Students use official data about accidents to calculate relative frequencies and probabilities of different accidents occurring. Emphasis is given to the reliability both of the data and the conclusions that can be drawn.

Suitability

Level 2 (intermediate/Higher)

This resource includes data relating to fatal and major accidents as well as those of a less serious nature. You are advised to consider the content in relation to your knowledge of your class before using it.

Time

1–2 hours depending on how many of the sections you use.

Resources and equipment

Slideshow, students' information and work sheets, calculators

Key mathematical language

Relative frequency, probability, representative sample

Notes on the activity

The information sheet gives simplified versions of HASS (Home Accident Surveillance System) and LASS (Leisure Accident Surveillance System) data for the year 2000. The website at http://www.hassandlass.org.uk/query/index.htm gives data for 2001 and 2002 – the latest years when such data was collected.

Students need to be aware that real data such as these give only rough estimates of probabilities. It is recommended that you spend time discussing the methods and results to point out their limitations.

The slideshow can be used to aid class discussion. Students will need to refer to the tables on the student sheets whilst the slides are shown and discussed.

Important discussion points are given with the answers below.

A Accidents and activities

Points for discussion

What could 'Basic needs' include?
This category includes things like eating and drinking.

What could be included in the 'Other/Unspecified' activities?
There are a wide variety of possible answers involving activities not covered by the other categories.

DIY is often seen as a dangerous activity. Why is the number in the table less than for other activities like shopping?
Far fewer people are likely to be involved in DIY than in the other activities such as shopping, so DIY may be more dangerous than some of these activities but still less likely to be responsible for a hospital casualty.

Which activity seems the most dangerous? Do you think this is the case?
Sport seems to be the most dangerous, but limitations in the data may mean that this is actually not the case and perhaps DIY may be more dangerous.

A discussion about how to improve the data could bring up a number of valuable points.

One suggestion might be to estimate how many people are involved in each activity during a year, and give the number of resulting casualties as a fraction or percentage of this number. However this does not allow for different people spending different amounts of time on the activity.

This could lead to further discussion about methods which could be used that take into account the time spent on the activity.

For a particular person, the probability of having an accident would also depend on how careful they are, how much experience they have, and so on.

Try this A: answers

1 **Activity**	**Number of accidents**	**Relative frequency**	**Percentage**
Household activity	5286	0.002	0.2
DIY/Maintenance	15 236	0.005	0.5
Shopping	71 514	0.023	2.3
Education/Training	172 895	0.056	5.6
Sport (excluding education)	784 220	0.256	25.6
Leisure/Hobby	574 745	0.187	18.7
Travelling/Touring	415 238	0.135	13.5
Basic needs	222 608	0.073	7.3
Other/Unspecified	805 016	0.262	26.2
Total	**3 066 758**	**1.000**	**100.0**

2 Other/unspecified activities, Sport, Leisure/hobby, Travelling/touring, Basic needs, Education/training, Shopping, DIY/maintenance, Household activity.

B Accidents at work

Points for discussion

How could you compare how dangerous each industry is to work in?
The relative frequency of accidents could be used, but again there are limitations in the data.

Discussion should include the fact that work done in a particular workplace might be more or less dangerous than the norm, but the number of accidents will also depend on how safety-conscious the workers are.

How could you estimate the number of accidents that would occur in a particular workplace with a given number of employees?
Suggestions might include using records of accidents occurring in the past for that particular job and workplace.

However there are many reasons why an accurate estimate would be difficult. There may have been very few accidents, especially in the major or fatal categories. Some workers may have been in the job for a long time, whilst others moved on after a short time. Some workers will have been more careless than others, and may have had more than one accident.

How could you estimate the probability that a particular worker doing a particular job in a particular workplace has a minor, major or fatal accident during his/her whole career?

Considering the past record of the particular worker in question may give useful information about their accident rate, but the data are likely to be very limited and will not allow for his/her increasing experience of the job.

There are so many variables that it would only be possible to give a very rough estimate.

Try this B: answers

1

	Probability of worker having accident during year		
Industry type	**Fatal**	**Major**	**Over 3 days**
Agriculture, forestry and inland fishing	0.000115	0.0023	0.0046
Energy and water supply and mining	0.000037	0.0027	0.0133
Manufacturing	0.000010	0.0020	0.0100
Construction	0.000069	0.0040	0.0089
Service	0.000003	0.0008	0.0042
All included industries	**0.000009**	**0.0012**	**0.0054**

2a Agriculture, forestry and inland fishing
b Construction
c Energy and water supply and mining

3a Service
b Service
c Service

4a Service
b Opinions could vary about this with 'Agriculture, forestry and inland fishing' the most likely choice because of the much higher probability of a fatal accident.

C Accidents at home

Points for discussion

How does the figure 'roughly 5% of casualties' link to multiplying by 18.29?

Roughly 5% means roughly $\frac{1}{20}$

Presumably 18.29 is a more accurate multiplier than 20.

Is it possible to use the data to find a good estimate of the probability that a particular person will have a particular type of accident in a particular room in their house?

Students need to realise that the data just give overall probabilities that home accidents requiring hospital treatment were of particular types in particular locations.

The probability of a particular type of accident in a particular location will vary widely from one person to another depending on how long the person spends in each location, what they do there, how careful they are, and so on.

Try this C: answers

1a Fall **b** Electric

2a Kitchen **b** Living/dining room **c** Kitchen

3a Cut **b** Fall **c** Cut

4a Fall **b** Fall

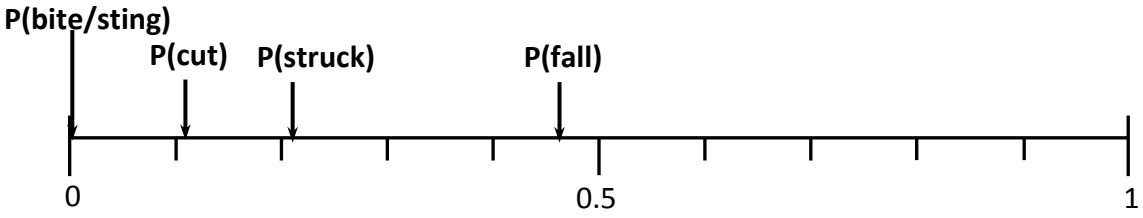
5

National estimates	Fall	Struck	Cut	Bite/sting	Poisoning	Thermal	Electric	Other	Total
Indoor accidents	594 000	262 000	138 000	21 000	15 000	54 000	1 000	169 000	1 254 000
Outdoor accidents	251 000	114 000	68 000	18 000	2 000	5 000	2 000	91 000	551 000
Total at home	846 000	376 000	206 000	39 000	17 000	59 000	3 000	260 000	1 805 000

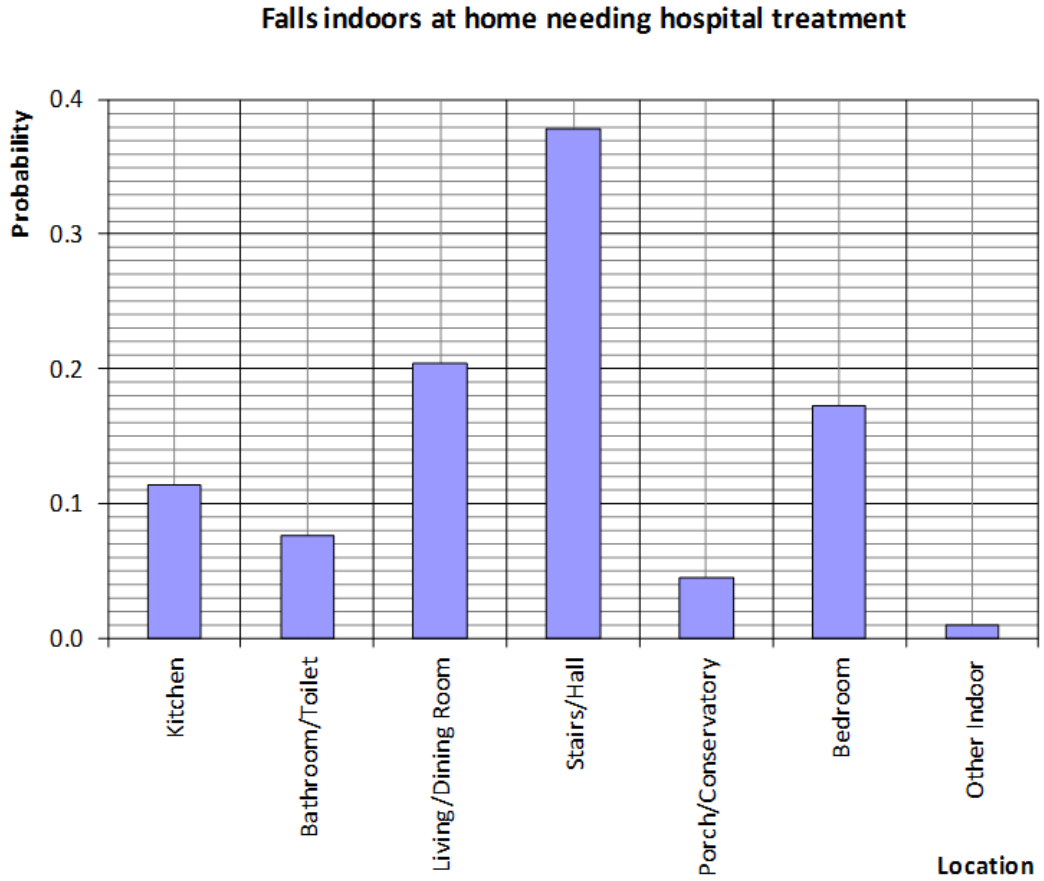
6a 0.47 (2 dp) **b** 0.21 (2 dp) **c** 0.02 (2 dp)

Estimates of probability using relative frequencies

Probabilities that accidents at home are of particular types

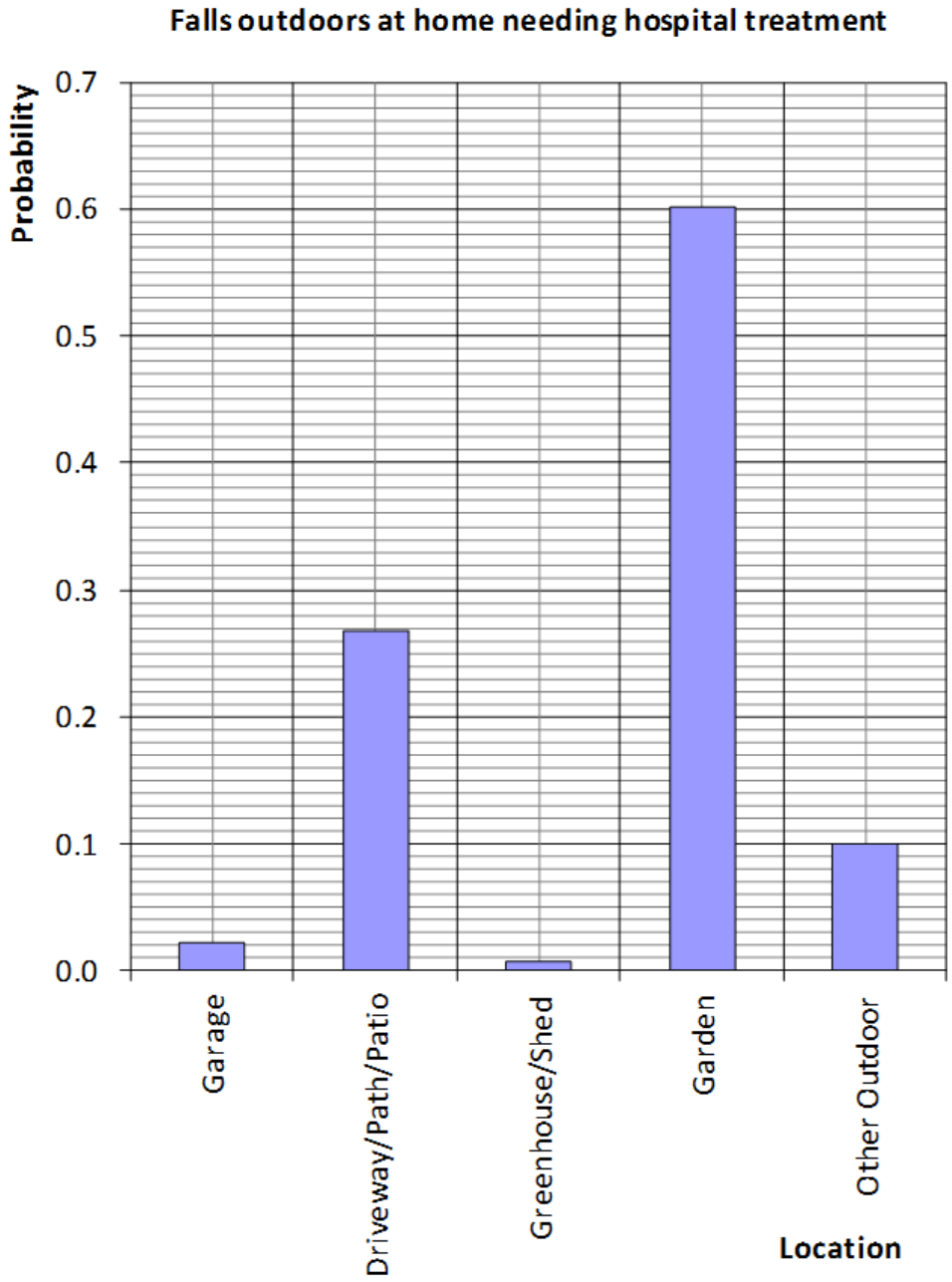


7a



7b Stairs and hall

8a



b Garden

Extensions

The 'Think about' questions in the student activities will stretch more able students to consider some of the subtleties of data collection and interpretation.

Students could compare the given data with the data for 2001 and/or 2002 on the HASS/LASS website at http://www.hassandlass.org.uk/query/index.htm

or search for other data on accidents.