aspects as new car prices, second-hand prices, car equipment, etc. are available from newsagents, and brochures concerning new cars can be obtained from car showrooms.

The main emphasis of the work covered in this topic relates to the two Attainment Targets **Number** and **Handling Data**, but opportunities are also given for work related to **Using and Applying Mathematics**. The particular *Yearly Teaching Programmes* in the National Numeracy Framework are given in the chart below.

Topic	Sheet number	National Numeracy Framework reference
Introduction	0	
Colours of cars	1	4/E1
Types of cars	2	4/E1
Engine sizes	3	5/A1 and 5/D1
How old? (Information)	4	–
How old? (Problems)	5	6/E1
Where from? (Information)	6	–
Where from? (Problems)	7	6/E1
One way traffic	8	5/C2
Speed conversion	9	6/D1
Buying petrol	10	6/D1 and 6/E1
Area codes (Information)	11	–
Solutions		

Look at cars passing your school or home.

What is the most popular colour?

How do you know?

To find out you must do a survey.



Activity

Construct a tally chart like the one below and note the colours of the first 100 cars passing.

BLACK	
RED	
WHITE	
BLUE	
GREY	
GREEN	

The colour of each car is marked on the chart with a line. You mark the fifth line by crossing through all the previous four.

The example opposite shows how you tally 7 black, 3 red and 11 white cars.

BLACK		7
RED		3
WHITE		11

After you have done your survey, answer the following questions.

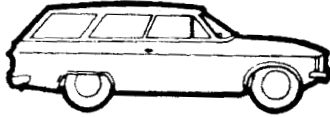
Problems

1. What was the most popular colour of all the cars in your survey?
2. How many cars were there in the most popular colour?
3. What is the fraction of cars in the most popular colour?
4. What percentage of the total number of cars is this?

Cars come in different shapes and sizes.

Here are some types of car you might see.

Estate car



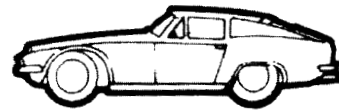
Saloon car



Hatchback



Sports car



Which type of car do you think is most popular?

To see if you are right, you must do another survey.

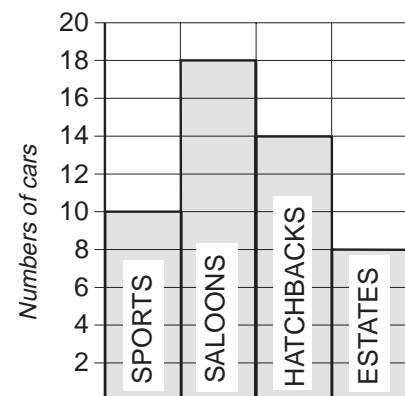
Activity

Note the type of car for the first 50 cars to pass your school or home. Transfer your results to a tally chart.

Add up the number of each type of car.

Show this information in a bar chart.

SPORTS CARS	
SALOON CARS	
HATCHBACKS	
ESTATE CARS	



Types of cars

Bar chart

From your data, answer the following questions.

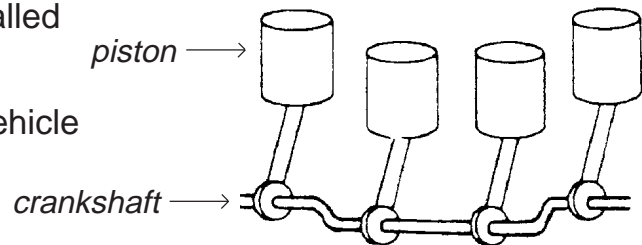
Problems

1. Which is the most popular type of car?
2. What fraction of cars are of this type?
3. What percentage of cars are of this type?

Most cars have four cylinders. Each cylinder contains one piston connected to the crankshaft.

The total volume of these cylinders is called the engine size or **capacity**.

For example, a typical 1-litre capacity vehicle has four cylinders, each of volume 250 cubic centimetres.



The total volume of the engine is

$$4 \times 250 = 1000 \text{ cubic centimetres, which is 1 litre.}$$

So the engine capacity is 1 litre.

The table gives the engine size in cubic centimetres for some models of cars.

CAR	Volume (cubic centimetres)	→	Volume (nearest 100 cubic centimetres)	→	Capacity (litres)
<i>Renault Laguna</i>	1598	→	1600	→	<input type="text"/>
<i>Saab 2.0i</i>	1985	→	2000	→	<input type="text"/>
<i>Skoda Octavia 1.8</i>	1781	→	<input type="text"/>	→	<input type="text"/>
<i>Land Rover 4.0</i>	3950	→	<input type="text"/>	→	<input type="text"/>
<i>Peugeot 306</i>	1360	→	<input type="text"/>	→	<input type="text"/>
<i>Ford Escort 1.3</i>	1299	→	<input type="text"/>	→	<input type="text"/>
<i>Fiat Punto</i>	1108	→	<input type="text"/>	→	<input type="text"/>
<i>Daihatsu</i>	847	→	<input type="text"/>	→	<input type="text"/>

Activity

Complete the table by writing the volumes to the nearest 100 cubic centimetres and the engine capacities in the boxes.

Use this data to answer the following questions.

Problems

- From the list above, which car has the largest engine capacity?
- Which car in the list has the smallest engine capacity?
- Write out the names of the cars listed in order of engine size, starting with the largest.

You can generally tell how old a car is by looking at its registration number-plate.

The system of registration for cars changed in September 2001, so cars on the road today are likely to have registration plates showing details in one of the following formats:

1. Car registrations from July 1990 to July 2001

The first letter of the number-plate is the age identifier.

The chart on the right shows the letters used as age identifiers on registration plates from August 1990 until August 2001.

H	August 1990 - July 1991
J	August 1991 - July 1992
K	August 1992 - July 1993
L	August 1993 - July 1994
M	August 1994 - July 1995
N	August 1995 - July 1996
P	August 1996 - July 1997
R	August 1997 - July 1998
S	August 1998 - February 1999
T	March 1999 - July 1999
V	August 1999 - February 2000
W	March 2000 - July 2000
X	August 2000 - February 2001
Y	March 2001 - August 2001

2. Car registrations from 2001

The current system, brought in on 1 September 2001, uses a number instead of a letter as the age identifier. The numbers change every 6 months, on 1 March and 1 September. Numbers from 01 to 99 are available to be used .

- Numbers issued from March to August begin with '0'.
- Numbers issued from September to February begin with '5'.

So the age identifiers issued in the first 3 years of the system are:

51	September 2001	-	February 2002
02	March 2002	-	August 2002
52	September 2002	-	February 2003
03	March 2003	-	August 2003
53	September 2003	-	February 2004
04	March 2004	-	August 2004

Problems

Use the information on Sheet Cars : 4 to solve the following problems:

- What is the age identifier letter for a car registered in
(i) March 1992 (ii) November 1996 (iii) June 1998 ?
- What is the age identifier number for a car registered in
(i) September 2001 (ii) March 2004 (iii) December 2006 ?
- How old is each of the cars with the registration number
(i) S 207 VTT (ii) J 106 SYA (iii) W 989 ESN ?
- Write down a month and year when each of these registration plates might be issued:
(i) DC03GMM (ii) EA54EJC (iii) CP07LME

You can find out the average age of cars by noting the age identifiers of the registration plates on 50 cars passing your school or home. Here are some sample data you can use if you do not do your own survey.

<i>Years old</i>	0	1	2	3	4	5	6	7	8
<i>Number of cars</i>	10	14	11	6	4	2	2	0	1

Activity

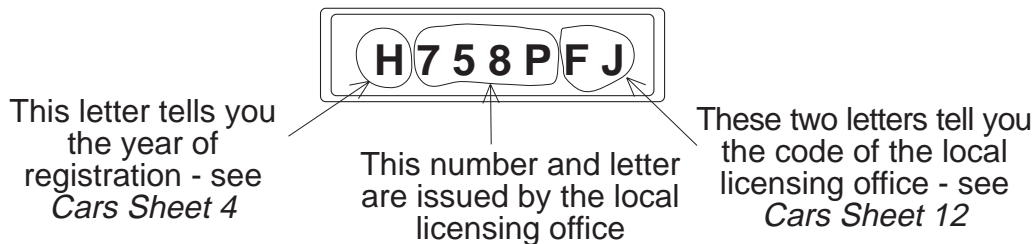
With the data above or using your own data

- Draw a bar chart to show the data*
- Calculate the average value for the ages of cars passing.*

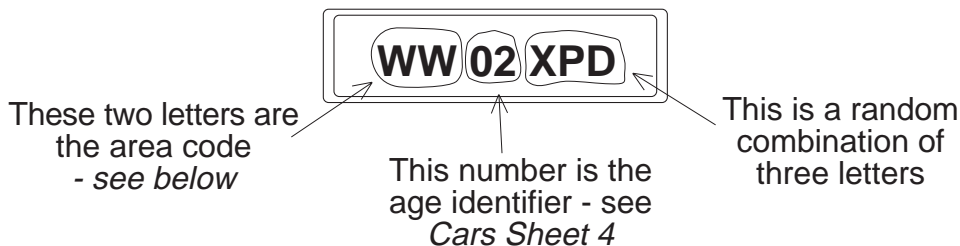
Car registration plates can tell you where the vehicle was first registered.

The system of registration for cars changed in 2001, so cars on the road today are likely to have a registration plate in one of the following formats:

1. Car registrations between 1983 and August 2001



2. Car registrations from September 2001



Area codes from September 2001

A	Anglia : Peterborough (AA - AN), Norwich (AO - AU), Ipswich (AV - AY)
B	Birmingham : Birmingham (BA - BY)
C	Cymru (Wales) : Cardiff (CA - CO), Swansea (CP - CV), Bangor (CW - CY)
D	Deeside / Shrewsbury : Chester (DA - DK), Shrewsbury (DL - DY)
E	Essex : Chelmsford (EA - EY)
F	Forest & Fens : Nottingham (FA - FP), Lincoln (FR - FY)
G	Garden of England : Maidstone (GA - GO), Brighton (GP - GY)
H	Hampshire & Dorset : Bournemouth (HA - HJ), Portsmouth (HK - HY except Isle of Wight - HW)
K	n/a : Luton (KA - KL) Northampton (KM - KY)
L	London : Wimbledon (LA - LJ), Stanmore (LK - LT), Sidcup (LU - LY)

M	Manchester : Manchester (MA - MY except MN - reserved for Isle of Man system only)
N	North East : Newcastle (NA - NO), Stockton (NP - NY)
O	Oxford : Oxford (OA - OY)
P	Preston & Peaks : Preston (PA - PT), Carlisle (PU - PY)
R	Reading : Reading (RA - RY)
S	Scotland : Glasgow (A - J), Edinburgh (K - O), Dundee (P - T), Aberdeen (U - W), Inverness (X, Y)
V	Severn Valley : Worcester (VA - VY)
W	West : Bristol (WA - WN), Exeter (WO - WW), Truro (WX - WY)
Y	Yorkshire : Leeds (YA - YK), Sheffield (YL - YU), Beverley (YV - YY)

X series will be used for EC exports, **Q series** for temporary imports (J, T, U spare)

bold names serve as "memory tags" only, city and town names show issuing Vehicle Registration Office

Problems

Use the information on Sheet Cars : 6 and Sheet Cars : 11 to solve the following problems:

1. Where was each of the cars with the following registration plates registered:

K 521 BOB

H 774 SKY

T 502 SSS

Y 279 PCC

N 554 OKO

P 267 TMG

2. In which city or town was each of the cars with the following registration plates registered:

MC01HFD

AP51WKM

HJ02JRE

YR01RRR

AW52XDR

WB51LEA

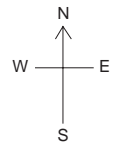
Tourist Boards often make surveys of car registrations to find out where visitors to their areas come from.

Activity

Write down the registration plates of all the cars parked at a local tourist attraction or in a shopping car park. Find out where all the cars are registered and mark this information on a map of the UK.

Problem

3. Write down *two* reasons why information gathered in the Activity above might not be a reliable indication of where the owners of the cars live.

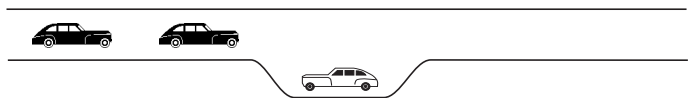


Some country lanes are single track with passing places. These passing places sometimes hold only **one** car.

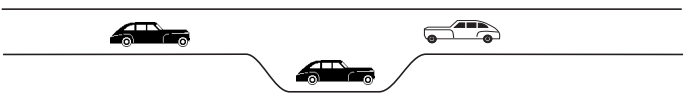
An example of this is shown opposite, where two cars are going from west to east and one from east to west.



One solution is shown opposite, with the white car going into the passing place to allow the black cars to pass.



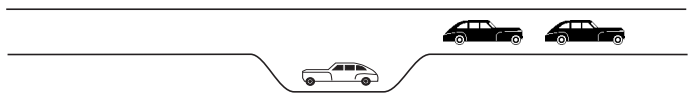
What will happen if the first black car reaches the passing place first and goes into it?



One way out of this is for the white car to move forward in order to let the first black car out.

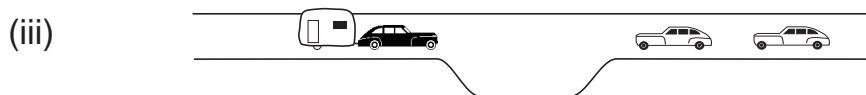
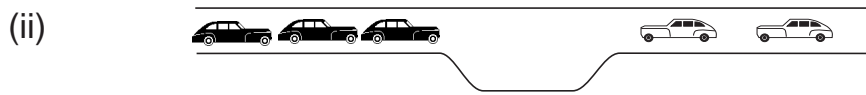
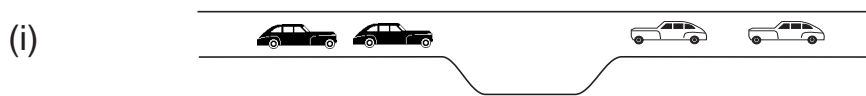


The white car can now reverse into the passing place to allow the second black car to move past. The white car can now continue on its way.

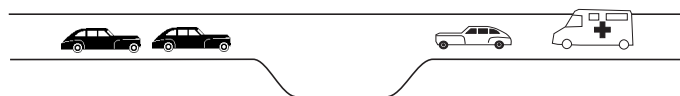


Problems

1. Find out how to clear the following traffic jams.



2. How can you clear the way for the ambulance?



We measure speed in mph (miles per hour).

For example, the sign opposite means that you are entering a region where the maximum allowed speed is 30 mph.



In many other countries, speeds are measured in km/h (kilometres per hour).

Most new cars will have both speeds given on the speedometer at the front of the car.

We will see how to convert speeds from mph to km/h.

It is useful to know that

3 miles is about 5 kilometres

Problems

1. Use the approximation above to convert the following distances from miles to kilometres.

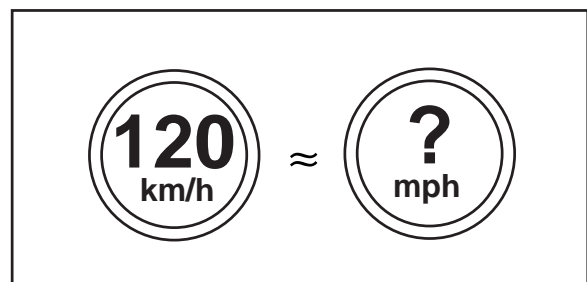
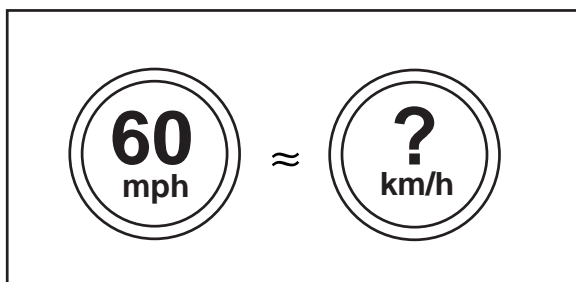
- (i) 6 miles (ii) 12 miles
(iii) 30 miles (iv) 1 mile

2. A speed of 3 mph is about the same as 5 km/h.

Use this approximation to convert the following speeds from mph to km/h.

- (i) 30 mph (ii) 90 mph
(iii) 45 mph (iv) 1 mph

3. Convert the following speed limits.



Petrol in the UK is sold in litres.
The price is given per litre – for example, 80p per litre.

Petrol used to be sold in gallons.
You can easily convert between gallons and litres by using the approximation

1 gallon is about 4.55 litres

Problems

1. Convert these quantities to litres. Give your answers to 1 decimal place.
 - (i) 2 gallons
 - (ii) 10 gallons
 - (iii) 5 gallons

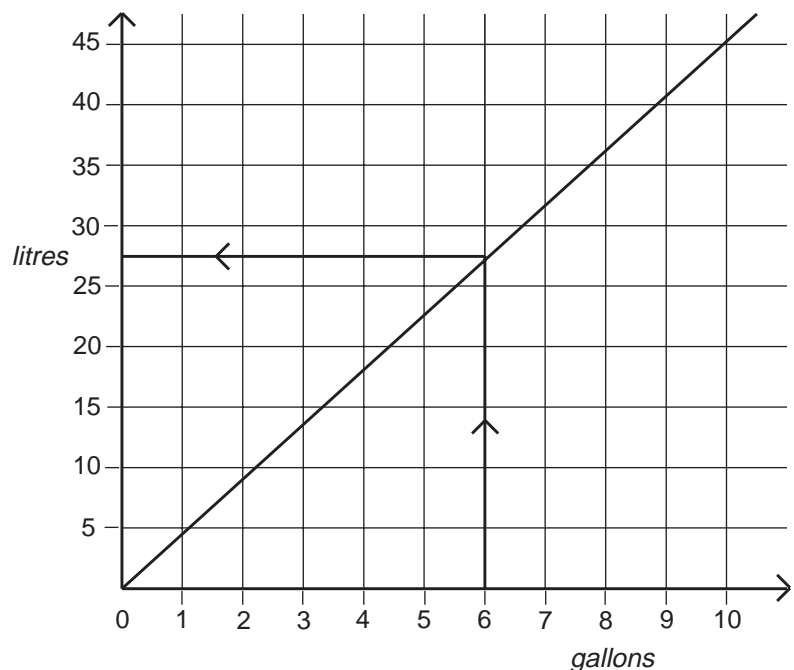
A method that can be used to convert gallons to litres or litres to gallons is by drawing a **conversion graph**, as shown opposite.

A straight line is drawn from the origin to the point that shows that 10 gallons is about 45.5 litres.

You can now read off values between 0 and 10 gallons.

For example

6 gallons \approx 27.5 litres.



Problems

2. Use the graph to convert to litres. Give your answer to the nearest litre.
 - (i) 3 gallons
 - (ii) 6.5 gallons
 - (iii) 9 gallons

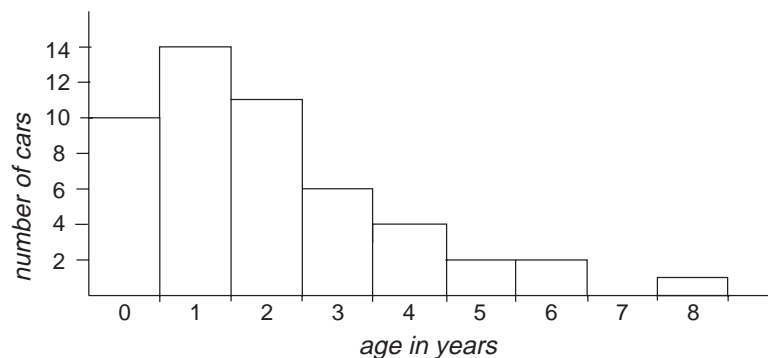
3. Use the graph to convert to gallons.
 - (i) 25 litres
 - (ii) 40 litres
 - (iii) 10 litres

AA	Bournemouth	DS	Glasgow	HJ	Chelmsford	MA	Chester	PR	Bournemouth	UH	Cardiff
AB	Worcester	DT	Sheffield	HK	Chelmsford	MB	Chester	PS	Aberdeen	UJ	Shrewsbury
AC	Coventry	DU	Coventry	HL	Sheffield	MC	London NE	PT	Newcastle	UK	Birmingham
AD	Gloucester	DV	Exeter	HM	London (Central)			PU	Chelmsford	UL	London (Central)
AE	Bristol	DW	Cardiff	HN	Middlesbrough	MD	London NE	PV	Ipswich	UM	Leeds
AF	Truro	DX	Ipswich	HO	Bournemouth	ME	London NE	PW	Norwich	UN	Exeter
AG	Hull	DY	Brighton	HP	Coventry	MF	London NE	PX	Portsmouth	UO	Exeter
AH	Norwich			HR	Swindon	MG	London NE	PY	Middlesbrough	UP	Newcastle
AJ	Middlesbrough	EA	Dudley	HS	Glasgow	MH	London NE	RA	Nottingham	UR	Luton
AK	Sheffield	EB	Peterborough	HT	Bristol	MJ	Luton	RB	Nottingham	US	Glasgow
AL	Nottingham	EC	Preston	HU	Bristol	MK	London NE	RC	Nottingham	UT	Leicester
AM	Swindon	ED	Liverpool	HV	London (Central)	ML	London NE	RD	Reading	UU	London (Central)
AN	Reading	EE	Lincoln	HW	Bristol	MM	London NE	RE	Stoke-on-Trent	UV	London (Central)
AO	Carlisle	EF	Middlesbrough	HX	London (Central)	MN	(not used)	RF	Stoke-on-Trent	UW	London (Central)
AP	Brighton	EG	Peterborough	HY	Bristol	MO	Reading	RG	Newcastle	UX	Shrewsbury
AR	Chelmsford	EH	Stoke-on-Trent	JA	Manchester	MP	London NE	RH	Hull	UY	Worcester
AS	Inverness	EJ	Haverfordwest	JB	Reading	MR	Swindon	RJ	Manchester	VA	Peterborough
AT	Hull	EK	Liverpool	JC	Bangor	MS	Edinburgh	RK	London NW	VB	Maidstone
AU	Nottingham	EL	Bournemouth	JD	London (Central)	MT	London NE	RL	Truro	VC	Coventry
AV	Peterborough	EM	Liverpool	JE	Peterborough	MU	London NE	RM	Carlisle	VD	series withdrawn
AW	Shrewsbury	EN	Manchester	JF	Leicester	MV	London SE	RN	Preston	VE	Peterborough
AX	Cardiff	EO	Preston	JG	Maidstone	MW	Swindon	RO	Luton	VF	Norwich
AY	Leicester	EP	Swansea	JH	Reading	MX	London SE	RP	Northampton	VG	Norwich
BA	Manchester	ER	Peterborough	JJ	Maidstone	MY	London SE	RR	Nottingham	VH	Huddersfield
BB	Newcastle	ES	Dundee	JK	Brighton	NA	Manchester	RS	Aberdeen	VJ	Gloucester
BC	Leicester	ET	Sheffield	JL	Lincoln	NB	Manchester	RT	Ipswich	VK	Newcastle
BD	Northampton	EU	Bristol	JM	Reading	MC	Manchester	RU	Bournemouth	VL	Lincoln
BE	Lincoln	EV	Chelmsford	JN	Chelmsford	ND	Manchester	RV	Portsmouth	VM	Manchester
BF	Stoke-on-Trent	EW	Peterborough	JO	Oxford	NE	Manchester	RW	Coventry	VN	Middlesbrough
BG	Liverpool	EY	Norwich	JP	Liverpool	NF	Manchester	RX	Reading	VO	Nottingham
BH	Luton	EX	Bangor	JR	Newcastle	NG	Norwich	RY	Leicester	VP	Birmingham
BJ	Ipswich	FA	Stoke-on-Trent	JS	Inverness	NH	Northampton	SA	Aberdeen	VR	Manchester
BK	Portsmouth	FB	Bristol	JT	Bournemouth	NJ	Brighton	SB	Glasgow	VS	Luton
BL	Reading	FC	Oxford	JU	Leicester	NK	Luton	SC	Edinburgh	VT	Stoke-on-Trent
BM	Luton	FD	Dudley	JV	Lincoln	NL	Newcastle	SCY	Truro (Isles of Scilly)	VU	Manchester
BN	Manchester	FE	Lincoln	JW	Birmingham	NM	Luton	SD	Glasgow	VV	Northampton
BO	Cardiff	FF	Bangor	JX	Huddersfield	NN	Nottingham	SE	Aberdeen	VW	Chelmsford
BP	Portsmouth	FG	Brighton	JY	Exeter	NO	Chelmsford	SF	Edinburgh	VX	Chelmsford
BR	Newcastle	FH	Gloucester	KA	Liverpool	NP	Worcester	SG	Edinburgh	VY	Leeds
BS	Inverness	FJ	Exeter	KB	Liverpool	NR	Leicester	SH	Edinburgh	WA	Sheffield
BT	Leeds	FK	Dudley	KC	Liverpool	NS	Glasgow	SJ	Glasgow	WB	Sheffield
BU	Manchester	FL	Peterborough	KD	Liverpool	NT	Shrewsbury	SK	Inverness	WC	Chelmsford
BV	Preston	FM	Chester	KE	Maidstone	NU	Nottingham	SL	Dundee	WD	Dudley
BW	Oxford	FN	Maidstone	KF	Liverpool	NV	Northampton	SM	Glasgow	WE	Sheffield
BX	Haverfordwest	FO	Gloucester	KG	Cardiff	NW	Leeds	SN	Dundee	WF	Sheffield
BY	London NW	FP	Leicester	KH	Hull	NX	Dudley	SO	Aberdeen	WG	Sheffield
CA	Chester	FR	Preston	KJ	Maidstone	NY	Cardiff	SP	Dundee	WH	Manchester
CB	Manchester	FS	Edinburgh	KK	Maidstone	OA	Birmingham	SR	Dundee	WJ	Sheffield
CC	Bangor	FT	Newcastle	KL	Maidstone	OB	Birmingham	SS	Aberdeen	WK	Coventry
CD	Brighton	FU	Lincoln	KM	Maidstone	OC	Birmingham	ST	Inverness	WL	Oxford
CE	Peterborough	FV	Preston	KN	Maidstone	OD	Exeter	SU	Glasgow	WM	Liverpool
CF	Reading	FW	Lincoln	KO	Maidstone	OE	Birmingham	SV	(Spare)	WN	Swansea
CG	Bournemouth	FX	Bournemouth	KP	Maidstone	OF	Birmingham	SW	Carlisle	WO	Cardiff
CH	Nottingham	FY	Liverpool	KR	Maidstone	OG	Birmingham	SX	Edinburgh	WP	Worcester
CJ	Gloucester	GA	Glasgow	KS	Edinburgh	OH	Birmingham	SY	(Spare)	WR	Leeds
CK	Preston	GB	Glasgow	KT	Maidstone	OJ	Birmingham	TA	Exeter	WS	Bristol
CL	Norwich	GC	London SW	KU	Sheffield	OK	Birmingham	TB	Liverpool	WT	Leeds
CM	Liverpool	GD	Glasgow	KV	Coventry	OL	Birmingham	TC	Bristol	WU	Leeds
CN	Newcastle	GE	Glasgow	KW	Sheffield	OM	Birmingham	TD	Manchester	WV	Brighton
CO	Exeter	GF	London SW	KX	Luton	ON	Birmingham	TE	Manchester	WW	Leeds
CP	Huddersfield	GG	Glasgow	KY	Sheffield	OO	Chelmsford	TF	Reading	WX	Leeds
CR	Portsmouth	GH	London SW	LA	London NW	OP	Birmingham	TG	Cardiff	WY	Leeds
CS	Glasgow	GJ	London SW	LB	London NW	OR	Portsmouth	TH	Swansea	YA	Taunton
CT	Lincoln	GK	London SW	LC	London NW	OS	Glasgow	TJ	Liverpool	YB	Taunton
CU	Newcastle	GL	Truro	LD	London NW	OT	Portsmouth	TK	Exeter	YC	Taunton
CV	Truro	GM	Reading	LE	London NW	OU	Bristol	TL	Lincoln	YD	Taunton
CW	Preston	GN	London SW	LF	London NW	OV	Birmingham	TM	Luton	YE	London (Central)
CX	Huddersfield	GO	London SW	LG	Chester	OW	Portsmouth	TN	Newcastle	YF	London (Central)
CY	Swansea	GP	London SW	LH	London NW	OX	Birmingham	TO	Nottingham	YG	Leeds
DA	Birmingham	GR	Newcastle	LJ	Bournemouth	OY	London NW	TP	Portsmouth	YH	London (Central)
DB	Manchester	GS	Luton	LK	London NW	PA	Guildford	TR	Portsmouth	YJ	Brighton
DC	Middlesbrough	GT	London SW	LL	London NW	PB	Guildford	TS	Dundee	YK	London (Central)
DD	Gloucester	GU	London SE	LM	London NW	PC	Guildford	TT	Exeter	YL	London (Central)
DE	Haverfordwest	GV	Ipswich	LN	London NW	PD	Guildford	TU	Chester	YM	London (Central)
DF	Gloucester	GW	London SE	LO	London NW	PE	Guildford	TV	Nottingham	YN	London (Central)
DG	Gloucester	GX	London SE	LP	London NW	PF	Guildford	TW	Chelmsford	YO	London (Central)
DH	Dudley	GY	London SE	LR	London NW	PG	Guildford	TX	Cardiff	YP	London (Central)
DJ	Liverpool	HA	Dudley	LS	Edinburgh	PH	Guildford	TY	Newcastle	YR	London (Central)
DK	Manchester	HB	Cardiff	LT	London NW	PJ	Guildford	UA	Leeds	YS	Glasgow
DL	Portsmouth	HC	Brighton	LU	London NW	PK	Guildford	UB	Leeds	YT	London (Central)
DM	Chester	HD	Huddersfield	LV	Liverpool	PL	Guildford	UC	London (Central)	YU	London (Central)
DN	Leeds	HE	Sheffield	LW	London NW	PM	Guildford	UD	Oxford	YV	London (Central)
DO	Lincoln	HF	Liverpool	LX	London NW	PN	Brighton	UE	Dudley	YW	London (Central)
DP	Reading	HG	Preston	LY	London NW	PO	Portsmouth	UF	Brighton	YX	London (Central)
DR	Exeter	HH	Carlisle			PP	Luton	UG	Leeds	YY	London (Central)

- Sheet 3** **Activity** 1. 1.6, 2.0, 1.8, 4.0, 1.4, 1.3, 1.1, 0.8
- Problems** 1. Land Rover 4.0 2. Daihatsu
3. Land Rover 4.0, Saab 2.0i, Skoda Octavia 1.8, Renault Laguna, Peugeot 306, Ford Escort 1.3, Fiat Punto, Daihatsu

- Sheet 5** **Problems** 1. (i) J (ii) P (iii) R
2. (i) 51 (ii) 04 (iii) 5 (at January 2002)
3. Answers dependant on present date
(at March 2002, at least (i) 3 years, (ii) 9 years, (iii) 1 year)
4. Dates between:
 (i) Mar 03 and Aug 03
 (ii) Sep 04 and Feb 05
 (iii) Mar 07 and Aug 07

- Activity** 1. For data given:



2. For data given average value for ages is 2 years.

- Sheet 7** **Problem 1** Birmingham **Problem 2** Manchester
- Sheffield Norwich
- Aberdeen Bournemouth
- Bangor Sheffield
- Maidstone Ipswich
- London NE Bristol
- Problem 3** E.g. Cars might have been bought 'second hand', not necessarily in the area in which they were first registered; cars might be 'company cars', registered centrally.

- Sheet 9** **Problems** 1. (i) 10 km (ii) 20 km (iii) 50 km (iv) 1.67 km
2. (i) 50 km/h (ii) 150 km/h (iii) 75 km/h
(iv) 1.67 km/h
3. 100 km/h ; 72 mph

- Sheet 10** **Problems** 1. (i) 9.1 litres (ii) 45.5 litres (iii) 22.8 litres
2. (i) 14 litres (ii) 30 litres (iii) 41 litres
3. (i) 5.5 gallons (ii) 9 gallons (iii) 2 gallons