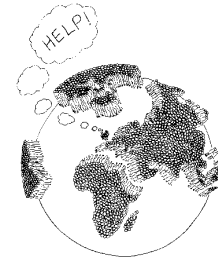


Some of our citizens are missing!



UNIT 1

This unit offers students experience in manipulating large numbers and calculating percentage errors. The context is the 1991 census. It also offers them a chance to reflect on their own significance within society.

Using this unit

The unit has four activities and two suggestions for further work and is suitable for pupils working at Intermediate Level at GCSE. The four main activities are designed to take about one and a half hours.

The first activity acts as a general introduction to the census and should encourage classroom discussion. The second and third activities introduce the main mathematical ideas, writing large numbers and calculating percentage errors. The fourth and fifth activities are slightly less structured but use the same skills and so can be used by students who work more quickly.

There are two suggestions for further work. The first suggests that students design and carry out their own census. The second suggestion is that students should compare our modern census with the biblical census which took place at the birth of Christ.

Before starting this unit, students need to be familiar with the idea of a percentage and should have met the concept of percentage change and have practised some straightforward examples.



Students will need a calculator.

Mathematical content

AT2

- ◆ Writing, and calculating with, large numbers
- ◆ Calculating percentage errors

AT4

- ◆ Census
- ◆ Interpretation of tables

Spiritual and moral development

It is hoped that students will reflect on their own significance in society and whether they can believe in a God who is concerned about them.

Background

In our crowded world we are constantly being counted and categorised. Perhaps this should make us feel significant, but it frequently seems to have the opposite effect. Many people find it hard to believe that God can be interested in them personally but Christians believe that Jesus made it very clear that God is so concerned with each individual that “even the hairs of your head are numbered” (Matthew chapter 10 verse 30).

A census is incomplete unless every member of the population is accounted for and census organisers go to great lengths to find people who seem to be missing. In the same way, Christians believe God is concerned about each one of us and is not content until He has found us and we have responded to Him.

Additional sources

The figures quoted in the unit are taken from the *1991 Census User Guide Number 58* published by the Office of Population Censuses and Surveys (OPCS) in 1994. It deals with the issue of undercoverage in the census and is obtainable free from:

Information branch (Dept. M), Office of Population Censuses and Surveys, St. Catherine’s House, 10, Kingsway, London WC2B 6JP. Telephone: 0171 396 2208 or 2242.

Notes on the activities

Lost in a crowd

This is an introductory activity to ensure that students understand the concept of a census. The questions could be answered in a written form but there are opportunities for class discussion on:



- ◆ The status of different individuals in society
- ◆ The difference between censuses and surveys
- ◆ Why we conduct a national census every 10 years
- ◆ Who uses census information and why (e.g. government departments for planning services, etc.)
- ◆ The difficulties in conducting a census etc.

Filling in the census form is likely to raise many questions about the way in which the census is carried out. Students will need to know that a form is delivered to each separate household and that each person who is in that household, or is normally in that household, is listed on the form on census night. A

photocopy of the first inside page of the form is included for question 6 so that students can fill it in for themselves and for one adult member of their household.

“Round numbers are always false”

Students are likely to find difficulty in interpreting figures such as fifty four point nine million. Some preliminary explanation is needed and a few similar examples would be useful before they start this activity.

The questions on percentage error in this activity and later ones should bring out the importance of deciding on the “true value” against which the error is compared. This is assumed to be the Registrar General’s figure for all population counts in the second, third and fourth activities.

Task 2 answers:

1. 54,900,000
2. 56,200,000
3. 1.3 million or 1,300,000
4. 2.3%
5. This question invites students to consider the sorts of people who might be missed when a census is taken. OPCS lists the following population groups as being under-represented:
 - ◆ Young men in their twenties
 - ◆ People in inner city areas
 - ◆ Some ethnic groups
 - ◆ Those in shared accommodation
 Students are likely to suggest reasons such as homelessness, travelling abroad, those evading local taxes or the law, etc..

carried out in class. Results would make an interesting wall display.

The selection of suitable questions should lead to a useful class discussion and the data collected can be used for further statistical work.

An historical census (extension activity)

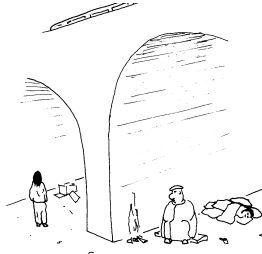
The census account in Luke chapter 2 verses 1 - 7 makes an interesting comparison with our own census. The census encompassed the whole Roman world and verse 2 suggests that such censuses were not uncommon. The major difference is that people had to travel to their own home town in order to register.

Missing persons

The Registrar General’s population figure is assumed to be the true value.

Task 3 answers:

1. 250,000
2. 55,150,000
3. 1,050,000
4. 1.9%



Several censuses are described in the Bible and it is interesting to compare the purposes for which they were carried out with the reasons for carrying out our modern censuses.

The census in Exodus chapter 30 verses 11 - 16 was to ensure that each person paid their atonement money.

There is a detailed account of a census of the tribes of Israel carried out by Moses and Aaron in Numbers chapter 1 (in particular verses 1 - 4, 17 - 19 and 44 - 49). The purpose seems similar to ours. A population count was made and men over 20 who were eligible for military service were listed by name. Notice that the Levites, the priestly tribe set aside to serve God, were not to be counted.

Over the border

The Registrar General’s population figure is assumed to be the true value.

Task 4 answers:

1. England 2.4% (largest % error), Wales 2.0%, Scotland 2.1%

Task 5 answers:

	England	Wales	Scotland
1. Adjusted account	47,284,000	2,846,000	5,006,000
2. Error	924,000	46,000	101,000
3. % Error	1.9%	1.6%	2.0% (largest)

A further census was carried out by Moses and Eleazer, Aaron’s son, after the plague. This is described in Numbers chapter 26 and the purpose of carrying it out is given in verses 63 - 65.

King David’s census, described in 2 Samuel chapter 24 verses 1 - 10 and in 1 Chronicles chapter 21 verses 1 - 8, is the only one condemned by God, presumably because David was assessing his assets in terms of the size of his fighting force when God wanted David to rely on Him.

Designing your own census (extension activity)

Some discussion of appropriate questions might be needed so that sensitive issues are avoided. Once a set of questions has been agreed the census could be

David’s son Solomon completed his father’s census by extending it to aliens living in Israel apparently for the purpose of employing them as labourers (2 Chronicles chapter 2 verse 17).

Some of our citizens are missing!

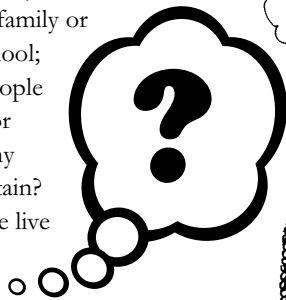


UNIT 1

This unit will give you some practice in dealing with large numbers and calculating percentage errors. You will need a calculator.

Lost in a crowd

We can count exactly the number of people in our family or in our class at school; but how many people live in our town or village? How many people live in Britain? How many people live in the world?

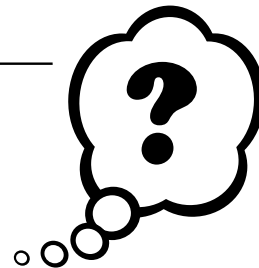


The large numbers needed to answer these questions are unlikely to be given exactly; they are rounded off. The population of a town may be given to the nearest thousand; the population of the world may be given in millions or even billions; it seems as though we lose the individual. Do you think some individuals in our society are considered to be less important than others?



In 1991 a census was held in Britain.

1. Write a sentence to explain what is meant by a census.
2. How do you think a census differs from a survey?
3. How often is a national census held in Britain?
4. What sort of questions are asked in our national census?
5. Who uses information from our national census?
6. Look at the photocopy of a page from the 1991 census. Fill in the form for yourself and one adult who lives with you.



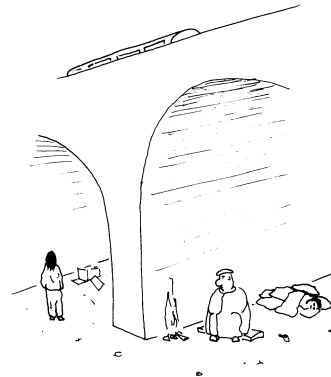
“Round numbers are always false” (Dr. Johnson)

The numbers in the census report are rounded. There are good reasons for rounding. We cannot easily be accurate about very large numbers and the rounded numbers are easier to understand but rounding introduces an error into our solutions. We need some way of measuring errors so that we can decide when they become unacceptably large. One of the easiest ways to do this is to compare our error with the true value and express this as a percentage. This is called a percentage error and can be calculated from the formula given below.

$$\text{Percentage error} = \frac{\text{error}}{\text{true value}} \times 100$$

2

1. According to the 1991 census there were fifty four point nine million people living in Britain at the time. Write the number fifty four point nine million in figures.
2. The Registrar General of Births, Marriages and Deaths was surprised by this figure. He had kept a count ever since the last census 10 years earlier and he calculated that the population in 1991 should be fifty six point two million! Write the number fifty six point two million in figures.
3. How many people were missing in the 1991 census?
4. Assuming the Registrar General has the correct value for the population in 1991, what is the percentage error in the census? (Use the percentage error formula and give your answer correct to one decimal place.)
5. Can you suggest some reasons why people may be missed when the census is taken?

**Missing persons**

The Office of Population Censuses and Surveys (OPCS) conducted a follow-up survey to try and find the missing people. In this way they managed to find another **two hundred and fifty thousand**.

**3**

1. Write the number two hundred and fifty thousand in figures.
2. What was the population of Britain in 1991 according to the census and the follow-up survey taken together?
3. After the follow-up study, how many people were still missing?
4. What is the percentage error after the follow-up study, still assuming that the Registrar General is correct? Give your answer correct to one decimal place.

Over the border

The census population figures can be broken down into countries. The figures are given below.

4



	Census	Registrar General
England	47,055,000	48,208,000
Wales	2,835,000	2,892,000
Scotland	4,999,000	5,107,000

1. Calculate the error and from it the percentage error in the census figure for each country. In each case assume that the Registrar General's figure is the correct one. Give all your answers correct to one decimal place.
2. Which country had the largest percentage error?

5



After the follow-up study the census count was adjusted to include those found in the follow-up study. The table below shows how many *extra* people were found in the follow-up studies for each country.

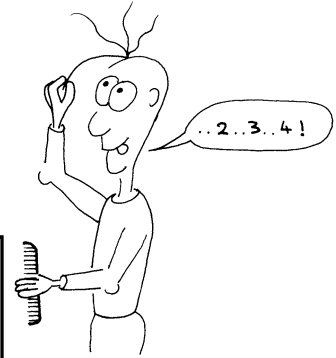
England	229,000
Wales	11,000
Scotland	7,000

Calculate the following for each country:

1. The total number in the adjusted census count, i.e., the original census count plus the follow-up study.
2. The error in the adjusted census count, i.e., the difference between the adjusted census count and the Registrar General's figure.
3. The percentage error in the adjusted census figures assuming the Registrar General's figures are correct. Give your answer correct to one decimal place.
4. Which country now has the largest percentage error?

The OPCS went to a great deal of trouble to try to find people who were missing from the census count. It does not matter who you are, the census is not complete without you! So individuals do matter in a census.

But what about the rest of the time? Who do you think would look for you if you went missing? Do you know of any charities or organisations which care for people without families or friends? Some people believe in a God who cares about each one of us, no matter who we are.



“Are not two sparrows sold for a penny. Yet not one of them will fall to the ground apart from the will of your Father. And even the very hairs of your head are numbered. So do not be afraid; you are worth more than many sparrows.” Matthew chapter 10 verse 29 - 31.

Designing your own census



You are going to take a census of your class or year group.

Write a list of suitable questions that you could ask.

For each question you have written down, suggest a good way of presenting the answers you would get.

eg. How do you get to school?

Use a pie chart to show the different proportions coming by bicycle; bus; car; train; on foot etc..



An historical census



There was a census taken in the year that Jesus was born. It is mentioned in the Bible in Luke chapter 2 verses 1 - 7.

Read this account and describe the main differences between this biblical census and our modern censuses.

Annex A

1991 Census H form for private households, England



For office use

<input type="checkbox"/>	1
<input type="checkbox"/>	2
<input type="checkbox"/>	3

To the Head or Joint Heads or members of the Household aged 16 or over

Please complete this form for all members of the household, including children, and have it ready for collection on Monday 22nd April. Your census enumerator will call to collect it then or soon afterwards and will help you with the form if you have any difficulties. The enclosed leaflet explains why the Census is necessary and how the information is used.

Completion of the form is compulsory under the Census Act 1920. If you refuse to complete it, or give false information, you may have to pay a fine of up to £400.

Your answers will be treated in strict confidence and used only to produce statistics. Names and addresses will not be put into the computer; only the postcode will be entered. The forms will be kept securely within my Office and treated as confidential for 100 years.

Anyone using or disclosing Census information improperly will be liable to prosecution. For example, it would be improper for you to pass on to someone else information which you had been given in confidence by a visitor to enable you to complete the Census form.

If any member of the household aged 16 or over does not wish you, or another member of the household, to see their information, please ask the enumerator for an individual form with an envelope.

After completing the form, please sign the declaration on the last page. Thank you for your co-operation.

P. J. Wormald

P J Wormald
Registrar General

Office of Population Censuses and Surveys
PO Box 100 Fareham PO16 0AL
Telephone: 0329 844444

Please read these instructions before filling in this form

A Household:

A household comprises either one person living alone or a group of people (not necessarily related) living at the same address with common housekeeping — that is, sharing at least one meal a day or sharing a living room or sitting room.

People staying temporarily with the household are included.

- ▶ If there is more than one household in this building, answer for your household only.
- ▶ First answer questions H1 and H2 on this page and H3 to H5 on the back page about your household and the rooms which it occupies.
- ▶ When you have answered the household questions, answer the questions on the inside pages about each member of your household.
- ▶ If a member of the household is completing an Individual form please still enter their name and answer questions 5 and 6 on this form.
- ▶ Then complete Panel B and Panel C on the back page.
- ▶ Answer each question by ticking the appropriate box or boxes where they are provided.
- ▶ Please use ink or ballpoint pen.

To be completed by the Enumerator

Census District	Enumeration District	Form Number
<input type="text"/>	<input type="text"/>	<input type="text"/>
Name <input type="text"/>		
Address <input type="text"/>		
Postcode <input type="text"/>		
		ABS <input type="checkbox"/>

H1 Rooms

Please count the number of rooms your household has for its own use.

Do not count: small kitchens, under 2 metres (6 feet 6 inches) wide
bathrooms
toilets

Do count: living rooms
bedrooms
kitchens at least 2 metres (6 feet 6 inches) wide
all other rooms in your accommodation

The total number of rooms is

Panel A
To be completed by the Enumerator and amended, if necessary, by the person(s) signing this form.

Tick one box to show the type of accommodation which this household occupies.

A caravan or other mobile or temporary structure 1

A whole house or bungalow that is

{	detached	<input type="checkbox"/> 2
	semi-detached	<input type="checkbox"/> 3
	terraced (include end of terrace)	<input type="checkbox"/> 4

The whole of a purpose built flat or maisonette

{	in a commercial building (for example in an office building or hotel or over a shop)	<input type="checkbox"/> 5
	in a block of flats or tenement	<input type="checkbox"/> 6

Part of a converted or shared house, bungalow or flat

{	separate entrance into the building	<input type="checkbox"/> 7
	shared entrance into the building	<input type="checkbox"/> 8

H2 Accommodation
If box 7 or box 8 in Panel A is ticked, tick one box below to show the type of accommodation which your household occupies.

A one roomed flatlet with private bath or shower, WC and kitchen facilities. 1

One room or bedsit, not self-contained (to move from your room to bathroom, WC or kitchen facilities you have to use a hall, landing or stairway open to other household(s)). 2

A self-contained flat or accommodation with 2 or more rooms, having bath or shower, WC and kitchen facilities all behind its own private door. 3

2 or more rooms, not self-contained (to move between rooms or to bathroom, WC or kitchen facilities you have to use a hall, landing or stairway open to other household(s)). 4

Please turn to the back page and answer questions H3 to H5 ▶

<p>1-3 Name, sex and date of birth of people to be included</p> <p>Important: please read the notes before answering the questions. In answering the rest of the questions please include:</p> <ul style="list-style-type: none"> ▶ every person who spends census night (21-22 April) in this household, including anyone staying temporarily. ▶ any other people who are usually members of the household but on census night are absent on holiday, at school or college, or for any other reason, even if they are being included on another census form elsewhere. ▶ anyone who arrives here on Monday 22nd April who was in Great Britain on the Sunday and who has not been included as present on another census form. ▶ any newly born baby born before the 22nd April, even if still in hospital. If not yet given a name, write BABY and the surname. <p>Write the names in BLOCK CAPITALS starting with the head or a joint head of household.</p>	<p>Person No. 1</p> <p>Name and surname</p> <div style="border: 1px solid black; height: 40px; width: 100%;"></div> <p>Sex Male <input type="checkbox"/> 1 Female <input type="checkbox"/> 2</p> <p>Date of birth Day Month Year <div style="display: flex; justify-content: space-between; width: 100%;"> <div style="border: 1px solid black; width: 30px; height: 20px;"></div> <div style="border: 1px solid black; width: 30px; height: 20px;"></div> <div style="border: 1px solid black; width: 30px; height: 20px;"></div> </div> </p>	<p>Person No. 2</p> <p>Name and surname</p> <div style="border: 1px solid black; height: 40px; width: 100%;"></div> <p>Sex Male <input type="checkbox"/> 1 Female <input type="checkbox"/> 2</p> <p>Date of birth Day Month Year <div style="display: flex; justify-content: space-between; width: 100%;"> <div style="border: 1px solid black; width: 30px; height: 20px;"></div> <div style="border: 1px solid black; width: 30px; height: 20px;"></div> <div style="border: 1px solid black; width: 30px; height: 20px;"></div> </div> </p>
<p>4 Marital status</p> <p>On the 21st April what is the person's marital status? If separated but not divorced, please tick 'Married (first marriage)' or 'Re-married' as appropriate. Please tick one box.</p>	<p>Single (never married) <input type="checkbox"/> 1 Married (first marriage) <input type="checkbox"/> 2 Re-married <input type="checkbox"/> 3 Divorced (decree absolute) <input type="checkbox"/> 4 Widowed <input type="checkbox"/> 5</p>	<p>Single (never married) <input type="checkbox"/> 1 Married (first marriage) <input type="checkbox"/> 2 Re-married <input type="checkbox"/> 3 Divorced (decree absolute) <input type="checkbox"/> 4 Widowed <input type="checkbox"/> 5</p>
<p>5 Relationship in household</p> <p>Please tick the box which indicates the relationship of each person to the person in the first column. A step child or adopted child should be included as the son or daughter of the step or adoptive parent. Write in relationship of 'Other relative' — for example, father, daughter-in-law, niece, uncle, cousin.</p> <p>Write in position in household of an 'Unrelated' person for example, boarder, housekeeper, friend, flatmate, foster child.</p>	<p>Relationship to Person No.1</p> <p>Husband or wife <input type="checkbox"/> 1 Living together as a couple <input type="checkbox"/> 2 Son or daughter <input type="checkbox"/> 3 Other relative <input type="checkbox"/> <i>please specify</i></p> <div style="border: 1px solid black; height: 20px; width: 100%;"></div> <p>Unrelated <input type="checkbox"/> <i>please specify</i></p> <div style="border: 1px solid black; height: 20px; width: 100%;"></div>	<p>Relationship to Person No.1</p> <p>Husband or wife <input type="checkbox"/> 1 Living together as a couple <input type="checkbox"/> 2 Son or daughter <input type="checkbox"/> 3 Other relative <input type="checkbox"/> <i>please specify</i></p> <div style="border: 1px solid black; height: 20px; width: 100%;"></div> <p>Unrelated <input type="checkbox"/> <i>please specify</i></p> <div style="border: 1px solid black; height: 20px; width: 100%;"></div>
<p>6 Whereabouts on night of 21-22 April 1991</p> <p>Please tick the appropriate box to indicate where the person was on the night of 21-22 April 1991.</p>	<p>At this address, out on night work or travelling to this address <input type="checkbox"/> 0 Elsewhere in England, Scotland or Wales <input type="checkbox"/> 1 Outside Great Britain <input type="checkbox"/> 2</p>	<p>At this address, out on night work or travelling to this address <input type="checkbox"/> 0 Elsewhere in England, Scotland or Wales <input type="checkbox"/> 1 Outside Great Britain <input type="checkbox"/> 2</p>
<p>7 Usual address</p> <p>If the person usually lives here, please tick 'This address'. If not, tick 'Elsewhere' and write in the person's usual address. For students and children away from home during term time, the home address should be taken as the usual address. For any person who lives away from home for part of the week, the home address should be taken as the usual address. Any person who is not a permanent member of the household should be asked what he or she considers to be his or her usual address.</p>	<p>This address <input type="checkbox"/> 1 Elsewhere <input type="checkbox"/></p> <p>If elsewhere, please write the person's usual address and postcode below in BLOCK CAPITALS</p> <div style="border: 1px solid black; height: 40px; width: 100%;"></div> <p>Post-code <input style="width: 40px; border: none; border-bottom: 1px solid black;" type="text"/> <input style="width: 40px; border: none; border-bottom: 1px solid black;" type="text"/> <input style="width: 40px; border: none; border-bottom: 1px solid black;" type="text"/> <input style="width: 40px; border: none; border-bottom: 1px solid black;" type="text"/></p>	<p>This address <input type="checkbox"/> 1 Elsewhere <input type="checkbox"/></p> <p>If elsewhere, please write the person's usual address and postcode below in BLOCK CAPITALS</p> <div style="border: 1px solid black; height: 40px; width: 100%;"></div> <p>Post-code <input style="width: 40px; border: none; border-bottom: 1px solid black;" type="text"/> <input style="width: 40px; border: none; border-bottom: 1px solid black;" type="text"/> <input style="width: 40px; border: none; border-bottom: 1px solid black;" type="text"/> <input style="width: 40px; border: none; border-bottom: 1px solid black;" type="text"/></p>
<p>8 Term time address of students and schoolchildren</p> <p>If not a student or schoolchild, please tick first box. For a student or schoolchild who lives here during term time, tick 'This address'. If he or she does not live here during term time, tick 'Elsewhere' and write in the current or most recent term time address.</p>	<p>Not a student or schoolchild <input type="checkbox"/> This address <input type="checkbox"/> 1 Elsewhere <input type="checkbox"/></p> <p>If elsewhere, please write the term time address and postcode below in BLOCK CAPITALS</p> <div style="border: 1px solid black; height: 40px; width: 100%;"></div> <p>Post-code <input style="width: 40px; border: none; border-bottom: 1px solid black;" type="text"/> <input style="width: 40px; border: none; border-bottom: 1px solid black;" type="text"/> <input style="width: 40px; border: none; border-bottom: 1px solid black;" type="text"/> <input style="width: 40px; border: none; border-bottom: 1px solid black;" type="text"/></p>	<p>Not a student or schoolchild <input type="checkbox"/> This address <input type="checkbox"/> 1 Elsewhere <input type="checkbox"/></p> <p>If elsewhere, please write the term time address and postcode below in BLOCK CAPITALS</p> <div style="border: 1px solid black; height: 40px; width: 100%;"></div> <p>Post-code <input style="width: 40px; border: none; border-bottom: 1px solid black;" type="text"/> <input style="width: 40px; border: none; border-bottom: 1px solid black;" type="text"/> <input style="width: 40px; border: none; border-bottom: 1px solid black;" type="text"/> <input style="width: 40px; border: none; border-bottom: 1px solid black;" type="text"/></p>