LIFT OFF

Teacher Notes

Introduction

A passenger lift will typically carry a sign indicating its carrying capacity in kilograms and the number of people it can accommodate. This activity allows students to compare these data collected from a selection of passenger lifts in the UK and Europe. Students can interrogate the data in various ways to see if:

- the relationship between number of people and mass in kg is consistent;
- there is any difference between lifts in UK and other EU countries.

This is real data and students can be encouraged to add any other data they find.

The activity has been used with middle to high attainers in Key Stage 3.

Resources

There is a TI-Nspire document entitled LiftOff. This has twelve pages including

- explanations and instructions for students;
- two data sets (UK and European) on two separate spreadsheet pages;
- partially complete scattergraphs and boxplots for the two data sets;
- question and answer pages where students can enter their findings;
- a page displaying two boxplots to compare mean assumed weights of UK and European people.

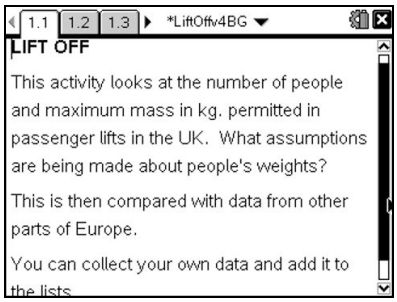
There are notes on the various pages and suggestions for teachers below.

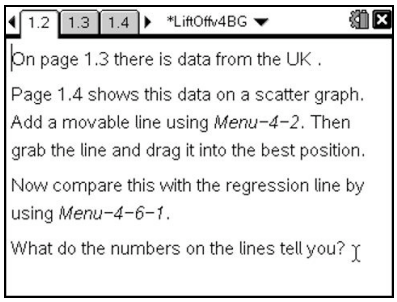
Prior knowledge

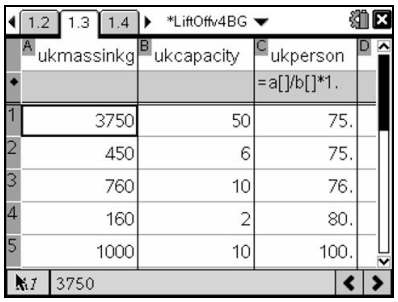
To use the LiftOff document students will need to: -

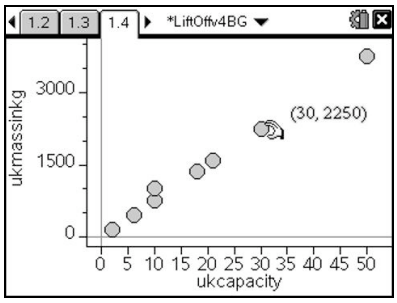
- open a TI-Nspire document and move between the pages of the document;
- move the cursor around the screen;
- grab and drag points on the screen;
- move to a different part of a split screen;
- be able to write on the Q&A pages using the alphabetic keys.

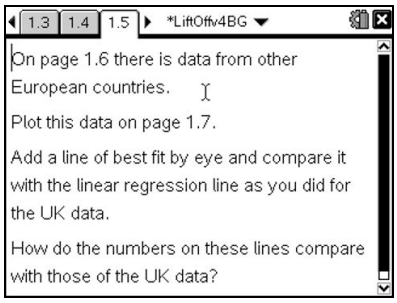
Screenshots of the pages

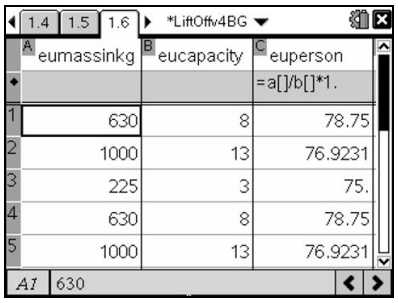


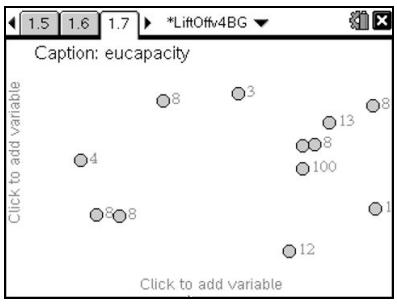


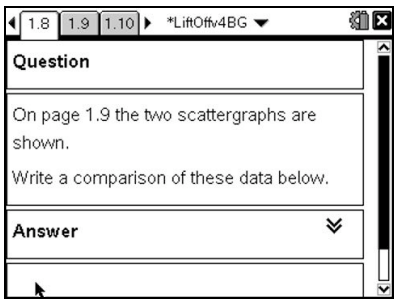


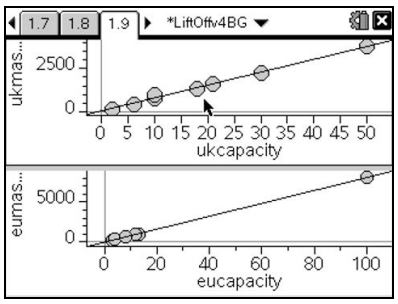


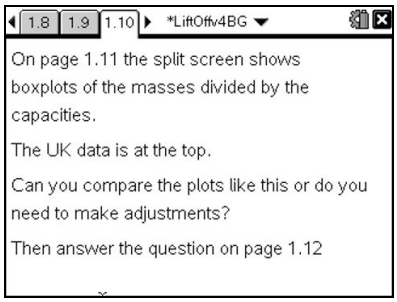


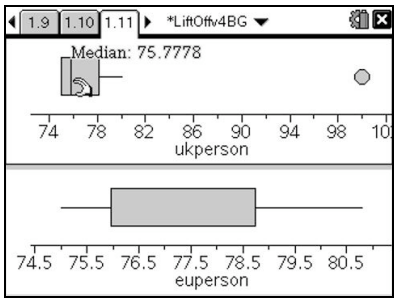


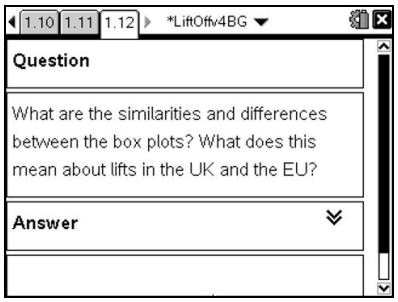












Objectives

Interrogate a database
Draw lines of best fit
Compare a line of best fit with a linear regression line
Interpret the gradient of a straight line
Compare two data sets using scattergraphs
Interpret box and whisker plots
Compare two data sets using box and whisker plots

This activity shows how the links between handling data and algebra can be used to strengthen learners' understanding of gradient and how outliers may affect hypotheses.

Teaching notes

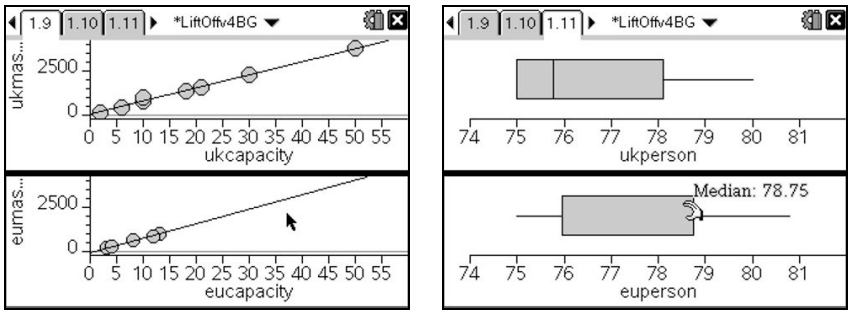
On page 1.3 column C is the result of dividing the maximum mass by the number of people allowed. This gives some idea of what the lift manufacturers expect the average person's mass to be. You may wish to discuss with students the validity of this assumption.

On page 1.4 you may need to explain to students what it means to draw a line of best fit by eye. They were told on page 1.2 how to insert a movable line, but instructions on manipulating it are not included: it is expected that students will explore how to do this for themselves. Then let them explain to others how to do it!
You may also want to explain the term Regression Line – perhaps say that this is the handheld's calculation of the line of best fit.

On page 1.7 students will have to click on the appropriate place on the axes to insert the data they wish to compare on the scattergraph.

Pages 1.9 and 1.11 show scattergraphs and boxplots comparing the two data sets. Students should realise that it is important to change the scales so they are comparing like with like. To change the window settings you need to press (menu) (5) (1) on each part of the split screen.

The boxplot reveals a clear outlier in the UK data, but this is not so obvious from the scattergraph! Similarly the scattergraph reveals an outlier in the EU data that is not obvious from the boxplot. This was not done on purpose, the handheld set it up that way by default and it was only when I was doing these notes that I realised just how rich this activity is! After discussion you may decide that it is best to remove the outliers from the analysis to produce comparative plots as shown below.



The data

The data used were collected from the following lifts.

Lift location in the UK	(mass, people)
Holborn tube station	(3750, 50)
Bonnington hotel, London	(450, 6)
Boots, Southampton	(760, 10)
Aranlaw, Bournemouth	(160, 2)
Bangor	(1000, 10)
Jury's Hotel, Birmingham	(1360, 18)
Marlands, Southampton	(2250, 30)
West Quay, Southampton	(1600, 21)
Car park, Southampton	(545, 8)
Car park, Salisbury	(975, 13)
Debenhams, Salisbury	(1600, 21)

Lift location in the EU	(mass, people)
Hotel, Utrecht	(630, 8)
Freudenthal, Utrecht	(1000, 13)
Copenhagen, Denmark	(225,3)
Uppsala, Sweden	(630, 8)
Hotel, Prague	(1000, 13)
Funicular, Prague	(8080, 100)
Hotel, Alençn, France	(300, 4)
Nîmes, France	(630, 8)
le Puy-en-Velay, France	(900, 12)
Avignon, France	(630, 8)
Rouen, France	(630, 8)
Toulouse, France	(630, 8)

Possible homework

Collect more lift data – either from lifts nearby or from the internet.
Write a report comparing the two data sets.

