TI-*nspire*™

# GB Olympic medals
## Teacher Notes

In a previous version of this activity students were asked to consider how many Olympic medals Team GB were expected to win in London in 2012. In this version their prospects for 2016 in Rio de Janeiro are assessed.

## Introduction

Students use historical data to try to predict a future events: the number of medals won by Team GB in all of the modern Olympic games may (or may not!) provide a useful estimate of the number that will be won in future Olympics.  Are there patterns in the number of medals won previously? Should the increasing size of the games affect predictions? Just how big is home advantage? There are no "right answers" in this investigation and students need to use their own judgement in assessing which historical data to use and which to reject. All this makes the activity most suitable for use in a classroom situation where students are first able to work individually on TI-Nspire handhelds and then class discussion takes place using TI-Nspire software projected onto a large screen.

As well as learning a little Olympic history, students will need to acquire and practise data-handling skills along the way.

Note: Great Britain is the name under which the United Kingdom of Great Britain and Northern Ireland competes at the Olympics. In this activity the abbreviations UK and GB are used interchangeably.

## Resources

There is a structured TI-Nspire document, **GBOlympicMedals.tns**, divided into 5 separate problems.
>	1) Introduction
>	2) Some Olympic history
>	3) The UK's number of medals
>	4) The UK's share of the medals
>	5) Home advantage

Data for this activity was extracted from the website www.databaseolympics.com, from www.olympic.org and from Wikipedia. It is possible that some students may wish to use these or other websites to search for extra data

## Skills required

Students will need the following basic TI-Nspire technical skills:
- opening a previously saved document,
- moving from one page of a document to another,
- moving from one part of a split page to another,
- use of keyboard to type answers on Q & A pages,
- selecting variables for axes on Data & Statistics pages.

In some cases teachers may need extra skills and these are often referred to in these notes

# TI-*nspire*™

## The activity

### 1) Introduction

| | | |
|---|---|---|
| GB Olympic Medals<br>by Barrie Galpin<br>1) Introduction<br>2) Some Olympic history<br>3) The UK's number of medals<br>4) The UK's share of the medals<br>5) Home advantage | How many Olympic medals (gold, silver and bronze) do you think Great Britain will win in 2016?<br><br>Last time, in London, we won 65 medals, which was 18 more than we won in Beijing, China, in 2008. How many do you think Team GB will win in Rio de Janiero, Brazil, in 2016? | You can use data from previous years to try to predict what may happen in the future.<br><br>But firstly you may need to know a bit about the history of the Olympic Games… |

### 2) Some Olympic History

This section provides some necessary information that enables students properly to interpret the data they will meet in Problems 3 , 4 and 5

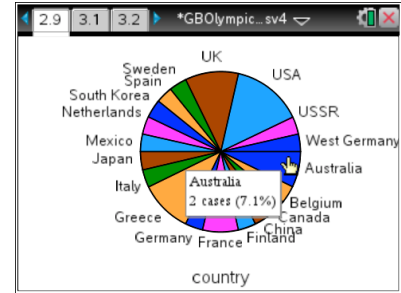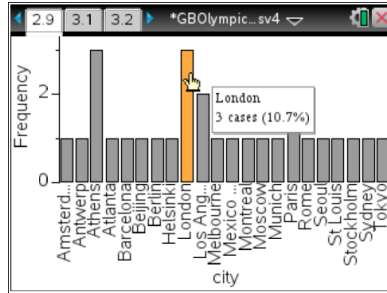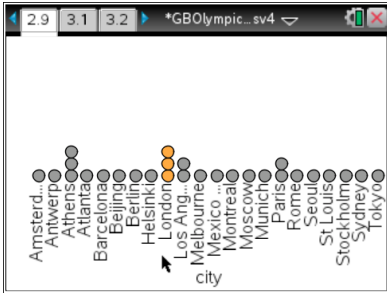| | | |
|---|---|---|
| **The history of the Olympic Games**<br>The *ancient* Olympic Games were held in Olympia, Greece, from the 8th century BC to the 5th century AD.<br><br>They took place every 4 years, a period known as an *Olympiad*. | The actual dates are not certain but the first games may have been in 776 BC and the last in 426 AD. How many Olympiads is that?<br><br>○ Less than 40<br>○ About 120<br>● About 270<br>○ About 350<br>○ Over 400 | Notice that the ancient games took place over a period about 10 times longer than the modern ones! |
| The first of the *modern* Olympic Games took place in Athens, Greece, in 1896 and they have been held in various cities since then.<br><br>Now there are Summer and Winter Olympic Games, Paralympics and Youth Games.<br><br>The rest of this activity concerns just the Summer Olympics. | If you assume that the games took place every 4 years, how many Olympics would there have been from 1896 up to 2012?<br><br>Student: Type response here. | The expected response is 30. This is (2016-1896)/4. Or: 1 in the 19th century, 25 in the 20th century and 4 in the 21st century<br><br>There's a need for inclusive counting because of the wording of the question. |
| In fact 2012 was not the 30th Olympics because they have *not* taken place every 4 years.<br><br>On page 2.6 you can scroll down to see the list of years and the cities and countries where they have taken place.<br><br>Look for when there were extra games or missing ones. | year / city / country<br>1896. Athens / Greece<br>1900. Paris / France<br>1904. St Louis / USA<br>1906. Athens / Greece<br>1908. London / UK<br>1912. Stockholm / Sweden<br>A1 1896 | There was an extra games in 1906 and no games took place during the World Wars. |
| There were no Olympics in 1916, 1940 or 1944. Why do you think this was?<br><br>Student: Type response here. | On the next page a dot chart displays the *years* data.<br><br>Change the variable at the bottom of the page to find out which *cities* have hosted the games more than once.<br><br>Which *countries* have hosted the games more than once? | Note that the dot chart displays years as numerical, rather than categorical, data and this reinforces the extra and missing games. Changing the variable to *cities* and *countries* reveals information that was not obvious from scanning the spreadsheet. |
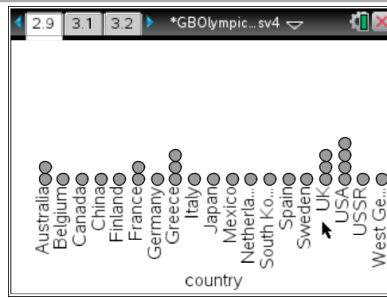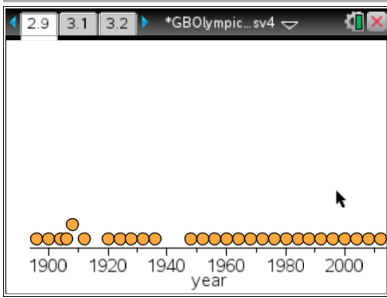
Bar charts and pie charts are alternatives for the categorical data. They can be selected using the Plot Type menu.

## 3) The UK's number of medals

Column C shows the UK's position when countries are ranked in order of total medals won.

**The UK's number of medals**

On the next page you can see the total number of medals won by the UK in each of the modern Olympics. (Column C shows the UK's position in the records table.)

When were the largest and smallest numbers of medals won?

| A year | B ukmedals | C ukposn | D | E |
|--------|-----------|----------|---|---|
| 1 1896. | 7. | 5. | | |
| 2 1900. | 31. | 3. | | |
| 3 1904. | 2. | 6. | | |
| 4 1906. | 24. | 3. | | |
| 5 1908. | 145. | 1. | | |
| 6 1912 | 41 | 3 | | |

A1  1896

On the next page you can produce a scatterplot to show the number of medals won by the UK over the years. Choose appropriate variables for the x- and y-axes.

Would you agree that 1896, 1904 and 1908 were very un-typical results for the UK?

Caption: ukmedals
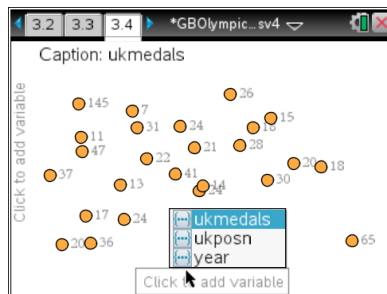
In the early 20th century home nations had a massive advantage: so for example, the UK won nearly half of all the medals in the 1908 games held in London.
This makes the early data unreliable for the purposes of prediction.
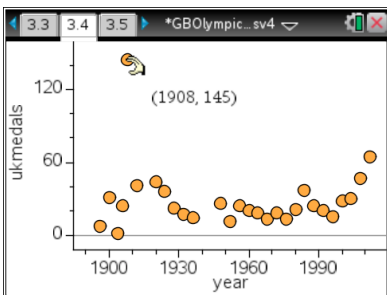
The next page shows the same data but just for the Olympics held since 1948.

Does this graph help you predict how many medals the UK should win in 2016?

It may be important to know that the results for 1980 and 1984 may not be reliable in predicting future results. In 1980 the USA and some other countries boycotted the games. Some UK athletes did not attend but those

It may be important to know that the results for 1980 and 1984 may not be reliable in predicting future results. In 1980 the USA and some other countries boycotted the games. Some UK athletes did not attend but those who did faced less strong opposition than usual. In 1984 the USSR and other communist countries boycotted the games and so the UK won more medals than you might otherwise expect.
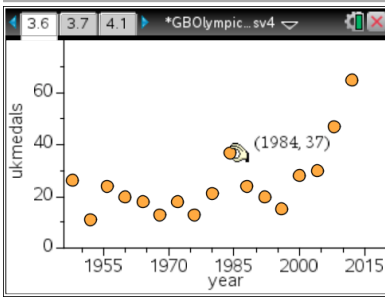
Note that on page 3.6 both x and y window settings have been changed.
Even the data for the games since 1948 need to be interpreted with care, particularly that for 1980 and 1984 when teams from two of the strongest countries did not compete.
It is important for students to look critically at data before embarking on analysis and that lesson can be stressed here.
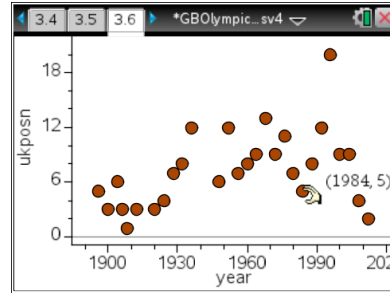
When plotting *ukposn* students have to make a mental adjustment – poor results are now higher on the page.

## 4) The UK's share of the medals
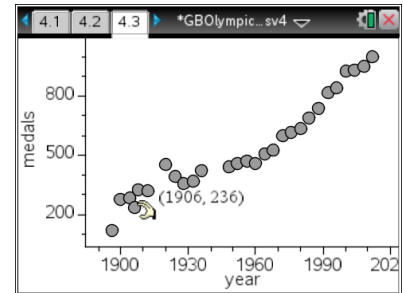
There is clearly the opportunity to discuss and use various regression calculations here. To do this, choose *Regression* from the Analyze menu. For example, you could choose exponential regression then, on a Calculator page, choose stat.RegEqn from the list of variables. stat.RegEqn(2016) is then evaluated as 1004.

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There has been a fairly regular increase in the UK's share of medals since 1996 and you may think it reasonable to assume that this trend might continue.
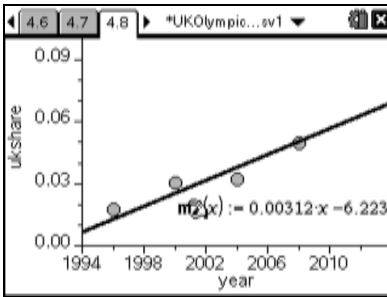
The Movable Line can be entered using option 2 in the *Analyze* menu. Drag the centre of the line to translate it or towards the end of the line to rotate it.
Entering, for example, **m1**(2016) gives an estimate for the predicted share in 2012. Depending on the position of the line this estimate may be about 0.75.

$$m2(x) := 0.00312 \cdot x - 6.223$$

This analysis may yield an estimated number of medals for the Rio de Janeiro games in the mid 70s.

### 5) Home advantage

There are alternative ways of rating home advantage but what is suggested here is comparing the number of medals won by the host nation with the number they won in the next games (usually) four years later.

| year | country | host... | next... | decm... |
|---|---|---|---|---|
| 1896. | Greece | 46. | na | |
| 1900. | France | 108. | na | |
| 1904. | USA | 239. | 24. | |
| 1906. | Greece | 34. | 3. | |
| 1908. | UK | 145. | 41. | |
| 1912. | Sweden | 65. | 62. | |

| 5.3 | 5.4 | 5.5 | ▶ | *GBOlympic...sv4 ▽ |

Go back to page 5.3 and delete all the "dirty data", as well as any numbers that you think tell you nothing about the advantage to the host nations.

Then in the grey cell in column E enter **=c−d** to work out the decreases in medals won by the host nations in their next Olympics. Look for the biggest decreases. Did any do better in their next Olympics?.

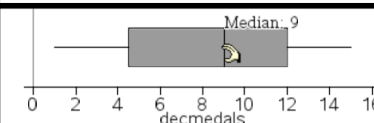| 5.4 | 5.5 | 5.6 | ▶ | *GBOlympic...sv4 ▽ |

What do you think was the average decrease on page 5.3?

Move to the space below and enter **mean(decmedals)** or **median(decmedals)**.

0/99

Clearly, the averages will depend on which data have been rejected. If the games from 1948 onwards are used with 1976 to 1984 omitted the mean decrease is 8.3 medals and the median decrease 9.0

| 5.5 | 5.6 | 5.7 | ▶ | *GBOlympic...sv4 ▽ |

Which average is better for these data? Choose **decmedals** below and then draw a boxplot to see how the values are distributed.

Median: 9

0   2   4   6   8   10   12   14   16
        decmedals

| 5.6 | 5.7 | 5.8 | ▶ | *GBOlympic...sv4 ▽ |

How many less medals do you think the UK will win in 2016 following their home advantage in 2012. Type your prediction for the total number of medals here.

Student: Type response here.

It seems that judging only from previous results of countries after their home advantage, the UK can expect to win about 10 less medals in 2016 than we did in 2012. However, it will perhaps be worth stressing that previous results are not always a reliable predictor of future performance!